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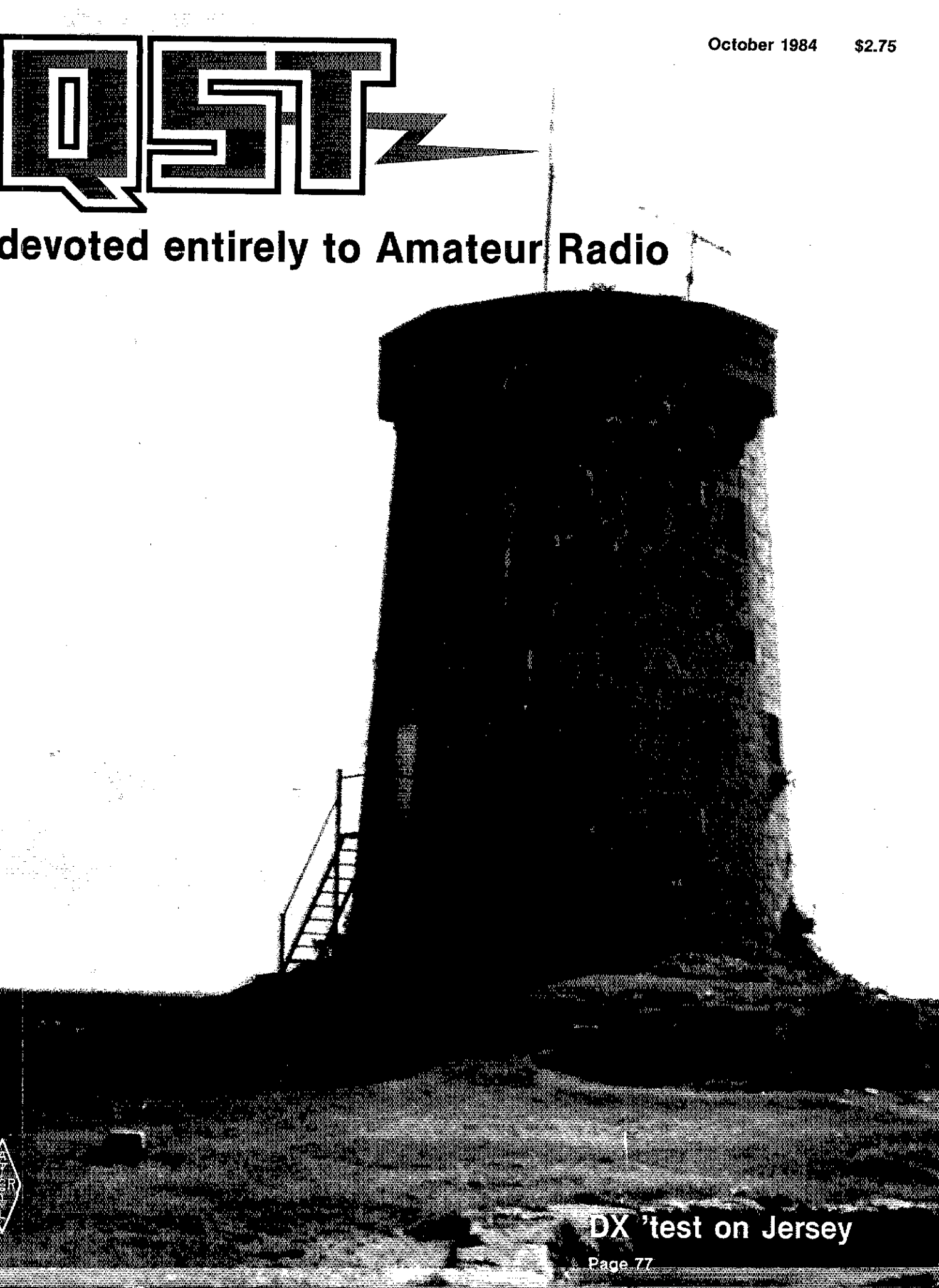

DX 'test on Jersey

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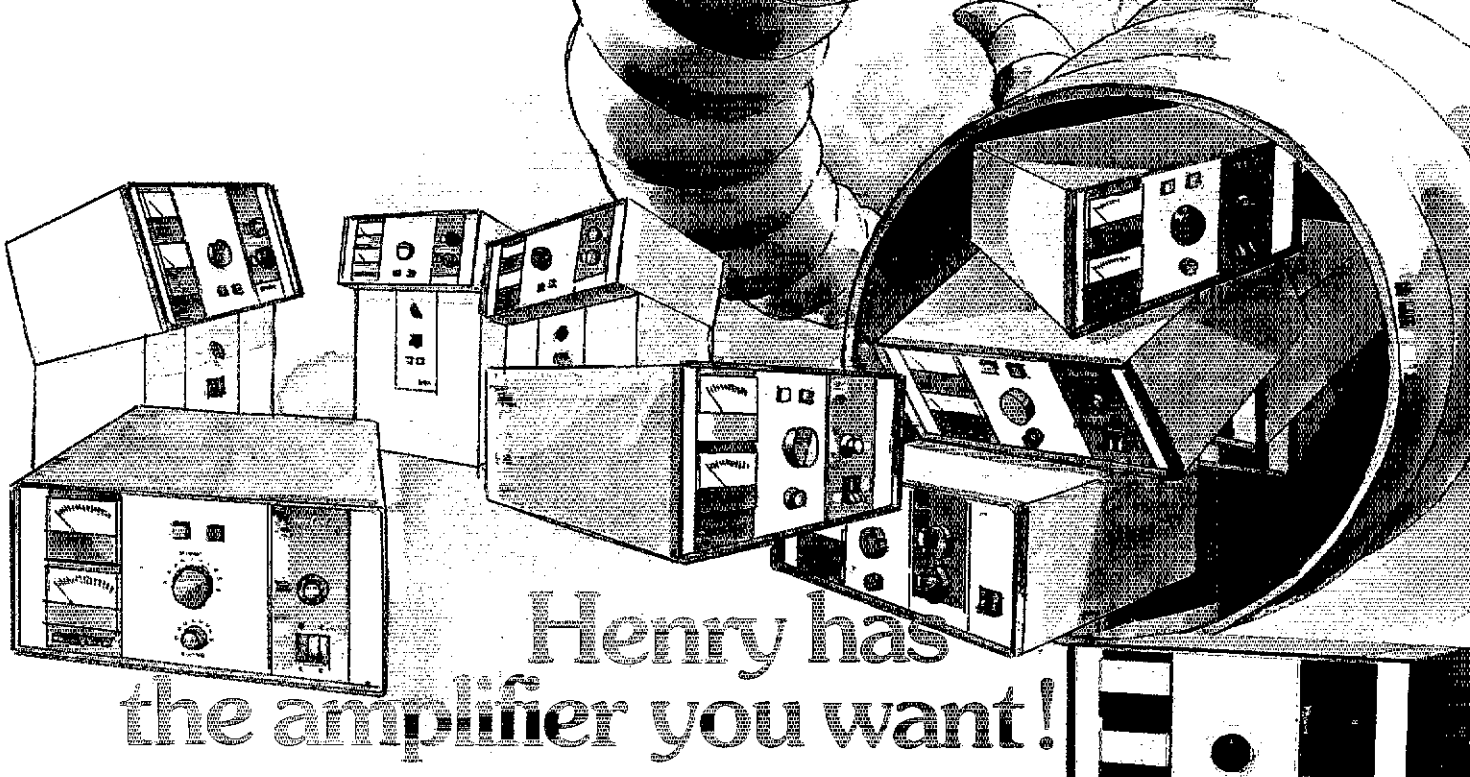


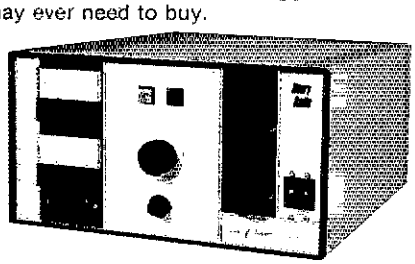
Henry has the amplifier you want!

Take your choice. The world famous 2K Desk Classic, 2K Console Classic and 3K Console Classic HF amplifiers speak for themselves. Now to complete your range of choice, the superb new 1002-A and 2002-A for 146 MHz and the 1004-A and 2004-A for 440 MHz.

Now a veritable cornucopia of superb amplifiers. Just make your choice!

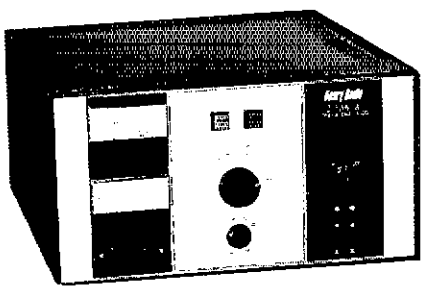
2K Classic...the culmination of more than fifteen years of developing the 2K series into the world famous line that sets the standards for top quality HF linears. A true "workhorse"; built to loaf along at full legal power, trouble free, for years of hard service. Operates on all amateur bands, 80 through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

2K Classic "X"... We can't think of any way to make this magnificent 2000 watt amplifier better. Rugged...durable...the last amplifier you may ever need to buy.



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

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



2002-A...a bright new rework of our popular 2002 2 meter amplifier. Uses the new Eimac 3CX800A7. The RF chassis uses a ¼ wave length strip line design for extremely reliable approach. It provides 2000 watts input for SSB and 1000 watts input for CW. Because this tube is rated at an unheard of 15dB gain, only about 25 watts drive is required for full output.

2004-A is identical to the 2002A except that it is set up for the 430 to 450 MHz band. This amplifier will use a ½ wave strip line and offer all of the same specifications as the 2002A. This will replace our limited production 2004.

1002-A A 2 meter amplifier with the same design as the 2002A, except using one 8874 tube for ½ power specifications. Rated at 600 watts PEP output and 300 watts continuous carrier output. It employs the same strip line design as the 2002A.

1004-A...a half-power version of the 2004A. Will cover the 430 to 450 MHz band using a ½ wave strip line design.

Henry amateur amplifiers are available from select dealers throughout the U.S. and are being exported to amateurs all over the world. Henry Radio also offers a broad line of commercial FCC type accepted amplifiers for two way FM communications to 500 MHz, as well as special RF power generators for industrial and scientific users. Call or write Ted Shannon or Mary Silva for full information.

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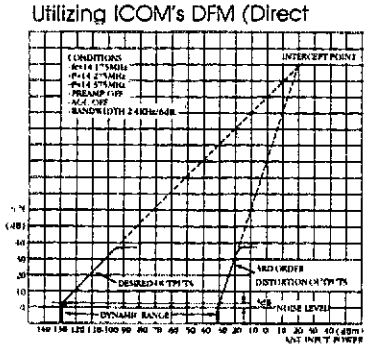
ICOM IC-730

Proven, Reliable HF Compact Transceiver

BUILT-IN SWR BRIDGE | **BUILT-IN RECEIVE PREAMP** | **ONE MEMORY PER BAND** | **DUAL VFOs** | **TUNING KNOB LOCK** | **LARGE RIT TUNING KNOB**

ICOM's IC-730 go-anywhere HF all-band SSB/CW/AM transceiver, the best value on the market, has a proven record of high performance, ease of operation and durability. Compact in size, yet full-featured, the IC-730 has gained an uncomparable reputation.

Receiver Performance. Utilizing ICOM's DFM (Direct Feed Mixer), the IC-730 obtains a dynamic range of 100dB and an intercept point of 19.5dBm.



Superior front-end receiver performance, coupled with a switchable preamplifier and IF shift or passband tuning (optional), gives the IC-730 receiver flexibility yet allows it to be easy to operate.

Compact. The IC-730 is sized to be used mobile — either in a car, airplane or boat — to be carried in a suitcase, or to be used as a base station. Only 3.7 inches high by 9.5 inches wide by 10.8 inches deep, the IC-730 is a very compact package. Still the IC-730 sports a large tuning knob, large RIT knob, and large bandswitching knob to make mobile operation easy. The RIT control is conveniently located in the lower right corner to make access by touch easy while operating the unit mobile.

Convenience Features. The IC-730 has important features that make the unit easy to operate in a mobile environment. Two VFOs are easily accessed at the push of a button. Normal or split operation and three separate tuning rates for fast QSY or slow tuning are available. The dial lock deactivates the main tuning knob for rock-solid stability without the possibility of moving off frequency. One memory per band is provided to allow storage of net frequencies or favorite frequencies at the push of a button.

Full-Featured. The IC-730 has additional features which make it a joy to operate. A full 200W PEP input transmitter provides a powerful signal on SSB and CW (40W carrier power on AM). Eighty through 10-meter coverage is provided including the bands at 10, 18, and 24MHz. A speech processor is included as standard. Popular features such as digital readout, selectable AGC, VOX, SWR meter and noise blanker are also included as standard in the IC-730.

Complete. The IC-730 comes complete with a handheld microphone and power cord. The IC-730 is ready to use and ready to go when you are.

Affordable. Dollar-for-dollar, the ICOM 730 packs more punch and performance into a small package than ever thought possible.

Listen to IC-730s on the air and hear the sound of ICOM quality. The IC-730 is your best buy for a second rig for mobile portable operation or for your main HF station. See the IC-730 at your local ham equipment supplier today!

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The World System

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October 1984 *Volume LXVIII Number 10*

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CONTENTS

OUR COVER

Whether you operated the ARRL DX Contest from a (literal) shack, or, as the Jersey ARS group (GJ3DVC) did, from a 200-year-old tower built to defend the channel island against Napoleon, you'll find your score listed with the DX Test recap that begins on page 77.

TECHNICAL

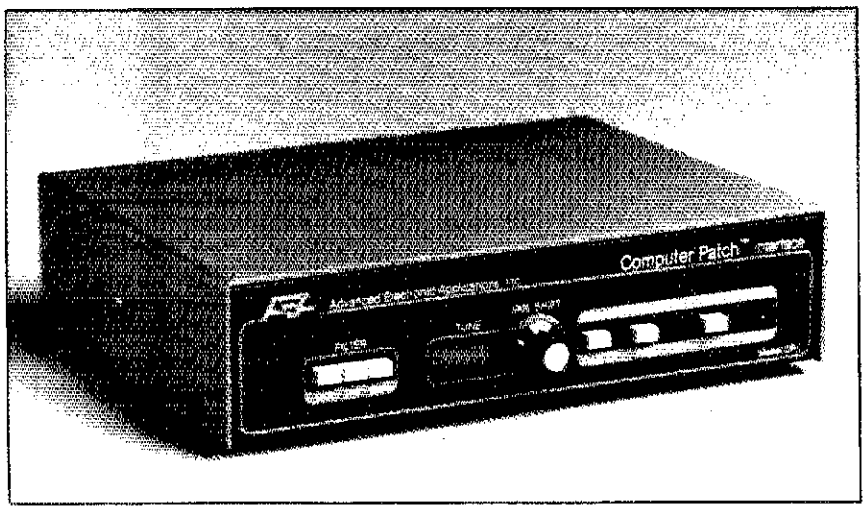
BEGINNER'S BENCH

NEWS AND FEATURES

OPERATING

DEPARTMENTS

ENGINEERING MAKES THE DIFFERENCE



Production Expertise And Service Integrity Form The Foundation For Your Long-Term Satisfaction

The fact that the Computer Patch Interface unit by Advanced Electronic Applications, Inc. is known as the best value on the market is no accident. The CP-1 was designed by Al Chandler, K6RFK (PHD-E.E.), an active RTTY user since 1963.

Given a cost per unit budget for the CP-1, Al designed as much performance as possible into the Computer Patch, including a unique new tuning indicator, referred to by one of our customers as the "Dead Eye Dick" tuning indicator. This indicator is ideal for RTTY and CW, in that it is both fast to tune and (within 10 Hz) as accurate as scope tuning. It also performs under poor signal to noise conditions in which other indicators provide no useful data.

Al's variable shift tuning was designed to move the space filter center frequency from 2225 Hz to 3125 Hz without changing the bandwidth (by varying the Q of the filter). All this is accomplished using a precision ganged potentiometer to assure proper tracking of the multiple filter stages. We could have used a pot costing a tenth as much by simply using a two-pole filter design, but we feel the advantage of a sharper filter reduces the noise bandwidth significantly and allows the variable shift control to be used like passband tuning for extra elimination of adjacent channel interference.

Some manufacturers are concerned that amateurs might try calibrating their own equipment and, therefore, have used non-adjustable components, which results in sub-optimal performance. Although more costly, trimpots used in AEA equipment allow factory adjustment for performance to design specifications. Competently designed active filter circuits need not be adjusted after leaving the factory; however, for specialized use the owner can easily change filter parameters.

Mindful of the fact that many of our customers are new to RTTY, Al made the CP-1 tuning as forgiving as possible, while providing the most critical operator a piece of equipment in which he could be proud. Even old "pro's" are surprised at the poor signal conditions under which the CP-1 will still provide good copy.

You can now experience the BEST RTTY, CW, and AMTOR offered. Couple the CP-1 with our new AEASOFT™ software packages designed for the MARS, SWL, or amateur radio operator, and you will feel a pride reminiscent of what "made in U.S.A." brought in years gone by. Please do not hold the low price of the CP-1 against us. This is one case where you get much more than you pay for relative to any of the competitive units. For more information send for our FREE catalog. Better yet, see your favorite dealer.

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

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

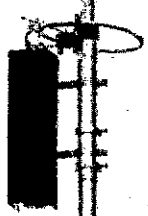
R3 brings high performance antenna features to those living in apartments, condominiums or on small city lots. Even if you have plenty of space, R3's combination of neat appearance and DX capability make it ideal for your station. The R3 includes an integral tuner to give a perfect match across 10, 15,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

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

FEATURES

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

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



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Pocket-size performers!

TH-21AT/41AT

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

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

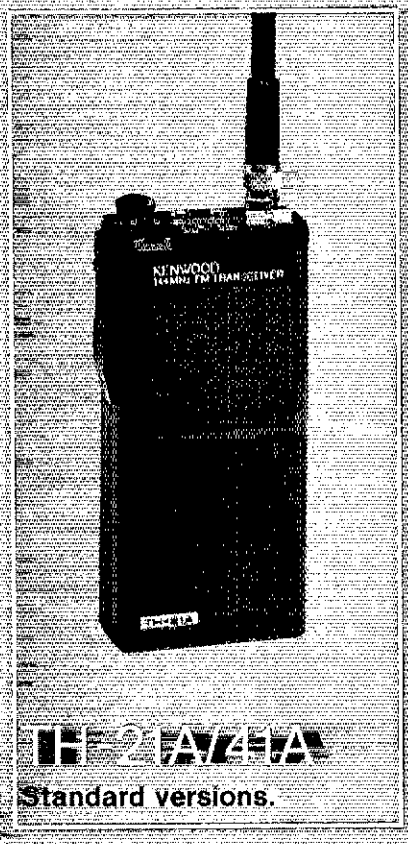
Both the 2 meter and 70 cm pocket/handheld transceivers are available in standard or 16-key autopatch DTMF encoder versions. Kenwood thread-loc antenna connector is also provided.

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

Optional accessories:

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

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



TH-21A/41A

Standard versions.

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

KENWOOD

paceseller in amateur radio

TR-7950, watts to see!

TR-7950/7930

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

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

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

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

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

TR-7950 optional accessories:

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

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

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

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Vermont — Ralph T. Stetson, III, KD1R, P.O. Box 123, Milton, VT 05468 (802-893-4856)
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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: 643958 AMRAD NEWI. MCI MAIL (electronic mail system) ID: 215-5052 (user name: ARRL).

"It Seems to Us..."

Phone Expansion — A Reality at Last

Just in time for the fall operating season, the FCC has come through with a much-needed expansion of most of the high-frequency telephony subbands. (Last month's "Happenings" carried the details, and this month's column lists the changes you need to make to bring your *FCC Rule Book* up to date.) The Friday evening of Labor Day weekend found the Commission's General, Advanced and Extra Class licensees exercising their new privileges in the 80, 15 and 10-meter bands; those in Alaska and the Pacific gained the added benefit of a phone band below 7100 kHz, away from the high-powered broadcasting stations that infest the 7100-7300 kHz segment outside the Americas.

These modest adjustments in the domestic phone bands were long overdue. To appreciate just *how* long overdue, one must turn the calendar back to 1971 — to a time before some present-day hams were even born. In February of that year, the FCC itself proposed an extensive phone expansion in Docket 19162. The inevitable period of discussion and debate followed, during which the amateur community settled on a slightly more conservative approach — an approach that was reflected in the League's comments. Then, more than a year later, citing its concern over the possible migration of overseas phone operators into the lower portions of the exclusive CW segments, the Commission backed away from its own proposals for the higher bands and adopted only a modest increase on 75 and 40 meters.

So matters sat until February 1982. Then, responding to petitions from a number of parties (including ARRL, which in 1981 had sought an expansion of the seriously overcrowded 20-meter phone segment in RM-3860), FCC released a "Notice of Inquiry and Proposed Rule Making" in Docket 82-83, which included a specific proposal for the 20-meter band and solicited comments on the other bands. The League sought membership input in an editorial and article in May 1982 *QST*, and based upon that input formulated an ARRL response in July of that year. The September 1982 *QST* editorial recapped the League's position that was developed by that process.

The next step came in the spring of the following year, when FCC enacted 20-meter phone expansion as originally proposed by the League and released a Notice of Proposed Rule Making soliciting comments on proposals for the other HF bands. Final Commission action, adopting the League's proposals virtually unchanged, came approximately one year after the closing date for comments.

While one might wish for faster action from an administrative agency, in fairness it must be acknowledged that the FCC has had bigger fish to fry in recent months — the issues related to AT&T divestiture being but one example. It also deserves to be said that the turnaround time on Docket 82-83 is probably better than average for a Federal rulemaking proceeding of the non-emergency variety. The Commission made a special effort to complete action before its August hiatus, without which we might have been without our new privileges until late in the year. So, let's not dwell on how long it's taken; instead, let's focus on the positive aspects of the proceeding. There are several.

- Last year's 20-meter phone expansion has provided more elbow room in this popular band — and just in the nick of time, since the declining sunspot numbers have reduced the utility of the 15- and 10-meter bands considerably. The change seems to be well accepted overseas; there has been no movement of foreign phone stations below 14.100 MHz, a possibility which had raised some concern.
- While we won't feel the full effect of the 15- and 10-meter phone expansions until the sun starts showing more freckles, the 75-meter nets will benefit greatly from the 36% increase in the General class 75-meter segment, and Advanced DXers will be able to taste the fruits of 75-meter transceive DX to much of the world for the first time. Extras have twice the room for this than they previously enjoyed.
- Alaskans and Hawaiians will be much better able to use 40-meter phone for intercontinental QSOs than before, an important improvement since 20 meters is closing at night these days (those sunspots, again).
- Perhaps even more significant, this time the *FCC did what we asked!* Sometimes in the past, the Commission staff succumbed to the temptation of substituting its own judgement for that of the Amateur Radio community when there was no overriding public-policy reason for doing so. This time, the dual democratic processes of ARRL policymaking and public comment to FCC were allowed to work — and they *did* work. FCC Private Radio Bureau Chief Bob Foosaner and his staff deserve our thanks for that; more public servants should follow their example.

Enjoy! — *David Sumner, K1ZZ*

League Lines...

The ARRL filed a Request for Issuance of Declaratory Ruling in mid-July requesting that FCC exercise pre-emptive authority over state and local zoning ordinances which affect transmitters and antennas used by hams. This request, if granted, would reduce the number of local restrictive zoning regulations limiting amateur antenna installations. The Commission seeks comments on this filing. An original and four copies of your comments must be received by the Secretary, Federal Communications Commission, 1919 M St., NW, Washington, DC 20054, on or before November 9. Reply comments are due on or before December 14. Comments should refer to document number PRB-1. Copies of the League's request is available from ARRL Hq. for a 9 X 12-inch s.a.s.e. with 88¢ postage.

Several full-time positions are open at ARRL Hq. in Newington. The Club and Training Department has two full-time positions available. The first is Affiliated Club Program Manager. Working with the Assistant Club Program Manager, duties include supervising clerical staff, conducting "Club Corner" in QST, and revising promotional and organizational materials for the Club Progam. Creativity, initiative, excellent writing skills and effective supervisory skills are important. General class or higher ham license is required. Experience in the psychology of groups desirable. The second position is the Assistant Club Program Manager. Duties include editing Radio Club News and contributing to "Club Corner" in QST. Excellent writing skills, a willingness to travel and a Technician class or higher ham license is required. Experience with Amateur Radio clubs a plus. Contact Steve Place, WB1EYI, Club and Training Department Manager, for details. Membership Services is looking for a licensed amateur to fill an opening for Membership Services Assistant. The successful candidate for this non-technical position will have good writing and oral skills, an ability to work effectively with other people, and a desire to work for the interests of Amateur Radio. College degree a plus. Contact Rick Palm, K1CE, Acting Manager, Membership Services Department. The Technical Department has two full-time job openings. One is for an Editorial Assistant with two years of formal electronics training or equivalent experience. The other is for a Technical Information Specialist with at least one year of formal electronics training. Both jobs require Amateur Radio licenses, General class or higher. Please contact Paul Rinaldo, W4RI, Technical Department Manager.

On July 31, the FCC dismissed a petition filed by Dennis M. Dutton, KI4FV, who requested that the Commission revisit the no-code-license issue. Dutton claimed that the international regulations gave the FCC "not only the right to make these amendments, but also the responsibility." The Commission, however, did not see it this way. Private Radio Bureau Chief Robert S. Foosaner noted in the order that Dutton had presented no new facts or issues to warrant further consideration.

Our "new and improved" Amateur Radio press kit, as adopted in Minute 39 of the March 1984 Annual Meeting of the Board, is now available from ARRL Hq. Containing accurate background information, the press kit is intended to be passed out to news reporters covering Amateur Radio activities. Public Information Field Officials and Affiliated Clubs will be receiving samples of the kit in the mail. The new press kits are available from ARRL Special Requests. A $2 donation would be appreciated to help us defray printing and postage costs.

Attention repeater owners and operators: Register your repeater with ARRL Hq. by November 1 so it can be included in the 1985-1986 Repeater Directory. Listings from the current ('84-'85) edition will be carried over as they now appear unless an update comes in. Register your machine using form CD-240, available from Hq. for an s.a.s.e.

AMSAT's 75-meter net frequency has been changed to 3855 kHz. This will allow General class operators to check in. The East Coast, Mid-West and West Coast nets are still 9 P.M. local time every Tuesday.

The 1985 Handbook is going to be a blockbuster! With 1024 pages -- 376 more than last year -- this is the largest Handbook ever. Copies should be on sale in early November. See page 151 for details.

Congratulations are in order for Darrell Pace, N8FTS, winner of an Olympic Gold Medal in Archery at the recent Games in Los Angeles. Also, Sheila Conover, KB6CZX, finished sixth in the Women's 500-meter Kayak Singles.

A Complete Morse-Code System for the VIC 20™ Computer

If you liked the "Keyboard Keyer and Code-Practice System" in January 1984 *QST*, you'll love this receive program.

By Barry King,* KA7SPU

When I read the January 1984 *QST* article by Dan Whipkey, N3DN, I went out and bought a VIC 20 computer, built the interface and entered his program.[1] It worked exactly as described. I was impressed with the versatility of the VIC 20, and began to wonder if I could add code-reading capability to this already powerful system.

Being able to copy Morse code off the air would complement N3DN's keyboard sender, and the ability to monitor a hand key would round out the code-practice system. Could I do this without investing in the usual peripherals, such as expansion RAM for the computer, a disk drive, a printer, a commercially made interface unit or professionally written software? After several false starts, and lots of trial and error in the development of the machine-language code-reading routine, I found that the answer is "yes!"

My program preserves most of the special functions developed by N3DN. Several additional commands have been added to make full use of the reading program. From the keyboard sending mode, pressing the RETURN key takes you into the reading mode and opens the PTT line on your rig. From the reading mode, pressing S (for send) takes you back to sending.

The "up arrow" key serves as a transmit switch, like the PTT switch on your mike. The switch will stay closed until you open it with SHIFT/R or RETURN. If you're using full- or semi-break-in, you may not need that capability, but it's there just in case.

If you're like me, you'll never be able to remember all those commands, but don't despair! Press the @ key, and a menu appears that lists all of the functions, along with those developed by N3DN (for temperature conversion, frequency tables, screen clearing and sending special concatenated symbols). From the menu, you can continue by pressing the space bar or any of the command keys listed in the menu.

As an optional alternative to N3DN's time printer, I designed a six-digit clock that resides in the cassette-buffer-memory area and runs continuously. Time is displayed in the upper-right-hand corner of the screen without interfering with the sending or receiving programs.

The speed range for reading code is about the same as that of the sending program — 3 to 70 WPM. The reading program can understand all of the characters that can be sent by the sending program, except for $\overline{AR}$, $\overline{SK}$, $\overline{KN}$ and $\overline{BT}$. These appear on the screen as the keys used to send them: comma, semi-colon, equals sign and hyphen. Any invalid character, such as four dashes or six dots, prints as an underlined space. That provision allows for the possibility that it was actually a misunderstood letter, in which case the word will appear with an underlined space where the invalid character occurred. Such an error is easier to read than if the invalid character were left out entirely.

Any seven-element character will display "(ERROR)." That may, in fact, be part of the message, as in cases where the operator you're listening to makes a mistake and sends seven dots to indicate his intention to start over.

Software Logic

To intialize the program and enter the keyboard mode, you need to set the time (if you're using the clock) and desired code speed in response to the program queries. If at any point you want to go back and change the transmitted code-speed, STOP the program and type RUN50. That starts with the code speed question and goes on from there.

When you call the reading program with the RETURN key, the code sending speed currently in use is loaded into the reading-program speed variables. From there, automatic speed-adjustment routines take over. Seven variables are used in character analysis and speed adjustment. Incoming dots and dashes are measured and averaged, as are element spaces and character spaces. From this data, an overall speed variable is continually updated. The results are used as criteria for determining whether subsequent elements are dots or dashes, and whether spaces are element spaces, character spaces or word spaces.

In addition to this code-speed fine tuning, there are routines that watch for symptoms of a grossly off-speed condition, such as consecutive dot characters (E, I, S,

[1]Notes appear on page 16.

*1140 W. 12th, Albany, OR 97321

Table 1
VIC 20 Part 1

```
5 PRINT"PACKING PART 1":POKE55,86:POKE56,27:CLR
10 FORA=6998TO7679:READA$
15 B=ASC(LEFT$(A$,1)):C=ASC(RIGHT$(A$,1))
20 D=-(B)64)*(B-55)*16-(B(65)*(B-48)*16-(C)64)*(C-55)-(C(65)*(C-48)
25 POKEA,D:NEXT
30 CLR:PRINT"LOAD PART 2"
100 DATAAD,FB,03,C9,20,F0,60,C9,2C,90,47,C9,5B,B0,43,AA,BD,97,18,A0,D8,84,01,0A
105 DATAC6,01,90,FB,85,02,A5,02,0A,85,02,A0,01,90,02,A0,03,A9,F6,8D,0B,90,A9,01
110 DATA0D,10,91,8D,10,91,20,A9,1B,8C,0B,90,A9,02,2D,10,91,8D,10,91,A0,01,20,A9
115 DATA1B,C6,01,D0,D1,A0,02,20,A9,1B,60,98,0A,0A,A8,A5,00,A2,FA,CA,D0,FD,38,E9
120 DATA01,D0,F6,88,D0,F1,60,A0,04,20,A9,1B,60,73,31,55,32,3F,2F,27,23,21,20,30
125 DATA38,3C,3E,2A,45,80,36,80,4C,80,05,18,1A,0C,02,12,0E,10,04,17,0D,14,07,06
130 DATA0F,16,1D,0A,08,03,09,11,0B,19,1B,1C,68,AA,68,A8,B6,03,84,04,E6,03,D0,02
135 DATAE6,04,A0,00,B1,03,C9,FF,F0,06,20,D2,FF,18,90,EC,A6,03,A4,04,98,48,8A,48
140 DATA60,20,F2,1B,28,45,52,52,4F,52,29,FF,A6,8B,9A,E6,21,A2,02,38,E4,21,B0,0E
145 DATA46,8F,A2,00,86,21,E4,8F,D0,04,A2,20,86,8F,A9,00,8D,0B,90,18,90,12,20,F2
150 DATA1B,0D,52,45,41,44,49,4E,47,0D,FF,A9,00,8D,10,91,A5,8F,85,8D,85,8E,4A,85
155 DATAFD,65,8E,85,FE,A5,8D,4A,85,FB,65,8D,85,FC,EA,A5,C5,C9,29,D0,0E,20,F2,1B
160 DATA0D,53,45,4E,44,49,4E,47,0D,FF,60,A9,00,85,8C,A2,00,A0,00,AD,1F,91,29,04
165 DATAF0,2B,88,D0,F6,E8,E4,8E,D0,EF,E6,8C,A9,04,C5,8C,D0,E5,18,90,B3,E6,20,A2
170 DATA04,38,E4,20,B0,07,38,26,FE,A2,00,86,20,A9,20,20,D2,FF,18,90,A8,E6,20,A2
175 DATA04,38,E4,20,B0,07,38,26,FE,A2,00,86,20,BA,86,8B,18,90,02,8A,48,A2,00,A0
180 DATA00,A9,F6,8D,08,90,EA,EA,EA,EA,88,D0,F4,AD,1F,91,29,04,D0,05,E8,EA,18,90
185 DATAE6,8A,48,BA,86,8C,A5,8B,38,E5,8C,C9,0C,90,03,4C,17,1C,A2,00,A0,00,A9,00
190 DATA8D,0B,90,EA,EA,EA,EA,88,D0,F4,AD,1F,91,29,04,F0,BA,E8,E4,8E,D0,E6,A9,00
195 DATA85,8C,A0,08,68,38,C5,8D,66,8C,88,38,C5,8D,B0,08,65,FB,6A,85,FB,18,90,06
200 DATA18,65,FC,6A,85,FC,BA,E4,8B,F0,0A,68,18,65,FD,6A,85,FD,18,90,D7,38,66,8C
205 DATA8B,18,66,8C,88,D0,FA,A5,8C,C8,C0,30,F0,0C,D9,C2,1B,D0,F6,98,18,69,2B,18
210 DATA90,02,A9,72,C9,45,F0,13,C9,49,F0,0F,C9,53,F0,0B,C9,48,F0,07,C9,35,F0,03
215 DATA18,90,0A,E6,1D,A2,05,E4,1D,D0,06,46,FC,A2,00,86,1D,C9,54,F0,07,C9,45,F0
220 DATA03,18,90,0B,E6,1F,A2,04,E4,1F,D0,07,38,26,FD,A2,00,86,1F,20,D2,FF,A6,8E
225 DATAA0,00,AD,1F,91,29,04,F0,17,EA,88,D0,F5,84,21,E8,A5,8E,0A,85,8C,E4,8C,D0
230 DATAE9,A5,FD,2A,2A,18,90,07,BA,18,65,FE,6A,85,FE,18,65,FD,6A,85,8E,A5,FB,18
235 DATA65,FC,6A,85,8D,EA,EA,EA,EA,A2,00,A0,00,AD,1F,91,29,04,F0,0B,88,D0,F6,E8
240 DATAE4,8E,D0,F1,4C,A3,1C,4C,C7,1C
```

H or 5), consecutive Ts, seven-element characters and excessive insertion of spaces. In such cases, large adjustments are made to the speed variables in an attempt to bring them under the control of the fine-tuning routines.

All of this is done automatically by the machine-language program. All you will see is the final result printed on the screen. In most cases the program will adjust itself, even to large and abrupt speed changes, without missing more than a word or two. Nevertheless, you may encounter an unusual off-speed condition from which the program does not recover, even after several lines of trying. In that case, toggle to the transmit mode and return immediately to receive. That resets the speed variables and gives the computer another try at self-adjustment. If the problem persists, you may have to go back to transmit, STOP the program and type RUN50 to tell the computer the approximate speed of the code you want it to read. With that much TLC, it can hardly fail!

There are actually two programs required to achieve all this. The first one consists of a few lines of loading instructions followed by 29 long DATA statements that contain the machine-language structure. That program takes up 2383 bytes of memory. The second part contains the entire BASIC language portion of the program. It takes up 2814 bytes. If you already know something about the VIC, you're thinking, "Wait a minute! The VIC has only 3583 bytes free, and besides, it's impossible to use two programs simultaneously!" You're right, but hang on a minute and I'll tell you how to make it work.

Here's what happens. The first program is 2383 bytes long and, like all BASIC programs, it loads into the first 2383 available slots of free memory. This leaves over 1000 unused bytes between the end of the program and the limit of memory. When the program is run, the first thing it does is to reset the computer "memory limit" pointers from the actual memory limit to a new position 682 bytes lower. This creates a block of memory that is off-limits to all BASIC programs, and which is protected against interference and erasure.

The program then takes the two-digit hexadecimal values in the DATA statements and packs them, in order, into the reserved section of memory. There are 682 of them, so they fit neatly in that space. This process takes about 40 seconds. When it's done, the program itself is no longer needed, but the 682-byte machine-language routine it has created is firmly entrenched in the top of free memory space, and will stay there until the power is turned off, even if you load and run another program in the 2901 bytes that remain free. The Part 2 program, then, loads into that remaining memory and calls the machine language program when needed.

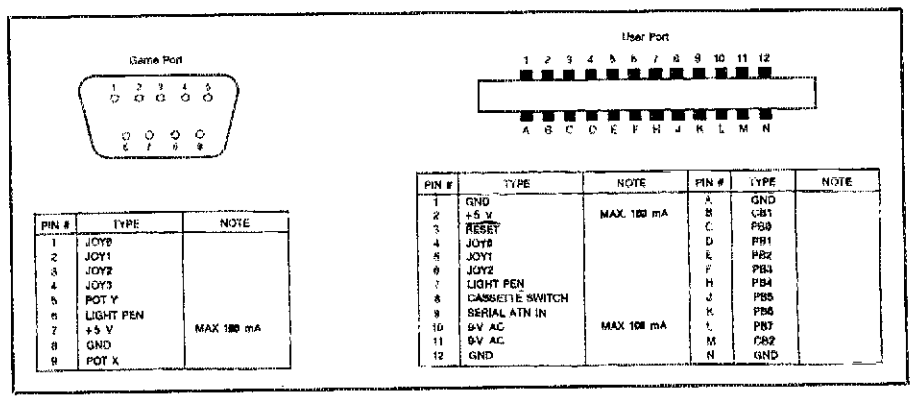
Typing in the Program

The complete program listings for the VIC 20 are given in Table 1, and Table 3 has a listing for the C64 computer. Be very careful when entering the DATA statements of Part 1. A single incorrect or misplaced character in that section can make the program fail. (See Table 2 for a short proofreading program to help you check for errors.) Also, be sure to SAVE a copy of your work on tape before attempting to RUN the program. If it does have a mistake, it may crash and be completely lost. Unless you have a copy, your typing time will be wasted.[2]

SAVE Part 1 at the beginning of a new blank cassette with the command SAVE "PART 1". Then enter Part 2 and SAVE it on the section of tape immediately following the end of Part 1. I like to run the tape forward just a bit after the end of Part 1 to make sure there's no overlap.

When you've got these programs on tape, you can LOAD the whole thing by rewinding the tape then holding down the SHIFT key and pressing RUN/STOP twice. The second stroke goes into the keyboard buffer and is read at the appropriate time as the command to LOAD PART 2.

The computer SEARCHes for, LOADs and RUNs Part 1. The tape stops while Part 1 does its machine-language program-



PIN #	TYPE	NOTE
1	JOY0	
2	JOY1	
3	JOY2	
4	JOY3	
5	POT Y	
6	LIGHT PEN	
7	+5 V	MAX 100 mA
8	GND	
9	POT X	

PIN #	TYPE	NOTE	PIN #	TYPE	NOTE
1	GND		A	GND	
2	+5 V	MAX. 100 mA	B	CB1	
3	RESET		C	PB0	
4	JOY0		D	PB1	
5	JOY1		E	PB2	
6	JOY2		F	PB3	
7	LIGHT PEN		H	PB4	
8	CASSETTE SWITCH		J	PB5	
9	SERIAL ATN IN		K	PB6	
10	9V AC	MAX 100 mA	L	PB7	
11	9V AC		M	CB2	
12	GND		N	GND	

Fig. 1 — VIC 20 Game Port and User Port pin identification information. Note that on the User Port, the terminals named with numbers are on the top of the board, and those identified by letters are on the bottom.

Table 1 (continued)
VIC 20 Part 2

```
1 IFPEEK(833)<>47THENOPEN1:CLOSE1:SYS858
2 PRINT"{CLR}{C/DN}{C/DN} CLOCK SET":INPUT" HHMMSS";A$:IFA$=""THEN10
3 A=848:FORB=1TO4:IFB=3ORB=5THENA=A+1
4 C=A+8:POKEC,VAL(MID$(A$,B,1))+48:NEXT
10 PRINT"{CLR}{C/DN}{C/DN}  MORSE CODE PROGRAM":PRINT:PRINT"     BY N3DN  AND":PRINT
20 PRINT"      KA7SPU/TL8CB":PRINT
25 FORA=1TO2500:NEXT:GOSUB780:PRINT"{CLR}{C/DN}{C/DN}"
30 PRINT" KEYBOARD=1":PRINT:PRINT" CODE PRACTICE=2":PRINT:INPUT" YOUR SELECTION";G
40 POKE36878,15:ONGGOTO50,480
50 CLR:PRINT"{CLR}{C/DN}{C/DN} CODE SPEED":INPUT" WPM";S:T=225/S:PRINT:POKE0,T:TC=0:
   POKE37138,255
70 GETB$:IFB$=""THEN70
75 IFB$="E"THENGOSUB780
90 IFB$="*"THEN350
100 IFB$="+"THEN410
110 IFB$="S"THEN470
115 IFASC(B$)=94THEN890
120 IFASC(B$))132ANDASC(B$)<142THEN210
125 IFASC(B$)=210THEN900
130 IFB$=";"THENPRINT"{AR}";:GOTO190
140 IFB$=":"THENPRINT"{SK}";:GOTO190
150 IFB$="="THENPRINT"{KN}";:GOTO190
160 IFB$="-"THENPRINT"{BT}";:GOTO190
170 IFASC(B$)=13THEN770
180 PRINTB$;
190 POKE1019,ASC(B$):SYS6998:GOTO70
210 N=ASC(B$)-132:ONNGOTO220,230,240,250,260,270,280,290,300
220 AD$=HC$:GOTO310
230 AD$=" DE KA7SPU ":GOTO310
240 AD$=" KA7SPU ":GOTO310
250 AD$=" CQ CQ CQ DE KA7SPU KA7SPU KA7SPU K ":GOTO310"
260 AD$=" R TKS UR RST IS ":GOTO310
270 AD$=" QTH IS ALBANY, OR. ALBANY, OR. ":GOTO310
280 AD$=" NAME IS BARRY BARRY BARRY HW? ":GOTO310
290 AD$=" RIG HERE IS ICOM720-ANT IS DIPOLE ":GOTO310
300 PRINT:CLR:INPUT"HIS CALL";HC$:GOTO70
310 X=1
320 B$=MID$(AD$,X,1):X=X+1
330 IFX=LEN(AD$)+2THEN70
340 PRINTB$;:POKE1019,ASC(B$):SYS6998:GOTO320
350 PRINT"{CLR}":INPUT" FAR=1,CEL=2";H:PRINT
360 ONHGOTO370,390
370 INPUT" DEG. FAR";FA:PRINT:CE=INT((FA-32)*5/9)
380 PRINT" FAR";FA;"= CEL";CE;:PRINT:GOTO70
390 INPUT" DEG. CEL";CE:PRINT:FA=INT(CE*9/5+32)
400 PRINT" CEL";CE;"= FAR";FA:PRINT:GOTO70
410 PRINT"{CLR}":PRINT"FREQ. ALLOC-EXTRA":PRINT
420 PRINT"10 PH.","28500-29700":PRINT"10 CW.","28000-29700"
430 PRINT"15 PH.","21250-21450":PRINT"15 CW.","21000-21450"
440 PRINT"20 PH.","14200-14350":PRINT"20 CW.","14000-14350"
450 PRINT"40 PH."," 7150- 7300":PRINT"40 CW."," 7000- 7300"
460 PRINT"80 CW.","10100-10109":PRINT"AND","10115-10150":GOTO70
470 PRINT"{CLR}":GOTO70
480 PRINT"{CLR}":INPUT" CODE SPEED";CC:PRINT:PRINT:CS=225/CC:POKE0,CS
490 CLR:PRINT" 1=LTRS,NUMS,PUNCT":PRINT
500 PRINT" 2=LTRS,NUMS":PRINT
510 PRINT" 3=LTRS ONLY":PRINT
520 INPUT"YOUR SELECTION";PS:PRINT"{CLR}"
530 CT=1:PRINT:PRINT:PRINT
540 PRINT" 1=RANDOM SPACING":PRINT
550 PRINT" 2=5 CHAR. GROUPS":PRINT
560 INPUT"YOUR SELECTION";SS
570 IFSS=1THEN2R=INT(RND(0)*10)
580 IFSS=2THEN2R=5
590 FORT=1TO2R
600 ONPSGOTO610,630,650
610 RN=INT((RND(0)*47)+44):IFRN)57ANDRN<630RRN=64THEN610
620 GOTO660
630 RN=INT((RND(0)*43)+48):IFRN)57ANDRN<65THEN630
640 GOTO660
650 RN=INT((RND(0)*26)+65)
660 PRINTCHR$(RN);:CT=CT+1
670 POKE1019,RN:SYS6998:NEXTT
680 PRINT" ";:RN=32:POKE1019,RN:SYS6998
690 IFCT>200THEN710
700 GOTO570
710 PRINT:PRINT:PRINT" 200 CHARACTERS SENT"
720 PRINT" CHECK YOUR COPY":PRINT
730 PRINT" 1=ANOTHER SESSION":PRINT
740 PRINT" 2=QUIT":PRINT
750 INPUT" YOUR SELECTION";YQ
760 ONYQGOTO480,10
770 POKE143,2*PEEK(0):SYS7236:POKE198,0:GOTO70
780 PRINT"{CLR}{C/DN}"
790 PRINT" THESE SPECIAL KEYS":PRINT" ARE AVAILABLE IN"
800 PRINT" SENDING MODE:":PRINT
810 PRINT"      ↑:RADIO TRANS.":PRINT"SHIFT/R:RADIO REC."
815 PRINT" RETURN:RADIO REC.AND"
820 PRINT"        READING MODE":PRINT
830 PRINT"   *:TEMP CONV.":PRINT"   +:FREQ. TABLE"
840 PRINT"   £:CLEAR SCREEN":PRINT"   @:READ THIS LIST"
850 PRINT"   ::{AR}":PRINT"   ;:{SK}":PRINT"   =:{KN}"
860 PRINT"   -:{BT}":PRINT:PRINT"   (HIT SPACE BAR)"
870 GETB$:IFB$=""THEN870
880 PRINT"{CLR}":RETURN
890 POKE37134,2:GOTO70
900 POKE37134,0:GOTO70
```

Note that characters inside of braces represent keys on the keyboard. {C/DN} is the ↓ key.

VIC 20 Clock Loader

```
5 PRINT" PACKING CLOCK":FORA=833TO988:READA$
10 B=ASC(LEFT$(A$,1)):C=ASC(RIGHT$(A$,1))
15 D=-(B)64)*(B-55)*16-(B(65)*(B-48)*16-(C)64)*(C-55)-(C(65)*(C-48)
20 POKEA,D:NEXT
25 CLR:FORA=833TO988:A$=A$+CHR$(PEEK(A)):NEXT
30 PRINT" SAVING CLOCK":OPEN1,1,1,A$:CLOSE1
35 PRINT" CLOCK TAPE IS READY"
100 DATA43,4C,4F,43,4B,00,00,00,00,00,00,00,00,00,00,30,30,3A,30,30,3A,30,30
105 DATA18,78,A9,74,8D,14,03,A9,03,8D,15,03,58,60,FE,51,03,BD,51,03,60,A9,30,9D
110 DATA51,03,60,48,08,CE,59,03,D0,5D,8A,48,98,48,A9,3C,8D,59,03,A2,07,20,67,03
115 DATAC9,3A,D0,37,20,6E,03,CA,20,67,03,C9,36,D0,2C,20,6E,03,CA,CA,E0,04,F0,E5
120 DATA20,67,03,38,C9,35,90,1B,AC,51,03,C0,32,D0,09,CA,20,6E,03,A9,31,8D,52,03
125 DATAC9,3A,D0,07,20,6E,03,CA,20,67,03,A2,08,BD,50,03,9D,0C,1E,A9,06,9D,0C,96
130 DATACA,D0,F2,68,A8,68,AA,28,68,4C,BF,EA
```

packing job, and then hands control back to the computer, which starts the tape again to SEARCH for and LOAD Part 2. That part will eventually come up running. All of this is automatic, but it does take quite a bit of time — over 2½ minutes. You might want to start the loading routine a bit ahead of time so that it will be ready and waiting when you need it. Once it's loaded, there are no further delays or pauses in the program operation.

If you want to try the code-reading program with your hand key before investing time and materials in the radio interface, it's easy enough to do. Use miniature clips, or pin-plug sockets, to attach wires to the JOY Ø and GND pins in the VIC joystick port. (See Fig. 1.) Hook these wires to your hand key. Put the program in reading mode and pound away. You'll hear the code you're sending through the TV audio, and you'll see the computer interpretation on the screen.

Adding The Digital Clock

If you don't want to use the clock, delete lines 1, 2, 3 and 4 from Part 2. If you do want to use it, here's how. After you've entered and SAVEd correct copies of Parts 1 and 2 on tape, clear your computer and enter a copy of the clock-loader program. SAVE it, on a separate cassette. Then reload the cassette containing Parts 1 and 2, and position it at a point on the tape just after the end of Part 2. Now, RUN the clock loader. It will take a few moments to assemble the clock in the cassette buffer, and then the program will instruct you to press RECORD and PLAY on the tape player. When you do this, the clock is stored as a short data file that will be loaded automatically by Part 2 each time you start the program. You'll have no further need of the clock loader, unless you later want to make another clock on a different cassette.

When this is done, you're ready to try loading the whole thing. Rewind your tape of "Part 1," "Part 2" and "Clock." Clear your computer, depress the SHIFT key and push RUN/STOP twice. If you've got it all right, the whole program, including the clock, will come up running in a couple of minutes. You're offered a chance to set the clock every time the program is RUN from the beginning. If you don't need to set it, just ignore the question and push RETURN. The clock can be turned off by typing RUN/STOP and RESTORE, and turned on again by the command SYS 858.

The clock has blue digits and runs on a 24-hour format. The color is controlled by the character 06 in line 125. It can be changed to any number from 00 through 07, yielding any of the VIC's eight colors. The numbers correspond to the order in which the colors appear on the keyboard, i.e., 00 = black and 07 = yellow. You can change colors while the clock is run-

Table 2

Proofreading

Many readers have difficulty correctly entering the machine language section of computer programs. Part 1 of my program will be even more difficult than N3DN's was. Here's a short proofreading program that will help you check your entry of Part 1 for errors.

```
970 A=256*PEEK(44)+PEEK(43):FOR
   B=1TO35:C=PEEK(A+2):D=A
980 A=256*PEEK(A+1)+PEEK(A):FOR
   E=DTOA:F=F+PEEK(E):IF F > 999THEN
   F=F-999
990 NEXT:PRINTSTR$(C);":";F,:NEXT
```

Type it in after you've finished typing Part 1 and have SAVEd a copy. Type RUN970 and you will get a list of all the BASIC line numbers, along with a number that is derived from the sum of the numerical values of all the characters in the line. A correct copy of Part 1 yields the following list:

```
  5: 424     10: 876
 15: 215     20: 184
 25: 103     30: 501
100: 615    105: 774
110:  79    115: 422
120: 504    125: 726
130: 910    135:  84
140: 379    145: 549
150: 690    155: 140
160: 560    165:  28
170: 230    175: 572
180:   4    185: 245
190: 788    195: 105
200: 400    205: 807
210: 309    215: 722
220:  55    225: 579
230:  72    235: 426
240: 609
```

If any of the numbers on your own list differ from mine, you have an error somewhere in the indicated line number. Look for it, correct it, and try again. When you're done, erase lines 970, 980 and 990 by typing each of the numbers with nothing following it and pressing RETURN. This method will not catch an error in which two correct characters are out of sequence, nor will it catch two or more errors that, by coincidence, exactly offset each other. Fortunately, most errors are not like that, and will be detected. Now you have an exact copy of Part 1 ready to be SAVEd on tape.

ning by POKEing 973 with one of the color code numbers.

The 24-hour format is controlled by the characters 35 and 32 in line 120. For a 12-hour format, change them to 33 and 31, respectively.

Incidentally, this clock should also work with any of your other VIC 20 or C 64 programs. Just add lines 1 through 4 from Part 2 to that program, and use the clock loader program to make a copy of the clock on tape right after the program with which you want to use it.

Remember that the clock will be erased by any subsequent tape operation. It should be turned off before attempting a LOAD or SAVE.

Building the Interface Circuit

Output Keying

I checked the CW key jack of my ICOM IC-720 for open-circuit voltage and short-circuit current, and found it to be within the capabilities of a transistor. I suspect this would probably be true of most rigs. The limits of the 2N2222 are 30 V and 800 mA. I used a single 2N2222 for keying. The emitter is connected to ground, the collector to the positive key line, and the base to the PBØ user-port terminal (pin C) in the computer. See Fig. 1. A disadvantage of this approach, as compared to N3DN's relay, is that it is polarity sensitive and you must make sure the positive line of your key cord is connected to the transistor. If in doubt, turn your rig on, plug in a keying cord, and short the ends of the wires with a diode. It should key in one direction, but not the other. When it keys, you've got the cathode (marked with a stripe) connected to ground. The other wire is positive and should be connected to the switching-transistor collector.[3]

TR Switching

I still had the relay I purchased for N3DN's circuit. I wanted to be able to do TR switching from the computer keyboard, so I decided to use it for that. The current and voltage requirements in this application are much higher than for keying, at least in the ICOM. I bought a mike connector for the radio, found the two pins that activate the PTT circuit, and hooked them up to the relay contact points. N3DN's circuit for driving the relay from computer output works perfectly, and I have duplicated it in my circuit (Fig. 2), except that it connects to User Port pin D (PB1) instead of pin C (PBØ), since that is where the program directs the TR-switching commands.

Audio Input

Now we get to the bulk of the circuit: the audio input section for reading Morse code. It's built around the 741 op amp, which is available from Radio Shack (part no. 276-007). In this configuration, the 741 serves double duty as a voltage amplifier and as an RC active band-pass filter for a specific audio frequency. That means that if you connect the circuit to the terminals of a speaker that's putting out a faint Morse code signal at, say, an 800-Hz tone, you can amplify the code signal while attenuating static and noise.

This circuit has a high input impedance meant to be connected in parallel with a speaker, not to replace the speaker. If the external speaker jack on your radio is the kind that disconnects the internal speaker when you use it, you will need to modify the radio in some way. You could change the jack to the kind that doesn't disconnect

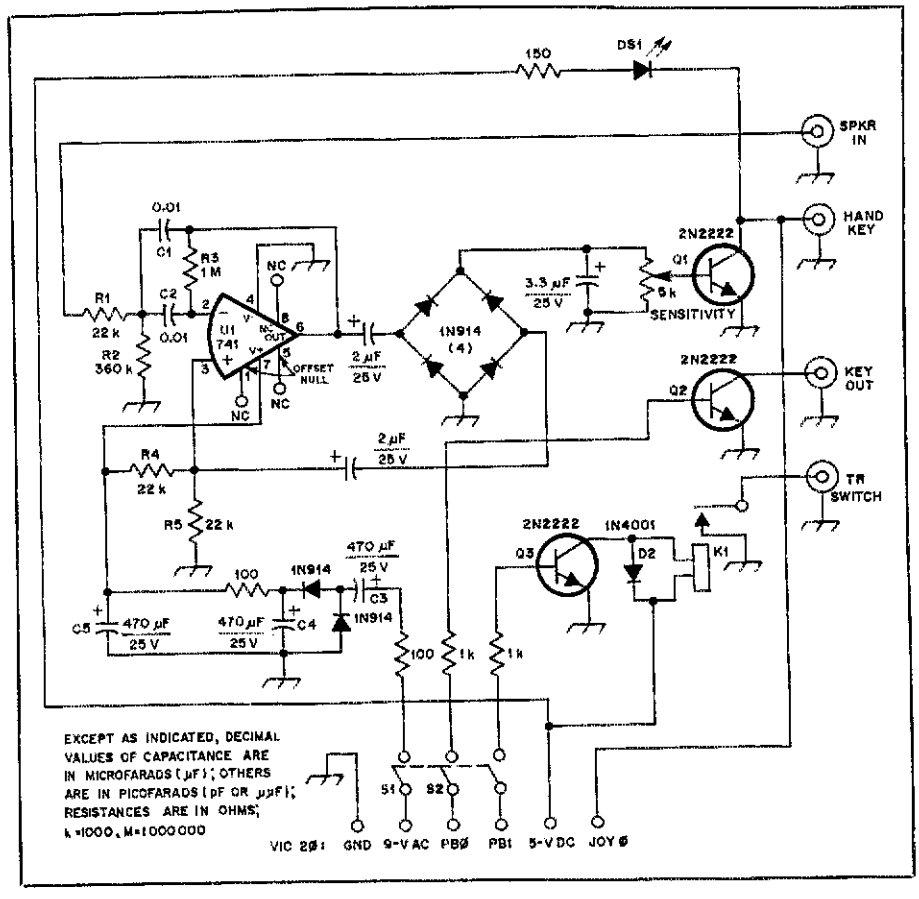


Fig. 2. — Complete schematic diagram of the VIC 20 interface circuit. C1 and C2 along with R1 through R5 produce a band-pass filter centered on 800 Hz. The filter has a gain of 24 and a Q of 27.

K1 — Miniature 5-V relay, Radio Shack part no. 275-240, or equiv.

U1 — 741 op-amp, Radio Shack part no. 276-007, or equiv.

Table 3

C64 Part 1

```
5 PRINT"PACKING PART 1":POKE55,86:POKE56,157:CLR
10 FORA=40278TO40959:READA$
15 B=ASC(LEFT$(A$,1)):C=ASC(RIGHT$(A$,1))
20 D=-(B)64)*(B-55)*16-(B(65)*(B-48)*16-(C)64)*(C-55)-(C(65)*(C-48)
25 POKEA,D:NEXT
30 CLR:PRINT"LOAD PART 2"
100 DATAAD,FB,03,C9,20,F0,60,C9,2C,90,47,C9,5B,B0,43,AA,BD,97,9D,A0,08,84,FB,0A
105 DATAC6,FB,90,FB,85,FC,A5,FC,0A,85,FC,A0,01,90,02,A0,03,A9,11,8D,04,D4,A9,01
110 DATA0D,01,DD,8D,01,DD,20,A9,9D,8C,04,D4,A9,02,2D,01,DD,8D,01,DD,A0,01,20,A9
115 DATA9D,C6,FB,D0,D1,A0,02,20,A9,9D,60,98,0A,0A,A8,A5,02,A2,FA,CA,D0,FD,38,E9
120 DATA01,D0,F6,88,D0,F1,60,A0,04,20,A9,9D,60,73,31,55,32,3F,2F,27,23,21,20,30
125 DATA38,3C,3E,2A,45,80,36,80,4C,80,05,18,1A,0C,02,12,0E,10,04,17,0D,14,07,06
130 DATA0F,16,1D,0A,08,03,09,11,0B,19,1B,1C,68,AA,68,A8,86,03,84,04,E6,03,D0,02
135 DATAE6,04,A0,00,B1,03,C9,FF,F0,06,20,D2,FF,18,90,EC,A6,03,A4,04,98,48,8A,48
140 DATA60,20,F2,9D,28,45,52,52,4F,52,29,FF,A6,8B,9A,E6,21,A2,02,38,E4,21,B0,0E
145 DATA46,8F,A2,00,86,21,E4,8F,D0,04,A2,20,86,8F,A9,00,8D,04,D4,18,90,12,20,F2
150 DATA9D,0D,52,45,41,44,49,4E,47,0D,FF,A9,00,8D,01,DD,A5,8F,85,8D,85,8E,4A,85
155 DATAFD,65,8E,85,FE,A5,8D,4A,85,FB,65,8D,85,FC,EA,A5,C5,C9,0D,D0,0E,20,F2,9D
160 DATA0D,53,45,4E,44,49,4E,47,0D,FF,60,A9,00,85,8C,A2,00,A0,00,AD,00,DC,29,01
165 DATAF0,2B,88,D0,F6,E8,E4,8E,D0,EF,E6,8C,A9,04,C5,8C,D0,E5,18,90,0C,E6,20,A2
170 DATA04,38,E4,20,B0,07,38,26,FE,A2,00,86,20,A9,20,20,D2,FF,18,90,A8,E6,20,A2
175 DATA04,38,E4,20,B0,07,38,26,FE,A2,00,86,20,BA,86,8B,18,90,02,8A,48,A2,00,A0
180 DATA00,A9,11,8D,04,D4,EA,EA,EA,EA,88,D0,F4,AD,00,DC,29,01,D0,05,E8,EA,18,90
185 DATAE6,8A,48,BA,86,8C,A5,8B,38,E5,8C,C9,0C,90,03,4C,17,9E,A2,00,A0,00,A9,00
190 DATA8D,04,D4,EA,EA,EA,EA,88,D0,F4,AD,00,DC,29,01,F0,BA,E8,E4,8E,D0,E6,A9,00
195 DATA85,8C,A0,08,68,38,C5,8D,66,8C,88,38,C5,8D,B0,08,65,FB,6A,85,FB,18,90,06
200 DATA18,65,FC,6A,85,FC,BA,E4,8B,F0,0A,68,18,65,FD,6A,85,FD,18,90,D7,38,66,8C
205 DATA88,18,66,8C,8B,D0,FA,A5,8C,C8,C0,30,F0,0C,D9,C2,9D,D0,F6,98,18,69,2B,18
210 DATA90,02,A9,72,C9,45,F0,13,C9,49,F0,0F,C9,53,F0,0B,C9,48,F0,07,C9,35,F0,03
215 DATA18,90,0A,E6,1D,A2,05,E4,1D,D0,06,46,FC,A2,00,86,1D,C9,54,F0,07,C9,45,F0
220 DATA03,18,90,0B,E6,1F,A2,04,E4,1F,D0,07,38,26,FD,A2,00,86,1F,20,D2,FF,A6,8E
225 DATAA0,00,AD,00,DC,29,01,F0,17,EA,88,D0,F5,84,21,E8,A5,8E,0A,85,8C,E4,8C,D0
230 DATAE9,A5,FD,2A,2A,18,90,07,8A,18,65,FE,6A,85,FE,18,65,FD,6A,85,8E,A5,FB,18
235 DATA65,FC,6A,85,8D,EA,EA,EA,EA,A2,00,A0,00,AD,00,DC,29,01,F0,0B,88,D0,F6,E8
240 DATAE4,8E,D0,F1,4C,A3,9E,4C,C7,9E
```

C64 Part 2

Only those lines with changes to the VIC 20 listing are shown.

```
22 PRINT" COMMODORE 64 VERSION"
25 FORA=1TO2000:NEXT:GOSUB780:PRINT"(CLR)(C/DN)(C/DN)"
27 POKE56579,255
29 S=54272:POKES,110:POKES+1,52:POKES+5,16:POKES+6,240:POKES+24,15
40 ONGGOTO50,480
50 CLR:PRINT"(CLR)(C/DN)(C/DN) CODE SPEED":INPUT" WPM";S:T=225/S:PRINT:POKE2,T:TC=0
190 POKE1019,ASC(B$):SYS40278:GOTO70
340 PRINTB$;:POKE1019,ASC(B$):SYS40278:GOTO320
480 PRINT"(CLR)":INPUT" CODE SPEED";CC:PRINT:PRINT:CS=225/CC:POKE2,CS
670 POKE1019,RN:SYS40278:NEXTT
680 PRINT" ";:RN=32:POKE1019,RN:SYS40278
770 POKE143,2*PEEK(2):SYS40516:POKE198,0:GOTO70
890 POKE56577,2:GOTO70
900 POKE56577,0:GOTO70
```

C64 Clock Loader

Only those lines with changes to the VIC 20 listing are shown.

```
105 DATA09,78,A9,74,8D,14,03,A9,03,8D,15,03,58,60,FE,51,03,BD,51,03,60,A9,30,9D
125 DATAC9,3A,D0,07,20,6E,03,CA,20,67,03,A2,08,BD,50,03,9D,1D,04,A9,0E,9D,1D,D8
130 DATACA,D0,F2,68,A8,68,AA,28,68,4C,31,EA
```

the speaker, or fabricate some other way of hooking up to your speaker without disconnecting it. External speaker sockets that disconnect the internal speaker usually have an unused terminal that remains connected to audio output even when a plug is inserted. You can put a jumper from there to the one where the internal speaker is connected, or just connect the internal speaker wire directly to the other terminal.

The amplified and filtered signal can be rectified, filtered again and used to bias a switching transistor, which can then be read by the computer. I originally tried to do this with another miniature relay, but the speed of the machine-language program is such that even the slightest relay-contact bounce was read as a code element of infinitesimal length. The status of the switch is tested tens of thousands of times every second. Although this could probably be corrected with a debouncing circuit, solid-state switching seems to be a better all-around solution.

To provide some control over the switching sensitivity, I applied the dc output of my circuit to one side of a 5-kΩ potentiometer and grounded the other side. The potentiometer becomes a variable voltage divider. The wiper can tap into any dc voltage between ground and the amplifier output, which is determined by the strength of the signal you're reading and the voltage gain of the op amp (more on that later), up to a maximum of 5 or 6 V. The amplifier output may vary with the signal strength and the volume setting on your radio. The voltage needed to bias the switching transistor remains constant, but you will always be able to find a range of positions on the potentiometer where the dc voltage goes over that threshold when a code element is present, and drops below it during the spaces. That's exactly what you need for accurate code reading!

I needed a way to monitor the performance of the switching transistor while setting the pot. An LED (Radio Shack part no. 276-021A) with its anode connected to +5 V, and cathode connected to the transistor collector, does the trick. The light turns on when the transistor is forward biased, and off when it's not. I drilled a hole through the Commodore logo at the top left of the computer and placed the LED there. The potentiometer can be used to adjust switching sensitivity until the blinking light matches the code you want to read. Acceptable performance can be obtained over a wide range of settings. I have achieved the best results by setting the radio volume low and the variable resistor near the high end of its range, but only a little higher than the point where the light first starts to blink. The software is designed to read a connection between the Game I/O or User port pin JOYØ and GND as a code element.

Power Supply

Capacitors C3 to C5 and the other components near them make up the op-amp power supply. They draw a tiny amount of current from the VIC 20 9-V ac supply and put out about 14-V dc for the op amp, with the 470-μF capacitor I used. The 741 normally needs both positive and negative power supplies. R4 and R5 make a voltage divider used to create a pseudoground at a voltage that is half the total. This approach allows us to connect pin 3 of the amplifier to the pseudoground and apply true ground to pin 4 as −7 V and the positive dc supply to pin 7 as +7 V.

Customizing The Audio Frequency

Capacitors C1 and C2 are the key to the circuit filtering performance. Unwanted signals can be attenuated two ways: by keeping them off the input terminal in the first place, or by bringing their result from the output back to the input on the feedback line that goes from pin 6 to the junction of C1 and R3. This works because the 741 is wired as an inverting amp, meaning that the output is opposite in polarity to the input. If an instantaneous voltage at the input was +3 V on a unity-gain op amp, the output would be −3 V. It's clear that a shorted feedback line would cancel everything to zero. A selectively closed feedback line, though, cancels only those

signals that are high enough in frequency to get from the output, through C1 and C2, and back to the input. That's the low-pass filtering. C2 and R2 also perform the high-pass filtering by shorting the low-frequency signals to ground before they arrive at the amplifier input.

The center frequencies are high enough to squeeze through the input filtering, but not high enough to develop a lot of self-canceling feedback. In this application, we can get away with using a very high Q (narrow filter bandwidth). No one is listening to the output except the computer, and it doesn't care at all about tone quality, which is usually the limiting factor on the Q of CW audio-filtering circuits.

The voltage gain, center frequency and Q of the circuit are all determined by the relative values of resistors R1 through R5 and capacitors C1 and C2. You can customize the circuit performance by varying these components to achieve the characteristics you want.

You will probably want to read code at the same pitch as the sidetone your radio generates. Match the filter characteristics of your interface to the center frequency of the CW filter in your transceiver. On many rigs that frequency is around 800 Hz.

Formulas for this kind of circuit can be found in *The Radio Amateur's Handbook*, pp. 4-47 and 8-29. The exact values of gain and Q are not really critical. High Q narrows the bandwidth of your filter; low Q broadens it. High gain means your system will work with the radio volume turned down and the SENSITIVITY potentiometer turned down; low gain means the opposite. The more important task is to find any reasonable pair of values for gain and Q that will make a circuit to filter your chosen frequency, and that can be built with standard-value components. Most combinations of gain, Q and center frequency will call for resistances and capacitances that can't be easily achieved when it comes to actually assembling the circuit.

That means using the formulas by trial and error, which would be very time-consuming on a calculator. I know you have a VIC 20, or are going to get one (otherwise you wouldn't be reading all this), so let's use it to do the dirty work. Table 4 lists a short BASIC Program for this task.

Enter your chosen center frequency in line 10 instead of the 800 Hz that I used, and the value of your capacitors if they're different from mine, which are 0.00000001 F, or 0.01 μF. RUN the program, choose a value for gain and another for Q in response to the computer queries, and see what you get. Each complete circuit design takes only a fraction of a second, so you're free to try as many as you like.

I cannibalized an old cassette player for resistors and capacitors. This program discovered a circuit with a gain of 24 and Q of 27, which I could build with the parts I found inside of that unit. Those values are shown on my schematic. You can use my values if you like, but it's easy to design your own, with the help of the VIC.

Once you've customized the circuit to read code at your chosen audio frequency, it's nice to adjust the computer program so it will generate that same tone through the TV audio in keyboard sending, code practice and reading modes. The pitch of the computer-generated code is controlled by the hexadecimal numbers "F6" that appear in lines 105 and 165 of Part 1. F6 is the hexadecimal equivalent of the decimal number 246. These values are packed into memory locations 7075 and 7388. You can check them any time after Part 1 has done its packing, by typing in the commands ?PEEK (7075) and ?PEEK (7388). Both should return the number 246. The first one controls the pitch of the sending program code; the second, that of the reading program. They produce an 800-Hz tone on the TV audio.

To select a higher pitch you need to change 246 to a higher number (up to 255), and vice versa. Change the numbers with the commands POKE 7075,X and POKE 7388,X (X being the new number you want to try). Run the program, listen to the results, compare it to the sidetone from your rig, and change it again as necessary. When you've found the number you want, convert it to hexadecimal. (For an explanation of decimal to hexadecimal conversion, see N3DN's article in January *QST*.) LOAD and LIST Part 1, lines 105 and 165, and type in your new hexadecimal number in place of the F6 values. Be sure to copy over the remainder of these lines when you make the changes. SAVE the modified program in place of the original, and you're all set.

Table 3 (continued)
Notes on the C64 Version

The 64 has two sets of joystick switches.

Connect the interface wire marked "Joy Ø" to "Joy BØ" in the 64. All other connections are the same as those on the VIC.

The pitch of the audio tones generated by the 64 can be changed by varying the values POKEd to S and S+1 in line 29 of Part 2.

On some TV screens, the clock may be hidden just off the top right corner of the screen. To move it nearer the center, find the 1D values in line 125 of the (C64) clock loader and change them to a lower number, like 10. The color of the digits is controlled by the 0E in line 125, and may be changed to any of the 16 available colors.

Running the proofreading program (Table 2) with the C64 Part 1 gives the following list:

```
  5: 472      10:   6
 15: 342      20: 309
 25: 226      30: 622
100: 783     105:  72
110: 505     115: 907
120: 997     125: 218
130: 400     135: 571
140: 874     145:  44
150: 223     155: 689
160: 111     165: 574
170: 774     175: 115
180: 522     185: 771
190: 317     195: 631
200: 924     205: 340
210: 839     215: 251
220: 581     225: 107
230: 597     235: 952
240: 154
```

Table 4
Filter-Value Program

```
10 F0 = 800:W0=2*3.1416*F0:C1=.00000001
20 INPUT "GAIN"; AV: INPUT "Q";Q
30 R1=Q/(AV*W0*C1)
40 R2=Q/((2*(Q^2)-AV) *W0*C1)
50 R3=(2*Q) / (W0*C1)
60 R4=.02*R3
70 PRINT"R1=";R1:PRINT"R2=";R2:PRINT
   "R3=";R3:PRINT"R4=";R4:GOTO10
```

Summary

This Morse code system provides good performance at a very reasonable price — even if you were to buy a new VIC 20 especially for it. It can be used as a starting point for further development, depending on your own interests. Hardware fans might want to add a small audio amp and mike plug so the VIC could actually hear and read the sound of code. Software fans may want to find ways to add screen windows, word-processing functions and the ability to generate hard copy on a printer.

A note to programmers: The program is tailored to the unexpanded VIC 20. It should also work with the 3-kbyte expansion, but any larger expansion will use the area where I put machine language for screen memory. The machine language is not relocatable. Although I kept absolute addresses to a minimum, there are still some there, and these would have to be changed before you could relocate the program.

Enjoy your computerized CW terminal!

Notes

[1]D. Whipkey, "A Keyboard Keyer and Code-Practice System," Jan. 1984 *QST*, pp. 13-16.

[2]The author will supply a copy of the programs to anyone who sends him a blank cassette tape and a self-addressed stamped cassette mailer, along with $3 to cover handling. Be sure to specify whether you want the VIC 20 or C 64 version. The ARRL and *QST* in no way warrant this offer.

[3]This will work only if your rig requires a connection to ground for keying. If it needs a voltage source for keying, build the circuit shown in the 1984 *Radio Amateur's Handbook*, p. 11-3, Fig. 5. It provides output for both kinds of keying.

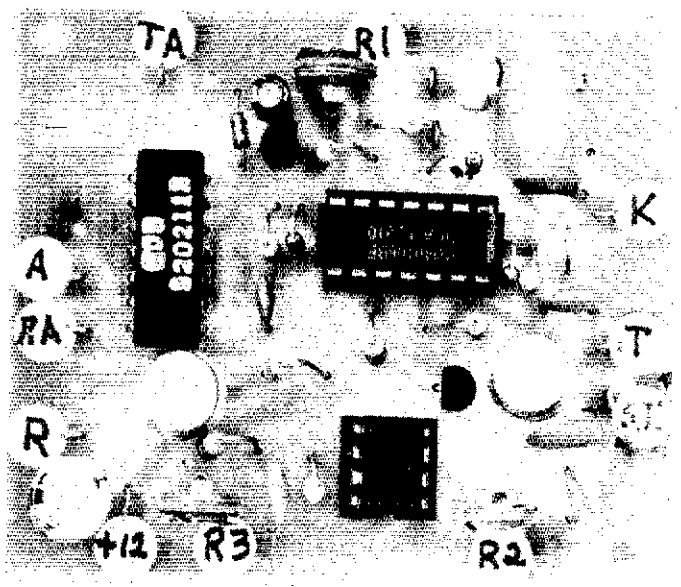
Strays

I would like to get in touch with...

☐ anyone with a service manual for a CLEGG FM-DX transceiver. Alan H. Carp, K1HLZ, 4 Post Oak La., Natick, MA 01760.

TR Circuits for Homemade Rigs

BEGINNER'S BENCH



The published circuits for many solid-state transmitters of amateur design lack TR or break-in delay circuits. This month's workshop project is a TR module for full QSK or semi break-in.

By Doug DeMaw,* W1FB

Did you build a CW rig from an article, but found that it lacks a TR (transmit-receive) circuit that does not require manual operation? We often find ourselves duplicating solid-state transmitter designs, only to do a bit of head scratching in an effort to come up with a suitable TR type of circuit.

The trend today is toward full break-in (QSK) by CW operators, but few commercial transceivers contain that feature. I think an ideal solution is to have the equipment outfitted for semi or full break-in at the flip of a switch. Traffic handlers and many ragchewers prefer full break-in for expediency in getting from the transmit mode to the receive mode almost instantly. The more casual operator may not care to be so fast on the draw, so he or she may prefer a delay period between transmit and receive — the common feature of most commercial transceivers today.

Whatever your preference, the practical circuit in this article provides the choice between break-in delay or full QSK for low-power transmitters. It also contains a sidetone generator and dc switching for muting the receiver during transmit periods. It is compact and inexpensive to build, and a parts kit is available.[1]

Simple TR Methods

In the early days of Amateur Radio, many of us were satisfied to throw one or more switches to change from transmit to receive. It was not uncommon to throw three or four switches in those days of long transmissions on AM or CW, which surely aided the acquisition of the ARRL Rag Chewers' Club certificate! In my shack, at the start of my amateur experience, I threw two toggle switches and a large knife switch to transfer the transmitter and receiver operating voltages. The knife switch took care of antenna changeover!

Today's operation prohibits such archaic TR techniques, and we can be thankful for that. But, we are still restricted by the delay features contained in the VOX (voice-operated switch) circuits of modern equipment. The drop-out (delay) period can be set by the operator through adjustment of a delay control, but erratic operation will result when we attempt to provide instantaneous break-in with VOX circuits. Furthermore, the relay that switches the antenna will not follow fast CW without the contacts bouncing apart or hanging up during the keying period. We should have no trouble envisioning the kind of CW that would be generated with that anomaly taking place! The reed relay offers the best solution to the problem, up to a specific RF power limit. It switches with minimum contact bounce and is suitable for all but high-speed CW work. Too much current through the contacts, however, will cause arcing and subsequent sticking of the contacts.

Solid-state switching seems to be the best way to go for TR purposes, but the state of the art has not favored high-power TR switching at RF. High-power transistors

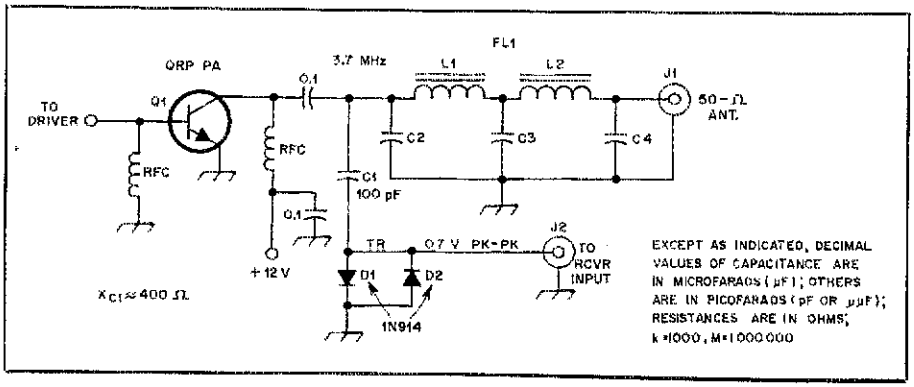


Fig. 1 — Schematic diagram of a simple TR circuit that utilizes a pair of small-signal diodes to shunt the sampled RF energy to ground during transmit periods. This circuit is suitable for low-power operating only, and permits approximately 0.7 V to reach the receiver input circuit.

[1]Notes appear on page 20.

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

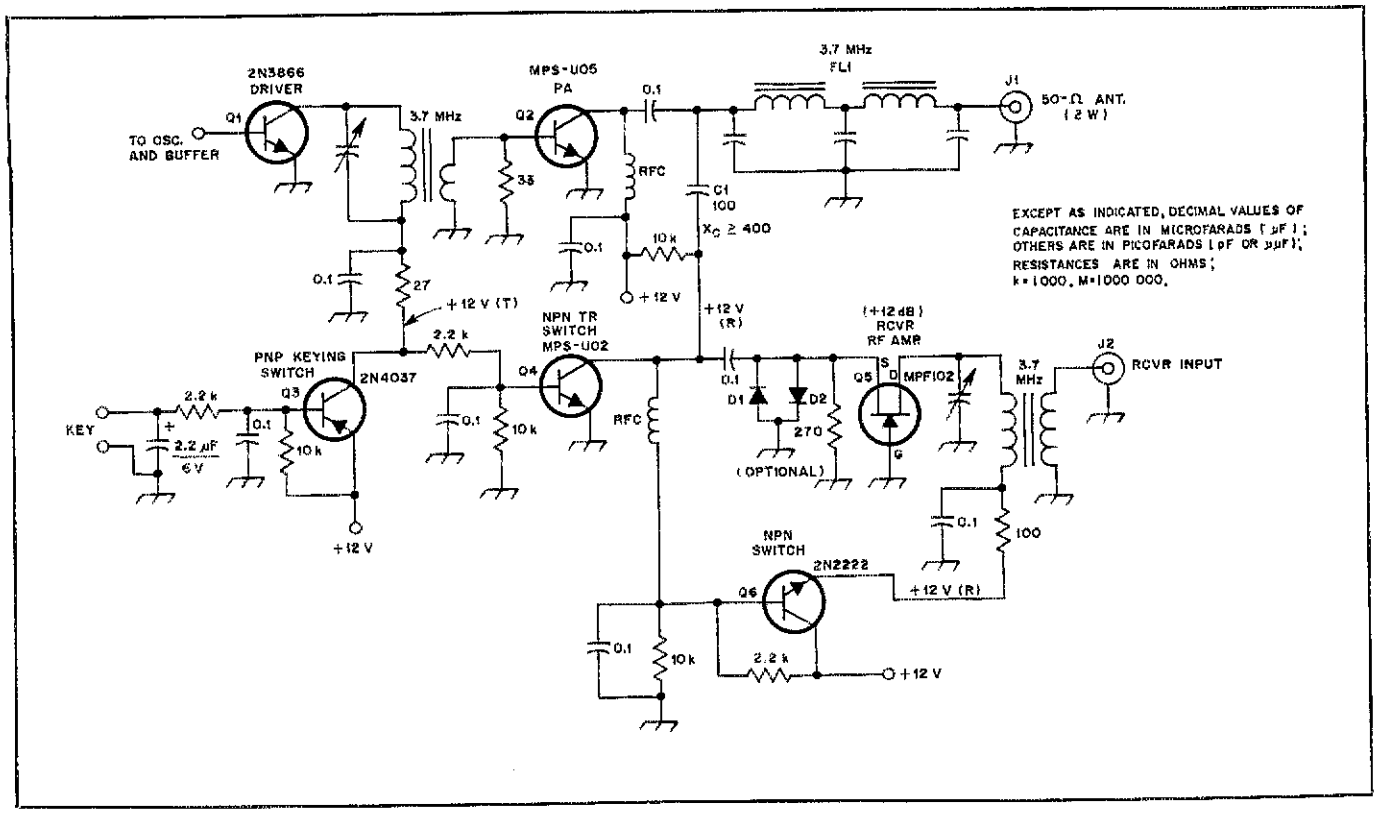


Fig. 2 — A circuit example of a suggested TR circuit for use with low-power transmitters to permit full QSK. The TR logic provides for transmitter keying, antenna switching and receiver RF amplification. An explanation is in the text.

and diodes offer too much leakage from the transmitter to the receiver, and devices that would be well suited to high-power operation would carry a prohibitive price tag. More work needs to be done in this area, especially with regard to PIN diodes. MOS power FETs also offer good promise in this area.

The QRP operator is fortunate with regard to solid-state TR switching, because many diodes and transistors are available for this application at low cost. Let's examine some proven and suggested circuits for low-power solid-state switching of dc and RF. Fig. 1 shows a method used by Wes Hayward, W7ZOI, in some of his QRP transceivers. It suffers a couple of minor shortcomings. These trade-offs often come with simplified circuitry.

Q1 of Fig. 1 represents the last stage of a transmitter. A typical output LC network (C2, C3, C4, L1 and L2) forms a half-wave harmonic filter. The station antenna is connected to J1 of the transmitter. At the Q1 side of the network we attach C1, a sampling capacitor. The value of C1 must be included in the calculation of the value of C2, since the two capacitors are in parallel during key-down periods. During receive, FL1 is between the antenna and the receiver input circuit, thereby adding some low-pass filtering during receive. There will be a slight insertion loss through the filter (unavoidable), however, and the size of C1 will be so small that additional losses will result during the receive period. It is necessary to keep C1 small in value to prevent significant loss to ground via D1 and D2 during transmit. This is one of the trade-offs mentioned earlier. A capacitive reactance (X_c) of 400 ohms is suggested for C1. Do not use a lower value. Assuming the circuit in Fig. 1 was designed for the 80-meter Novice band (3.7 MHz), we would arrive at the recommended capacitance value from

$$C_{\mu F} = \frac{1}{f(MHz) \times X_c \times 2\pi} \quad \text{(Eq. 1)}$$

$$C = \frac{1}{3.7 \times 400 \times 6.28} = 0.000107\ \mu F$$

where X_c is in ohms. From this we can see that 107 pF is required. Since 100 pF is the nearest standard value for C1, we shall use it. Thus, when calculating the value for C2, we must include the 100 pF of C1 in the design.

The remaining trade-off for the circuit of Fig. 1 is the barrier voltage of the shunt diodes, D1 and D2. If we use 1N914s or some equivalent silicon diode, they will conduct and clamp the voltage level at roughly 0.7. This amount of RF voltage will not harm the receiver input, but if the receiver has AGC it may lock up the AGC circuit, causing a delay in receiving until the AGC circuit recovers.

The signal loss with this sample TR circuit may reach 10 dB, which on the higher HF bands may be prohibitive in terms of receiver noise figure. I have used this technique successfully in simple gear from 160 through 30 meters. I have a better circuit for these bands and higher — see Fig. 2.

Improved Solid-State QSK

Although the circuit of Fig. 2 may look overly elaborate for a low-power transmitter, it is inexpensive and requires very little space on a circuit board. It illustrates how we might overcome the loss mentioned in our discussion of Fig. 1. Q3 is used as the keying transistor. When the key is closed, Q1 conducts and permits the flow of dc to the driver, Q2. At the same moment it provides forward bias to Q4, which conducts and shorts out the RF energy through C1. Q4 is more effective for this function than are D1 and D2 of Fig. 1. The resultant RF voltage to Q5 is on the order of 100 mV, key down. D1 and D2 of Fig. 2 need not be used unless you are weak of heart. That is, if you fear a failure of Q4, the diodes will afford backup protection of the receiver RF amplifier, Q5.

A grounded-gate FET stage, Q5, serves as an RF amplifier to compensate for the loss through the TR circuit (discussed with regard to Fig. 1). During transmit, the +12 V to Q5 is removed by means of NPN switch Q6. When Q4 is conducting (during transmit), the forward bias to Q6 is removed, thereby turning off Q6. TR switch Q4 also protects the source of Q5 from excessive RF energy when the key is closed.

This circuit is similar to one I have used a number of times. The transistors specified

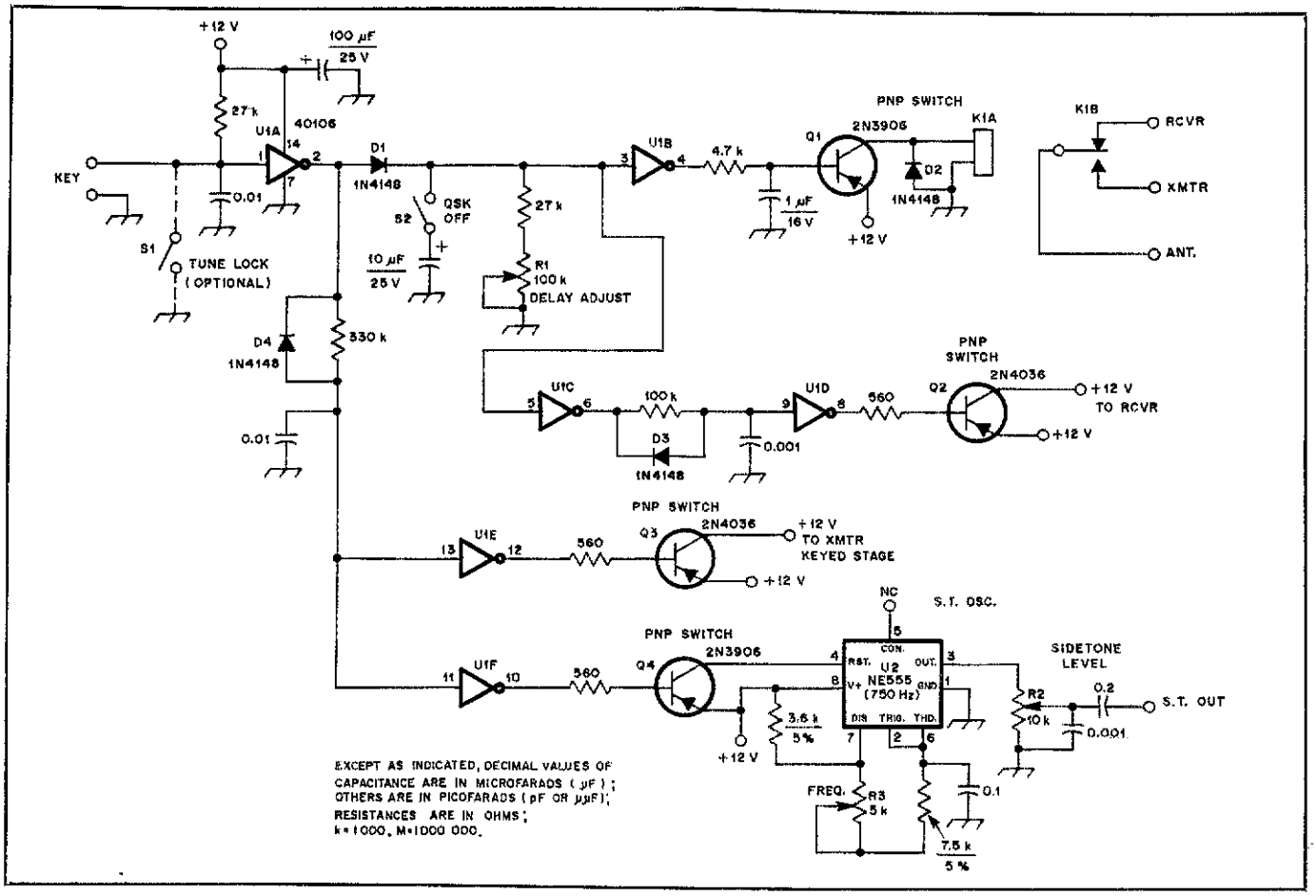


Fig. 3 — Practical circuit for a TR circuit with sidetone generator. Semi-break-in or full QSK is possible with this circuit by means of S2. Capacitors are disc ceramic except those with polarity marked, which are electrolytic or tantalum. Resistors are ¼-W carbon composition. Variable resistors are circuit-board-mount controls. K1 is a reed relay, SPDT, in a 14-pin DIP package, 12 V. S1 and S2 are SPST toggle or slide switches. U1 is an RCA CD40106BE IC. This circuit is not recommended for RF powers in excess of 25 W.

may be replaced by a number of other types, provided they carry similar ratings. The shortcoming of this circuit is that it is suitable for only one band, unless a band-switch is added to change the frequency of the transmitter and RF amplifier Q5. At any rate, it permits full QSK for transmitters up to, say, 5 W. Additional switching transistors can be added to permit receiver muting and sidetone keying during the transmit period. Additional information on solid-state TR circuits can be found in the ARRL book, *Solid State Design for the Radio Amateur.*

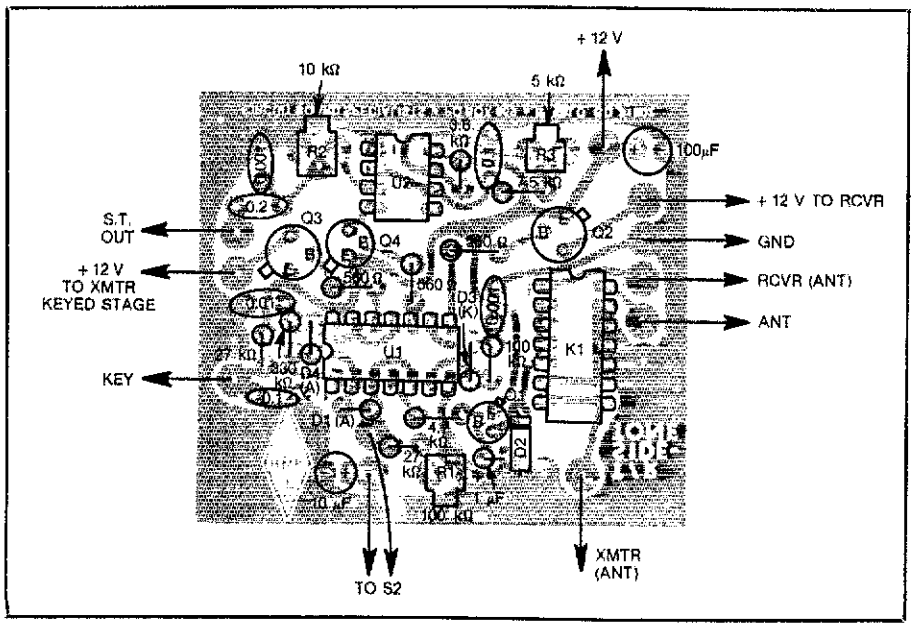


Fig. 4 — Parts-placement guide for the TR module as seen from the component side. Diode anodes and cathodes are shown as (A) and (K), respectively.

A TR Module with Reed Relay

A practical TR circuit is seen in Fig. 3, and it represents our workshop project for this month. The idea was hatched by Bob Shriner (WAØUZO) and me for use in a transceiver that may appear in ARRL literature later on. Bob derived this circuit from a repeater COR (carrier-operated relay) he designed earlier.

All of the U1 gates are inverters. They are contained in an RCA CD40106BE 14-pin DIP IC. This chip is a hex inverter with built-in Schmitt triggers. Bipolar transistors have been added for dc switching of the various lines. An NE555 timer IC serves as the sidetone generator. Output from U2 can be fed to a receiver for monitoring your CW sending.

When S2 is closed, the break-in delay function is activated. The drop-out time for K1 is set by means of R1. When S2 is open, the TR module provides full QSK, consistent with the sending speed the relay can handle. The circuit board is 2¼ by 2¾

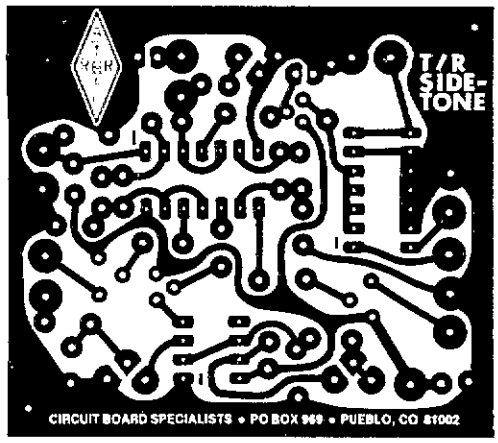


Fig. 5 — Circuit-board etching pattern for the TR module. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil.

inches in size, which makes it easy to tuck it into small equipment cabinets.[2] A parts-placement guide is given in Fig. 4. The circuit-board template is presented in Fig. 5.

In Summary

If there is a bottom line I might offer here, it is that very little added cost and effort are needed to make your low-power transmitter a convenience and joy to operate. If you're into contesting, full break-in will save time for logging and dupe-sheet checking.

If you have not operated a QSK rig before, you may at first be annoyed at hearing noise and QRM each time the key is up. It took me some time to adjust to this distraction. It tended to interrupt my train of thought the first few times I used a QSK CW transceiver. But, there are some advantages to full break-in: For example, other stations can break in without waiting until you stand by. Also, if there is heavy QRM on your operating frequency, you will become aware of it almost immediately! With this knowledge, you may want to ensure that the other station is copying your message before you proceed. If the copy is bad, you can move to a clear frequency and avoid a repeat of your transmission.

Some QRPers may try to convince you that a QRP rig should be ultra simple, with the fewest stages possible, and minus the frills. Balderdash! There is no reason why operating conveniences and advantages should not be included in any transmitter, nigh-power or not! You may experience a great deal of pride when you complete your transmitter after having included a good break-in circuit (and any other features you deem appropriate). Good luck with your workshop endeavors!

Notes

[1]Circuit boards and parts kits for the QSK module are available from Circuit Board Specialists, P.O. Box 969, Pueblo, CO 81002.

[2]mm = in × 25.4.

New Products

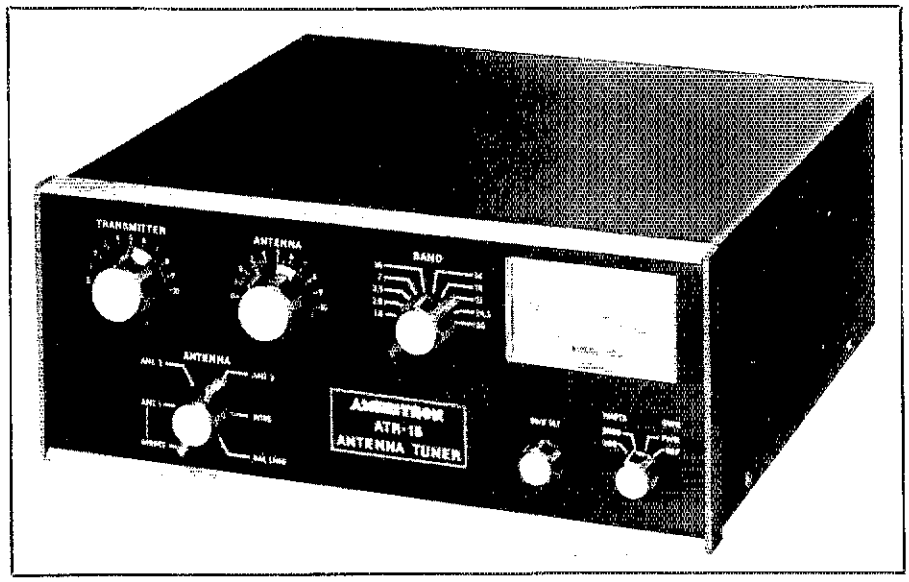
AMERITRON ATR-15 ANTENNA TUNER

☐ The ATR-15 is a T network-type of antenna-matching network that covers the frequency range of 1.8-30 MHz in 10 switch-selected ranges. Sufficient network tuning overlap provides continuous tuning coverage of the ranges. On the 80-10 meter bands, the unit is rated to handle a maximum power input of 1500 W; on 160 meters, 1000 W. The BAND switch is silver-plated and its contacts are rated at 7 A; the air-variable capacitors have 4.5-kV ratings.

An input impedance of 50 ohms is specified for the ATR-15. Output impedances may range from 20 to 800 ohms. For use with balanced feeds, an internal balun is supplied. You may select 1:1 or 4:1 ratios for the balun. Three coaxial, one single-wire and a balanced output are switch selected from the front panel.

A peak-reading wattmeter and an SWR indicator are included. The wattmeter has two ranges: 0-200 and 0-2000 W. Metering functions are still available when the ATR-15 is bypassed. The meter may be illuminated if you supply an external 12-V source to the available rear-panel connector.

Dimensions: 5¼ × 13¼ × 13½ inches (133 × 337 × 343 mm) HWD. Price class: $290. The ATR-15 is available from Ameritron, 9805 Walford Ave., Cleveland, OH 44102. — *Paul K. Pagel, N1FB*



Wire Beam Antennas and the Evolution of the "Double-D"†

Need a compact beam antenna? Try this aerial, developed by one of our neighbors across the pond. Build one for your favorite HF or VHF band.

By Peter Dodd,* G3LDO

During March 1979, I wanted a beam antenna to take further advantage of the sudden improvement in conditions on 28 MHz. It had to be lightweight because of the tall, unguyed mast in use, and a quad was not feasible because of the obstructions encountered when the mast was tilted over. This article describes the development of an antenna that met these requirements.

VHF modeling is a well established technique and is used by many designers as a method of testing HF-antenna design.[1,2] Using this method to design different types of amateur antennas seems to be beneficial and has been used extensively in this project.

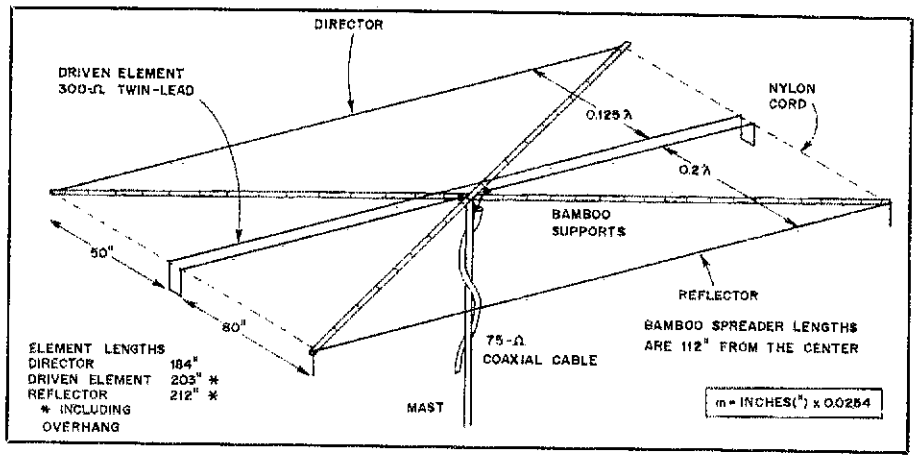


Fig. 1 — Construction details of a 28-MHz wire Yagi.

First Attempt

The first wire Yagi beam was constructed using graphs from *The ARRL Antenna Book* as a guide.[3] The wire elements were laid on a crossed bamboo support as shown in Fig. 1. The support was not quite large enough, and the driven element and the reflector were allowed to dangle over the edge of the support. The elements were pruned for a low SWR and reasonable directivity. The beam proved quite successful, giving an average improvement of two S units when compared with a dipole at the same height.

The only problems encountered were with the dangling ends of the elements, which caused fluctuation in SWR and, presumably, gain, in windy weather. Heavy rain caused an increase in SWR from 1.4:1 to 1.8:1.

Wire Yagi Experiments

To obtain some insight into the performance of the wire Yagi, a VHF model was constructed and measurements performed with test equipment used on previous tests.[4] The elements were pruned for minimum SWR and maximum forward gain, which fortunately occurred at the same element dimensions (Fig. 2). The driven element of the Yagi was not located halfway between the director and the reflector because it would be too close to the metal of the support mast.

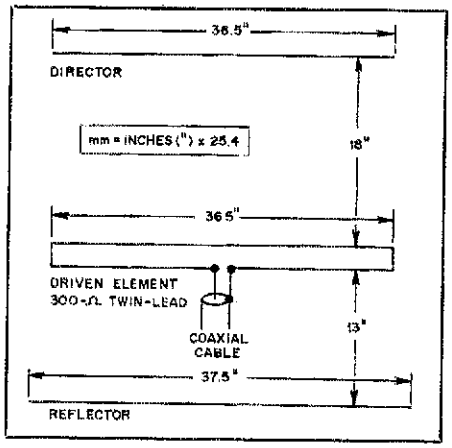


Fig. 2 — Dimensions of a 145-MHz Yagi optimized for maximum gain.

Antenna field strength was compared with a reference dipole whose performance had been optimized. The model performed as well as an all-metal beam at the center of the band, with a comparative directivity pattern shown in Fig. 3.[5]

These models were constructed from no. 18 wire, which gave a length-to-diameter ratio in the range of 10^2:1. When the model is scaled to the HF band, the range will be in the 10^3:1 region. The appropriate factor will have to be applied if the antenna is scaled directly from the VHF model, using the graph in Fig. 4. When an attempt was made to calculate the factors for scaling up, it was obvious something was wrong: On checking the dimensions of the model it was noted that all the elements were nearly 2 inches shorter than normal 144-MHz antennas.[6] The model was rebuilt using insulators at the end of the elements, and the tuning and testing procedure was performed again. The elements finished up slightly longer, but the increase was less than ¼ inch.

When the model was rebuilt a third time, using uncovered wire for the parasitic elements, the measured length returned to "normal" proportions, and it was evident that the insulating material had a loading effect. To determine the loading effect of PVC insulation, a 15-foot length of wire was measured for resonance using a GDO. The measured frequency was 31.1 MHz. This is very close to the theoretical value given by:

$$\ell(\text{ft}) = \frac{468}{f(\text{MHz})} \qquad \text{(Eq. 1)}$$

[1]Notes appear on page 23.

[†]Adapted from an article by the same title in *Radio Communication* (RSGB), June/July 1980, p. 616.

*66 Arundel Rd., Augmering, West Sussex, England

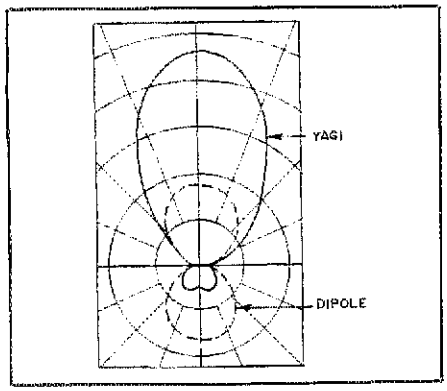


Fig. 3 — Wire Yagi and dipole directive patterns compared.

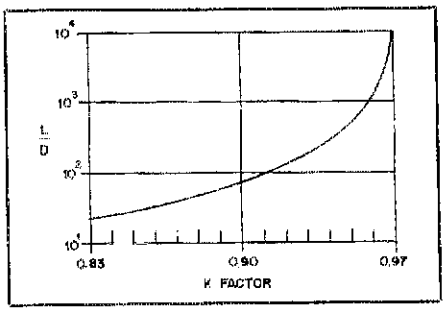


Fig. 4 — Graph of length/diameter correction factors for antenna-element lengths.

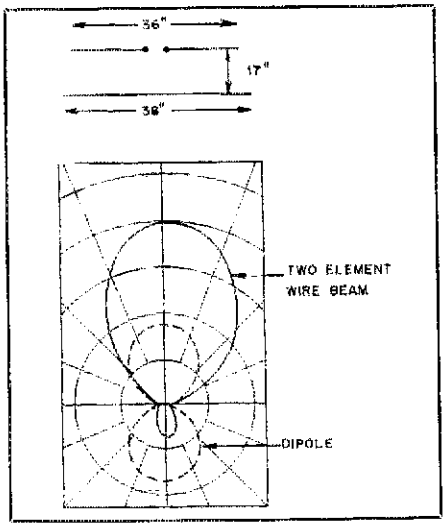


Fig. 5 — Two-element wire beam dimensions are shown at A. At B, the directive pattern is compared with that of a dipole.

Different thicknesses of a 15-ft length of PVC-covered wire were also checked, and were found to vary between 29.9 and 30 MHz. It would seem that the velocity factor of PVC-covered wire is about 0.965.

Two-Element Wire Beam

A two-element model was constructed. The dimensions and radiation pattern are illustrated in Fig. 5. A 28.6-MHz antenna was scaled from this model and fed directly with 75-Ω coaxial cable. The minimum

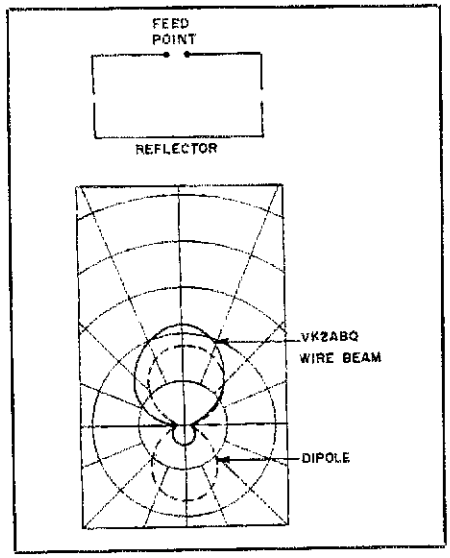


Fig. 6 — The VK2ABQ-antenna configuration is shown at A. At B, the directive pattern of this antenna is compared with that of a dipole.

SWR of 1.5:1 probably results from a driven element center impedance of 50 Ω, so the antenna would perform better if 50-Ω cable were used.

The antenna's performance over a three-month period was comparable to the three-element model previously used. This could be accounted for by the difficulty of adjusting three elements for optimum performance.

Two-Element Wire Beam Derivatives

A number of experiments were performed to investigate methods of making the two-element beam more compact without compromising gain. All theoretical and previously published work on the subject was ignored, and an empirical approach was used in performing the experiments.

A further objective was simplicity. This is necessary because the more complex the array, the more interacting parameters that require adjustment. It is also more difficult to scale and build a complex array. Simplicity means ignoring traps and loading coils, which leaves element bending as the only solution to making a compact antenna. When an element is bent, the resonant frequency appears to rise. A GDO is necessary to determine the exact resonant frequency of a bent element.

What to do with the bent elements is a mechanical problem. One way out of this is to make a VK2ABQ configuration as shown in Fig. 6. This has good directivity, but poor gain compared with the two-element antenna. If the mechanical aspects are ignored and the elements are allowed to droop (like the top half of a quad), the gain returns to that of the two-element antenna (Fig. 5). As this seems to have the same gain as a quad, there appears to be little point in making a full-wavelength loop quad.

Table 1
Equations for Calculating the Dimensions of an HF-Band Double-D

Dimension	*Length (inches)†*
A and B	$\ell = \frac{3350}{f(MHz)}$
C	$\ell = \frac{2370}{f(MHz)}$
D	$\ell = \frac{700}{f(MHz)}$
E	$\ell = \frac{1336}{f(MHz)}$
Total element length	$\ell = \frac{6022}{f(MHz)}$

†m = inches × 0.0254

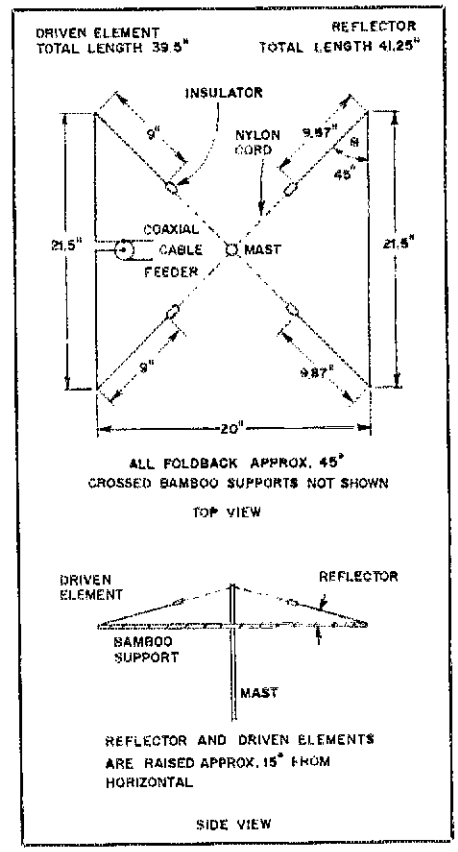


Fig. 7 — A Double-D antenna, showing construction details and dimensions for a 145-MHz model.

The Double-D Configuration

The Double-D was the final result of a number of experiments to overcome the problem of what to do with the folded parts of the elements. A VHF model is shown in Fig. 7, and the HF version in Fig. 8. Dimensions for the HF version can be calculated from the equations given in Table 1. The early HF models were derived by scaling the VHF-model dimensions with the correction factors from the graph in Fig. 4. Results of this approach were disap-

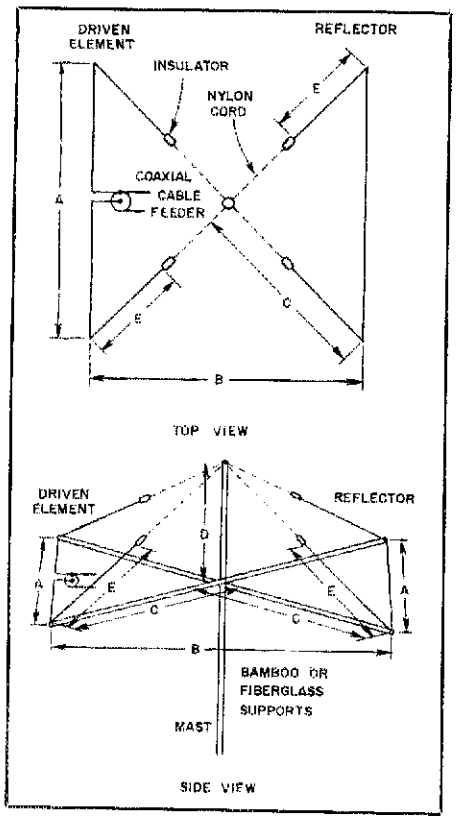


Fig. 8 — General construction details of an HF version of the Double-D. The letters refer to equations given in Table 1 for each section.

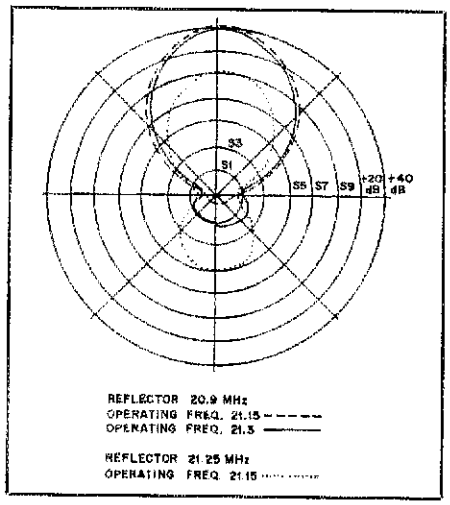


Fig. 9 — Directive-pattern variations, with changes in reflector length and operating frequency for a 21-MHz Double-D.

pointing. The equations given in Table 1 are derived from careful measurements made on a 21-MHz-band model. The most surprising result was that optimum performance occurred when the reflector was approximately the same length as the driven element.

Effects of different reflector lengths relative to the operating frequency are shown in Fig. 9. These diagrams were obtained by placing a modulated signal generator in the apex of the house roof approximately two wavelengths from the antenna. Readings were obtained from the transceiver S meter while rotating the antenna, and can only be regarded as comparative.

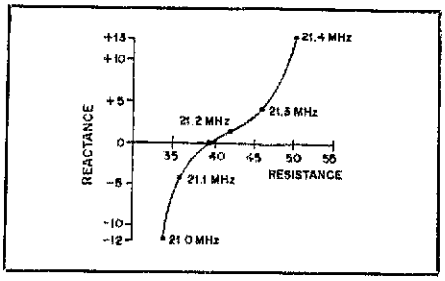


Fig. 10 — Variations in feed-point impedance with frequency changes for a 21-MHz version of the Double-D.

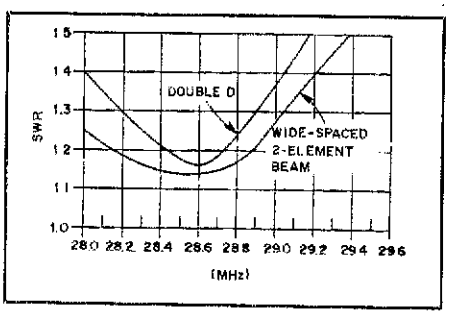


Fig. 11 — Graph comparing the SWR of a Double-D and a wide-spaced, two-element beam antenna.

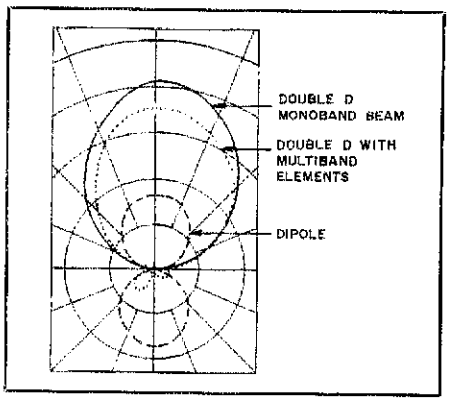


Fig. 12 — Comparative antenna directive patterns for monoband and multiband Double-D beams, along with a dipole for reference.

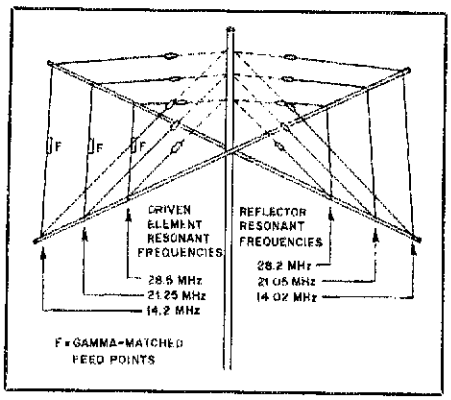


Fig. 13 — Diagram showing a suggested layout for a multiband version of the Double-D.

Effects of different reflector lengths relative to the operating frequency are shown in Fig. 9. These diagrams were obtained by placing a modulated signal generator in the apex of the house roof approximately two wavelengths from the antenna. Readings were obtained from the transceiver S meter while rotating the antenna, and can only be regarded as comparative.

The radiation-resistance readings of Fig. 10 were obtained via a 3/2-λ section of 75-ohm coaxial cable, using the method described by Doyle Strandlund.[7] Separate noise-bridge measurements and an SWR of 1.5:1 confirm a feed impedance of 35 to 50 ohms. The feed impedance of a driven element without a reflector is about 50 ohms. A previously constructed 28-MHz version had a feed impedance of 50 to 60 ohms, and the VHF model matched very well into 75-ohm coaxial cable. A comparison of SWR for the Double-D and a wide-spaced, two-element beam is shown in Fig. 11.

Experiments with the VHF model showed that it was not detuned by the presence of other-band elements, although the feed impedance and radiation pattern were disturbed (Fig. 12). This seems to suggest that a multiband version is feasible. A possible configuration is shown in Fig. 13.

Construction Details

The spreaders were made by clamping bamboo canes to angle aluminum.[8] Insulators are made from any thin insulating material (such as Plexiglas®). This construction overcomes the problem of not knowing how much wire to allow for attachment to the insulator. Nylon cord rather than wire should be used between the insulator and mast, if detuning effects are to be avoided. The elements are attached to the spreaders with PVC insulating tape.

HF-Band Performance

In practice, the performance of the Double-D antenna on 28 MHz appears to be as good as was predicted by the VHF model. The front-to-back ratio, according to local reports, is about four or five S units. When the antenna was used with a QRP 3-W homemade SSB transceiver, QSOs with all continents were made in less than a week of normal operating. Versions of this antenna for 14 and 21 MHz have been tried, and they perform well. An antenna system comprising these two antennas has been mounted on a single support and fed directly with one coaxial feed line. The directional properties of each antenna are unimpaired, but the SWR on the 14-MHz antenna is nearly 2:1.

Notes

[1] P. G. Dodd, "Assessment of HF Aerials Using VHF Aerials" *Radio Communication*, Dec. 1972, p. 809.
[2] M. F. Radford, "Aerial Gain and How It is Measured," *Wireless World*, Oct. 1966.
[3] *The ARRL Antenna Book*, 14th ed. (Newington, CT: American Radio Relay League, 1982), p. 9-5.
[4] See note 1.
[5] The antenna-directivity patterns shown in this article are for comparative purposes only. No scales are shown in the graphs because they do not represent exact measurements.
[6] mm = inches × 25.4; m = feet × 0.3048.
[7] D. Strandlund, W8CGD, "Amateur Measurement of R + jX," *QST*, June 1965, p. 24.
[8] See note 3, p. 9-8.

The Full-Wave Delta Loop at Low Height

You'll be surprised at the results you'll get from a full-wave loop at low heights.

By Doug DeMaw,* W1FB and Lee Aurick,** W1SE

Property size and antenna-support height are ever-present concerns of the urban amateur. Many good antennas are untried because the radio amateur is unable to imagine how a large wire antenna could be squeezed onto a small lot. Certainly, this is typical in the case of full-wave loop antennas. But, there is no rule that dictates using a symmetrical loop. It can be distorted rather severely without spoiling the performance. The same philosophy is appropriate with regard to height above ground and the plane in which the antenna is erected. In most instances, a less-than-optimum full-wave loop will outperform a dipole or inverted-V antenna that is close to the ground in terms of wavelength. It is possible that such a loop will give comparable or better performance than a vertical antenna that is less than 90 degrees (with respect to ground), or one with a substandard ground screen.

We want to discuss the practical considerations of loops that can be supported from low supports on small pieces of property. The results we have obtained are noteworthy with respect to all-around "solid" communications within and outside the USA. Perhaps you will be inspired to unroll some wire and try a loop at your QTH.

Some Loop History

Loops were used first as receiving antennas. While single- and multiturn small loops worked well for receiving, they were not satisfactory for transmitting: They were inefficient in terms of gain, and the feed impedance was generally a fraction of an ohm, making them difficult to match. The losses were significant. But, it was possible to use a compact loop (less than 0.5 wavelength) for receiving in place of a full-size version that could require thousands of feet of conductor. One of us owned a portable broadcast-band receiver in the 1930s. The loop antenna was stored in the lid of the cabinet, and needed to be mounted atop the radio during reception periods! The radio was heavy: It weighed 91 pounds, including the various dry batteries.[1]

Receiving loops continued to be useful for many years in the commercial services, especially for LF and VLF applications. Amateurs also used them (and continue to do so) for improved reception on 160 and 80 meters. The signal-to-noise ratio of receiving loops is markedly better than that of vertical antennas, and they are directional.[2] Many successful 160-meter DXers owe their success to the use of receiving loops with low-noise preamplifiers. Practically, these loops are the next best thing to Beverage antennas.[3]

Loop Characteristics

What are some of the advantages of a closed, full-wave loop? Perhaps number 1 on the list is the lack of need for a ground screen. The matter of effective height above ground is still a consideration, but we need not lay a ground-radial system as would be the case with a vertical antenna. Consideration number 2 is that a full-wave loop (depending on the shape) has some gain over a dipole. Number 3 relates to noise factor. A closed loop is a much "quieter" receiving antenna than are most vertical and some horizontal antennas.

To illustrate this point, the 160-meter antenna at W1FB is a 3/8-wavelength inverted-L with twenty 3/8-wave radials. Since this is essentially a vertically polarized antenna, it is noisy (man-made and atmospheric noise). There are times when an S9 signal is unreadable because of the ambient noise being S9 or greater in strength. Upon switching to the 75-meter Delta loop, the same signal will rise above the noise by 1 or 2 S units, while the noise and signal will drop well below S9. For example, the received signal may drop to S6 on the loop, but the noise will decline to S4.

Feed-point selection will permit the choice of vertical or horizontal polarization. Various angles of radiation will result from assorted feed-point selections. The system is rather flexible when we want to maximize close-in or faraway communications (high angle versus low angle). Fig. 1

[1]Notes appear on page 26.

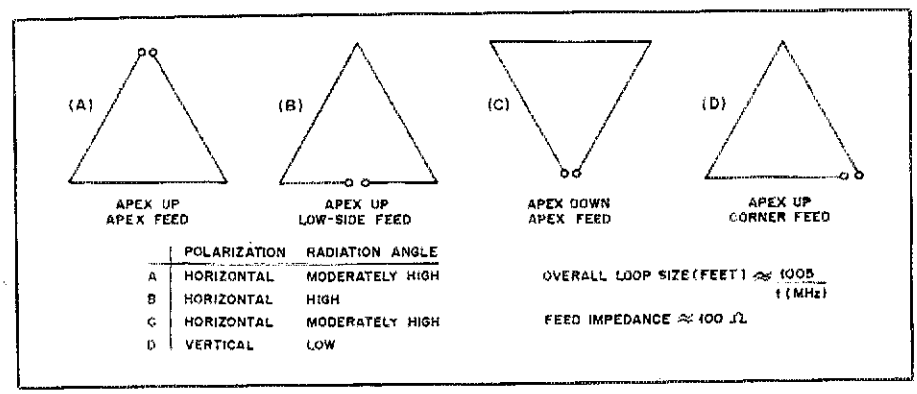


Fig. 1 — Various configurations for a full-wave Delta loop. Radiation angles and polarization are affected by the feed-point placement and location of the apex.

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**Advertising Manager, ARRL

illustrates various configurations that can be used. The arrangement at C is used at W1SE, and the shape at D is being applied at W1FB. Both antennas are cut for 80-meter operation. The bandwidth at resonance is on par with that of a dipole. A Transmatch is used for matching the system to the transmitter in those parts of the band (75 and 80 meters) where the SWR is too high to deal with.

Our loops are not deployed in a vertical plane, owing to the lack of tower height. A 60-foot tower and 50-foot tree support the W1SE antenna. A single 50-foot tower is used at W1FB.[4] Both loops are tilted away from the supports at roughly 45 degrees (Fig. 2). This shows the present W1FB system. The loop is broadside northeast and southwest for maximum radiation in those directions at 80 meters. More on this later.

When these low-to-the-ground experiments began in the summer of 1983, we were joined by Bill Martinek, W8JUY, near Traverse City, Michigan. Bill experimented with various loop configurations so that he and W1FB could make signal comparisons locally and afar. He finally adopted the W1SE format with the apex down (Fig. 1C, with the flat top strung between two 50-foot trees). In order to keep the loop completely vertical (not sloping), he chose a triangle that was not equilateral. The upper side of his triangle is substantially longer than the two downward sides. His signal on 75 meters is consistently 10 to 20 dB stronger than with his inverted V. The point of this discussion is that you need not use an equilateral triangle if it will not fit on your property. Erect whatever you can, then give it a try!

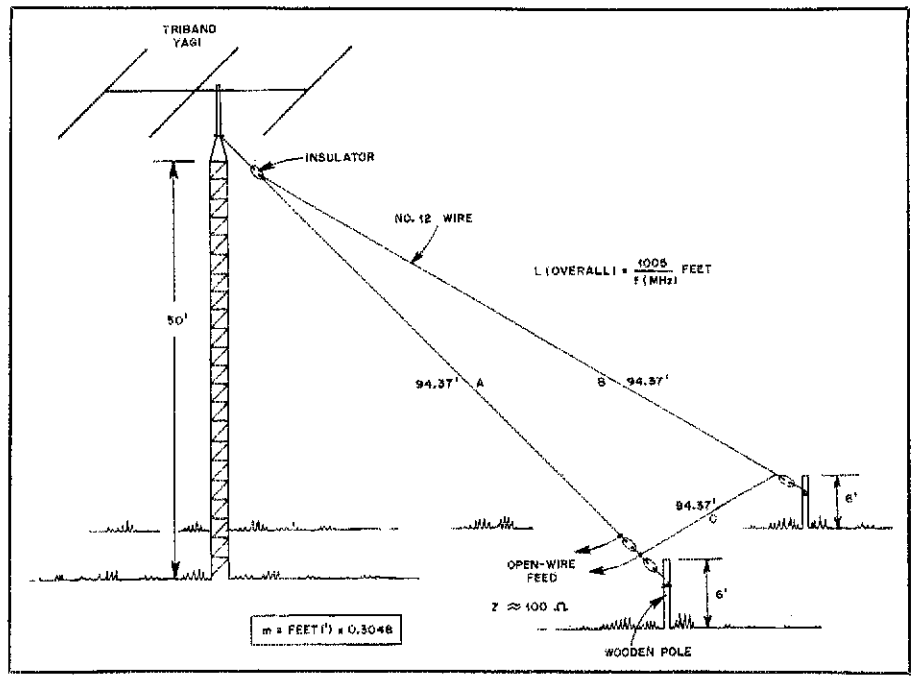


Fig. 2 — A tilted Delta loop for 80 meters is used at W1FB. The tower height is only 50 feet. Homemade open-wire line is used as the feeder to permit multiband use with vertical polarization and a low radiation angle.

Feed Methods

A Q section is used for feeding the W1SE loop. A Q section is a quarter-wavelength line with an impedance that is somewhere between the antenna feed impedance and that of the feed line. Calculation is a simple matter:

$$Z \text{ (Q section)} = \sqrt{Z1 \; Z2} \text{ ohms} \quad \text{(Eq. 1)}$$

where Z1 is the antenna impedance, and Z2 is the feeder impedance in ohms. In this case, assuming approximately 100 ohms for the antenna feed impedance, we would have $\sqrt{100 \times 50} = 70.7$ ohms for the Q-section impedance. This represents a close match to 52-ohm coaxial cable. The Q-section length (made from RG-59/U) can be determined from L(feet) = 246 V/f(MHz), where V is the velocity factor of the coaxial line for the matching section. (The length should be verified using a dip meter.) For operation at the W1SE-chosen frequency of 3.825 MHz, the calculation calls for a Q section of 42 feet 5 inches (Fig. 3).

Open-wire feed is used at W1FB (Fig. 3B) to permit multiband operation through 10 meters. Unfortunately, a short run of RG-8/U was needed to bring the feed line to the ham station — under the driveway. The coaxial cable was buried in the ground for this reason. A homemade 4:1 toroidal balun transformer (two stacked T200-2 Amidon cores and Teflon-insulated no. 14 wire) was enclosed in a weatherproof box and mounted on one of the support poles for the 450-ohm open-wire line. The RG-8/U was run underground from that location (about 25 feet). Ideally, the open-wire line would have been brought into the house, where it would be matched to the station gear with a Transmatch. Fortunately, the SWR at loop resonance is 1.3:1 without the Transmatch in use.

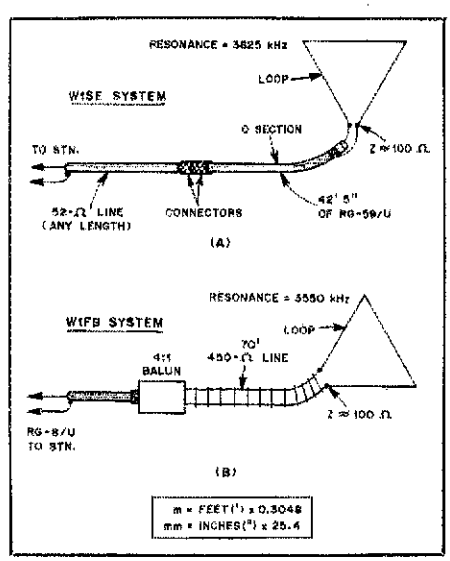


Fig. 3 — At A is the feed method used at W1SE. A coaxial Q section closely matches the 100-ohm feed impedance to a 52-ohm coaxial line. Illustration B shows the W1FB feed arrangement. Open-wire line, a balun transformer and a short length of RG-8/U cable permit multiband use with a Transmatch. Ideally, the open-wire line would continue all the way to the Transmatch, and the balun transformer would be located at the Transmatch.

Performance

This is the part of our article that many of you have been waiting to read. Well, the W1FB results have been entirely gratifying. The loop replaced an inverted V with an apex height of 50 feet. This led to a pronounced improvement in all-around communications on 75 and 80 meters out to 500-600 miles. But, the loop proved to be very effective also for DX communications to Europe on 80 meters. The first version was that of Fig. 1B. Although the antenna was outstanding for close-in 75- and 80-meter work, it offered dismal DX performance. The configuration at D of Fig. 1 seems to offer a good compromise in performance for local and DX work. The theoretical launch angle to the horizon at the loop fundamental frequency is 10 degrees, as reported by VE2CV in a letter to W1FB. This assumes that the loop is erected vertically and at a reasonable height above ground.

Harmonic operation of the loop, as depicted in Fig. 1D, is superb. At times it outperforms the trap tribander atop the tower during DX operation to Europe and Africa. The loop shows an average 6-dB signal increase on 20 and 15 meters in the

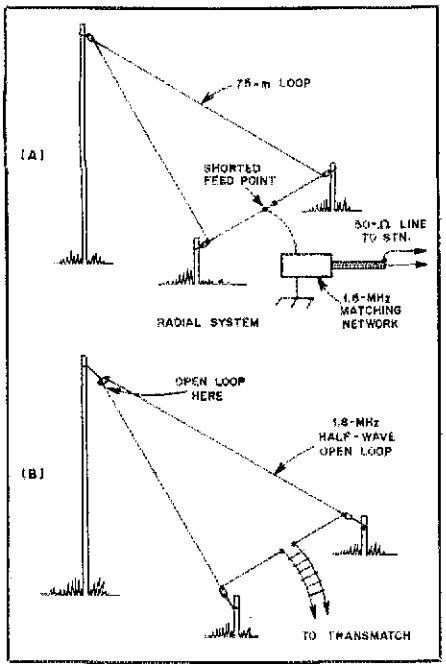


Fig. 4 — Two methods for using a full-wave loop at half frequency. A switching arrangement could be applied at the feed point to change from a closed, full-wave loop to the first configuration seen here. The method at A performs as a ¼-wavelength radiator, but a ground screen is required. Method B is satisfactory as a ½-wavelength open loop for half-frequency use. It requires opening the loop at the electrical point opposite the feed point. A relay could be used for this purpose.

favored direction, owing to the gain and lower radiation angle of the loop. Radiation at the harmonics is in the plane of the loop rather than broadside to it. This makes it ideal for contacts into Africa. It is perhaps the most effective 40-meter DX antenna that has been used at W1FB from northwest lower Michigan. The Transmatch is required on all harmonic frequencies other than 18.111 MHz, where W1FB has been conducting propagation studies with Bill Orr, W6SAI, Prose Walker, W4BW, Bob Haviland, W4MB and Stu Cowan, W2LX, under special experimental/research licenses (KM2XQV). The loop has worked very well on 24.9 MHz as well during these tests. At 18.111 MHz, the SWR is 1.4:1.

The operating results at W1SE also indicate that a tilted loop, close to the ground, functions quite well. With loop resonance at 3825 kHz, the 2:1 SWR points occur at 3734 and 3934 kHz, respectively. This 200-kHz bandwidth spectrum can be shifted up or down the band by lengthening or shortening the loop conductor and Q section accordingly. From the W1SE location in Newington, the loop has delivered impressive performance for local and DX work.

A 40-meter Delta loop was constructed for use at W1SE after noting the fine performance of the 80-meter system. It was cut for resonance at 7016 kHz. This model was erected in a completely vertical format, using 143 feet 3 inches of wire. The Q section is 23 feet 2 inches long. The apex (feed point) is 4 feet above ground. The SWR on 40 meters is less than 2:1 across all of the band. The 80- and 40-meter W1SE loops showed resonance slightly apart from the design frequency, perhaps because of the proximity of the antennas to ground. Resonance on 40 meters was checked as 7050 kHz. Both loops are performing better for local and DX contacts than any of the many antenna types tested at W1SE. We would be even more impressed if we could elevate our Delta loops so the lower portions were a half wavelength or greater above ground.

In Conclusion

There is no rule that dictates the shape of a full-wave loop. The triangular format is convenient for mounting the radiator. If the apex is at the top, only one high support structure is needed. You may have one or more tall trees that can be used as supports. Circular, square or rectangular shapes have been used by many amateurs, and the results were good. Certainly, a loop is an impressive receiving antenna, in terms of noise reduction. In some urban locations, that may be more important than transmitting a "death-ray" signal! There is something to be said about the age-old expression, "If you can't hear 'em, you can't work 'em."

An 80-meter Delta loop can be used on 160 meters by adopting one of two simple methods (Fig. 4). A closed loop does not, however, offer good results when the overall length is a half wavelength. Either of the techniques in Fig. 4 will work, but the method at A requires a ground-radial system for best results.

Notes

[1]kg = lb × 0.454.
[2]D. DeMaw, "Beat the Noise with a Scoop Loop," *QST*, July 1977, and "Maverick Trackdown," *QST*, July 1979.
[3]H. H. Beverage and D. DeMaw, "The Classic Beverage, Revisited," *QST*, Jan. 1982.
[4]m = ft × 0.3048; mm = in × 25.4.

New Products

LAMBDA SEMICONDUCTORS SWITCHING POWER-SUPPLY-CONVERSION KIT

☐ A monolithic switching power-supply-conversion kit is available from Lambda Semiconductors. When operated from 25-V dc, this "Cooler" kit will deliver 5 V at 5 A, with 77% efficiency. Total noise and ripple is limited to 30 mV P-P.

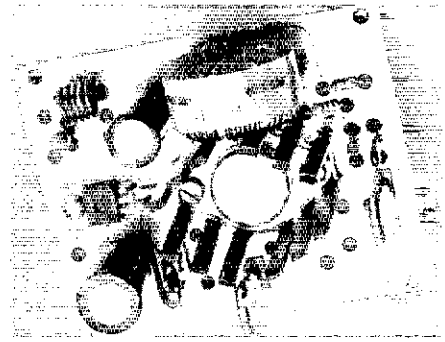
The heart of the design is an LAS 6301 monolithic switching regulator in a hermetically sealed 8-pin TO-3 case. This contains a temperature-compensated voltage reference, sawtooth oscillator with over-current frequency shift, linear trailing-edge pulse width modulator and double-pulse suppression logic, error amplifier and a 5-A, current-limited output transistor.

The kit contains a double-sided, silk-screened PC board, a hefty heat sink for the LAS 6301, and all necessary components and mounting hardware. Assembly is a snap. A pictorial board view and detailed photograph of the assembled unit help to identify parts and determine correct component polarities.

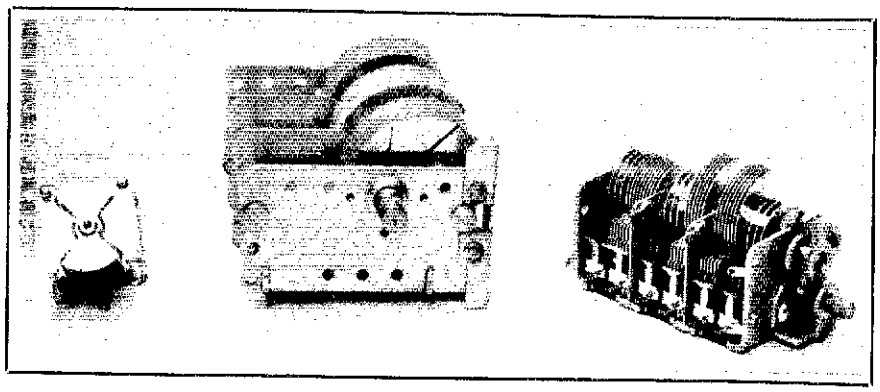
Alignment and testing are straightforward. A VOM is the only required test instrument, although photographs of oscilloscope waveforms are also provided by the manufacturer. These show circuit operation under various loading conditions, and may prove useful for troubleshooting. Assembly and testing take less than 2 hours.

The LAS 6301 is capable of output powers in excess of 100 W, but can be destroyed if the critical 25-V-input requirement is not met. Also, a reasonably constant output load should be maintained. (Sudden open- or short-circuited conditions cause severe electrical stress to switching-type dc-dc converters.) Properly operated, however, this kit provides higher conversion efficiency than linear-type converters, and is smaller and lighter.

Further information on the "Cooler" kit or the LAS 6301 can be obtained from Lambda Semiconductors, 121 International Dr., Corpus Christi, TX 78410, tel. 800-255-9606. — *Greg Bonaguide, WA1VUG*



Shapes of Variable Capacitor Plates



Ever wondered why variable capacitors have such a variety of shapes? Or why that new VFO you built tunes faster at one end of the tuning range? This article describes the development of variable capacitors from a historical viewpoint.

By Joe Rice,* W4RHZ

Every once in a while I read a construction article, or hear some amateurs talking, about a project that indicates to me that they do not understand the fundamentals of variable-capacitor-plate shapes. These hams lament the fact that when they try to calibrate a dial it does not turn out to be linear with respect to frequency. They have not taken into account why there are certain shapes to the rotor and stator plates of any variable capacitor. The shape of these plates control whether the tuning will be linear with respect to frequency, wavelength or capacitance. There is a definite shape to produce each tuning characteristic, and selecting just any junk-box capacitor for a project can lead to unexpected results.

There are three basic types of capacitor-plate shapes, though dozens of different ones have evolved over the years. These are called straight-line capacitance (SLC), straight-line wavelength (SLW) and straight-line frequency (SLF). For some reason, the information about these capacitor-plate shapes has not appeared in any Amateur Radio literature over the years (at least to my knowledge). I have become familiar with the capacitors as they were developed because I serviced radios as early as 1934.

In the early days, a radio dial would be marked from 0 to 100 or 100 to 0 depending on whether the variable capacitor increased capacitance with clockwise or counterclockwise rotation. Around 1928 dials were marked in wavelengths because the broadcasting station licenses used the term "wavelength" to define the station operating point.

By the early 1930s, all American radios had dials marked in frequency. It wasn't until after 1934 that the FCC granted licenses to commercial broadcasters using frequency to define the operating point.

One goal of the design engineers was always to provide a linear tuning rate for each of these different dial-marking methods. It takes a different shape of variable capacitor to provide a linear frequency change per rotation than it does to produce a linear wavelength change.

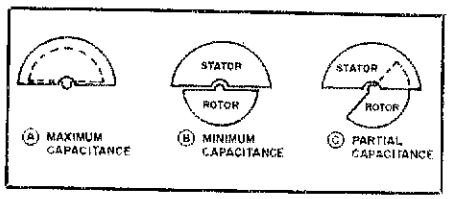


Fig. 1 — The capacitance of an air-dielectric variable capacitor is changed by moving the rotor plates so they mesh more or less with the stator plates. When the plates mesh completely, the capacitance is at a maximum.

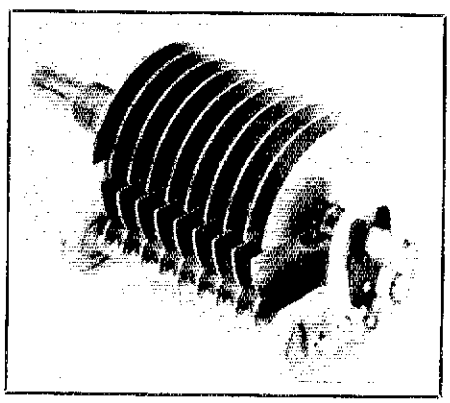


Fig. 2 — A straight-line-capacitance variable capacitor. Notice the semicircular plate shape and the central axis of rotation.

Variable Capacitors

Capacitors having an air dielectric find their greatest use in the tuned RF circuits of radio receivers and transmitters. They are commonly made variable; that is their effective capacitance may be changed while the capacitor is being used in the circuit. These units consist of a group of stationary plates called the *stator*, and a set of rotating plates called the *rotor*. The capacitance of these units is varied by moving the rotor plates so they fit between the stator plates. The more the plates mesh, the greater the capacitance. When they mesh completely, the capacitance is at a maximum (Fig. 1). The size of the plates and the spacing between them determines the maximum capacitance and voltage rating of the capacitor.

Straight-Line-Capacitance Variables

A capacitor with semicircular plates and the axis of rotation in the center will have a linear capacitance curve. This means that as the shaft is rotated the capacitance changes in direct proportion to the amount of rotation. (Equal capacitance changes for equal dial rotations throughout the tuning range of the capacitor.) This type of capacitor is shown in Fig. 2.

*916 Western Ave., Covington, KY 41011

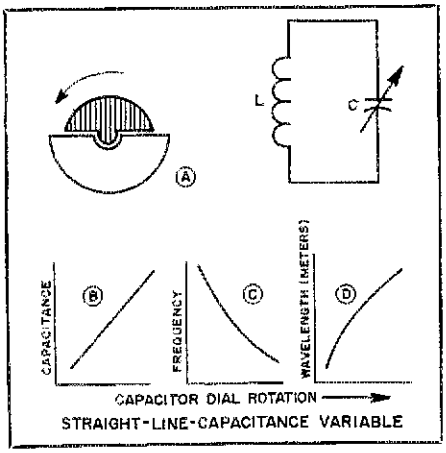


Fig. 3 — The value of a variable capacitor may be made to vary directly with the angle of rotation by using semicircular rotor and stator plates, as shown at A. B shows the relationship between dial rotation angle and capacitance. A graph of frequency versus dial rotation is shown at C, and that for wavelength versus rotation is shown at D.

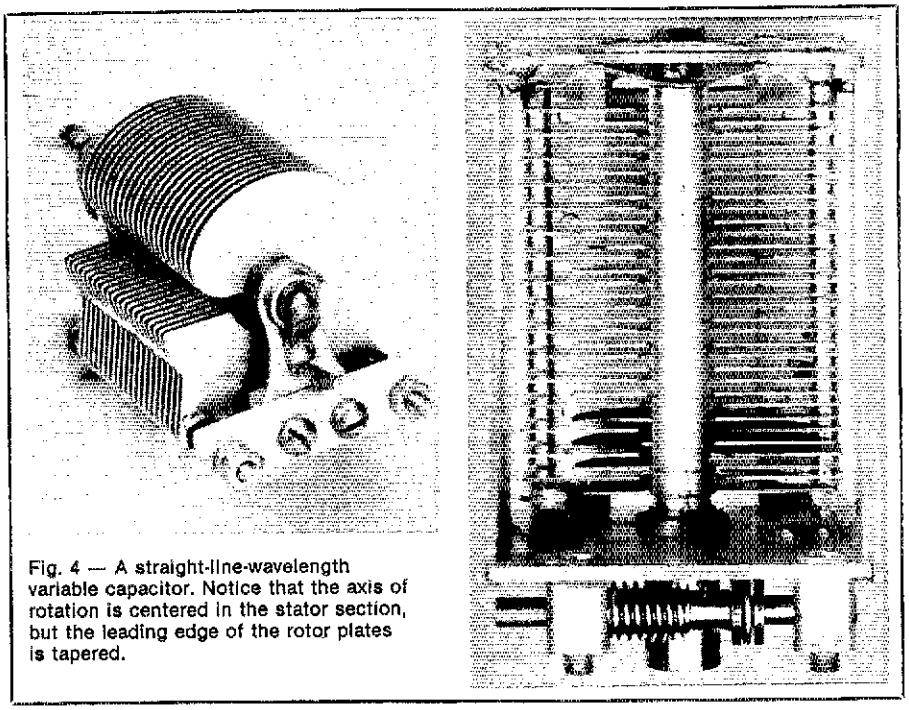


Fig. 4 — A straight-line-wavelength variable capacitor. Notice that the axis of rotation is centered in the stator section, but the leading edge of the rotor plates is tapered.

At first glance, you might think a capacitor that has a linear capacitance change per degree of dial rotation would be ideal. But if you want the frequency or wavelength to change linearly with dial rotation, this capacitor will not do it. We can see this by studying the formula for resonant frequency:

$$f_R = \frac{1}{2\pi\sqrt{LC}} \qquad \text{(Eq. 1)}$$

where

f = frequency in hertz, L = inductance in henrys and C = capacitance in farads. This is a basic formula, even though we normally use smaller values of L and C, such as microhenrys and picofarads.

Since the 2π is a constant and L is also a constant for most tuned circuits, they can be disregarded so we can determine what kind of curve this mathematical formula represents. If we simplify it this way, we can write

$$f_R \propto \frac{1}{\sqrt{C}} \qquad \text{(Eq. 2)}$$

This shows that the frequency will vary as the inverse square root of the capacitance. Since wavelength is the reciprocal of frequency, the wavelength will vary as the square root of the capacitance varies. Fig. 3 shows the tuning curves of the SLC capacitor.

If this type of capacitor is connected in parallel with a fixed tuning coil, the resonant frequency of the circuit can be changed by rotating the capacitor knob. The graph of resonant frequency versus dial settings shown in Fig. 3 indicates that the curve becomes steeper at the smaller-capacitance end of the scale. This means that a given dial rotation near this end produces a much greater change in the frequency of the circuit than an equal rotation at the upper end of the scale.

If a tuning capacitor having semicircular plates is employed in a radio receiver, many stations will be received over a small, crowded portion of the dial. At the high-frequency end of the scale, you must set the capacitor with a high degree of accuracy in order to receive only a single station at a time.

Straight-Line-Wavelength Variables

Many years ago, a type of capacitor having a plate shape such that equal angles of rotation produced equal changes in the *wavelength* of the tuned circuit was used extensively in wavemeters. These were designed to measure the wavelength of a transmitted signal. This type of variable capacitor was convenient for the purpose, since the dial could be calibrated directly in wavelengths and equal divisions would represent equal changes in wavelength. Designers found they could obtain this response by tapering the advancing edge of the rotor on the variable capacitors. Fig. 4 shows such a capacitor.

Straight-line-wavelength variable capacitors were used in receivers in an attempt to reduce the crowding of stations at the low-wavelength end of the tuning range. Fig. 5 shows the capacitance, frequency and wavelength versus shaft rotation curves for this type of capacitor. It might seem that this would be the ideal capacitor for tuning a radio receiver;

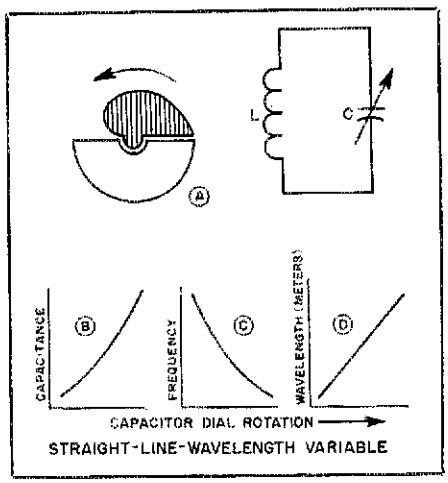


Fig. 5 — The basic shape of the plates for an SLW variable capacitor is shown at A. Graphs of capacitance, frequency and wavelength changes with capacitor rotation are shown at B, C and D, respectively.

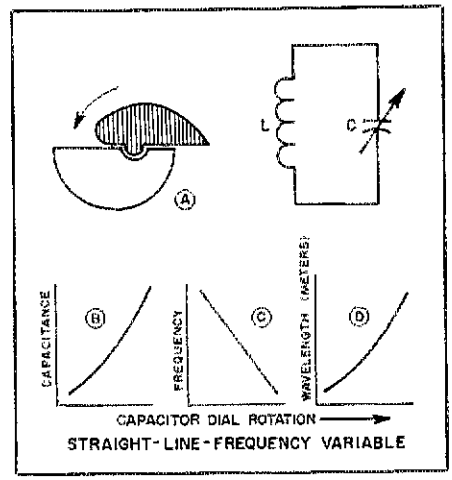


Fig. 6 — By proper shaping of the capacitor plates, as shown at A, we can obtain the capacitance, frequency and wavelength variations with shaft rotation shown at B, C and D, respectively.

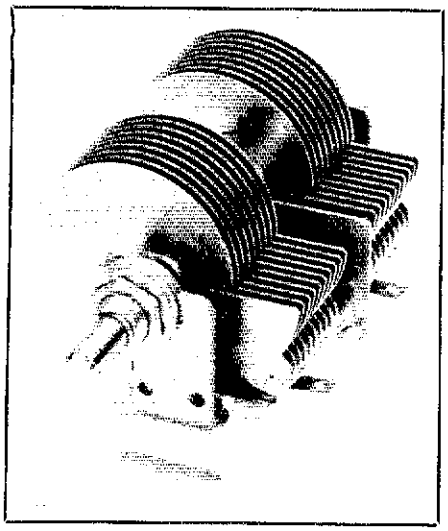


Fig. 7 — A Centraline variable capacitor. The plate shapes are semicircular, but the axis of rotation is off center for both sets of plates.

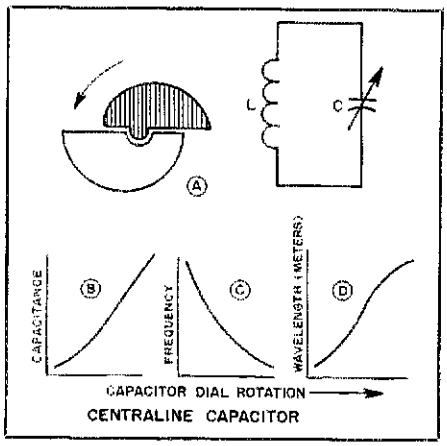


Fig. 8 — Compromise tuning curves can be obtained by varying the shape of the capacitor plates from the three basic types. Here the capacitance, frequency and wavelength changes with dial rotation for a Centraline capacitor are shown.

however, the operating wavelength (or frequency) of broadcast stations is not determined by equal wavelength changes. So even with this type of capacitor, the stations at the low-wavelength (high-frequency) end of the scale are crowded. There is a decided improvement over the SLC capacitor. Stations at the upper wavelengths are also crowded somewhat, but the separation of stations in the middle of the tuning range is just about perfect.

Straight-Line-Frequency Variable Capacitors

The straight-line-frequency variable capacitor is designed with a plate shape that makes the rotation of the dial proportional to the resonant frequency of the tuned circuit in which it is used. Fig. 6 shows the plate shapes for this type of capacitor. SLF capacitors are useful in oscillators and in wavemeters calibrated in frequency, where it is desirable to have equal dial divisions to indicate equal frequency changes.

With this type of capacitor, stations separated by an equal 10 kHz spacing, such as on the standard broadcast band, can be tuned with equal dial rotations from one station to the next. There may still be some problems if the high-power stations in a certain area tend to be concentrated at one end of the dial.

For most Amateur Radio work, we are dealing with relatively small tuning ratios, such as from 7.0 to 7.4 MHz. In this narrow band, it is possible to make your own SLF capacitor by selecting a semicircular-plate capacitor. You can use this capacitor for a bandspread circuit. By setting the coarse-tuning adjustment with another capacitor, you may only need one or two rotor plates on your bandspread capacitor. Draw the general shape of an SLF capacitor plate onto the rotor and stator plates of your capacitor. Then, carefully cut or file the plates to shape. In this manner it is not too difficult to shape a capacitor that will meet your needs.

Other Tuning Curves

Capacitors having rotor- and stator-plate shapes designed to produce certain compromises in their tuning curves have also been developed. Some designers may choose a customized capacitor to obtain desired tuning characteristics. Capacitors designed to produce a composite tuning curve, such as is shown in Figs. 7 and 8 are commonly known as Centraline or Midline capacitors. These desirable tuning characteristics can be obtained by irregular shaping of the rotor plates, the stator plates, or both.

Making Ganged Variables Track Properly

Most radios use a superhetrodyne circuit similar to the one shown in Fig. 9. The first RF stage must tune from 540 to 1600 kHz for a standard broadcast receiver. The local oscillator in this radio must tune from 996 to 2056 kHz to maintain the constant 456-kHz IF. The local oscillator is set to the high-frequency side of the incoming signal, so $C1_B$ must have a smaller plate surface area than $C1_A$. But the two capacitors must track properly so that both tuned circuits change frequency at the same rate. These capacitors are ganged on a common shaft, and the plate shape for the two sections must be designed properly. The one set of plates may be smaller in size, one section may have fewer plates, and many times the plates are constructed with serrated or slotted plates. In that case, individual sections can be bent slightly to provide a customized tuning curve.

Conclusion

It is evident that the effect of all these capacitor-plate shapes is to produce a gradual change in the capacitance as the rotor shaft is turned. The same result can be accomplished with a slow-motion vernier dial constructed to vary its reduction ratio automatically at various points in the rotation. Shaping the plates to produce the desired result is a much simpler and more economical method of producing the different tuning curves. After the proper punching dies have been made, it costs no more to make capacitor plates with special shapes than it does to make semicircular ones.

Today, we can overcome many of the tuning problems described by using varactor diodes. Varying the voltage across these devices causes them to exhibit the characteristics of variable capacitors. By studying the charts of different variable resistors we can produce any desired tuning curve.

Reference

Ghirardi. *A Radio Physics Course*. New York: Technical Publishing Co., 1933.

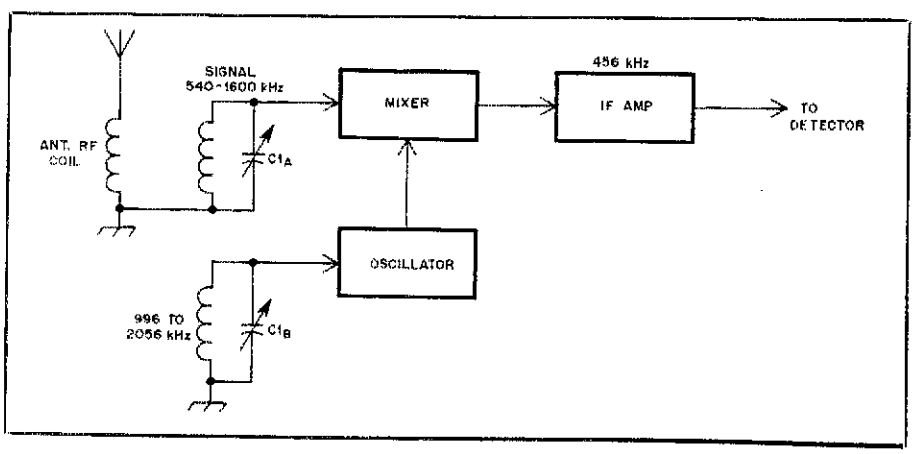


Fig. 9 — Diagram of a superheterodyne receiver, showing the RF and LO tuning capacitors ganged on one shaft. These capacitors must track properly for the radio to work.

• *First Steps In Radio*

How Receivers Work

Part 10: The antennas we discussed last month are of little use until we connect a receiver or transmitter to them. Understanding how receivers operate is a basic part of learning to be a radio amateur. Let's see what makes them tick.

By Doug DeMaw,* W1FB

Some hams lovingly call their receivers "hearing aids." Despite the misnomer being technically incorrect, the term does tell us what a receiver in an amateur station does: It aids us in hearing the other station's message. But, simply hearing signals does not mean we can dicipher them — at least without a good receiver (and some experience and operator skill). After all, many ham bands contain a jumble of radio signals that wax and wane, cover one another up and rattle our earphones or loudspeakers.

A good receiver is not necessarily one that costs $500 or more. Many simple, homemade receivers are capable of good performance if we are willing to do without countless knobs and features that are not essential to separating and copying signals. I think all beginners owe themselves the education and thrill of building at least one receiver. Many a new ham has been known to shout in excitement when that first distant station was pulled in on a homemade receiver. Words can't convey the feeling that goes with that experience. But, in order to pass your Novice exam or build a simple receiver, it is important to understand some fundamentals about receiver circuits.

There are many routes to follow in choosing a station receiver — store bought or made by hand. Let's take a look at some receiver concepts and follow briefly the evolution of the communications receiver.

At the Beginning

You may not be old enough to have heard about the "crystal set." Old-time amateurs still have nostalgic conversations about those early receivers. They consisted of a large coil on a readily available coil form, such as a toilet-tissue roll, oatmeal box or other cylindrical insulating form. The other vital element was a crystal and cat's whisker combination, which was used to detect the incoming signal. Earphones completed the package, apart from the antenna and earth ground. The circuit for such a radio is found in Fig. 1. I would like to suggest that you build one of these broadcast-band receivers for the experience. They are not suitable for reception of amateur signals, since they are incompatible with CW, SSB and FM transmissions.

Remembering that by today's standards these radios are very crude, we must accept limitations in performance. They do not separate strong signals very well, they require long antennas if one is not near a broadcast station, and the sound level in the earphones may be low on the weaker stations. But, the detected signal will be crisp and clear — more so than on some expensive receivers. The fidelity of a crystal set is amazing!

The early-day crystal radios used a galena crystal to detect the signal (Fig. 2), and adjustment of the cat's whisker was a tedious task, indeed. The experimenter had to move the metal whisker about on the surface of the crystal until a "hot spot" was located. The mere act of bumping the table would require readjustment of the whisker, and the really good hot spots were seldom found a second time! The combination crystal and whisker functioned as a modern point-contact diode, which of course has no adjustment (thank goodness!). Tuning capacitors were generally not used. Instead, the insulation along one side of the main coil was bared, and a conductive slider was moved across the exposed turns to change the coil inductance, and hence alter the tuned frequency of the receiver. Other crystal sets had many coil taps that could be selected by means of a tap switch, eliminating the slider mechanism. Enough about the "dark ages." Let's learn what makes so simple a receiver operate before moving to newer things.

The signal is collected by the antenna and flows to ground through coil, L2. The combination of L2 and C1 provides resonance at the desired radio frequency (your favorite station) when you tune C1. The energy flows from the tap on L2, and as it passes through the detector diode it is rectified. This converts the radio energy (RF) from ac to pulsating dc. This dc then flows through the headphones at an audible rate, permitting us to hear the signal.

The process is not unlike that of an ac power supply that uses no filtering after the rectifier. A link winding (L1) is used over L2 when the antenna is long. Were we to

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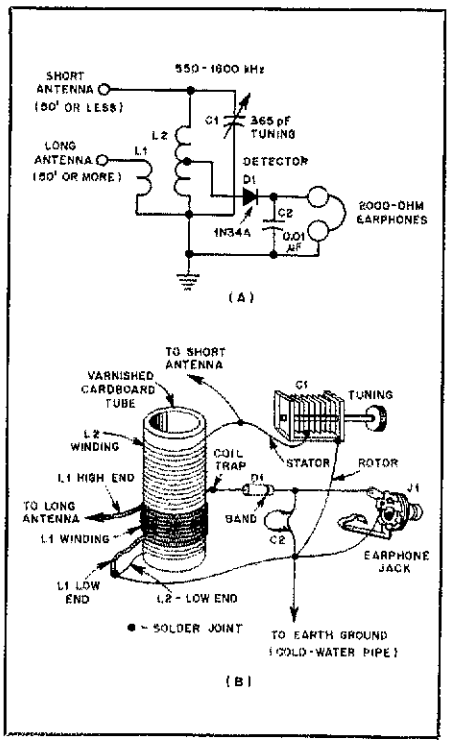

Fig. 1 — The schematic diagram at A shows the simplicity of the first radios, known as crystal sets. C1 was used to tune the stations of the standard AM broadcast band. The pictorial diagram at B illustrates how to connect the component parts of the crystal set. The radio can be built on a piece of wood or Masonite®. C1 is a 365-pF tuning capacitor. The small transistor-radio tuning capacitors are suitable for use at C1 if they have 365 to 400 pF of maximum capacitance. C2 is a disc-ceramic or tubular capacitor. D1 may be a small-signal diode, such as a 1N34A or Schottky diode of the type sold by Radio Shack. J1 is an earphone jack that matches your headphones, which should be 2 kΩ or greater in impedance. Alternatively, you may plug the output of this receiver into the input of your hi-fi amplifier. If so, insert a 0.01-μF capacitor between D1 and J1. L2 can be wound on a toilet-tissue tube. L2 should be about 220 μH in inductance. Use 150 turns of no. 26 enamel wire, close wound. Tap at 50 turns above the ground end. L1 may consist of 40 turns of no. 26 enamel wire, close wound, over the ground end of L2.

connect it directly to the top of L2, it would make the receiver tune very broadly and all of the stations would tend to come in at one setting of C1. In other words, the loading effect of the long antenna would ruin the selectivity of the receiver. The short antenna will not have a serious effect on the performance.

Enter the Vacuum Tube

The vacuum tube came along to help make reception more dramatic and practical. It permitted amplification of the radio signals *before* they were detected. This improved the receiver *sensitivity* immeasurably. Also, tubes could then be used to amplify the audio frequency (AF) after detection. This made loudspeakers practical, and several persons could listen to a radio at the same time. Radios of this class were known as tuned-radio-frequency (TRF) units. They are still used by hi-fi enthusiasts, but contain modern transistors and integrated circuits (IC).

Fig. 3 shows a typical circuit for a TRF radio. Additional RF-amplifier and audio-amplifier stages are used. They greatly increase the level of both the radio-frequency and audio signals, which enables the user to hear weak stations at comfortable volume. A shorter antenna will work reasonably well when the additional amplification is included.

Another popular amateur receiver that came along when vacuum tubes first appeared was known as the *regenerative circuit*. Exceptional sensitivity and selectivity for that era were possible with very few tubes or stages. The detector operated somewhat as an oscillator (just on the brink of oscillation). Part of the oscillator output energy was routed to the input circuit of the state and adjusted to bring the detector to the edge of self-oscillation. This action was called regeneration. It made the detector very sensitive and also aided the selectivity so that stations could be separated easily.

A typical circuit is shown in Fig. 4. The tubes (VT1 and VT2) were, depending on the era, O1As, 6C5s, 6C4s or dual triodes, such as the 6SN7 and 12AT7. Field-effect transistors, such as the MPF102, could be used today for this style of circuit. This kind of radio had a couple of problems. The detector, since it was a self-oscillating stage (like a small transistor), would permit energy to be radiated by the antenna (at the frequency to which the set was tuned). This would cause interference to nearby receivers that were tuned to the same frequency. Also, if the antenna would swing about in the wind, the radio would change frequency, causing the listener to keep his or her hand on the dial to compensate for the slight shift in frequency.

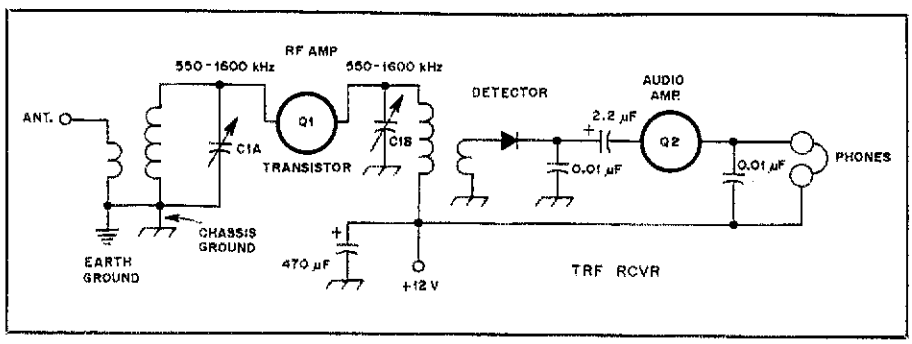

Fig. 3 — Block diagram showing how a TRF radio was set up (see text).

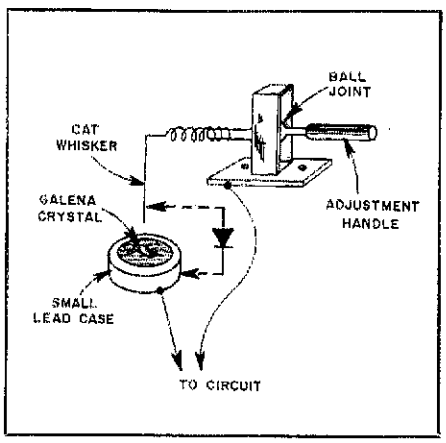

Fig. 2 — Example of a galena crystal and a cat's whisker, as used for detecting signals during the crystal-set era.

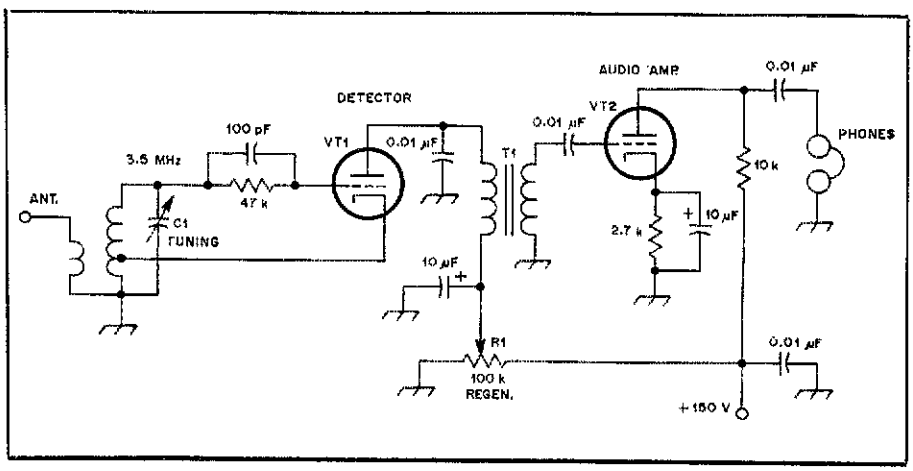

Fig. 4 — A regenerative receiver circuit. C1 was adjusted to the desired listening frequency, and R1 was set so the detector was on the verge of self-oscillation.

Clearly, something better was needed for reliable reception.

The Superheterodyne Receiver

It is not my intent to saturate you with nostalgia, for as the saying goes, "What is past is past." But, the evolution of the radio is important in terms of background if we are to understand how our present-day receivers operate.

About five decades ago, we were blessed by the invention of the superheterodyne receiver concept. Strangely, it has remained the standard circuit ever since, but with improvements and frills. Many of the circuits found in early receivers are common to today's circuits. The primary advancement is the use of semiconductors in place of vacuum tubes. The solid-state parts are, in general, more efficient: They operate cooler and last longer.

What is a superheterodyne radio (often called a "superhet")? The general scheme of the critter is shown in Fig. 5. At the left, we find an RF amplifier. It builds up the signal level from the antenna and helps to separate the stations by way of *selectivity* of the tuned circuits. If the receiver includes an RF gain control (R1), it is used to vary the gain of Q1. Next, the signal, say, 3.7 MHz, is routed to the mixer, Q2. The signal from Q1 is *mixed* with the one from our local oscillator, Q7. The output from the mixer can be either the sum of the two frequencies (9 MHz) or the difference (1.6 MHz). For reasons beyond this discussion we have chosen the higher intermediate frequency (IF). The local oscillator can be thought of as a tunable low-power transmitter that creates a CW carrier. In reality, it is not a signal unless intelligence is contained on it — at least by definition. If we were to be precise in describing the local-oscillator output energy, we would call it RF voltage.

Now that we have mixed our two frequencies in Q2, we have a 9-MHz IF. To ensure that this energy is pure and free of other frequencies (including the difference IF of 1.6 MHz), we have included FL1. This filter contains four or more quartz crystals that permit the passage of the desired frequency (9 MHz) while greatly attenuating or rejecting frequencies above and below 9 MHz. Depending on the design goals for the filter, it may pass only a narrow band of CW frequencies (250 Hz), or it may be wide enough to permit SSB or AM signals to pass (2 to 3 kHz). An FM filter will pass a much wider band of frequencies (15 kHz for many modern amateur FM transceivers).

There is always some signal loss (insertion loss) through a filter, for in order for it to be a filter it must have that characteristic. The typical loss through a filter will range from 5 to 10 decibels (dB). If the station to which we are listening is running 100 W of power, a 10-dB filter loss would be equivalent to that station reducing its power to only 10 W. Therefore, we must build up the IF signal by means of IF amplifiers (Q3 and Q4).

Our ability to separate the signals has come through the selectivity of the RF amplifier stage and the filter, FL1. Therefore, the IF amplifiers do not need to have a high degree of selectivity, since the job has already been done. In fact, if we chose to use no tuned circuits between the IF amplifiers, we could design our circuit that way. Most IF tuned circuits are used to provide an impedance match between stages, rather than to increase the selectivity.

Now that we have increased the signal level from FL1, we are ready to detect or *demodulate* it. This brings us to the product detector, Q5, of Fig. 5. Generally speaking, it functions as does the mixer, Q2. The major difference is that the IF of this stage is at audio frequency rather than at RF. Therefore, the local oscillator (BFO Q6) is offset in frequency by an audio amount. For CW reception it is usually between 700 and 1000 Hz, depending on the designer's philosophy. Thus, our BFO crystal can be 700 Hz above or below the 9-MHz IF for CW reception. The offset is about 1.5 kHz for SSB reception. No BFO is needed for AM or FM reception, but special detectors are required. A product detector can be used for AM reception, however, if the AM signal is tuned in as one might tune in an SSB signal (tuned until no whistle from the AM carrier is heard). A wider IF filter is desirable for AM reception so that better fidelity will result.

Now that we have detected the signal, all that remains is to build it up (at audio frequency) until it is strong enough to operate headphones or a speaker. An audio-gain control (R3) is included for setting the level for comfortable listening. Some receivers use an IF-gain control (R2) for varying the IF gain.

The circuit of Fig. 5 is that of a single-conversion superheterodyne receiver. Double- and triple-conversion receivers are common as well. They offer some advan-

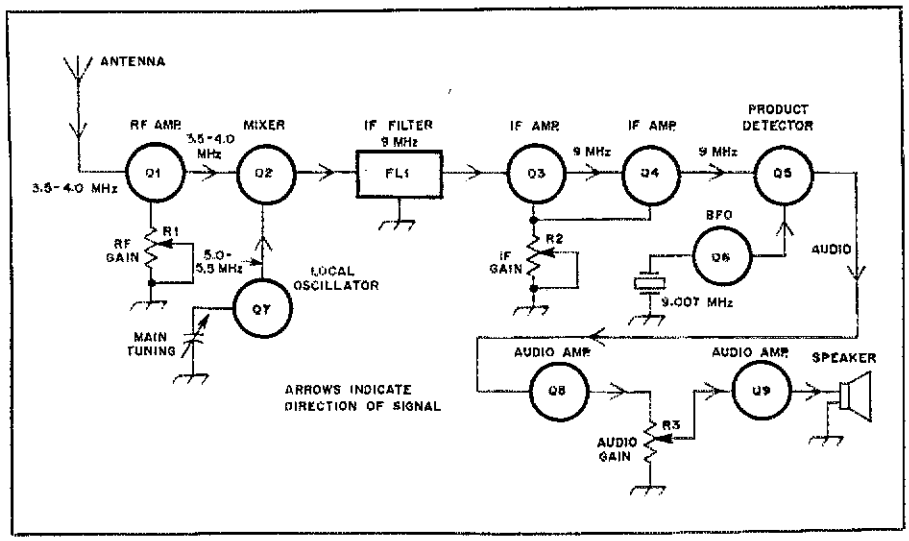

Fig. 5 — Block diagram that shows the lineup of a single-conversion superheterodyne receiver. The function of the stages is treated in the text.

Glossary

AGC — automatic gain control. An electronic circuit that lowers the receiver gain as the incoming signal becomes stronger.

BFO — beat-frequency oscillator. It generates an RF voltage that is beat or mixed with the IF signal to produce an audible voltage or signal.

decibel — (dB) — a unit of relative power measurement.

demodulate — the process of removing signal energy from an RF or IF signal and changing it to an audio frequency.

filter — a circuit used to pass desired frequencies while rejecting unwanted frequencies.

IF — intermediate frequency, as related to superheterodyne circuits.

local oscillator — generally considered the circuit in a radio receiver or transmitter that controls the operating frequency. It is adjustable by the operator from the front panel of the equipment.

regeneration — a state that exists when the output energy from a stage (amplifier) is routed to the stage input, intentionally or otherwise. It causes the stage to self-oscillate.

selectivity — the ability of a circuit to select the desired frequency while rejecting other frequencies.

sensitivity — the ability of a receiver to extract weak signals from the internal noise of a receiver to make them discernible or readable. Based on the ratio of the inherent receiver noise to the level of a received signal.

S meter — a panel instrument on a receiver that provides visual observation of received signal levels on a relative basis.

TRF radio — a nonsuperheterodyne receiver that has tuned RF amplifiers, a detector and audio amplifiers.

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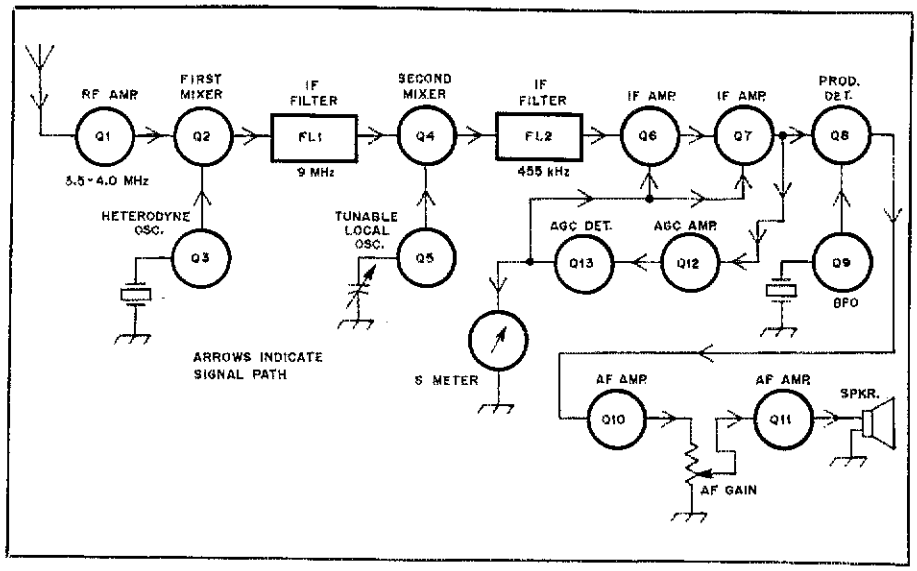

Fig. 6 — Block diagram of a double-conversion superheterodyne receiver. The function of the circuit, plus the addition of AGC and an S meter, are discussed in the text.

tages that we won't get involved with here, but Fig. 6 shows how they differ from a single-conversion receiver.

Practically, we have two receivers in series. There are two local oscillators (Q3 and Q5), two mixers (Q2 and Q4) and two IF filters (FL1 and FL2). What we are doing is converting the signal frequency from our antenna to 9 MHz, then converting it again to a lower frequency (455 kHz). The lower frequency is known as the second IF, while the 9-MHz frequency is the first IF. A triple-conversion receiver would have three local oscillators, three mixers and perhaps another IF filter. Fig. 6 shows the most fundamental method for realizing a double-conversion receiver. Modern receivers are substantially more esoteric than the example we have examined.

AGC and S Meters

Today's radios have automatic gain control (AGC) and relative signal-strength indicators (S meters). The technique for obtaining these features can be seen in simple form by returning to Fig. 6. Some IF energy is sampled at the output of the last IF amplifier, routed to an AGC amplifier (just another IF amplifier, actually), which is Q12 in our circuit, then it is rectified at Q13. The resultant dc voltage is sent back to the two IF amplifiers (Q6, Q7) for the purpose of changing their gain as the incoming signal from the antenna changes in amplitude.

The stronger the received signal, the greater the AGC voltage, and hence the lower the IF amplifier gain. This helps to keep the signal at the speaker from changing in volume, even though the received signal may vary considerably in strength. Some of the rectified AGC voltage may be used to operate an S meter, which gives us a visual indication of the relative strength of the received signal.

Today's receivers feature many additional frills, such as digital frequency readout, passband tuning, notch filters (for removing interference) fast and slow AGC response and frequency memories. But, the basic circuit is of the type shown in Figs. 5 and 6.

What Have We Learned?

If we are to summarize this lesson about receivers, we can say that the superheterodyne receiver is the common circuit today. It grew from the simple crystal detector of yesterday through a long period of evolution that brought performance landmarks step by step. A knowledge of how our receivers function is important if we are to pass the FCC license examination. It is vital also if we are to service our equipment or experience the thrill of designing and building a homemade receiver. If you wish to learn more about receivers I suggest you obtain a copy of *Understanding Amateur Radio*. There is an additional wealth of information on this subject in *The Radio Amateur's Handbook*, also available from the ARRL.

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 September issue were:

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- "Tips For Using Ribbon Cable," a reprint from the journal of the South African Radio League
- A review of a new book, *Land Mobile Communications Engineering*

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Next Month in QST

Among the fall collection of technical articles in November *QST* will be

- one showing how to build a waveform shaper that will make your CW signal the envy of your friends.
- one that will help with that all-too-common complaint — "where do I find parts for construction projects?"
- one that explains, in easy-to-understand language, how transmitters work — another in the First Steps in Radio series.

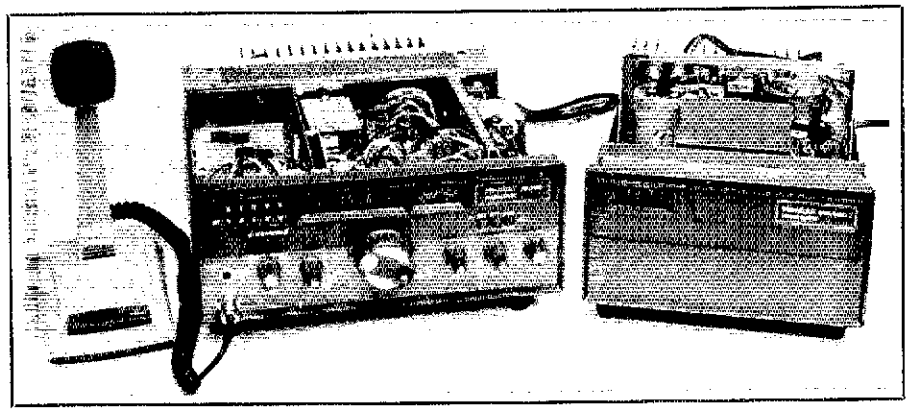
Happenings will bring you up to date on the brewing 220-MHz battle, and How's DX? will explore the rarefied world occupied by members of the DXCC Honor Roll.

Whatever your ham radio interests may be, you'll find lots of fascinating reading in November *QST*.

Product Review

Conducted By Paul K. Pagel,* N1FB

Heath HW-5400 HF Transceiver



My excitement ran high that Christmas of 1967. I had recently passed my Novice exam, and my parents had bought me a Knight-Kit T-60 crystal-controlled AM and CW transmitter. I spent most of my Christmas vacation assembling the kit. I got a lot of soldering experience, I learned how the pieces of my transmitter fit together (so that later, when repairs were necessary, I was willing to dive right in and locate the faulty components), and my parents saved about 40% of the cost of an assembled, comparable rig.

There was a lot of excitement around my house for the Christmas of 1983, too. This time most of the excitement was generated by my three harmonics, but I also had a new radio kit to build. I had been asked to complete the construction and review the Heath HW-5400 transceiver. This rig has many features I wish I could add to my Tempo 2020, so I quickly accepted the challenge.

A former ARRL Hq. staffer had started the project in April 1983. Three boxes were returned to Headquarters by mid-December: one for the radio, one for the power supply, and the heaviest and smallest one of all for the power transformer. The review unit also included the optional SSB filter unit, the push-button frequency-entry keypad and the HDP-242 desk microphone.

Luckily, the original reviewer had followed the most important instruction of all when he began the project: *Do not remove any bag or parts from the shipping carton until it is called for in the instructions.* There are 14 circuit boards in this kit, and the components for each one are found in one or two small paper bags. Heath has even included a map to show you where each bag of components is located in the carton.

My first step was to transfer all of the corrections on the enclosed addendum into the construction manual (a large, three-ring notebook). One point of confusion here was that I had two sets of addendum sheets, and at one or two points they made different changes to the same assembly step! Which change is correct? A call to Heath helped me determine which sheet to follow in those cases.

Most of the small hook-up wires are supplied in a 30-inch length of 25-conductor ribbon cable.[1] One of the first steps is to cut this cable into various length strands and multi-conductor cables. I found that it is very easy to ruin this wire. If you try to cut the full length of the cable with a knife, you are sure to nick the insulation in many places. When you perform this operation, do not attempt to cut all the way along the length of cable. Use a very sharp knife to start the cut, then zip the wires apart by hand. I called Heath and explained why I needed a new length of ribbon cable and a few other parts that had not survived the change in hands for the project. In the meantime, I had all of this work to do, and a deadline for the review that was only about a month away.

That was when I decided to start on a fresh project — the power supply. Actually, I recommend that anyone building this kit start with the power supply. It is a small project that goes together quickly. My total assembly time, including circuit checkout and a minor modification (more on this later), was just over 13 hours. Besides, when you have completed the '5400 assembly, you will want to power it up right away, so it helps to have a power supply ready and waiting.

The HWA-5400-1 complements the transceiver nicely. It supplies 13.8 V at up to 20 A to power the rig. It also supplies a 13.8-V memory keep-alive voltage so the transceiver will remember the frequencies stored in memory and the last operating frequency even when the power is switched off. The main supply transformer is activated with the HW-5400 power ON/OFF switch. It features a remote voltage-sensing circuit for the regulator transistors. This circuit monitors the voltage being supplied at the rig, and feeds control information back to the transistors. The power supply includes a remote speaker, and it even has a digital-display clock! What more could you ask for?

A small transformer is used to power the clock and memory keep-alive circuit. This transformer is on as long as the supply is plugged in. The main power-transformer primary circuit is closed by means of a relay that is activated when the power switch is turned on.

At construction time, you must decide if you will use the supply on 117- or 234-V mains. There are separate steps in the procedure to guide you through the installation of the proper fuses and jumpers. I decided to wire my supply for use on 117-V circuits. Even though a 234-V supply is more efficient, it is easier to find a 117-V outlet to plug into! Heath provides a standard 117-V, 15-A plug on the line cord. If you decide to go with 234-V operation, you are instructed to cut the plug off the cord and install the proper one.

When you wire the clock circuit board, you must select 50- or 60-Hz operation, depending on the line frequency you have, and you also select 12- or 24-hour display format. I chose the 24-hour format.

The only problem I had while constructing the power supply occurred when I tinned a couple of the larger-diameter wires, as instructed. They would not fit through the circuit-board holes provided. Then I had to clip off the tinned end and use a clean end to solder the wire to the PC board. The wire lengths provided seem adequate in most cases, so making the wire ½-inch shorter did not present any problems. As expected, the instruction manual is detailed and well written.

After completing the power supply and checking the operation, I was shocked to realize that this beautiful station clock provided no way to synchronize the seconds with a WWV time signal! The only way to come close is to plug the power cord in right on the BEEP. I found I could get the clock within 5 or 6 seconds of the correct time this way. But wait! If the only radio I will have in my station to receive WWV signals is the '5400, and it needs the power supply to operate, how can I listen for the tone to plug my supply in? It just won't work! What a disappointment.

Inspection of the clock chip revealed it to be an MM53113N IC. Checking the specifications on this chip in the back of the instruction book proved that it is indeed a full-featured clock chip, capable of alarm functions and much more. Grounding pin 32 (by means of a switch) displays a single minute digit, along with seconds. Now the fast-set switch holds the seconds and the slow-set switch resets them to zero. It didn't take me more than a few minutes to drill a small hole on the bottom of the cabinet, near the front, and to epoxy a small toggle switch to the main chassis

[1]mm = in × 25.4; m = ft × 0.3048.

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so the handle just fits through the hole. One word of caution here. Since Heath's warranty does not cover modified kits, I would recommend you build the radio and power supply without modification. After you are sure everything is operating as it should be, then go back and start making your modifications. You might even want to wait for the warranty to expire.

To set the clock, you must use some device to reach through a small hole in the front panel. A plastic tube about 1 inch long, which is a molded part of the front panel, guides the tool to the contact switch. Heath suggests use of a toothpick, but it did not work for me. A flat toothpick flares too much to fit all the way through the tube, and when I shaved one down so it would fit, it lacked the necessary strength. The perfect instrument proved to be a paper clip, with one end straightened. The remaining bends in the clip form a nice handle, the metal is thin enough to fit through the tube, and it has the required strength.

On with the Construction

The replacement parts arrived before I had completed assembling the power supply, so I was ready to get on with the radio by now! After I got into "virgin territory," things went smoothly with the kit assembly. The 259-page assembly manual is complete and detailed (so what else is new?). The instructions for each circuit board direct you the parts-box map to locate the correct bag and circuit board. Then you do a quick parts inventory for that section, and begin stuffing the board. Some of the boards are rather densely packed, but not so much that you can't work on them. The parts are installed in an orderly fashion, usually starting with the small resistors, diodes and capacitors, and then on to the larger components, such as electrolytic capacitors. You are instructed to move around the board, adding components section by section. A pair of small needle-nose pliers and a close-cut dikes are handy tools for this project.

Chuck Hutchinson, K8CH, showed me a nifty trick for installing the components. Even though the instructions are to mount the small components flush against the PC board, Chuck likes to mount them a little above it. His reasoning is that when a component burns or explodes, it is not as likely to char the PC-board markings. This can be important when you try to identify the part number and value to replace the damaged part. A piece of scrap PC-board material can be cut to a width about equal to the length of a ¼-W resistor body, and several inches long. This "spacer" can be held under the component being installed and the leads flared slightly to hold it in place while you solder them to the board. This provides a uniform spacing for the components above the board, and makes a very professional-looking job when the circuit board is done.

After each circuit board is completed, you are directed to make a series of visual checks on your work. It is much easier to double-check each component location and orientation at this time than after the boards are installed in the chassis! Also be sure to check every solder connection for cold-soldered joints or excess lead lengths that could short against another circuit trace or the chassis.

Most of the check-out procedures include a few resistance measurements. Heath recommends use of a high-input-impedance VOM. My meter has an input impedance of 20 kΩ/V. Heath also cautions that the negative ohmmeter lead must be connected to the ground foil unless you are told to do otherwise. Most hams will be aware that the red (+) lead on most VOMs is negative in the ohmmeter positions. Be sure to check your meter with a second voltmeter. You will get erroneous results on many of the measurements if the leads are reverse connected. My VOM gave results that did not agree with the expected measurements in a number of instances. I tried a VTVM from the ARRL lab to double-check those results. In most cases, the results were in the range of acceptable values when I used the VTVM. I would recommend the use of an FETVM or VTVM if at all possible.

Even with the VTVM, some measurements indicated problems with certain components. On the audio board, I found one troublesome measurement that indicated a faulty capacitor. When I tried to locate that part on the board, I discovered that it had been replaced with a jumper wire in the installation step! This illustrates the fact that a kit as complex as an HF transceiver is a dynamic project. The engineers at Heath are constantly working to improve the radio, but the documentation may not always keep up with the changes. (Of course, the same is also true for fully assembled rigs, but you would not be as aware of the changes. Many of the schematic diagrams supplied with those rigs do not match the actual circuitry inside the box.) There are markings and mounting holes on several boards for components no longer used. I used a felt-tip pen to mark off those areas, just so I wouldn't wonder if I had left out an important component later on.

There were a few other minor snags in doing these resistance checks. On the HI and LOW VCO boards you are instructed to check for shorts on the feedthrough capacitors, using your ohmmeter set to the ×1-kΩ range. The +12 V leads on both these boards have a 600-Ω resistor to ground on this capacitor, which looks like a dead short on the recommended range. It can be rather confusing until you start tracing the circuit wiring and schematic diagram.

On the controller circuit board, I installed a set of wires in holes I, G and O. A few steps later, I was again instructed to solder wires to holes I, G and O. That was when I discovered two sets of holes on the board with the same labels! Of course, I had seen the wrong set first. So I had to unsolder the wires and move them. Why label two sets of holes with the same letters on one board? Beats me!

Well, I finally had all of the boards built after spending about 70 hours working on the radio. Approximately another 10 hours of putting the circuit boards on the chassis, and I was ready to begin the alignment procedure. It has been very time-consuming, but fun. I am intimately familiar with every piece of my radio, and how it all fits together.

Then came the snag! While adjusting the USB oscillator on the BFO board, I found that I could not set the frequency to 8.83145 MHz. In fact, I could not adjust it higher than 8.827 MHz. Heath suggests a couple of diodes, an inductor or a transistor as possible culprits, so I lifted them off the board to check. All seemed normal. After many hours searching the circuit board for a bad solder joint and studying the schematic diagram for other possibilities, I came to realize that there was plenty of tuning adjustment, and everything was working. The trimmer capacitor was set to minimum value when the oscillator was tuned to the highest frequency possible. I just couldn't tune high enough — too much capacitance in the circuit! Then I noticed that the manual originally called for a 7.7-pF NP0 capacitor in the circuit, but that value had been changed to a 27-pF NP0 unit. I tried replacing the capacitor with the original one supplied with the kit. Now the frequency was too high, and would not adjust low enough! Well, try some values in between. After several hours of changing capacitors and checking the resonant frequency, I managed to hit on a combination that worked. Now I was able to adjust the frequency properly.

I spent some time on the phone with the Heath technicians on this one! They suggested a faulty capacitor or an incorrect inductor in the circuit. I received prompt, courteous service every time I called (even without identifying myself as an ARRL employee!), and within a few days I had some replacement parts to install. These did not seem to cure my problem, so I put my previous capacitor combination back into the circuit.

Toward the end of the alignment procedure, I hit another snag. To adjust the HI VCO circuit on 12 meters, you are instructed how to set the controls, and then directed to adjust a trimmer capacitor for a reading of +4 V at a test point. I found that by changing the trimmer setting, I could set the voltage to +1.6 or +11, but nothing in between! More calls to Heath. This is a complicated piece of equipment, and troubleshooting over the telephone is next to impossible, but the hams on the technical assistance line really know their stuff. The two or three gentlemen I talked to always had some suggestions or ideas about what could be causing my problems. We finally decided that I had a defective band-switch wafer, causing improper voltages to be switched to the HI VCO board. The band-switch wafers mount on the RF circuit board. A plastic shaft goes through three wafers on this PC board, and connects the front-panel knob and a wafer mounted to it with the sections mounted on the filter circuit board. There seems to be quite a bit of play in this system, and if one of the plastic-capsule wafers is a bit loose (as one of mine was), I don't see any way the whole thing can track properly. I replaced the band-switch wafers on the RF board and a few other components suggested by the Heath technicians. The problem just would not go away!

Heath Solves the Problem

I concluded that I was spending an unreasonable amount of time trying to solve this problem, while Heath could probably swap one or two circuit boards to locate the faulty one, and then it would be much easier to pinpoint the problem component. So I completed the final assembly without doing the rest of the alignment. Then I packed the radio up and shipped it back to Heath, along with a detailed letter explaining the problem I was having. The unit was sent out in early April, but by early June I still had not even received an acknowledgment that it had arrived at the service center! After several phone calls to the Advertising Manager, we did locate the radio. It appears to have had been repaired since early May, but it had been misplaced. I was promised that it would be returned that day, and a week later I had my '5400. I believe this is a case in which a regular customer would have received faster service. Apparently, there was some confusion about how to handle a repair for the ARRL!

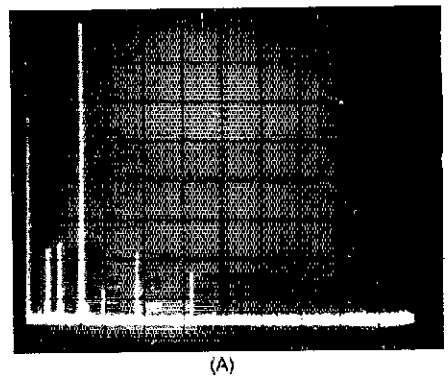
Heath returned a copy of the service technician's report and all of the components they replaced. One small coil on the HI VCO board was open. That apparently caused all of

Table 1
Heath HW-5400 HF Transceiver, Serial No. 01-47504

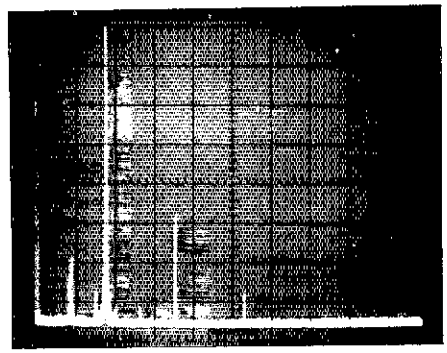
Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency Coverage: 3.450-4.050 MHz, 6.950-7.350 MHz, 10.000-10.200 MHz, 13.950-14.400 MHz, 18.018-18.218 MHz, 20.950-21.500 MHz, 24.840-25.040 MHz, 28.000-29.750 MHz.	As specified.
Modes of operation: CW-W, CW-N, LSB, USB.	As specified.
Tuning rate: 50 Hz/step, 1.25 kHz/turn 1 kHz/step, 25 kHz/turn with touch sensor.	As specified. Backlash nil.
Frequency display: 7 digit, vacuum-fluorescent green.	5/16-inch-high digits.
S-meter sensitivity (μV for S9): Not specified.	80 m: 46; 40 m: 43; 30 m: 85; 20 m: 65; 17 m: 82; 15 m: 160; 12 m: 180; 10 m: 94
Transmitter power input: 100 W minimum, except 80 W minimum on 10 m.	117 W maximum on 12 m, 94 W minimum on 10 m.
Harmonic suppression: −50 dB min., referenced to 100-W output.	−58 dB worst case, except −48 dB on 17 m.
Spurious suppression: −60 dB min., referenced to 100-W output.	See Fig. 1.
Third-order IMD: −30 dB min., referenced to 100-W output.	As specified.
Receiver sensitivity: less than 0.35 μV for 10 dB S + N/N.	Receiver dynamics measured with narrow (250-Hz) CW filter:

	80 m	*20 m*
Noise floor (MDS) dBm:	−135	−133
Blocking DR (dB):	110	112
Two-tone, 3rd-order IMD DR (dB):	82	90
Third-order intercept (dBm):	−12	+2

Receiver audio output at 10% THD: 2 W min. into 4 Ω.	2.2 W.
IF shift tuning: ±600 Hz (receive only).	Not measured.
RIT tuning: ±350 Hz.	+400, −700 Hz.
Operating temperature range: 0 to 40° C.	Not measured.
Size (HWD): 5 × 11½ × 14 in (12.7 × 29.2 × 35.6 cm).	5½ × 11½ × 15 in (14 × 29.2 × 38.1 cm), with raised front feet and clearance for heat sink and knobs.
Weight: 24 lb (10.9 kg).	



(A)



(B)

Fig. 1 — Worst-case spectral output of the HW-5400. At A, the rig was operated at 100 W on the 20-meter band. At B, the power output was 109 W on the 17-meter band. For both photos, the vertical scale is 10 dB/division and the horizontal scale is 10 MHz/division. The spectrum analyzer bandwidth was 100 kHz. The transceiver meets the manufacturer's specifications and current FCC spectral-purity requirements.

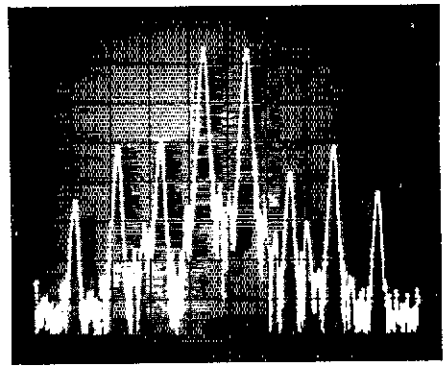


Fig. 2 — Results of the two-tone transmitter test. Third-order products are down approximately 30 dB. The transmitter was being operated at 100-W PEP output on the 20-meter band. The horizontal scale is 1 kHz/division, and the vertical scale is 10 dB/division. The spectrum analyzer bandwidth was 100 kHz.

the difficulty I had with the alignment. I believe I did also have a defective band-switch wafer, but it is hard to be sure. Several other components had to be replaced as a result of improper voltages being applied, either as I had tried to set the band switch to track properly or because of the defective wafer. The technician had even replaced my two 7.7-pF parallel capacitors on the BFO board with the original 27-pf value, and the USB BFO circuit adjusts to the proper frequency now. All of the remaining alignment steps had been completed.

After testing the rig in the ARRL lab (see Figs. 1, 2 and 3 and Table 1), I was ready to take it home for some on-the-air operating. Field Day weekend was fast approaching, and I planned to to use that contest to really see how good the receiver is.

Circuit Description

The main signal flow follows the pattern of most modern transceivers. I will describe only those features that are unique or specific to the HW-5400. Two voltage-controlled oscillators (VCOs) provide the LO signals for the transceiver. One operates on 80, 40 and 30 meters, while the other functions on the higher-frequency bands. Incoming signals are converted to the 8.83-MHz IF before being routed to the audio circuit board. With the HWA-5400-2 2.1-kHz, four-pole SSB crystal filter installed, the signal is filtered before being amplified. After the first IF amplifier, the signal goes through a six-pole filter and three more stages of amplification before being passed to the audio board. The wide and narrow CW filters are active audio stages. The narrow CW filter has a 250-Hz bandwidth, centered on 700 Hz.

At the heart of this radio is a microprocessor. Some of the functions it performs are: refresh the frequency display line; receive input from the shaft encoder or the frequency-entry keypad; program the frequency synthesizer for the desired frequency; poll the front-panel switches for the desired band and modes of operation; ensure that the PLL circuits are locked and the frequency is within certain limits before allowing the transmitter to operate; store the display and memory frequencies for each band, even when the transceiver is turned off (provided the memory-keep-alive voltage is present); and perform diagnostics on the transceiver when it is first powered up.

This last feature can be helpful if some problems develop with your radio. The controller displays certain information to help you track down the problem. If you see PLL on the display when you turn the transceiver on, for example, you will know that one or more of the PLL circuits has not locked. The information is rather limited, but it could prove helpful.

BCD information from the CONTROLLER board is routed to the display circuit board to provide a frequency readout. The vacuum-fluorescent display includes seven digits, a comma, a decimal point and several special display symbols. A small U, L or C to the left of the digits indicates USB, LSB or CW operation. A one-segment bar above this letter indicates that the unit is in the transmit mode. If you tune above or below either amateur-segment band edge, a left-pointing arrow near the left edge of the display will warn you that you are out of band. When you select split-frequency

operation, a bar will light under the arrow position; and if you choose to display the memory frequency (which is the transmit frequency during split-mode operation), a bright M will light.

The main-tuning method is quite interesting. The knob contains a metal insert connected to a capacitive-touch circuit. If you place a finger into this indentation, the microprocessor changes from a 50-Hz tuning rate to a 1-kHz rate! Behind the front panel is a plastic disc that has alternate clear and black radial stripes. When you rotate the tuning knob, these stripes pass between two pair of optical encoders. Signals from these encoders enable the microprocessor to determine which way you are turning the knob, and then decide to increase or decrease the operating frequency. During alignment, I discovered that if a bright light shines on the encoder, the frequency will not change! This could lead to a simple "dial lock" modification for the radio!

Most modern transceivers use PLL frequency-synthesis circuits. One problem with these circuits is that the time required to make a frequency step is inversely proportional to the loop filter bandwidth. This filter must have a bandwidth that is narrow enough to attenuate the reference-frequency signal to an acceptable level, and yet wide enough to allow a fast response to frequency changes. For a single-loop synthesizer, the minimum step size is equal to the reference frequency. If the filter bandwidth is left wide enough to provide small frequency steps, then more reference-frequency-oscillator noise will get through to the audio stage, or appear in the transmitted output.

A dual PLL synthesizer is employed in the Heath HW-5400. Loop one has a 10.05-kHz reference frequency, while loop two has a 10-kHz reference. Thus, the loop filters can have a fairly wide bandwidth and still provide good attenuation of the reference frequency. Each loop uses a VCO, whose output varies depending on the band and operating frequency. The VCO signals are combined with the PLL reference oscillators through a divide-by-N counter on the synthesizer board to provide 50-Hz frequency steps. The output from this synthesizer does not suffer from severe phase-noise problems, as has been common with many synthesized rigs. Evidence of this is shown in Table 1. We were able to measure the blocking dynamic range. Many rigs have a "noise limited" entry in that position!

The power amplifier uses three push-pull amplifier stages to produce 100 W of RF output. The final-amplifier transistors are a matched pair of Motorola SRF3351P power transistors. These devices are thermally protected by a pair of diodes mounted in contact with them. As the diodes heat up, they turn off a bias transistor, reducing the bias on the finals. While the transmitter should only be operated into a 50-ohm load, this type of protection does prevent the transistors from being damaged by a mismatched condition. When rigs with transistor final amplifiers first came out, they were prone to destruction of the output transistors if the SWR on the feed line was allowed to go too high. Many hams still seem to believe that this is a problem, but protection schemes such as are employed in the Heath HW-5400, have virtually eliminated this effect.

An Uncluttered Front Panel Means Easy Operating

One of the first things I noticed about the '5400 was that the pictures show a minimum of control knobs on the front panel. Does that mean the radio lacks some of the features of the other manufacturers' newest offerings? You may have noticed that some manufacturers seem to be competing to see how many controls they can squeeze onto the front panel of their radios. Well the HW-5400 may not have *all* of the features, but it does seem to have the important ones!

There is a grand total of six knobs on the front panel. Three of them are concentric, dual controls, however. Single knobs control the main tuning, and select the band and operating mode. The dual controls are for MIC/CW GAIN on transmit, AF/RF GAIN on receive and RIT/IF SHIFT. There are also six, small push-button switches to select other operating features, such as FAST or SLOW AGC action, PTT or VOX operation, TUNE, SPLIT transmit/receive operation, swapping memory and display frequencies or writing the display frequency to memory. With the optional frequency-entry keypad (for the price, I don't understand why anyone would choose to be without this), add 11 more buttons in the top-left corner. Hidden under the name label at the top right are the VOX controls and the sidetone-level adjustment. While you will need a small-bladed screwdriver to turn these controls, it sure beats hiding them under the top cover, where they end up being virtually inaccessible in many cases. Rounding out the front panel are the S meter, a PHONE jack and a MIC connector.

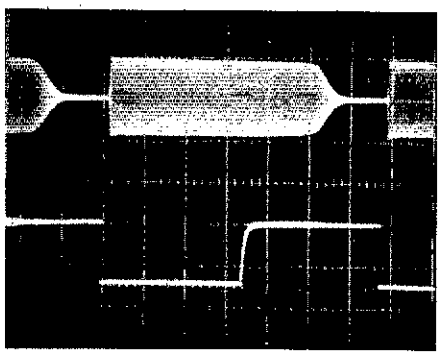


Fig. 3 — Display of the original keyed CW output waveform. The top trace is the RF output envelope, and the bottom trace is actual key closure and opening. Each horizontal scope division is 10 ms. Notice that it takes approximately 20 ms after the key contacts open before the output wave begins to decay. This delay appears to be independent of keying speed, and tends to eliminate the interelement spacing at speeds much above 20 WPM. This should be considered unacceptable for high-speed CW operation.

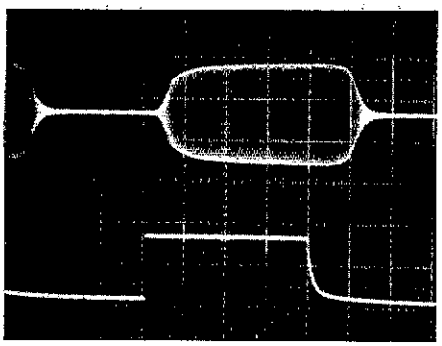


Fig. 4 — CW output waveform of the HW-5400 after I performed Heath's suggested modification. Each horizontal division is only 5 ms on this photo. The rise and fall times are much better, but most important, it only takes about 5 ms for the radio to begin to turn off the carrier after the key contacts are opened.

The rear panel is equally simple. A large heat sink for the power amplifier circuit board takes up most of the space. On one side of the heat sink is an SO-239 coaxial connector, a ground lug and phono jacks for a power amplifier ALC voltage and a set of relay contacts that close when the transmitter is activated. On the other side is a six-pin accessory connector, which provides a speaker output, memory-keep-alive voltage input and an output for the voltage-sensing circuitry of the HWA-5400-1 power supply. There is a phono jack for a positive CW keying line and a switch to turn the relay on or off. The largest connector on this side is for the four-conductor power-cord.

Operating Impressions

Lab testing of the receiver section showed it to be a fine performer. The characteristics listed in Table 1 will compare favorably with most receivers on the market today. The two-tone output spectrum and the CW keyed waveform gave me reason for concern about the transmitter portion of the radio, however. The two-tone output does meet Heath's specifications for the radio in terms of the third-order products, but normally we expect the fifth-order products to be reduced below that level. Fig. 2 indicates that the transmitted audio may be distorted somewhat. This is not a major problem, but something that could be improved. Actual operating experience brought no complaints of distorted audio.

My main concern was for the CW waveform. When you look at Fig. 3, you will notice a rather sharp turn-on characteristic, but the real problem is what happens when you let the key up. It takes 20 ms for the radio to realize it is supposed to turn off the carrier, and then about 6 ms more to accomplish this task. For the dot shown here, the transmitted dot length is almost twice the keyed dot length.

Notice what happens to the interelement spacing. For speeds much above 20 WPM, the space almost goes away completely. At Novice speeds, the rig will probably work fine, but for a high-speed CW operator, this waveform would be totally unacceptable. I called Heath for help with this problem. Their engineers looked at the waveform from a '5400 they had, and discovered that it was not what they had intended. I received a phone call a few days later, with a suggested modification to the keying circuit. I was assured that this simple change is being incorporated immediately. If you own an early version of the kit, contact Heath for the information. Any new kits purchased should include the changes on the RF board. Fig. 4 shows the keyed waveform after I made the changes. Quite an improvement!

I made a few contacts prior to the start of Field Day to become familiar with the operation of the rig. This radio is easy to operate, and the controls are placed so that large fingers can use them. The concentric controls have a full-sized knob next to the front panel, with a thin extension through the center. I do not feel like I must carefully reach around the center control to reach the rear one, as I do with many rigs that use this type of control.

I was anxious to try the IF SHIFT feature. I found several CW and SSB signals that had rather severe interference on them during Field Day. By turning this knob to the + or − side, I could usually find a setting that would allow copy of the original station. I find this feature to be very effective!

Since it was such a nice day, I decided to take the rig out to my picnic table for some Field Day fun. After about a half hour of sitting in the direct sunlight, I was getting warm, but not ready to quit yet. The '5400 felt differently about it, though. The brown cabinet and black heat sink were soaking up more heat than I was, and the radio decided to "go north" for a while! After I took it back inside and let it cool off a bit, everything was back to normal.

Switching between the memory and display frequency is an effective way to make a few more contest exchanges while listening to a particular station, waiting for a chance to work it. A single front-panel button makes this change quick and easy.

Fast break-in CW operation is achieved by setting the VOX DELAY to a minimum. It takes a little practice to get used to hearing the active receiver between code letters. But there is no better way to keep track of what is happening on your transmit frequency. More than once I completed a transmission with a non-QSK rig, only to find that the contact was broken because of a strong interfering signal. It is much easier to pick up the pieces when you are aware of the interference right away.

The HW-5400 selects the "normal" sideband on each amateur band. You have the option of choosing the reverse sideband if you have some reason to do so. There are two active audio filters that are selectable for CW operation. The narrow filter has a 250-Hz bandwidth. If you wish to operate other modes, you will have to adapt the radio to suit your needs. To get on RTTY, for example, you will have to wire an extra microphone connector to your modem for AFSK operation.

The S meter has the normal 0-to-9 signal-strength markings, plus marks for 20, 40 and 60 dB over S9. During transmit, the meter doubles as a relative power output meter. There is a block marked ALC on the meter face. It is important that you keep the needle within this block on voice peaks while transmitting SSB. Otherwise, you will overdrive the final amplifier, causing a distorted signal. Adjust the MIC GAIN control while talking into the microphone. For CW operation, you press the TUNE push button and adjust the CW GAIN control for the desired output.

I obtained an extra power cable from Heath so I could connect the transceiver in my car during the review period. The '5400 is small and lightweight, making it be a nice mobile rig. It may present some problems if you want to find space under the dash of a compact car, however. You will have to find some means for connecting a speaker for mobile operation. This could be through the front-panel PHONE jack or by means of a mating connector for the accessory jack. If you want the radio to remember your favorite frequencies between operating periods, you will also have to provide a battery connection to the memory-keep-alive pins.

What has been left out of the HW-5400? It has no noise-blanker circuit, no RF attenuator and no crystal-calibrator or marker-generator circuit. Neither is there any means to disable the AGC operation. There is no provision for auxiliary microphone input or audio output. These features would make it easier to connect an RTTY modem to the radio.

Tuning the receiver without an antenna connected revealed numerous weak "birdies" and other "growlies." The receiver has some odd-sounding noises on the 80-meter band. These seem to be coming from the controller circuit, because when I entered numbers on the keypad while tuned to some of these frequencies, the noise would change. The loudest birdies occur at 4.02112 MHz, 7.0362 MHz, 28.13850 MHz and 28.96365 MHz. These signals just barely move the S meter. I found one stronger signal by tuning to 10.000 MHz and then turning the RIT control as low in frequency as possible. When I also move the IF SHIFT control to the low-frequency side, the S meter moves nearly half an S unit. I did not find any of these spurious signals to be a problem during normal operation, even after I knew where to look for them.

Conclusions

At the beginning of this review I mentioned my first transmitter, a Knight-Kit T-60. There were many reasons for buying a kit then, the greatest of which was the fact that it was possible to save as much as 40% of the cost of a comparable rig. Other reasons were the claims that the builder would learn a lot about electronics in the process, gain knowledge of the radio itself and the sheer pleasure associated with being able to say, "I built it myself!" Were these claims valid then, and are they still valid today? Well, there are probably many different opinions about this.

I never did believe a person could learn electronics by building a kit. You certainly gain a lot of soldering experience, but there is more to electronics than being able to solder properly. There is a potential to learn some electronics, however, if you want to take the time to learn the function of each component as you install it. By tracing the schematic diagram as you go, you can certainly begin to understand the general flow of signals through the radio. While my T-60 was an excellent first-time kit for a high-school-aged Novice, I don't think I could recommend the HW-5400 as a first project under the same circumstances!

Dollar for dollar, can you get a better-performing rig today by building it from a kit than if you bought one already built? Probably not. The price of a fully equipped HW-5400 may be a little less than the price of a comparable transceiver already assembled, but you must be willing to spend on the order of 100 hours to complete this transceiver. Certainly not a weekend project!

So why buy a kit radio? Well, it is certainly true that you will be intimately familiar with the component layout. And I am sure that I will be better able to dig into my '5400 to correct any problems. Heath includes a detailed troubleshooting section with the manual. Complete realignment instructions are also included. To get similar information about another brand of transceiver, you would have to purchase a service manual. Even that may not contain as much material as Heath supplies.

All of this familiarity with the radio also leads to ease of modification. While I was building my kit I thought of several features I might add at some point. I like having a stereo phone jack for my headphones. I have purchased a pair of the lightweight headphones that go with the popular portable FM stereo radios. These 'phones are ideal for long hours of operating, because they are light and comfortable. Also, with a stereo jack, it is possible to insert the plug half way, and have audio in the speaker and the headphones. I've found this to be handy under a variety of circumstances. It might also be nice to have an auxiliary audio output and mic input for use with a radioteletype modem or phonepatch. These and many other modifications will be easy to add.

Finally, there is definitely a great satisfaction to be gained by operating a radio that you have built yourself. This sense of pride is all the greater when the result of your work is a nice-looking, functional transceiver like the HW-5400.

Yes, there are many valid reasons for building a project like this. I hope you'll enjoy it as much as I did. The HW-5400 and accessories are available from Heath Company, Benton Harbor, MI 49022, tel. 616-982-3411. Price classes: HW-5400, $500; HWA-5400-1 (power supply), $200; HWA-5400-2 (SSB crystal filter), $60; HWA-5400-3 (frequency-entry keypad), $60. — *Larry Wolfgang, WA3VIL, ARRL Hq.*

New Products

TRIM-TRONICS AIR-VARIABLE CAPACITORS

☐ Trim-Tronics, Inc., offers a line of air-variable capacitors designed with a self-resonant frequency greater than 5 GHz. They are suitable for sensitive telecommunications applications such as satellite, microwave, two-way radio and test instrumentation, where very precise tolerances are required. Typical applications include uses with RF amplifiers and oscillators, and for crystal tuning, coupling, impedance matching and filter tuning.

A unique design produces a high-Q factor (greater than 5000 at 200 MHz), allowing the capacitor to operate at microwave frequencies. The vertical slotted rotor mechanism of the capacitor results in complete surface area contact, producing uniform torque and a contact resistance of less than 1 milliohm.

Available in several mounting styles, the Trim-Tronics air-variable capacitor has a temperature coefficient of ±15 parts per million over a wide temperature range. The capacitor has a voltage rating of 250-V dc.

Trim-Tronics manufactures air plate and tubular capacitor lines. The company is a member of the Trush Group, Inc., and is affiliated with Alfred Tronser GMBH of Germany. For more information concerning their capacitor lines, contact Mr. James E. Dowd, Trim-Tronics, Inc., 67 Albany St., Cazenovia, NY 13035; tel. 315-655-9528. — *Paul K. Pagel, NIFB*

Hints and Kinks

Conducted By Larry D. Wolfgang,* WA3VIL

HAIRPIN MATCH FOR THE COLLINEAR-COAXIAL ARRAY

☐ I have built several collinear-coaxial-array antennas over the years. A 2-meter version of this antenna is described in *The ARRL Antenna Book*, 13th edition, pp. 247-249. I could not adjust the SWR below 1.7:1. After talking with other hams who built antennas like this, I found that 1.7:1 is about normal for a minimum SWR value.

After many hours of experimentation, I devised a hairpin match that achieved a 1:1 SWR. Dimensions for the antenna and details of the hairpin are shown in Fig. 1. Fig. 2 illustrates the method of connecting the coaxial-cable sections together.

I suggest that you make an antenna using three ½-λ elements to start. Use solid-dielectric cable, which has a velocity factor of 0.66. If the resonant frequency of the antenna is off by more than about 1 MHz, you will have to trim the elements a bit. If it is only off by 0.5 MHz or so, then you can add extra elements at an adjusted length to fine-tune the resonant frequency. Add ½-λ elements in pairs, always maintaining an odd number of ½-λ sections.

I built a collinear-coaxial array for a local repeater. The antenna has nine ½-λ elements, and it seems to provide a reasonable amount of gain. — *Barry Boothe, W9UCW, Channahon, Illinois*

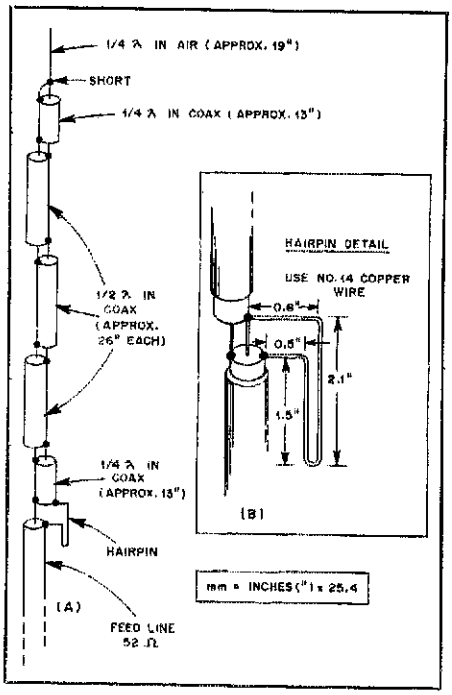


Fig. 1 — Approximate dimensions for the construction of a collinear-coaxial-array antenna are shown at A. B shows the details of a hairpin match used to obtain a 1:1 SWR.

DRILLING IC-PIN HOLES IN CIRCUIT BOARDS

☐ There are many different methods and ideas for producing circuit boards for projects. One step that has given most hams a problem is drilling the holes for a DIP IC. Here is a method I use to make circuit boards for construction projects.

Use rubber cement to attach a blank piece of circuit-board material to a block of wood. Place a copy of the board layout over the PC material and tape it to the wood. Now, drill the indicated holes, but when you come to an IC, drill two holes at diagonally opposite ends of the IC. Then, use two brads to hold a Radio Shack IC board (part no. 276-024) over the appropriate position. Use this predrilled board as a template to drill the other holes. (A piece of perforated board with the proper hole spacing or other template could also be used.)

After drilling all holes, slip a piece of carbon paper under the board-layout pattern and trace the wiring. Finally, remove the carbon paper and pattern and go over the lines with an etch-resist pen or enamel. Make pads around the drilled holes, even putting resist in the holes. The board is now ready to etch.

This system also works for projects with no published PC-board pattern. Carefully plan the layout to conserve as much space as possible. Avoid crossovers and keep the traces from coming so close together that they touch. — *Edson B. Snow, W2UN, Pompano Beach, Florida*

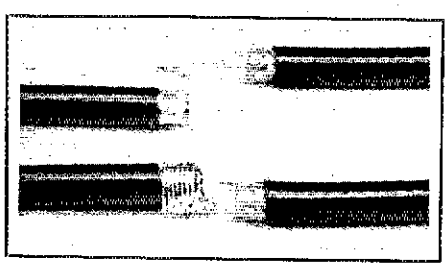


Fig. 2 — Prepared ends of the coaxial cable and the method of soldering them together.

COPPER-FOIL TAPE CIRCUITS

☐ When my wife and I enrolled in a class to learn stained-glass techniques, I made a wonderful discovery for my Amateur Radio projects.[1] Strips of copper tape applied to pieces of stained glass allow the project to be soldered together. This tape is inexpensive and is sold at any hobby shop that has stained-glass supplies. It is available in 5/32, 3/16, 7/32, 1/4-inch and wider rolls.[2] The adhesive on the tape is designed to withstand soldering heat.

The possibilities for this tape seem endless. It is great for making circuit traces for PC projects. If the 5/32-inch width is too great, narrower strips can be cut with scissors or a razor blade. The wider rolls of tape can be used to make round pads with a paper punch, or to cut curved traces. The adhesive is nonconducting, but I would not trust it to insulate the circuit traces. Build the pattern on an insulating material. Crossover traces can be insulated from one another by a piece of paper or other thin, insulating material. Where overlapping traces must be connected electrically, you simply solder them together. The tape is easy to solder to, but I recommend that you keep it in an airtight plastic bag to prevent the copper from oxidizing.

The tape is 0.0015 inch thick (1.5 mils). The cross-sectional area of the 3/16-inch tape is 281.25 square mils, which is equivalent to 358 circular mils. A no. 25 wire has an area of 320 circular mils. The tape should be able to handle 500 mA with no problems.

This copper tape can be used to wind coils on a cylindrical form. Such coils are ideal for a Transmatch because they exhibit low distributed capacitance. Fig. 3 shows why the tape coil has less capacitance than one made from wire.

The March 28, 1983 issue of *Design News* contains an article titled "Foil Tape Converts Reed Switch to Switchable Coaxial Conductor." This article describes how the CATV industry is using 4.2-mil-thick copper tape to make coaxial switches.[3] Fig. 4A illustrates the basic operation of a reed switch (relay) and Fig. 4B shows how a foil-wrapped switch can be soldered into a coaxial line. If the foil is wrapped in a spiral around the switch, the overlap edges should be soldered to form a cylindrical conductor around the glass.

Apparently, the relays and foil being used in

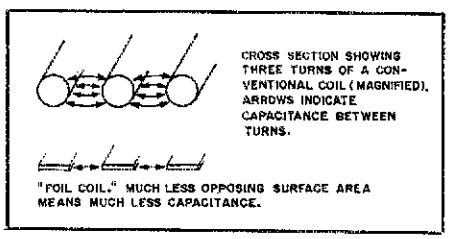


Fig. 3 — The cross-sectional area and distributed capacitance between turns of a wire coil and a foil-tape coil are shown.

*Assistant Technical Editor

[1]This article is adapted from the June 1983 Ozaukee Radio Club Newsletter, P.O. Box 13, Port Washington, WI 53092.

[2]mm = in x 25.4.

[3]Scotch 1245 tape; available from 3M Company, St. Paul, MN.

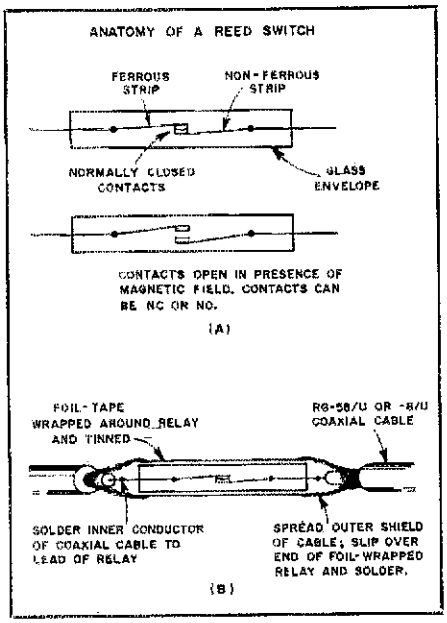


Fig. 4 — The parts of a typical reed switch are shown in A. B shows the construction of a coaxial reed relay.

the CATV industry produce a 75-Ω impedance. Amateurs may have to experiment with relay dimensions and foil thicknesses to obtain the best impedance match for their systems. There are certainly some interesting applications for this idea. The insertion loss is claimed to be less than 0.2 dB, with good isolation. You can use two or more relays in series to increase the isolation if needed.

I am sure there are other uses for this versatile tape. Someone will probably even try building a transmitter in a bottle! Actually, building circuits on a curved surface is no problem at all with this material. — *Stan Kaplan, WB9RQR, Mequon, Wisconsin*

HIGH-VOLTAGE POWER-SUPPLY SAFETY

☐ We all know that a 3000-V power supply with a large filter capacitor is a lethal device. Even with the transformer primary circuit open, the charge stored in the capacitor can be deadly.

While testing some transmitting tubes under actual operating conditions, I was running the amplifier with the safety cover off. I was being extra careful, but as it turned out, not careful enough. Preparing to change tubes, I turned off the power and was reaching for a screwdriver when the telephone rang. As I picked up the phone, I heard my wife come on the line. Since the call was for her, I hung up my phone and went back to my testing.

That is when I made the almost fatal mistake. Instead of picking up the screwdriver to short the filter capacitor, I reached for the tube plate clip. This time I "only" got a slight burn and a severe jolting, jarring, electric shock. Luckily, I was standing on a layer of plywood on the floor, and had only reached with one hand! The shock path was through my fingers to my forearm, which I had rested on the edge of the front panel. Had the shock path been through my chest cavity, I might have been killed! After I regained my composure, I decided to do something to reduce the risk of such a sequence of events recurring.

There is no need for voltage to be applied to the plate line when the tubes are not working. A relay could serve as a safety disconnect to isolate the lethally charged capacitor from the plate line. I looked through my relay collection and found several that would be able to handle the required voltage and current. My final choice was a Leach type 1127 relay with a 117-V ac coil. I cut away part of the mounting bracket near the high-voltage terminals to be sure of sufficient clearance.

I mounted the relay near the hot lead on the filter capacitor. Zip cord is used to wire the relay coil. You should find a spot that has voltage applied to it when the high-voltage supply is energized, and choose a relay that operates on the appropriate voltage. A piece of RG-8/U with the shield braid removed is good for wiring the high-voltage leads. Use the normally open relay contacts in the high-voltage line. I wired the two sets of relay contacts in series for extra isolation.

When I was sure all of the leads were properly soldered and nothing was shorted, I put the unit back in service. It seemed to work fine, but after a couple of weeks a slight corona leak developed between the switching contacts and the grounded frame. Remounting the relay on a piece of plastic spaced away from the chassis cured this problem.

The safety disconnect worked so well that I decided to install a similar relay in my other high-voltage power supplies. My homemade 30-meter transmitter has a 1000-V supply, is wired breadboard style, and has only a front panel. Putting a safety disconnect in this circuit was very worthwhile!

This technique does not render the high-voltage supply harmless, but it does reduce the chance of accidental contact with dangerous voltages. Seeing the high-voltage meter on the tube plate snap back to zero when I open the PTT line sure gives me a reassuring feeling. Adding a safety disconnect is so easy and effective that everyone should put one in the high-voltage-supply line of their transmitter or amplifier. — *John Labaj, W2YW, Elsmere, New York*

☐ We should all protect outselves against electric shock by following good workshop practice — such things as unplugging the power supply before working on equipment, using bleeder resistors on filter capacitors and installing safety switches on enclosures. There is still the risk, however, of human and mechanical failures. Moreover, there are numerous occasions when tube transmitter plate circuits must be accessible when high voltage is applied.

I make it a practice to attach a 4- to 10-MΩ resistor and a small neon lamp to the hot end of the plate choke, or in some other conspicuous place in the plate-circuit compartment (see Fig. 5). This gives a visual warning when the circuit is live, either because the power is on or the filter capacitors have not yet bled down to a safe voltage.

With power transistors carrying large low-voltage currents, it is not a bad idea to do the same thing in a solid-state rig. Use a small resistor and an LED, preferably a flasher type. Massive short circuits can be avoided simply by the extra reminder not to let your tuning tool slip. — *Alex Comfort, M.D., KA6UXR, Santa Barbara, California*

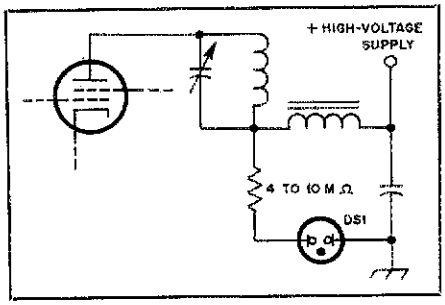


Fig. 5 — Partial schematic diagram showing how KA6UXR adds a visual indicator to warn of the presence of dangerous high voltages in his tube-type equipment.

BROADCAST ANTENNA FOR 2-METER MOBILE OPERATION

☐ Here is a simple system that permits simultaneous use of a car-radio antenna for broadcast reception and 2-meter operation. It is one way around the complications of drilling holes in your new car to mount an antenna, or of having an extra element to advertise the radio equipment inside the vehicle. There may be a slight signal loss on 2 meters, but little or no loss on the AM broadcast band.

The diplexer is shown in Fig. 6. It consists of two Motorola jacks for the antenna and car radio, plus a third coaxial connector for the line to the 2-meter rig. A parallel-resonant trap for 2 meters connects between the antenna and the car radio to isolate the BC receiver from the 2-meter signals.

The most common length for nontelescoping car antennas is probably 31 inches. I placed a 5- to 25-pF trimmer capacitor between the antenna jack and the 2-meter jack. This is used to tune out the inductive reactance of the antenna.

The whole diplexer fits into a 2 × 2 × 2-inch aluminum box. The trap frequency should be adjusted by means of a GDO before it is connected into the circuit. 5 pF and 0.2 μH are typical values. I used a slug-tuned coil form. The ceramic trimmer capacitor is adjusted for maximum received signal or maximum field strength before installing the cover on the box. The enclosure must be completely RF tight to prevent ignition-noise pickup. Do not use a plastic box! I use 73-ohm coaxial cable for the feed line to my 2-meter transceiver. — *William Skeen, W6WR, Hornbrook, California*

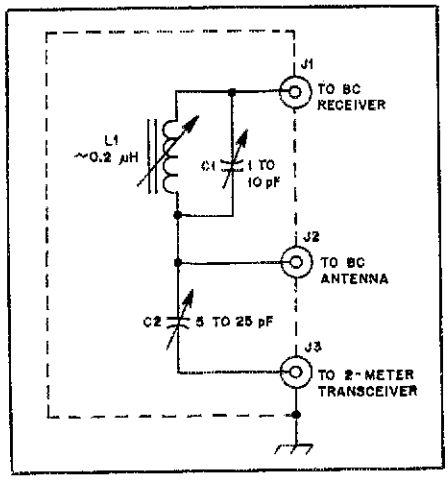


Fig. 6 — Schematic diagram of a 2-meter/AM broadcast diplexer. This circuit allows the use of an AM car-radio antenna for 2-meter operation.

Technical Correspondence

Conducted By
Bob Schetgen,* KU7G

A HIGH-GAIN MONOBAND DIRECTIONAL ANTENNA

☐ The X-ray antenna system was developed for the purpose of obtaining a simplified, high-gain antenna system with directional characteristics that can be changed quickly by remote control. This system provides:

- 6.5-dBd main-lobe gain
- broad bandwidth
- simple coaxial-cable feed
- instantaneous remote beam control
- low-angle DX capability
- modest height and space requirements

Essentially, the X-ray antenna consists of a pair of back-to-back, parallel connected, 1.25-λ V arrays. It could be described as an "inside-out" rhombic. This arrangement requires five supports, including a central support that is at least 0.5 λ high. The remaining four supports, however, can be significantly shorter because a 22° to 35° tilt is applied to all four antenna elements. The basic 1.25-λ V antenna presents an impedance of approximately 100 Ω at the feed point. Therefore, two of them connected in parallel result in an impedance that is near 50 Ω. This offers an extremely convenient point to apply coaxial-cable feed to the system. A 1:1 balun transformer preserves antenna balance. Also, a relatively broadband effect results from the wide-band balance and combined terminal impedances of both Vs.

The tilt angle, α, applied to each element provides a lower vertical-lobe angle. This favors long-range communication paths although it also produces quasi-elliptical polarization. Angle α, as shown in Fig. 1, may be anywhere between 68° and 55° with respect to the central support. Fig. 1 shows a plan and elevation view of the X-ray system. Fig. 2 illustrates the method employed for relay control of directional characteristics, and Fig. 3 shows the relay enclosure mounted on the central mast.

The relay box contains a DPDT relay and a 1:1 balun transformer. Appropriate chassis connectors are mounted at the bottom of the box for remote relay control and coaxial cable to the station. The box should be waterproofed by covering any openings or seams with RTV (General Electric or Dow) sealant. Four 5/8- to 1-inch-diameter holes are provided at four corners of the enclosure and covered by square pieces of Lucite™ or Plexiglas® sheet bolted to the box.[1] Flexible wire leads, from the relay contacts, are brought out through small holes in the insulating sheets and connect to the antenna elements, as shown in Fig. 3.

Table 1 provides the antenna element lengths and the minimum recommended central-mast height for each operating band. The element-length formula is:

$$L = \frac{1230}{f} \qquad \text{(Eq. 1)}$$

where

L = length in feet
f = frequency in megahertz

[1]mm = in × 25.4; m = ft × 0.3048

*Technical Editorial Assistant

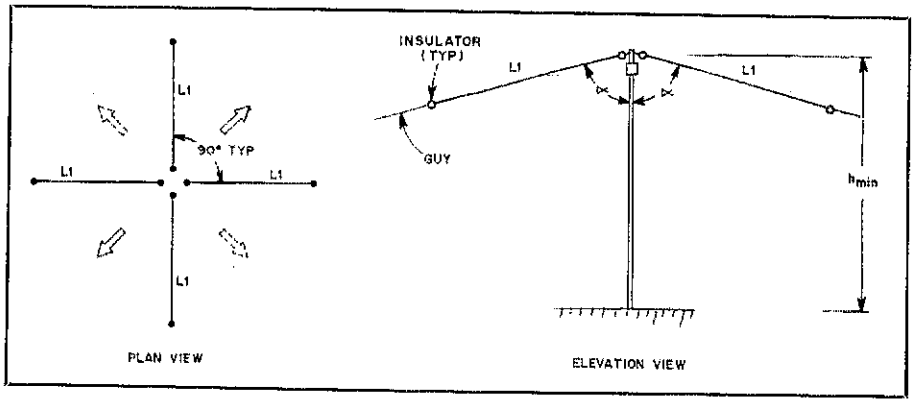


Fig. 1 — Plan View and Elevation of the X-ray antenna array. Minimum center mast height, h, is given in Table 1.

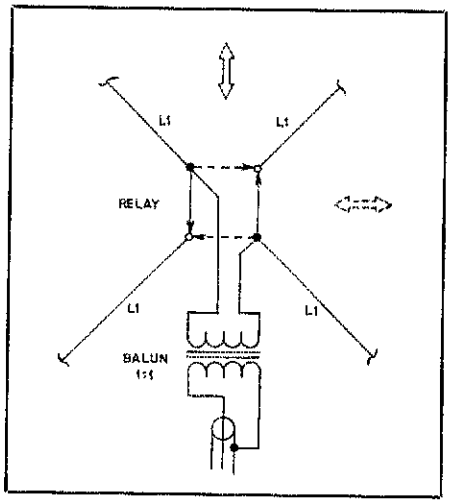


Fig. 2 — Schematic diagram of antenna array and switching system. The arrows indicate main-lobe orientation.

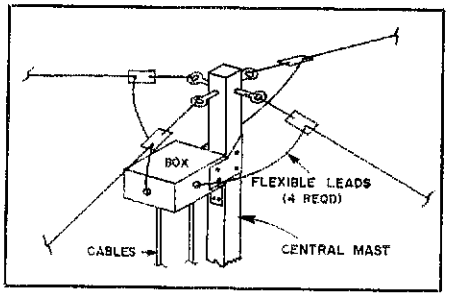


Fig. 3 — Arrangement of antenna and switching box at the top of the center mast.

The system completely covers all but the 10-m band, where it should be limited to any one 0.5-MHz segment. Cut the antenna elements for the center of any band shown in Table 1. Performance should be satisfactory, as long as all elements, including the leads to the relay and balun, are the same length. — *Richard R. Schellenbach, W1JF, Reading, Massachusetts*

Table 1
Element and Mast Dimensions

Band	Element Length	Center Mast
40 m	172 ft	67 ft
30 m	122 ft	46 ft
20 m	87 ft	34 ft
15 m	58 ft	22 ft
10 m (28.0-28.5 MHz)	43 ft 6 in	17 ft
10 m (28.5-29.0 MHz)	42 ft 9 in	
10 m (29.0-29.5 MHz)	42 ft	

TRANSMATCHES

☐ There seems to be mass confusion about what a Transmatch is and where it should be used. A Transmatch in the shack can, in fact, present a better load to the transmitter or amplifier than exists at the transmission-line input. In the presentation of this "corrected" load, however, only feed-line tuning is accomplished. That is, the transmitter is matched to the feed line, rather than the feed line to the antenna. At different frequencies and line lengths, the item that actually takes power (feed line or antenna) is determined by factors other than the Transmatch setting.

A Transmatch increases performance of the antenna system only when used at the antenna feed point. Consider a typical amateur installation. Coaxial cable has a fixed characteristic impedance. When attached to a mismatched load, however, the cable acts as a transformer. Input impedance may range from zero to infinity (if line losses are ignored) depending on the load impedance and cable length. Cable input impedance varies as a result of the difference between the load and cable characteristic impedances. Any matching is better done at the load, than the line input.

Transmatches are wonderful devices and I use

one often as I need to load a random-length wire onboard ship. I keep in mind, however, that I am only providing a proper load for the transmitter — not improving antenna system efficiency. — *Clifford R. Ward, WA5LVG, Spring, Texas*

CURRENT DISTRIBUTION ON DIPOLE ANTENNAS

☐ Dick Rollema, PAØSE, has pointed out an incorrect statement and diagram in my article, "The Effect of Supporting Structures on Simple Wire Antennas" (Dec. 1982 *QST*). On page 32, under the heading, "The λ/2 Inverted V," I stated, "The current elements ($id\ell$) on each arm of the dipole will be opposite in phase, so the currents that each induces on the tower will cancel." This statement is not correct, since the current on a λ/2 dipole is in phase over almost the entire length of the antenna.

Dick asks: 1) How does this affect the conclusions reached, and 2) Why is the current in all elements of a half-wave dipole in phase, when the magnitude varies cosinusoidally with position on the radiator?

Rollema is correct: The currents on the two arms of a dipole are in phase, but the spatial relationship of each arm current to the feed point is different. That is, if current is traveling toward the feed point on one side of the dipole, it is traveling away from the feed point on the other side.

Hence, for the inverted-V configuration, current is traveling "up" one sloping arm and "down" the other. The vertical components of these current vectors are opposite in phase, and the currents induced on a conductive center support (or the sheath of the coax, if a nonconductive mast is used) are opposite in phase and cancel. This is true only if a balanced feed is employed. More often than not, the inverted V is shown with unbalanced feed (see DeMaw, Jan. 1984 *QST*, p. 31). I cannot say what the radiation pattern would be with such a feed, but it is clear that the vertically polarized fields off the ends of an inverted V are very sensitive to unbalance (see my Technical Correspondence item in June 1982 *QST*).

Rollema points out that a similar wrong statement is made about the current phase on horizontal dipoles (page 33 of my December article). This does not affect the conclusions reached, however: Even for in-phase currents, the support towers are not symmetrical with respect to each arm of the dipole. The induced currents do not cancel.

Now let me address the second question: Why are the current elements on dipoles in phase, while the magnitude varies cosinusoidally with position on the radiator? This is a characteristic property of resonant antennas that is easy to explain for a half-wave dipole.

Consider a current element traveling from a center feed point along one arm of a dipole. As the current travels there is little change in amplitude, but phase changes with distance traveled, until current lags by 90° at the end of the antenna (Fig. 4). At the end of the antenna, where total reflection occurs, there is an abrupt phase change of 180° (associated with a change in the direction of travel) and the current elements travel back toward the feed point. The current on the antenna (amplitude and phase) is the sum of current elements that are traveling in opposite directions on each arm. At the ends of the dipole arms, the current is the sum of two vectors that are equal in amplitude and opposite in phase, and hence, the resultant current is zero.

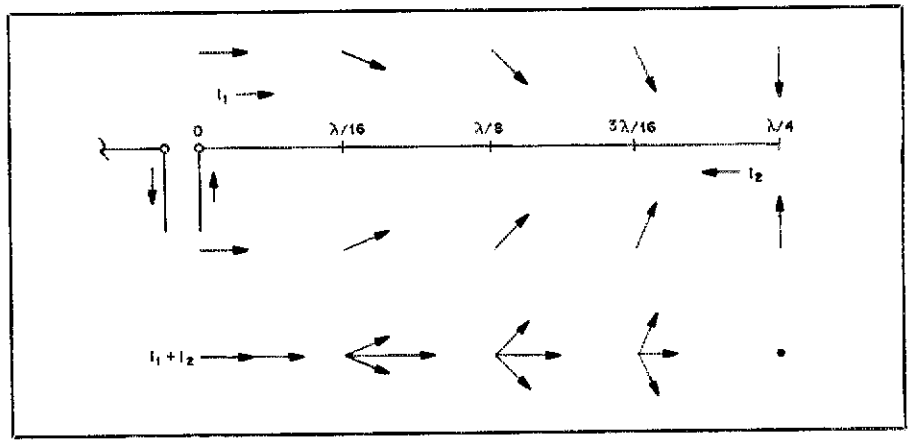


Fig. 4 — A resonant half-wave antenna with unit vectors showing the phase angles of current as it travels from feed point to end (I_1), then from end to feed point (I_2). The lower illustration ($I_1 + I_2$) shows the vectors and their sum, the resultant current, at various points on the antenna.

At the feed point, the currents are in phase, and the total current is maximum. For all in-between distances along the dipole arms the two vectors add, resulting in a total current that decreases cosinusoidally with distance along the arm, but the phase is constant, except at the ends of the dipole, where a phase discontinuity occurs as the amplitude of the current approaches zero (Fig. 4).

If the dipole is extended on one or both ends by a half wavelength, the current standing waves on opposite sides of a current node are 180° out of phase (see *The ARRL Antenna Book*, p. 2-7). Current distribution on nonresonant antennas depends on the method of feed, but the starting point in sketching the distribution is the fact that the current is zero at the ends of the conductor.

This discussion assumes a pure standing wave, whereas in reality, the antenna radiates, and the amplitude of a current element decreases as it travels from the feed point to the end of the antenna. The constancy of the current phase along most of the length of a dipole is, however, rather astonishing, as confirmed by rigorous calculation (Max Royer, private communication), and by measurement. This phase relationship is a property of resonant antennas that carry a standing wave of current, and it is fundamental to the explanation of how an antenna radiates. — *John S. Belrose, VE2CV, Aylmer, Quebec*

CHORDAL-HOP PROPAGATION

☐ In "Theory For Long-Range Propagation" (Technical Correspondence, May 1982 *QST*), K8IRY rediscovers a propagation "theory" that has been proven by others over the past 30 years.

In the early 1950s, Hans Albrecht, VK3AHH/DL3EC, proved that the low path losses and unpredicted times of openings on many HF amateur signals arriving in Australia from Western Europe could be explained only by: "rays propagated in geometrically inscribed hops along the layer but not necessarily with all the ground reflection points required by multihop theory." On his return to Europe, Albrecht further developed this theory and carried out more experimental work. He named the mode "Chordal Hop."

Since the original work by VK3AHH, much more work confirming the mode has been done. Notable in their efforts are Les Moxon; G6XN, K. J. Hortenbach and F. Rogler of the German external broadcasting service and Garry Bold of the Radio Research Centre University of Auckland (New Zealand) and many others (see references).

This work resulted in CCIR Report 250-1 of 1966 whereby communication engineers formally admitted the existence of long-distance ionospheric propagation modes without intermediate ground reflection. — *T. A. Dineen, VK2SV, Port Macquarie, Australia*

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Feedback

☐ Author DeMaw informs us of an error in "Some Basics of VHF Layout and Design," August 1984 *QST*. In Fig. 9, on page 22, the ground connection of Q1 is missing. The emitter of Q1, and all components connected to it, should be grounded.

☐ In "Setting Up Your Station" (July 1984 *QST*, the diameter of the coils used in the "brute-force" line filter is omitted. The coils may be anywhere from 1 to 1½ inches in diameter.

☐ Some people have had trouble winding the transformer for Wayne Cooper's one-transistor RF amplifier, described in the Hints and Kinks column for August 1984 *QST*. The toroid secondary winding (the first one on the core in this case) should cover only about 70% of the core. Do not space it out to fill the entire toroid. The one-turn primary is wound over the top of the secondary winding, near the lead that connects to the transistor.

Also, this circuit should terminate in 50 Ω. If your application requires different input and output impedances, you may need to add impedance-matching components to achieve optimum performance.

ZAP Your Repeater Interference with the Zero *Antenna Patrol*

By Albert W. Hamilton,* AG1F

All responsible Amateur Radio operators want to preserve proper on-the-air conduct. A vital force in support of this goal is the ARRL Local Interference Committee, a key component of the Amateur Auxiliary to the FCC's Field Operations Bureau (see Aug. 1984 QST, *p. 11). The following article describes the approach the North Shore Repeater Association (Salem, Massachusetts) uses to control interference on its repeaters. It was developed by Jim Morris, K1UGM, and NSRA. Local Interference Committees should find this approach helpful.*

We should use the strengths of Amateur Radio to keep our bands clean. Two of our greatest strengths are that we tend to spread out over a large area, rather than congregate, and at the same time have good local communication. This means someone is always close to any illegal transmission that may occur.

The ZAP (Zero Antenna Patrol) approach is both simple and effective.

1) Listen to the interfering station and note the signal strength and direction. Signal strength may be measured on a meter, with an attenuator or just noted as being "full quieting" or "noisy." If you can get a true bearing, do so. Even a general direction is helpful (if reported as such). Since you may not always be sure of the accuracy of your indicator, it is possible to rotate the antenna to a local repeater and measure the difference in reading. You then report the bearing as so many degrees north (east, south or west) of the repeater.

2) Remove your antenna and note signal strength.

3) Report your location, time and date of the interference and the station being interfered with, along with strength and direction. Report even if you don't hear the interfering station, and this will tell where the station *isn't*.

A typical report might be: "K1WET signal weak on beam from Wilmington, bearing 30° north of the Salem Repeater." A station that couldn't hear the interference might report: "ZAP zero Middleton." (Reporting that you cannot hear the interfering station may be the most important of all the information available.)

These three steps will very quickly place the interfering station (or stations) within a small area (5-mile-or-smaller radius). One can now move in with mobiles and direction finders and pinpoint the exact location. The ZAP information may be collected over a long period to locate and identify a station that only comes on briefly to interfere and then goes away.

Requirements for Effective Zapping

To be effective in locating transmitters one needs:

1) Hunt coordinators who can take the reports and plot them on a proper size map. You may also need to direct mobiles who do not have proper maps with them, or who may be too busy to do everything.

2) Training sessions for the base stations to get them used to reporting, particularly negative information. Keep in mind that

a) ZAP reporting is easy and effective once you get everybody trained.

b) Cooperative hunts coordinated with base stations develop a cooperative spirit and get people used to working and communicating together.

c) Individual competitive hunts are also useful. The wrapup of a successful hunt (and not all are successful) involves some individual actually being on the spot, so individual skills must be developed as well.

3) Reporting of the information gathered to keep everybody working together. This includes:

a) Over a repeater. Over the one being interfered with, or over a separate repeater.

b) On a direct frequency. This is very useful, but may make coordination difficult (unless the base has very good coverage). Coordination may be particularly difficult in hilly terrain, where the mobiles may not be able to work until they get within 5 miles of each other.

c) By phone. In our area, we maintain an automatic answering device that can be called, and a message left. The information becomes part of the long-term database. Sensitive information may be passed by landline.

4) Hunters

a) Fixed stations can be useful with or without directional capability. The more ZAP reports you get, the more precise your circle becomes.

b) Mobile units will eventually get to the area and, if fortunate, the interfering station will transmit as the mobile unit passes the location of the interfering station. (This is one of the more common ways of pinpointing the exact location.)

c) SWLs can be very important and should be given a phone number where they can report in. We may have 50 or more people in the area with their scanners tuned to the repeater.

5) Reporters

a) Hams, of course, can report in directly (if they have the proper license), and the hunters are reporters as well.

b) Again, SWLs can be very important and should be given a phone number where they can report in. Once informed that you would like them also to monitor the input frequency and report, they become a very valuable resource.

To get the most cooperation from hams and SWLs you need a lot of publicity and an open invitation to everyone in the area to participate. This may also act as a deterrent to anyone considering interfering with the repeater.

You don't want to chase the interfering party to another repeater, so you should be prepared to help train the other repeater groups in the area, or even provide them with some help. We pursue an active educational program by traveling to various sites in both Massachusetts and New Hampshire to discuss the ZAP technique and demonstrate the equipment.

Bear by the Tail: What to Do

Once the offender is located, you have to decide what action to take.

1) Accidental transmissions. In this case, it is usually safe and sufficient to notify the ham, who will be happy to correct the problem.

2) Occasional intermittent transmissions. It is essential that the Local Interference Committee have absolute verification of who the offending party is. The Local Interference Committee Chairman can then send a letter to that party requesting that he cease and desist. This should be sufficient to cure the problem.

3) Serious deliberate interference or use of foul language. Again, this must be absolutely verified by the Local Interference Committee using the ZAP technique. In these serious cases, the Local Interference Committee may require the assistance of the ARRL OO/RFI Coordinator and the

*President, North Shore Repeater Assn., 54 Hathaway Ave., Beverly, MA 01915

ARRL Regional Monitoring Station. Caution must be used here; assume that this person could be dangerous.

Be careful to take only legal steps and avoid anything that could be construed as libelous or threatening.

Since the ZAP technique is widely known in our local amateur community, our goal has been to deter any deliberate interference through a general recognition that the parties involved will be revealed. This will not always be sufficient, so one must be prepared to carry a given situation to its end. Here are two recent examples of our ZAP group being actually deployed.

One Saturday morning, a carrier came on and timed out the repeater. Our primary DF site had a bearing into an area of hills and reflections to the southwest. We received reports from several base stations that localized the area and identified it as fixed and not mobile. We eventually had about eight mobiles move into the area. The signal went mobile, then stationary, then mobile and finally stationary again at the original bearing. Shortly after this it was located at the home of a local ham. The mic switch was shorted out. This took a total of 45 minutes, and we had brought some mobiles from as far away as 15 miles to within 2 miles.

At the end, we had five or six hams within 2 miles of the site. We also got reports from an SWL to the published interference phone. We had about 20 participants actively working with us in just this 45-minute period.

The other example is completely different — deliberate interference that developed into a pattern of harassment of certain individuals on another repeater. The primary DF unit was again looking into an area where the readings were known to be low. Other bearings isolated the area, and the ZAP technique further isolated it. The possibility still existed that there were up to three stations working together or independently.

The victims would stand by until the hunters were in position and then become active. The harassment would continue for two to three hours at a time, and consisted of short transmissions and then a break to be sure the intended victim was still transmitting. The final clincher came when a transmission was made while a car was driving past the house. This took a week of solid work involving over 50 hams and 2000 miles of driving. The final verification was by three hams with hand-held RDF units with cross bearings from less than 200 feet.

A search of call books and repeater and club rosters gave us a call sign, name and phone number, and an observation gave us a car license number. Since the house is not a one-family dwelling, there was no positive identification. A ham with a Novice license (according to a call book) did reside at that location, and the roof was covered with antennas. Note that with the establishment of the League's Amateur Auxiliary program the next step would be the initiation of mediation resolution efforts by the Local Interference Committee Chairman, OO/RFI Coordinator and possibly the Regional Monitoring Station. FCC field personnel are contacted *only* if the Local Interference Committee has signed a cooperative agreement with the local FCC engineer-in-charge or an FCC monitoring station.

The only action taken was to notify the FCC and offer to assist them. Meanwhile, we spread word that the transmissions were coming from a certain area. The problem was reduced considerably, and is being watched to see if it recurs.

Maintaining ZAP Proficiency

We hold a practice session monthly in which the repeater is shut down for five minutes and a hidden station transmits on the output frequency. All stations then check in via the repeater, the data is correlated, and the most probable position or positions are reported back over the repeater. The hidden transmitter then reports his location. This immediate feedback is very useful, particularly to those stations reporting as not having heard the hidden transmitter. This is very important, and we first tell the location based on the negative reports. This encourages these reports. We then report the location based on the positive and negative reports combined, based on signal strength only. Next, we add all directional information. It is not unusual to have to discard some of the directional information because of incorrect readings or technique.

We also hold practice sessions in which a mobile hides and transmits on a direct frequency. (Our rules for this kind of practice are that the mobile stays within a certain area, basically the towns that border Salem, and parks on a public street. The mobile generally transmits on request only.) The hunters work cooperatively with base stations that have DF capability or can help locate the transmitter by ZAP. The base control then vectors the mobiles into the correct area. The mobiles work competitively when they get in close.

Summary

Decide what you wish to accomplish in your area, preferably with the input and cooperation of several radio clubs that cover a large geographical area (interference may be low power from another state). Once you know what your goals are, and you have formed your group, apply to your ARRL Section Manager (p. 8, this issue) to become an official League-sanctioned Local Interference Committee. Then your group can begin the important work toward maintaining a comfortable operating environment. It may be too late to start practicing *after* the interference disrupts your repeater.

Simple equipment that you are already trained to use will be sufficient for most tasks (see sidebar). More sophisticated equipment that you have practiced with under good conditions may make your task even easier. One hundred people working together with simple equipment is better than one person working alone with the best equipment. Good hunting, and good ZAPping! QST

Recommended Equipment for Zapping

Heavy use has been made of hand-held, fixed and mobile RDF equipment.

1) Base RDF — three units, Doppler type, located about 15 to 20 miles apart. These were locally built, based on all the published articles. The reason for this was to support marine RDF applications; therefore, two of these units are located on the coast. The third unit is at the home of K1UGM, who designed all three. The installation at W1MCX uses a dual beam to give better control over reflections. This unit is normally used on the VHF marine band, but works also on the 2-meter band. The receiver is a scanner, making multiband coverage easy.

2) We have two commercial Doppler systems presently. We are modifying one to see if we can use it at the repeater site. The other is used mobile and is reasonably effective if sufficient transmissions are made. The averaging effect when you are moving allows you to drive in the general direction of the station even when you are in an area of bad reflections.

3) Beams — half a dozen that can give reliable bearings; unfortunately, several lie in a straight line with one of the RDF units. A high-gain vertical enables you to listen in all directions and know when the interference is still there. You can run this off of a separate receiver, ideally, or use a coax switch.

4) Base stations — about 100, to give occasional reports.

5) Mobiles — about 100. These might be driving past at the time of a transmission and get readings with and without the antenna. These can also become active hunters.

6) Hand-helds — about 100, about similar to the mobile units. They can be anyplace.

7) Hand-held RDF — six or more units of the Doppler type, which are excellent for close-in work. The hand-held units with the larger elements are the most sensitive. Since these work on phasing and produce a null in the tone, one can use these on any rig without modification.

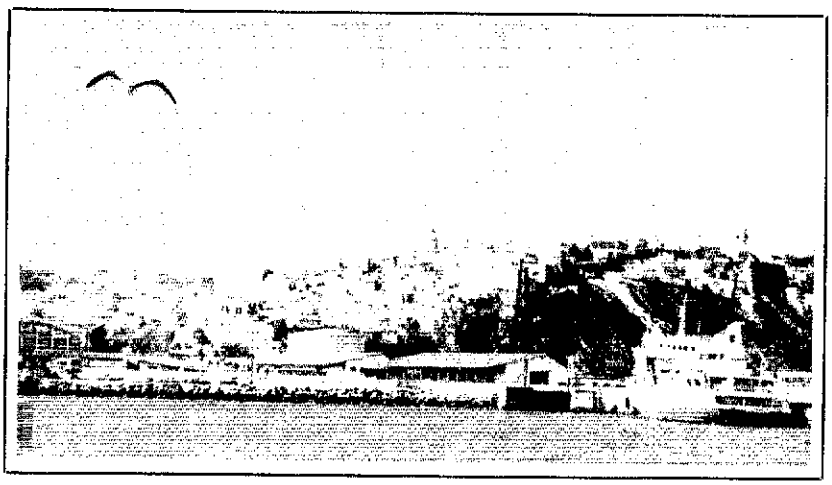
8) Hand-held loops — several of these. Are not good once you get close, however.

9) Attenuators — mandatory for use with any device that works on signal strength. They also give you the ability to record a signal strength for later comparison. We really need a source of good units.

10) Maps — important both for plotting and for finding your way into an area that you desire to search. Topographical maps, small-area road maps and large area maps are all needed. Some of the larger maps will have to be kept at the base stations, and information passed out as needed. It is helpful if you can standardize on a common set of maps for the group. Some of the maps may not be to scale; they may be squeezed in one or more directions to make the paper size convenient for the printer. In fact, these may be the only ones with all the street names.

11) Compasses — necessary for reporting bearings from hand-held units, and for knowing in what direction you are going.

New Voices from Old Tangier



(photos courtesy KJ6E/CN8CU)

By Wayne E. Houser,* KJ6E/CN8CU

"Take me to the Kasbah" is a familiar phrase from the land of CN8! Now, more amateurs are visiting near the legendary Kasbah, via the airwaves, to add Morocco to their stacks of DX QSLs. During the past 15 months, seven new CN8s have earned licenses to join the Amateur Radio ranks in Tangier. And, thanks to the generosity of American amateurs and organizations, equipment has been received to assist many of these licensees to go on the air. The new "Tangerines" are CN8BW, CN8CT, CN8DG, CN8DU, CN8DV, CN8ER and CN8LE.

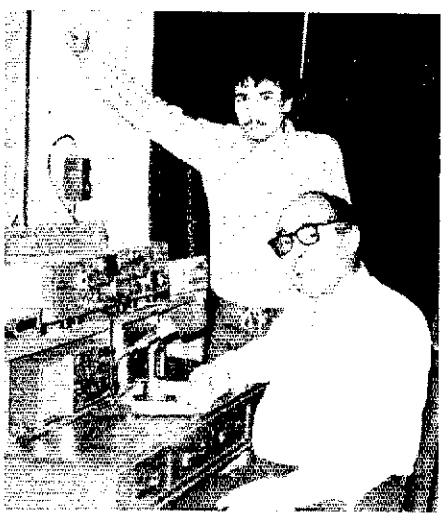
Since September 1981, the American School of Tangier has served as the focal point of this North African city's renewed interest in Amateur Radio. Code and theory classes, conducted on campus by enthusiastic school and Voice of America (VOA) Relay Station volunteers, served to "initiate" the program. Later, school authorities okayed plans to transform an old warehouse into a shack — complete with new interior and furnishings.

Today, the fully operational shack serves as both classroom and regular meeting place for the Tangier Amateur Radio Club (TARC). It stands as a proud example to one of the very basic tenets of Amateur Radio: promotion of international brotherhood and goodwill through combined pursuit of an exciting scientific hobby. Benefactors and club assistants include (new and old-timers alike) CN2AH, CN2AQ, CN8AT, CN8BP, CN8CV, CN8MK and CN8MT.

The class and club activity, first of its kind in Tangier, began in late 1981 as an extracurricular program for VOA family members. Operating under the auspices of the Royal Association of Radio Amateurs of Morocco, it quickly expanded to include students from the American School and other residents of the local community.

As interest picked up and more participants joined in the activities, work began to refurbish an old warehouse on the school's campus into what is now the center of Amateur Radio activity in Tangier. Today, shack equipment additionally includes a modern transceiver and a tri-band Yagi antenna. ICOM America donated four transceivers for use by new Moroccan licensees until they are able to purchase equipment of their own. The ARRL supplied various materials, including 15 sets of their popular *Tune in the World* instructional kit, for use in subsequent Amateur Radio classes.

CN2AQ and KA2SNT represent the most "senior" and "junior" Amateur Radio licensees living in Tangier. CN2AQ, a well-known CW operator, has been active on the HF bands since 1950. KA2SNT, first licensed at the age of nine, is now a fifth-grade student in the American School.



CN2AH and CN8LE (father and son) own and operate a station in common. CN2AH, a native of Tangier, is retired from the local Voice of America Relay Station. CN8LE began his VOA career in 1982.

*VOA Broadcast Engineer, American Embassy TNG, APO New York 09284

The current class has nine students from the local community. Most, who will meet the minimum age requirement of 18, are expected to take the Moroccan Amateur Radio examination when it is next offered, at the end of this year. Today, 43 people have completed the program and 22 have received licenses.

Tangerines look forward to making contacts with amateurs in all lands. Normally, they can be found weekends in the phone portions of the 15- and 20-meter bands. Some frequent the Foreign Service Net, which convenes Sundays at 1530 UTC on 21.416 MHz. This net is open to all who are interested in working amateurs assigned to embassies and other official posts around the world.

Authorized Frequencies (MHz) in Morocco

3.500- 3.800	144- 146
7.000- 7.100	430- 440
14.000-14.350	1215-1300
21.000-21.450	
28.000-29.700	

Proficiency in international Morse code is stressed for the 110 amateurs in Morocco; however, radiotelephone-only licenses are issued regularly. Mobile and hand-held operations are not yet authorized.

In appreciation for the assistance provided new Moroccan licensees, a local telephone line has been established in Tangier to aid travelers. Amateurs are invited to call 364-40 when vacations bring them to this beautiful city. For those interested, every effort will be made to provide a helpful orientation, including eyeball QSOs with local CN8s. Also, the Tangier Amateur Radio Club is interested in establishing a "sister-club" relationship with an ARC in the United States. More information can be obtained by writing to Headmaster, American School of Tangier, American Embassy TNG, APO New York 19284.

Meanwhile, from a QTH near the Kasbah in sunny Tangier: *Shokran, Salama* and 73!

Strays

DOUBLE THE PLEASURE

☐ In 1971, when I was 15 years old and living near Indianapolis, I got my first Novice ticket — with the now-obsolete call of WN9ICB. One of my first QSOs was with Allen Johnson, WØIDI, of Kansas City, Missouri. In those days, each time I received a QSL card I'd tack it up on my bedroom wall. WØIDI's red, white and blue card stood out among the rest, and maybe that's why I never forgot the call sign.

My Novice license expired in 1973. I was off the air until 1982, when my interest in ham radio was rekindled and I got back on the air with the Novice call of KA9OIH.

On May 9, 1984, I upgraded from General to Extra — quite a thrill for me. Four days later, a mild case of insomnia led me to another dose of excitement. I had just switched on my rig and begun tuning across the phone portion of 40 meters when I heard a net in progress on 7.235.5 MHz. I started eavesdropping, and five minutes later someone identified himself as "WØIDI." My jaw dropped. Had I heard it correctly? I heard him again, and this time there was no doubt. I could even picture his QSL card on my wall.

I jumped into the net at my first opportunity and hailed Allen. We chatted for a while, and although he didn't remember me, he acknowledged it was certainly possible we could have talked in 1971, since he's had the same call for many years.

Unfortunately, I had nothing but my memory to verify the previous QSO. My first logbook was lost years ago, and although I kept a box of old QSL cards I'd received as WN9ICB, WØIDI wasn't among them.

Then, a few weeks ago, while sifting through a box of ham radio papers, I discovered a bunch of old cards. Eagerly, I scanned them one by one until — there it was! I'd finally located the old red, white and blue QSL from WØIDI, dated September 18, 1971. I now have *two* red, white and blue QSL cards to remind me of that unforgettable QSO in the wee hours of a May morning. — *Brian D. Smith, KA9OIH, Fort Wayne, Indiana*

JOTA 1984

☐ The 27th Jamboree On The Air (JOTA) will be held October 20-21. An annual Scouting/Amateur Radio event, JOTA involves thousands of stations from over 100 countries. Scouts usually exchange their name, QTH, Scout rank and other hobbies, often becoming pen pals with their new-found radio friends.

Listen for K2BSA, the Boy Scouts of America (BSA) Headquarters station in Dallas, Texas, and for HB9S, the World Scout Headquarters station in Switzerland. Invite Scouts or Scout units to your shack. If you don't know any Scouts, contact your local council office, listed under "Boy Scouts of America" in the white pages. Call "CQ Jamboree" on the air.

No logs are necessary, but activity reports including Scout unit numbers, number of participants and interesting incidents are appreciated. Photographs with captions are especially welcome for the BSA report to the World Scout Bureau. Send reports to JOTA Coordinator, W2GND, 216 Maxwell Ave., Hightstown, NJ 08520 (see Contest Corral, this issue, for operating times and frequencies).

Sometime in November, you'll be able to purchase the biggest and, we'd like to think, the best, ARRL Handbook ever, the 1985 ARRL *Handbook for the Radio Amateur.* This group of Hq. employees (among others) made it possible. Front Row (l-r) KA1DYZ, Julie Shain, Debby Sandler, Brooke Craven, Nancy O'Neill. Second row: K1TD, KU7G (partially hidden), Jodi McMahon, WB2TRN, Sue Fagan, Rose Cyr, David Pingree, K8CH, W4RI. Third row: AA2Z, K8KA, W1CUT, W1OD, Shelly Fuini, N1FB, WA1VUG, N1BKE, AJ1N, K1XA, KE3Z, WA3VIL.

Maxim Award Winner: Tuned In To Amateur Radio

Jon J. Willis, WDØAIT, the 1983 Hiram Percy Maxim Memorial Award Winner, is a young man we are proud to call a ham.

By Richard Palm,* K1CE

It is with great pride and privilege that we announce the 1983 Maxim Memorial Award winner, Jon J. Willis, WDØAIT, of Littleton, Colorado. This award, the first to be presented since 1939, recognizes Jon's outstanding record of accomplishment and contribution to the Amateur Radio community. The Award Panel felt that at the age of 18, Jon had already displayed the talent, leadership qualities and potential to make him worthy of this high honor, 1983's most outstanding young radio amateur.

First licensed at age 10, Jon presently holds the Extra Class ticket. He is a full-time student at the University of Colorado, majoring in architecture with a minor in music. Just as the first recipient of the Maxim Award, former ARRL President Victor C. Clark, W4KFC, had contributed heavily in ARRL Field Organization roles, so too has Jon. As Colorado Section Traffic Manager, Jon oversees National Traffic System efforts in the state. He is a member of TCC, and holds Net Manager, Official Relay Station, Official Observer and Volunteer Examiner appointments. Author of the National Traffic System emergency plan for Colorado, Jon consistently makes the Public Service Honor Roll, and has won numerous Brass Pounder's League awards.

"What can I do to help?" is Jon's response when presented with public service opportunities. He has participated in countless events, including Red Cross functions, and March of Dimes and Kidney Foundation Drives, as well as walk-, bike- and run-athons. This past year, Jon served on the Convention Committee of the Rocky Mountain Division Convention, held last May in Aurora.

Jon is working his way through college as a technician at the university television support facility in the engineering department. He says his job skills come directly from his Amateur Radio background, one that so many others have found beneficial.

Jon J. Willis, WDØAIT

An accomplished musician, Jon started studying violin and viola at an early age. He is a member of the invitation-only Centennial League Orchestra, The Young Artists Orchestra sponsored by the Denver Symphony, the Columbine Orchestra and the Boulder Colorado Philharmonic. Having performed in concerts at Disneyland and Marineland Parks in California, Jon has refined his musical skills sufficiently to have earned a recording contract with the Warner Brothers Studio.

Nominations for the 1984 Award will be solicited later this year; watch *QST* for details. Now is the time to start thinking about that special young radio amateur who will make a good candidate. Let your ARRL Section Manager know about potential candidates, as the League's SMs will make the nominations.

In August 1983 *QST*, ARRL General Manager David Sumner prophesied: "When the first of the new awards is presented, sometime in 1984, we think The Old Man will be proud." With this year's winner, Jon J. Willis, WDØAIT, we *know* he's proud!

*Acting Manager, Membership Services Department, ARRL

Maxim Award Presented at ARRL National Convention

Labeling Jon J. Willis, WDØAIT, as a leader in Amateur Radio who is destined for leadership in his personal and professional lives as well, Maxim Award Panel Chairman Dr. Eugene Zimmerman, W3ZZ, presented the 1983 Hiram Percy Maxim Memorial Award to Jon at the National Convention Banquet in New York City July 21. In his opening remarks, Dr. Zimmerman said Jon embodies the ideals that Hiram Percy Maxim, the League's cofounder and father of Amateur Radio, stood for. He said also the selection decision for the 1983 Award was a difficult one because of the great number of highly qualified, bright, young candidates nominated by ARRL's Section Managers. "Jon was the strongest of a very strong group," Zimmerman said. His accomplishments in leadership roles in Amateur Radio and in the League's Field Organization, his excellence in academic pursuits and his dedication to the arts have made him a strong candidate indeed.

Zimmerman concluded by dedicating the first Maxim Memorial Award to be given in over 40 years to the memory of beloved ARRL President Victor C. Clark, W4KFC, who passed away last November. Vic was the first recipient of the Award in 1936, and was the driving force behind the Award's resurrection in 1983. Zimmerman then presented Jon with the Award, a beautifully engraved plaque and $1000. Jon had attended the convention at the invitation of the League.

In his acceptance remarks, Jon thanked the League and the Maxim Award Panel, and said how grateful and pleased he was to receive the award. He said he hoped he could measure up to the high standards and expectations that are commensurate with this honor. We know he will!

Moved and Seconded...

MINUTES OF EXECUTIVE COMMITTEE
No. 415
August 26, 1984

AGENDA

1. Approval of Minutes of May 25 meeting (No. 414)
2. Certification of candidates for Director and Vice Director, and review of candidates' statements.
3. President's report on CRRL Board Meeting
4. FCC matters
4.1 Consideration of ARRL comments to oppose RM-4829 and RM-4831 (220 MHz)
4.2 Consideration of ARRL position with respect to BC Docket 79-47 (retransmission of amateur radiocommunications in the Broadcasting Service)
4.3 Consideration of ARRL position with respect to MM Docket 84-706 (use of 7100-7300 kHz by nongovernment HF BC stations in Region 3)
4.4 Review of draft petition for inquiry into spectrum requirements for the Radiolocation Service
4.5 Amendment of the Communications Act to make malicious interference a statutory offense
4.6 Consideration of ARRL position with respect to RM-4835 (petition to shorten waiting time in the event of examination failure to seven days, from 30)
5. Local antenna/RFI matters
6. Residence status of Section Managers
7. Requests for additional funding for Advisory Committees
8. IARU matters
A. First Vice President's Report on the IARU Administrative Council Meeting in Paris
B. Consideration of IARU Proposal 179, Ratification of the Nominations for IARU President and Vice President.
9. Review of status of studies assigned to the Executive Committee
9.1 Minute 73 (study of simplex autopatches)
9.2 Minute 99 (study of nets)
9.3 Minute 104 (study of Board committee structure)
10. Report on certificate stock (Minute 20, May 25 meeting)
11. Revision of authorizations for the signing of checks
12. Recognition of new Life Members
13. Affiliation of clubs
14. Approval of conventions
15. Review of correspondence and the other material concerning Collins Repair and Alignment Service Ham-Ad
16. General Manager's report
17. Date and place of next meeting
18. Appointment of Committee of Tellers

Pursuant to due notice, the Executive Committee of the American Radio Relay League, Inc. met at 8:30 A.M. Eastern Daylight Time, Sunday, August 26, 1984, at the Westin Hotel, Toronto, Ontario, Canada. Present were President Larry E. Price, W4RA, in the Chair; First Vice President Leonard M. Nathanson, W8RC; Directors Lys J. Carey, KØPGM, Paul Grauer, WØFIR, Gay E. Milius, Jr., W4UG, and Hugh A. Turnbull, W3ABC; and General Manager David Sumner, K1ZZ. Also present were Directors Thomas B. J. Atkins, VE3CDM, and Edmond A. Metzger, W9PRN, Vice Director Harry MacLean, VE3GRO, and Counsel Christopher D. Imlay, N3AKD.

1) On motion of Mr. Grauer, the Minutes of the May 25 meeting were accepted in the form in which they were issued by the Secretary.

2) The Committee then proceeded to examine the qualifications and candidates' statements of those nominated for Director and Vice Director for the 1985-1986 term. The Committee found a valid petition nominating Paul Vydarney, WB2VUK, for Director of the Hudson Division; but the Secretary was in receipt of a written comunication from Mr. Vydarney declining the nomination. The Committee also found a valid petition nominating Linda Ferdinand, N2YL, for Vice Director of the Hudson Division; but in view of there also being a valid petition for Director, in accordance with Bylaw 22, the nomination for Vice Director was declared void. On motion of Mr. Turnbull, the Committee found the following candidates to be lawfully nominated and eligible. In the case of uncontested positions, the candidates were declared elected without membership balloting pursuant to the Bylaws, the terms of office to begin at noon on January 1, 1985; in the case of contested positions, the candidates' names were ordered placed on ballots to be sent to Full Members of the respective Divisions, accompanied by the candidates' statements of no more than 300 words.

Central Division
Director:
Edmond A. Metzger, W9PRN
Vice Director:
Kenneth A. Ebneter, K9EN
Howard S. Huntington, K9KM

Hudson Division
Director:
George Diehl, W2IHA
Linda Ferdinand, N2YL
Vice Director:
Stephen Mendelsohn, WA2DHF

New England Division
Director:
Thomas Frenaye, K1KI
John C. Sullivan, W1HHR
Vice Director:
Richard P. Beebe, K1PAD

Northwestern Division
Director:
M. L. Gibson, W7JIE
Mary E. Lewis, W7QGP
Joseph N. Winter, WA7RWK
Vice Director:
Rush Drake, W7RM
Robert S. Orr, KB7CC
Armand R. Pilotte, WA7IIM

Roanoke Division
Director:
Gay E. Milius, Jr., W4UG
Vice Director:
John C. Kanode, N4MM

Rocky Mountain Division
Director:
Lys Carey, KØPGM
Vice Director:
Marshall Quiat, AGØX
Robert A. Scupp, WB5YYX

Southwestern Division
Director:
Fried Heyn, WA6WZO
Vice Director:
Wayne Overbeck, N6NB
Karl Pagel, N6BVU
Katherine F. Schaffstein, WA6FAH
Adrienne Sherwood, WA6YEO

West Gulf Division
Director:
Raymond B. Wangler, W5EDZ
Vice Director:
Thomas W. Comstock, N5TC

3) Mr. Price reported on his attendance as an invited observer at the Annual Board Meeting of the Canadian Radio Relay League on August 4, which he said had given him better insight into the activities and concerns of the CRRL. Mr. Price noted the continuing progress being made toward the objective of an autonomous CRRL, a subject which had been discussed extensively the previous day by the Ad Hoc Committee on the Strengthening of CRRL.

4) FCC matters were dealt with as follows:

4.1) On motion of Mr. Milius, Counsel was authorized to file comments opposing those portions of RM-4829, a proposal submitted to FCC by the Land Mobile Communications Council, dealing with the 220-225 MHz band; and Counsel was further authorized to file comments opposing RM-4831, a proposal submitted to FCC by Sideband Technology, Inc., concerning the 220-222 MHz segment of the same band.

4.2) On motion of Mr. Turnbull, Counsel was authorized to file comments in response to the Notice of Proposed Rule Making in FCC BC Docket 79-47, relating to the retransmission of amateur radiocommunications in the Broadcasting Service. The comments are to support the deregulation of the present rules which require prior FCC consent to such retransmission, but are to oppose changes in Sections 97.91 and 97.113, which would impose new restrictions upon the Amateur Radio Service.

4.3) On motion of Mr. Carey, Counsel was authorized to file comments in response to the Notice of Proposed Rule Making in FCC MM Docket 84-706, relating to the use of 7100-7300 kHz by Commission-licensed high-frequency broadcasting stations in Region 3 (Guam and Saipan). The comments are to seek such restrictions as may be necessary to preclude further interference to amateur stations operating in this band in Region 2.

4.4) On motion of Mr. Nathanson, Counsel was instructed to file with FCC a "Petition for Initiation of Inquiry Proceeding" seeking an examination of the spectrum requirements of nongovernment radiolocation in the medium-frequency band. Preparation of this petition had been authorized at Minute 17 of the May 25 meeting of the Executive Committee.

4.5) After discussion of a number of possible approaches, on motion of Mr. Carey, Counsel and staff were directed to assist in the preparation of a draft bill aimed at amending the Communications Act so that malicious interference would become a statutory offense.

4.6) On motion of Mr. Milius, Counsel was authorized to file comments opposing a proposal to reduce from 30 days to seven days the waiting time for reexamination in the event of failure of an amateur examination. The proposal is designated RM-4835 by FCC.

The Committee was in recess from 11:05 to 11:30 A.M.

5) Counsel Imlay expanded briefly on a written report submitted to the Committee earlier that had summarized the status of several local antenna/RFI legal problems faced by amateurs. The final $1500 of the $7500 in financial support for the Burbank, Illinois, ordinance case (Borowski, et al v. City of Burbank) originally authorized by the Executive Committee on July 9, 1982 has been requested and will be paid as soon as a written report on the status of the case is received.

6) Prompted by an inquiry from a member, the 'Rules and Regulations of the Field Organization' had been reviewed and it was determined that the rules concerning the place of residence of a Section Manager were unclear. The rules do not state explicitly that a Section Manager must reside in the section whose members he serves, though this has always been assumed to be their intent. After discussion, the General Manager was requested to prepare a clarifying amendment for consideration by mail vote of the Executive Committee as soon as possible.

7) The desirability of funding travel by certain Advisory Committee members was discussed briefly. It was noted that the Membership Affairs Committee is studying the subject of Advisory Committees, in response to an instruction from the 1984 Annual Meeting of the Board. A request from the Chairman of the VHF-UHF Advisory Committee for an additional $250 for postage and other incidental expenses of the committee was presented. On motion of Mr. Milius, the request was approved.

8) Mr. Nathanson reported on his attendance, as Vice President of the IARU, at the meeting of the IARU Administrative Council in Paris the previous month. He noted in particular the outstanding hospitality of the Reseau des Emetteurs Francais, the IARU member-society for France. At the meeting there had been considerable discussion of the term of office of IARU officers, with the matter resolved in a way that was acceptable to all concerned and which had led to IARU Proposal No. 179. Proposal No. 179 by the Administrative Council seeks the ratification by the IARU member-societies of the nominations of Richard L. Baldwin, W1RU, as IARU President, and Carl L. Smith, WØBWJ, as IARU Vice President, for terms of office such that their renomination, or nomination of successors, will take place in early 1988. On motion of Mr. Carey, the Secretary was instructed to cast an AYE vote on Proposal No. 179 on behalf of ARRL.

9) The status of studies assigned to the Executive Committee by the Board at its 1984 Annual Meeting was reviewed as follows:

9.1) Minute 73 (study of simplex autopatches). Considerable input had been received from members on this subject. The General Manager was instructed to revise the existing draft report in light of members' comments, and to circulate the revised draft to the Executive Committee for review and approval for submission to the Board Meeting in October.

9.2) Minute 99 (study of nets). The condition of the draft report is as described in the minutes of the May 25 meeting. A revised draft is to be circulated for Committee review and approval prior to the October Board Meeting.

9.3) Minute 104 (study of Board committee structure). Comments from Board members, submitted in response to the solicitation sent to them following the May 25 meeting, have been reviewed. A draft report will be prepared for Committee review.

10) Mr. Sumner distributed a written report in response to Minute 20 of the May 25 meeting, concerning the inventory of blank certificates bearing out-of-date signatures. The General Manager was instructed

(continued on page 52)

Happenings

- *New Phone-Band Rule Amendments*
- *Volunteer-Examining Rule Changes*
- *Goldwater and FAR Scholarships*

Land Mobile Takes Aim at 220 MHz

The FCC has received two Petitions for Rule Making requesting that the 220-MHz band be shared with land mobile radio services. The first petition, RM-4829, was filed by the Land Mobile Communications Council (LMCC). LMCC asks the Commission to examine potential frequencies for future land mobile use. Besides 800 MHz, LMCC suggests that FCC explore potential use of UHF TV frequencies, government frequencies, 220-225 MHz, and others.

With regard to 220-225 MHz, LMCC cites a report *(Future Private Land Mobile Telecommunications Requirements, Final Report,* Planning Staff, Private Radio Bureau, FCC, August 1983) that says, "this band [220-225 MHz] is only lightly used." LMCC goes on to say, "Because of the limited number of channels that the 220-225 MHz band will provide, however, it is not anticipated that this spectrum can meet the immediate requirements of land mobile licensees ... approximately 32 MHz of spectrum is needed for Part 90 and 22 users. While these requirements may best be satisfied by making available spectrum from the 800-MHz reserve, the band 220-225 MHz may prove to be valuable for future land mobile operations." LMCC concludes by saying simply that they are asking the FCC to allocate an additional 32 MHz of spectrum for immediate land mobile radio services.

The second petition, RM-4831, was filed by Sideband Technology, Inc., a manufacturer of Amplitude Compandored Sideband (ACSB) equipment. STI proposes that 216-222 MHz be segmented into 5-kHz channels, and be dedicated exclusively to private and government narrowband land mobile radio systems.

STI says, "The 220 MHz spectrum area is particularly attractive for reallocation consideration for the following reasons: (a) The draft NTIA [National Telecommunications and Information Administration] report, *Assessment of Narrowband Modular Technologies for Government Land Mobile Operations* (NTIA-TR-81-85), states that 'a spectrum resources assessment of the 216-225 MHz band points out that generally, the 216-225 MHz band is not extensively used throughout the United States ...' (b) One of the recommendations in the NTIA report is "that the NTIA should pursue discussions with the FCC to consider planning of the 216-225 MHz band for shared Government and non-Government use of narrowband technologies by the Mobile and Fixed Services. The narrowband techniques would share this band with the Amateur Service ..."

STI goes on to say that the segment 216-222 MHz is "very attractive for narrowband authorizations, and it is currently not heavily used. Reallocation of part of this spectrum for narrowband use would be a very positive move towards incentivizing [sic] the use of narrowband technologies ..."

However, NTIA Report 81-85, *Spectrum Resource Assessment in the 216-225 MHz Band,"* says, "the Amateur Service is the heaviest user of the 220-225 MHz band. The 3-MHz portion in 222-225 MHz is used for FM communications involving conventional land mobile communications techniques using repeaters, base stations and land mobile units. Communications are usually within a 60 km radius of the repeater. This portion of the band is channelized into 20-kHz channels and the modulation is 16F3 with a 5-kHz deviation (Pasternak, 1980). The heaviest use of the band by amateurs is in the larger metropolitan areas and in areas where there are concentrations of electronics industry. The Southern California area contains the heaviest concentration of activity.

"The 220-222 MHz portion of the band is used by the amateurs for point-to-point communications using single sideband (SSB) and FM modulation techniques. Experiments are conducted involving propagation and long-distance communications ...

"In summary, the spectrum usage measurements have indicated considerable activity in 220-225 MHz band in Los Angeles and, to a lesser extent, San Diego. The 216-220 MHz band is used less than the 220-225 MHz band. Radar usage was observed and can be expected in coastal areas where major ports are located."

Wanted: Additional Spectrum Space

Both petitions ask for additional spectrum space in the 220-225 MHz amateur band for land mobile use. Both petitions seek these frequencies on the premise that the 220-MHz band is lightly used. Although this may be true in some geographical areas, the two petitioners admit two things: (1) LMCC says that 220-225 MHz will not provide an adequate number of channels needed for land mobile systems. LMCC is simply looking for 32 MHz of spectrum somewhere, and their main suggestion is 800 MHz. (2) STI cites a draft report made by NTIA that says 220 MHz is not heavily used; however, another study (the published version) says amateurs are the heaviest users of the band.

ARRL will file timely comments opposing both petitions. See Happenings, next month.

ALASKA EMERGENCY FREQUENCY CHANGED

The Alaska Emergency Frequency has been changed to 5167.5 kHz from 4383.8 kHz. The old frequency was not an effective emergency frequency because calling was prohibited and thus many Alaska Private Fixed Service licensees chose not to monitor it, and because many HF radios were not equipped to transmit and/or receive on 4383.8 kHz. The Alaska Emergency Frequency may be used by amateur stations to communicate with any other station authorized in Alaska for emergency communication. Stations operating on this frequency must be located in or within 50 nautical miles of Alaska.

To update Part 97 in The FCC Rule Book, *Second Edition (red cover), Second Printing, make the following changes:*

1) In the table in Section 97.61(a), fifth line, change "4383.8" to "5167.5."

2) In Section 97.61(b)(13), first line, change "4383.8" to "5167.5."

3) In Section 97.61(b)(13), starting at fifth line, delete all after "emergency communications." Replace with "All stations operating on this frequency must be located in or within 50 nautical miles of the State of Alaska. The frequency 5167.5 kHz may be used by licensees in the Alaska-private fixed service for calling and listening, but only for establishing communication before switching to another frequency."

4) In Section 97.107, footnote 1, first line, change "4383.8" to "5167.5."

5) In Section 97.107, footnote 1, fifth line, delete "Additionally,"

6) In Section 97.107, footnote 1, append at the end "The frequency 5167.5 kHz may be used by licensees in the Alaska-private fixed service for calling and listening, but only for establishing communication before switching to another frequency."

VOLUNTEER-EXAMINING RULES UPDATE

Last month, we reported on several modifications to the FCC Rules, including provisions to allow for volunteer-exam reimbursement. Now that the FCC has released final *Orders* in these matters, we can tell you how to keep Part 97 in your *FCC Rule Book* current.

To update Part 97 in The FCC Rule Book, *Second Edition (red cover), Second Printing, make the following changes:*

1) In the Table of Contents for Part 97, under 97.517, change "Written examinations" to "Examinations".

2) In the Table of Contents for Part 97, delete 97.523 and its accompanying heading.

3) In Section 97.27(a), fifth line, delete the word "key" and insert "(key, straight key, or, if supplied by the applicant, any other type of hand operated key such as a semi-automatic or electronic key, but not a keyboard keyer)".

4) In Section 97.27(b), sixth line, delete the word "key" and insert "(key, straight key, or, if supplied by the applicant, any other type of hand operated key such as a semi-automatic or electronic key, but not a keyboard keyer)".

5) In Section 97.27(b), eighth line, after "prescribed speed" insert "during a five-minute test period".

6) In Section 97.27(d), second line, replace both occurrences of "FCC" with "VEC".

7) In Section 97.27(d), starting at fifth line, delete all after "latest date of issue)." and replace with "The VEC must select the appropriate number of questions from each category of the syllabus (PR Bulletin 1035) as specified in PR Bulletin 1035 B, C, or D. These questions must be taken verbatim from the appropriate PR Bulletin in the form in which they have been approved by the Commission. Beginning January 1, 1987, volunteer examiners may also design Elements 3, 4(A), and 4(B) in accord with the provisions of this paragraph. Each VEC and each volunteer examiner is required to hold current examination designs in confidence."

8) In Section 97.28(a), fifth line, after the word "accredited" insert "(see §97.515)."

9) In Section 97.28(a), starting with fifth line, delete all after "volunteer examiners." Replace with "An examiner administering telegraphy examination Element 1(A) or written examination Element 2 (in conjunction with an examination other than a Novice Class examination) or written examination Element 3 must hold an Amateur Extra Class or Advanced Class radio operator license. An examiner administering telegraphy examination Element 1(B) or 1(C) or written examination Element 4(A) or 4(B) must hold an Amateur Extra Class radio operator license."

10) In Section 97.28(e), starting at fifth line, delete all after "examination." Replace with "This certificate may be used for a period of one year for examination credit for telegraphy elements 1(A), 1(B) or 1(C) (See 97.25[b])."

11) In Section 97.31(b), starting at lines 10 and 11, delete all after "operator examination." Replace with "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."

12) Delete Section 97.31(c) in its entirety and replace with "(c) Volunteer examiners may not be compensated for services. They may be reimbursed for out-of-pocket expenses, except for Novice class examinations (see §97.36)."

13) Delete Section 97.33 in its entirety and replace with:

"§97.33 Volunteer examiner conduct.

"No volunteer examiner shall give or certify any examination by fraudalent means or for monetary or other consideration. Violation of this provision may result in the revocation of the amateur radio station license and the suspension of the amateur radio operator license of the volunteer examiner. This does not preclude a volunteer examiner from accepting reimbursement for out-of-pocket expenses under §97.36. Reimbursement is any amount in excess of that permitted may result in the sanctions specified herein."

14) Delete Section 97.35 in its entirety and replace with:

"97.35 Temporary operating authority.

"Unless the FCC otherwise prescribes, an applicant already licensed in the Amateur Radio Service, upon successfully completing the amateur radio examination(s) required for a higher class, may operate an amateur radio station consistent with the rights and privileges of that higher class for a period of one year from the date of the most recently completed examination for that operator class provided that the applicant retains the certificate(s) for successful completion of the examination(s) (see §97.28[e]) at the station location, provided that the applicant uses the identifier code of the new class of license for which the applicant has qualified (KT for Technician Class, AG for General Class, AA for Advanced Class and AE for Amateur Extra Class) as a suffix to the present call sign (see §97.84), and provided that the FCC has not yet acted upon the application for a higher class of license."

15) New Section 97.36 is added as follows:

"§97.36 Reimbursement for expenses.

"(a) Each volunteer examiner coordinator and each volunteer examiner may be reimbursed by examinees for out-of-pocket expenses incurred in preparing, processing or administering examinations for amateur station operator licenses above the Novice class. The volunteer examiner coordinator or the volunteer examiners must collect the reimbursement fee, if any, from the examinees. No reimbursement may be accepted for preparing, processing or administering Novice class examinations.

"(b) The maximum amount of reimbursement is $4.00 for 1984 and will be adjusted annually each January 1 thereafter for changes in the Department of Labor Consumer Price Index. Changes in the maximum amount of reimbursement will be announced by the Commission in a Public Notice. The amount of such reimbursement fee from any examinee for any one examination at a particular session regardless of the number of examination elements taken must not exceed the published maximum.

"(c) Each volunteer examiner coordinator and each volunteer examiner who accepts reimbursement must maintain records of out-of-pocket expenses and reimbursements for each examination session. They must certify on or before January 31 of each year to the Commission's office in Gettysburg, PA 17325 that all expenses for the period from January 1 to December 31 of the preceding year for which reimbursement was obtained were necessarily and prudently incurred.

"(d) The expense and reimbursement records must be retained by each volunteer examiner coordinator and each volunteer examiner for 3 years and made available to the FCC upon request.

"(e) Each volunteer examiner must forward on or before January 15 of each year the certification concerning expenses to the volunteer examiner coordinator who coordinated the efforts of the volunteer examiner and for which reimbursement was received. The volunteer examiner coordinator must forward all such certifications and its own certification concerning expenses to the FCC on or before January 31 of each year.

"(f) The volunteer examiner coordinator must disaccredit any volunteer examiner who fails to provide the annual certification. The volunteer examiner coordinator must advise the FCC on January 31 of each year of the volunteer examiners that it has disaccredited for this reason."

16) In Section 97.84(f), second line, change "1.925(e)" to "97.35".

17) In Section 97.84(f), starting with third line, delete all after "privileges" and replace with "for the class of operator license currently held by the licensee, a licensee must identify in the following manner:"

18) In Section 97.84(f)(1), starting with third line, delete all after "identifier code" and replace with "for the new class of license for which the licensee has qualified (see §97.35)."

19) In Section 97.84(f)(2), starting with third line, delete all after "identifier code" and replace with "for the new class of license for which the licensee has qualified (see §97.35)."

20) In Section 97.503(a), second line, change "entity" to "organization".

21) In Section 97.505, first line, change "entity" to "organization".

22) In Section 97.507(e), second line, after "as a VEC," delete "AND" and replace with "except reimbursement for out-of-pocket expenses permitted by §97.36; and".

23) In Section 97.509, first line, change "entity" to "organization".

24) In Section 97.511, change "entity" to "organization" in both occurrences.

25) In Section 97.511, fourth line, change "that" to "the".

26) In Section 97.515, third line, after "volunteer examiners" insert "see §97.30)".

27) In Section 97.515, line 11, after "organization" insert "A VEC may not discriminate in accrediting volunteer examiners based upon their accepting or declining to accept reimbursement."

28) Delete Section 97.517 in its entirety and replace with:

"97.517 Examinations.

"A VEC will design (see §97.27[d]), assemble, print and distribute written examination Elements 3, 4(A) and 4(B). A VEC may design, assemble, print and distribute examination Elements 1(B) and 1(C). A VEC is required to hold examination designs in confidence."

29) Delete Section 97.523 in its entirety and insert "(Reserved)".

PHONE-BAND EXPANSION UPDATE

As reported in this column last month, the HF phone bands have been expanded.

To update Part 97 in The FCC Rule Book, *Second Edition (red cover), Second Printing, make the following changes:*

1) In the table in Section 97.7(a), second line, change "3775-3800" to "3750-3775".

2) In the same table, seventh line, change "21,250-21,270" to "21,200-21,225".

3) In the same table, eighth line, change "3800-3890" to "3775-3850".

4) In the same table, last line, change "21,270-21,350" to "21,225-21,300".

5) In the table in Section 97.61(a), third line, change "3500-3775" to "3500-3750".

6) In the same table, fourth line, change "3775-4000" to "3750-4000".

7) In the same table, line 14, change "21000-21250" to "21000-21200".

8) In the same table, line 15, change "21250-21450" to "21200-21450".

9) In the same table, line 17, change "28000-28500" to "28000-28300".

10) In the same table, line 18, change "28500-29700" to "28300-29700".

11) In Section 97.61(b)(11), third line, append "and amateur radio stations located within Region 2 which are west of 130 degrees West longitude."

TWO NEW 420-MHz PROTECTED AREAS

There were a handful of protected geographical areas within which amateurs who wish to operate on 420-450 MHz with more than 50-W peak envelope power (PEP) output must first obtain the authorization of the appropriate FCC Engineer-in-Charge and the appropriate Military Area Frequency Coordinator. The areas sur-

rounding Warner Robbins Air Force Base, Georgia, and Goodfellow Air Force Base, Texas, have now been added to this list.

To modify Part 97 in The FCC Rule Book, *Second Edition (red cover), Second Printing, make the following changes:*

1) In Section 97.61(b)(7), add subparagraphs (ix) and (x) as follows:

(ix) In the States of Alabama, Florida, Georgia and South Carolina within a 200 kilometer (124 mile) radius of Warner Robins Air Force Base, Georgia (latitude 32° 38′ North, longitude 83° 35′ West).

(x) In the State of Texas within a 200 kilometer (124 mile) radius of Goodfellow Air Force Base, Texas (latitude 31° 25′ North, longitude 100° 24′ West).

JOHN M. HAERLE, WB5IIR

We regret to report the passing of ARRL Technical Advisor John M. Haerle, WB5IIR, on August 1, 1984, in a tragic motor accident. John was well known to amateurs in the Dallas/Ft. Worth area and on the Medical Amateur Radio Council (MARCO) net. Before his retirement about 10 years ago, John headed the field engineering/customer service organization of Rockwell International Collins Radio Group in Dallas. He became a radio amateur after his retirement from Collins and held an Extra Class license. An accomplished musician, he played trombone in the dance band of Alvino Rey, W6UK. John was 69.

Be a Contributor to the Goldwater Scholarship Fund

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

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

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

Recent contributors of $25 or more include: Roland W. Aldrich, Jr., K1LEC; George Anderson, W7ON; Joyce Anderson, WB7TWC; Kenneth O. Anderson, K6PU/G5CFJ; Babe Andrews, W6GCG; Bertha Andrews, WB6VQJ; Lloyd E. Angle, WØRWE; Arizona Repeater Association; Marty Baker, KB1AD; Ralph F. Bergman, W9RPW; J. L. Boockholdt, AA5F; Jesse O. Bostwick, WØRHS; Garold E. Bramblett, W9POF; Alvin W. Campbell, N8FIY; Michael J. Cassidy, WA6LOW; H. J. Childress, Jr., KDØQE; Charles W. Clifford, Jr., W6QMY; Cumberland Valley ARC, W3ACH; Jim Cushing, KD7FW; Donald V. Dold, N9DGM; Dr. Edward S. Eby, KF1B; Edward F. Erickson, W2CVW; Charles B. Estep, W9JGO; Robert B. Fairchild, K4FG; Stanton K. Farley, NØABA; Fellowship Amateur Radio Club, Gratigny Branch; James H. Ferguson, Jr., AD5F; David Fisher, W2TNI; Edward W. Garland, K5WSX; Fred D. Gray, WD5CPL; L. H. Hamilton, ND6C; Maurice J. Hindin, W6EUV; Edwin T. Hodges, K6YJ; Hot Springs Amateur Radio Club, WA5BRF; John W. Hulet, KC7LJ; Marson B. Hull, K6CQ; Indianapolis Amateur Radio Assn., Inc.; Russ Joslin, W7OYA; Joseph Kershaw, W6ECT; Manhattan Avenue of the Americas Radio Club; Ronald G. Martin, W6ZF; Mary M. McDonald, WB5LBR; Michael Minerva, KA3BYK; Melvin Morris, W2KHP; Bob Nellans, KB9DE; Dot Nellans, N9ECC; Nittany Amateur Radio, W3YA; Katashi Nose, KH6IJ; Jim Olszowka, WA9SPA; Theodore H. Perry, W9EZY; David W. Persons, KD5K; P. Kenneth Pierpont, KF4OW; William R. Rapp, W2HWC; James Irvin Reynolds, KA4BMZ; Richard C. Rhodes, KH6IO; Merlin Rice, WDØBQG; Shirley Rice, KAØBCB; Arthur W. Saboe, W9ZM; David R. Siddall, K3ZJ; Thomas K. Snell, K4HCW; Joseph H. Stafford, NJ8F; David Strain, WA3AHK; David Talley, W2PF; John G. Troster, W6ISQ; James Webster, W6WZX; Joseph C. Wellington, Jr., KC6H; David W. Wood, NX6J; Bruce Wyman, K4OP; Carl Yarbrough, WB7DYC.

FAR SCHOLARSHIP WINNERS ANNOUNCED

The Foundation for Amateur Radio is pleased to announce the 1984 winners of the 15 scholarships it administers.

John W. Gore Memorial Scholarship ($900): David J. Schmocker, KJ9I, Oconomwoc, WI.

Richard G. Chichester Memorial Scholarship ($900): Paul D. Sargis, KI6U, Modesto, CA.

Edwin S. Van Deusen Memorial Scholarship ($350): Timothy Wettach, N2TW, Webster, NY.

QCWA Silent Key Memorial Scholarships ($500 each): Bruce A. Wade, N9UR, Glendale, WI; Ian R. McNicholl, KA9KOW, La Habra, CA; Scott Smith, KA2EMO, Malone, NY.

Radio Club of America Scholarship ($500): Doyle B. Johnson, KF6BD, Pleasant Hill, CA.

Edmund B. Redington Memorial Scholarship ($500): David Swiatlowski, KA2KLM, Camillus, NY.

Young Ladies' Radio League Scholarship ($500): Diane E. Willemin, N8CAY, Elyria, OH.

Amateur Radio News Service Scholarship ($500): Marc C. Vernon, KI9V, Hinsdale, IL.

Columbia (MD) Amateur Radio Association Scholarship ($650): Eric J. Smith, KA3KJO, Silver Spring, MD.

Baltimore (MD) Amateur Radio Club Scholarship ($500): Richard A. White, Jr., KA3T, Mt. Airy, MD.

Dade Radio Club Tropical Hamboree Scholarships ($500 each): Wayne F. Poole, KC4XL, Surfside, FL; Craig F. Rodgers, WA4C, Boca Raton, FL.

Lewis G. Wilkinson Memorial Scholarship ($500): David Cheitel, KA2PNR, Bronx, NY.

These scholarships are open to all radio amateurs meeting the qualifications and residence requirements of the various sponsors. The Foundation is a nonprofit organization representing 50 clubs in Maryland, the District of Columbia and Northern Virginia. It is devoted exclusively to the scientific, literary and educational pursuits that advance the purposes of the Amateur Radio Service.

MORE ON THE AIRS PROGRAM

Day and night, the 25 monitoring stations that make up the AIRS program continue to keep a vigilant watch for nonamateur signals that are causing harmful interference to our communications. Evidence gathered in May, June and July from AIRS has been submitted to FCC's Treaty Branch regarding signals on 7060 kHz (A1A emission, call sign SGJ), 14,003 kHz (F1B emission, call sign thought to be ZZU 11582, QTH possibly in the USSR), 14,141 and 14,171 kHz (A1A and F1B emissions, possibly station UMS), 14,164 kHz (F1B emission, no identification), 14,203 kHz (A3C, F1B, F7B emissions, possibly from the USSR), 14,211 kHz (A3C, F1B emissions, call sign thought to be FA, possibly in the USSR) 14,217 kHz (F1B emission, possibly from the USSR) and 14,226 kHz (F1B emission, call sign thought to be ZZU 8568, possibly from the USSR).

At this writing, approximately 8000 reports from AIRS stations are in the ARRL Hq. data base. AIRS stations also completed a four-month study of signals heard in the 30-meter segment 10.109 to 10.115 MHz, where U.S. amateurs are not yet legally allowed to transmit.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Montana, Mississippi, Iowa, Arizona, Orange, Northern Texas, Arkansas, Kentucky and Wyoming Sections: You are hereby solicited for nominating petitions persuant to an election for Section Manager. Incumbents are listed on page 8 of this issue.

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

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

(Place and date)

General Manager, ARRL
225 Main St., Newington, CT 06111

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

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

An SM candidate must have been a member of the League for a continuous term of at least two years and a licensed amateur of Technician class or higher immediately prior to receipt of petition at Headquarters.

Petitions must be received at Headquarters on or before 5:30 P.M. Eastern Local Time, December 7, 1984.

Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before January 2, 1985. Returns will be counted February 19, 1985. SMs elected as a result of the above procedure will take office April 1, 1985.

If only one valid petition is received for a Sec-

tion, that nominee shall be declared elected without opposition for a two-year term beginning April 1, 1985.

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

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

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

REPEAT NOMINATING SOLICITATION

Since no petitions were received for the Eastern Pennsylvania Section by the petition deadline of June 8, 1984, as a result of notices in the April and May *QST*, nominating petitions for this Section are herewith resolicited. See the above notice for details on how to nominate.

Are You a Lawyer?
Amateur Radio Wants You!

Your legal expertise is needed in the Amateur Radio community to help build and maintain the legal foundations for our hobby. The League has initiated a Volunteer Counsel Program, designed to help stem the tide of overly restrictive regulations on Amateur Radio. You can help. If you have an interest in this exciting area of communications law, are a reputable member of the bar of at least one state and are a League member, please contact us. As a Volunteer Counsel, you will be kept well informed about areas of law affecting Amateur Radio. For further information, write to the ARRL Volunteer Counsel Program, 225 Main St., Newington, CT 06111.

SECTION MANAGER ELECTION RESULTS

The following election was conducted for a two-year term of office beginning October 1, 1984:

Balloting Results: In the Oklahoma Section, Dave Cox, NB5N, received 373 votes and Meinhardus K. Schenkel, W5VXU, received 181 votes. Mr. Cox was declared elected.

SECTION MANAGER ELECTION RESULTS

The following were elected for a two-year term of office beginning October 1, 1984:

Uncontested
Connecticut — Robert J. Koczur, K1WGO
Eastern Pennsylvania — James B. Post, KA3A
Idaho — Lemuel H. Allen, Jr., W7JMH
Minnesota — George E. Frederickson, KCØT
North Dakota — Joseph M. Gregg, KNØA
Ohio — Jeffrey A. Maass, K8ND
Southern Florida — Richard D. Hill, WA4PFK
Western New York — William W. Thompson, W2MTA.

SM APPOINTMENT

In the Mississippi Section, Paul Kemp, KW5T, has been appointed to complete the term (until March 31, 1985) of Thomas Hammack, W4WLF (resigned).

Moved and Seconded...

(continued from page 48)

to discontinue the use of certificates bearing the signature of the late President Clark, out of respect to his memory, and to investigate the feasibility of in the future maintaining the inventory of blank certificates in a way that will avoid their bearing out-of-date signatures.

Mr. Price left the room, and Mr. Nathanson assumed the Chair at 1:15 P.M.

11) On motion of Mr. Turnbull, the following resolution was adopted:

RESOLVED, that The Connecticut Bank and Trust Company be and hereby is designated as a depository of this corporation and that the officers and agents of this corporation be and hereby are and each of them hereby is, authorized to deposit any of the funds of this corporation in said The Connecticut Bank and Trust Company;

RESOLVED, that, until the further order of this Executive Committee, or of the Board of Directors, any funds of this corporation deposited in said The Connecticut Bank and Trust Company be subject to withdrawal or charge at any time and from time to time upon checks, notes, drafts, bills of exchange, acceptances, or other instruments for the payment of money or upon directions for the wire transfer of money when made, signed, drawn accepted, endorsed or orally directed on behalf of this corporation, by any two of the following (one from each group):

For the General Manager: David Sumner, E. Laird Campbell, W. Dale Cliff.

For the Treasurer: James E. McCobb, Michael R. Zeigler, Martha Babcock, Isabelle Mahoney;

RESOLVED, that The Connecticut Bank and Trust Company is hereby authorized to pay any such instrument or make any such charge and also to receive the same from the payee or any other holder without inquiry as to the circumstances of issue or the disposition of the proceeds even if drawn to the individual order of any signing person, or payable to said The Connecticut Bank and Trust Company or others for his account, or tendered in payment of his individual obligation, and whether drawn against an account in the name of this corporation or in the name of any officer or agent of this corporation as such; and be it further

RESOLVED, that the Secretary and/or any other officer or officers of this corporation be and hereby are authorized to certify to said The Connecticut Bank and Trust Company that these resolutions have been duly adopted and that they are in conformity with the Articles of Association and the Bylaws of this corporation.

12) On motion of Mr. Carey, the names of 33 newly elected Life Members were recognized, and the General Manager was directed to list their names in *QST*.

13) On motion of Mr. Carey, the affiliation of the following Category I clubs was approved:
Chipola Amateur Radio Club, Marianna, FL
Cumberland County Amateur Radio Service, New Kingstown, PA
Ham Association of Mesquite, Mesquite, TX
Kansas City ARC, Inc., Shawnee Mission, KS
Kearsarge Amateur Radio Society, Bradford, NH
Mark 4 Radio Club, Greensboro, NC
Sam's Radio Hams, Torrance, CA
Tishomingo County ARC, Burnsville, MS
Wang Amateur Radio Club, Lowell, MA
With this action, the League now has the following number of active affiliated clubs: Category I, 1,694; Category II, 11; Category III, 168.

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

Kentucky State	October 27, 1984	Owensboro, KY
Louisiana State	March 9-10, 1985	Lafayette, LA
CRRL	September 27-29, 1985	London, Ontario, CANADA

Mr. Price returned to the room, and resumed the Chair at 1:29 P.M.

15) The Committee reviewed correspondence and other material relating to the inadvertent omission of Ham-Ads for the Collins Repair and Alignment Service on two occasions, in 1981 and 1984. The Committee noted the omissions with regret. On motion of Mr. Turnbull, it was unanimously voted to affirm the handling by staff of these unfortunate incidents.

16) Mr. Sumner reported on a number of matters relating to staff, publications and progress made in responding to Board directives from the 1984 Annual Meeting.

17) On motion of Mr. Milius, the time and place of the next meeting of the Executive Committee were established as follows: noon, Monday, November 19, at the Headquarters offices of the League in Newington, Connecticut.

18) On motion of Mr. Milius, the following Committee of Tellers was appointed for the counting of ballots on November 20: Mr. Metzger, Chairman; Messrs. Turnbull and Grauer; alternates, Messrs. Milius and Carey.

There being no further business, on motion of Mr. Carey, the Committee adjourned at 3:16 P.M.
Respectfully submitted,
David Sumner, K1ZZ
Secretary

LIFE MEMBERS ELECTED
August 26, 1984

Charles Alcorn, KB8LM; Ronald Beauchemin, WB1ETS; Mark D. Beckwith, WA6OTU; Dennis P. Bernier, WA1W1A; George G. Bethea, WN5IJZ; Randy C. Butts, KC8CZ; Suzann L. Chism, N4ENX; B. Eric Cooper, WB1ASK; Selden Dambrosky, WBØHUD; Edmund A. Davis, W5DNG; George H. Forfa, WA2LPH; John M. Glass, NU6P; Greg Glevanik, KD3F; G. D. Gopal, VU2GDG; John R. Healey, KA9GXW; Margret Heyn, N6KFC; Brian L. Johnson, KDØDY; Marjorie Jorgensen, WDØBBB; John T. Kehley, W1ICW; Corwin L. Liston, WD9ABB; Gary Robert Long, KD2Q; Nellie Myers, KA9DVY; Lane A. Palmer, KK2K; Raymond Patterson, KA9GVV; Jeffery L. Pulver, WA2BOT; James W. Rapp, KA4WSF; Larry Schwartz, WB3DBI; John A. Sohl, Jr., KC4WQ; Allen P. Swicinski, WB2PQG; Curtis B. Thompson, WA6RLE; Don Vucasovich, K7SIK; William R. Wimberly, KB4LB; Allen J. Zimmerman, K3WGR.

Correction: M. Michael Dorr's call sign was listed incorrectly in Moved and Seconded, June 1984. His correct call is KC9EJ.

How's DX?

Conducted By Ellen White,* W1YL/4

Simulation

Doctor DX is a Morse code contest trainer that brings you the excitement of the DX chase without actually being on the air. You can place yourself anywhere in the world, at any time of day you wish, and experience low-band Amateur Radio operating conditions as they would be felt at that time and place. You need no antenna, no linear amplifier, no postage for QSL cards. You can improve your operating skills with no fear of on-the-air humiliation.

It was one of those situations that seemed, somewhat miraculously, too good to be true! A family member was flat on his back, undergoing many long months of accident recovery. Knowing him to be an ardent contest/DX type, we did the best we could for him — setting up the station for prone operation, running a line down the hall to the linear, etc. But what we *couldn't* do was to generate DX/contest activity mid-week!

It was the July doldrums, between the IARU Radiosport Competition and the Texas DX Society Armadillo Run. The phone rang and there it was — a call from Advanced Electronics Applications, Inc. inquiring of our interest in reviewing a prototype of Doctor DX, a Morse Code Contest Trainer for the Commodore 64 computer. Plugging the board into your C-64 is guaranteed to bring a look of amazement to your face. Listening to the program, and operating it, will make you realize truly where we are in today's technology! In addition to the following AEA overview of Doctor DX, there are a number of italicized observations by K1ZX/horizontal 4, who spent many fun-filled hours playing DX Contest.

"When you first turn on the program, you go through a simple procedure of setting the clock for the time of day you want to be operating. You also select the latitude and longitude of the part of the world from which you wish to simulate operation. Then you start the contest. Once you are operating, you can change bands, frequency and power levels. If Doctor DX decides that the selected band is normally open for the time of day you selected, you will hear computer-generated CW signals spread across the band. The signals are working each other or calling CQ. Some are even talking with stations in your skip zone, which you cannot hear."

Countries are CQ countries, not DXCC countries. The contest is based on the popular CQWW. Some good ones I worked were A35/BY/FO0/KH8/9N1.

"The radio propagation programmed for each band represents what you would expect to hear on a good propagation day with an omnidirectional antenna. The propagation follows the internal real-time clock that you set before the contest. The simulated stations you hear (with proper prefixes) are at distances you would expect to hear under normal conditions for the time of day and band selected. All call letters of the stations you hear are totally random (subject to the country's call sign assignment rules). The prefixes are weighted according to population density, with the guarantee that for each of the 304 'countries' there is at least one station represented. The speed of the stations operating in the lower band segments is much faster than those in the upper band segments."

Not a perfect depiction of propagation or an equitable distribution/representation of CW-active hams — lots of Central and South Americans who are usually on phone. Too many JAs; must be a West-Coast program. Not enough Europeans. It affords a very good opportunity to learn hunt-and-pounce techniques and polish one's operating efficiency.

"The typical two-way contact exchange involves call letters, signal reports and CQWW zones. If you miss any part of your QSO, you can ask for and receive a repeat. You may even ask the other station to slow down (QRS) or speed up (QRQ), and he will."

It requires clean CW; a sloppy fist will slow you down. You can't get by with an H99 instead of a 599 because you'll be asked for repeats. If you lose yourself in the heat of battle and send GL *to the computer, you'll get a reply of* TU.

"For good, clean, competitive fun, Doctor DX shows your score and QSO rate continuously. You can set a time limit on the contest if you wish, so you can track your improvement with identical conditions each contest session. Or, settle those club rivalries by competing with your friends under identical conditions. AEA has set up an awards program by which you can get certificates for achieving certain milestones."

Additional Thoughts

The choice of power is a cute one, though it may not be your cup of tea. You have your "choice" of running 2, 20 or 200 W. Doctor DX equates your power level, inversely, with a multiplier — X3 for 2 W, X2 for 20 W, X1 for 200 W. To keep a balance in the contest, it becomes "easier" to make a contact with high power, and more difficult with the other two lower-power levels. K1ZX found the eight-"position" audio filter to be a big help. He noted that the color changeability of the screen was nice, but not really necessary. The tuning procedure with the four-function C-64 keys permit a slow or fast band scan at the rate of either 2 or 20 kHz. (You can just see a future optional mechanism via the joystick port to simulate, perhaps, a big vernier receiver dial!)

Documentation of this software is a brief tutorial itself in operating techniques. Screen scoring starts off first with a "good luck" message, followed by a display showing your QSO rate in contacts/hour. This is a 15-minute moving average of your contact rate. If that number falls to 0, your "good luck" message will reappear! The rate doesn't figure into your score, but it can be used in measuring improvement in your operating skills, or in rating different operators under the same condition.

One recent Saturday, while we were examining Dr. DX, there came a knock at the door of our very remote QTH, which borders Everglades National Park. Lo and behold, there appeared W3AU, aka W3MSK/VU2MSK/etc., of very-long-lived DX contest multi-multi fame. An old family friend, Ed was passing through and had a moment or two for an in-person visit. We realized immediately we had a captive audience, and rapidly loaded the program. *Now* your column editor wishes she had taken a snapshot of the expression on Ed's face. He was hooked. We could see him questioning the wisdom of his many trips up and down the W3MSK towers during the long, hard northern winters. Realistic, indeed!

It is possible to nitpick this program. Criticisms would have to be very minor, however. (In fact, the only thing *very* obviously missing to this reporter was the ubiquitous on-the-air policeman!) This is the sort of simulator we've all looked for — a trainer to permit new DX/contesters to sharpen skills *off* the air, a simulator to permit possible DXpeditioners to get the feel of operating "on the other end," a fun club program and a brief peek into the awesome technology of tomorrow, up and running *today*. Congratulations indeed to Advanced Electronic Applications, Inc., Box C-2160, Lynnwood, WA 98036-0918, tel. 206-775-7373.

THE CIRCUIT

☐ Peter I: Update, thanks to LA5VAA — Geir has already established contact with a handful of experienced W operators, and is hoping for others (not just W and LA amateurs) to volunteer. He is negotiating transportation with a Norwegian shipping company, and is working on enhancing official interest and support. With a year ahead on Hopen Island (JW5VAA), ample time remains to do the groundwork. An interesting sidelight from Geir is information from Norwegian telecommunications that K. G. Dabrowski, SP5EXA, has been authorized to operate through August 15, 1985 as JWØEQ at the Polish Research Station at Hornsund.

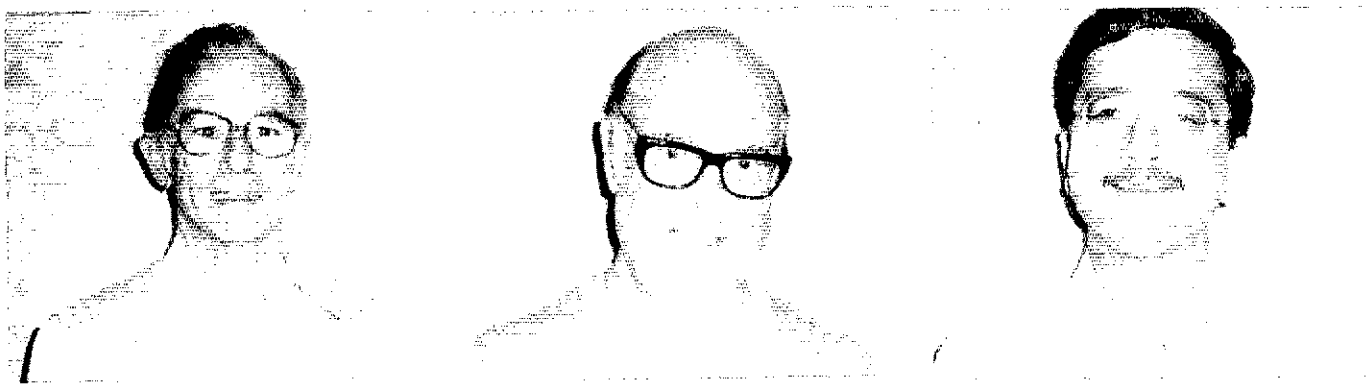
☐ Taiwan: The South Florida DX Association has been working on this one all year, and at copy time fellow October travelers were scheduled to include W4WJ, WD4IYS, W2SR, N5RM. Harvey, WD4IYS, put together an attractively priced package. Trip coordinator is experienced world traveler W4AAV.

☐ 4U1ITU: Contacts made during March 24 to April 1, 1984 go to Steve Richman, KS2C, 30 Quebec Rd., Marlboro, NJ 07746.

☐ New York City National Convention: Kudos to K2BS and the Long Island DX Association for a fine late-July DX program featuring Old-time Nostalgia DXing by W2GHK/4 (forever), ZL1AMO and South Pacific style DX, the new DXer's Primer by VE3FRA, DXpedition to P42E by ARRL Vice Director N4MM, Peter and Paul Rocks by WA2MOE, and China DX by WA2BGE. Welcome rare-DX attendees included ZL1AMO, CEØAE and AP2AD.

☐ Yasme "Poolside" Dxpedition: Five hams with three of their ladies took their dream trip to French Polynesia in mid-July. K6KH worked 21 OSCAR 10 satellite stations, W6GC/FOØILE worked teletype by

*19620 SW 234 St., Homestead, FL 33031



DX notables at the July NYC National Convention (l-r): ZL1AMO, CEØAE and AP2ZA. *(W1YL photo)*

the hour, W6MI/FOØSIW brought along a complete station, and old CW pro W6AM/FOØDCW filled 37 pages of the ARRL logbook. The local hams, FO8s IW FB GW KS KI and 35 others made the trip incredibly pleasant.

☐ China: The fifth station in China (after BY1PK, BY8AA, BY4AA and BY1QH) was to have been inaugurated in mid-August in Fuzhou City, as reported by JARL. Look for BY5RA on all bands/modes. Lucky confirmations go to Box 730, Fuzhou, China.

☐ HL5AP: Byong-joo Cho, ELØAP (ex-HM1AP, HM9AAP, HM5AP, ELØP/MM, 5LØP/MM, PA9SR) expects to be active again at his home QTH this fall, after his radio operator stint on the high seas. He is now chairman of the Korea DXers Society and makes note of their Worked All Korea award (WAK), which requires one HL9 and HM or HL since September 1960 and an award fee of $2 U.S. or 7 IRCs with log extract to the Korea DXers Society, Box 4, Haeundae, Pusan, Rep. of Korea 607-04. Cho's maritime mobile QSL manager is JH4NPP, Box 229, Okayama, Japan 700, with s.a.s.e. His 5LØP/MM operation is handled by ON5YL.

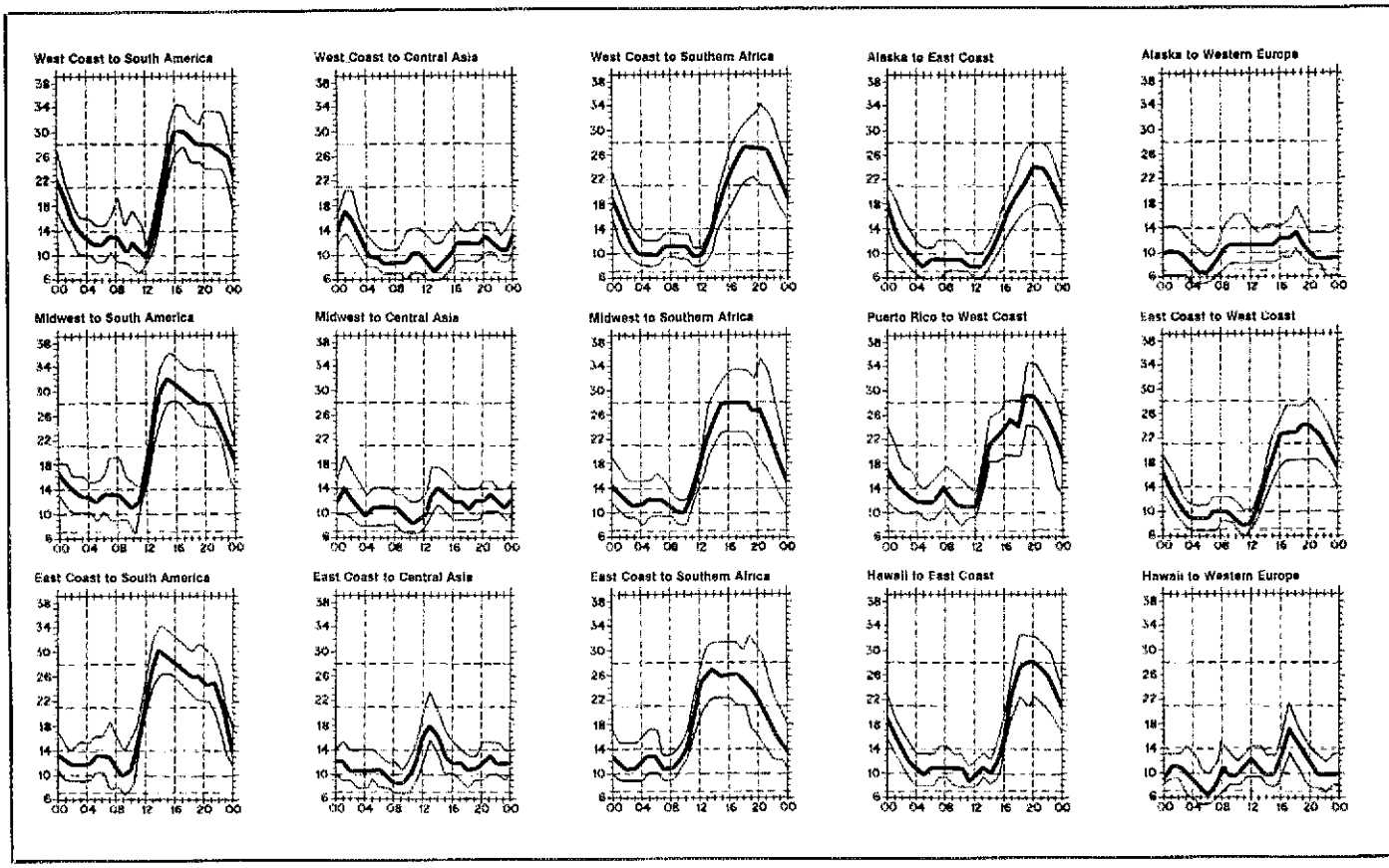
☐ 160 Meters: The hot news this month means that ARRL's top-band DXCC will be endorsable, effective November 1, with contacts retroactive to November 15, 1945.

☐ Rodrigues: DK7PE will be operating at 3B9 on Nov. 19-25, in time for the CQWW CW, 160-10 meters. QSL via Rudi Klos, DK7PE, Kleine Untergasse 25, D-65011 Neider-Olm, Fed. Rep. of Germany.

☐ Mozambique: AB4Y asks, please, that a low profile be maintained vis-à-vis the Mozambican ministry of communications and ON6BC. Chuck is optimistic that the future may bring him, his wife (N4GPB) and at least three other Americans in the country operating permission. Have any information on ham radio/electronics in Portuguese? Chuck would welcome it to make a pitch to the telecommunications ministry. Interested in being a QSL manager for Mrs. Nancy De Vos? She would prefer someone in the Columbus, Ohio, or Washington, DC areas. Contact her, or Charles E. Martin, American Embassy Maputo, Department of State, Washington, DC 20520.

☐ Mellish: The "Down Under DXers" plan an assault on Mellish for CQWW phone — hopefully with the call VK9MR (even though the Mellish "block" is VK9ZM to VK9ZR). The crew should include VK2WU, VK3CE, VK2CK, VK5ARO, VK2CIA and VK2AD. Anticipated departure is October 19, with operation planned October 25 through November 6, all bands. Cards will be handled by VK2WU, and should be sent to Box 31, Winmalee, NSW, 2777, Australia.

☐ Haiti: For Update QSL information for all



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

HH2WW (N4WW) and March 1984, send cards to Dr. Austin Regal, 1425 Foxfire Dr., Apopka, FL 32703.

☐ Cards: ZL1AMO still has logs and cards for the following operations — VR6HI, March/April 1979; ZK1MB, Aug. 1979; ZK2EA-A35EA-5W1CW, Aug./Sept. 1980; H44RW, Apr./May 1981; VK4ANS/LH, July 1981; YJ8RW, Nov./Dec. 1981; 3D2RW, Sept. 1982; ZK1CQ, Aug. 1979/April 1982; ZL1ZMO/C, Nov./Dec. 1980 and March/April 1983; ZK9RW, Oct. 1983; ZL8AMO, March 1984; and ZL7AMO, May/June 1984. Ron has reply coupons for sale at $45/100. Write to Ron Wright, 28 Chorley Ave., Massey, Auckland 8, New Zealand.

☐ El Salvador. YS1UL notes the formation of the Radio Club YSDX, with himself as provisional president. Watch for future club news from YSDX, Box 05-43, San Salvador, El Savador, C.A.

☐ Sao Tome: WB7RFA expects to arrive Oct. 23, hoping for the license on arrival. If that fails, he will try to secure a D2 call from Angola. All-band phone operation is hoped for Oct. 23-Nov. 26.

☐ Closing out! W8CNL has moved and would like to close out a lot of the older logs he handled cards for. As of December 31 this year, out goes: CR6IK, CT4IK, D2AIK, XX6IK, CR6AA, CR6II, CR6YY, CR6WW, TY5ABK, CR7JO, C9MJO, C9MGK, CR7GK, HR6SWA (opr. Dale) CT4UE, CT1AOZ, LU6TEA. All requests must have s.a.s.e. or s.a.e. and 1 IRC. Send to Raymond H. McClure W8CNL, 2617 Glouster Rd., Village Green Apts., Augusta, GA 30909.

☐ DXPO '85: New date to note is Sept. 27-29, 1985 for all you advance planners! The venue chosen is the renovated Lanier Plaza in Atlanta. Watch for details as they develop.

☐ GBØTXS: Late August this operation was to have been by the Southend and District Radio Society in conjunction with the Anglican Diocese of Chelmsford, to the Island of Tanera, a small isle off the northwest coast of Scotland. This is part of the Summer Islands group, and was to have been the first operation from this area. Cards with IRC or s.a.s.e. via the bureau or Brian Wood, G4RDS, 27 Fernlea Rd., Benfleet, Essex SS7 1HG, England.

☐ K5KG/OHØ: That last-July operation took place at the OHØW QTH, but cards go to K5TU, 8302 Clover Gardens Dr., Houston, TX 77095.

QSL Corner

Administered By Joan Hushin, KA1IFO

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

A4XJW (N4WF)
CN8EL (W2PD)
DA2CK/HBØ (KA2JFY/HBØ)
FK2CE (K2ROR)
FO8JP (F1BBD)
G4GED (T3ØAT)
HC1OT (W2KF)
HH2CQ (WD4IKI)
HK1AMW (KC3EK)
H44SA (AD1S)
H44SH (AD1S)
JTØDJT (I8YGZ)
JV4MB (WA4HNL)
LA7WI/XE2 (KA7KAI)
OA4BID (K5MK)
OD5LT (KA2BZS)
OX5RJ (WA1FSV)
P42J (W1KDD)
R1Z (UK1ZAA)
TG9HH (N5HH)
TK6JUN (F5JY)
VP2KBU (KCØFW)
VP2KBZ (VE3KZ)
VP2KG (WB2LCH)
VP8KF (G3VPW)
VP2MDG (W6FDG)
VP2MLD (WB2LCH)
VQ9AC (KA3EDN)
XT2BW (KF4Y)
ZD8JT (G4JYL)
ZD9CA (KA1DE)
ZF2AL (W5QJM)
ZF2GW (W2HPF)
ZF2ØCZ (WA3UFI)
ZM7VU (F6DYG)
ZLØAEA (K9AKS)
3D2DX (VE5RA)

QSL Manager Volunteer

KB4CVW

New QSL Bureau Addresses

Third call area (all calls): C-CARS, P.O. Box 448, New Kingstown, PA 17072-0448.

Fourth call area (two letter prefixes — (AA4, KB4, NC4, WD4, etc.): Sterling Park ARC, Call Box 599, Sterling Park, VA 22170.

Fifth call area (all calls): ARRL W5 QSL Bureau, P.O. Box 44246, Oklahoma City, OK 73144.

SWL: Mike Witkowski, 4206 Nebel St., Stevens Point, WI 54481.

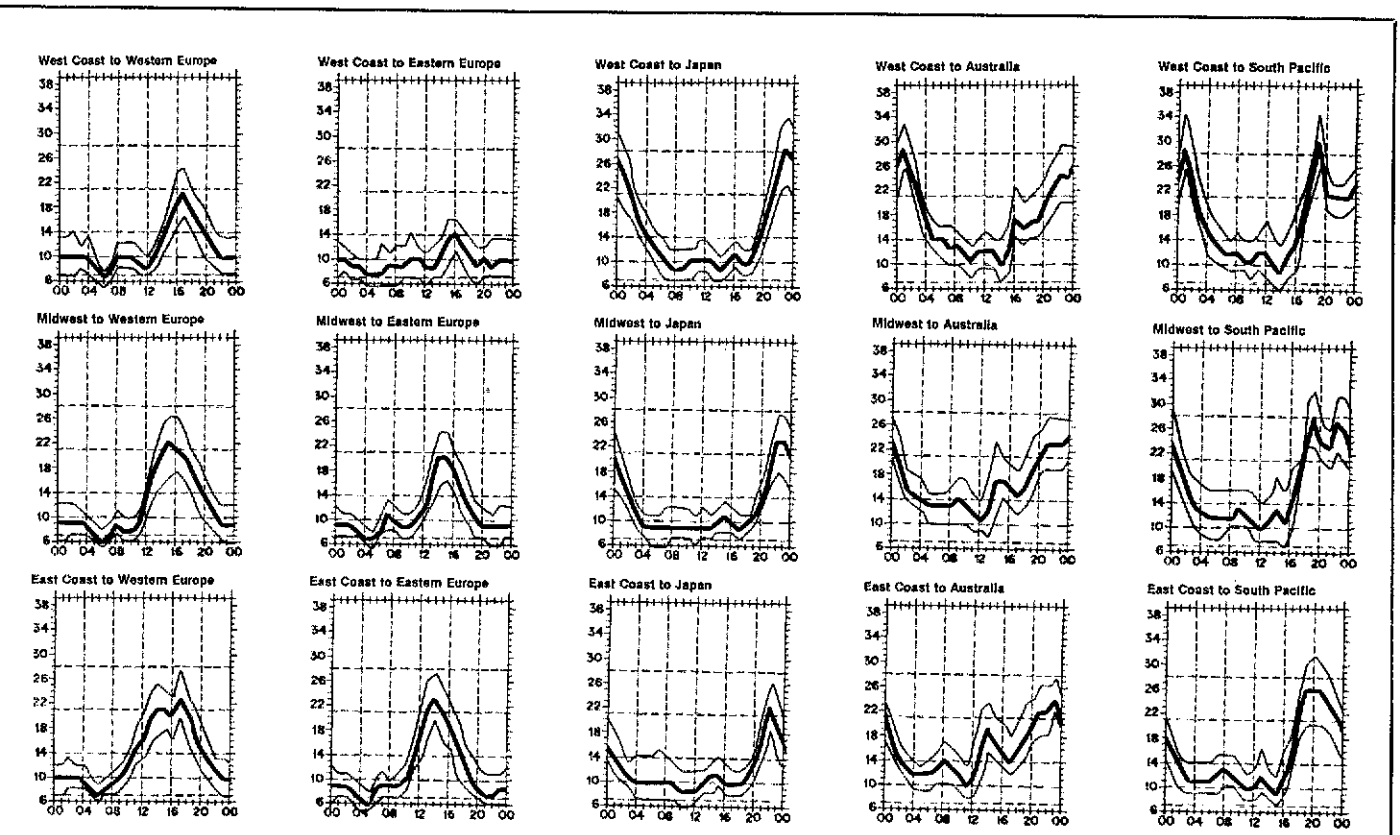
U.S. Virgin Islands (all calls): Virgin Islands ARC, GPO Box 11360, Charlotte Amalie, St. Thomas 00801.

VE5 QSL Bureau: B. J. Madsen, VE5ADA, 739 Washington Dr., Weyburn, SK S4H 2S4, Canada.

CRRL Incoming Bureau: N. F. Waltho, VE6VW, General Delivery, 9714-94th St., Morinville, AB T0G 1P0, Canada.

Special Notes

☐ Sept. 1984 QSL Corner, contains information on the operation of the ARRL Outgoing Overseas QSL Service. June 1984 QSL Corner, page 63, contains information and addresses for the Incoming Bureaus. For information on bureau operations (Incoming and Outgoing), send a self-addressed stamped envelope to ARRL QSL Bureau, 225 Main St., Newington, CT 06111.



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 October 15 to November 15, 1984 assume a sunspot number of 42, which corresponds to a 2800-MHz solar flux of 96.

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 July 1 through July 31, 1984. An s.a.s.e. will bring you the rules and application forms for participation in the DXCC Program.

New Members

Mixed

AH9AB/111 AP2HM/123 DF4NL/110 DF7XD/103 DL8ZAW/122 EA1XC/146 HA8KUN/100 HB9ALZ/103 HB9BMU/105 HS1AMT/104 JJ1EMA/110 JA2BHG/330 JA4HBP/206 LU9DBK/120 ON5FU/311 PA0BEA/130 SK7AX/219 SK7GL/179 SM5CSS/221 TI2JMV/105 VE7BCU/110 YU2CAY/176 YU3LI/118 4X4LH/175 5T5DX/100 K1YIA/166 KA1CFA/125 KA1HUS/128 KE1A/102 K8IG/101 KV1I/110 N1CLC/102 WB1BPU/105 W3GRK/108 N4FKZ/EA4/105 WB4EHS/103 KC2G/130 ND2A/103 WA2DSC/151 WA2LOG/260 W3GRK/108 N4FKZ/EA4/105 WB4EHS/103 WD4KXM/128 WZ4S/101 K5PNR/121 ND5H/102 NJ5X/152 WA7IIM/102 KY6I/106 W6NHU/102 WD6HDF/100 KA7LUK/105 KV7Q/103 N7AJ/103 WA7IIM/102 KA8OSS/100 W6ABC/114 W6LSF/101 KD7PS/108 K8WWA/107 KC8GJ/111 W6SLC/114 W6LSF/101 KD7PS/108 K8WWA/107 KC8GJ/111 KG8I/102 KR8Y/202 KG9G/100 N9EJL/100 WB9GYU/272 KN0V/288 N0DSG/103

Radiotelephone

AH9AB/110 C21BD/128 DU6ZO/113 EA8BB/155 EC4BIR/14B G4JMB/CT3/100 G4NXG/108 HS1AMT/104 I1BSN/302 I1UWE/125 JE1ZSK/101 JE2QWC/263 JH7CUO/132 JY9RC/226 LU8DPM/108 PA0BEA/112 PY2CXH/128 SK7GC/130 SM5CSS/208 VE1BKC/101 YS9HH/120 ZP5RG/195 4X4LH/173 K1YIA/163 W1QJI/103 WB1BPU/105 KA2DRE/108 WA2LOG/192 K3NA/101 WA3TUC/103 K4YEH/118 N4FKZ/EA4/102 W4ABV/168 WD4KXM/126 K5PNR/121 NB5C/105 W5UXR/122 KY6I/104 N6GAH/102 W6ABC/114 W6LSF/101 KD7PS/108 K8WWA/107 KC8GJ/111 KI8G/109 KA9FYZ/118 KB9SW/102 WB9GYU/250 N0DWU/100

CW

DL8BL/222 EA1XC/141 EA8IR/105 F6EVS/109 JG1RNL/108 JA7AZJ/109 JH7GFO/101 OK1ALQ/100 SK7GC/110 SM5CSS/147 SM0LJF/104 VE3DIT/108 W1HUE/103 K4PR/123 N4RI/224 W4ABV/125 WB4FNH/108 K7BLU/107 W7KZK/106 WA8MAM/111 KA9EPS/104 W9KE/118 KA0DXE/114 NG0A/102

RTTY

HB9HK GM3ITN

160 Meters

W4OWJ

5BDXCC

NA2M KD8V WD5DBV DL8CM W3YQ W1ZE K4BVQ OZ1BOD W4KHW SP8EMO ZP5JCY K2LQ N9RS

Endorsements

Mixed

DF2HL/290 DJ4XA/324 DJ0LC/254 DK2OY/201 DK4BW/315 DJ4LK/320 DK5WS/305 DK6NJ/285 DL1EY/295 DL1LD/332 DL1RB/315 DL6MK/341 DL8CM/347 DL0WU/292 EA1NZ/191 EA4MY/317 F6DYY/267 F6GXB/263 G3OLU/206 GM4KHE/231 GM4KLO/167 HB9AMO/323 HB9BLQ/287 HB0LL/321 HI8LC/305 HL4XM/128 I2LAG/332 IS0RZW/273 JA1GO/321 JA1NVB/273 JA2AIR/329 JA2APA/314 JI2MBN/152 JA3FYC/314 JA3PG/153 JH4UVU/268 JA7COE/262 JH7CUO/175 JH7GFO/138 JH7NRE/262 JH7UJN/201 JA8AYN/325 KH6CF/313 KL7PI/320 LA4YW/259 OE6MKG/317 OK1KRS/290 ON6HE/310 ON7EJ/304 OZ4RT/340 OZ7NJ/267 PY1DFF/230 PY2DBU/280 PY2FNB/300 SM0KV/351 SV1IW/288 T77C/312 TG9AL/304 UA1CK/345 VE1BWO/153 VE2DWH/152 VE3DGX/304 VE3GJH/306 VK6PP/202 XE1FR/298 XE1OD/154 XE1OX/301 YB4AQC/220 YU2OM/282 YU3NP/272 YU4BM/252 YV5AE/331 Z24JS/335 4Z4AB/282 K1EM/306 K1ER/261 K1VJH/309 K1VKO/306 K1WJ/309 KA1CR/203 KA1ILA/202 KB1BE/286 KN1M/132 W1BR/325 W1ESN/311 W1PEA/300 W1QV/315 W1RFW/223 W1WEF/299 W1WW/270 K2NT/292 K2UO/314 K2UU/322 KB2HK/273 KC2X/266 KD2GB/250 KF2G/279 KS2O/201 KV2S/304 KY2W/228 N2DR/189 N2MF/310 W2ARQ/302 W2HG/283 W2QXA/308 W2VUF/335 WA2FUE/280 WA2PPV/261 AC3D/127 AF3E/320 K3FB/205 K3NA/171 K3JZU/175 K3PPI/225 K3WGR/183 KB3OQ/296 N3CTB/150 W3LPL/332 W3XM/335 W3YT/307 WA3LJP/301 WB3FID/280 WB3HAZ/303 WB3IGR/255 WB3KAM/281 WB3LGO/253 AA4FL/126 K4BOE/231 K4LR/305 K4LRX/175 K4PR/277 K4PVZ/315 K4XI/321 KB4I/298 KC4N/150 KE4RX/306 KF4YH/179 N4CQ/311 N4DRC/274 N4VZ/317 NI4H/275 NN4R/270 W4ABV/203 K4CXY/306 W4GYP/322 W4OTX/328 W4YKH/319 W4ZMC/309 WA4DAN/307 WB4UBD/300 WD4FAB/151 WI4K/226 WT4T/301 AF5M/309 K5AS/301 K5PP/305 K5SSB/283 KA5V/308 KB5IM/256 KE5AX/279 N5DC/259 NA5S/200 W5DV/315 W5ERY/284 W5KFN/315 W5PWG/203 W5VJP/316 W5ZF/320 WA5TOD/225 WB5MJK/150 WB5ZDP/127 K8QS/272 KD6GC/129 N6VI/289 W6AN/310 W6KYJ/336 K7KG/334 N7AYK/244 NB7R/270 W7BCT/305 W7EOI/319 W7HPI/258 W7KSG/329 K8DB/304 K8JE/150 K8MNG/305 KC8BK/268 KB8XN/195 NE8R/270 W8BKP/351 W8ELE/325 W8GS/318 W8NJC/310 W8QWI/334 W8YGR/344 WA8SAE/292 WD8MGQ/306 K9TI/300 K9VTD/190 KA9BKW/203 KB9M/250 KF9D/262 KJ9I/260 N9ALC/281 N9AU/303 W9IU/345 W9KE/193 W9LNQ/333 W9RXJ/320 W9TGN/200 W9TY/310 WA9CYG/180 WA9YTQ/282 WB9NOV/295 K0ALL/322 K0CS/310 K0NN/280 K0XB/151 KR0S/150 N0AFW/261 W0GKE/324 W0HZ/340

Radiotelephone

CT4UW/192 DF4PL/274 DF9RB/263 DF2HL/281 DJ3VM/172 DJ4XA/302 DJ7ZG/341 DK5WS/305 DK8MZ/307 DL1EY/294 DL8CM/304 DL0WU/276 EA5AYD/154 EL2AO/150 F6AJA/322 F6DLM/309 F6GXB/235 G3NLY/337 GM3BQA/330 GM4KHE/230 HB9BL/271 HC2RG/241 HI8LC/304 I2LAG/332 I2SLA/325 I2WZX/251 I4FAF/294 I5JHW/282 I8JN/323 I0CEP/309 JA1NVB/271 JA2APA/314 JA2KVD/298 JA3PG/153 JE6WVT/130 JE6WVU/154 JH7NRE/260 JA8UJY/188 JA9GXY/150 LA7ZO/312 LU8MBV/280 OA4OS/333 OE2WJL/273 ON5FU/310 ON7EJ/301 OZ3ZK/127 PT2TF/281 PY2FNB/273 PY3BXW/333 PY4IL/155 SV1IW/282 TG9AL/304 UA1CK/340 VE1BWQ/131 VE3DGX/304 VE3GJH/306 VE4AT/300 VE4IS/270 XE1OD/154 XE1OX/301 YB4AQC/210 YU1NR/216 YU2OM/273 4Z4AB/254 K1EFS/292 K1EM/273 K1ER/239 KB1BE/285 W1ESN/283 W1VRK/285 WA1WMS/185 K2UO/313 K2UU/321 K2TQC/321 KB2HK/272 KB2XS/300 KC2X/191 KD2GB/244 KS2O/189 KV2S/303 NA2G/152 W2ARQ/299 KB3PJ/317 KN3P/225 W3FDP/310 W3XM/334 WB3LGO/239 K4CXY/302 K4PQV/327 KA4D/307 KB4I/298 KC4BR/285 KE4RX/305 KF4YH/178 N4CQ/309 N4DRC/272 NI4H/262 W4EBO/314 W4GEH/154 W4JHE/300 W4OTX/328 W4UWC/343 W4ZMC/259 WA4DAN/303 WB4UBD/300 WI4K/226 WT4T/294 K5SSB/280 KA5V/303 KB5IM/256 NA5S/200 NI5D/125 NJ5X/152 NQ5W/216 W5ERY/279 W5VJP/316 W5WJQ/284 WA5NQJ/149 WB5ROW/278 K8SD/281 W6AN/292 W6AEO/236 W6CN/306 W6FAH/199 W6KYJ/318 W6WCA/168 WB6FZN/181 WB6VSK/299 WB6UBR/235 KC7XB/177 KK7O/296 NB7R/262 N7CTY/171 WA7AEP/292 W7BCT/304 W7EOI/319 W7OM/323 W7QK/335 K8DB/301 K8ZZO/300 KA8DBM/205 KB8WC/251 KB8XN/190 KB8ZM/140 KC8BK/266 NE8R/270 W8GS/269 W8QHG/253 W8QWI/253 W8TN/294 W8YGR/311 WA8SAE/182 WA8VPN/253 WA8ZDL/266 WD8MGQ/305 WD8IPJ/270 WD8PUG/286 AI9U/280 K9TI/290 K9KA/332 KS9R/201 W9IGK/250 W9LNQ/272 W9ROK/125 W9TY/260 WB9JBH/275 WB9NOV/291 K0ALL/315 N0AFW/281 W0DXY/245 W0PT/301 W0RTB/226 W0YZL/151

CW

CO2PY/136 DF2HL/203 DJ4XA/283 DK6NJ/149 DL8CM/293 EA1NZ/174 F6GXB/222 HB9BFU/152 JA1GO/261 JA2KVD/231 JA3FYC/307 JF3AUA/183 JH7CUO/132 JH7UJN/180 KL7PI/116 ON7EJ/301 PY2FNB/222 SM7KJH/133 K2UO/305 KC2X/219 WB2FXK/196 K3NA/127 K3UA/294 AA4KT/301 K4CXY/280 K4XI/197 N4VZ/299 NI4H/232 WA4DAN/282 WB4ZBI/149 WT4T/205 AF5M/255 K5AS/295 WA5TOD/193 AA6EE/150 K6EID/125 K6RK/274 KA6DXY/159 NE6I/178 WB6VSK/126 KU7Y/176 K8DYZ/305 KR8Y/181 W8ELE/231 W8QWI/289 WA8SAE/281 WA8YTM/150 K9TI/272 KF9D/251 W9LNQ/262 W9TY/298 WB9NOV/158

DXCC Notes

160 Meters Endorsable

Endorsements for 160 meters DXCC shall be available beginning 1 November 1984 for contacts made on or after 15 November 1945. The same provisions as applied to the mixed, phone and CW award will prevail, with the exception that there will be no Honor Roll. This is to comply with Minute 35 of the March 1984 Board Meeting. Since 160 meters was not endorsable in the past, a complete record of the original 100 credits submitted for the award was not kept. To apply for endorsement, the 100 previously submitted confirmations plus 25 additional confirmations (Rule 5) must be sent. Original 160 meters certificate numbers will be retained. Those holding 160 meters DXCC, applying for endorsement and new initial applicants must submit forms CD 164 and CD 253. Forms are available from ARRL Hq. for a business-size s.a.s.e., with two units of first-class postage.

Correspondence

Conducted By Peter R. O'Dell,* KB1N

IT IS A CRIME

☐ There is a problem in the Amateur Radio fraternity — software piracy. Whether by ignorance or simple disregard for the law, many amateurs are stealing copyrighted programs. Most do not consider their theft a crime or a serious problem, but unless this practice is discontinued, Amateur Radio will suffer.

With the influx of computers into the hobby, a degree of software piracy was inevitable. Unfortunately, the problem has become a blemish on Amateur Radio. Thousands of dollars have been spent in litigation involving software piracy outside the hobby, and I had hoped Amateur Radio would police the problem internally and not require legal action. Sadly, this is not the case.

I recently confronted two hamfest exhibitors who were selling copies of a Kantronics program. These people were copying and selling our programs to any amateur willing to pay the price. I bought one of the programs for evidence and informed the seller that legal action would be taken. This person was not a ham, but those buying the programs were. We have several other examples of programs copied and sold.

There are a few, simple steps we can all take as those interested in seeing the problem solved: (1) never buy copied software; (2) report pirates to the software manufacturer; and (3) don't allow illegal sales at your local hamfest.

Kantronics plans to prosecute those who steal our programs, as we have in the past. But without the assistance of the entire amateur community, the manufacturers will not be able to stop pirates from stealing their profits. If manufacturers are not able to sell enough product to make a profit, other new and improved programs will not be written. Don't let the greed of a few deny the hobby of future expansion. — *Mike Forsyth, Marketing Director, Kantronics, Inc., Lawrence, Kansas*

REVENGE OF THE METRICS

☐ KDØNF asked why the English measurement system should be replaced by the metric system (July *QST*, p. 61). For those to whom the reasons are not yet obvious, here are a couple.

The metric system is the standard for nearly all the technological world except the United States, and particularly for physics and electronics, from which our hobby derives. We already commonly use watts, microfarads, milliamps, etc., all derived from metric units. Why hold out on mass and length?

Most of us wouldn't have trouble converting yards to inches because we know the more common English conversion factors. But how many of us could quickly convert 2.5 cups to bushels or 375 feet to furlongs? Analogous conversions in the metric system are trivial because the prefixes tell us how many places to move the decimal point (common sense tells us which way) and no arbitrary conversion factors (i.e., 1 furlong = 660 feet) are needed. — *Dan Duncan, WA6NZZ, Los Angeles, California*

☐ Add my name to those who advocate all measurements in *QST* be in the "common system." The time is long overdue for this change. Let's recognize the bands for what they really should be, the 44-yard band being my personal favorite. It's so much simpler to look for the lower band edge at 48611.11111111 grosherz.

Let's get with it. — *Werner P. Dolde, K2KPF, Maple Shade, New Jersey*

☐ I must disagree with KDØNF's views on metrification. Since the initial stages of our hobby we have referred to wavelengths in meters, not feet. We have used coulombs, volts and amps. If he has ever done computations with English units for force, mass and viscosity, he would appreciate the beauty of the SI metric system. Conversion to the use of metric lengths is basically *all* we need to be concerned with and is a minor discomfort. — *Kevin B. Albough, KA2UJX, Potsdam, New York*

SOURED

☐ I am not renewing my ARRL membership. It seems that Amateur Radio has turned into something that I and a lot of other people would rather not associate with.

The 2-meter band is a cesspool; every repeater control operator thinks he is a god. If you are on a repeater and the control op does not like what you are saying, the machine is dumped. I am not talking about foul language, either.

I would never recommend Amateur Radio to anyone that is a sensitive human being. I am so glad that I saved my Pace CB. I am tired of being insulted, ignored and censored. I have been a ham for over 24 years, and I have never seen such conduct over the amateur bands. You had better get the word out, or not only will *you* lose the 220-MHz band, but a lot of other frequencies, too. — *B. J. Levow, KC2ZM, Flushing, New York*

THANKS

☐ On August 6, 1984, almost a year to the day after purchasing ARRL's *Tune in the World with Ham Radio* on a whim, I passed the 13-WPM code test and got on the air as a General class. I know that it's been done more quickly, but I doubt that it's ever been done with more satisfaction.

With a Heathkit HW-101 purchased used at the Hamfest and a bargain-basement vertical antenna, I've become a confirmed DXer. My first DX QSO with F6CDX in Limoges, France, was fantastic. I'm hooked for life. It's a great hobby, and I'm thrilled to be part of it.

I'm particularly impressed with the attitude of so many people who've been genuinely interested in helping a beginner get started. To the very kind lady at the Virginia Beach Amateur Radio Club who referred me to the Southern Peninsula Amateur Radio Klub (SPARK), and literally a dozen others: Thanks! Your enthusiasm and very generous gifts of your time and energies have gotten me a great start in a life-long hobby.

To ARRL: Keep up the good work. Your monthly Beginner's Bench and Hints and Kinks columns in *QST* have been especially helpful, and without the W1AW code-practice sessions I never would have gotten over the 13-WPM hurdle. — *Daniel M. Bergeron, KB4IYK, Fort Monroe, New York*

WHERE DO HAMS COME FROM?

☐ I've been mulling over, for a long time now, the widely disseminated doctrine that future ham-ops will come predominantly from computer-oriented youth. Frankly, I think this view is askew of the truth. Not only does it short circuit the potential for autumn-aged or senior citizen ops, but in addition it almost completely overlooks the perennial psychological roots of Amateur Radio's appeal.

Don't we often say to others, "Just imagine: Communicating across continents and oceans, using satellites and moonbounce." Now, aren't we really appealing to the imagination? Isn't Amateur Radio a blend of imagination, the quest for knowledge and the desire to communicate beyond the boundaries of our immediate terrestrial community?

Recently, and as if by fate, I was thinking about this problem, when my young, bespectacled and owl-eyed friend, John, sauntered past my table at a local eatery. "'Have you heard about the ham, Owen Garriott, in space?" I said.

John had! "How'd you like to be able to speak to him?" I continued. John's eyes lit up and grew larger, and a large look of amazement shone on his face. Now, isn't *this* the beginning of a new radio amateur? I think so!

Quite simply, blend imagination and technology, of *whatever* modality and stir with enthusiasm. New amateurs will be forthcoming, forever. — *Marty Wincott, K2BRY, Harrison, New York*

MEANINGFUL DX QSO

☐ I could *not* believe what I read in [How's DX?] in July 1984 *QST*. I was especially amazed that such a subject would be in a DX column. You *can't* really be serious about "enjoying a meaningful DX QSO"? It is nearly impossible to have anything close to a QSO with a DX station. Because of things such as DXCC and general outright discourteousness on the part of a *large* number of amateurs, you *cannot* expect to be able to relax and enjoy a DX QSO! I don't know, but maybe I'm wrong and all these amateurs in foreign countries only like to try to talk to dozens of people all jamming the same frequency at once only to say enough words to give recognition to a call sign, a signal report and a QSL manager, and then move on to the next. I do agree that sometimes a question or two is asked/answered that has nothing to do with getting a QSL card, but a one minute or less conversation can hardly be called "meaningful"! I also will agree that it *is* easy to carry on a QSO, such as you suggest, with someone who is *not* in a "prized" DXCC country (England, Mexico, Canada, etc.), and it is *very* enjoyable to be able to do so. — *Scott Cranston, KB1NW, Nashua, New Hampshire*

*Public Information Coordinator, ARRL

Washington Mailbox

Conducted By Katherine Hevener,* WB8TDA

Exams for Persons With Disabilities

A growing interest in Amateur Radio among the physically handicapped population has raised many questions regarding the licensing requirements and methods that this group can use to fulfill them. This month, we will focus on these issues.

Q. I have a physical disability that makes it difficult for me to take exams in the conventional manner. Where can I find a person who is qualified to give me an Amateur Radio exam?

A. You may obtain the names of individuals who are capable of administering the Novice class exam from local amateurs, ARRL Hq. and/or the Courage HANDI-HAM System (3915 Golden Valley Rd.; Golden Valley, MN 55422, tel. 612-588-0811). You should contact the Volunteer Examiners (VE) who administer the test at an exam session you wish to attend, and make known your special needs.

Q. My Dad is a quadriplegic, and his disability makes it difficult for him to attend and participate in "normal" exam sessions. Because of this, may I give him any Amateur Radio operator license exams that he wishes to take?

A. According to Section 97.31, "each person administering an examination for an amateur radio operator license must be an accredited VE, and must not be related to the candidate." This information should not discourage your father or any other person with a physical disability from taking Amateur Radio exams. Section 97.26(g) states that a candidate whose physical disabilities require special procedures to allow participation in examination sessions shall attach a physician's statement to his/her application that indicates the nature of the disability. If the candidate is unable to travel, the VEs may administer the test at his/her house. However, the candidate is responsible for providing any special equipment needed, such as an audio transducer, a sip and puff keyer, a talking calculator or a Braille writer.

Q. I am a physically handicapped person who has limited financial resources. Does this mean I am exempt from payment of any fees that VECs may legally charge for exams?

A. No. You are required to pay any fees that a VEC may legally charge ($4). If this is not possible, then you must locate a VEC whose fee structure is within your budget, or seek sponsorship from a friend, local Amateur Radio club, charitable organization, etc.

Q. As an examiner, how do I obtain the tests that have been designed for the physically handicapped population?

A. There are no "special" tests, since this group is expected to fulfill the same licensing requirements as people who are not disabled. Thus, if you are administering a Novice exam, you are responsible for developing Element 1(A) and designing Element 2 from the information contained in PR bulletin 1035A. Eventually, accredited VEs giving the Technician, General, Advanced or Extra Class exams will be required to construct the exams from information contained in PR bulletins 1035 B, C and D. In so doing, they will be expected to select questions that will not adversely affect a physically handicapped person's test performance. For example, a question involving a diagram might be a poor choice for a blind person. However, for the next two years, the questions will be chosen by the VECs.

Q. I am blind and have a speech disorder that causes me to stutter. This condition makes it difficult for me to fulfill the Morse code requirement. Because of my unique situation, will this portion of the test be waived?

A. No. Section 97.23 indicates that despite your handicap, you must fulfill the same exam requirements as individuals who are not disabled. The FCC does permit you to use special devices and procedures for this purpose, however. For example, you may type or dictate what is being sent as the Morse code is being transmitted. Or, an examiner may read the questions and you may communicate your answers orally.

Q. I have a handicapped student who can pass the 20-WPM code test if I send a character and wait for his response before sending another one. Does this constitute proper use of special procedures?

A. In this case, you are testing your student's ability to recognize characters rather than his ability to comprehend Morse code that is sent at a rate of 20 WPM. Since this is a *modification* of the exam requirements, it is not permissible.

Q. I understand that a team of three people must administer exams for the Technician, General, Advanced and Extra Class operator license. Does this rule apply to situations in which one handicapped applicant is being tested?

A. Yes. According to Section 97.28(a), "Unless otherwise prescribed by the Commission, each examination for an amateur radio operator license (except the Novice class operator license) shall be administered by *three* accredited volunteer examiners." To repeat, the Commission requires that each test session conducted under the Volunteer Examiner Program be administered by *three* Volunteer Examiners.

Q. What criteria must an applicant with a protracted physical disability meet in order to receive credit for successful completion of the various exam elements?

A. The standards for passing are identical to those for persons who are not disabled. Thus, applicants may obtain a license, or upgrade, if they answer at least 74 percent of the questions correctly on a written test and/or prove their ability to transmit correctly by hand key and receive correctly by ear Morse code at a given rate of speed for a five-minute period (97.29[b], [c]). FCC has stated that their experience convinced them that a receiving test alone is adequate proof of both sending and receiving ability (discussion section of *Report and Order* PR 83-27).

Q. I failed the exam for the Advanced class operator license. How does this affect my future in Amateur Radio?

A. You are governed by the same rules that apply to nonhandicapped persons in this situation. Thus, you will retain those operating privileges governed by the class of license you currently hold. Furthermore, you may not be reexamined for the same element you failed within 30 days (97.26[h]).

Q. Where can I find information regarding other services that may be available to handicapped persons who are interested in Amateur Radio?

A. You may request a complimentary print copy of the *ARRL Program For The Disabled* booklet from ARRL Hq. This publication focuses on special training materials, equipment and services that exist for the benefit of this population. You may also contact the Courage HANDI-HAM System.

*Membership Services Assistant, ARRL

Mini Directory

As a convenience to our readers, here is a list of items of particular interest and when they most recently appeared in *QST*.

Advisory Committee Members	March 1984, p. 60
Board Standing Committees (Minute 65)	May 1984, p. 60
Call Sign Assignment System	June 1983, p. 61
Contest Guidelines	July 1984, p. 88
Int'l EME Competition	Sept. 1984, p. 69
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MARS Information	April 1984, p. 86
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Reciprocal-Operating Countries	Nov. 1983, p. 71
Section Emergency Coordinators	Oct. 1983, p. 95
SET Announcement	Sept. 1984, p. 67
Third-Party-Traffic Countries	This issue, p. 73
U.S. Amateur Frequency and Mode Allocations	Sept. 1984, p. 47

Conducted By Bob Atkins,* KA1GT

GaAsFET Biasing and Transient-Voltage Protection

A number of people have reported problems with GaAsFET amplifiers related to premature failure of the GaAsFET itself. In almost all these cases, such failures can be attributed to voltage transients. GaAsFETs are *very* sensitive to voltage spikes. They may typically have an absolute maximum V_{DS} (drain to source voltage) of +6 V and V_{GS} (gate to source voltage) of −6 V. Any voltage spikes above these levels, even if only of microseconds duration, will almost certainly destroy the device. Such spikes may come from the switching of inductive loads (e.g., relays) or distant lightning strikes on power lines. Even if the GaAsFET is fed from a power supply unconnected to any relays (as it should be), voltage spikes may still be present via inductive pickup on wiring or via the 110-V supply.

There are two common schemes for supplying power to GaAsFET circuits. The first is source biasing, as shown in Fig. 1B. This scheme requires only one supply voltage. V_{GS} is derived from the voltage drop across the source resistor. It is absolutely essential that the supply voltage be decoupled with a circuit similar to that shown in Fig. 1C. A voltage regulator or Zener diode is used to regulate the supply voltage, and several capacitors (large capacitance tantalum and smaller low-inductance disc capacitors) are used in conjunction with a choke to suppress voltage spikes. The transient-suppression circuit must be mounted right at the preamp.

The second common power supply scheme is shown in Fig. 1A. Here, the drain and gate voltages are supplied independently, often by batteries. This is an inherently safer scheme, as batteries on their own cannot produce transients. It is still a good idea, however, to decouple the supply voltages with a similar circuit to that described above, since voltage spikes may still be picked up inductively. A second advantage of this scheme is that gate bias may be adjusted easily to give optimum performance. One point to note when using this scheme is that the gate voltage must be applied before the drain voltage.

As can be seen in Fig. 2, the application of a negative bias to the gate reduces I_{DS} (drain to source current) to a safe level. Since the I_{GS} (gate to source current) is very small (typically 1 microamp), even a static charge on the gate is sufficient to cause excessive I_{DS} if drain voltage is applied with the gate floating. It is a good idea to switch the gate supply between the battery and the voltage divider resistor network so that the gate is always connected to ground via the network.

Coax-to-Microstrip Transitions

Many microwave circuits are built using microstrip construction techniques. This technique uses a thin strip of conductor separated from a large ground plane by a dielectric. This is similar to the stripline technique in which the thin conductor is sandwiched between two ground planes separated by a dielectric. While the circuits may employ microstrip construction, circuit inputs and outputs are usually coaxial; so coaxial-to-microstrip transitions are needed. Two such transitions are shown in Fig. 3C and 3D. Fig. 3C shows the in-line transition preferred at frequencies above 3 GHz, since it gives a lower SWR than the right-angle transition shown in Fig. 3D. The right-angle transition can be adjusted to give a low SWR at higher frequencies, but usually by a cut-and-try method requiring test equipment for optimization.

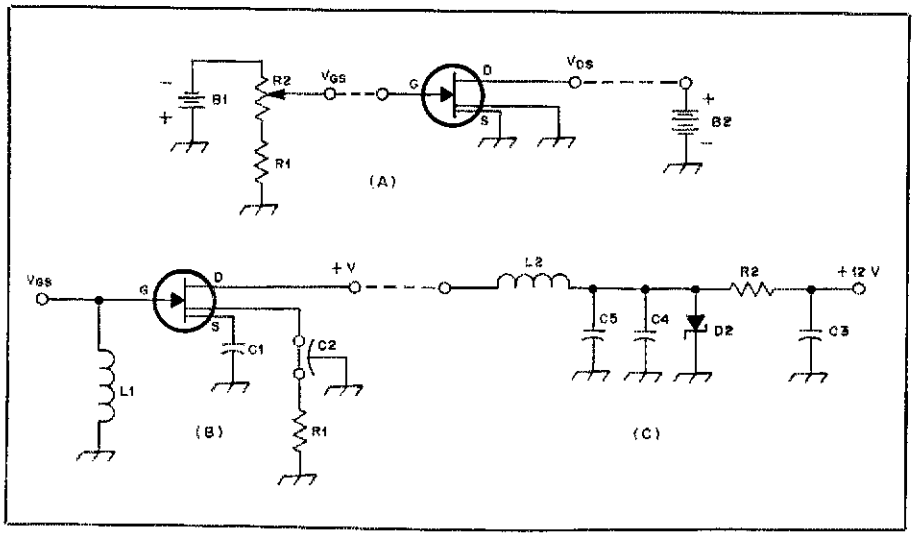


Fig. 1 — GaAsFET power supply, biasing and transient suppression.
(A) Independent Bias Supply.
B1, B2 — Batteries.
R1 — 1-kΩ fixed resistor.
R2 — 25-kΩ potentiometer.
(B) Source Resistor Bias.
L1 — RF choke.
C1, C2 — Chip capacitors (typically ~500 pF).
R1 — Source bias resistor (typically ~100 Ω).
(C) Transient Suppression.
L2 — RF choke.
C3 — 10-μF tantalum capacitor.
C4 — 0.1-μF disc ceramic.
C5 — 1000-pF disc or feedthrough.
R2, D2 — Zener diode regulation circuit.

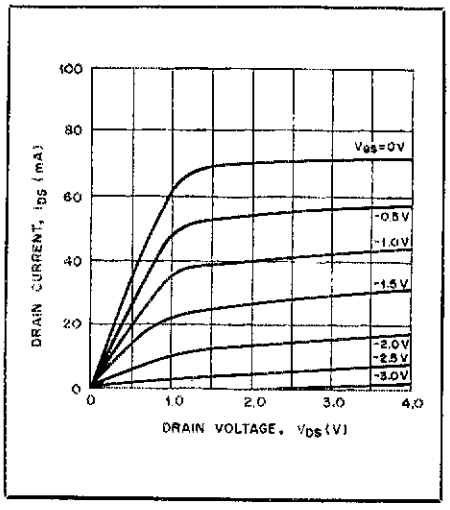


Fig. 2 — Typical GaAsFET dc characteristics (NE720 series).

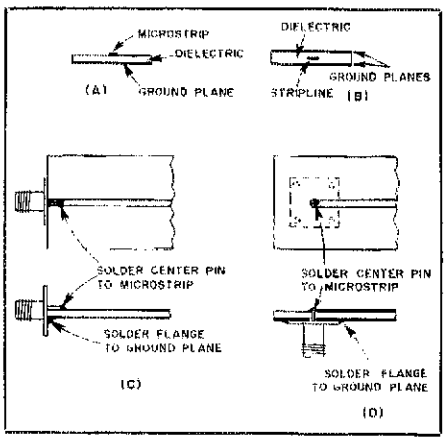


Fig. 3 — Coaxial-to-microstrip transitions. (A) microstrip circuit construction, (B) stripline circuit construction, (C) collinear coaxial-to-microstrip transition, (D) right-angle coaxial-to-microstrip transition.

*103 Division Ave., Millington, NJ 07946

Canadian NewsFronts

Conducted By Harry MacLean,* VE3GRO

Moved and Seconded . . .

CRRL BOARD MEETING MINUTES
No. 7
1984 August 4

1) Pursuant to due notice, the Board of Directors of the Canadian Radio Relay League, Inc. met in annual session at the Airport Holiday Inn in Toronto, Ontario, on 1984 August 4. President Tom Atkins, VE3CDM, called the meeting to order at 0855 EDT. The following were present: Vice President and Secretary Harry MacLean, VE3GRO; and Directors William Kremer, VE7CSD, Western Region; George Spencer, VE6AW, Prairies Region; Raymond Perrin, VE3FN, Ontario Region; Albert Daemen, VE2IJ, Quebec Region; and Andrew McLellan, VE1ASJ, Atlantic Region. Also present, but as observers without vote, were Honorary Vice President Noel Eaton, VE3CJ; CRRL Headquarters Manager Audrey Staines, VE3KGS; Assistant Directors Al d'Eon, VE3AND, William Loucks, VE3AR, Marvin Nash, VE3FON, Ray Staines, VE3ZJ, and Gordon Steane, VE3BMG; and ARRL President Larry Price, W4RA.

2) President Atkins welcomed everyone to the meeting and announced that CRRL Counsel Robert Benson, Q.C., VE2VW, would be unable to attend as a result of a sudden family emergency. Everyone then observed a moment of silence in memory of amateurs who had passed away, and particularly in memory of former ARRL President Vic Clark, W4KFC.

3) It was agreed to follow the agenda that was provided. On motion of Mr. Perrin, seconded by Mr. McLellan, the Board VOTED to adopt the minutes of CRRL Board Meeting No. 6 as issued by the Secretary, but deleting the following from Item 5: " . . . and a diamond logo that was similar to the logo used by CRRL."

4) President Atkins then called for reports. Each member of the Board outlined recent activities: travel, visits to clubs and new projects. Finally, ARRL President Price brought greetings from the ARRL Board and expressed his pleasure at being able to attend the meeting.

5) The Board recessed from 1015 to 1035.

6) The Board then discussed guidelines for a CRRL affiliated-club program. Board members agreed that there should be several classes of affiliation: one so that a club with only a few CRRL members could indicate its general support for CRRL; another with membership requirements and benefits similar to those for the ARRL affiliated-club program; and still others for school and senior citizens' groups, provincial societies and large-area special-interest groups. On motion of Mr. McLellan, seconded by Mr. Perrin, the Board VOTED to refer the matter to a committee chaired by Mr. Kremer. This committee would present recommendations to the Board later in the year, at which time the Board would take further action.

7) Mr. Loucks, as CRRL RABC Representative, reported on his work with representatives of CARF and CCTA, the Canadian Cable Television Association, in preparing a proposed joint resolution on interference between amateurs and cable television systems. This resolution would have had all parties accept the standards outlined in DOC's BP-23 (Broadcast Procedures 23). However, several members of the Board expressed serious concerns about the resolution. Some felt it did not place sufficient emphasis on BP-23 Sections 3.11 and 3.12, which state that the cable companies are responsible for seeking out and remedying harmful interference. Others felt there was insufficient protection for mobiles. A few wondered what interpretation some cable operators might eventually place on phrases such as "reasonable steps," "co-operate with cable companies" and even "harmful interference." On motion of Mr. MacLean, seconded by Mr. Spencer, the Board VOTED not to adopt this particular resolution, but to refer the matter to a committee chaired by Mr. Loucks, with a view to drafting another resolution that would be more favourable to the amateurs.

8) The Board then discussed the possibility of deregulation of Canadian amateur bands. This would permit Canadian amateurs to operate any mode anywhere on their bands, subject only to convention and to "gentlemen's agreement." Several directors had polled amateurs in their area. Results were mixed, but the majority of amateurs contacted were not in favour of the idea. However, DOC had not yet issued a *Gazette* notice on the matter; DOC's intentions were far from clear. Of more concern was imminent U.S. phone band expansion on 10, 15 and 80 metres. Directors reported that there was considerable support for expanding the Canadian 80-metre phone band downwards to 3700 or even 3675 or 3650 kHz. On motion of Mr. Kremer, seconded by Mr. McLellan, the Board VOTED to have the Secretary prepare survey questions on these matters, and to include the questions in a mailing to be sent to all Canadian amateurs in October.

9) The Board then heard a report from Audrey Staines, VE3KGS, Manager of the CRRL Headquarters office in London, Ontario. This office is constantly busy processing memberships, filling orders for ARRL and CRRL materials, preparing packages for hamfests and conventions, and answering routine inquiries from all over Canada. ARRL Headquarters staff now report they are rarely asked to service CRRL members; it is all being handled from London. On motion of Mr. MacLean, seconded by Mr. McLellan, the Board VOTED to express its thanks to Mrs. Staines and her husband, Ray, VE3ZJ, for their dedication and hard work in maintaining the CRRL Headquarters office. (Applause)

10) The Board recessed for lunch from 1145 to 1245.

11) During the early part of the afternoon, the Board discussed the following, with no formal action being taken at the time:

a) the Five Year Plan: Most provisions were moving ahead smoothly; member acceptance was high;

b) improved delivery of *QST:* Efforts to obtain a Second-Class mailing permit were stalled; alternatives were being explored; a recent agreement between Canada Post and the U.S. Postal Service to give transborder mail the same priority as domestic mail offered hope;

c) section organization: Several sections had successfully implemented the new structure; there would be a need for a Canadian Communications Manager in the near future;

d) ARES Canada Net: This was "laying low" for the summer; emergency preparedness exercises and use of the net in the fall SET would rekindle interest;

e) CRRL Can-Am Contest: Forms were ready; rules were in August *QST;* space would be available for results; it would be important to publish results before April;

f) awards: Several amateurs were close to qualifying for the "Worked All QST Award"; CRRL should co-sponsor or establish a Canadian award similar to WAS.

g) QSL bureaus: The name change for the individual incoming bureaus was well received; the CRRL Central Incoming Bureau was now processing 4000 cards a *week;* use of the new CRRL Outgoing QSL Bureau doubled since November;

h) DOC initiatives: CRRL did write to DOC asking them to "hold the line" on licence fees; on 902-928 MHz, CRRL had asked DOC to allow modes other than A3 or F3; this was incorporated into a recent DOC proposal;

i) North York by-law; CRRL had had significant influence on the outcome; the by-law will specifically exclude federally licensed (including amateur) installations — an important precedent; and

j) events: Plans for the RSO-CRRL convention, to be held in London, Ontario, in 1985 September, were going ahead smoothly; amateur participation at Expo '86, to be held in Vancouver, was still possible; 1995 would mark 75 years of CRRL and be an excellent year to hold an IARU Region 2 Triennial Conference in Canada.

12) The Board recessed from 1420 to 1435.

13) On motion of Mr. Kremer, seconded by Mr. McLellan, the Board unanimously VOTED to award a CRRL Certificate of Merit to Douglas Lockhart, VE7APU, in recognition of Doug's work in developing packet radio standards now in use all over North America.

14) The Board then discussed procedures for upcoming CRRL elections. It was agreed that such elections should be conducted with the same attention to detail as given to ARRL elections. On motion of Mr. Daemen, seconded by Mr. Perrin, the Board VOTED to appoint Honorary Vice President Eaton as Chairman of the Committees of Tellers; Mr. MacLean would be the Board representative; Mr. James Miller, VE3AGC, would be approached to become a third member of the committee; actual opening and counting of ballots would be supervised by an independent chartered accountant, Mr. William Shanks of London, Ontario.

15) On motion of Mr. MacLean, seconded by Mr. Perrin, the Board VOTED that CRRL should try to continue to work with CARF, the Canadian Amateur Radio Federation, on projects of mutual interest, for the benefit of Canadian Amateur Radio.

16) President Atkins then reviewed the committees that had been formed. There being no further business, the Board adjourned at 1710 EDT. Total time of meeting: 6 hours, 40 minutes.

Respectfully submitted,
H. J. MacLean, VE3GRO
Secretary

CANADIAN PHONE BAND EXPANSION?

CRRL has written to DOC, advising DOC of recent U.S. phone band expansion on 10, 15 and 80 metres, and that there is considerable support among Canadian amateurs for some downward expansion of Canadian phone bands, particularly on 80 metres. CRRL asked DOC to issue a *Gazette* notice on the subject, soliciting the opinions of all interested parties. CRRL will also be surveying Canadian amateurs on the matter. If Canadian amateurs want it, CRRL will support Canadian phone band expansion.

NOTES FROM ALL OVER

☐ DOC has informed CRRL of a new reciprocal-operating agreement with the Bahamas, C6. The agreement took effect on June 25.

☐ According to DOC, Brian Lingard, VE3CDB, is the first blind amateur to obtain a Digital class licence. Brian works for Revenue Canada in Toronto, and holds a degree in computer science from York University. He uses a computer with a Braille terminal, which he will soon be incorporating into his station.

☐ There was an error in the August 1984 *QST* Canadian NewsFronts column. Send those Dominion Stores or Best for Less stores cash register tapes to Libby Stevens, VE3IOT, at 21 (not 1) Ida St., Thornhill, ON L3T 1X4.

☐ Congratulations to Halifax ARC and Montreal ARC. This year, both clubs celebrate *50 years* of affiliation with the League!

*163 Meridene Crescent West, London, ON N5X 1G3, Tel. 519-433-1198

The World Above 50 MHz

Conducted By
Bill Tynan,* W3XO

Several Issues — What's Your Opinion?

This month, I am asking you, the readers of this column and active VHFers, to voice your opinions on several questions that have arisen recently. Some of these were brought up at the Central States VHF Conference held in Cedar Rapids, Iowa, at the end of July (see report below). Another, concerning VHF/UHF contests, has been debated extensively by the VHF Ad Hoc Contest Committee, on which this conductor has been proud to serve. Let's cover that one first.

This might be considered two issues and concerns the relative lack of activity in the September VHF QSO Party, in comparison to the similar June contest, as well as the low participation in the UHF test. The latter affair has been held the first weekend in August since its inception several years ago, and a number of people have cited its scheduling for the low turnout. The date selected was based mainly on the weekends that are available and their time separation from other major events such as the June and September VHF contests, Field Day and July 4. It was felt that the contest should be held sometime during the warm months in order to encourage portable operation as well as increase the probability of reasonably good tropo, the mainstay of the higher bands. Many have complained, however, that the early August date is bad because of vacations, and that propagation is not very good during the hottest portion of the year. Of course, one of the reasons that participation in the September event pales in comparison to the June affair is the lack of E-layer propagation on 6 meters during the late summer period.

Since one of the principal objectives of the VHF Contest Ad Hoc Committee is to make VHF/UHF contests as popular as possible, the group has been discussing approaches that might be taken to revamp these two affairs in such a manner as to achieve that objective. One suggestion is the creation of two new contests to replace both of the current ones. One would be a UHF test, with rules very much like the present ones but possibly enhanced with point credit for the higher bands. The 1¼-meter band would be included to provide maximum stimulation for operation on that endangered band. This event would be scheduled for sometime in September, probably near the autumnal equinox. The cool evenings that begin to occur about that time of year should make for tropospheric propagation better than that encountered during the height of the summer, but the weather should still be pleasant enough to encourage mountaintopping. The other contest would replace the present September VHF QSO Party and be a VHF-only affair, i.e., 6 meters, 2 meters and 1¼ meters. [Someone suggested it be called the "VHF Rallye." — Ed.] This would be held about mid-August so as to take advantage of meteors, which are quite prevalent at that time of year, as well as any lingering E-layer propagation. Most years are better in this respect than was 1984!

What are your opinions on the replacement of the UHF contest and the September QSO Party with these two, new contests? If you favor the idea, how do the suggested dates sound?

Also on the subject of contests: One of the rule changes that came out of the VHF Contest Ad Hoc Committee was the reduction in hours and the elimination of mandatory time-off periods. This conductor strongly favored doing away with the time-off requirements, as I have always felt that they were unenforceable and were ignored by too many contesters. On the other hand, I had reservations about shortening the hours. The argument for doing so was to permit Eastern mountaintoppers to fold their tents and get home at a reasonable time. My feeling was that it eliminated one of the evenings of enhanced tropo propagation for Westerners who, under the new rules, now must stop collecting points at 2000 local time Sunday evening on the Pacific Coast.

This specific point was made to me at Cedar Rapids by WB6NMT, who urged that something be done to redress what he considers a wrong committed on his part of the country. One approach might be to begin and end the contests on the basis of local time. This carries with it all the problems inherent in one section of the country being in the contest and another not. A different tack might involve beginning the timing of the contest for each participant based on that contestant's first log entry. Few in the East would pass up the high QSO volume that generally accompanies the first hour of a contest, merely to be able to operate into the wee hours of Monday morning, with the possible exception of those of us who never seem to be quite ready to go at the appointed hour!

What are your views as to hours for VHF contests?

Another topic that came up at the Central States VHF Conference has to do with the VUCC and the fact that it presently covers bands through 23 cm. Several urged that awards be extended to the other microwave bands.

Should the VUCC award be extended to the microwave bands, and if so, how high? What should be the number of grids required for the basic award on the various bands?

The final question I have on my list concerns the standings boxes. Actually, it's two questions. Someone at the CSVHF Conference suggested that, while retaining state listings, I put grids in the first column as the primary means of ranking the stations. I can see a few problems with this approach, not the least of which is the fact that only a few have submitted grid listings so far. If it were to be done, should it apply to all bands, 2 meters and up or only to the higher bands?

Another suggestion regarding the boxes comes from K1FO. Steve proposes that call areas — the 10 U.S. call areas plus KH6 and KL7, plus VE and XE call areas, plus DXCC countries not located within the U.S., Canada or Mexico — be replaced with DXCC countries. This would certainly simplify matters, as many do not appear to understand the "call area" column since it was changed to the present definition from merely the 10 U.S. call areas some years ago. This move would, of course, mean that only those with EME could sport a listing greater than two or three.

I have considered doing away with the call area listing altogether, now that we have grids. It seems to make far less sense now than it once did when VHF contacts were made only via terrestrial modes.

Should changes be made to the way that listings are presented in the standings boxes? Should they be based on grids rather than states? If so, for what bands? Should the call area column be kept as it is or be changed to DXCC countries? Should it be kept at all?

I welcome your opinions on these questions, as well as any other ideas you may have. You can bet that I will give careful consideration to the ones associated with the running of the World Above 50 MHz. Those dealing with VHF and UHF contests will be passed on to the VHF Contest Ad Hoc Committee so all of the members will get an opportunity to study them and make recommendations to the Chairman, John Lindholm, W1XX, at League Headquarters.

PACKET METEOR TESTS SUCCEED

What is believed to be the first amateur communication using packet techniques over a path supported by meteor-induced ionization took place August 5, between 1415 and 1605Z. The participating stations were WØRPK near Des Moines, Iowa, and W3OTC Rockville, Maryland. FM was used on 50.505 MHz. On the Iowa end, the rig was a converted commercial land-mobile base station running about 250-W output to a five-element Yagi. The station represents the group effort of the Central Iowa Technical Society, but was located at the QTH of WØRPK. The Eastern station was more of a conventional amateur setup. The transceiver was a FT726R with a 150-W Mirage amplifier and, at times, a 4-250A PA delivering about 500 W to a six-element Yagi. Both stations used the so-called TAPR boards (see this column for August), operating at a baud rate of 1200.

On the first occasion, only a few lines of text were exchanged, but the following weekend, when the Perseids meteor shower got underway in earnest, many lines of error-free text were exchanged between them. An interesting sidelight on this is that nearly 30 years ago in his professional life, W3OTC participated in the development, by the National Bureau of Standards, of the meteor-burst communication system now in use on many government and commercial communication circuits.

As this is being written, no word has been received on how the 2-meter packet tests, being conducted between K1HTV/3, W3IWI and WØPN and WØRPK, are going. I hope to have information on these by next month's column.

CENTRAL STATES VHF CONFERENCE REPORT

The 1984 Conference was true to the fine tradition established by the Central States VHF Society over the years for great get-togethers and excellent technical programs. This year's affair was held in Cedar Rapids, Iowa, under the very able guidance of Rod Blocksome, KØDAS, and Barry Buelow, WAØRJT, assisted by an able staff of helpers. Registration topped all previous years, with a total of 264, including 78 wives. The conference got underway Thursday evening with an informal gathering, but early arrivers were treated to a very interesting tour of the Collins Rockwell facility that afternoon.

The technical papers began the following morning. Paul Shuch, N6TX, led off with an informative discussion of low-noise preamps, with particular emphasis on dynamic range and intermod performance, followed by Al Katz, K2UYH, who highlighted both the technical and economic aspects of direct-broadcast satellites. A technique, which shows promise for improved copy of weak, fading VHF signals, was disclosed by Richard Campbell, KK7B. Rick's approach involves the use of two quite closely spaced antennas, each feeding separate receive channels which, in turn, go to a set of stereo headphones. Obviously, each channel must share a common LO and maintain an exact phase relationship with one another. Rick showed off a 2-meter receiver built around the principle, and demonstrated tapes of how the process performs. Warren Weldon, W5DFU, presented a very interesting talk on G Line, a simple low cost way to construct low-loss transmission lines for the higher bands. This is not a new idea, but has apparently been overlooked by the younger among us and forgotten by the rest.

This conductor discussed some of the latest developments in the world above 50 MHz, including the new 23-cm world record and chances for extending it to the higher bands. I also suggested the possibility of several changes in operating procedure, such as a revised exchange for MS and the adoption of an EME transmission/reception sequence that might find acceptance on all bands. More on these in the months to come.

The amateur space program — its current status and future plans, including the possibility of a constellation of synchronous satellites — was presented by Jan King, W3GEY, Tom Clark, W3IWI, and Ralph Wallio, WØRPK. Ralph also introduced the group to packet radio and was assisted in a demonstration of the new mode by W3IWI. The latest in techniques for the 23-cm band was the subject of an always interesting and informative talk by Al Ward, WB5LUA.

Dick Jansson, WD4FAB, chairman of the VHF/UHF Advisory Committee, reviewed the recent work of that group, particularly with regard to formulating a proposed, new 23-cm band plan as well as one for the new 902- to 928-MHz band, which we hope to get soon (see accompanying section).

Of course, the Conference featured the customary antenna-gain and noise-figure events, with Mark Thorson, WBØTEM, and Al Ward, WB5LUA, officiating at the former and Louis Anciaux, WB6NMT, at the latter. An excellent Saturday evening banquet

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

23-Cm Standings

Listings are call, state, number of states worked, number of call areas worked, number of grids worked and best DX in statute miles for farthest terrestrial contact. Call areas are the 10 continental U.S. call areas plus KL7 and KH6, plus VE and XE call areas, plus other DXCC countries not located within the borders of the above. Compiled August 15, 1984. Deadline for next update is February 1, 1985.

K1PXE	CT	13	5	—	448	WA3NZL	MD	11	7	—	780	K5DHU	TX	3	1	3	—	W8YIO	MI	16	7	—	551
W1JR	MA	12	7	17	665	W3HMU	PA	11	5	—	300	K5LLL	TX	2	2	—	847	WB8BKC	MI	14	7	—	650
K1FO	CT	12	5	—	451	K3IUV	PA	9	4	—	290	W5LDV	TX	2	2	—	847	WA8TXT	OH	12	7	—	550
WA1JOF	MA	9	4	10	—	W3IP	MD	8	5	12	369	N5BBO	TX	2	2	—	734	K8WW	OH	12	7	—	448
W1XP	MA	7	5	—	300	WA3JUF	PA	7	4	—	300	W5UKQ	LA	2	1	—	365	W9ZIH	IL	19	9	—	790
W1QXX	MA	6	3	—	260	K4QIF	VA	15	6	—	790	WA5TBE	TX	1	1	—	571	WB9SNR	IL	8	5	—	760
K2UYH†	NJ	20	9	—	770	W3IY/4	VA	7	5	—	274	W5GVE	TX	1	1	—	366	W9UD	IL	5	4	—	760
WA2LTM†	NJ	17	6	—	770	K4NTD	FL	4	2	—	847	K5PUF	TX	1	1	—	290	W9JIY	IN	5	3	—	300
W2VC	NJ	15	5	—	537	K4KJP	FL	2	2	—	670	WA5HNK	TX	1	1	—	250	W9WCD	IL	3	3	—	770
W2DWJ	NJ	15	5	—	—	W4VHH	GA	2	1	—	350	N6CA		5	7	26	2472	W9AAG	IL	2	2	—	350
K2YGO	NY	11	8	—	570	WB5LUA†	TX	14	17	—	839	K6ZMW		4	3	—	402	W0OHU	MN	9	4	13	575
W2EVJ	NY	10	6	—	426	W5HN	TX	7	3	—	625	W6XJ		2	3	—	250	W0RAP	IA	7	3	6	—
K2JNG	NJ	10	4	—	305	W5DFU	OK	5	3	—	500	W6OQQ		2	2	—	200	W0YZS	MO	4	2	—	425
W2PGC	NY	6	6	—	473	K5MWH	AR	4	2	—	280	WB6NMT		1	1	—	296	W0PW	CO	3	2	3	97
WA2FUZ	NY	5	3	—	125	W5HPT	TX	4	1	—	571	KC6A/6		1	1	—	130	W0ZJY	KS	3	1	—	170
WA2EUS	NY	4	5	—	320	KR5F	TX	3	2	—	750	N6TX		1	1	—	112	W0MDL	MN	2	2	—	340
K2OVS	NY	3	2	—	135	W5UWB	TX	3	2	—	720	K7GNV/7	AZ	5	3	6	426	W0VB	MN	2	2	—	290
						N4JS/5	MS	3	2	—	467	N6NB/7	UT	4	2	—	295	VE4MA		2	2	5	475
						WB5LBT	LA	3	2	—	—	WB5TCO/7	AZ	2	2	2	403	XE2BC		1	1	—	370
												WA7JUO	NV	2	1	—	—						
												W7LUX	AZ	1	1	—	130						

†Indicates that some contacts were made via EME

featured a light-hearted talk by Terry VanBenschoten, WØVB, on the trials and tribulations he and his family endured in his quest for the first 1¼-meter WAS. The Society's prestigious John Chambers Award for technical achievement went to Ron Dunbar, WØPN, for his many contributions to the amateur space program, and the Mel Wilson Award for service to VHF/UHF was presented to Ray Nichols, W5HFV, for his long service as Society Historian.

The 1984 Conference introduced two innovations. The technical papers have been collected into a proceedings. A few copies may still be available. Contact KØDAS, 690 Eastview Dr., Robins, IA 52328. The other new feature was a Friday evening flea market. Nowhere else has this conductor seen such an array of VHF/UHF goodies for sale in one place, and at good prices, too. One of the several actions taken by the Society Board of Directors was a decision to maintain and publish VHF/UHF beacon lists and DX records for Region 2 (North and South America).

Officers for next year are Charlie Calhoun, WØRRY, president; Connie Marshall, K5CM, vice president; with Ed Fitch, WØOHU, and Joe Muscanere, WA5HNK, continuing as secretary and treasurer, respectively. The 1985 Conference will be held in Tulsa the last weekend in July. Those putting it on have promised that it won't snow on the antenna-gain competition.

23-CM BAND PLAN PROPOSED BY THE VUAC

The currently proposed 23-cm band plan, which the VHF/UHF Advisory Committee (VUAC) intends to submit to the ARRL Board of Directors at their meeting October 25, is based on the one published in *QST* for June with changes prompted by responses received since its airing. A few additional modifications were made during an open meeting of VUAC members present at the Conference. Those having an interest in seeing this final version may obtain a copy by sending an s.a.s.e. to this column conductor. WD4FAB suggests that those who have an opinion on the plan should make thoughts known to their Directors. Only by hearing from us about issues such as this, can the Directors make decisions to our liking. Whatever your view, it's important that you contact your Director and let him or her know what you think and that you support the principle embodied in the Advisory Committees, especially the VUAC.

ON THE BANDS

6 Meters — Six-meter news is quite sparse this month, with almost everyone citing a poor E_s season. Most of those I encountered at the Central States VHF Conference who work the band agreed. This includes a wide geographical spread, so I am not talking about one particular part of the country. WA5IYX puts it in a more quantified form, but then he usually does. Pat regularly observes the occurrence of E_s at his San Antonio QTH and records the number of days per month on which an opening was noted, the total number of openings per month and the number of minutes per month during which E_s-propagated signals could be heard. His observations include 6 meters, the TV channels, the FM broadcast band and frequencies above it, including 2 meters. For May of this year, these figures are 14, 29 and 1045, compared with May 1983 numbers of 9, 15 and 585, and May 1982 numbers 13, 25 and 990. So, May 1984 compares favorably with earlier years. For June, the corresponding figures are: 1984 — 19, 43 and 2180; 1983 — 20, 50 and 3430; and 1982 — 22, 46 and 2235. It is July that really shows up the difference between this year and the two preceding ones. For 1984, the numbers are 13, 30 and 670, compared with 22, 51 and 3300 in 1983. The same month in 1982 produced 20, 44 and 2555. It appears that the big drop was in July.

Another interesting measure, which is harder to obtain, from WA5IYX's location in the center of the country, is the amount of double hop. From this vantage point, on the East Coast, it appears that there were far fewer and shorter occurrences of multi-hop E_s this year than in previous ones. WA4MVI, who has been studying a possible correlation between major weather disturbances and E_s, notes that the jet stream seems to be in a different pattern this year than previous ones, much farther to the north. Jim's studies indicate that it has shown similar patterns during the declining portions of previous solar cycles. He contends that, through a process known as wind shear, thunder storms with very high tops (60,000-70,000 feet) may be one cause of E_s. To accomplish this, he feels that these tops must penetrate the tropopause. During these declining years, he points out, they appear to be about 10,000 to 20,000 feet lower and, thus, are less likely to trigger E_s. Like many others, WA4MVI notes a very poor month during July, but says that August began somewhat better. He even observed a 2-meter E_s opening to VE2 on the 6th, with much 6-meter activity apparent, also.

The 6th must have been a pretty good day, as it was then that another one of those surprises, for which 6 meters is so famous, occurred. K4GOK, in the Virginia suburbs of Washington, checked 28,885 when he arrived home from work and found G4GLT calling CQ. Marion went back to him and learned that something was apparently brewing on 6 meters on the other side of the Atlantic. Upon firing up, he received a 5 × 3 from G4GLT. The crossband QSO took place at 2128Z, about an hour before the Gs who have 50-MHz permits are allowed to transmit. K4GOK heard nothing else, and no other similar accounts have reached me as of this writing, August 15. One continues to speculate on how it will be if general 6-meter operation is authorized in the U.K. after the shutdown of the Band 1 TV transmitters, scheduled for the end of the year.

2 Meters — As this is being written only a few days after Perseids, few reports have arrived. Thus, it's hard to draw a conclusion as to how good the shower was. Some of the reports received so far are as follows. WAØTKJ Salina, Kansas, writes that he "had a ball with the meteors last weekend." Dean says that he worked four new states and 12 new grids. He now has only five more to go for VUCC. W2RS Glen Rock in northern New Jersey comments that he did not think that, like last year, conditions were too good. Specifically, Ray comments that stations less than about 1000 miles away were quite loud, but those at a much greater distance were very weak. He did manage to work AA5V Oklahoma for state number 37 despite weak signals over the 1200-mile path. The other successful contact was with W5RCI, with strong signals over a distance of about 975 miles. Several other schedules were not successful, with only scattered calls being heard. WA8MIL Michigan was quite pleased with his results. Stan worked a total of 14 stations between Saturday morning, August 11, and the following Monday evening. Best DX was W5FF in New Mexico.

If it were told of an April 1 happening, I might understand it, but the fascinating tale that W1YOL tells concerns an occurrence he says took place July 28. Arthur says that he was talking to a local through the WA1KGQ repeater in the Hartford area and was broken by a station signing WD6FLL. The operator appeared confused, as he thought that he was working through his own local repeater WB6NRL at Lake Hughes, California, in the Los Angeles area. According to the latest ARRL *Repeater Directory*, both are 19/79 repeaters. W1YOL says that he talked to the California station for 20 minutes, from 0300 to 0320Z. Can anyone shed any more light on this one? Did anyone else make unusual 2-meter contacts at about this time with which an inference as to propagation mode can be deduced? Was 6 meters open at the time? I need help on this one! Another piece of FM DX comes from W3ZZ. Gene recounts working VO2AG through the Frederick, Maryland, 13/73 repeater at 2158Z August 6. Note that this jibes with the accounts from WA4MVI and K4GOK reported in the 6-meter section.

The Higher Bands — Reports of 13-cm accomplishments seem to be coming along monthly, reflecting increasing activity on that band. The latest is from WA4HGN Savannah, Tennessee. Bill says that, at 0240Z August 10, he completed a contact with WB5LUA McKinney, Texas, over a path of 508 miles. CW was used initially, followed later with some success on SSB. Reportedly, 2 meters was marginal at the time, so it doesn't appear that the contact resulted from especially unusual tropo conditions. Both stations run VA-802B Klystrons. The antenna at WB5LUA is a 5-foot dish at 80 feet, while WA4HGN is using the 28-foot dish formerly owned by W3GKP, with its center mounted at 30 feet above ground.

The August issue of K2UYH's *432 and Above EME News* says that VE4MA is now concentrating his efforts on 23- and 13-cm moonbounce using a 9-foot TVRO dish on both bands. A short W2IMU horn is used to produce circular polarization on the higher band, while the chore is handled on 23 cm by dual dipoles. Barry is receiving 9 dB of sun noise on 2320 MHz and 12 dB on 1296. This conductor feels that these dishes should make a good source of hardware for the higher bands as people begin to tire of watching tube entertainment from the satellites.

The August issue of *Cheese Bits*, the Pack Rats monthly publication, reports the sad news of the passing of W2DWJ, who succumbed to a heart attack while working on his tower. Bill, who was 79, was a UHF pioneer and a mainstay on 23 cm in the Mid Atlantic area. It goes without saying that his presence will be missed.

In other not good news, it is reported that W6ABN is having to abandon his 70-cm EME efforts. Stan is moving from his desert QTH to one where large antennas are not possible. However, he does plan to keep in touch with his VHF friends via OSCAR 10.

VUCC UPDATE

It was planned to run the complete list of those who have qualified for the VUCC award in this month's column. However, since a number of applications are now just coming following the Perseids meteor shower and the summer sporadic-E season, this feature will be held until later, probably December.

IARU News

Conducted By Richard L. Baldwin,* W1RU

Amateur Licensing in the Federal Republic of Germany

[Editor's Note: The following is another in an occasional series of articles on Amateur Radio licensing in other countries.]

How does a German national get a ham license? This is very quickly answered by reading the "Regulations Concerning the Amateur Service" from the German P&T authority, Deutsche Bundespost. Like everything else in the Federal Republic of Germany, even the smallest question is answered by regulations, bylaws, bylaws of bylaws, etc.!

There are three different classes, which may be reached step-by-step or all at once. Class C allows you to work on 144 MHz and up, all modes except CW. Class A includes Class C privileges and you are further allowed to work on the portions 3.520-3.700 MHz (CW, but SSB only on 3.6-3.7 MHz), 21.090-21.150 MHz (CW) and 28-29.7 (all modes). Power limit is 150-W PEP. Class B is the highest, with a power limit of 750-W PEP. As in the U.S., you can recognize the different classes of license by the call signs (prefix). Class C calls begin with a DB, DC, DD or DG. Class A calls start with a DH. All others, such as DF, DJ, DK and DL, are Class B holders.

To understand how to get a license, there is the need to know the difference between the ARRL and the German League (DARC). The clubs in the various German cities are all affiliated, and cannot be separate from DARC. Such a club does not have a president, only a chairman. At least that system does make for a powerful league!

Since the beginning of ham radio, DARC has been a partner with the P&T authorities. An examination is always held with a radio amateur in the examination group. Also, the examination

Dr. John Allaway, G3FKM, who has served twice as president of the Radio Society of Great Britain, is IARU Region 1 Secretary and a member of the IARU Administrative Council. *(K1ET photo)*

questions are worked out together with the DARC. All possible questions (and the answers) are published in one booklet, which you can buy for about $1. There is the possibility of getting a license by self-study of this booklet, but most successful candidates are graduates of training courses initiated by the clubs in a city (four hours a week for one year). The examination consists of three parts: (1) knowledge of communications (regulations, how to QSO, Q codes, abbreviations, knowledge of the IARU band plan, etc.) and a telegraphy test of 6 WPM for Class A, or 12 WPM for Class B; (2) technical knowledge (with a very high standard!); and (3) knowledge of radio regulations concerning ham radio and technical regulations (such as how to work with high voltages).

Normally, the examination takes place in the building of a P&T authority in a city, but if a group wants to have it some other place (such as a school), that can be arranged, too. The examiner group consists normally of two officials from the P&T authority and one licensed amateur nominated as the representative of the DARC. Each examination part consists of about 10 or 15 questions, which the candidate must answer on a piece of paper within one hour. To pass the examination, 65% of the answers must be correct, except that candidates for Class B must have a passing grade of 75% on the technical matters. The three examiners correct the candidates' answers together. The result of the examination is usually announced on the same day, and the successful candidate can go home with license in hand. Candidates must be at least 14 years old, with no prior convictions. But youngsters between 14 and 18 are allowed to work only from club stations. The license does not expire, and the monthly fees are DM 3 (about $1.10 U.S.).

About 90% of licensed radio amateurs in Germany are members of DARC. One reason might be the sponsored training courses. Another one is the free exchange of QSL cards all over the world. But the main reason is the knowledge that a strong league (DARC) can help Amateur Radio in Germany and in the head organization, IARU. — *DJ6TJ*

THE SIZE OF QSL CARDS

The following has been excerpted from *QUA*, a new monthly publication created by the Executive Committee of IARU Region 2:

"We would like to remind all societies in Region 2 and all amateurs in general of the decision taken in Cali with regard to the sizes of QSL cards. The optimum size for QSL cards will be 9 cm high by 14 cm wide (3½ × 5½ in). The maximum limits are from 7 to 11 cm high and 12 to 16 cm wide. Member societies have been asked to advise all of their Membership of these standards. Furthermore, the following proposal was approved at the Cali Conference:

It is proposed that all member societies limit the outgoing QSLs through their bureaus to those that meet the standards approved by this conference as of January 1, 1985. Furthermore, that this action be announced to all member societies of IARU. This action should not hinder those QSLs incoming not within these standards.

"The above resolutions simply mean that the QSL bureaus of Region 2 will not process any outgoing QSLs that are not within the standards approved in both the Lima and Cali conferences. We ask all amateur operators to help the QSL bureaus by complying with these decisions."

These size standards have been adopted to help the QSL bureaus cope with the volume of QSLs now being handled. Undersize or oversize QSLs foul up the system and complicate the work of those who spend so much of their volunteer time handling your cards. Please help them.

WORLD TELECOMMUNICATION DAY

On May 17, 1984, IARU Secretary David Sumner, K1ZZ, sent the following message to ITU Secretary-General Richard E. Butler: "Please accept the congratulations and best wishes of the worldwide radio amateur community on World Telecommunication Day. Your support of the Amateur Radio movement during the past year is deeply appreciated. The member societies of the International Amateur Radio Union look forward to continued progress in bringing the benefits of telecommunications to the peoples of the world."

*President, IARU

YL News and Views

Conducted By Jean Peacor,* K1IJV

"Dear YL . . ."

The following is contributed by Roz Eiswirth, N5HBK (ex-KA5QPA), of Luling, Louisiana.

It takes a special kind of woman to be a ham. To many people, ham radio is still for men and boys; they think that women who get into ham radio do so in self-defense, because their husbands are hams. That is just not so. We women enjoy meeting and communicating with people as much as men do. Women join our fascinating hobby for as many different reasons as the guys do, and for whatever reason, once introduced to ham radio, we learn how exciting and rewarding it can be.

I am an XYL whose OM is not a ham. I thought this was probably a rare situation, so I put a request in a *QST* Stray to hear from other XYLs whose OMs were not hams. I was pleasantly surprised to hear from quite a few. Almost all of the XYL hams I heard from said that their husbands have been tolerant of their hobby. Their OMs are not interested themselves, but are willing to help with climbing on the roof to install antennas and working on rigs.

One of the hard things about our situation is finding an Elmer to help you get started. It's rare to find a wife who would put up with a gal coming over all the time to be with her husband. Once learning code and theory are behind you and your ticket is proudly displayed on the wall, it all seems worth it, though.

Some of the XYLs wrote that they attend club meetings, but most said they did not because they would be the only XYL there. They also hesitate to call on any of the male hams for advice, so they try to solve their problems on their own.

It's difficult to take advantage of some of the off-radio activities because we either have to attend the functions alone or drag along an uninterested husband. The conventions and hamfests never seem to advertise activities for the OM.

All female hams share our problem of being in a hobby the whole world seems to think is masculine. Just once, I'd like to receive a ham-related advertisement that didn't start with "Dear OM."

Within Amateur Radio itself, I have met many friendly people willing to help, including my Elmer, WD6EKO. Many thanks to him, to his understanding wife and to all the XYLs who took the time to answer my Stray. It's good to know I'm not alone. Thanks to K4VM, KKØW, WB8SHP, NØGP, NØDGM, N3CWE, KO3M and N5DXD.

Although I'd love to have my OM join me in the excitement of ham radio, there is an advantage to my situation: I don't have to share the rig!

Their OMs Are Tolerant

Roz Eiswirth upgraded to General class in May. At the time she wrote the above article, she was anxiously awaiting her new call, N5HBK. She relies on ARRL for much help with technical information. She received a letter from one Advanced class YL who had yet to brave the airwaves because "it all seemed so mysterious."

*Country Club Dr., Monson, MA 01057

Roz Eiswirth, N5HBK, found she was not alone

Wilma June Schaaf, WB8SHP

Anne Keiser, KO3M

Roz has also heard from some very technically qualified YLs. But the majority, like Roz, are somewhere in the middle of the two extremes.

In addition to her enthusiastic interest in Amateur Radio, she also collects rabbits and shares an avid interest in organic gardening with her OM. Here are the stories of some of the YLs who answered Roz's Stray in *QST*.

Martha Colburn, K4VM, of Clarksville, Tennessee, credits Amateur Radio as being responsible for the management position she now holds with South Central Bell. Martha's interest in ham radio prompted her career change from homemaker to college graduate in mid-life, after their children were in grade school. She would encourage other women who are at that point in their lives, and who live in college towns, to consider taking this route. Obtaining her Amateur Radio license was only a beginning to opening the doors to a whole new world for her.

Betty Evans, N3CWE, of Media, Pennsylvania, was the XYL of a tolerant OM at the time she answered Roz's Stray. A highlight of Betty's home career changed this status when her husband passed his Novice exam and received the call KA3TMB earlier this year.

Betty's first motivation for hamming was to get her sons interested. Her idea did not meet with success, but when they were grown it resurfaced for her. *Tune in the World with Ham Radio* provided her with a beginning. It was the only Amateur Radio book she could understand. She joined the League and started receiving *QST*, and for a while Strays were the only articles she understood.

Through enjoyment of study and learning gradually, Betty increased her code speed along with her knowledge of theory. The first year she concentrated on code, the second and third years on theory and a General class ticket. Advanced and Extra followed rather quickly. She credits The Aware Club in Delaware and the kindness of the many Elmers and Ellens among its membership for all of her successful learning.

June Schaaf, WB8SHP, of Frankfort, Ohio, started out by providing transportation to radio classes for her 14-year-old son and ended up with a Novice license in 1974. Her General followed in the same year. June is a homemaker and shares her husband's hobby of gardening, but finds it a thrill to escape from the everyday household routine by "Tuning in the World" at her radio station.

June maintains CW skeds with son Jake, WB8SHO, who is now in the Army and stationed in Colorado. She enjoys chasing DX and operates mostly CW.

Anne Keiser, KO3M, of Lehighton, Pennsylvania, attained her goal of Extra Class. Anne's OM is not a ham, yet he is understanding, extremely proud of her accomplishment and always ready to help with antenna raisings.

Anne's son, Dave, WB3EFH, aroused her interest in Amateur Radio. She quickly turned her new hobby into a public-service activity when she joined the MARS Radio System (Navy, Marines). "The Rich and Rewarding Life of the Lady from Mars" recently headlined a feature article about Anne in their newspaper's Sunday edition. Anne also serves as secretary/treasurer of the Carbon County Amateur Radio Club.

On their 108-acre farm, where the Keisers have raised six children (all married now), they also garden and raise peacocks. A manager of a drugstore for the past 15 years, Anne still finds time to hunt and fish with her husband, Jack, during their off hours.

Taxidermy is another of Anne's interests. Upon learning the cost of having an animal mounted, Anne reacted with, "I'll learn to do it." She has since learned that taxidermy is very time-consuming, difficult and worth every penny that taxidermists ask. The art also became a challenge. After studying long and hard under the tutelage of two professional taxidermists, Anne received word in July that she had passed the lengthy and difficult examination and is now licensed in the art.

Exceptional women, tolerant husbands, Roz Eiswirth's Stray — all add to the plus side of Amateur Radio.

Amateur Satellite Program News

Conducted By
Bernie Glassmeyer,* W9KDR

WHAT EVER HAPPENED TO SATELLITE WAS?

Worked All States via satellite is still around, but not very much has happened since the launch of OSCAR 10. Amateurs pursuing WAS on the HF bands use propagation to achieve their goal, but to obtain the award via satellite is a different story.

The secret to achieving Satellite WAS is having an operating satellite at an altitude high enough to allow the operator a "window" to all 50 states. The maximum height of a satellite's orbit above earth sets this communication window. A close look at the WAS roster (Table 1) gives us a few clues as to what has happened.

OSCAR 6 was launched October 15, 1972, followed by OSCAR 7 November 15, 1974 — both at an altitude of about 910 nautical miles. The first Satellite WAS was issued February 18, 1975.

Even with the launch of OSCAR 8 on March 5, 1978, amateurs on the East Coast were not able to get a "window" to Hawaii. When the Soviets launched RS 1 and RS 2 at a higher altitude, this finally gave the East Coast of North America a tiny "window" to Hawaii. K1HTV (CT) was the first New England station to qualify for Satellite WAS.

It is easy to see that 1982 and 1983 are the best Satellite WAS years so far. This was made possible by the four high-altitude Soviet RS 5, 6, 7 and 8 satellites (RS 3 and 4 were never made operational; they were held in reserve, even though the beacons did operate).

All of this history seems logical so far, but a big question is quite obvious: What happened to Satellite WAS this past year since the launch of OSCAR 10? There are several reasons for the dropoff in applications; the most obvious ones are

1) Satellite operators do not realize OSCAR-10 QSOs count for WAS.

2) All 50 states are not represented in large numbers.

3) There is not enough activity on OSCAR 10.

Number 1 is a reasonable assumption because DXCC via satellite is presently being postponed until AMSAT has assurance that it is appropriate. Reasons 2 and 3 may account for part of the inactivity, but overall it is probably all three reasons combined.

WAS via satellite is available to ARRL members who submit proof of two-way satellite contacts (QSLs) from all 50 states. You can use QSL cards from OSCARs 6, 7, 8 and 10 and, from RSs 1, 2, 3, 4, 5, 6, 7 and 8 for WAS.

Now is the time to set your operating goals for Satellite WAS. Clear up any doubts you may have. With a little effort, you could be number 116.

*Satellite Program Manager, ARRL

Table 1
WAS/Satellite Roster

1.	K9JUU	2/18/75
2.	K7GWE	5/19/75
3.	W9OII	5/21/75
4.	WA6RQP	7/14/75
5.	W6CG	8/25/75
6.	VE5XU	10/31/75
7.	W7MCU	11/14/75
1976		
8.	W8CSM	3/12/76
9.	WB4RUA	5/20/76
10.	W6ETJ	6/17/76
11.	W6NZX	7/2/76
12.	WØIT	7/13/76
13.	W6HEW	12/28/76
14.	WA6TUF	12/28/76
15.	WØII	12/30/76
1977		
16.	K9EIV	1/21/77
17.	WBØNST	2/11/77
18.	K5KQG	2/11/77
19.	W4JRC	3/3/77
20.	W4AIT	3/3/77
21.	W7FF	3/4/77
22.	WØSL	5/26/77
23.	WØRWC	6/2/77
(End of radio life of OSCAR 6, 6/21/77)		
24.	K4WT/W4BE	7/21/77
25.	W6ABN	7/21/77
26.	WØWMP	7/21/77
27.	WB5PMU	8/10/77
28.	WBØIUT	9/28/77
29.	N4DT	10/12/77
30.	K9SM	10/28/77
31.	W7ZC	12/30/77
32.	N3ES	12/30/77
33.	KØRZ	12/30/77
(OSCAR 8 launched 3/5/78. Altitude 568 N.M.)		
1978		
34.	KØSE	4/20/78
(RS 1 and RS 2 launched 10/26/78. Altitude 1064 N.M.)		
35.	W7US	11/15/78
1979		
36.	K1HTV	1/10/79
37.	W9MXC	3/31/79
1980		
38.	WØCA	4/15/80
39.	W5UCY	5/1/80
40.	W7UFE	5/12/80
41.	W9HAD	10/13/80
42.	W7ID	11/12/80
43.	W2SBI	11/12/80
44.	K3NW	12/15/80
1981		
45.	K9CIS	2/2/81
46.	WA5ZIB	6/4/81
47.	W9HR	6/18/81
(OSCAR 7 end of radio life, 6/21/81)		
48.	WB8OTH	6/25/81
49.	W6XN	8/6/81
50.	WA6VGS	9/1/81
(RS3, 4, 5, 6, 7, 8 launched 12/17/81. Altitude 1120 N.M.)		
1982		
51.	KA7DLC	1/7/82
52.	W2RS	2/17/82
53.	W1NU	2/25/82
54.	WA7GCS	2/25/82
55.	WA2CBB	2/25/82
56.	K4AUS	3/3/82
57.	K2ZRO	3/9/82
58.	W2BXA	3/9/82
59.	W2YY	3/9/82
60.	W2LV	4/5/82
61.	W2GN	4/14/82
62.	WA1ZUB	4/20/82
63.	W9KE	4/28/82
64.	W1PV	5/4/82
65.	W9KDR	6/2/82
66.	W5VVR	6/24/82
67.	WB4ZXS	6/24/82
68.	WD4FAB	6/29/82
69.	KØCY	6/29/82
70.	WØRPK	6/29/82
71.	WA8LLY	6/30/82
72.	K4GSX	9/1/82
73.	WH6AMX	9/1/82
74.	K5DHU	9/1/82
75.	K6UGS	10/5/82
76.	K2OVS	10/5/82
77.	KØEU	10/28/82
78.	W4CKD	11/4/82
79.	W2GFF	11/4/82
80.	W3JPT	11/4/82
81.	N4VW	11/18/82
82.	W1JR	12/7/82
83.	K1DS	12/15/82
1983		
84.	W5AL	1/25/83
85.	K5ADQ	1/25/83
86.	K8YAH	2/15/83
87.	WB5PMR	2/16/83
88.	KC2ME	3/18/83
89.	W5QVZ	3/30/83
90.	WA8KEM	4/20/83
91.	K8IFF	5/10/83
(OSCAR 8 end of radio life 6/15/83)		
(OSCAR 10 launched 6/16/83. Altitude 22,200 N.M. at apogee)		
92.	W1JSM	6/21/83
93.	K9IIG	6/28/83
94.	AJ6T	7/5/83
95.	WBØRLY	7/28/83
96.	KH6P	7/28/93
97.	W3IWI	8/17/83
98.	WDØHCA	8/17/83
99.	VE2QO	8/24/83
100.	WØIZ	9/1/83
101.	W6AHD	9/22/83
102.	K8TL	9/22/83
103.	KD6PY	10/5/83
104.	AF1U	10/18/83
105.	AAØW	10/18/83
106.	N6FX	11/4/83
107.	W1BIH	11/28/83
1984		
108.	K3NS	2/2/84
109.	W2XI	2/2/84
110.	VE3KXF	2/14/84
111.	WA3YGQ	3/23/84
112.	KE2N	4/5/84
113.	W9AG	4/5/84
114.	DL1CF	4/5/84
115.	VE3HD	5/9/84

Keplerian Elements
AMSAT-OSCAR 10

Catalog number: 14129.
Epoch time: 84211.48473784
Sun., July 29, 11:38:01.349 1984 UTC.
Element set: 112
Inclination: 25.7334 deg.
RA of node: 186.4173 deg.
Eccentricity: 0.6078114.
Arg. of Perigee: 292.8558 deg.
Mean anomaly: 15.6016 deg.
Mean motion: 2.05850258 rev/day.
Decay rate: −1.35E-06 rev/day/day.
Epoch rev: 848.
Semi-major axis: 26106.063 km.
Anom. period: 699.537622 min.
Apogee: 35598.904 km.
Perigee: 3863.779 km.
Beacon: 145.810 MHz.

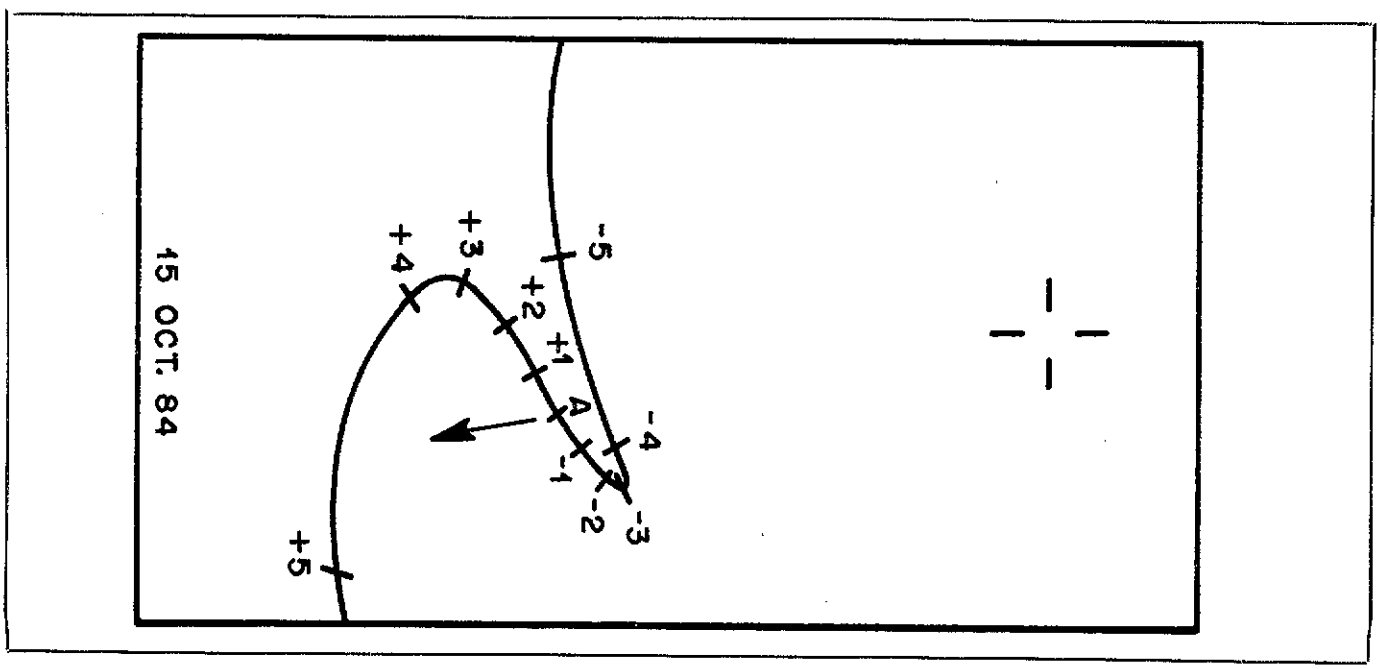


Fig. 1 — AMSAT-OSCAR 10 ground-track cursor for OSCARLOCATOR.

On Line

Conducted By Stan Horzepa,* WA1LOU

Beware of Dogs

How does one personal computer become more popular than others? The formula is simple. All you need is to be an internationally known business-machine manufacturer with a good reputation as a builder of mainframe computers. Then, you put together a hardware package consisting of tried and tested components (you want to make sure that the hardware works, so don't be too innovative). Businesses that are in the market for a personal computer will buy yours because they know your mainframe reputation (they may even own one of your mainframes).

Software developers are similarly impressed. They know that businesses will be anxious to buy your computer, so they write a lot of software for your computer. More people buy your computer because there is a lot of software available for your hardware. As a result, more software is written, and so it goes. There you have a short history of the IBM personal computer, also known as the "IBM PC."

Cloning, the Sincerest Form of Flattery

Someone once said that imitation is the sincerest form of flattery. If that is true, then IBM has been flattered 30 times over, as more than a score of computer manufacturers have introduced IBM clones or "IBM-compatible" computers. Everyone from Heathkit to Radio Shack has some kind of IBM-compatibility for sale. And whether it's more features or more economical, each one of them claims to offer more than the IBM; however, compatibility is the main attraction.

Generally speaking, IBM-compatibility means that any program written for the IBM PC will run successfully on the IBM-compatible computer. Things are not as compatible as the competition would like, however. To be truly compatible, a competitor would have to steal IBM's design and face a lawsuit. Thus, no computer is 100-percent compatible. Each competitor uses its own design to emulate the design of the IBM PC, and some competitors do the job better than others; therefore, some compatibles are more compatible than others.

Will It Fly?

One of the benchmarks for compatibility is a program published by Microsoft called "Flight Simulator." Flight Simulator is an adult game in which you, the pilot, try to takeoff, fly and land an airplane without crashing. The program is realistic and operates in real time with the computer keyboard providing the controls you would need to fly a real airplane. Flight Simulator gives the computer a workout. It is said that if you can successfully run the IBM PC version of the program on an IBM-compatible, then that compatible is very compatible. Needless to say, there are a lot of windowshoppers carrying diskettes containing Flight Simulator from computer store to computer store trying to find out how compatible the compatibles really are. As it turns out, some compatibles never get off the ground. The best advice is, if IBM-compatibility means a lot to you, buy an IBM. It may not offer some of the features of the compatibles, but rest assured, it is truly compatible.

MacDifference

Whereas IBM played it safe with their PC, Apple (one of the few computer companies that does not offer a PC-compatible) gambled a lot with their Macintosh computer, also known as the "Mac." If you read reviews of the Mac in the various computer magazines, they all sounded similar: They tended to praise the Mac as being very innovative, but they felt that it still lacked something that would prevent it from becoming the computer du jour. Its limited, unexpandable 128k RAM, the lack of a color display, the lack of keyboard cursor control and the lack of expansion slots were some of the major complaints. PC fanatics had a field day finding faults with the Mac.

As of this writing (eight months after the Mac's introduction), there still is not much software available for the Mac. Software writers are finding it difficult to write software within the constraints of 128k RAM. Some of this difficulty is because some software "writers" are simply trying to convert PC software to run on the Mac. Trying to squeeze a program that eats up 256k of PC RAM into 128k of Mac RAM is not an easy task.

PC vs. Mac

The PC vs. Mac battle for supremacy is the main event in the computer world today. Although most hams will not be buying a PC or a Mac for ham radio applications, the outcome of the battle will have a rippling effect in the ham radio computer world of Apple IIs, PC jrs, Commodores, TRS-80s, VICs, etc. Keep your eyes and ears open for casualties in the computer war zone.

PX: Code Practice

A bug was discovered in PX program number 43, KC8KD's VIC-20 version of MINIMUF. To correct the program, change line 1030 to read: 1030 W0 = W0 – P1.

In this installment, PX offers programs for seven popular computers that provide Morse code training:

"Code Practice" for the Apple II + was submitted by Stew Strickler, WØICS (program number 52).

Larry Jones, WØAY, wrote "CAI (computer aided instruction) Morse Code Practice" using Microsoft BASIC (program number 53).

Steve Aberle, WA7PTM, offered "Code Oscillator" for the HP-75, which is adjustable from less than 5 to well over 20 WPM (program number 54). Please include 54 cents postage for this program.

"Morse Keyboard/Trainer," an Advanced BASIC program for the IBM PC, was written by Gerry Hull, AK4L (program number 55).

"Learning Morse Code" with a TI-99/4A was offered by Wayne Novack, K3GBV, and Keith Wiese, WA3UQR (program number 56).

Doug Hulen submitted his "Morse Tutor" program for the TRS-80 Model I (program number 57).

Bob Putnam K7ACP, provided a VIC-20 conversion of N3DN's code-practice program that appeared in January *QST* (program number 58).

To obtain a listing of any PX program, send an s.a.s.e. (preferably no. 10, business-size) with 37 cents' postage to ARRL, Dept. PX, 225 Main St., Newington, CT 06111. Use a separate s.a.s.e. for each program request and write the PX program number of the desired program at the lower left-hand corner of the s.a.s.e. Please do not send correspondence other than PX requests to Dept. PX, ARRL Hq.

COMPUTER PROGRAMS FOR AMATEUR RADIO

Are you looking for a program to log your Field Day efforts? Or a program that will calculate grayline? How about a program that will assist you in designing a new antenna? Your search is over. These programs, and more, can be found in *Computer Programs for Amateur Radio*, a new book published by Hayden Book Company, Hasbrouck Heights, NJ. The book contains 23 different programs in five categories: data base management (logging and awards), latitude-longitude (beam heading, sunrise, grayline), contest (logging and duping), antenna design and evaluation, and EME and beyond. The programs are written in BASIC, and versions of each are provided for Apple, Commodore, CP/M and TRS-80 computers. Some VIC and Timex/Sinclair versions are also included.

I keyed two programs ("Sunrises Anywhere" and "Grayline") into my TRS-80 Model I, and both programs ran flawlessly (after correcting my typos). According to the authors, each program "had to meet two requirements: (1) It had to do something worthwhile in the hamshack — and do it well — and (2) it had to run on several of the most popular brands of personal computers on the market today." All of the programs meet this criteria and will find a happy home in a ham's computer.

*75 Kreger Dr., Wolcott, CT 06716
CompuServe ID no. 70645,247

SOFTWARE

TRS-80 Model 100: CW Compu-Contester I is a CW contest program for the Radio Shack TRS-80 Model 100. It features complete maintenance of log and dupe sheets for up to 2100 contacts on as many as six bands (with 32k RAM) while providing automatic CW transmission via the computer's keyboard with selectable weight and speed (5 to 32 WPM). For more information, send an s.a.s.e. to Pete Smith, N4ZR, 2003 Sarazen Pl., Reston, VA 22091.

IBM PC: RTTY and CW. CompRtty II is an RTTY/CW program for the IBM PC that will operate at any Baudot or ASCII speed and parity, and has CW transmission and reception with automatic tracking of received speed. The program requires an IBM PC with at least 128k RAM, a serial port, PC DOS 1.1 and a terminal unit with an RS-232-C interface. For more information, send an s.a.s.e. to David A. Rice, KC2HO, 7373 Jessica Dr., North Syracuse, NY 13212.

IBM PC jr: Contest Logging and Duping. The IBM Contest Logger/Duper program for the IBM PC jr can be used to log single or multiband and multimode contests, and checks calls for duplicates on each band and mode separately. The program requires DOS 2.1. For more information, send an s.a.s.e. to Dick Bass, K9RFW, 1786 Concord Dr., Princeton, IN 47670.

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1BHK, Max F. Ortelt, Rehoboth, MA
WA1ECH, Joseph T. Brescia, Vernon, CT
W1ETZ, Asahel N. Morse, San Antonio, FL
K1EUW, Frank J. Treiber, Meriden, CT
W1FVM, H. Corwin Miller, Rindge, NH
W1GEO, Gerald E. Morgan, Arlington, MA
W1GSD, Dorothea M. Nutini, Smithfield, RI
W1YOB, Arthur W. Bentley, Glastonbury, CT
W2AAZ, Alexander M. Wessel, Riverdale, NY
K2ALO, Elis D. Hanson, Eatontown, NJ
WB2CVZ, Edward J. Kafka, Mastic Beach, NY
K2DSG, C. Anthony Paterra, Yonkers, NY
W2DWJ, William Romanow, Elizabeth, NJ
W2EAP, Lloyd E. Beaumont, Sr., Dexter, NY
KC2GC, Eugene W. Jackson, Lindenwold, NJ
KA2IAL, Jackson A. Glover, Middletown, NY
WA2LCK, John W. Marko, Bayonne, NJ
W2MAB, Orel D. Orvis, Whiting, NJ
WA2MVS, Jack A. Muller, Northfield, NJ
W2NCY, Henry Spillner, Dumont, NJ
W2NMF, Donald E. Brinkmann, Schenectady, NY
KA2NMK, Louis W. Rose, Eggertsville, NY
W2SJK, Eugene Borowski, Lyndhurst, NJ
KC2VN, Edward J. Wigdorski, Buffalo, NY
*N3AJE, Ernest Cascio, Upper Black Eddy, PA
W3AQT, Glenn V. Lichtenfels, Fort Pierce, FL
W3BYP, Frederick C. Decker, Warner Robins, GA
WA3DQL, LeRoy Fisher, Lemont Furnace, PA
WA3MXX, John J. Mallon, Philadelphia, PA
W3SIH, Charles B. Myers, Taveres, FL
WD4ARP, Vernon N. Simmons, Jr., Chesapeake, VA
*WB4BSH, William W. Behmer, Cocoa, FL
W4DCR, Eugene J. Troutman, Kannapolis, NC
W4EJC, J. Herb Axsom, Anderson, SC
K4GDR, Glenn M. Horton, Louisville, KY
N4HIB, Doug Beckham, Bowling Green, KY
K4HPC, Gerlad L. Chassman, Blue Jay, FL
WA4IYG, Maurice L. Ash, Jr., Punta Gorda, FL
K4KQI, Joseph Czyz, Port Charlotte, FL
KA4MMD, Woodrow "Woody" Faulkner, Charlotte, NC
W4MVX, Conrad J. Arrington, Winnsboro, SC
KA4NAT, George N. Phillips, Sr., Fairfax, VA
K4OCF, F. P. Fischer, Ft. Lauderdale, FL
W4OMW, Robert H. Knapp, Greenville, NC
WD4PJA, Bob E. Parrish, Jr., Greensboro, NC
WD4PLM, J. Wayne Yelton, Covington, KY
W4RLC, Hugh M. Carden, Paducah, KY
W4TCD, J. Ralph Johnson, Winder, GA
*WB4UKO, Nicholas J. Peteti, New Port Richey, FL
WB4WRJ, Donald M. Hood, Lehigh Acres, FL
W5ACE, Walter P. Cuga, Royal, AR
W5AQF, Joe T. Hargis, Pauls Valley, OK
K5BPY, Paul R. Loafman, Edmond, OK
W5HRH, T. W. Lewis, Galveston, TX
WB5IIR, John M. Haerle, Frisco, TX
W5INI, John T. Odle, Oklahoma City, OK
KA5MFN, Roland H. Allen, Waco, TX
K5MYS, Florian D. Smith, Ada, OK
KD5OE, Robert D. Coffey, Garland, TX
W5OX, Robert E. Franklin, Houston, TX
W6ACN, Archie Waring, Castro Valley, CA
K6AZB, Norman Christian, Santa Barbara, CA
W6ELA, Harry S. Culver, Los Angeles, CA
WA6HUB, Halton S. McQueen, Palm Desert, CA
W6JWE, John F. Palmquist, Exeter, CA
KA6NYC, James A. Burkhart, El Cajon, CA
K6QP, Clifton T. Nichols, Palm Desert, CA
WA6RZC, William R. Wallman, San Diego, CA
WA6ZJN, Clarence "Chief" Munnell, La Mesa, CA
W7EMC, Carl C. Self, Phoenix, AZ
W7HJU, Edwin S. Lamb, Portland, OR
W7KHL, William R. Lingenbrink, Hayward, CA
WB7NXP, E. Deloss Shirts, Portland, OR
WB7TNO, Violette C. Furfaro, Tucson, AZ
K8BDK, Robert H. Shupe, Akron, OH
W8CNV, Donald H. Myers, Cincinnati, OH
N8ENI, John A. Wilson, Highland, MI
WA8HBW, Frank P. Magin, Sarasota, FL
KA8LWL, Hugh T. George, Southfield, MI
W8PNC, Louis Binder, Cincinnati, OH
K8RFM, Robert F. Johnson, Sr., Sanford, MI
KA9CZR, Thomas D. Kisky, Franklin, IN
WB9HHH, Ralph L. Shaff, Rockford, IL
W9HMK, Lester G. Wisman, Sheridan, IN
W9HPP, Leonard J. Kramer, Mt. Prospect, IL
*WA9IRP, Martin J. DeWitt, Hammond, IN
KA9KGQ, John F. Urig, Milwaukee, WI
KC9KQ, John J. Holzer, Platteville, WI
W9KQH, George Barnich, Buckner, IL
K9SNF, Herman S. Kruzel, South Chicago Heights, IL
WA9VVI, Franklin Britt, Princeton, IN
KAØBBE, Harold J. Corwin, Cedar Rapids, IA
WØFFR, William S. Johnson, Blue Springs, MO
*WDØGCW, Charles S. Pulliam, Kansas City, MO
AKØH, Loren D. "Dee" Whittall, Gladstone, MO
WØIN, George A. Melin, Brainerd, MN
WØNZP, Wilbert G. Stephens, Overland Park, KS
WØPF, W. Bryce Bandy, Wichita, KS
WØRXG, Farrell D. Snow, Licking, MO
KCØSY, John M. Price, Licking, MO
WØUNZ, Melvin G. Knowles, Knoxville, IA
WØVLM, Harold L. Fleshman, Sr., St. Joseph, MO
WØVZH, Cecil D. Combs, Lincoln, NE
KV4DC, Harold C. Kauffman, Christiansted, VI
VE3AKS, George L. Perritt, Windsor, ON
*VE3AW, David S. Lloyd, Toronto, ON
VE3FFP, Stuart C. Henry, Wingham, ON
VE3ST, Joseph C. Kirby, Chatham, ON
VE7AQM, Robert L. Bennett, New Hazelton, BC
LA7WI, Leif Rorstad, Aalesund, Norway
VK4DO, Harold L. Hobler, North Rockhampton, Queensland, Australia

*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys are confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from Hq.

Note: All Silent Key reports sent to Hq. must include the name, address and call sign of the *reporter* as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

50 Years Ago

October 1934

☐ "We amateurs are going to lick these ultra highs . . ." the editorial promises, in introducing Ross Hull's feature story on 5-meter extended DX work.

☐ Ross put up a four-radiator, four-director vertical wire beam atop a veranda roof, and laid down an R8 signal on 5 meters into the Boston area, 100 miles away. The antenna permitted enhanced reception also, and numerous QSOs were had with consistency. His fertile mind is now digesting various transmission and reception phenomena noticed during the experiments, perhaps looking toward some new propagation principles.

☐ Bell Labs has developed a new "A" cut of quartz crystals that provides almost zero temperature coefficient.

☐ Most of us use tuned r.f. transformers in our receivers, often with strange difficulties. Lou Hatry provides a nuts-and-bolts analysis of how they are affected by parts layout, physical size of the ticklers, plate capacitance of the tube, and the like.

☐ Reports like QSA3 R7 T5 are destined for oblivion with W2BSR's proposal to establish a sweeping change in our admittedly inadequate reporting systems. RST for readability-strength-tone, with a 559 maximum (later changed to 599 to salve our egos!), is the suggested, simplified replacement.

☐ W8JK's visit to the Soviet Union included some amateur contacts as well as commercial radio inspections, and he recounts some of the regulations governing Russian ham radio. Communist Party members have the advantage of a lower code-speed test for various license classes. Operation on 20 meters requires special permission.

☐ Those new RK-20s impressed W1HRX, who built a rack-and-panel rig (which he can disassemble for reasonable portability) with a pair in the push-pull final.

☐ W9FVM adapts the basics of the tri-tet circuit to get quadrupling from a 3.5-Mc. crystal. Actually, he finds it practical to double in the triode part and double again in the tetrode section, to get on 20 meters.

☐ The Correspondence section is filled with objections to an earlier letter proposing a volunteer reduction in our maximum authorized power.

☐ The National Company inserts its complete parts catalog in this issue. Certainly helps the exchequer in these lean times.

☐ The Wireless Institute of Australia is sponsoring a four-weekend contest in October, with points for working VKs. One weekend will get competition from a W/VE party, though mostly on different bands.

☐ Thumbing through the ad pages brings lots of nostalgia from names like Hammarlund, Cardwell, Bliley, Candler, RME, Thordarson, Teleplex, Trimm, E. F. Johnson, Burgess. Gross Radio still has a transmitter kit for $13.95 (less tubes)!

☐ A total of four amateurs make up the Silent Key list.

25 Years Ago

October 1959

☐ The League is likely the largest hobby-oriented outfit in the world, and the Editor attempts to answer many queries from members on who does what — relationships between the Board, members, administration and editorial staff.

☐ W6TC's "HBR-14" in *QST* a couple of years ago inspired many amateurs to duplicate his excellent receiver design. Now, Ted has revamped the unit to an "HBR-16" — smaller size and improved circuits.

☐ The new 6DQ5 was designed for sweep circuits in television sets, but W9RWZ and W9YRV find it a good choice for sideband linear amplifiers, giving twice the output of a 6146.

☐ Continuing his campaign for more activity on the higher frequencies, particularly by Technicians, W1HDQ has compiled a number of useful tips concerning receivers, transmitters, converters and antennas on 6 and 2 meters.

☐ WØIC describes the high-power amplifier he built to work seven new states on 2 meters by bouncing his output off trails of the Perseid meteor shower.

☐ Most of us find QRM a real problem when working mobile. K8EEY's solution was to switch to 160 meters, where the occupancy is light and solid QSOs can be had, though over only limited distances.

☐ A group of Cleveland hams got New York Central's permission to operate gear on the Empire State Express, round-trip to New York, and made contacts despite an antenna only 14 inches above the roof of a steel railroad car.

☐ W1ICP helps the beginner understand the advantages (and limitations) in using parts from the junk box to replace those described in an article.

☐ Though chosen for their professional skills, three top officials of the world radio conference now in session in Geneva, Switzerland, are also hams — Chairman Charles Acton, VE3AC; Vice-Chairman Juan Autelli, LU9DL; and Secretary Gerald Gross, HB9IA. — *W1RW*

Coming Conventions

TEXAS STATE CONVENTION
October 6-7, Houston

The ARRL Texas State Convention will be held in Houston's Astro Village Hotel, 2350 South Loop 610 West at Kirby Drive, immediately across from Astroworld and the Astrodome. Talk-in on 69/09, 28/88 and 52. Hospitality suites include the DX Society, the QRP group and the Women's group.

An indoor, air-conditioned flea market, including a section just for women, will be held on both days. Additional, limited roped-off parking spaces will be available for tailgating. As of press time, the Technical Program includes antenna design, getting into ham radio, MARS, packet radio, DXing, contesting and RTTY. The QRP Forum includes An Introduction to QRP, Simple Transmitter Design, From Paper to Completed Rig, V-Beam Antenna Design for Portable Operating and a question and answer panel discussion. Women's activities will include a makeup/wardrobe color-coordination seminar, a luncheon and style show, and a craft demonstration with hands-on participation by the audience. Children's activities are planned on Saturday for both the little ones and the younger teens. Highlighting the social events will be a banquet held on Saturday evening. Additional information is available by calling 713-333-1466.

KENTUCKY STATE CONVENTION
October 27, Owensboro

The ARRL Kentucky State Convention/ABC Fest will be held October 27, from 7 A.M. to 4 P.M. (CST), at the Chautauqua Youth Center, 1503 E. 11th St., Owensboro. Admission is $3. Indoor display area, free display space, all tables $3 while they last (bring your own and save). Forums. Talk-in on 81/21. For further information, write to ABC Fest, Box 231, Owensboro, KY 42302, tel. 502-684-0997.

TENNESSEE STATE CONVENTION
October 27-28, Chattanooga

The ARRL Tennessee State Convention and HAMFEST CHATTANOOGA will be held October 27-28 at the Memorial Auditorium located in downtown Chattanooga on Oak Street at Lindsay Avenue. Activities will include forums, contests and nonham activities. Amateur exams will be given Saturday in the West Assembly Room of the Memorial Auditorium at 8 A.M. Examinations will include Novice through Extra elements (see "How to Register," above).

The Admiral Benbow Inn will be offering special hamfest rates. A Hospitality Party will be held at the Inn on Saturday. Phone 615-267-9761 for room reservations, and be sure to ask for "Hamfest Chattanooga" rates.

Inside space is available for dealers and flea market vendors. Eight-foot flea market tables will rent for $6 per day or $10 for both days. For further information, contact Hamfest Chattanooga, P.O. Box 3377, Chattanooga, TN 37404, or call Nita Morgan, N4DON, at 404-820-2065.

October 6-7
Texas State, Houston

†**October 12-13**
Iowa State, South Sioux City, Nebraska

†**October 12-14**
Southwestern Division, Santa Maria, California

October 27
Kentucky State, Owensboro

†**October 27-28**
Tennessee State, Chattanooga

†**November 24-25**
South Florida Section, Clearwater

ARRL NATIONAL CONVENTIONS

October 4-6, 1985
Louisville, Kentucky

September 5-7, 1986
San Diego, California

June 19-21, 1987
Atlanta, Georgia

†At press time, Amateur Radio exams are scheduled to be given at these conventions.

How to Register for Upcoming Exams

October 27, Tennessee State Convention (Chattanooga). Amateur exams will be given Saturday, October 27, in the West Assembly Room of the Memorial Auditorium at 8 A.M. Novice through Extra elements. Mail check for $4 (payable to WCARS/VEC), completed Form 610 and a copy of your license to: Hamfest Chattanooga, P.O. Box 22161, Chattanooga, TN 37422. Applications must arrive by October 15.

November 24-25, South Florida Section Convention (Clearwater). Mail check for $4 (payable to FGCARC) and completed Form 610 to: "EXAMS," FGCARC, Box 157, Clearwater, FL 33517. All exams, Technician to Extra, to be given both days. Applications must arrive by October 20.

Hamfest Calendar

By Marjorie C. Tenney,* WB1FSN

[Attention those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes of any kind and games of chance such as bingo. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes.]

†**Alabama (Montgomery) — October 27:** The Montgomery ARC will host the 7th annual Montgomery Hamfest at the Civic Center in historic downtown Montgomery. Free admission, free parking and 20,000 square feet of air-conditioned activities, including the flea market. Flea market set up begins at 6 A.M.; doors open to the public from 8 A.M. to 4 P.M. (CDST). For further information or flea market reservations, write to Hamfest Committee, c/o 2141 Edinburgh Dr., Montgomery, AL 36116, or phone Phil at 205-272-7980 (after 5 P.M. CDST or any reasonable hour on weekends and holidays).

Colorado (Colorado Springs) — October 5-7: The Rocky Mountain UHF/VHF Conference will be held at the Holiday Inn North in Colorado Springs. Contact Greg, NBØU, tel. 303-597-4351, for further details.

Connecticut (Poquonock) — October 20: The Second Annual Tri-City ARC Auction will be held at the St. James Parish Hall, Poquonock, 1½ miles east of Rte. 12 on Rte. 2A (south of Norwich). Setup at 9 A.M., auction from 10 A.M. until sold out. Admission is free; food available. Bring your equipment to be auctioned. Talk-in on 52. Call WA2RYV at 203-464-6555 for further information.

Delaware (Newark) — October 21: The Delmarva Hamfest (which was rained out in August!) will be held at the Newark campus of the University of Delaware. Admission is $2.50 in advance, $3 at the gate. Food and drink available. Talk-in on 52 and 13/73. For more info, send an s.a.s.e. to the Amateur Radio Association at the University of Delaware, 140 Evans Hall, University of Delaware, Newark, DE 19716.

†**Florida (Panama City) — October 20-21:** The Panama City Hamfest, sponsored by the Panama City ARC, will be held at the National Guard Armory on Sat., from 9 A.M. to 5 P.M., and Sun., from 9 A.M. to 3 P.M. Advance admission is $2; at the door $3. Women's activities and tour. Musical entertainment Saturday night. Talk-in on 99/39. Further information available from Dorothy Harlan, KA4GYE, 3728 E. 9th St., Panama City, FL 32401, tel. 904-769-4542.

Georgia (Rome) — October 1: The South's oldest (since 1932) hamfest, the Rome Hamfest, will be held at the

†ARRL Hamfest

*Convention/Travel Coordinator, ARRL

Civic Center beginning at 8 A.M. For further information, contact T. J. Freeman, tel. 404-232-2830. Talk-in on 90/30.

Illinois (Chicago) — October 21: The 3rd Annual CCRL Hamfest, sponsored by the Chicago Citizens Radio League, will be held from 7 A.M. to 2 P.M., at American Legion Post 21, 6040 N. Clark St., Chicago. Talk-in on 145.030 simplex. Admission is $1 in advance, $1.50 at the door; $2 per table. For information, write to Norman Geuder, KA9EZA, 6345 N. Magnolia, Apt. I-1, Chicago, IL 60660; John Ibes, KA9FUI, 2934 N. Mobile, Chicago, IL 60634; or Frank Bonnell, WB9OHN, 1674 W. Hollywood, Chicago, IL 60660.

Indiana (Fort Wayne) — November 11: The 12th Fort Wayne Hamfest sponsored by the Allen County ARS, Inc. will be held at the Allen County Memorial Coliseum, Coliseum Blvd. (U.S. 30) at Parnell Ave. All classes of radio exams will be given. Send your Form 610 and an s.a.s.e. to VE Coordinator, FWRC, P.O. Box 15127, Fort Wayne, IN 46885 by October 26. Advance tickets $3; at the door $3.50. Tables $8; premium tables $20. *No table sales at door.* Ticket and table deadline Oct. 20. Large indoor flea market and commercial vendors. Hear the infamous "Ham Band" again under the direction of Luke Matthew, WB9EWJ. Vendors 5 A.M. to 7 A.M., public 8 to 4. Talk-in on 88. For tickets, tables or more information, contact Hamfest Chairman AC-ARTS, P.O. Box 10342, Fort Wayne, IN 46851, or call Dave Smith, KA9FFT, at 219-493-2439.

†**Kansas (Scott City) — October 7:** The Sandhills ARC 1984 Swapfest will be held in the 4-H Building at the Scott County Fairgrounds. Doors open at 9 A.M. Covered-dish lunch. Talk-in on 10/70. Registration is $3.

Massachusetts (Dover) — October 20: The Middlesex ARC announces its annual amateur flea market, from 9 A.M. to 3 P.M., at Dover Town Hall. Free parking. Refreshments available. Admission is $1; tables available at $8 each. For further information, send an s.a.s.e. to Irv Geller, KO1N, 1450 Worcester Rd., No. 422A, Framingham, MA 01701.

Massachusetts (Framingham) — October 28: The Framingham ARA, Inc. will hold its annual fall flea market in the Framingham Civic League Bldg., 214 Concord St. (Rte. 126), downtown Framingham. Doors open at 10 A.M. (sellers may begin set up at 8:30). Admission is $2, and tables are $10 — preregistration required. Talk-in on 75/15 and 52. Radio and computer gear; food in-house; bargains galore. Contact Jon Weiner, K1VVC, 52 Overlook Dr., Framingham, MA 01701, tel. 617-877-7166.

Michigan (Kalamazoo) — October 28: The 2nd Annual Hamfest-Electronic Flea Market, sponsored by the Ham 10 FM Club of Kazoo, will be held at the Kalamazoo County Fairgrounds from 9 A.M. to 4 P.M. Dealer set up at 8:30 A.M. All inside, with 400 4-foot table spaces available. Admission is $2 in advance and $2.50 at the door. Table space (4 foot) $3; advance tables $2.50. Spaces with power must be reserved and paid for in advance. For further information and reservations, write to Ken, KA8RUA, 2825 Lake St., Kalamazoo, MI 49001.

Michigan (Taylor) — November 4: RADAR Eighth Annual Swap and Shop will be held from 8 A.M. to 3 P.M. at Kennedy High School. Forums and many activities scheduled. Free parking. For more info, send an s.a.s.e. to RADAR, Inc., P.O. Box 386, Taylor, MI 48180, or call William Meszaros, WB8MER, at 313-291-2298.

Minnesota (Waseca) — October 13: Corrected date.

†**Missouri (Grandview) — October 28:** "Octoberfest," sponsored by the Southside ARC of Kansas City, will be held at the Grandview West Junior High School Cafeteria, 10th & Main, from 9:30 A.M. to 4:30 P.M. Setup at 8 A.M. Advance tickets: $2 each or 4/$5; at the door, $2.50 each or 3/$5. Swap tables, commercial exhibits, various forums, snack bar. Talk-in on 72/12. For further information or tickets, call NBØE, at 816-966-1545, or KAØSEU, at 816-765-6128.

†**New Jersey (Paramus) — October 14:** The Bergen ARA is holding a Ham Swap 'n' Sell from 8 A.M. to 4 P.M. at Bergen Community College, 400 Paramus Rd. Tailgating only. Bring your own tables. Sellers $4, buyers free. Thousands of spaces. Talk-in on 79/19 or 52. For more info, contact Jim Greer, KK2U, 444 Berkshire Rd., Ridgewood, NJ 07450, tel. 201-445-2855 (nights only).

New Jersey (Montvale) — November 10: RADIO EXPO '84, sponsored by the Stateline Radio Club of New York and New Jersey, will be held on Sat., Nov. 10 (rain or shine), at Pascack Hills High School, Grand Ave. and Spring Valley Rd., Montvale. Indoors and outdoors. Doors open at 6 A.M. for vendors; 8 A.M. for public. Tables: $10 by mail prior to Oct. 31, $13 at gate. Tailgaters: $5 by mail prior to Oct. 31, $7 at gate. Donation: $3 at gate only. Ample parking. Featuring FCC license exams through Extra Class, DX films and forums, multi-media programs and transceiver clinic; food concession and seating available. Talk-in on 146.235/835 and 146.565 simplex. For further information, contact Robert Greenquist, P.O. Box 325, Montvale, NJ, tel. 201-666-3902 day or evening.

New Mexico (Lake Roberts) — October 27-28: The Fall Out Hamfest will be held at Lake Roberts, approximately 20 miles north of Silver City. Tailgate swapfest. Get together to ragchew. Overnight camping for self-contained RVs. Minimal lodging at Lake Roberts. Lodging available in Silver City. Talk-in on 3.939 MHz, 37/97 and 52. For further information, send an s.a.s.e. to Al Shell, WA5WYV, Rte. 9, Box 332, Silver City, NM 88062, tel. 505-388-4947.

New Mexico (Albuquerque) — November 3: The UNM ARC and the Westside ARC will jointly sponsor a tailgate swapfest in the parking lot of the UNM North Campus, University Blvd. and Tucker Ave., Albuquerque, from 10 A.M. (MST) to 2 P.M. (MST). Bring your own tables. No admission charge. Talk-in on 15/75 and 449.3/444.3. For further information, send an s.a.s.e. to K8BI, or WB5YYX or WA5WHN at their *Callbook* addresses, or via 3.939 MHz, 0100 UTC daily.

†**New York (Syracuse) — October 13:** The Greater Syracuse Hamfest, sponsored by the Radio Amateurs of Greater Syracuse, will be held in the Art and Home Center Bldg., New York State Fairgrounds. Admission is $3. For further information, contact Vivian E. Douglas, WA2PUU, 213 Monticello Dr. S., Syracuse, NY 13208, tel. 315-469-0590.

†**North Carolina (Maysville) — October 14:** The Maysville Hamfest, sponsored by the Maysville Hamfest Club, will be held from 9 A.M. to 3 P.M. at the Maysville Community Park. No admission charge. Flea market, tailgating, women's activities, lunches served on grounds. Talk-in on 146.685. For further information, contact JoAnn Taylor, WD4JYR, Rte. 1, Box 80-36, Swansboro, NC 28584, tel. 919-393-2120.

†**North Carolina (Concord) — November 4:** The Cabarrus ARS will hold their Sixth Annual Hamfest at the Central Cabarrus High School, on Hwy. 49 just south of Concord. (This is a new location.) Plans are being made to give FCC exams under the new Volunteer Examiner program. Forums; food available. Admission is $3 in advance, $4 at gate. For more information, contact CARS 1984 Hamfest, c/o Richard Wallace, WA4BHO, 810 S. Bostian St., China Grove, NC 28023.

Ohio (Lima) — October 14: The Lima Hamfest will be held at the Allen County Fairgrounds, Rte. I-75, Rte. 309, Rte. 117 Intersection, Lima. Advance tickets $3; at the door, $3.50. Tables $6; half tables $3.50. Send an s.a.s.e. to K8TCF, c/o NOARC, Box 211, Lima, OH 45802. FCC Volunteer Exams (all classes) will be given to those who submitted completed FCC Form 610 by September 16. For further information, write to NOARC, Box 211, Lima, OH 45802.

Ohio (Marion) — October 28: The Marion ARC will hold its 10th annual Heart of Ohio Ham Fiesta from 8 A.M. to 4 P.M. at the Marion County Fairgrounds Coliseum. Large parking area, food. Tickets $3 in advance, $4 at the door. Tables $5. Talk-in on 90/30 or 52. For information, tickets or tables, contact Paul Kilzer, W8GAX, 393 Pole Lane Rd., Marion, OH 43302.

Pennsylvania (Circleville) — October 20: The Irwin Area ARA will sponsor a swap and shop at the Circleville VFD, just off Rte. 30, 3.5 miles west of the Pennsylvania Tpke. Exit 7. Talk-in on 325/925 and 52. For further information, contact Don Myslewski, K3CHD, 359 McMahon Rd., North Huntington, PA 15642, tel. 412-863-0570.

†**Tennessee (Memphis) — October 13-14:** The Mid-South ARA, the Delta Radio Club and Memphis Radio Relay Club will hold the annual Memphis Hamphis at the Memphis Fairgrounds, in the air-conditioned Pipkin Bldg. All activities held inside. Two drive-in doors for unloading. Doors open 8 A.M. to 4 P.M. Sat. and 9 A.M. to 2 P.M. Sun. We hope to be approved as VEC by hamfest time and will give FCC exams. Forums, women's activities and large flea market. Special hotel rates nearby. Dealers call or write for reservations; booths are $60 each for entire weekend. Flea market tables $5 each per day. Trailer hookups available. For more information, call or write to Clayton Elam, K4FZJ, 28 No. Cooper, Memphis, TN 38104, tel. 901-274-4418 (days) or 901-743-6714 (nights).

†**Tennessee (Gray) — October 20:** The Fourth Annual Tri-Cities Hamfest will be held at the Appalachian Fairgrounds, Gray, 5 miles south of I-81 on Hwy. 23. Features include flea market, forums, dealers and RV hookups. Talk-in on 37/97 and 87/27. Registration is $2. For further information, write to Tri-Cities Hamfest, P.O. Box 3648 CRS, Johnson City, TN 37601.

†**Virginia (Falls Church) — October 13-14:** DXPO '84, sponsored by the National Capitol DX Assn., will take place at the Best Western Falls Church Inn, 6633 Arlington Blvd. (Rte. 50), Falls Church. Special room rates are available. Activities begin at 1 P.M., Sat. A broad variety of DX subjects are included in the program. Father Moran, 9N1MM, will be the featured banquet speaker. For further details, contact DXPO '84 Chairman Stuart Meyer, W2GHK, 2417 Newton St., Vienna, VA 22180, tel. 703-525-6286 (days) or 703-281-3806 (evenings).

Wisconsin (Waukesha) — October 14: The Kettle Moraine RAC will hold its annual Ham, Computer, Video Fest at the Waukesha County Expo Center, Hwys. F and FT, Waukesha. Tickets are $2.50 in advance and $3 at the door. Tables are $3 for each 4-foot length; reservations will be accepted until Sept. 24. Since all facilities will be indoors, the hamfest will be open rain or shine, beginning at 8 A.M. Commercial exhibitors. Food available. For reservations, send a check payable to KMRA Club, P.O. Box 411, Waukesha, WI 53187.

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. QST

Strays

I would like to get in touch with...

☐ anyone with a complete manual or schematic diagram for a DSI Frequency Counter, Model 5600A. Edwin C. Mutzer, K2EDF, 428 Oak St., Audubon, NJ 08106.

☐ anyone with an operator's manual for a Superior Instrument Co. genometer, Model TV-5A, and a Bud Radio, Inc. variable low-pass filter, Model LF-601. Steven Lutz, KA8TIA, 50467 Baytown, New Baltimore, MI 48047.

☐ anyone having amateur-related programs for the DEC Rainbow 100 computer. Ben Blodget, W1VEH, P.O. Box 416, Bucksport, ME 04416.

☐ anyone with a schematic diagram for a QWIP 1000 Series fax machine. Dick Whitten, WAØAHQ, 976 Motherhead Rd., St. Charles, MO 63303.

☐ any hams or clubs interested in getting a repeater going in the Wisconsin Dells area. Klaus Spies, WB9YBM, 8502 N. Oketo Ave., Niles, IL 60648.

☐ anyone who has a manual or information on calibration procedure for a HQ100A receiver. J. Gonzalez, KP4W, Box 1337, Cayey, PR 00634.

☐ anyone with an operating manual for a Precision signal generator, series E-200C, serial no. 35149, and a Dynatracer, Model 777. Edward W. Baar, 1909 Fabry St., Oshkosh, WI 54901.

☐ anyone with a SYM-1 microcomputer having BASIC and an Editor/Assembler for it. Dallas Shell, N5FEE, 212 S. Normal, Claremore, OK 74017.

Special Events

Conducted By Edith Holsopple,* N1CZC

Corpus Christi, Texas: The Armadillo Gang will operate KC5UN *Sept. 28-30* to commemorate Bayfest '84. Operation will be on 15-80 meters, 15 kHz from the lower General band edges. Certificate available via David Stephens, WB5YPE, 5709 Bobalo, Corpus Christi, TX 78412.

Hammond, Indiana: The Inland Steel ARA will operate K9DWI to commemorate the Little Red School House and Hammond's Centennial Year. Operation will be from 1400Z to 2400Z *Oct. 6*. Frequencies will be the General class phone portions of 10, 15, 40 and 80 meters, 146.42 simplex and CW on the Novice portions of the same bands. Certificate for an s.a.s.e. via Lucy Schendera, N9DTG, 812 E. 40th Pl., Griffith, IN 46319.

Grosse Pointe, Michigan: Southeastern Michigan ARA will sponsor Michigan All Saints Day from 1500Z to 2100Z *Oct. 6*. Phone only in General portions of 20, 40 and 80 meters, and 147.480 MHz. Look for St. Joseph, KC8JX; St. Helen, N8BAR; St. Johns, NI8L; St. Clair, W8GV; St. Charles, WB8TTA; St. Ignace, KD8CW; St. Louis, WA8AEG; St. James, KD8CG; and Sault Sainte Marie, WA8DLO. For a certificate, send a QSL, an s.a.s.e. and a copy of your log to N8COY, 161 Lothrop, Grosse Pointe, MI 48236.

Treasure Island, New Jersey: The Garden State ARA, W2GSA, will operate their 5th annual special event from Treasure Island, Monmouth Co., to commemorate the stay of Robert Lewis Stevenson on the island. Operating times will be from 1600Z *Oct. 6* until 1600Z *Oct. 7*. Suggested frequencies: 3.910 7.235 14.235 21.360.

Salina Kansas: The Central Kansas ARC will operate WØKQU in Lebanon from the marker of the geographic center of the U.S. Operation will be from 1700Z *Oct. 6* until 1900Z *Oct. 7*, 10 kHz up from the low end of the General class bands on 10-80 meters. Certificate via KBØBH, 2358 Aurora, Salina, KS 67401.

Columbus, Ohio: Columbus ARA members and other Columbus-area hams will be active from 1400Z to 2400Z *Oct. 6* and *7* to commemorate Columbus Day. Frequencies: Oct. 6, 21.375; Oct. 7, 7.240. Work club station W8TO and four other Columbus hams, or work 10 Columbus hams (excluding W8TO) for award. Certificate via 280 East Broad St., Columbus, OH 43215.

Philadelphia, Pennsylvania: In celebration of the 100th anniversary of the IEEE, the Philmont Mobil RC will operate the Franklin Institute Science Museum station, W3TKQ, at the opening of the IEEE-FI Centennial Technical Convocation. Operation will be 1400Z-2100Z *Oct. 6* and 1600Z-2100Z *Oct. 7* in the General class portions of 80-10 meter phone bands, with some Novice and some 144, 220 and 440 operations. Commemorative QSL via W3TKQ.

St. Peters, Missouri: The St. Peters ARC will operate from 1700Z *Oct. 6* to 1700Z *Oct. 7* at the Daniel Boone Home, Femme Osage Valley, St. Charles Co., to commemorate where Boone spent the last two decades of his life. KBØJ will be operating on approximately 3.915, 7.240, 14.280 and 21.420 MHz. A coonskin cap will be given to the first operator making contact on all four bands. Certificate via Tim Haake, WAØTSY, 128 Lake Point Dr., St. Peters, MO 63376.

Albuquerque, New Mexico: K5MHZ and KN5D will operate *Oct. 6-Oct. 14* during the International Hot Air Balloon Fiesta. Operation will be mostly phone, with some RTTY, CW and SSTV. Hours of operation will be variable. Primary frequencies will be 3.900, 7.230, 14.250, 21.350, 28.550 and 147.510 MHz. Special QSL available via P.O. Box 997, Corrales, NM 87048.

De Soto, Missouri: Jefferson Co. ARC will sponsor station KAØIAR from 1500Z to 2400Z *Oct. 13* at the Center of U.S. Population. Frequencies will be on the low ends of the General portions of 40, 20 and 15 meters, with some CW in the Novice bands. Certificate for an s.a.s.e. and a QSL via KAØIAR, 3009 High Ridge Blvd., High Ridge, MO 63049.

Clarksville, Tennessee: The Clarksville Amateur Transmitting Society (CATS) will operate N4GMT to celebrate the 200th anniversary of Clarksville, the Queen City on the Cumberland River. Operation will be from 1400Z to 2400Z *Oct. 13* and from 1800Z to 2200Z *Oct. 14*. Operating frequencies for phone, CW and RTTY will be approximately 21.375, 14.280 and 7.240 MHz. Certificate for an s.a.s.e. to KB4EFW, Rte. 1, Box 162 A, Indian Mound, TN 37079.

Hermiston, Oregon: The Hermiston ARC will operate KC7LK from Hat Rock State Park from 1800Z *Oct. 13* to 0100Z *Oct. 14*, and from 1800Z to 2200Z *Oct. 14*, to commemorate the 179th anniversary of Lewis and Clark's visit to Hat Rock. Operation will be in conjunction with the Oregon QSO Party, and will be on the General phone and Novice CW bands, with some 144- and 440-MHz operation. Send a large s.a.s.e. and your contact number for a certificate to HARC, P.O. Box 962, Hermiston, OR 97838.

Savage, Maryland: Laurel ARC will operate WA3QGA from 1300Z to 2400Z *Oct. 14* to commemorate the Bollman Truss RR Bridge. Phone frequencies will be 7.237, 14.285, 21.385, 144.250 and 147.54. Certificate available for an s.a.s.e. to LARC, P.O. Box 3039, Laurel, MD 20708.

State College, Pennsylvania: The Penn State ARC will operate K3CR from 0000Z *Oct. 14* until 2400Z *Oct. 21* to commemorate their 75th year of operation. Suggested frequencies: 1.850, 3.980, 7.280, 14.180, 21.380, 28.580 and 40 kHz from the bottom of the CW bands, and 10 kHz from the lower edges of the Novice bands. For a certificate, send a large s.a.s.e. and a QSL to K3CR, 213 Engineering Unit E, University Park, PA 16802.

Moultrie, Georgia: The Colquitt Co. Ham Radio Society will operate WD4KOW from the site of the Sunbelt Agricultural Exposition. Operation will be daily from 1300Z to 2100Z *Oct. 16, 17* and *18*. Operations will be in the General portion of the HF bands. A special QSL card will be available for an s.a.s.e. to P.O. Box 813, Moultrie, GA 31776.

Juneau, Alaska: The Juneau ARC will operate club station KL7GPG from the State Capitol building during the 24-hour period of *Oct. 18* to celebrate the 25th anniversary of Alaskan Statehood. Special QSLs will be sent to all stations contacted. QSLs may be sent to WL7K, 3470 Meander Way, Juneau, AK 99801, or to the KL7 bureau.

Merritt Island, Florida: The 24th Infantry Division Assn. will operate station K4TF in remembrance of the U.S. troops landing on Leyte Island in the Philippines on Oct. 20, 1944. Operations will take place from 0000Z to 2400Z *Oct. 20*, at approximately 10 kHz inside the General portion of each band. Conditions will determine which bands will be used. Certificates available for a QSL and an s.a.s.e. to K4TF, 1630 Venus St., Merritt Island, FL 32953.

Aransas Pass, Texas: The Armadillo Gang will operate WD5HOR on *Oct. 20-21* to commemorate the Aransas Pass Shrimporee. Operation will be on 80, 40, 20 and 15 meters, 15 kHz from the lower General band edges. A QSL card is available via an s.a.s.e. to David Stephens, WB5YPE, 5709 Bobalo, Corpus Christi, TX 78412.

Philadelphia, Pennsylvania: The LULU Temple Radio Unit members will operate from 1200Z to 2000Z daily *Oct. 20* and *21* to celebrate the 100th anniversary of the LULU Shrine Temple. Operation will be on approximately 3.950 and 14.328 MHz. For special QSL, send an s.a.s.e. to WR3IPE.

Alcatraz Island, California: The Sacramento ARC will operate club station W6AK from 1730Z until 2400Z *Oct. 27* from Alcatraz Island. Frequencies: CW — 3.725 7.125 14.050 21.085; phone — 3.950 7.270 14.300 21.400 146.54 147.54. Special QSL available for an s.a.s.e. and QSO info to Scott A. Jercich, KB6CCG, 2720 Tierra Grande Cir., Sacramento, CA 95827.

Gillette, Wyoming: The Campbell County ARC will operate station KC7RJ from 1600Z *Oct. 27* to 0100Z *Oct. 28*, to commemorate the 100th anniversary of Wyoming Gas and Oil. Primary frequencies will be the 20-meter phone band, and 15 or 40 meters as conditions warrant. Certificates via Box 309, Gillette, WY 82716.

Anoka, Minnesota: The Anoka County ARC will operate WØEG from 1500Z to 2400Z *Oct. 27* and from 0001Z to 0300Z *Oct. 28* to celebrate Anoka being the Halloween capital of the world. Suggested frequencies: CW — 3.725 7.125 14.045; phone — 3.910 7.240 14.285. Special QSL cards available for an s.a.s.e. to WØEG.

Knokke, Belgium: The Belgische Amateurs are sponsoring station ON4CLM from 1600Z *Oct. 30* until *Nov. 3* to honor the Canadians expected to arrive for the Fortieth Anniversary of the Normandy Landing. Suggested frequencies: CW — 3.515 7.012 14.020 21.020 23.020 144.020; phone — 3.785 7.045 14.125 (Canada) 14.249 (USA) 21.245 28.545 144.250 145.400. QSL to Radio ON4CLM, P.O. Box 140, 8300 Knokke-Heist 1, Belgium.

QSLing Special Events Stations: To get your QSL or certificate from any of the special events stations listed here, follow these simple guidelines. (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a stamped, self-addressed envelope. If sending for a certificate, use a 9- × 12-in envelope if you want an unfolded certificate, or a no. 10 size envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail both your QSL and your s.a.s.e. to the address listed, or to the address given on the air by the station you QSO. Be patient. Special-events stations will often print their cards and/or certificates after the operation is over so they will know how many to order.

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 October 15 to make the December issue. For the convenience of those wishing to operate, please be sure that the name of the sponsoring organization, the location, dates, times(Z), frequencies and call sign of the special-event station are included. Requests for donations will not be published.

*Communications Assistant, ARRL

Strays

QST congratulates...

☐ David B. Arnold, Jr., KA1CPL, of Concord, Massachusetts, on the establishment of a professorship in science in his name at Harvard University.

☐ Thomas Strickland, WD5JDI, of Byron, Oklahoma, on being named civil defense director for Alfalfa County.

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

- Richard L. Baldwin, W1RU, Waldoboro, ME
- James Walker, W4VX, Columbus, GA
- Dallas W. Wulf, W9FID, Mendota, IL
- Edward M. Little, W2PHQ, Dryden, NY
- Cyrus F. Jones, W3EHA, Hagerstown, MD
- Lyman Treaster, W6IFC, Visalia, CA
- Otto F. Dedrick, W6NGK, San Pedro, CA

☐ the following radio amateurs on being elected officers of the IEEE Electromagnetic Compatibility Society:

- President Eugene D. Knowles, N7EXC, of Renton, Washington
- Vice President Chester L. Smith, K1CCL, of Bedford, Massachusetts

I would like to get in touch with...

☐ anyone who has a schematic diagram or instruction manual for a Stelma, Inc. Telegraph Distortion Analyzer, Model TDA-2W. Warren Hoffnung, KF6VV, 21881 Summer Circle, Huntington Beach, CA 92646.

☐ anyone with a schematic diagram and instruction manual for a Model TV-12 Superior Instrument Co. tube tester. Gilbert Lahullier, 17 Kensington Ave., Clifton, NJ 07014.

Operating News

Conducted By John F. Lindholm, W1XX

Good Practice for Computer-Based Message Systems

In 1983, the ARRL Board of Directors was made aware of the concerns of some members about computer-based message systems (CBMS), also called message system operations (MSO). The Board directed the ARRL Ad Hoc Committee on Amateur Radio Digital Communication to draft interim recommendations for good practice for CBMSs. The interim recommendations, approved by the Board, are reproduced in full below. Please note that these are interim *recommendations. They are intended to be broad enough to cover all types of message systems, whether HF RTTY or VHF packet-radio types. Please look these recommendations over and send any comments and suggestions for new wording to the Chairman, ARRL Ad Hoc Committee on Amateur Radio Digital Communication, ARRL Hq.* — Paul Rinaldo, W4RI

Establishment of New Systems

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

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

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

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

Where sharing of an existing frequency is not feasible, new channels should be selected near the upper portion of the particular RTTY subband, leaving the lower parts of the RTTY subband to DX and other operator-to-operator QSOs.

Operational Safeguards

CBMSs should listen before transmitting. The system should sense activity on the channel and not transmit until the channel goes free. This can be accomplished by a carrier-detect circuit.

Incoming messages should not be retransmitted until read and released by the CBMS operator.

Until such time that the FCC permits unattended automatic operation of HF CBMSs, CBMS operators should monitor their transmissions (at least aurally) at all times that the CBMS is on the air and have a reliable method of terminating transmission in the event of malfunction. Monitoring may be done from a remote location.

The system should have software provisions to limit specific responses to a maximum of 10 minutes. Longer responses should be interrupted at least every 10 minutes for a go-ahead from the other station.

The system should have a hardware "watchdog" timer to limit individual transmissions to 10 minutes.

In order to make the channel available to other stations, CBMS operators should cull files that are out of date and offer user instructions for an s.a.s.e. by mail.

A CBMS operator should establish and make public a policy regarding acceptance of borderline traffic such as that relating to sale of equipment after reviewing current FCC rules and interpretations.

User Operating Practices

Monitor the frequency for a short period before calling a CBMS.

Do not interrupt another station using a CBMS.

Do not interfere with a QSO on or near the frequency.

Always properly identify your station.

Keep your signals on frequency.

Do not list "for sale" items without prior permission of the CBMS operator.

Make sure that you deactivate the CBMS by using that system's correct EXIT command.

*Communications Manager, ARRL

W1AW Schedule

October 28, 1984 — April 28, 1985 **MTWThFSSn = Days of Week** **Dy = Daily**

W1AW code practice and bulletin transmissions are sent on the following schedule:

UTC	Slow Code Practice	MWF: 0300, 1400; TThS: 0000, 2100; Sn: 0300, 2100
	Fast Code Practice	MWF: 0000, 2100; TTh: 0300, 1400; S: 0300; Sn: 0000
	CW Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Teleprinter Bulletins	Dy: 0200, 0500, 2300; MTWThF: 1600
	Voice Bulletins	Dy: 0230, 0530
EST	Slow Code Practice	MWF: 9 A.M., 7 P.M.; TThSSn: 4 P.M., 10 P.M.
	Fast Code Practice	MWF: 4 P.M., 10 P.M.; TTh: 9 A.M.; TThSSn: 7 P.M.
	CW Bulletins	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.
	Teleprinter Bulletins	Dy: 6 P.M., 9 P.M., 12 P.M.; MTWThF: 11 A.M.
	Voice Bulletins	Dy: 9:30 P.M., 12:30 A.M.
CST	Slow Code Practice	MWF: 8 A.M., 6 P.M.; TThSSn: 3 P.M., 9 P.M.
	Fast Code Practice	MWF: 3 P.M., 9 P.M.; TTh: 8 A.M.; TThSSn: 6 P.M.
	CW Bulletins	Dy: 4 P.M., 7 P.M., 10 P.M.; MTWThF: 9 A.M.
	Teleprinter Bulletins	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.
	Voice Bulletins	Dy: 8:30 P.M., 11:30 P.M.
MST	Slow Code Practice	MWF: 7 A.M., 5 P.M.; TThSSn: 2 P.M., 8 P.M.
	Fast Code Practice	MWF: 2 P.M., 8 P.M.; TTh: 7 A.M.; TThSSn: 5 P.M.
	CW Bulletins	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.
	Teleprinter Bulletins	Dy: 4 P.M., 7 P.M., 10 P.M.; MTWThF: 9 A.M.
	Voice Bulletins	Dy: 7:30 P.M., 10:30 P.M.
PST	Slow Code Practice	MWF: 6 A.M., 4 P.M.; TThSSn: 1 P.M., 7 P.M.
	Fast Code Practice	MWF: 1 P.M., 7 P.M.; TTh: 6 A.M.; TThSSn: 4 P.M.
	CW Bulletins	Dy: 2 P.M., 5 P.M., 8 P.M.; MTWThF: 7 A.M.
	Teleprinter Bulletins	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.
	Voice Bulletins	Dy: 6:30 P.M., 9:30 P.M.

Code practice, Qualifying Run and CW bulletin frequencies: 1.818, 3.58, 7.08, 14.07, 21.08, 28.08, 50.08, 147.555 MHz.

Teleprinter bulletin frequencies: 3.625, 7.095, 14.095, 21.095, 28.095, 147.555 MHz.

Voice bulletin frequencies: 1.89, 3.99, 7.29, 14.29, 21.39, 28.59, 50.19, 147.555 MHz.

On Monday, Wednesday and Friday, 1400 through 2200 UTC, transmissions are beamed to Europe on 14, 21 and 28 MHz.

Slow code practice is at 5, 7-1/2, 10, 13 and 15 WPM.
Fast code practice is at 35, 30, 25, 20, 15, 13 and 10 WPM.

Code practice texts are from *QST*, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from July 1984 *QST*, pages 9 and 81," indicates that the main text is from the article on page 9 and the mixed number/letter groups at the end of each speed are from the contest scores on page 81.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

On Wednesdays at 2330 UTC, an IARU Region 2 bulletin in English and Spanish on 45.45-baud Baudot is sent on the regular teleprinter frequencies, beamed to Central and South America. The 2300 UTC Teleprinter Bulletin transmission is also beamed south on Wednesdays.

W1AW bulletins are sent on OSCAR 10, Mode B, when the satellite is within range. Look for CW on 145.840 MHz and SSB on 145.972 MHz.

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode. Baudot, ASCII and AMTOR (in that order) are sent during all 1600 UTC transmissions, and 2300 UTC on TThFSSn. During other transmission times, AMTOR is sent only as time permits.

CW bulletins are sent at 18 WPM.

W1AW is open for visitors Monday through Friday from 8:30 A.M. to 1 A.M. EST and on Saturday and Sunday from 3:30 P.M. to 1 A.M. EST. If you desire to operate W1AW, be sure to bring a copy of your license with you. W1AW is available for operation by visitors between 1 and 4 P.M. Monday through Friday.

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

W1AW will be closed on November 22 and 23, December 24 and 25, January 1, February 18 and April 5.

Public Service

Conducted By Robert J. Halprin,* K1XA

Amateurs, NCS TANGO Across the Country

The National Communications System's (NCS) program to evaluate the capabilities of volunteer communications systems to support national-security and emergency preparedness requirements continues with the successful completion of Exercise NIGHT TANGO III and Exercise NIGHT TANGO IV. The NCS, a confederation of 22 Federal departments and agencies (see June 1984 *QST*, p. 94), conducts this program in cooperation with the ARRL Field Organization, each of the three Military Affiliate Radio System (MARS) organizations and the Civil Air Patrol (CAP). These five volunteer communications systems have again shown that they have the capability to provide alternate communications in support of national-security leadership requirements following a major national crisis.

Exercise NIGHT TANGO III was conducted in the eastern United States on May 17 and 19, 1984. During the exercise, a total of 104 separate messages were transmitted among NCS representatives (simulating senior government officials) located in Boston, Massachusetts; Providence, Rhode Island; Buffalo and Rochester, New York; Nashville and Memphis, Tennessee; and Miami, Florida. In addition to the usual high-frequency test, selected locations with equipment operating on the AMSAT OSCAR-10 satellite were tested to evaluate the amateur satellite capability to support national-communications requirements. During this exercise, each of the four NCS representatives sent the other representatives a basic message, for a total of 12 basic messages for each of the two exercise days. Each basic message, whenever possible, was sent out through the five volunteer systems. All 24 basic messages sent during the exercise were received at their destination through at least one of the volunteer systems.

Exercise NIGHT TANGO IV also evaluated the capability of the volunteer systems to support national-security and emergency-preparedness requirements. This exercise, conducted on June 28 and 30, 1984, required simulated critical messages to be passed among NCS representatives located in Tulsa and Oklahoma City, Oklahoma; Oakland and Sacramento, California; Salem and Portland, Oregon; and Rapid City, South Dakota. A total of 82 individual messages were sent during this exercise. These represented multiple transmissions of the basic 24 messages among NCS representatives. The overall success rate of 88% reflects 21 of 24 basic messages arriving at their destination.

Exercise NIGHT TANGO IV was the first test of the NIGHT TANGO series in which the volunteer operators did not have prior knowledge of the location of the other NCS representatives. This accounted for a slightly longer time to transmit, relay (if required) and receive the message (104 minutes versus 87 minutes for Exercise NIGHT TANGO III). Realism, however, was greatly enhanced because of this approach.

Future Exercise TANGO tests will continue to evaluate the use of the volunteer communications capability to support national objectives. The National Communications System recognizes the tremendous potential of the volunteer operators and expresses its thanks to the many participants and their parent organizations, who continue to make the exercise NIGHT TANGO program a success. — *Chuck Cavanaugh, K4VKU, NIGHT TANGO Coordinator*

FEMA/ARRL ACCORD

The ARRL has just entered into an agreement with the Federal Emergency Management Agency (FEMA). FEMA is the federal agency that provides support to the state and local civil-preparedness and emergency management agencies that you will undoubtedly be working with. Located in Washington, DC, with 10 regional offices throughout the country, FEMA provides technical and financial assistance and guidance to state and local government wishing to upgrade their emergency-communications and warning systems, as well as provides support, when required, during and after disasters.

FEMA is also in charge of administering the Radio Amateur Civil Emergency Service (RACES) program. RACES is administered by local or state civil-preparedness officials. FEMA recognition of ARRL-sponsored emergency preparedness programs can be a powerful tool in selling your ARES capability to local emergency-management officials, and in the growth of dual ARES/RACES structures throughout the country. Copies of the ARRL/FEMA agreement are available from ARRL Hq. for an s.a.s.e.

HOSPITALS-AMATEUR RADIO COMMUNICATIONS LINK ENHANCED

A donation from San Diego Council of Amateur Radio Clubs has resulted in the installation of 2-meter antennas on five South San Diego County, California, area hospitals. All five 'South Bay' hospitals maintain an emergency communications pact with the Amateur Radio Emergency Service (ARES) Program under the direction of EC Lloyd Beauregard, WD6CSS.

The five hospitals (Chula Vista Community, Coronado, Paradise Valley, Physicians and Surgeons, and Bay) are spread out over an area of 25 square miles. In past disaster drills and actual emergencies, the South Bay hospitals have relied on Amateur Radio communications extensively.

Dave Wilkie, American Red Cross South Bay Chapter Chairman, commented very favorably on the antenna installation and the role of Amateur Radio in a briefing provided to local media representatives, who provided coverage of the antenna installation at Chula Vista Community Hospital. The various South Bay ARES programs involve over 100 local Amateur Radio operations. — *Jerry Boyd, WA6CUP, PIO, San Diego Section*

*Deputy Communications Manager, ARRL

MEMORANDUM OF UNDERSTANDING

BETWEEN

THE FEDERAL EMERGENCY MANAGEMENT AGENCY

AND

THE AMERICAN RADIO RELAY LEAGUE, INC.

Copies of the Memorandum of Understanding between the League and the Federal Emergency Management Agency are available from Hq. for an s.a.s.e.

OREGON RIVER ADVENTURE

On July 28, 1984, members of the Marion-Polk Counties Amateur Radio Emergency Service (ARES) group, Salem Amateur Radio Club and some nonaffiliated hams provided communications for the 6th annual Willamette River (Oregon) Raft Race for the Muscular Dystrophy Association. We manned six 'guard' boats, three portable land stations and the Polk County Sheriff's boat, and had one home station on standby to make phone calls if needed.

We practiced the use of tactical call signs, using the designation "River 1," etc. for the boats; the portable land stations used location names. The procedure provided an efficient calling routine.

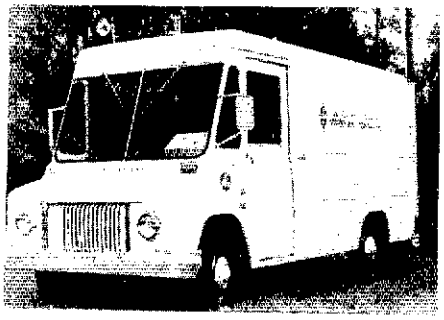
The race started at 8 A.M. and continued till 5 P.M. Most of the day was taken up with transfers of people from land to boats, and vice versa, and very commonplace communications.

Around 3:30 P.M., River 1 (N7FLE) called in and asked Control to notify the Polk County Sheriff's boat that they were going to be moving up the river at full speed to transport a child, who might be suffering from blood poisoning, up river to the parent's car. The child's mother had declined our offer to call for an ambulance. KA7QQV, who was aboard the Sheriff's boat, overheard the exchange between Control and River 1, and informed the deputies, who cleared a path for River 1.

While this run was being made, River 6 (WB7OEX) called in saying they were coming in with a young woman they had pulled from the water, and that she was having trouble breathing. The medic who had volunteered to help during the race from the city of Salem was at a land station close to River 6. He had been on River 3, but was deposited on land when that boat ran into some motor problems. The medic's location proved to be the right place at the right time for the victim.

Within a very few minutes, River 6 reported the victim had stopped breathing. I handed the mic to the medic and he asked if anyone aboard knew CPR. Fortunately, Barb, the skipper of River 2, had had CPR training. She stopped the boat and got the victim breathing again.

The Sheriff's boat had just about completed clearing the path up the river for River 1 when KA7QQV, overhearing the communications and realizing that the situation onboard River 6 was becoming more serious,



The Valdosta Amateur Radio Club (Georgia) used their communications van to provide communications for authorities following an environment-threatening train derailment in the Valdosta area. *(photo courtesy W4APS)*

Third-Party Traffic Agreements

Here is the latest list of countries (by prefix) with which U.S. amateurs may legally handle third-party-message traffic.

C5	The Gambia	J7	Dominica	VR6	Pitcairn Island[1]
CE	Chile	J8	St. Vincent	XE	Mexico
CO	Cuba	JY	Jordan	YN	Nicaragua
CP	Bolivia	LU	Argentina	YS	El Salvador
CX	Uruguay	OA	Peru	YV	Venezuela
EL	Liberia	PY	Brazil	ZP	Paraguay
HC	Ecuador	TG	Guatemala	3D6	Swaziland
HH	Haiti	TI	Costa Rica	4U1ITU	ITU, Geneva
HI	Dominican Republic	V2	Antigua and Barbuda	4X	Israel
HK	Colombia	V3	Belize	6Y	Jamaica
HP	Panama	VE	Canada	8R	Guyana
HR	Honduras	VK	Australia	9G	Ghana
J3	Grenada	VP2K	St. Christopher (St. Kitts), Nevis	9Y	Trinidad and Tobago
J6	St. Lucia				

[1]Informal agreement. See League Lines, Oct. 1981 *QST*, for details

held a quick conference with the deputies. They decided to turn around, pick up the medic and rendezvous with Boat 6.

Meanwhile, River 4 (N7DSL and KA7NYL) drew up to River 6. The skipper was a police officer who had CPR training. He climbed aboard River 6, and he and Barb both worked on the victim while Russ, a passenger on River 6, got the boat going again and headed for our land station.

As the boats headed toward each other, the medic gave me the number to call direct for an ambulance and the rescue squad. I was just about to bring up the autopatch when KA7CUI, a member of the Marion County Fire Department, called to tell us that he had used his fire-frequency hand-held radio and had called for the emergency equipment. It was on its way.

Hearing this, KA7RZG left the Control site on the river bank and headed for the road, which was about 400 yards uphill from the beach, to flag the medics and direct them down to the beach.

The Sheriff's boat picked up the medic and headed north to rendezvous with River 6. Upon examining the victim, the medic said "transport immediately." The victim was transferred to the Sheriff's boat because of its greater speed and its relatively flat position at high speed, which would enable the medic to continue emergency treatment. KA7KDM then rushed to the beach and cleared away rafts and people so the boat could beach quickly and safely.

The victim was taken to Salem Hospital where she was treated, and released later in the evening. We were thrilled when the medic told us "You've got a save." And it was my pleasure to "QST" all the boats with the good news. We were told that our ability to communicate from on site made the difference! — *Joan Upton, KD7YB, EC Polk Co.*

PUBLIC SERVICE DIARY

☐ Tulsa, Oklahoma — May 26-27. Amateurs helped with communications in what turned out to be Tulsa's worst flood in history. A severe-thunderstorm warning was issued at 9 P.M., and the Tulsa Weather and Tulsa Emergency Operations Center were both activated. Amateur communications were provided on the WA5LVT and K5MRJ repeaters, and 75/40 meters. Some areas reported 12 inches of rain, with as much as 6¾ inches falling in three hours. Before the watch was canceled the next day, 14 people had died, property loss had been estimated to be in the millions, and President Reagan had declared it a federal disaster area. (K5ENA)

☐ Santa Maria, California — June 2. A dozen amateurs provided communications for the 41st Annual Elks Parade and Rodeo. WB6IIY served as net control; N6UE and AJ6Y roved the parade route with the parade chairman. W2KVA, KA6MBB, WB6BHT, N6MB and WB6WWY were stationed at each public-address system to announce locations along the parade route for any last-minute changes from KF6T at the start of the parade. This function was all handled on simplex with the cooperation of the police department. (WB6IIY)

☐ Salida, Colorado — June 16-17. The first day began with a parade in downtown, followed by kayak races. Amateur Radio communications were set up along the route. The next day was the 22-mile race from Salida to Tepar Creek bridge, a course of mostly white water. The river canyon rise averages 800 feet above the river, making radio contact difficult, so a portable repeater was hauled up the vertical walls with a remote link at the finish line. (NØAWD)

☐ Iowa — July. A message-relay team followed the route of over 7000 bicyclists riding in the Registers Annual Great Bike Ride Across Iowa. The bikers originated a total of 1350 messages from seven overnight stops. Message destinations included six countries and 33 states. This year, KBØZP rode with the bikers and accepted incoming traffic, which was posted on a bulletin board. Because telecommunications were overcrowded at each stop, the message center was especially welcomed by the riders. (KØCY)

☐ Rochester, Minnesota — July 8. Nine amateurs supplied communications for a 100-mile bicycle race involving about 225 riders. The hams tracked the bikers and provided communication with the start at each checkpoint. There was one accident, in which a biker was hit by a car. K9QKA called the local police and got an ambulance on the scene. Luckily, the injuries were slight, but the victim was taken to the hospital for examination. (KØTS)

☐ Coldwater, Ohio — August 1. At 5 P.M. EDT, a tornado was sighted over Coldwater, moving east. Law-enforcement agencies were informed, and New Bremen was alerted by sirens. In about 20 minutes, the storm intensity abated. Amateurs were alerted and prepared for action, although the tornado never touched down. (K8LMN)

☐ Ocala, Florida — August 3. Fifteen people were injured in an accident involving a tractor trailer loaded with steel, a motor home, a van and an auto. W4ABV, mobile on I-75, called in to the Ocala Repeater (K4GSO/R), through which K4UBR, WD4PQN and KB9HD assisted in reporting the accident. A trained paramedic, W4ABV, assessed and treated injured people, with the help of a dentist and a nurse, until ambulances arrived. After assisting the medical personnel, W4ABV remained on the site to transmit information for relay to Gainesville via W4UEA and WD4RJI to WA4SSA for a noninjured victim. KA4YBY helped at the site. W4ABV then stayed on the scene until all the noninjured people were taken care of, about 3½ hours later. (WD4RJI)

☐ New Carlisle, Ohio — August 8. It was midafternoon when W8ILC received a call informing him that the New Carlisle Central Office of Ohio Bell had suffered a major outage and communications help was urgently needed. Clark County EC WB8RYA was called to get radio operators with autopatch facilities to report immediately. At the same time, the area was under a local weather alert, and W8OK at the National Weather Service was notified of the telephone failure in New Carlisle. The city was divided into four sections; mobile units were dispatched to each section to handle emergency phone calls from the citizens. Nursing homes, hospitals, the fire department and the police station were covered. Over 100 messages were handled in the five hours it took to get things under control. (W8ILC)

AMATEUR RADIO EMERGENCY SERVICE REPORTS

☐ Clemmons, North Carolina — March 17. Numerous messages were handled by 10 members of the ARES of Forsyth County simplex net during the 10K running races in Tanglewood Park. Hams were stationed with race officials, the rescue squad, in the roving sheriff's deputy car and at six water/aid stations around the course. (WA4TCR, EC Forsyth County)

☐ Pittsburgh, Pennsylvania — April 29. Twenty-four Allegheny County Public Service Net of ARES members took part in a day-long March of Dimes 1984 WalkAmerica by providing communications along a 20-mile route through the city. Ham operators were stationed at net control, at the start/finish line and at additional checkpoints around the route. Hams were also assigned to ride with March of Dimes officials and on two Army Reserve ambulances. The sponsoring organization was impressed with the reliability and discipline of the operators. (N3BPB, EC Allegheny County)

☐ San Luis Obispo County, California — May 30. When two fires (started by lightning) burned together and out of control shortly after 1 A.M., the California Department of Forestry called the Volunteers in Prevention-ARES to establish communications between the fire camp at Bidwell Park and the CDF headquarters. N6BDE and WB6IIY served as net controls, and the other ARES members furnished communications from the fire camp until CDF could set up their own radio systems, about 12 hours later. (WB6IIY, EC San Luis Obispo County)

☐ Babylon, New York — June 2. Babylon ARES members put forth a superb effort providing communications for a 10K foot race. They stayed at their posts throughout the duration of the race despite a pouring rain, which kept away over two-thirds of the registered racers. (KA2RGI, EC Babylon)

☐ Spokane, Washington — June 16-30. Communications were provided by 27 ARES members for the U.S. Olympic cycling trials. They spent 10 hours a day for 10 days assisting in the time trials and the actual races. Hams rode in the race and in support vehicles, and posted themselves at strategic intersections crucial to the safety of cyclists. (KA7CSP, Inland Empire VHF Club)

☐ Peterborough, Ontario — July 7. Amateur operators were called in to assist in a search for a senior citizen missing from the Fairhaven Home for the Aged in Peterborough. Amateur Radio provided coordination for over 60 members of the search team, which included church groups, the local search and rescue team, police and Citizen's Band operators. After about three hours, the missing man was found, taken to a nearby hospital, and listed in satisfactory condition. (VE3KXB, EC Peterborough)

ARRL SECTION EMERGENCY COORDINATOR REPORTS

For July, 29 SEC reports were received, denoting a total ARES membership of 18,647. Sections reporting were AB, AZ, CO, ENY, IA, IN, KS, ME, MI, MN, MS, MO, NE, NH, NLI, NFL, NTX, OH, ORG, PAC, SV, SJV, SD, SNJ, SFL, TN, VA, WA, WI, WV and WNY.

NATIONAL TRAFFIC SYSTEM

July Reports

1	2	3	4	5	6	7

Cycle Two

Area Nets

EAN	31	868	28.0	.567	88.2
CAN	31	996	32.1	.597	100.0

PAN*	62	705	11.4	.389	100.0	
Region Nets						
1RN	60	485	6.1	.355	97.1	100.0
2RN	59	226	3.8	.218	73.2	96.8
3RN	31	274	6.8	.425	89.5	96.8
4RN	62	535	8.6	.365	75.6	100.0
RN5	62	802	12.9	.418	96.2	100.0
RN6	62	437	7.0	.319	96.8	100.0
RN7	62	413	6.7	.404	89.6	100.0
8RN	62	239	3.9	.319	93.0	83.9
9RN	62	363	5.9	.287	100.0	100.0
TEN	62	697	11.2	.362	67.9	100.0
ECN						51.6
TWN	60	282	4.7	.239	66.1	100.0
TCC						
TCC Eastern	101'	485				
TCC Central	87'	435				
TCC Pacific	104'	457				
Cycle Four						
Area Nets						
EAN	31	1598	51.6	1.243	93.0	
CAN	31	983	31.7	.929	100.0	
PAN	31	952	30.7	.828	94.1	
Region Nets						
1RN	31	868	28.0	.567	58.1	93.6
2RN	93	595	6.4	.483	93.3	83.9
3RN						100.0
4RN						96.8
RN5	62	934	15.1	.707	93.6	100.0
RN6	62	609	9.8	.597	98.8	93.5
RN7	62	485	7.8	.727	92.2	100.0
8RN	61	384	6.3	.369	96.0	83.9
9RN	61	541	8.9	.526	92.7	100.0
TEN	62	440	7.1	.423	72.2	100.0
ECN						100.0
TWN	48	290	6.0	.250	69.4	88.7
TCC						
TCC Eastern	136'	776				
TCC Central	58'	374				
TCC Pacific	117'	634				
Sections²	6483	22,796	3.5			
Summary	7855	41,958	5.3			
Record	10,319	50,268	18.4			

*PAN operates both cycles one and two.
'TTCC functions not counted as net sessions.
²Section and local nets reporting (229): AENB AEND AENX AENZ ATNM WAEN (AL), ATEN HARC (AZ), SWN (AZ/NM), BCEN (BC), NCN NCTN RTTY/V SCN SCN/V (CA), DEPN DTN SEN (DE), BEN CFRN CFRN DEN ENMC FAST FMSN FMTN FPTN GCVTN GN LSTTN NFPN PBTN PEN PRVAN QFN QFNS SEFTN SPARC SVTN SWFTN TPTN VEN (FL), CGVN CSCN GSBN GTFN (GA), I75EN I75MN TLCN (IA), ILN ISN ITN (IL), IRN ITN QIN (IN), CSTN KMWN KPN KSBN KWN QKS QKS-SS (KS), 3ARES 4ARES 7ARES 11ARES BARES CARN KNTN KTN KYN MKPN NKARC PAWN TSTMN WTEN (KY), CITN EM2MN EMRI EMRIPN EMRISS HHTN NEEPN RIEM2MTN (MA/RI), MEPN MMN MTN WRIN (MB), AEN MPSN PTN SGN (ME), MACS MITN MNN QMN UPN (MI), MSN MSPN MSSN PAW (MN), ACAN CMEN HBN IFN JCCC LOZCW LOZFM MEOW MON MOSSB MTTN PHD PTN RRBN SARN (MO), MTN (MS), CNCTN NCEN NCMN PCTN RARS (NC), CN CSN (NC/SC), BRARES BVARES CC2MN EN2MARES MARES MNARES NCHN NCN NE40 NE75 NMPN NNN PARC PV2MN SBARES WNN (NE), GSFM GSPN MCEN NHN (NH), NJM NJN NJPN TCETN (NJ), NSN (NV), BAVTN CDN EPN HVN NYPON NYS NYS/M SCVHFTN SDN (NY), BN BRTN BSSBN COTN HCARES NEON O6MN OSN OSSN WCTN (OH), CARA EATN NWOSN OLZ ONON OPEN TWN QCWA-63 STN (OK), KTN OPN OSN OSN2 OSND TIN (ON), BSN LBLARES OARES OHNN OSN PDXARES PTTN SOFM THN (OR), ATN (PA), PTN (PAC), QSN WQVUARES (PQ), GPD2MN LC2MN SCNTN SCSSBN (SC), BHN SDEN WCEN (SD), TNCN TNPN TNVN TSRN (TN), DFW NET TEX TSN TTN (TX), BUN DCESN UCN (UT), SSN STARES SVEN VLN VN VSBN VSN VTN (VA), VTN (VT), EWTN NTN NWSSBN PSTS WARTS WSN (WA).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

1				
Cycle Two				
TCC Eastern	99	85.3	887	452
TCC Central	93	84.7	969	491
TCC Pacific	97	86.7	785	375
Summary	289	85.6	2641	1318
Cycle Four				
TCC Eastern	155	87.4	1537	776
TCC Central	60	87.6	702	344
TCC Pacific	124	94.4	1263	634
Summary	339	89.8	3502	1754

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (July) — *Cycle Two* — Eastern Area (KA1GBS, Director) — W1AF AA4AT N1BHH WB1BYR KA8CPS KK3F WA2FJJ WD4FTK KA1GBS WB3GZU KO2H KB2HM WD8LRT K8OZ W8PMJ W8QHB W1QYY KB3UD AF8V W2VY N2XJ W1XX WB8YDZ. Central Area (N5AMK, Director) — N5AMK K9AZS N5BT W5CTZ N5DFO KAØEPY NG5G KW9J W4JL WA4JTE W9JUJ K5KJN W5KLV WB9NVN WB5OXE KD5RC K5UPN WF4X WB5YDD. Pacific Area (WØHXB, Director) — NI6A KT6A N7CSP NØCXI KU6D KB7FE W7GHT WØHXB W5JOV KR7L KBØMB KD6ME K6OWA WAØOYI KF7R ND5T NV6T W7TGU K6UYK KO7V WB7WOW. *Cycle Four* — Eastern Area (W2CS, Director) — AA4AT VE3AWE K1BA W3BBN KI3C WA4CCK N3COY W2CS N8CW KA3DTE WB2EAG W1EFW W2FR WD4FTK KA1GBS W2GKZ VE3GOL WB3GZU KB2HM WB9IHH W1ISO K4JST KN1K N4KB AH2M W2MTA W1NJM W8PMJ WB4PNY W3PQ W8QHB W1QYY W2RQ K3RZR KA1T KB3UD WB4UHC W4UQ W2VY VE1WF W2XD N2XJ W1XX N8XX WB8YDZ K4ZK K2ZM W2ZOJ. Central Area (K5GM, Director) — WØAM W9CXY W5GHP K5GM WØHI K5OAF W5RB N5TC W5TFB K5TL KØSU WB9UYU KB9X KV5X. Pacific Area (KN7B, Director) — ADØA KØBN KCØD W7DZX W6EOT W7EP W7GHT N2IC W6INH W5JOV W7LG W7LYA WB7NHR WØOGH ND5T W7VSE W6VZT KM7Z VE7ZK.

Public Service Honor Roll
July 1984

This listing is available to amateurs whose public service performance during the month indicated qualifies for 50 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max. 30; (2) Checking into phone/RTTY nets, 1 point each, max. 30; (3) NCS CW nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned NTS liaison, 3 points each, max. 12; (6) Delivering a formal message to a third party, 1 point each, no max.; (7) Handling an emergency message, 5 points each, no max.; (8) Serving as emergency coordinator or net manager for the entire month, 5 points, max. 5; (9) Participating in a public service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that are listed in the Public Service Honor Roll for 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from Hq.

319
K7VW
208
K5CXP
147
KA3DLY
KJ3E
142
K4SCL
140
KC9CJ
138
W9FZW
137
WA4QXT
130
K4ZK
128
KAØEPY
127
WD8MIO
124
WB7WOW
120
WB4WYG
KA1KML
KA1EXJ
119
KB2HM
N4GHI
K6UYK
118
AL7W
WF4X
117
KA8GJV
116
WØOYH
W7VSE
N8FCQ
114
WF4Y
WD9FRI
W2MTA
113
WA2KOJ
K8KQJ
112
KA1GBS
WB1GXZ
111
WA2FJJ
110
K4KDJ
NC1PX
WB6QBZ
KA9RHN
109
W3YVQ
VE7BNI
KC4VK
AE1T
108
KØGP
107
W2VY
W6RNL
KAØARP
WA4CCK
106
KA4BCM
105
W9JUJ
W1KK
WD4JDH
W9YCV
KB4WT
104
W4ANK
KD7ME
WØFRC
KØSI
103
KW9J
KT5Y
K7GXZ
WB2OWO
102
KC2TF
AF3S
VE3BDM
101
W6VOM
KB7FE
KZ8Q
WA4PFK
KB4OZ
KC3LY
100
W1PUO
WB1GLH
AA4AT
WX4J
WB1HIH
KC2ZO
99
WØKK
KA8NCR
KA2BHR
N9BDL
98
N5AMK
WA2ERT
AE5I
KT6D
K4VWK
K9TI
97
N4PL
WB2VUK
KA6BNW
96
WB6TIF
KD1R
W5CTZ
95
K8ND
K2ZVI
KK1A
WA4LXP
WB2MCO
WB6TED
K6TWJ
WB2UVB
94
AK1W
KØCY
93
KBØZ
WD4ALY
KA4AMC
W2PKY
92
WØIKT
WB4YQP
WX4I
WD8RCU
KV5X
AG9G
K3JL
W9DM
91
N6AWH
WB4WII
KD5FR
90
KA4SAA
N3COY
W4CKS
AG2R
KK1E
89
WB4GHU
VE3DPO
N7CSP
KAØBWM
N1BJW
NI6A
88
W7GHT
KDØJM
KA2MYJ
KD8KY
87
WB6DOB
ND2S
KA1GWE
W2BIW
KA9OBP
NØEVC
NDØN
86
KA5LQA
WAØTFC
N8AEH
W6INH
WB4HRR
VE3WM
85
KL7IJG
84
NØDZA
WØOHB
WA4EIC
W9QBH
N1ARI
KA4MTX
KA4GUS
KE5PP
83
W8UE
K4ZN
W2AET
82
K6TP
K4NLK
K5OAF
81
N5TC
AK2E
KC3Y
WD8OUO
W1EOF
WB7OEX
WB2IDS
80
KF8J
K4JST
WDØBOX
KI5P
KA4EYF
KAØGOA
79
KAØODQ
KR4V
WB2RBA
KT6A
KC3AV
77
KAØJQG
N1AJJ
KA8PQH
WB5MMI
WA8HGH
N2XJ
K2ZM
KX7W
KD9K
76
W5KLV
K6UXO
KA1EPO
W1RWG
N8EVC
75
KY8Q
K1CB
W7JMH
74
WA1DXT
W9NXG
73
NT4S
N5BT
N7BGW
W4LXB
KB4LB
WB5YDD
72
KT1Q
WA4EYU
WDØDOK
K3NNI
WA1YNZ
KB9LT
71
NCØR
N2BGP
N1BGW
K6APW
70
KA1T
WB6RTE
N6CVF
WD9DNQ
W1TN
69
KA4BBA
WB4TZR
KV8O
WA6ZUD
68
WB2GHN
K2VX
VE2EDO
VE3KK
WB8MTD
K1ABO
67
WA8GMT
WA3UNX
KA2DQA
W6NTN
N5EZM
W7LG
KI1M
66
AIØO
WD4OCW
VE3GT
NEØP
65
W4FMZ
WA4JTE
W6IPL
KØPCK
KA9FFO
WD4KBW
64
KB4GPN
W4ESH
N4EDH
N5DFO
KR7L
VE3GOL
WØOUD
W1AF
WD5GKH
KA4SKV
WD4PBF
K8JDI
63
VE2FMQ
WA4RAJ
KAØJZF
WA6QCA
62
WØLAE
KU2N
KA9EWN
KB3FW
KG2D
WB5LBR
KX7T
W2GJ
WDØAIT
KA1KVI
WA4RNP
61
K8VOY
WB2PID
WD4BSC
N7FXM
W9DBO
W9IEM
KA1EGE
W3DKX
60
K7OVK
K2YQK
WD8EIB
WB4HBP
WA8MAZ
W4ZJY
WB2KCR
58
N1BY6/T
KA2OPG/T
52
WB8NHV/T
51
KA5SPO/T
50
KA1HPO/T
47
KA6HJK/T
46
WB2ANK/T
44
N2EQM/T

Brass Pounders League
July 1984

The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SM a message total of 500 or a sum or originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL form.

1	2	3	4	5	6
W3CUL	742	976	1517	121	3356
NØBQP	36	1745	179	1050	3010
KA9CPA	44	1303	150	925	2422
WA6HJZ	0	825	31	483	1349
W9JUJ	4	519	515	4	1042
KA1GBS	3	529	434	11	976
W3VR	301	212	331	26	870
WA4JDH	1	388	340	4	733
KØJAN	0	420	31	216	667
K6UYK	28	302	284	30	644
N4GHI	52	268	271	24	615
AA4AT	37	263	293	4	597
N4PL	70	215	263	43	591
KAØJQG	264	24	276	8	576
KT6A	4	312	246	7	569
KA1KML	21	236	277	19	553
N5AMK	1	257	286	2	546
W1EOF	1	198	330	3	532
W7VSE	2	291	230	5	528
KB2HM	9	269	230	18	526
WF4X	6	237	256	22	521
WAØAUX	24	192	291	1	508
WB5YDD	0	289	203	14	506
W5GHP	11	19	469	6	505
KØCY	32	222	190	57	501
K6UYK (June)	42	301	267	13	643
Multioperator station:					
W1PUO	3	425	461	4	893

BPL for 100 or more originations plus deliveries:

WØFIR	158
W1FYR	143
K5CXP	122
NFØN	108
WB2UVB	107
NØSM	100

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DLVD.
6 — TOTAL

Independent Nets (July 1984)

1	2	3	4
Amateur Radio Telegraph Society	31	404	242
Central Gulf Coast Hurricane	31	115	2135
Empire Slow Speed	30	65	417
Hit and Bounce Traffic	31	404	548
IMRA	26	661	1397
Midwest RTTY	31	141	188
Mission Trail	29	106	908
New England Novice	31	199	269
Southwest Traffic	31	108	1214
West Coast Slow Speed	31	95	474
75-Meter ISSB	31	230	729
7290 Traffic	48	515	2757

1 — NET NAME
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By
Edith Holsopple,* N1CZC

OCTOBER

2

West Coast Qualifying Run, 10-35 WPM, at 0400Z Oct. 3 (9 P.M. PDT Oct. 2). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3590/7090 kHz. Underline one minute of the highest speed you copied, certify your copy was made without aid and send to ARRL for grading. Please include your full name, call sign (if any) and complete mailing address. A large s.a.s.e. will help expedite your award/endorsement.

6-7

ARRL QSO Party, CW, September *QST,* page 78.

Worldwide SSTV Contest, September *QST,* page 78.

VK/ZL/Oceania Contest, phone, September *QST,* page 78.

California QSO Party, sponsored by the Northern California Contest Club, from 1600Z Oct. 6 until 2159Z Oct. 7. Single ops may operate only 24 hours. Off-times must be at least 15 minutes long and noted in the log. Work stations once per band and mode. CW QSOs in the CW subbands only. No repeater or MCW QSOs. CA stations may be reworked as they change counties. Exchange serial number and QTH (county for CA stations; state, province or country for others). Suggested frequencies: CW — 1.805 and 60 kHz up from low end; phone — 1.815 3.895 7.230 14.280 21.365 28.560; Novice — 25 kHz up from lower end. Try CW on the half hour and 160 meters at 0500Z. Count 2 points per phone QSO and 3 points per CW QSO. CA stations multiply by total number of states and VE call areas (max. 58) worked. Others multiply total CA counties (max. 58) worked. Mail entry by November 10 (include large s.a.s.e. for results) to Alan Brubaker, K6XO, 3675 El Grande Dr., San Jose, CA 95132.

10

W1AW Qualifying Run, 10-40 WPM, at 0200Z Oct. 11 (10 P.M. Oct. 10, EDT). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Oct. 2 listing for more details.

13-14

ARRL QSO Party, phone, September *QST,* page 78.

VK/ZL/Oceania Contest, CW, September *QST,* page 77.

Maryland-District of Columbia QSO Party, September *QST,* page 77.

Pennsylvania QSO Party, September *QST,* page 77.

GARTG-RTTY Contest, September *QST,* page 78.

Columbus Day DX Contest, September *QST,* page 78.

Oregon QSO Party, September *QST,* page 78.

Fall QRP QSO Contest, September *QST,* page 78.

Rhode Island QSO Party, September *QST,* page 78.

14

21/28 MHz Telephony Contest, September *QST,* page 78.

17-18

YL Anniversary Party, CW, sponsored by the YLRL, from 1800Z Oct. 17 until 1800Z Oct. 18 (phone contest will be 1800Z Oct. 31 until 1800Z Nov. 1). YLs work YLs only. No crossband, net or repeater QSOs. Work stations once per contest. Exchange serial number, signal report and ARRL Section or country. Count one point per QSO with stations located in an ARRL Section, 2 points per DX QSO. DX YLs count 2 points for all QSOs. Multiply QSO points by number of different ARRL Sections and DX countries worked for final score. Entrants running less than 150 W on CW or 300 W on phone may multiply score by 1.25. Send separate entries for phone and CW contests by Nov. 12 (must be received by Dec. 10) to Marty Silver, NY4H, 3118 Eton Rd., Raleigh, NC 27608.

20-21

Simulated Emergency Test, September *QST,* page 67.

ARRL International EME Competition, Part 2, September *QST,* page 69.

Worked All Y-2 Contest, sponsored by RKDDR (East Germany), from 1500Z Oct. 20 until 1500Z Oct. 21. (These are last year's rules; nothing has been received this year.) Phone and CW, single or multioperator. 80-10 meters. Do not use first 10 or last 25 kHz of each band. Exchange signal report and serial number. Y2-9 stations will send signal report and two-digit number representing "Kreiskenner." Count 3 points per Y-QSO. Multiply by sum of different districts worked per band (max. 15 per band). Districts are indicated by last letter of call sign (letters A through O; P = D, X = F, R = L, S = M, T = N, U = A, G = W, V = H, Q = I, Y = J. Mail logs within 30 days to Y2ITL, RKDDR, Hosemannstr. 14, DDR 1055 Berlin, German Democratic Rep.

Jamboree On The Air, sponsored by the World Scout Bureau and Boy Scouts of America, for the 48-hour period (local time) of Oct. 20-Oct. 21. Everyone work Scouts; Scouts work everyone, including other Scouts. The exchange is informal. Suggested frequencies are: CW — 3.590 7.030 14.070 21.140 28.190; phone — 3.940 7.290 14.290 21.360 28.990; RTTY; and SSTV. Send activity reports, number of participants, interesting incidents and photographs (logs are unnecessary) to W2GND, 216 Maxwell Ave., Hightstown, NJ 08520. Participation certificates are available via Jamboree On The Air, 1325 Walnut Hill, Irving, TX 75062.

20-22

RTTY DX Maple Leaf Sweepstakes, sponsored by the Canadian AR Teletype Group, from 0200Z Oct. 20 until 0200Z Oct. 22. Single-ops operate 30 hours max. Multiops may use the entire period. 3.5, 7, 14, 21 and 28 MHz only. Single-op, multiop-single transmitter and SWL categories. Exchange signal report, UTC and CARTG zone. Count two points for QSOs with your own zone. QSOs with other zones are awarded point values based on the CARTG zone chart (available from sponsor for s.a.s.e.). Multipliers are DXCC countries plus W/K, VE/VO and VK call districts. Stations may be worked on each band for QSO points, but only once for multiplier credit. Final score equals exchange points × multipliers × continents worked (max. 6). Add 200 bonus points to final score for each VE QSO. Mail logs by Jan. 1, 1985 to CARTG, 85 Fifeshire Rd., Willowdale, ON M2L 2G9, Canada.

21 MHz Contest, sponsored by the Radio Society of Great Britain, from 0700Z to 1900Z Oct. 21. 21 MHz, CW only. Approximately 21.075 to 21.125 MHz. Single-op and single-op QRP (10-W max. input) categories. Exchange signal report and serial number starting with 001. Work British Isle stations only (G, GD, GI, GJ, GM, GU, GW); contacts with GB stations do not count. Count 3 points per QSO. Multiply by total number of different British Isle prefixes worked. Mail entries to be received by Dec. 31 to R. A. Treacher, 79 Granby Rd., Eltham, London SE9 1EH, England.

World-wide DX Sprint Contest, sponsored by the Red River DX Assn., from 1200Z until 2400Z Oct. 21. Single op only, on all HF phone bands. Exchange signal report and serial number starting with 001. Count one point per QSO and multiply by the number of DXCC countries worked. Awards. Send logs to RRDXA Sprint Scoring Committee, Red River DX Assn., P.O. Box 54, Wichita Falls, TX 76307.

27-28

CQ World-Wide DX Contest, phone, sponsored by *CQ,* from 0000Z Oct. 27 until 2400Z Oct. 28 (CW contest 0000Z Nov. 24 until 2400Z Nov. 25). 1.8 through 28 MHz. Entry classes: single op, all bands; Single op, single band; single op, QRP; multiop, single transmitter; multiop, multi transmitter. QRP is defined as 5-W output or less. Multi-single: Only one transmitter and one band permitted during a 10-minute period. Exception: one (and only one) other band may be used during the same 10-minute period if (and only if) the station worked is a new multiplier. Stations found in violation of the 10-minute rule will be reclassified as multi-multi. Multi-multi stations are allowed one signal per band maximum. All transmitters must be located within a 500-meter-diameter circle, or within the limits of the licensee's address property, whichever is greater. All antennas must be physically connected to the transmitters by wires. Exchange signal report and CQ zone number. A station in a different zone or country than indicated by its call sign must sign portable. QSOs between stations on different continents count 3 points. QSOs between stations on the same continent but in different countries count 1 point. Exception: QSOs between North American stations in different countries count 2 points. QSOs with your own country count for multiplier credit, but not for QSO points. Multipliers: Count one multiplier for each different CQ zone worked per band (max. 40 per band). Count one multiplier for each different country worked per band (DXCC and WAE lists). Multiply QSO points from all bands operated by multipliers (zones plus countries) from all bands operated for final score. Single band logs eligible for single-band awards only. Single ops must operate at least 12 hours (multiops, 24 hours) to be eligible for awards. Dupe sheets required for any band with more than 200 QSOs. Entry forms are available from the sponsor for an s.a.s.e., and all entrants are encouraged to send for a set. Each dupe removed by the CQ Contest Committee also carries a 3-QSO penalty. Phone logs must be postmarked by Dec. 1, 1984, and CW logs must be postmarked by Jan. 15, 1985. Mail phone logs to Larry Brockman, N6AR, 7164 Rock Ridge Terr., Canoga Park, CA 91307. CW logs go to Bob Cox, K3EST, 6548 Spring Valley Dr., Alexandria, VA 22312. Logs may also be sent to *CQ* Magazine, 76 North Broadway, Hicksville, NY 11801.

28

W1AW Qualifying Run, 10-35 WPM, at 2400Z (7 P.M. EST) Oct. 28. See Oct. 10 listing for more details.

High Speed Code Test, sponsored by W1NJM and Conn. Wireless Assn. Five minutes of plain English text will be sent at 40, 45, 50, 55 and 60 WPM, in that order. Copy one minute solid of any of the five transmissions for certification. W1NJM and K6DYX will transmit simultaneously on 3636/7085 and 3325/7025, respectively, starting at 0120Z (Oct. 29). For further details, copy the semi-weekly announcement from W1NJM on 3636/7085 kHz, starting at 0130Z Mondays and Thursdays (Sunday and Wednesday evening local time). Each announcement is followed by an hour of high-speed practice.

31

West Coast Qualifying Run, 10-35 WPM, at 0500Z Nov. 1 (9 P.M. PST Oct. 31). See Oct. 2 listing for more details.

31-Nov. 1

YL Anniversary Party, phone. See Sept. 17-18 listing.

NOVEMBER

3-4

ARRL November Sweepstakes, CW, this issue, page 77.

8

W1AW Qualifying Run, 10-35 WPM, at 0300Z Nov. 9 (10 P.M. EST, Nov. 8). See Oct. 10 listing for more details.

10

Manitoba QSO Party, sponsored by the Winnipeg ARC, from 0000Z to 2359Z Nov. 10. Work as many VE4s as you can. Work stations once per band (160-10 meters including OSCAR 10, RS satellites and EME). Satellite QSOs count as a separate band. VE4s count one point per QSO and multiply by states, provinces and DXCC countries per band. Others count 5 points per VE4 QSO and multiply total number of VE4s worked per band. Exchange signal report and state, province or country. VE4s exchange signal report and serial number starting with 001. Awards. Mail logs by Dec. 25 to Kelly Taylor, VE4ALO, 31 Doubleday Dr., Winnipeg, MB R2P 0P3, Canada.

ALARA Contest, sponsored by the Australian Ladies' ARA, from 0001Z until 2359Z Nov. 10. YLs work everyone; OMs work YLs only. Phone and CW count as separate bands, 80-10 meters. No net, list or crossmode operations permitted. Exchange RS(T), serial number starting with 001, ALARA membership status (if a member) and name. Suggested approximate frequencies: CW — 3.525 7.010 14.050 21.100 28.100; phone — 3.570 7.100 14.280 14.180 21.350 21.180

*Communications Assistant, ARRL

28.480. Count 5 points for each QSO with an ALARA member, 4 points for each YL nonmember and three points for each OM QSO. Double all CW QSO points. Awards. Mail logs to be received by Dec. 31 to Margaret Loft, VK3DML, 28 Lawrence St., Castlemaine, Victoria, Australia, 3450.

10-11

Delaware QSO Party, sponsored by the Delaware ARC, from 1700Z Nov. 10 until 2300Z Nov. 11. Work stations once per band and mode. Exchange serial number, signal report and QTH (county for DE stations; ARRL Section or country for others). Suggested frequencies: CW — 1.805 3.570 7.070 14.070 21.070 28.070; phone — 1.815 3.975 7.275 14.325 21.425 28.650; Novice — 3.720 7.120 21.120 28.120. DE stations count one point per QSO. Multiplier is total ARRL Sections and DX countries worked. Others count 5 points per DE QSO. Multiplier is total DE counties worked per band and mode (36 multipliers max.). Mail logs by Dec. 17 to Charlie Sculley, AE3H, 103 E. Van Buren Ave., New Castle, DE 19720.

European DX Contest, RTTY, sponsored by the Deutscher ARC, from 0000Z Nov. 10 until 2400Z Nov. 11. Work stations once per band; 3.5, 7, 14, 21 and 28 MHz only. Entry classes: single op, all band and multiop, 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 ops 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 one point per QSO and one point per QTC (explained later). Europeans use the ARRL countries list. In addition, each call area in the following countries will be considered as a multiplier: JA, PY, VE, VO, VK, ZL, ZS, UA9/0. Each W/K state will be considered a multiplier, but not W/K call areas. Contacts between all continents and also one's own continent are permitted. Multipliers will be counted according to the European and ARRL countries list. QSO as well as QTC-traffic with one's own country (district or state) is not allowed. Multiply by number of EU countries worked per band (DXCC list, plus GM-Shetland, IT, UN1 and W/VE states). 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 once, and not back to the originating station. A maximum of 10 QTCs to the same station are 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. Deadline — Dec. 15. Mail to WAEDC Committee, P.O. Box 1328, D-895 Kaufbeuren, Fed. Republic of Germany.

10-13

Montana QSO Party, sponsored by the Yellowstone RC of Billings, from 1700Z Nov. 10 until 0400Z Nov. 11 and from 1700Z Nov. 11 until 0100Z Nov. 12. Work stations once per band and mode. MT-to-MT QSOs allowed. Work portables/mobiles again as they change county. No repeater QSOs. Exchange signal report, serial number and QTH (county for MT stations; state or country for others). Suggested frequencies: CW — 1.810 3.540 7.035 14.035 21.035 28.035; phone — 1.835 3.905 7.285 14.285 21.385 28.585. Count one point for phone QSOs and two points for CW QSOs. For the final score: MT stations multiply total QSO points by the number of states, countries, provinces and MT counties. Others multiply total QSO points by number of MT counties worked (max. 56). Mail logs by Dec. 15 to Yellowstone RC, 2626 Burlington, Billings, MT 59102.

17-18

VK vs. the World, QRP

ARRL Sweepstakes, phone, see page 77, this issue.

19

W1AW Qualifying Run

In Training

Conducted By John Foss, W7KQW

MORE HELP FOR INSTRUCTORS

The slight recent drop in the amateur population can be explained easily by the change in examination procedures. So drastic a change in testing was certain to have such short-term effects. A seasonal factor's operating, too: Not many ham classes are conducted during the summer months. The total number of licensed hams will rise again before Christmas, won't it?

Probably. Still, over the past year Amateur Radio has received much favorable publicity (Grenada, for instance). Thus, one would think that, even considering the factors mentioned above, the total amateur population should be increasing instead of decreasing. Why isn't it?

That question simply won't go away. No, we're not seeing a *startling* drop in the number of hams. No, it isn't too hard to find a ham class, an Elmer, a Volunteer-Examiner session. No, the code isn't *that* hard to learn, no matter what you might have heard to the contrary. No, there's no lack of opportunity in ham radio to learn — and do — something new. None of these are the real reasons why more Americans (and Canadians) don't become hams.

We don't presume to answer that big question — definitively or even temporarily. But several factors are obvious: (1) We must alert the entire population to the fun, personal challenge and opportunity for service that Amateur Radio offers; (2) we must provide instruction in regulations, code and theory so that potential hams can pass their Amateur examinations and become top-notch operators; (3) we must make this instruction both competent and interesting so that students don't drop out of the program, either before or after they obtain their first licenses; (4) we must make the federal examinations readily available (the Volunteer Examining program, conducted by several FCC-certified Volunteer Examiner Coordinators); (5) we must help new hams choose the most appropriate equipment for their particular interests and budgets, and help them build and install it properly; and (6) we must stay with the new hams until they are comfortable operating on the air. Then, we must encourage them to upgrade their licenses, not only to gain more operating privileges, but also to become increasingly competent operators. Always looming over the horizon is the specter of disaster — local, national or international — which will demand every bit of competence and experience hams have to offer.

These requirements, of course, are more easily mentioned than implemented. Your League is involved in the fulfillment of all of them. Steve Ewald, the training staff, Steve Place, and I are especially involved in number three.

Our intention is to expand your League's training program. A synopsis of all the facets of this expansion would require more space than can be devoted to this column in one issue of *QST*. From time to time, therefore, we'll tell you about some of the new elements we're adding to our existing program. This month, we'll talk about the expansion of the *License Manual* from one volume to four, and the instructional program the change represents.

Many of you already have seen the League's *FCC Rule Book*. It contains, verbatim, Part 97 of the FCC Rules (the section pertaining to Amateur Radio) and a clear explanation and thorough discussion of these rules. This book is frequently revised to keep you abreast of the rule changes affecting Amateur Radio. It is crucial to a knowledge of where ham radio is today and how it fits into the big picture of international communications.

The fourth edition of *Tune in the World* includes an 8½- × 11-inch book on theory and regulations and a tape cassette containing code instruction. Intended as a textbook for Novice classes, TITW also can be used for independent study. For most students, it and the *FCC Rule Book* will be sufficient as study guides at that level. Other aids are available, of course, such as the *ARRL Handbook* (extensively revised and expanded to more than 1000 pages for 1985), the *ARRL Antenna Book*, *Understanding Amateur Radio* and many other excellent publications, including several published by vendors other than your League. Still, most students will be able to pass their Novice examinations without owning or even borrowing a copy of any of these other books.

For theory instruction for candidates for the Technician and the General class licenses, we'll have a new *Technician/General License Manual*, the same size (8½ × 5½ inches) as the *FCC Rule Book*. This will contain a complete course in the theory required to pass the Technician/General examination.

We are preparing a similar *License Manual* for candidates for the Advanced class license and another for candidates for the Extra Class license. Each will be the same size as the *FCC Rule Book*, although the number of pages in each manual will depend on the amount of material necessary to cover the subject. Each manual will contain the FCC syllabus, the questions presently in the FCC question pool (in multiple-choice format) for that level of license and a discussion of the theory involved in answering properly all the questions in the pool. (The rules are in the *FCC Rule Book*, of course, and will not be duplicated in the *License Manuals.*)

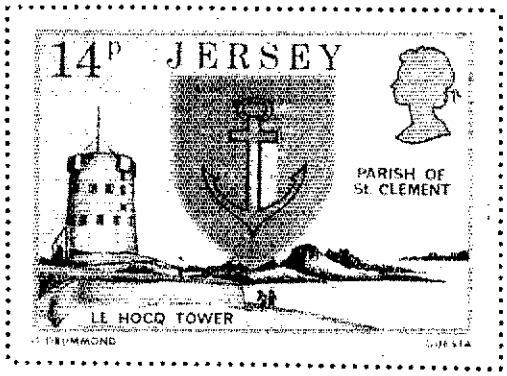
Also available will be four different instructor's guides — one for the Novice course, one for the Technician/General course, one for the Advanced course and one for the Extra course. Each will be keyed to the appropriate *License Manual* by reference to the page numbers in the manual where the material is discussed. Each lists in the left-hand column on each page the subject under discussion and the class time suggested for that subject. In the right-hand column are suggestions to the instructors for the teaching of that material. Each instructor's guide will be about 40 printed pages, 8½ × 11 inches.

Except for those in the *Novice-Class Instructor's Guide*, suggestions for teaching the code are extremely brief. Such instructions are published separately by the League. Many of you already have this material. Cassette tapes at all relevant speeds are available, not only from ARRL but also from others. Most improvement in code speed must come from practice at home, not in class, once the code has been learned well enough to permit passing the 5-WPM test.

Your League also is about to test a new internship program for training instructors at all levels, Novice through Extra. A pilot program began in Newington in September 1984, with plans to expand it to selected areas of Canada and the United States in 1985.

The goal of these new and expanded programs is to make the teaching of Amateur Radio classes easier for instructors, more interesting for students and more successful for all. We want to make sure students learn and understand the necessary material (as opposed to memorizing a collection of facts). The key to success is competent instruction in the classroom. Helping instructors to offer their students the best possible instruction is the purpose of our efforts. Your comments, criticisms, suggestions and League membership are eagerly sought and most welcome. Drop us a line at your League Headquarters in Newington.

Results, 1984 ARRL International DX Contest



By Mike Kaczynski,* W1OD and Edith Holsopple,** N1CZC

It's been said that when the going gets tough, the tough get going. This year's ARRL International DX Contest proved the adage true: Despite declining solar activity, competition was as fierce as ever, with several titles decided by as little as a kilopoint. In fact, scores were generally higher this year.

For the second year in a row, the number of logs submitted dipped below 3000 — 2909 logs were received from the Feb. 18-19 and March 3-4 weekends, compared to last year's 2942. Not too shabby, considering that we're on the down side of the solar cycle.

W/VE Highlights

This year, the W/VE single-op phone plaque was hotly pursued by several New Englanders. When the smoke cleared, Jeff, K1ZM at W1ZM was at the top of the pile, defeating number 2 K1KI (remember him?) by only 37 k. Two other operators also broke the 2-megapoint barrier during the hunt: K1s DG and RX. While single-op stations in the northeast occupied the top four phone slots, the top ten was rounded out by five non-W1s. N2LT and KM6B managed to make it to the top ten for the second time in a row — good show!

The results on the low end (CW) were more one-sided: only three non-northeasterners made the list: N4AR (for the second time in a row), KØRF and W9RE. K1AR copped the top position with just under 1.95 M, beating KC1F by 43 k. Can the 2-meg plateau be topped on CW? Only time will tell.

Last year's top-tenner N8II went low power (200-W class) this year, and beat out dual mode runner-up W2TZ for top CW honors. On phone, WA4PFN/2 scored 397 k, topping 'TZ by 6 k. K4JRB made the low power top five this year while running only 10 watts! AA2Z's 265 k phone effort earned him the number two QRP spot. K3WS proved to be the most versatile operator in the QRP ranks, earning a first-place finish on CW and a fourth on phone.

Old Sol's doldrums didn't hamper the multi-op efforts of KN3O and crew. Ken's group graced the unlimited category on phone, taking the event by storm, with a 1.3-meg victory over second place W3LPL. On code it was still KN3O, but *only* by a mere 700 k over . . . you guessed it, W3LPL. Ken is moving to the west coast soon — I wonder what club in the San Francisco area will get his scores next year.

In the two-transmitter category, the competition was close. On CW, K1RX was on top, by a 286 kilopoint margin over WA8YVR. The point spread was even closer on phone, where "King Fred" (K2TR) and crew topped W4QAW by only 119 k. Outstanding efforts by W3GM's team on both modes placed them in the top five on both modes — awesome!

Multi-single CW action was dominated by the team of K1ZZ and K1TO, who broke the 2-meg barrier to edge out W3BGN by a narrow margin. K2BU won phone honors, scoring 2.96 M, to finish 800 k ahead of K3LR.

Low-band phone activity was at an all-time high, evidenced by VE1YX quadrupling his last year's number-one score on 160 meters. W1FC was busy racking up 65 k on 80 meters for the plaque. Other single band winners that turned in outstanding efforts were K8NN/9 (40 meters), K1UO (20 meters) and WØZV (15 meters). WA6DBC braved the 10-meter band, finishing a whisker ahead of NO4J.

1985 ARRL International DX Contest

CW	Phone
February 16-17	March 2-3

The MUF increased during the CW weekend, and so did high-band scores. K3UA took 20 meters with 301 k, while WB4TDH topped 15 with 169 k. In the close 10-meter race, Jack, W1WEF, was on top, with a 1 k over W4NL.

DX Highlights

On the DX side, North and South American stations dominated the top spots. VK2WU and 3D2DX (VE5RA) battled the odds and managed to break into the top ten on phone. 'WU finished number 8 with 2.45 M, while 'DX placed number 10 with 2.18 M. ZF2FL (N6RJ) again topped the list with 7.02 M, with HH2CQ almost 1 million points behind. HR1DAP (K8CC) morsed his way to the top of the CW top ten, followed closely by VP2KBZ (VE3KZ). P42J (W1BIH) was the most consistent operator this year, finishing number 3 on both modes to earn the plaque for total QSOs.

One call says it all this year in the multioperator unlimited class, *XE2FU*. The Texas DX Society vacated the Lone Star state and ran away with the multi-multi plaque — to the tune of 14.3 million points on phone and a little over 8 meg on CW. Good show, guys (see

JA7FWR placed second in Asia in the all-band category.

Veteran contester K3SA did it again to place first on CW from the MDC Section. It looks like Steve is bringing his son up right.

*Assistant Communications Manager, ARRL
**Communications Assistant, ARRL

DX Plaque Winners

Phone

Category

Single Operator	*Winner*	*Donor*
World	ZF2FL	North Jersey DX Assn.
Africa	TU7J	John M. Shinall, K4BYK
Asia	JA1ELY	Acadiana DX Assn.
Europe	OK1DWA	Murphy's Marauders
North America	ZF2FL	Chod Harris, VP2ML
Oceania	VK2WU	Doc, N7AVK and DX Intl. Soc.
South America	P42J	Carl L. Smith, WØBWJ
1.8 MHz	AH6BK	W8FR — Frederick C. Race CPO USN
3.5 MHz	HI8LC	Rogert Peterson, W3YY
7 MHz	JA2BAY	Central Arizona DX Assn.
14 MHz	KP4EQF	Don C. Wallace, W6AM
21 MHz	CT2FH	W3KLG, Albert Snyder Memorial
28 MHz	HC1HC	Mike Badolato, W5MYA
QRP	OK3CGP	Gerald Griffin M.D., W8MEP

Multioperator, Single Transmitter

World	ZF2HM	Gloucester County ARC
Africa	EA9AM	David Vogel, NL7P
Asia	JA1YCL	Grand Mesa Contesters
Europe	F3TV	Metro DX Club
North America	ZF2HM	Nick G. Lash, K9KLR
Oceania	H44R	Carl L. Smith, WØBWJ
South America	KC2GE/PJ3	Carl L. Smith, WØBWJ

Multioperator, Two Transmitter

World	K9GL/VP2V	John Olsen, K1NG and Rick Davenport, KI1G
Asia	JH7YJF	ARRL
Europe	I5NPH	Tom & Joy Middleton, WB4CKY
North America	K9GL/VP2V	ARRL

Multioperator, Unlimited

World	XE2FU	Gloucester County ARC
North America	XE2FU	Willamette Valley DX Club

DX Plaque Winners

CW

Single Operator	*Winner*	*Donor*
World	HR1DAP	North Jersey DX Assn.
Africa	9U5JB	San Diego DX Club
Asia	JI1QPU	Alamo DX Amigos
Europe	4U1ITU	Clarke Greene, K1JX
North America	HR1DAP	W4KFC Memorial — PVRC
Oceania	ZL8AJW	Tom Morton, KT6V
South America	P42J	E. Eugene Davis, Jr. W8NMA Memorial
1.8 MHz	YV1OB	Jim Dionne, K1MEM and Bill Poetlmitz, K1MM
3.5 MHz	W9NXD/HR2	Mad River Radio Club
7 MHz	4M7QP	Kansas DX Association
14 MHz	KP4EQF	Bencher, Inc.
21 MHz	YT3L	Southern New England DX Assn.
28 MHz	HC1HC	ARRL
QRP	K7SS/KH6	Rochester DX Club Marlis Cartwright

Multioperator, Single Transmitter

World	N5RM/C6A	John Brosnahan, WØUN and George Schultz, WØUA
Asia	JA7YFB	ARRL
Europe	F3TV	Mile Hi DX Assn.
North America	N5RM/C6A	Tom Taormina, K5RC
Oceania	AH6AZ	Thomas Scott Walton
South America	W6QL/ZP5	ARRL

Multioperator, Two Transmitter

World	HH2B	Tom Frenaye, K1KI
Asia	JA9YBA	ARRL
North America	HH2B	ARRL

Multioperator, Unlimited

World	XE2FU	H. Stephen Miller, N0SM
Asia	JA7YAA	Martha D. and Charles J. Ellis
Europe	LZ2KTS	W2PV James Lawson Memorial Schenectady ARA
North America	XE2FU	Willamette Valley DX Club

United States and Canadian Plaque Winners

Phone

Single Operator	*Winner*	*Donor*
All Band	W1ZM	Jim Rafferty, N6RJ/ZF2FL
1.8 MHz	VE1YX	Butch Greve, W9EWC Memorial Plaque
3.5 MHz	W1FC	Lance Johnson Engineering
7 MHz	K8NN/9	Dave Thompson, K4JRB/K5MDX
14 MHz	K1UO	Mark Michel, W9OP and Richard Loehning, N9ACP
21 MHz	W6ZV	John Allyn, W7XR
28 MHz	WA6DBC	Frank Wolk, N5FW
QRP	K4JRB	Rochester DX Club — KZ2E

Multioperator

Single Transmitter	K2BU	Jeff Maass, K8ND
Two Transmitter	K2TR	George Taft, W8UVZ
Unlimited	KN3O	Buffalo Area DX Club — W2RR

CW

Single Operator	*Winner*	*Donor*
All Band	K1AR	John C. Kanode, N4MM (W4KFC Memorial)
1.8 MHz	W1RR	W1TX Memorial Trophy
3.5 MHz	W1FV	Northern Illinois DX Assn.
7 MHz	W2YV (KQ2M)	ARRL
14 MHz	K3UA	Neenah-Menasha ARC
21 MHz	WB4TDH	Carl Luetzelschwab, K9LA
28 MHz	W1WEF	Mike Badolato, W5MYA
QRP	K3WS	Hollywood ARC, Inc.

Multioperator

Single Transmitter	W3BGN	Jeff Maass, K8ND
Two Transmitter	W3GM	George Taft, W8UVZ
Unlimited	KN3O	Colorado Contest Conspiracy

Special Plaque Winners

Single Operator	*Winner*	*Donor*
W/VE High Combined Total Multiplier (both modes)	K1DG	The DX Bulletin
W/VE Operator Combined Score	W1ZM (K1ZM)	National Contest Journal
W/VE Low Power (phone)	WA4PFN/2	Rochester DX Assn.
Great Lakes Division (CW)	N4AR	Livonia ARC
Great Lakes Division (phone)	W8UA	Livonia ARC
California (phone)	KM6B	Dave Bell, W6AQ
Texas (phone)	K5DX	North Texas Contest Club
Caribbean Resident (phone)	HH2CQ	Arturo Gigante, HI8GB
Japan (CW)	JI1QPU	Randy Thompson, K5ZD and Tom Morrison, K5TM
Japan (phone)	JA1ELY	Western Washington DX Club
Israel (CW)	4X6FR	Martin Hart, N6WW
Israel (phone)	4X6IF	Martin Hart, N6WW
World All Band Total CW + SSB QSOs	P42J	Edward C. Tletz, W5OSH and Danny Weil, ex-VP2VB
Zero Call Area (CW)	KØRF	Eastern Iowa DX Assn.
USSR — All Band (CW)	UAØBBN	10 Sponsors
USSR — All Band (phone)	UWØMF	10 Sponsors
Fifth Call Area (CW)	N5AW	Red Stick DX Assn.

Multioperator

Caribbean Multi-Single (CW)	N5RM/C6A	The YASME Foundation
Caribbean Multi-Single (phone)	ZF2HM	Mike Badolato, W5MYA
Multi-Multi Combined World	XE2FU	W2PV — James Lawson Memorial Schenectady ARA
Most Improved Club (points per member)	Murphy's Marauders	Steve Place, WB1EYI

photo on page 151)! In the two-transmitter class, HH2B ran away with the CW plaque.

The multi-single category turned out to be a single-country contest on each mode this year. ZF2HM narrowly defeated ZF2GW on phone. Only 200 k separated the top three contenders, with N2BA/6Y5 managing a third-place finish. On CW, it was the Bahamas on top, with N5RM/C6A defeating runner-up N4BP/C6A by nearly a megapoint. F3TV was the top European score (2.2 M), followed closely by IØJX at 1.8 M.

Single-band competition was very popular this year. Of the 12 categories, top scores were down in only three: 80, 40 and 15-meter phone. AH6BK ran away with top-band honors on phone, with nearly double the score of second place YV1DWQ. HI8LC topped CT2DL on 80 meters for the plaque. KP4EQF was number one on 20 meters with 365 k. KK9A/V2A was in the right place to take 15, while HC1HC scored 500 k on 10. There must be a few big 40-meter beams out there, because JA2BAY, the only Asian in the single-band top five, scored 72 kilopoints to take 40-meter honors. On CW, the Americas were the place to be. YV1OB led the way with 41,328, over 10 times the top 160-meter score of last year!

QRPers were led by OK3CGP's 59 thousand points on phone, while K7SS/KH6 scored *over one million points* on CW. What an effort!

Affiliated Club Competition

Only two clubs made it into the unlimited

K9RS and AA5B operated ZF2HM on phone to the tune of over 7 million points. They made 7858 QSOs.

category this year — Frankford Radio Club and Yankee Clipper Contest Club. YCCC managed to cut FRC's lead to 6 million (compared to 9 million last year), but that wasn't quite good enough for top ranking. The Potomac Valley Radio Club (last year's number three unlimited club) dropped to the medium club category this year, and took the club gavel by 15 million points over Murphy's Marauders. In the local club category, the central Virginia Contest Club was dominant with 12.7 million points, almost 9 million over the second-place Carolina DX Assn.

Thanks to everyone who operated for making this contest a pleasure to operate in. Get those "death rays" tuned up for the '85 contest — why not try 'em out on statesiders in the November Sweepstakes?

Thanks to Ted Beilman for his assistance in the preparation of this report.

SOAPBOX

Biggest thrill: Working 4U1ITU on 160 m, and 3D2DX on 40 m with my 33' half-sloper antenna (W3ICM). Where did all of the YU4s come from? (KM3G). A great way for the DX stations to build up a big dupe

Top W/VE QRP Scores (Less Than 10 W)

Phone		CW	
Call	*Score*	*Call*	*Score*
K4JRB	328,923	K3WS	167,184
AA2Z	265,761	KZ2E	135,660
N3RS	233,688	W8VSK	121,635
K3WS	231,903	N7IR	92,928
		W5VGX	92,400

W/VE Division Leaders — Single Operator

Phone	*Division*	*CW*
N3BB	Atlantic	W2REH
N8DE	Central	W9RE
NØAT	Dakota	NØAT
WB4PUD	Delta	W4XJ
W8UA	Great Lakes	N4AR
N2LT	Hudson	N2LT
WAØTKJ	Midwest	WØWP
W1ZM	New England	K1AR
N7TT	Northwestern	W6RR
K6HNZ	Pacific	AI6V (WA6VEF)
W3YY	Roanoke	N8II
WØZV	Rocky Mountain	KØRF
KX4R	Southeastern	K4BAI
KM6B	Southwestern	W7IR
K5DX	West Gulf	N5AW
VE7AAQ	Canadian	VE3IY

Affiliated Club Program

Unlimited Category	*Score*	*Entries*	*CW Winner*	*Phone Winner*
Frankford Radio Club	56,768,961	78	N2LT	N3BB
Yankee Clipper Contest Club	50,865,300	83	K1AR	W1ZM
Medium Category				
Potomac Valley Radio Club	27,933,111	43	N8II	W3YY
Murphy's Marauders	12,847,500	21	K1BW	K1NG (KI1G)
North Texas Contest Club	12,798,744	27	N5AW	K5RR
Mad River Radio Club	8,048,646	23	W8UA	W8UA
Northern California DX Club	6,904,763	42	AI6V	K6HNZ
Southern California DX Club	5,110,326	17	W6TMD	KM6B
Meriden ARC	3,805,731	13	KS1L	KS1L
San Diego DX Club	3,512,070	13	N6CW	N6AW
Rubber Circle Contest Club	2,766,327	13	N7TT	N7TT
Dixie DXers	2,633,399	9	NQ4I	KA4KMH
Eastern Iowa DX Assn.	2,731,647	20	WØWP	KZØC
Southeastern DX Club	2,542,974	15	KX4R	KX4R
Kansas City DX Club	1,699,275	20	WØJLC	W6FN/Ø
Kansas DX Assn.	1,376,631	13	KØUR	WAØTKJ
Grand Mesa Contesters	1,308,672	20	KJØG	NDØE
Long Island DX Assn.	1,221,201	8	K2MFY	K1EFI
Mississippi Valley DX/C.C.	1,214,706	11	K9FD	KØIFL
Order of Boiled Owls of NY	994,980	4	W2GGE	K2LE/1
South Jersey Radio Assn.	865,200	14	WA2VYA	WA2VYA
Ohio Valley ARA	690,270	8	W8RSW	W8RSW
Southern California Contest Club	567,393	9	N6TR	NI6W
Fox River Radio League	403,740	11	—	KC9UM
Four Lakes ARC	323,535	13	KF9U	KC9LM
Local Category				
Central Virginia Contest Club	12,742,034	9	KG4W	N4BLX
Carolina DX Assn.	3,249,339	5	N4VQ	N4ZC
Greater Milwaukee DX Assn.	2,085,543	3	—	W9AMM
Rochester DX Assn.	2,050,107	10	W2TZ	W2TZ
Ashtabula Co. ARC	1,886,757	8	N3BJ	KC8PQ
Southern New England DX Assn.	1,649,139	6	W1DA	W1DA
Reading Radio Club	1,593,693	7	W3UM	WA3SPJ
Redwood Empire DX Assn.	1,396,568	7	K6ANP	N6OJ
Northern Illinois DX Assn.	1,249,062	4	K9DX	W9CH
Central Indiana Contesters	1,227,357	5	W9RE	KJ9D (KK9V)
South Florida DX Assn.	1,199,544	10	K4KUZ	K4KUZ
Michigan DX Assn.	1,165,158	4	W8TWA	W8TWA
Western Pennsylvania DX Assn.	1,159,218	6	K3UA	AD8J/3
Central Arizona DX Assn.	1,156,194	7	W7IR	KC7V
Gloucester County ARC	1,086,876	5	W2YC	W2YC
Mile Hi DX Assn.	1,058,253	7	WØZV	WØZV
Texas DX Society	1,044,900	6	K5BZU	K5DX
Northern Ohio ARS	1,011,957	6	N8BJQ	N8BJQ
Willamette Valley DX Club	836,076	7	KA7FEF	W7FP
Eastern Michigan ARC	767,559	4	N8CQA	N8CQA
Split Rock ARA	632,937	5	KR2Q	WA4PFN/2
Columbus ARA	498,768	10	W8ZCQ	W8ZCQ
Northern Ohio DX Assn.	496,830	5	N8BC	K8DJC
Dauberville DX Assn.	480,813	8	KC3AF	KA3DSW
Morton Area DX Assn.	455,760	5	K9ZO	WB9JKI
Lincoln ARC	373,776	4	KØSCM	KØSCM
Alamo DX Amigos	328,515	9	N5HB	K5DB
Ill. Wind Contesters	294,414	6	K9UIY	KV9S
ARINC ARC	287,993	6	KD3U	KD3U
Kettle Moraine Radio Amateurs	268,863	5	W9XT	N9KS
Utica ARC	264,865	4	KK2B	WB2SZY
Western Washington DX Club	248,625	6	W7IIT	W7IIT
Ventura Co. ARC	238,332	3	N6HK	N6HK
Northern New Mexico DX ARC	150,018	4	N5EPA	N5ACP
Rip Van Winkle ARS	128,148	3	W2DW	—
Long Island Mobile ARC	81,717	3	W2LPA	—
Hampden County Radio Assn.	78,615	6	W1MM	W1DGJ
Rock Creek ARA	46,966	5	W3CY	N3API
Hollywood ARC	45,081	4	WA4KXQ	WB4CKY
Poway ARS	34,176	3	AA6EE	N6JMV

Top W/VE Single Band Scores — Phone

160		*80*		*40*	
VE1YX	12,696	W1FC	65,280	K8NN/9	40,584
W1RR	9102	W6RJ	37,050	K9MWM	38,097
AB1A	6384	K2EK	32,844	AD8C	37,011
K5UR	6105	KC8JH	24,375	N6ADI	35,733
AA1K	5832	WA8DXG	19,665	WB9POH	23,808
20		*15*		*10*	
K1UO	630,738	WØZV	462,990	WA6DBC	194,400
W2YV (KQ2M)	610,740	W9ZRX	364,824	NO4J	189,711
WB3GPR (K3UA)	273,429	AC3T		NU4Y	140,481
W1GG	152,964	(KA3B)	197,106	WB7FDQ	139,050
K2IBW	140,553	WC4E	160,344	N5UD	125,829
		WB2SZY	145,440		

Top W/VE Single Band Scores — CW

160		*80*		*40*	
W1RR	4800	W1FV	61,440	W2YV (KQ2M)	238,800
K1NA	3762	K2EK	60,264	N6CW	186,150
AA1K	3306	KM1H	52,704	K1XM	180,840
N4SU	3192	AA4S	20,286	W5MMU	178,200
N4IN	2250	KJ9D	17,760		
20		*15*		*10*	
K3UA	301,644	WB4TDH	169,752	W1WEF	81,852
K8NZ	287,472	N4ZZ	133,905	W4NL	80,640
WØZV	195,300	KDØQ	116,604	WB8JBM	45,018
N5CR	188,640	N5JB	81,900	(KW8N)	
W1YN	175,152	WB1CNM	78,744	WB2ENW	12,987
				W8ZF	12,690

Top Ten — W/VE Phone

Call	Score	160	80	40	20	15	10
W1ZM	2,263,980	36/29	74/44	118/58	655/106	888/87	169/65
K1KI	2,226,300	24/22	74/49	125/60	733/111	680/95	174/73
K1DG	2,148,615	29/23	79/47	130/56	463/95	880/98	214/80
K1RX	2,107,125	19/19	85/49	114/51	435/92	1039/94	181/70
N3BB	1,854,144	21/20	68/42	90/40	416/86	1000/92	181/68
KM6B	1,801,071	0/0	58/31	366/43	302/87	960/76	363/56
W3GRF	1,785,591	24/21	66/40	101/45	395/88	724/91	303/84
N2LT	1,642,116	16/15	66/41	90/49	553/94	711/85	146/52
K1AR	1,641,681	23/21	69/51	89/50	507/97	653/85	142/65
W3BGN	1,580,448	24/20	72/41	81/38	621/87	666/88	152/52

Top Ten — W/VE CW

Call	Score	160	80	40	20	15	10
K1AR	1,947,792	15/14	118/48	321/66	611/86	631/72	209/56
KC1F	1,904,148	14/12	103/46	438/61	564/78	650/73	190/54
W1ZM	1,829,910	26/23	83/37	361/69	553/80	510/67	277/61
K1BW	1,741,476	22/20	126/49	328/67	529/77	554/71	179/50
K1DG	1,735,988	19/17	127/42	463/76	381/79	477/69	246/56
N2LT	1,671,381	11/9	106/104	386/66	504/77	635/73	161/43
N4AR	1,537,164	12/11	68/38	348/71	389/78	527/75	204/58
K1EA	1,439,856	6/6	62/34	248/59	552/77	578/71	170/50
KØRF	1,235,061	22/11	99/36	477/74	222/70	446/73	75/43
W9RE	1,189,899	12/11	55/37	200/58	369/75	659/68	68/42

Top Ten W/VE Low Power Scores (Less Than 200 W)

Phone

Call	Score	160	80	40	20	15	10
WA4PFN/2	396,900	0/0	21/18	16/12	468/74	195/55	35/21
W2TZ	390,978	0/0	19/15	25/22	158/58	264/67	143/52
*K4JRB	328,923	0/0	30/19	55/33	137/58	140/57	121/60
WA1FCN	283,860	0/0	15/11	19/12	201/67	161/62	102/38
KG1D	271,656	0/0	18/15	23/14	133/53	195/67	93/47

QRP

CW

Call	Score	160	80	40	20	15	10
N8II	981,360	7/6	49/34	138/41	330/77	420/72	216/52
W2TZ	648,018	0/0	20/16	100/46	295/59	421/54	137/47
N5AW	467,088	16/12	53/32	138/55	157/58	143/55	85/51
VO1MP	458,595	25/19	73/33	115/30	180/487	214/40	104/46
N3CXV	420,210	7/6	40/25	79/35	202/53	238/49	124/35

Top W/VE Multioperator Scores — Phone

Single Transmitter

Call	Score	160	80	40	20	15	10
K2BU	2,959,200	43/34	143/58	136/65	740/91	871/107	259/95
K3LR	2,089,500	20/18	67/48	108/57	491/97	892/99	172/79
K1TO	1,991,760	27/21	72/45	112/51	423/94	802/97	284/78
K2VV	1,749,705	24/21	59/37	70/40	605/97	894/90	89/50
K4VX/Ø	1,716,138	17/15	79/55	238/75	333/90	599/98	157/69

Two Transmitter

Call	Score						
K2TR	4,451,616	53/50	95/51	162/67	1030/117	1404/116	272/91
W4QAW	4,332,076	24/20	130/63	208/74	942/115	1342/112	368/94
N5AU	4,164,426	24/22	111/64	404/73	493/101	1268/113	574/110
NA8V	3,480,516	37/31	92/59	229/73	809/114	1107/113	574/100
W3GM	2,358,840	21/19	75/52	139/72	725/112	650/102	177/83

Unlimited

KN3O	7,369,965	74/45	202/80	295/94	1573/139	1461/125	510/111
W3LPL	6,070,590	64/40	147/68	294/92	1268/133	1406/119	467/103
W4DR	4,672,200	24/21	118/61	276/101	1130/132	1113/110	334/95
KX4S	4,631,616	30/25	150/68	194/90	1128/133	1143/114	347/86
N4ZC	3,118,284	25/23	111/62	150/68	721/113	690/100	524/102

Top W/VE Multioperator Scores — CW

Single Transmitter

Call	Score	160	80	40	20	15	10
K1ZZ	2,214,354	25/22	109/50	430/72	528/83	683/78	264/57
W3BGN	1,951,362	25/22	131/51	298/69	576/86	575/74	217/55
KM1C	1,624,590	10/8	71/37	372/71	580/85	432/73	176/56
K4VX/Ø	1,477,074	16/13	92/48	378/73	290/78	551/84	96/50
W3GRF	1,454,112	14/12	81/39	295/67	452/75	521/57	221/56

Two Transmitter

K1RX	3,088,761	10/9	207/55	530/83	919/90	792/78	273/62
WA8YVR	2,802,483	20/18	122/56	480/81	732/93	786/86	237/59
N5AU	2,618,460	36/18	173/49	564/83	435/91	838/87	192/62
W3GM	2,582,712	15/13	179/59	345/77	650/96	752/93	233/58
N2RM	2,282,544	0/0	119/43	367/80	582/84	672/86	356/70

Unlimited

KN3O	5,495,535	32/26	355/71	834/102	1208/117	999/96	349/73
W3LPL	4,758,075	37/28	187/62	733/107	1037/109	908/93	437/76
N9MM	3,378,672	29/22	181/62	471/85	798/98	898/98	232/67
K3ZUF	2,106,054	17/15	82/55	213/75	676/98	592/87	234/57
W4MYA	2,045,144	0/0	91/41	297/61	902/87	683/77	205/47

Top DX Single Band Scores — Phone

160		80		40	
AH6BK	13,392	HI8LC	92,826	JA2BAY	71,883
YV1DWQ	7740	CT2DL	75,636	CE7GDR	67,620
CT2CE	7590	EA8RL	67,536	ZS6DW	36,504
4U1ITU (W2GD)	3534	YV5JEA	54,567	I4AVG	24,309
		YV5DWB	32,490	HA7UG/P	22,260

20		15		10	
KP4EQF	365,736	KK9A/V2A	485,811	HC1HC	499,662
HI3EMS	314,328	CT2FH	420,849	KH6XX	469,053
G3FXB	235,872	VP9KA	202,986	HC1OT	431,433
CE3DNP	233,856	I5FCK	197,217	HI8QB	416,304
LU9CF	198,288	JA2APA	195,696	LU1CLA	308,313

Top DX Single Band Scores — CW

160		80		40	
YV1OB	41,328	W9NXD/HR2	82,080	4M7QP	223,776
C6ABA (KØGVG)	33,138	CT2CY	57,405	YT3M (YU3EW)	123,930
CT2BQ	20,424	G4CNY	35,862	IO3FIY	118,872
KL7Y	9600	LZ1KVV (LZ1G-40)	31,080	CT2CQ	118,800
CT4BD	1209	JA2YKA	21,090	YU7AD	110,397

20		15		10	
KP4EQF	247,296	YT3L (YU3EV)	136,890	ZP5XDW (N4PW)	134,400
OH8AA	199,650	OH8PF	125,664	K2KTT/PJ7	43,080
YU1RL	151,200	YU3TDM	109,233	YU7AF	24,831
SMØAJU	115,920	YU1DW	94,668	VK4XA	21,423
UT5QG	114,840	JK1JQQ	90,480	DL6RAI	13,950

Top Ten — DX Phone

Call	Score	160	80	40	20	15	10
ZF2FL (N6RJ)	7,017,498	188/40	663/56	824/56	1342/57	1409/57	2816/57
HH2CQ	6,136,416	194/37	537/49	493/54	1772/58	1073/57	2487/57
P42J W1BIH KØEJI	4,420,185	78/27	432/53	526/54	899/55	1232/56	1728/56
VP2M	4,277,448	65/27	247/44	297/42	1066/55	710/52	2781/56
XE2MX (N6ND)	3,561,435	48/11	554/52	597/52	693/56	1384/55	981/53
K3ZO/HK3	2,882,505	0/0	0/0	575/51	942/55	842/53	2110/56
LU1BR	2,665,680	0/0	42/21	314/48	1131/55	986/54	1357/54
VK2WU	2,454,543	0/0	85/32	476/50	948/52	549/54	1309/55
LU8DQ (LU8ETB)	2,373,600	0/0	10/6	250/42	1105/56	1005/55	1310/56
3D2DX (VE5RA)	2,177,250	0/0	*/37	*/51	*/50	*/55	*/57

* QSO breakdown not provided

Top Ten — DX CW

Call	Score	160	80	40	20	15	10
HR1DAP (K8CC)	3,772,680	118/34	358/48	742/53	1071/54	979/56	952/53
VP2KBZ (VE3KZ)	3,384,945	66/26	470/49	702/52	927/51	862/55	933/52
P42J (W1BIH)	3,368,016	96/31	400/53	650/54	867/56	702/55	978/55
8P6G (N8DCJ)	3,149,820	75/24	394/49	582/53	1180/56	931/55	532/48
K5NA/KP2	3,044,934	43/17	401/51	547/51	1027/56	838/54	800/49
KP4BZ (NP4Z)	2,963,346	57/22	214/43	574/54	1212/55	785/54	724/49
LU8DQ	2,154,900	0/0	6/5	363/48	958/56	952/56	986/55
8P6NX (W6SA)	2,105,586	0/0	261/46	809/53	716/56	977/53	186/50
K8WW/VP9	1,949,985	77/26	136/33	589/52	980/55	633/53	138/36
K3ZO/HK3	1,499,040	0/0	162/41	662/54	396/48	555/52	307/45

total is by not signing a call sign for long periods of time — that way we work them first, and then ask for the call sign after the QSO. I especially noticed this among the DXpeditions to the Caribbean (W2UP). These were the 30 hardest hours I've ever put into any contest. Next year I will retire the FT301SD and put a 10 W board into my shiny new FT980 . . . or maybe I'll wise up and use my Henry 2K and go high power. One station said "59KW, you're just barely readable. Repeat your state several times." I made 5-band contacts with F3TV, P42J, P47C, ZF2FL, VP2KBU, K9GL/VP2V. Hats off to these operators for hearing my QRP (K4JRB). Sure would like to see a rule against the incessant CQing (N4SU). Just got my homebuilt 2-el quad up and operating at 120 ft only 3 weeks before the contest. Boy, 59 signals everywhere, especially from countries I never even heard before on dipoles. Viva la BEAMS! (WD4SKH). All this fancy equipment and antennas don't help one bit if you just don't have propagation (WC4E). I had S7 power-line noise here on 10 meters. The power company crews came out three times during the week before the contest, but couldn't find the source. It robbed me of at least 100 QSOs during the good 10-meter opening to Europe on Sat. morning (W3VT/4). These were the best conditions I have observed on 15 m in the past 3 years (KC4HN).

Top DX Multioperator Scores — Phone

Single Transmitter

Call	Score	160	80	40	20	15	10
ZF2HM	7,406,004	231/47	860/54	1176/54	1635/55	1813/56	2147/48
ZF2GW	7,292,907	103/28	816/54	1264/56	1103/55	1956/56	2781/54
N2BA/ 6Y5	7,197,144	96/27	678/51	1070/53	1781/57	1333/57	2966/57
KP4BZ	6,384,063	170/36	602/55	449/55	1602/57	1543/57	2347/57
F3TV	2,712,060	121/26	236/36	408/47	867/54	1435/57	410/40
IØMGM	2,612,475	50/19	294/43	418/44	1120/57	1027/52	506/40

Two Transmitter

K9GL/ VP2V	11,124,579	325/47	1218/57	1485/56	1570/57	2938/57	3667/57
VP2KBU	10,365,474	239/47	741/55	1351/56	2296/57	2290/57	3585/57
I5NPH	3,928,104	50/22	445/43	748/51	1342/57	1681/55	638/39
JH7YJF	1,512,147	0/0	50/13	573/49	449/47	956/55	455/39
YU1EXY	1,502,922	46/19	392/39	165/33	427/50	1154/46	157/27

Unlimited

XE2FU	14,359,233	720/55	1709/55	2403/57	3172/57	3213/57	2986/56
JG1ZUY	2,012,982	0/0	191/29	303/45	620/50	1233/56	622/46
JA2YKA	1,981,308	0/0	144/29	539/50	460/50	1098/56	643/44

Top DX Multioperator Scores — CW

Single Transmitter

Call	Score	160	80	40	20	15	10
N5RM/ C6A	3,540,135	230/44	666/52	844/53	1041/55	873/52	215/49
N4BP/ C6A	2,613,648	264/46	464/51	941/52	969/56	476/44	89/23
F3TV	2,198,502	26/14	305/42	727/48	757/52	722/50	442/40
IØJX	1,832,985	0/0	242/39	805/50	685/53	573/53	340/36
G3FXB	1,770,390	13/7	278/40	452/47	797/54	620/54	330/35
LX1PD	1,566,006	0/0	279/36	593/51	536/48	590/48	364/38

Two Transmitter

HH2B	6,668,004	266/49	623/55	1487/56	1635/56	1842/56	945/54
KL7RA	1,479,222	0/0	28/9	371/48	883/56	826/52	274/42
JA9YBA	1,107,540	0/0	140/31	266/47	628/55	634/54	90/23

Unlimited

XE2FU	8,064,153	642/50	1144/55	2105/56	2050/57	1762/57	962/56
JA7YAA	1,025,010	14/7	122/28	368/47	570/57	469/50	84/21
LZ2KTS	918,195	0/0	30/19	308/48	424/54	513/55	218/29

DX Continental Leaders — Phone

	Africa		Asia		Europe	
All Band	TU7	1,470,660	JA1ELY	827,316	OK1DWA	957,720
1.8 MHz	—	—	—	—	CT2CE	7590
3.5 MHz	EA8RL	67,536	UA0FOH	48	CT2DL	75,636
7 MHz	ZS6DW	36,504	JA2BAY	71,883	I4AVG	24,309
14 MHz	EA8AFB	108,633	JH3DPB	104,004	G3FXB	235,872
21 MHz	—	—	JA2APA	195,696	CT2FH	420,489
28 MHz	—	—	JA9RPU	37,440	IS0KNG	15,486
QRP	—	—	JH3LCU/1	20,424	OK3CGP	59,535
Multioperator						
Single Transmitter	EA9AM	2,341,170	JA1YCL	636,795	F3TV	2,712,060
Two Transmitter	—	—	JH7YJF	1,512,147	I5NPH	3,928,104
Unlimited	—	—	JG1ZUY	2,012,982	—	—

	North America		Oceania		South America	
All Band	ZF2FL	7,017,498	VK2WU	2,454,543	P42J	4,420,185
1.8 MHz	—	—	AH6BK	13,392	YV1DWQ	7740
3.5 MHz	HI8LC	92,826	AH6AZ	28,896	YV5JEA	54,567
7 MHz	CM2QP	15,750	—	—	CE7GDR	67,620
14 MHz	KP4EQF	365,736	K9RA/KH6	195,934	CE3DNP	233,856
21 MHz	KK9A/V2A	485,811	W7PSO/KH6	13,608	HK8BVN	162,621
28 MHz	HI8GB	416,304	KH6XX	469,053	HC1HC	499,662
QRP	—	—	VK2PMC	32,868	—	—
Multioperator						
Single Transmitter	ZF2HM	7,406,004	H44R	2,314,515	KC2GE/PJ3	1,575,015
Two Transmitter	K9GL/VP2V	11,124,579	—	—	—	—
Unlimited	XE2FU	14,359,233	—	—	—	—

DX Continental Leaders — CW

	Africa		Asia		Europe	
All Band (W2GD)	9U5JB	274,134	JI1QPU	735,552	4U1ITU	1,292,229
1.8 MHz	—	—	JA7NI	1020	CT2BQ	20,424
3.5 MHz	—	—	JA2YKA	21,090	CT2CY	57,405
7 MHz	EA5YU/EA8	85,260	HZ1AB (W7SE)	42,780	YT3M (YU3EW)	123,930
14 MHz	EA8QE	135,099	UA0SAU	111,321	OH8AA	199,650
21 MHz	—	—	JK1JQQ	90,480	YT3L (YU3EV)	136,890
28 MHz	ZS6BCR	13,362	UM8MCY	1008	YU7AF	24,831
QRP	—	—	JA1KFX	11,424	G2QT	317,832
Multioperator						
Single Transmitter	ZS1CT	236,070	JA7YFB	437,517	F3TV	2,198,502
Two Transmitter	—	—	JA9YBA	1,107,540	YU4EZC	107,868
Unlimited	—	—	JA7YAA	1,025,010	LZ2KTS	918,195

	North America		Oceania		South America	
All Band	HR1DAP (K8CC)	3,772,680 (W1BIH)	ZL0AJW	1,086,825	P42J	3,368,016
1.8 MHz	C6ABA	33,138	—	—	YV1OB	41,328
3.5 MHz	W9NXD/HR2	82,080	—	—	—	—
7 MHz	VP2EEH (W2KN)	30,492	KX6DS (K4TO)	59,094	4M7QP	223,776
14 MHz	KP4EQF	247,296	VK3AGX	26,676	PY1VT	62,928
21 MHz	—	—	KH6WT	32,805	LU1BCE	89,925
28 MHz	K2KTT/PJ7	43,080	VK4XA	21,423	ZP5XDW (N4PW)	134,400
QRP	—	—	K7SS/KH6	1,079,299	—	—
Multioperator						
Single Transmitter	N5RM/C6A	3,540,135	AH6AZ	1,288,656	W6QL/ZP5	874,146
Two Transmitter	HH2B	6,668,004	—	—	—	—
Unlimited	XE2FU	8,064,153	ZL2AH	71,712	—	—

Top DX QRP Scores — Phone and CW

Phone		CW	
OK3CGP	59,535	K7SS/KH6	1,079,299
G3IMW	34,200	G2QT	317,832
VK2PMC	32,868	F9YZ	124,605
EA2SN	31,500	DL8CM	92,367
JH3LCU/1	20,424	G4EBO	27,150

This was my first DX contest. I had lots of fun — the band was open here (KB4DFK). I added seven new countries to my 40-meter DXCC total (WB5YLT). I avoided 20 meters with my 100 W and vertical. I am not a glutton for punishment (KG5G). In spite of the part of the solar cycle we were supposed to be in, 10-meter conditions were better this year than in 1983. As it always seems to ... 50 MHz sprang open on Saturday for a few hours into Ecuador! Too bad it wasn't included in the contest (WA5IYX). The 20-meter band opened up late Sunday from Iceland. The greatest challenge was competing with Europeans for band spots. Snow showers brought static. We dipole operators are thankful for stateside beams (KE4SX/TF). The beam makes the difference (W6RJ). Some S9 line noise, but then I guess I can't have everything (W6MSN). Propagation was screwy, with paths skewed much of the time. I worked most of the JAs with the beam on South America! Their signals were about twice as loud that way than direct. Long path? Antenna screwed up? (W6BYH). Western Europeans were hard to come by. Conditions lacked a lot and my noise level was very high on the long path (K6RN). I was disappointed in the lack of good signals from the Mideast and USSR (WA7IVZ). What a great contest! Working 33 countries on 10 meters with 80 watts and a vertical was a thrill for this first-timer (N7CQY). Quite good propagation on 20 m. There were some nice pileups on HZ1AB and ZK2RS (WA7CGR). This was great fun. I didn't know my dipole could reach out so well at times (KD7RX). I still enjoy this business after 60 years on the air (W8YGR). I made one less QSO than last year, but my KT-34XA gave me 13 more multipliers, mostly off its backside (WØZV). Conditions on 10 meters were excellent. There was lots of activity for a band that is supposed to be dead (VE3CVX). I worked 159 G4s on 21 MHz. I'd say the band was open. Hearing VK6HD's 160-meter signal come up to 7 S units above the noise Sunday morning was one of the biggest thrills in contesting (NA8V). Everything broke (KM6K). After listening to all our operators complaining about the length of my call, I am beginning to feel a bit ancient (WA8YVR). 10 meters was a big surprise. I didn't hear any JAs, though my timing might have been off (W1CNU). Running low power in this contest really can teach a person humility, especially when he gets to wait in every pileup on 40 and 80 (K1VUT). The lack of a low-noise receiving antenna sure hurt my score. Like the old Brooklyn Dodgers, wait till next year (KM1H)! Some of the Big Guns are sure LIDS. Don't they have to check a freq. before starting their CQs? I do and most others do so also (WA2LOG). I was not able to put in the time I wanted, but I sure enjoyed it (KCØET). The operator of N5RM/C6A was fantastic. Such CW is music to my ears (N4ES). Europeans were scarce; I only heard the big guns (N4IN). My scores seem to be going up as the sunspots drop. This is my third DX contest and each year I have more than doubled the previous year's score! I know things can't continue like this (KW6Q). This gets to be an awful chore when you're almost 69; especially when you lose the linear on the 33rd QSO! Nevertheless, I'll be rarin' to go next year (N8BC). FB contest. My rule is listening = multipliers (KF8K). High flux = high MUF = high absorption in Colorado. I should have been on 15 (WØZV). This was my first single op all band 'test in 15 years, sure fun (KØRF). All that noise Friday night came from right over my head! Three lightning strikes within ½ mile of my QTH (N7DF). Conditions were

generally fair during the contest with enough activity to maintain interest. A brief 10-m opening on Sunday provided much needed multipliers (VE3IY). We had a series of disasters. K5MM permanently lost his luggage to the airlines with all our dipoles, power cords, etc. The beams I shipped in advance never got there. On Sat. morning the FT-107 started to smoke and the transmitter died (N5RM/C6A). Conditions on 75 were bad and the activity from North America was low (DL8PC). I operated from the northeast of Spain while I was there for a family reunion and to welcome two new hams, my nephews (11MOL). Working conditions were no good. Sorry (EA1CM). Propagation was completely closed on the second day (EA3CTI). Propagation was good on 10 meters (EA1CVY).

Feedback

Please note the following corrections to the results of the 1983 ARRL International DX Contest starting on page 78 of October 1983 *QST*.

CW: In the Eastern Pennsylvania Section, K3YD's power classification was B, not C. In the Georgia Section, the score of the number one 15-meter entry should be W4JFL, not W4JF. In the Virginia Section, KC4HN should have been listed as power classification B, 15-meter single band.

In the Affiliated Club Competition scores, medium category, the Columbus ARA scored 1,238,031 points.

SCORES

The scores are listed by mode — phone and CW. For both W/VE and DX scores, single operators are listed first, followed by multioperator, single transmitter, then multioperator, unlimited. W/VE single-operator scores are broken down by call area and ARRL Section. W/VE multi-single scores are broken down by call area only. All W/VE multiop two-transmitter and unlimited scores are grouped together in descending order by score. DX single-op and multiop scores are broken down by continent and country. Under each ARRL Section (and country for DX), single-op scores are listed in descending order by category. All-band scores are listed first, followed by 160, 80, 40, 20, 15 and 10-meter single-band scores.

Each line score lists the following information: call, score, QSOs, multipliers, power input used (A = 10 W or less, B = 11- 200 W; C = more than 200 W). The first station in each category (other than all band) has a designator following the power indicator; single-band entries are indicated by 160, 80, 40, 20, 15 or 10). W/VE multiop entries have their ARRL Section abbreviation after their power designator. Example: In Connecticut, the top all-band phone scorer is W1ZM. The top low power (200 W or less) entrant is WA1FCN. KM1R has the top 80-meter single-band score, K1BV the top 20-meter, WB1CZX the top 15-meter, W1WEF the top 10-meter and AA2Z the top QRP score.

W/VE — Phone

Single Operator

1

Connecticut

W1ZM	2,263,980	1940	389	C
K1KI	2,226,300	1810	410	C
K1RX	2,107,125	1873	375	C
K1RM	1,070,013	1421	251	C
K1WA	845,340	965	292	C
KS1L	779,361	1243	209	C
WA1FCN	283,860	498	190	B
K1EFI	283,404	452	209	C
KG1D	271,658	462	196	B
AA2Z	265,761	459	193	A
K1WJL	223,938	377	198	C
N1API	160,140	340	157	C
K1VDF	158,004	399	132	C
K1YXG	110,295	285	129	C
KA1FSO	67,932	222	102	C
K1EM	30,660	140	73	C
W1DO	30,000	100	100	C
KA1JFJ	29,412	129	76	B
K1NYK	29,160	120	81	C
KT1Y	25,542	129	66	B
KM1P	22,374	113	66	B
KB1IZ	15,732	92	57	C
KA1CZF	6120	51	40	A
WA2WIP	2418	31	26	B
W1AW (WB2TRN, opr.)				
	918	18	17	C
K1NGD	432	12	12	C
KM1R	16,038	99	54	C-80
K1BV	15,606	102	51	C-20
WA1NGN	540	15	12	B-20
WB1CZX	462	14	11	B-15
W1WEF	99,372	338	98	C-10

Eastern Massachusetts

K1AR	1,841,681	1483	369	C
KC1F	114,426	326	117	C
W1FM	125,145	309	135	B
KA1EKR	75,258	222	113	B
W1FJ	52,038	177	98	C
W3OD	34,560	144	80	B
KA1CLV	33,120	138	80	B
K3ZJ/1	31,374	126	83	C
KB1GN	15,006	82	61	C
N1CRD	13,365	81	55	C
AI3E	12,936	77	56	C
W1BK	10,584	72	49	C
N1CJK	8910	66	45	B
W1PLJ	6240	52	40	C
KT1O	4536	42	36	C
KB2R	2610	30	29	B
AB1A	6384	56	38	C-160
K1NA	2856	34	28	C-160
W1FC	65,280	272	80	C-80
W1FV	7548	68	37	C-80
W1DA	23,895	135	59	C-20
K1RB	11,340	90	42	B-15
NM6U	4283	49	29	B-15
KO1F	42,636	187	76	C-10

Maine

K1JB	244,399	808	161	C
N1AFC	80,730	230	117	A
K1SA	27,540	153	60	C
K1UO	630,738	1569	134	C-20
KB1U	30,282	206	49	C-15
W1MGP	9462	83	38	B-15

New Hampshire

K1DG	2,148,615	1795	389	C
K1TR	43,344	172	84	C
AK1K	24,072	118	68	B
KE1E	23,625	105	75	B
W1RR	9102	74	41	C-160
N1ACH	1320	66	20	C-160
W1VY	12,996	78	57	C-20
W1FZ	16,416	144	48	C-10

Rhode Island

K1NG (KI1G, opr.)				
	1,568,379	1481	353	C
K1VSJ	459,108	702	218	C
AI1K	182,153	419	129	B
W1RFQ	15,840	96	55	C

Vermont

K2LE/1	290,418	449	194	C
K1HKI	63,240	310	68	C
W1ZK	3483	43	27	C-80
W1KQ	53,808	236	76	C-15

Western Massachusetts

WB1EYL	77,910	265	98	C
KA1DNX	2886	37	26	B
WA1ZAM	7200	60	40	C-80
W1GG	152,964	607	84	C-20
W1DGJ	45,225	201	75	C-20
N1ADX	1458	27	18	B-15
K1BE	108	6	6	B-15

2

Eastern New York

K2QF	469,854	678	231	C
KN2Q	100,386	286	117	C
N2BJ	93,951	219	143	C
W2NC	71,400	200	119	C
KY2J	68,052	214	106	B
N2FS	32,625	145	75	C
N2AIF	28,568	108	82	C
W2HES	17,280	96	60	B
K5NA	10,560	64	55	C
W2KZN	6360	53	40	B
K2EK	32,844	161	68	C-80
W2YV (KQ2M opr.)				
	610,740	1508	135	C-20
K2IBW	140,553	483	97	C-20
KF2O	33,075	175	63	C-15
N2ECD	72,090	270	89	C-10
WB2PTP	864	24	12	B-10

NYC & Long Island

KA2AEV	243,858	419	194	B
K2YGM	48,360	155	104	C
AC2P	17,934	98	61	C
W2AYJ	14,964	86	58	C
WA2OVG	10,251	67	51	C
WB2ITR	12,825	95	45	C-80
K2MFY	53,325	225	79	B-15
WB2AMU	7455	71	35	B-15
W2KZE	8532	79	36	C-10
K2KTT	7245	69	35	C-10

Northern New Jersey

N2LT	1,642,118	1582	346	C
KZ2S	427,572	666	214	C
WA4PFN/2	398,900	735	180	B
WB2VIR	283,284	516	183	C
K2BK	175,212	372	157	C
WA2VUM	130,869	333	131	C
WB2HJW	51,744	178	98	C
WB2DND	38,190	134	95	B
W9NTU	30,240	144	70	B
KA2RLW	27,488	119	77	B
KB2ZQ	23,232	121	64	B
W2HTX	14,940	83	60	B
KC2X	585	15	13	C
W2FCR	2475	33	25	C-160
KR2Q	3417	73	43	C-80
W1GD	55,440	240	77	C-10
KY2P	30,450	175	58	B-10
K2OLG	22,272	116	64	B-10
K4BNC	5049	51	33	C-10

Southern New Jersey

N2SS	1,124,784	1284	292	C
K2FL	405,324	558	243	C
N2VW	207,756	398	174	C
WA2VYA	188,421	347	181	C
W2YC	184,569	329	187	C
K2SNK	157,500	375	140	C
W2FGY	117,160	275	142	C
N2HF	88,304	248	116	C
W2SDO	71,568	213	112	C
WA2LBT	40,866	139	98	B
W2ORA	20,700	115	60	B
K3GYS	7560	56	45	C
WA2AWS	8000	50	40	B
ND2P	5439	49	37	B
N2AWC	2574	33	26	B
KD2AE	900	20	15	C
KZ2I	16,059	101	53	C-80
KC2TN	18,645	113	55	B-10
N2DZY	855	19	15	C-10

Western New York

W2TZ	390,978	609	214	B
KB2WN	115,830	270	143	C
KK2B	56,745	195	97	B
KB2SE	45,900	150	102	C
NA2A	43,884	159	92	C
W2FUI	36,972	156	78	B
KC2GZ	5814	51	38	C
N2AU	2262	29	26	C-160
KA2CDE	15,600	100	52	C-40
KC2RS	96,553	381	91	C-20
WB2SZY	145,440	608	80	C-15
KC2VT	43,665	205	71	C-15
N2EAW	4836	62	31	B-10

3

Delaware

W3XU	1,222,020	1460	279	C
KB3XD	144,258	278	137	B
W3WD	114,240	280	136	C
AA1K	5832	54	36	C-160
AC3T (KA3B, opr.)				
	197,106	722	91	C-15

Eastern Pennsylvania

N3BB	1,854,144	1776	348	C
W3BGN	1,580,448	1618	326	C
WA3SPJ	547,479	751	243	C
W3UM	497,475	737	225	C
W3DHM	302,202	489	206	C
W3MA	234,330	365	214	C
N3RS	233,688	428	182	A
W3ARK	208,917	417	167	B
W3GU	180,420	388	155	C
W3KV	160,056	342	156	C
W3EVW	159,284	336	158	C
KA3DSW	158,319	359	147	C
WB3CIW	153,384	308	168	C
WB3FYL	141,831	309	153	B
AD3Z	114,660	245	156	C
N3HW	94,869	249	127	C
KB3YJ	89,625	239	125	B
K3OX	76,890	233	110	C
W3YFV	67,410	214	105	C
WB3HYX	39,150	150	87	B
WB3EPW	37,584	144	87	C
W3SOH	25,347	119	71	B
W3WJC	23,754	107	74	C
K3DYX	23,391	113	69	B
KI3N	22,374	113	66	C
KR3I	6042	53	38	B
W3EHZ	5661	61	37	B
W3HMR	5439	49	37	C
N3CIX	4320	45	32	B
KB3YY	3360	35	32	B
WA3YTI	1440	24	20	B
W3AP	27	3	3	C-160
K3ND	8856	72	41	C-80
WB3KIL	4500	50	30	B-80
K3WGR	10,962	87	42	C-40
N3EC	80,730	299	90	C-20
WB3FPA	44,943	211	71	B-15
WA3DMH	18,054	118	51	C-15
KO3F	5508	51	36	C-15
KQ3V	40,683	191	71	C-10
WA3WYQ	297	11	9	A-10

Maryland-DC

W3GRF	1,785,591	1613	369	C
K2ITG	611,292	842	242	C
W3UJ	529,137	777	227	C
K3TC	374,148	547	228	C
K3WS	231,903	409	189	A
W3GNQ	101,640	280	121	C
W3ICM	97,893	219	149	C
W3AZ	97,538	256	127	C
W3HVM	81,096	218	124	C
K4CGY	65,700	219	100	C
K3SA	54,600	200	91	B
KD3U	52,290	166	105	B
N3AOE	51,900	173	100	B
W3FQE	44,361	159	93	C
N3API	33,282	129	86	B
W3JPT	24,282	114	71	B
N7IR	12,240	80	51	A
KA3JLW	9308	88	47	B
NN3SI	1028	19	18	C
WB3GCG	3908	42	31	C-160
W3GG	3999	43	31	C-80
W3RGX	720	20	12	B-20
W3TUX	396	12	11	C-15
W3PWO	27,126	137	66	C-10

Western Pennsylvania

AD8J/3	345,240	548	210	C
KM3G	26,138	121	92	C
AK3J	8037	57	47	C
W3KYN	4388	43	34	B
KA3DFK	3060	34	30	A
W2UP	4800	50	32	C-40
WB3GPR (K3UA, opr.)				
	273,429	741	123	C-20
W3KHQ	24,180	124	65	C-20
WB3GPR	4089	47	29	C-15
W3FSB	1656	24	23	B-10

4

Alabama

KF4FN	778,728	914	284	C
N4UN	127,875	275	155	C
WM4M	103,230	222	155	C
N4DLE	3627	39	31	C
N4AJZ	14,382	94	51	C-80

Georgia

KX4R	824,064	928	296	C
N4NX	503,064	612	274	C
K4JRB	328,923	483	227	A
KA4KMH	208,590	409	170	C
K4EZ	151,704	344	147	C
KC4GR	129,876	274	158	C
W9KTB/4	115,902	274	141	B
K4BAI	102,584	259	132	C
WI4K	90,915	209	145	C
KC9BC/4	39,897	143	93	C
W4UYC	34,170	134	85	C
NN4K	28,050	110	86	C
K4DLI	23,940	95	84	C
KC4LQ	5934	46	43	B
WA4QZR	2574	33	26	C
NE4S	109,440	480	76	C-15
W4DXI	56,880	240	79	C-15
W8ZF	32,292	156	69	C-10

Kentucky

KB4GBE	1152	24	16	B
N4XM	7560	60	42	C-80

North Carolina

N4UH	791,482	1008	249	C
WD4AVY	131,052	326	134	A
KF4HK	81,510	190	143	C
KA4JEX	76,860	183	140	A
N4AYO	4455	45	33	C
N4SU	3780	42	30	C-160
K8CFU	2262	29	26	C-160
W4UW	14,382	102	47	C-40
WD4SKH	32,589	153	71	B-15
WB4QWM	30,807	163	63	C-10

Northern Florida

W4WKQ	215,475	425	169	C
W4IIR	126,184	258	163	C
WA4MOJ	54,843	181	101	C
W4JAT	28,125	125	75	C
N4WW	4488	44	34	C-160
W4VQ	2100	35	20	C-40
WC4E	160,344	524	102	C-15
NO4J	169,711	591	107	C-10
NU4Y	140,481	473	99	C-10

South Carolina

W3VT/4	811,890	873	310	C
AA4V	14,391	123	39	C-15

Southern Florida

K4KUZ	715,617	777	307	C
K8UNP	515,043	643	267	C
WK4F	93,090	214	145	B
W4OWJ	28,080	117	80	C
W4PC	24,804	106	78	C
WB4CKY	21,255	109	65	B
KA4UBC	18,815	95	59	B
W4BV	15,810	85	62	C
KB4FO	8968	54	43	C
NV4O	5439	49	37	B
W4FLA	16,692	107	82	C-80
W4PZV	4484	46	31	C-80
KF4UI	45,156	212	71	C-20
W4YN	7956	78	34	C-20
W2SDB/4	3741	43	29	C-15
W4OO	8658	78	37	C-10
VE3BTQ/W4				
	1782	33	18	C-10

Virginia

W3YY	940,800	1120	280	C
AI2C	718,856	952	251	C
N4XD	210,975	485	145	C
WC4B	139,536	272	171	B
N4BLX	97,500	250	130	C
K4GKD	75,276	204	123	C
K4OD	50,700	169	100	C
N4GTU	46,851	161	97	B
KA6PKJ	46,746	159	98	B
K4FPF	32,760	130	84	B
W4IQ	21,306	108	67	C
WY4T	14,904	92	54	B
N3RC	1388	24	19	B
KV4P	105,966	406	87	C-20
KE4MM	26,496	138	64	B-20
KC4HN	73,959	277	89	C-15
KB4DFK	12,126	94	43	C-15
N4MM	40,110	191	70	C-10

Tennessee

WB4PUD	226,420	423	180	B
WB4LHO	89,244	222	134	C
N4BSN	89,010	215	138	C
N4TG	54,162	177	102	C
N4JII	44,226	189	78	C

K4JHT 22,770- 110- 69-B
K4XO 60- 5- 4-C-80
W4XJ 7560- 70- 36-C-40
K4CXY 1482- 26- 19-C-40
KE4HX 38,964- 191- 68-C-10

5

Arkansas

W5EIJ 32,574- 122- 89-C
K5UR 6105- 55- 37-C-160

Louisiana

K5KLA 137,676- 298-154-A
W5OB 68,400- 200-114-C
KA5LFF 60,588- 187-108-B

Mississippi

WA5OYU 212,619- 379-187-C
ND5M 84,269- 193-111-C
K5FA 26,649- 141- 63-C
WB5ZKR 3969- 49- 27-B-40

New Mexico

N5ACP 85,485- 205-139-C
WB5TGL 65,637- 221- 99-C
N5EPA 41,760- 174- 80-B
N5EZA 15,093- 117- 43-B
WB5YLT 357- 17- 7-C-40

Northern Texas

K5RR 554,466- 682-271-C
KA5W 487,701- 729-223-C
K5LP 402,069- 601-223-C
NI5M 246,390- 430-191-C
N5UA 209,808- 372-188-C
K5RX 174,870- 335-174-C
W5LMG 143,424- 332-144-C
W9PLI/5 54,945- 165-111-C
KB5UW 42,465- 149- 85-B
N5FDQ 41,676- 151- 92-B
W5AE 28,875- 125- 77-C
NN5T 5928- 52- 38-B
KM5R 363- 11- 11-C-160
WB5CRG 1380- 23- 20-C-80
W5FO 64,560- 269- 80-C-20
WB5UDX 93,138- 361- 86-C-15
N5JB 54,180- 258- 70-C-15
K4VUD/5 63,315- 315- 67-C-10

Oklahoma

N5CG 355,680- 760-156-C
W5JME 154,035- 315-163-C
KG5G 32,850- 146- 75-C
W5UXR 17,202- 94- 61-B
KK5I 390- 13- 10-C-160
K5WE 468- 13- 12-C-20

Southern Texas

K5DX 655,776- 792-276-C
WA5IYX 106,920- 297-120-B
K5DB 89,700- 260-115-C
W5LLU 67,512- 194-116-C
KD5UQ 65,670- 189-110-C
K5RF 22,680- 126- 60-C
N5HB 19,110- 98- 65-B
W5OSJ 48- 4- 4-B
W5PWG 2139- 31- 23-C-80
K5TSQ 131,931- 411-107-C-20
KE5IV 93,585- 367- 85-C-20
K5BZU 60,663- 277- 73-C-15
W8MEP/5 20,829- 131- 53-B-15
KE5FI 22,098- 127- 58-C-10

6

East Bay

WB6FCR 787,844-1326-198-C
AK6T 144,348- 523- 92-C
K6GSL 30,444- 172- 59-B
K6RK 17,424- 121- 48-C
N6GRM 15,222- 118- 43-B
W6RJ 37,050- 190- 65-C-80
W6BSY 122,604- 601- 68-C-15
KB6JK 103,950- 525- 66-C-10
K6PJY 37,779- 257- 49-B-10

Los Angeles

KM6B 1,801,071-2049-293-C
K6EID 483,840- 840-192-C
W8AKS/6 114,570- 335-114-C
W6CN 87,300- 291-100-A
N6AA 83,448- 244-114-C
N6IC 41,013- 147- 93-C
K6DMN 19,116- 118- 54-C
W6OES 7182- 57- 42-B
W6AQ (WA6OTU, opr.) 2475- 33- 25-C-40
W6OK 25,380- 141- 60-C-20
K6YRA 47,265- 137-115-C-10
WB6ZAK 630- 21- 10-B-10

Orange

N6AW 934,200-1557-200-C
W6TMD 673,200-1100-204-C
NI6W 316,936- 548-194-C
K6LEB 106,020- 285-124-C
NM6L 20,862- 114- 61-C
N6UC 5202- 51- 34-C-80

Santa Barbara

WB6HDG 433,620- 803-180-C
NV6L 91,692- 283-108-C
WA6FGV 68,640- 286- 80-B
W2KVA/6 54,426- 193- 94-C
W6OUL 11,319- 77- 49-C
N6ADI 35,733- 277- 43-B-40

Santa Clara Valley

K6HNZ 1,043,563-1603-217-C
KY6I 263,703- 671-131-C
K6ITL 164,610- 465-118-C
N6AN 84,906- 267-106-C
KB6GV 76,191- 233-109-C
N6HR 75,600- 200-126-C
W6OKK 54,366- 221- 82-C
N6UW 47,736- 204- 78-C
WA6TKT 22,869- 121- 63-C
W6YVK 46,305- 245- 63-A
WA6TKT 46,182- 179- 88-C
W6DUB 28,968- 142- 68-C
K6DC 22,512- 112- 67-C
W6RFF 18,189- 129- 47-B
KJ6V 11,160- 93- 40-B
KG6AM 11,544- 74- 52-C
AJ6V 1428- 28- 17-C-80

San Diego

W6LUN 38,763- 177- 73-C
K6MC 24,780- 118- 70-C
N6ADK 23,985- 123- 65-B
N6JMV 15,606- 102- 51-B
W6ABT 11,907- 81- 49-C
AA6EE 5220- 58- 30-C
WA6VNR 61,650- 411- 50-C-15
WA6DBC 194,400- 864- 75-C-10
W6FAY 37,881- 207- 61-C-10

San Francisco

N6OJ 634,200-1057-200-C
W6MSN 228,942- 553-138-C
W6WB 95,940- 260-123-C
KB6HT 49,551- 199- 83-C
OH8DX/W6 1890- 63- 10-C

San Joaquin Valley

KA6BIM 208,083- 499-139-C
N6HK 92,718- 306-101-C
K6BPY 76,266- 223-114-C
W6BYH 28,775- 119- 75-C
K6YK/M 9729- 69- 47-B
W6SX 660- 20- 11-C

Sacramento Valley

K6SG 327,780- 607-180-C
K6DR 200,646- 471-142-C
W6YMH 13,455- 115- 39-A
K6RN 27,840- 145- 64-C-20

7

Arizona

KC7V 157,950- 450-117-C
W7AYY 131,445- 345-127-C
K7BTB 135,324- 358-126-A
WA7IVZ 117,096- 328-119-C
KU7A 74,448- 282- 88-B
KX7J 42,930- 159- 90-C
WA7KLK 37,350- 150- 83-C
W7FF 21,222- 131- 54-C
N7CQY 14,523- 103- 47-C
W7RIR 2484- 36- 23-B
KD7RF 3168- 44- 24-B-20
WB7FDQ 139,050- 618- 75-C-10

Idaho

W7DTL 18,146- 117- 46-B

Montana

KS7T 75,192- 241-104-C
K7ABV 35,040- 146- 80-C

Nevada

WA7CWM 224,688- 604-124-C
KC7DB 46,314- 168- 93-B
NC7K 19,557- 123- 53-B
WB7VVH 15,759- 103- 51-C
W7YKN 9798- 71- 46-C

Oregon

W7FP 715,077-1023-233-C
KA7EEF 10,710- 85- 42-B
KA7FEF 4200- 70- 20-B
WA7CGR 4875- 65- 25-B
W7ERH 627- 19- 11-B
KC7LK 11,340- 105- 36-C-15
KI7F 777- 37- 7-B-15
WB7RFA 89,775- 475- 63-B-10
W7YAQ 11,439- 93- 41-B-10

Utah

W7HS 80,040- 230-116-C
W7MFU 27,648- 128- 72-B

Washington

N7TT 1,100,295-1497-245-C
N7ABJ 243,045- 494-164-B
W7IIT 78,624- 252-104-C
WA7PVE 58,760- 249- 80-C
W7QN 35,784- 142- 84-C
KB7NV 30,954- 154- 67-A
KC7KU 21,168- 147- 48-C
W7TSQ 17,160- 88- 65-B
W7TS 11,172- 76- 49-C
K7RS 5544- 56- 33-C
W7BQG 1260- 28- 15-B
K7UU 1008- 21- 16-B
AK7F 504- 14- 12-B
W7ERH 627- 19- 11-B-20
KO7G 120,156- 646- 62-C-15
WB7WQE 21,291- 151- 47-B-10

Wyoming

KC7QE 9585- 71- 45-B
KD7RX 8514- 66- 43-B
KT7V 13,230- 90- 49-C-40

8

Michigan

W8UA 938,997-1033-303-C
N8BTU 174,660- 410-142-C
K8KUH 41,610- 146- 95-C
K8CV 37,401- 137- 91-C
N8CQA 29,151- 123- 79-A
WA8LPT 22,848- 112- 68-C
K8NLD 22,311- 111- 67-C
KC8UP 14,337- 81- 59-B
K8DD 243- 9- 9-B-80
W8TWA 91,182- 334- 91-C-20
W8FEM 672- 18- 14-B-15
N8CNT 43,878- 208- 71-C-10

Ohio

KB8HV 304,800- 508-200-C
N8BJQ 245,295- 395-207-C
K8DJC 187,974- 354-177-C
N8ATR 103,275- 225-153-C
W8FN 94,872- 236-134-C
WB8UCW 86,400- 225-128-C
W8UPH 82,422- 241-114-C
KC8PQ 76,257- 229-111-B
W8RSW 64,800- 200-108-C
W8YGR 52,328- 153-114-B
W8ZCQ 50,796- 166-102-C
N8CRB 45,216- 157- 96-C
KI8B 43,650- 150- 97-B
WD8BKT 41,400- 150- 92-C
W8EX 38,340- 142- 90-C
KC8HJ 39,330- 138- 95-C
WA8RYD 34,710- 130- 89-C
W8NPF 33,516- 133- 84-B
W8DWP 29,766- 121- 82-B
N8EKS 21,942- 106- 69-B
KB8XT 17,595- 85- 69-C
WD8QAC 15,576- 88- 59-B
W8IMF 12,375- 75- 55-C
WA8LLY 9108- 92- 33-B
K8MR 8640- 64- 45-C
W8VZE 4794- 47- 34-C
KA8MPT 3480- 40- 29-C
WA8AGH 1638- 26- 21-A
K8PYD 1518- 23- 22-B
AI8S 741- 19- 13-B
KC8JH 24,375- 125- 65-C-80
WA8DXG 19,685- 115- 57-C-80
KU8E 17,304- 103- 56-C-80
AD8C 37,011- 189- 73-C-40
W8KKF 100,296- 398- 84-C-15
WB8JBM (KC8MK, opr.) 41,040- 190- 72-C-10
NA8W 17,100- 100- 57-C-10
KB8WB 12,384- 96- 43-B-10

West Virginia

W8WVM 585- 15- 13-B-80
W3IJT 4350- 50- 29-C-20

9

Illinois

WB9JKI 144,918- 291-166-C
KC9UM 102,543- 257-133-B
K9BQL 101,346- 288-127-C
WD9GIG 56,994- 181-118-C
KB9AW 44,064- 144-102-C
K9SD 35,256- 228- 52-C
KE9Y 34,602- 146- 79-C
KV9S 30,504- 164- 82-C
W8PNE 26,070- 110- 79-C
W9ZGP 25,680- 107- 80-C
W9TNZ 25,179- 109- 77-B
W9CD 23,280- 97- 80-C
KA9HVU 19,008- 99- 64-C
NA9A 15,405- 79- 65-C
W9LYN 13,728- 88- 52-B
N9BTF 10,350- 69- 50-C
WD9DGE 8601- 61- 47-C
W9REC 4620- 44- 35-B
WA9MRU 2346- 34- 23-B
KG9Z 1794- 26- 23-C
W9PQH 945- 21- 15-B
N9GB 7812- 62- 42-C-80
K8NN/9 40,584- 176- 76-C-40
W9CH 21,594- 118- 61-C-40
KR9G 44,352- 192- 77-C-20
WD9FUJ 42,336- 196- 72-C-20
WD9IFS 6837- 53- 43-B-15
WB9HAD 63,960- 260- 82-C-10
KA9MOM 5115- 55- 31-B-10
K9UIY 3276- 42- 26-B-10
KA9KDZ 468- 13- 12-B-10

Indiana

N9DE 412,641- 527-261-C
WB8RNL 71,424- 192-124-B
W9OBF 71,736- 196-122-C
KV9C 46,872- 168- 93-B
K9VQK 31,488- 128- 82-C
W9PC 25,986- 122- 71-B
KA9LWL 4386- 43- 34-B
N9NB 4185- 45- 31-C
KJ9D 300- 10- 10-B-160
KJ9D (KK9V, opr.) 14,352- 92- 52-C-80
WB9POH 23,808- 128- 62-C-40
WA9CYG 1560- 26- 20-C-20
W9ZRX 364,824-1126-108-C-15
KC9FC 39,204- 198- 66-C-15
KN9C 38,976- 203- 64-B-15
N9ACD 20,178- 118- 57-B-15

Wisconsin

K9CAN 407,190- 554-245-C
W9OP 346,239- 527-219-C
W9GIL 221,652- 393-188-C
N9BUS 125,496- 252-166-B
KC9LM 43,200- 160- 90-C
WB9UIO 27,948- 137- 68-B
WB9HRO 19,776- 103- 64-A
N9CXJ 13,272- 79- 56-C
N9KS 11,130- 70- 53-B
WB9NOV 10,404- 68- 51-C
K9PBV 8100- 60- 45-C
W9YCV 7497- 51- 49-C
KB9DZ 1680- 28- 20-C
W9RN 11,781- 77- 51-C-80
KQ9L 5184- 48- 36-C-80
K9BIL 1596- 28- 19-C-80
W9AMM 48,357- 199- 81-C-15
K9GDF 12- 2- 2-C-10

0

Colorado

W0OSK 219,810- 431-170-C
KS0E 164,328- 334-164-B
KK0L 130,980- 295-148-C
N0ZA 86,751- 243-119-C
K0UK 84,075- 295- 95-C
N0EKK 90,400- 268-100-C
W0GOQ 37,683- 159- 79-C
KD0NB 23,760- 132- 60-B
K0IYF 13,959- 99- 47-C
W0JF 9372- 71- 44-C
W0BWJ 6505- 63- 45-C
W0KEA 5816- 48- 39-C
W0RSG 1701- 27- 21-C
KG7Z 1560- 26- 20-C-80
K9MWM 38,097- 249- 51-C-40
K0ZX 100,464- 368- 91-C-20
KD0MZ 27- 3- 3-C-20
W0ZV 462,990-1342-115-C-15
ND0E 133,620- 655- 68-C-15
N0DWR 31,200- 200- 52-C-10
W0GOR 29,046- 206- 47-C-10
K0ZFL 18,768- 92- 68-B-10
W0IZV 18,753- 133- 47-B-10

Iowa

KZ0C 296,730- 471-210-C
K0CF 230,724- 377-204-C
W0WP 217,338- 407-178-B
KC0XK 203,196- 413-164-C
W0EJ 102,258- 247-138-C
K0LUZ 100,251- 237-141-C
W0PPF 62,586- 183-114-C
K0GT 45,114- 148-103-A
WB0CHS 32,574- 122- 89-C
W0MJN 25,773- 121- 71-C
WA0DCB 14,442- 83- 58-C
W0SML 2175- 29- 25-C-40
AG0M 3600- 40- 30-C-20
W0IZ 22,344- 133- 56-B-10

Kansas

WA0TKJ 336,990- 470-239-C
W0FNI/0 201,474- 369-182-C
KC0XH 96,624- 244-132-B
WD0CFZ 75,600- 200-126-C
W0IYR 63,684- 183-116-C
W0UQD 27,798- 113- 82-C
N7DF 19,620- 109- 60-C-80
K0UR 95,256- 378- 84-C-15
WB0ISW 29,028- 164- 59-C-15
AB0X 22,152- 142- 52-C-15
KB0U 27,144- 156- 58-B-10
K0VUA 7440- 80- 31-C-10
W0YZL 5088- 53- 32-C-10

Minnesota

N0AT 387,612- 666-194-C
N0BSH 204,795- 369-185-C
AC0W 63,315- 201-105-B
W0SW (WD0HXW, opr.) 43,326- 174- 83-C
WA2HFI/0 33,518- 133- 84-B
W0YA 18,818- 112- 56-B
W0LP 12,642- 86- 49-C
KD0HN 720- 16- 15-B
AB0P 3483- 43- 27-C-40
KA0M 16,317- 111- 49-C-20

Missouri

K0IFL 184,002- 337-182-C
AC0N 53,856- 176-102-C
KC0LX 21,105- 105- 67-C
KM0L 3510- 39- 30-B
KA0P 363- 11- 11-B
K0CS 6216- 56- 37-C-80
W0JU 4524- 52- 29-C-80
KC0GC 21,054- 121- 58-B-15
K0RWL 14,850- 110- 45-C-15
W0JLC 51,726- 233- 74-C-10

Nebraska

K0SCM 188,339- 347-179-C
W0OLL 21,060- 108- 65-B
KB0YK 6240- 52- 40-B
W0SSC/0 35,577- 177- 67-C-10

North Dakota

K0QQ 196,080- 380-172-C
KC0UM 3360- 40- 28-B
KC0CU 14,310- 90- 53-C-20

South Dakota

W0WUU 4388- 52- 28-C
K5LZT 60- 5- 4-B
WA0YBT 462- 14- 11-B-80

VE

Maritime-Newfoundland

VO1CA 35,235- 135- 87-C
VO1AW 9372- 71- 44-C
VE1YX 12,696- 92- 46-B-160
VE1FW 103,248- 478- 72-B-15
VE1BNN 41,418- 177- 78-C-10

Quebec

VE2AYU 255,339- 441-193-C
VE2WA/3 155,310- 334-155-C

Ontario

VE3DLT 150,936- 331-152-C
VE3FDP 135,864- 308-148-C
VE3FEA 35,604- 138- 86-C
VE2AEJ/3 9936- 69- 48-A
VE3INQ 270- 10- 9-B-160
VE3MFA 3963- 81- 41-C-40
VE3CUI 108- 6- 6-B-40
VE3CVX 52,206- 226- 77-C-10
VE3NBE 18,000- 120- 50-B-10

Manitoba

VE4JK 142,710- 355-134-C
VE4CCC 59,670- 195-102-C
VE4ALO 26,862- 121- 74-B

Saskatchewan

VE5AFF 1458- 27- 18-B
VE5ADA 11,070- 82- 45-C-20
VE5ACY 858- 22- 13-A-10

Alberta

VE6OU 141,120- 420-112-C
VE6XS 11,583- 99- 39-C-20

British Columbia

VE7AAQ 485,300- 825-188-C
VE7EIK 15,042- 109- 46-C-20

NWT

VE6DX 15,552- 144- 36-A-20

Multioperator

Single Transmitter

1

K1TO (+K1ZZ, KA1ZD) 1,981,760-1720-386-C
KM1C (+WB8BTH, W1PH) 1,593,000-1500-354-C
WB1ELC (+KB1J, K1FWE) 1,436,820-1555-308-C
K1VR (+N1RC,W1FV) 945,720-1110-284-C

KA1X (+ AK1L)
705,528- 984-239-C
KT1N (+ WB1FPF)
440,076- 676-217-C
KR1R (+ KS1N, KB1W)
357,684- 727-164-C
W1IHN (+ KA1FBY, KO1R)
260,934- 554-157-C
AG1C 93,177- 261-119-C
N1CZC (+ W1OD)
1512- 24- 21-C

2

K2BU (+ WA2HGM)
2,959,200-2192-450-C
K2VV (+ N2JJ)
1,749,705-1741-335-C
K2XR (KC2X,KD2I,KR2Q,KT2B,W2HWG, WA2s PID,VUN,WB2s EGI,WIK,oprs)
1,027,548-1173-292-C
W2XL (+ N2DRR,NA2N,K5NA)
861,228-1018-282-C
WA2LQG (K2s UAT,DOD,N2DYE,W2DKM, WB2FMP,oprs)
622,710- 814-255-C
W2HG (+ WA2LOG)
350,715- 615-227-C
W2UI (+ N3KR)
279,210- 454-205-C
K2TD (+ Net)
175,440- 344-170-C
W2VJN (+ Net)
32,472- 123- 88-C
KW2D (KC2KK,WA2UYM,oprs.)
32,226- 131- 82-B

3

K3LR (+ AF3P,N8DET,K8CC)
2,089,500-1750-398-C
K3TUP (+ AI8S,KB3A,KB8IZ,KJ3L,N3BJ, W8CY,WA3UCS)
1,622,880-1380-392-C
N3KZ (KH6CP,KM3T,N3ATQ,oprs.)
943,800-1100-286-C
KF3L (+ WB3HGQ)
210,672- 399-176-C
K3UEI (+ Net)
175,959- 343-171-C
W3NX (+ Net)
78,626- 198-129-C

4

W4NL (+ K3KG)
1,703,825-1475-365-C
N4KG (+ KC4ZV,N4AJZ)
1,396,688-1279-364-C
W4DFU (+ KA3IKE,KA4s FOO,ZIU, KB4ABE,KF4s GI,IT,K8OO,WA1THV, WB4JCM)
777,042- 881-294-C

5

K5QY (+ KM5K,KM5R)
1,013,760-1056-320-C
KA5QWN (+ KA5RCI)
47,520- 144-110-C

6

K6OKW (+ AD6P,K5KT,K6SVL,NE6I)
833,112-1218-228-C
W6VLD (K6TXA,N6KN,W3CEQ,WA6s DPQ,HJK,WB6ICK,oprs.)
725,220-1185-204-C
W6BIP (+ WA6DJI,WA6PYN)
665,808-1067-208-C
WB6ZHT (+ WB6QPO)
510,822- 962-177-C
NF6L (+ WA6s EJI,JBO,K6TQ)
444,198- 733-202-C
WA6ZEF (+ KA6s YOI,YOJ,YOL,ULW, KE6TZ)
188,469- 487-129-C
N6CCL (+ N6IYI)
159,558- 406-131-C
WB6JHC (KA8OHP,KC6W,WA6CWQ, WB6CWT,WL7AIH,oprs.)
109,125- 485- 75-C
KE6PQ (+ Net)
99,120- 295-112-C
NQ6X (+ Net)
62,445- 181-115-C
K6LRN (+ Net)
1176- 28- 14-C

7

WA6PVA/7 (+ WA7QXH)
461,898- 766-201-C
AF7Z (+ WA7VYJ,and members of the Brigham Young U. ARC)
395,016- 872-151-C
K7GEX (+ K7LXC, WB7BNP)
365,400- 812-150-C
NF7P (+ KA7AGM,KC7s LX,ZS,KY7N, N7RH,NF7K,WA7HVU)
211,928- 494-143-C
W7DK (K1DPO,K7s GYP,ETU,QLC, KA7BRT,KD7s LJ,OY,KL7JR,N7s ANF, DRT,W7s WG,DWW,WA6UBX,WB7s WPQ,QCW,BLQ,oprs.)
120,060- 345-116-C
KA7ODD (+ KA7s OSX,OSZ)
8184- 88- 31-B

8

K8GG (+ W8UVZ, WD8CRY, K8AQM, WB8ATA,W5ONL,KC8KQ)
998,520-1060-314-C
W8LT (K3JT, K8EM, KA6TGE, KD8NS, N8CJD, WB8PHI, WD8s IXE, LXX)
277,761- 443-209-C
KA8IIC (+ KA8s PTT, POM)
98,820- 244-135-C

9

K9GM (+ KE9A, KR9S, KO9G,KV9V, KR9R, WA9OVU, WB9s YXY, GLB)
916,980-1054-290-C
W8A1H/9 (+ W8UC, K8FVF,WA8RBW, KM9O)
895,977- 881-339-C
KC9XF (+ N9EJL)
134,904- 292-154-C

0

K4VX/0 (+ K9BGL, KM9D, N9NC, KR0U)
1,716,138-1423-402-C
AD0O (+ KX0O, N0DV)
690,000- 920-250-C
K0SR (+ KF0P)
651,240- 804-270-C
W0HBH (AA0A, KA0DQI, WD0FSJ, WD0GML, WB0IUN, KM0R)
462,000- 616-250-C
W0UO (+ AB0I, K0UAA,K0UBU)
401,886- 538-249-C
KR0B (+ N0s BKL, BNG, BKY, BIL, AF9T, KD0KF)
348,300- 540-215-C
KC0WP (+ WA0EBI)
110,208- 287-128-C
KJ0G (+ K0GAS)
102,843- 293-117-C
K0GND (+ W0MCP, WA0WRI, WD0EGK)
82,680- 212-130-C
KM0P (+ KM0R)
75,168- 232-108-C
AE0M (+ N0BBS)
49,686- 182- 91-C

VE

VE6AO (VE6s GO, CCB, CCL, CCM,CQA, CHW,oprs) 24,300- 150- 54-C

Multioperator

Two Transmitter

K2TR (+ K2XA, NC2R, W2ARQ, WA2SPL)
4,451,616-3016-482-C
W4QAW (+ K3s EST,RV,W3ZZ,WB4SGV)
4,322,078-3014-478-C
N5AU (+ K5ZD, N5DDO, WB5VZL)
4,164,426-2874-483-C
NA8V (+ K8s IA, LX, W8TA, WA8YVR)
3,480,516-2479-468-C
W3GM (+ W3FV, N3VV, K3s ND,GM)
2,358,840-1787-440-C
N2RM (+ N2MM, K3KNH, KB3TN)
2,144,241-1969-363-C
KS9K (+ KS9Z, K9CJK, KJ9I. KD9ET, KB9QC, KE9U, WB7DZN, WB9AUK, WD9JKZ, SM7DZT)
2,025,405-1667-405-C
KA1GG (+ K1s KJT,VUT,KC1Q,W1KM)
1,848,440-1784-345-C
WI4R 1,599,780-1485-384-C
N7RO (+ W7EKM, WB7CLU, WA7ZWG, AI7P, KC7GX)
1,098,468-1453-252-C
KB1H (+ K9ZO, KS1Q, WA1s RLV, HYN)
650,334- 766-283-C
W8NGO (+ W8s KR, ONA,K8s ZE, ZZU, WD8s JTJ, JTK)
514,254- 694-247-C
W2ZQ (WA2JZF, KD2EZ, K3CPF, N2AEM, KA2s TLS, IEU,oprs.)
184,764- 356-173-C

Multioperator

Unlimited

KN3O (K1PT,W2REH,K2UU,KB2XZ, K3sJLT,WJV N3s AD,DAY,RD,oprs)
7,369,965-4115-597-C
W3LPL (+ AI3M,K3DI,KD4NI,W3MR, N3GB,KA1GD,WA3KCY,W4BVV,N8II, KC8C)
6,070,590-3846-555-C
W4DR (+ K3RZR,KA4EVH,N4ND, W4sRNP,MYA,PDL)
4,672,200-2995-520-C
KX4S (+ K4WHN,KA3DTE,KG4W, WA4sBKD,HOT,WB4BVY.WK4Y)
4,631,616-2992-516-C
N4ZC 3,118,284-2221-468-C
K8RF (+ KY8s,N2IC,N8CQS,W8s PSY, RLY,UN,oprs.)
3,090,204-2556-403-C
K3ZUF (+ K3NZ,K3OO)
2,480,205-1817-455-C
K3ZZ (+ K3TM,KC3s EK,FL,KI3L,KR3M, WA3EKL)
1,905,120-1620-392-C
KF3R (+ N7BIT,WB2YOF)
779,532-1052-247-C
K3II(+ KQ2O,WA3IMY)
782,795- 759-335-C
KB8TI (+ N8DXI,NE8I)
269,310- 470-191-C
WD4RCO (+ net)
86,400- 200-144-C
KM6K 7482- 58- 43-C
K1XM (+ net)
6510- 62- 35-C

DX — Phone

Single Operator

Africa

A22ME	414,750	1106	125-C
CN8EL	26,163	171	51-B
EA8ZI	699,336	1786	132-B
EA8RL	67,536	536	42-C-80
EA5BAA/8	12,960	144	30-B-80
EA8AFB	108,633	739	49-B-20
EA8ACH	41,925	325	43-B-20
TU7J	1,470,660	2540	193-B
ZS6BRZ	181,865	545	99-C
ZS6DW	36,504	312	39-C-40
ZS6BYK	1836	35	17-C-20
ZS1JY	594	18	11-B-20
5N8AFE	1160	386	148-B
9U5JB (N4HX,opr.)	1,151,568	2181	176-C

Asia

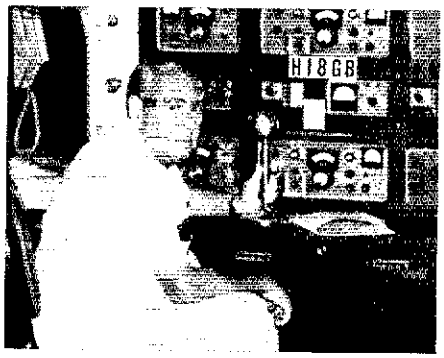
HL4CBI	750	60	5-B-10
JA1ELY	827,316	1407	198-C
JH7DNO	723,948	1403	172-C
JA8CDT	626,145	1235	169-C
JP1DYZ	301,056	896	112-C
JA7DAH	237,846	809	98-C
JH8LFE	190,242	542	117-B
JA1BWA	132,888	392	119-C
JH7YJF	83,349	567	49-C
JA6LDD	83,349	343	81-C
JH4UYB	82,566	417	66-C
JH1KLN	48,756	239	68-B
JF3CCN	42,273	231	61-B
JA7YYL (JA7FKF,opr.)	39,627	259	51-B
JA3YKC (JR6NWN,opr.)	25,118	182	46-C
JH3LCU/1	20,424	148	46-A
JR3WXA	17,442	153	38-C
JA1JGP	16,731	143	39-B
JA1ALX	11,100	74	50-B
JI3BFQ	9156	109	28-A
JA1VZM	8181	101	27-B
JH1MTR	7020	90	26-B
JP1TRJ	5073	89	19-B
JJ3BZS	3876	68	19-B
JA1KFX	3315	65	17-A
JK1UGC	3180	53	20-B
JE3VXD	2862	53	18-B
JI1WLL	2550	50	17-B
JI2NQS	2160	60	12-B
JM1VTJ	1560	40	13-B
JA1AAV	1440	32	15-B
JG2VMN	1296	36	12-B
JP1SRG	840	40	7-B
JA1FO	714	34	7-B
JR4ISK	672	32	7-B
JA5EO	483	23	7-B
JH8RGQ	135	9	5-A
JA2BAY	71,883	489	49-C-40
JI3PLX	576	24	8-B-40
JR6LDI	546	26	7-B-40
JA2SAP/1	288	16	6-B-40
JL1DBI	240	16	5-B-40
JH9GAV	171	19	3-B-40
JH3DPB	104,004	842	54-B-20
JA7YCQ	22,155	211	35-C-20
JH1APK	7308	84	29-C-20
JA1IT	324	12	9-B-20
JE1GZB	105	7	5-B-20
JA2APA	195,696	1208	54-B-15
JA7BJS	87,000	580	50-C-15
JA7YAI (JK1CYV,opr.)	84,816	589	48-C-15
JA2BNN	30,564	283	36-B-15
JA8UJY	17,172	159	36-B-15
JE7DOT	13,764	124	37-B-15
JM1WZP	12,705	121	35-B-15
JH8TDZ	9312	97	32-B-15
JG1WIC	8613	99	29-B-15
JI1QLB	8991	111	27-B-15
JF2AFJ	7728	92	28-B-15
JH1BUB	4233	83	17-B-15
JP1FZA	2856	56	17-B-15
JA6IP	2754	51	18-B-15
JE4ADO	2499	49	17-B-15
JO1ACW	1638	42	13-B-15
JA8CJY	1296	36	12-B-15
JE2GJD	1215	27	15-B-15
JP1TVZ	567	27	7-B-15
JH2XTV	348	16	8-B-15
JH1XIT	240	16	5-B-15
JA2KGQ	228	19	4-B-15
JE4BPJ	180	12	5-B-15
JP1DPC	72	6	4-B-15
JQ1BHW	30	5	2-B-15
JA9RPU	37,440	390	32-B-10
JA1CQT	28,880	280	32-B-10
JA8TPE	22,050	245	30-B-10
JO1CRA	17,475	233	25-B-10
JR6GIM/2	11,748	178	22-B-10
JH1IED	10,971	159	23-B-10
JM1SMY	6555	115	19-B-10
JA6GGD	4536	126	12-B-10
JA1DFQ	4448	78	19-B-10
JR7CDL	3360	80	14-B-10
JH1UUT	2100	70	10-B-10
JE1PJR	1530	61	10-B-10
JA7ZWD	1107	41	9-B-10
JA2EAB	588	28	7-B-10
JA3BBG	396	22	6-B-10
JH1FJK	120	10	4-B-10
UW6MF	153,972	564	91-B
UA9MR	59,682	343	58-B
UA0CDM	3024	84	12-B
UA0CFX	468	26	6-B
UA0FOH	48	8	2-A-80
UA0FCL	561	17	11-B-40
UA9ND	8976	88	34-B-20
UA0SMA	8075	81	25-B-20
UA0XAK	3510	65	18-B-20
UW9FD	231	11	7-B-20
UA0SGL	12	2	2-A-20
UA0ZBP	79,659	501	53-B-15
UA0CBW	4284	119	12-B-10
UA0FEP	1380	48	10-B-10
UA0LBM	696	58	4-B-10
UG6JJ	240	10	8-B
UJ8JKO	120	8	5-B-20
VS6JJ	2898	42	23-B
4X6IF	15,708	119	44-B
4Z4TR	13,755	131	35-B-15

Europe

CT4MS	115,632	584	66-B
CT1FL	55,275	335	55-C
CT2CE	7590	110	23-B-160
CT2DL	75,636	573	44-C-80
CT2FH (K1RZ,opr.)	420,489	2459	57-C-15
CT2CQ	192,660	1235	52-B-15
DA2ER	800,700	1570	170-C
DJ0BA	393,480	1093	120-C
DL5SBA	11,094	86	43-B
DL8ZAW	10,206	81	42-B
DJ3GE	5103	63	27-B
DL5MCH	2052	38	18-B
DL8PC	8184	124	22-C-80
DL8NBY	2025	45	15-C-20
DK8WF	111,690	730	51-C-15
DJ5TH	88,596	642	46-C-15
DF6FK	67,770	502	45-C-15
DL8AAE	6384	76	28-B-15
DA1WD	2652	52	17-B-15
DJ3HJ	12,276	186	22-B-10
DF2HL	315	15	7-B-10
EA3RCD (I1MOL, opr.)	332,955	1681	185-C
EA7AZJ	501,072	949	176-C
EA2IA	99,949	401	83-C
EA5RCH	42,456	244	58-B
EA2SN	31,500	175	60-A
EA5BMF	20,532	118	58-B
EA2CR	19,035	135	47-B
EA5JC	18,104	88	61-B
EA3NA	7881	71	37-C
EA2ABJ	7242	71	34-B
EA5TX	357	17	7-B-160
EA2QU	23,865	215	37-C-80
EA7BUU	660	20	11-C-80
EA3AQC	77,200	495	52-B-20
EA3AAY	8232	98	28-C-20
EA4KR	864	24	12-B-20
EA3DNC	378	14	9-A-20
EA1CDF	107,892	666	54-B-15
EA1CIM	252	12	7-B-15
EA3DMP	7590	115	22-C-10
EA3CTI	7392	112	22-B-10
EA3CSK	4968	72	23-B-10
EA3ELM	2961	47	21-B-10
EA1CVY	1782	33	18-B-10
EA3ELZ	1305	29	15-B-10
EA8OA	5874	89	22-B-20
EA6DE	9888	103	32-B-15
F6AOJ	154,833	1533	101-B
F6HOY	143,856	444	108-B
F6GPG	35,778	178	67-B
F6CLM	6030	67	30-B
F6BEE	11,934	117	34-C-40
F6BRK	2400	50	16-B-20
F9JS	46,170	342	45-C-15
F5BV	1488	31	16-B-15
G2QT	171,264	446	128-C
G3IMW	34,200	190	60-A
G4WGM	33,372	206	54-B
G2AOL	15,228	94	54-B
G6QQ	13,818	98	47-B
G3WQG	8880	74	40-A
G3CWL	810	27	10-A
G3FXB	235,872	1404	56-C-20
G3XWZ	38,745	287	45-C-20
G3NT	15,984	144	37-B-15
G5DSD (WA3NGL,opr.)	10,080	112	30-B-15
GM4KHE	1440	30	16-C-40
GM4CHX	12,036	108	34-C-15
GW4BKG	162,180	1060	51-C-15
HA8UB	19,680	160	41-B
HA8ZO	31,842	183	58-B
HA4XX	7088	76	31-B
HA8IB	4440	74	20-B-80
HA7UG/P	22,260	212	35-B-40
HA3GJ	2018	42	16-B-15
HA2PP	5100	100	17-B-10
HB9AAA	248,724	882	94-C
HB9Z (HB9RE, opr.)	7920	80	33-C
HB9DX	19,380	190	34-C-15
I2ZCE	27,387	179	51-B
I5MXX	22,506	242	31-C-80
I4AVG	24,309	219	37-B-40
I5FCK	197,217	1289	51-C-15
I1ZFT	43,890	385	38-C-15
I4CSP	9900	100	33-B-15
IK1BQD	3795	55	23-B-15
IS0KNG	15,486	178	29-C-10
JW6MY	336	14	8-B-20
LA4TE	135,252	578	78-C
LA8DY	56,700	252	75-B
LA1SEA	39,528	183	72-C
LA2AD	7533	81	31-B
LA7NDA	5829	67	29-B
LA2IJ	3864	46	28-B
LA8BBA	1785	105	17-B
LA4HW	4422	67	22-C-40
LA3KBA	432	16	9-B-20
LA9DI	35,920	216	40-B-15
LA2IZ	6723	83	27-B-15
LA5TBA	1260	28	15-C-15
LA4O (LA9HW,opr.)	28,580	290	34-B-15
LZ2KTS (LZ2PO,opr.)	154,710	955	54-C-15
LZ1KWS	8820	105	28-C-15
LZ1GD	6075	75	27-B-15
LZ1YG	1848	44	14-B-15
LZ1HA	1500	25	20-C-15
OH1TD	9348	82	38-C
OH1OR	8820	70	42-C
OH4PW	3888	48	27-B
OH8AA (OH6EI,opr.)	132,330	802	55-C-20
OH6QU	10,752	112	32-C-20
OH5OL	2964	52	19-B-20
OH1PY	840	28	10-C-15
OH8TA (OH2BQT,opr.)	594	18	11-C-15
OH8AM (OH6GO,opr.)	19,881	141	47-C
OK1DWA	957,720	1735	184-C
OK3CGP	59,535	245	81-A
OK2BWH	21,648	176	41-B
OK1KZ	11,583	99	39-B
OK3FON	8856	82	36-B
OK3PQ	5070	65	26-B
OK2BHQ	945	21	15-B
OK2KVI (OK2SWD,opr.)	390	13	10-C
OK2FD	7176	104	23-C-80
OK2BOL	4968	72	23-B-20
OK3KNS (OK9KY,opr.)	231	11	7-B-20
OK1ANS	45	5	3-B-20
OK3CSC	109,898	778	47-B-15
OK2KAN	5200	69	25-B-15
OK1PCL	3960	60	22-B-15
OK3YCA	2832	59	16-B-15
OK2ABU	2280	38	20-B-15
OK2BSA	1710	38	15-B-15
ON4AEV	4095	65	21-B
OY9R	7956	102	26-B
OZ5EV	154,164	443	116-C
OZ8T	17,802	129	48-B
OZ2OL	11,858	134	29-B
OZ2BM	6936	68	34-B

EA8RL took first place on 80-meter phone from the Canary Islands.

YV5DWB, "Baby Blue," operated 80-meter phone from Venezuela.



HI8GB worked 56 countries on 10-meter phone.

OZ3KE 360- 12- 10-C
OZ1APA 2280- 40- 19-B-20
OZ1FTE 3750- 50- 25-C-15
OZ1DYI 1953- 31- 93-B-15
OZ1AXG 570- 19- 10-B-15

PAØKDM 24,624- 144- 57-B
PAØRBS 9435- 85- 37-B
PA0CF 2904- 44- 22-B
PAØQX 17,442- 171- 34-B-20
PA3CEF 98,904- 634- 52-B-15

SK6AW (SM6DED,opr.)
107,004- 482- 74-C
SM7KIL 91,575- 407- 75-C
SM7FHJ 10,583- 107- 33-B
SM5AWR 7128- 72- 33-B
SM3EP 6680- 74- 30-B
SM6BGG 18,327- 149- 41-C-40
SM2LWU 24,570- 210- 39-C-20
SMØBDS 975- 25- 13-C-20

SP8ARY 6237- 77- 27-C
SP6KGN 495- 15- 11-B-20
SP6DVP 405- 15- 9-B-20
SP3CQP 2337- 41- 19-B-15
SP6CYV 780- 20- 13-B-15
SP4LVH 384- 16- 8-B-15

SVØDC 27,999- 183- 51-C

WA2CPY/ITF 4284- 51- 28-B
KE4SX/TF 3243- 47- 23-B-20

UA3EAL 120- 8- 5-B-80
UA4HDQ 3819- 67- 19-B-20
UA3AMB 9540- 106- 30-B-15

UA2EC 4032- 58- 24-B-15

UB5IFN 7371- 189- 13-B-80
UB5IUA 162- 9- 6-A-40
UT5GM 10,890- 110- 33-B-15
UB5VAZ 4800- 80- 20-B-15
UY5TE 2040- 40- 17-B-15

UL7QF 5940- 60- 33-B

UP2BBF 3432- 52- 22-B

YO3RN 6384- 76- 28-B
YO2ARV 2142- 42- 17-B

YU3UPI 44,200- 278- 53-B
YU3TUW 16,380- 182- 30-C-80
YU3DCR (YU3IX,opr.)
163,048- 911- 56-C-20
YT3T (YU3BQ,opr.)
149,655- 907- 55-C-20
YT3L (YU3WE,opr.)
124,695- 815- 51-C-15
YU5XTC 7568- 97- 26-B-15
YU7SF 528- 16- 11-B-15
YU1PUU 1092- 28- 13-B-10

Y47VN 13,209- 119- 37-B
Y49RF 10,200- 85- 40-B
Y22HF 8610- 82- 35-B
Y67YL 2430- 45- 18-B
Y22JJ 3276- 52- 21-C-40
Y33TA 12- 2- 2-C-40
Y23HN 1287- 33- 13-B-20
Y24LE 1092- 28- 13-B-20
Y22RK 720- 24- 10-C-20
Y76ZN (Y62QN,opr.)
264- 11- 8-B-20
Y33XB 141,033- 887- 53-C-15
Y57RH 11,811- 127- 31-C-15
Y24SG 10,710- 105- 34-B-15
Y31WI 5694- 73- 26-B-15
Y59UN 3888- 48- 27-B-15
Y24NG 3840- 64- 20-B-15
Y24IF/P 3564- 66- 18-B-15
Y38YE 3300- 55- 20-B-15
Y32KE 792- 24- 11-C-15
Y56WA 405- 15- 9-C-15
Y43TG 48- 4- 4-B-15
Y21TL 9- 3- 3-B-15

4U1ITU (W2GD,opr.)
3534- 62- 19-C-160

North America

CM2QP 15,750- 150- 35-B-40

K6QJ/C6A 1,492,785-2031-245-B
N4RP/C6A 388,880- 790-164-B
KE5MB/
C6A 251,808- 976- 86-B

HH2CQ 6,136,416-5556-312-C
HH2WL 577,524-1292-149-B
HH2VP 221,445- 777- 95-C

HI3AMF 234,738- 621-126-B
HI8LC 92,826- 573- 54-C-80
HI3EMS 314,328-1871- 56-C-20
HI8GB 416,304-2478- 56-C-10

NL7CJ 2925- 39- 25-C
WL7BIL 27,342- 217- 42-C-80
AL7DX 107,961- 679- 53-C-10

KØTG/KP2 1,269,693-1987-213-C
KP4EQF 365,736-2177- 56-C-20

OX5RJ 91,383- 387- 83-C

TI2BAM 348,000- 928-125-B

KØEJ/VP2M 4,277,448-5166-276-B
VP2MDB 99,165- 601- 55-C-15

VP9KA 202,966-1253- 54-B-15

KK9A/V2A 485,811-2841- 57-C-15

V3TV 498,420-1085-156-B

XE2MX (N6ND,opr.)
3,561,435-4255-297-C
XE2RB (KD5GY,opr.)
247,212- 756-109-B
XE1LLS 129,297- 917- 97-B-10

ZF2FL (N6RJ,opr.)
7,017,498-7242-323-C

Oceania

KJ9W/KH2 21,516- 183- 44-B

AH6BK 13,392- 124- 36-C-160
AH6AZ 28,896- 224- 43-C-80
KH6IJ 10,302- 101- 34-C-80
K9RA/KH6 194,934-1226- 53-C-20
W7PSO/
KH6 13,608- 126- 36-B-15
KH6XX 469,053-2743- 57-C-10

VK2WU 2,454,543-3367-243-C
VK1LF 4134- 53- 26-C
VK5BW 4941- 61- 27-C-80
VK3DMU 149,730- 805- 57-B-20
VK5ARO 49,407- 383- 43-C-10
VK2PMC 32,868- 249- 44-A-10

YB8ARA 261,030- 791-110-C

ZL1IM 20,862- 122- 57-B

3D2DX (VE5RA,opr.)
2,177,250-2903-250-B

5W1ER (K2FJ,opr.)
22,410- 166- 45-B

South America

CE2BNT 1,643,781-2839-193-C
CE8DQN 1,091,616-2192-168-C
CE7GDR 67,820- 460- 49-C-40
CE3DNP 233,856-1392- 56-C-20
CE2BXN 287,280-1710- 56-B-10

CE9AE 27,000- 200- 45-B-10

HC1HC 499,652-2922- 57-B-10
HC1OT 431,433-2523- 57-C-10

K3ZO/HK3 2,882,505-4469-215-B
HK6FIQ 10,395- 99- 35-B-40
HK8BVN 162,621- 951- 57-B-15

LU1BR 2,685,680-3830-232-C
LU8DQ (LU8ETB,opr.)
2,373,600-3680-215-C
LU9CF 198,288-1224- 54-C-20
LU8ESU 59,829- 407- 49-B-20
LU1CLA 308,313-1803- 57-C-10
LU6EM 302,400-1800- 56-C-10
LU1VK 137,214- 847- 54-B-10
LU1DRC 70,785- 429- 55-B-10

OA4SS 1,723,623-2749-209-C
OA8CP (KE4EW,opr.)
19,980- 180- 37-B-80

PP2ZDD 1,632,198-2734-199-C
PP8ZAT 880,508-1823-161-C
PY3DF 256,586- 701-122-B
PY2FZ 244,431-2469- 99-C
PS7KM 116,367- 491- 79-B
PP1ZGP (KF4EI,opr.)
83,538- 357- 78-C
PY5OC 104,463- 657- 53-C-15
PY2WR 9- 3- 1-B-15
PY3AMP 173,988-1074- 54-B-10
PY2RE/4 49,815- 398- 45-C-10
PY1VT 24,840- 207- 40-B-10

P42J (W1BIH,opr.)
4,420,185-4695-301-C

YV7QP 103,194- 702- 49-B
YV1DWQ 7740- 86- 30-C-160
YV5JEA 54,567- 387- 47-B-80
YV5DWB 32,490- 285- 38-C-80
YV5JEM 83,850- 559- 50-B-15

ZP5XDW 115,500- 700- 55-C-10
ZP5LOB 71,232- 448- 53-C

9Y4SO 20,040- 167- 40-B-15

Multioperator

Single Transmitter

Africa

EA9AM (+EA9IE)
2,341,170-3335-234-B
ZS1CT (DJ9MH, DK3GI, ZS1QM, oprs.)
274,482- 598-153-C

Asia

HL9RC (KA6KGS, KAØQFY, oprs.)
165,240- 612- 90-C

JA1YCL (JG1GQB, JH8MHZ, JHØDUG, JK1JSS, JL1QOC, JO1GAD, oprs.)
636,795-1335-159-C
JA7YAL (JH7VXM, JR7s QWW, TNW, UWK, VSE, oprs.)
228,852- 652-117-B
JA6YAI (JE6MQW, JH6VLF, JHØFCK, JR6s EZE,GAG, oprs.)
140,976- 528- 89-B
JE6JVJ (+JH6SOR)
154,791- 567- 91-B
JA3YQP (JA3PIA, JF3PGA, JI3QPN, JR3BOT, oprs.)
145,908- 579- 84-C
JA6YDH (JE6VFJ, JR6s GHN, PKJ, QHK, oprs.)
83,160- 396- 70-C
JA6YBR (JH6VZS, JE6s CFB, HQU, USQ, UXS, OFE, JF6s BHN, DEA, LOK, QZE, WWT,oprs.) 32,781, 223- 49-B

UKØQBE (UA8s-098-107,-098-121, QWJ,oprs.) 4368- 56- 26-B
UK9CAC (UA9s CNA, -154-1713, CWN,oprs.) 450- 16- 10-B

Europe

DFØEB (DFs 2RG, 4RD, 7RX, DLs 4NAC, 6RAI, oprs.)
285,369- 749-127-C
ED3CBE (EA3s BOW, BOX, CVA, DDU, DGQ, EIO, oprs.)
378,000- 900-140-B
EI7DJ (EI5FK, EI6s AK, 46, EI740, EI8AU, oprs.)
35,316- 218- 54-B

F3TV (F6s ARC, CTT, F9IE, oprs.)
2,712,060-3477-260-C

F6KAW (F6s BBD,BPX,CWN,DZS,EBN, GDK,GWV,HMQ,IFR, oprs.)
769,626-1518-169-B

GJ3DVC (GJ1EXC, GJ2LU, GJ3s LFJ YLI, GJ4s TVZ, TXB, GJ6s HWX, OZB, SNQ, oprs.)
37,050- 190- 66-B

HG5A (HA5s FM, FN, GF, MK, ML, OM, PP, UA, WE, HA7s RY, SU, oprs.)
990,228-1844-179-C
HG6N (HA6s ND, NF, NN, NQ, NY, ON, OQ, oprs.)
951,456-1802-176-C
HG6V (6 oprs.)
595,110-1195-166-C
HA3KMA (5 oprs.)
347,400- 965-120-B
HA1KSA (6 oprs.)
272,496- 811-112-C
HA1KRR (HA1s XO, XU, ZN, ZV, ZZ, oprs.)
195,225- 685- 95-B
HA3KNA (HA3s FTA, NU, OV,oprs.)
92,400- 385- 80-B
HA8KAX (4 oprs.)
37,698- 206- 61-B
HA2KMR (6 oprs.)
32,154- 233- 46-B
HA3KGC (6 oprs.)
21,252- 156- 46-B
HA5KFZ (5 oprs.)
12,840- 107- 40-C

HB9AUS (+HB9s BLQ, CIP, MWD, HE9s ASD, DUK, EEX, oprs.)
877,824-1524-192-C

I0MGM (+IØJX)
2,612,475-3415-255-C
I2QZ 101,871- 693- 49-C

OK2KMR (OK2s BQZ, SSS, oprs.)
105,072- 398- 88-B
OK1ORA (OK1s AYD, 22310, oprs.)
6048- 72- 28-B

ON6BR (ON4s ARL, AYL, KZ, ON6s JN, OU, ON7XN, oprs.)
591,840-1233-160-B
ON4KIP (+ON5FI, ON8s BK, MJ, ON-L6672)
266,454- 786-113-B

PI1GOE 12,555- 93- 45-B

SK6RR (SM6s CVT, LRR, oprs.)
623,644-1464-142-C
SK3AH (SM3s AJL, CDW, COL, OII, OWZ, RL, oprs.)
52,338- 288- 61-C

KD5YG/TF (+W3TB/TF)
17,907- 127- 47-B

UK3ABO (UA3-170s -339,-559, oprs.)
67,936- 338- 67-B
UK3DBV (UA3-142s -384, -1751,-1918, oprs.)
32,436- 204- 53-B
UK4LAA (UA4LCQ, RA4s LAI, LCJ, oprs.)
13,653- 123- 37-B

UK3ABC (3 oprs.)
1386- 33- 14-B
UK2BBK (UP2s BIJ, 038-1052, oprs.)
300,888- 796-126-B
UK2BCC (UP2s BDW, BJK, UP2038s 346, 565, oprs.)
51,504- 296- 58-B

UK5CAT (3 oprs.)
2394- 42- 19-B

UK5OAR 384- 16- 8-B
UK7CAO (3 oprs.)
4104- 57- 24-B

UK8MFA (2 oprs.)
480- 16- 10-B

YU4EZC 8514- 86- 33-B

Y44ZO (Y44s NO, PO, SO oprs.)
9384- 92- 34-C

North America

KP4BZ (KP4HC, NP4s CC, KA, Z, WU4P, oprs.)
6,384,063-6713-317-C

VP2KBQ (K1s JU, JV, W1JP, WB1ABF, oprs.)
294,672- 877-112-B

ZF2HM (AA5B, K9RS, oprs.)
7,402,236-7858-314-C
ZF2GW (AE4H, KB2SG, KZ2E, N2PP, W2HPF, oprs.)
7,292,907-8023-303-C

N2BA/6Y5 (+K2BMI)
7,187,144-7924-302-C

Oceania

DX7DX (DU6s EI, JM, DU7s BE, RLC, oprs.)
153,468- 588- 87-C

H44R (H44s DX, SH, oprs.)
2,314,515-3283-235-C

ZL2AH (2 oprs.)
473,400-1052-150-B

South America

W6KG/CEØ (+W6QL)
1,494,900-2265-220-B

KC2GE/PJ3 (+WB2PSD)
1,575,015-2561-205-C

VP8KF (+VP8s AIB, LP)
1,449,000-3000-161-C

Multioperator

Two Transmitter

Asia

JH7YJF (JA7DWU, JE7FEV, JH7s LRS, NHE, QKR, XWT, oprs.)
1,512,147-2483-203-C

JA7YFB (JE7MLJ, JF7GQK, JH7s XKI, XMO, JJ1GXY, JR7s GYC, JLU,LCI,OEF, JHØQNT, oprs.)
640,737-1249-171-C

JA4ZQA (JA4s CUU, CVJ, JR4DFO, oprs.)
184,032- 639- 96-C

Europe

I5NPH (+I5s MPN, SDG, IK5BAF, I8s CZW, MPO, ULL, I8IJ)
3,928,104-4904-267-C

YU1EXY (+YU1s EW, PKC)
1,502,922-2341-214-C

YU4FRS (K2VHW,K6ELX,W2SLF, WB2YAY,YU4s BZ,VQT,WDN,WEF,WFN, WPX,WSF,WXA,oprs.)
901,923-1661-181-C

North America

K9GL/VP2V
11,124-579-11,203-331-C

VP2KBU (K9GU, KC8FW, WB9MIV oprs.)
10,365-474-10,502-329-C

KL7RA (+AL7s CQ,AF,NL7V)
1,278,132-2477-172-C

Multioperator

Unlimited

Asia

JG1ZUY (19 oprs.)
2,012,982-2969-226-C

JA2YKA (12 oprs.)
1,961,308-2884-229-C

JA7YAA (JE7s HLZ, IQE, JH7s CUO, HWR, UJN, JJ1MVV, JR7s KIB, OMD, UKL oprs.)
1,176,435-2011-195-C

North America

XE2FU (22 oprs.)
14,359,233-14,203-337-C

W/VE CW

Single Operator

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Connecticut

W1ZM (K1ZM, opr.)	1,829,910-	1810-	337-C
K1XA	1,073,340-	1335-	268-C
KS1L	822,447-	1101-	249-C
K1WA	675,836-	923-	244-C
K1WJL	515,352-	788-	218-C
W1KKF	466,494-	756-	203-C
K1VDF	440,640-	816-	180-C
K1KI	336,474-	558-	201-C
WA1PCN	204,777-	373-	183-B
AA2Z	152,019-	399-	127-B
K1EFI	148,302-	321-	154-C
K1BV	142,560-	440-	108-C
W1OR	139,887-	297-	157-C
W1CNU	130,074-	326-	133-C
KS1K	100,737-	273-	123-B
AB1U	42,828-	166-	86-B
WA2WIP	38,808-	147-	88-B
N1JW	36,354-	146-	83-B
W1HUE	20,679-	113-	61-B
KA1CZF	8307-	71-	39-A
W1AB	1740-	29-	20-C
KB1N	243-	9-	9-B
KB1H	6570-	73-	30-C-40
W1WEF	81,852-	359-	76-C-10

Eastern Massachusetts

K1AR	1,947,792-	1904-	341-C
K1EA	1,439,856-	1616-	297-C
K1VR	1,103,568-	1328-	277-C
W1DA	1,071,696-	1328-	269-C
W1IHN	1,063,152-	1284-	276-C
K5MA	1,017,084-	1294-	262-C
W1KM	857,304-	1134-	252-C
W1FJ	316,713-	547-	193-C
W1WAI	290,160-	465-	208-C
K1VUT	209,760-	460-	152-B
N1RC	196,860-	386-	170-B
N1CWU	162,024-	344-	157-C
W1FM	158,550-	350-	151-B
WA1UDH	151,086-	338-	149-B
KA1CLV	144,381-	323-	149-B
N1CRD	93,744-	252-	124-B
W3OD	82,422-	241-	114-B
W1AX	72,150-	185-	130-C
WB1AEL	60,216-	193-	104-C
KT1O	41,850-	150-	93-C
KC1X	38,367-	147-	87-C
KQ1F	30,510-	113-	90-C
KD1U	24,072-	136-	59-B
KA1DWX	20,874-	142-	49-B
W1OPJ	13,776-	82-	56-B
KB2R	10,290-	70-	49-B
N1CJK	7656-	58-	44-B
W1BET	5202-	51-	34-B
W1BK	3078-	38-	27-C
K1NA	3762-	38-	33-C-160
W1FV	61,440-	320-	64-C-80
K1XM	180,840-	885-	88-C-40
AI3E	40,320-	224-	60-C-40
W1YN	175,152-	656-	89-C-20
WB1CNM	78,744-	386-	68-C-15

Maine

N1AFC	22,113-	117-	63-A
K1SA	17,802-	129-	46-C
WB1GLH	9185-	65-	47-B
KB1U	1683-	33-	17-C-15

New Hampshire

KC1F	1,904,148-	1959-	324-C
K1DG	1,735,968-	1712-	338-C
KR1G	275,772-	469-	196-C
K1NH	13,224-	76-	58-B
K1TR	1914-	29-	22-B
W1RR	4800-	50-	32-C-160
KM1H	52,704-	288-	61-C-80
W1NH	6912-	48-	48-C-80
W1VY	21,450-	110-	65-C-20

Rhode Island

W1GL	650,592-	864-	251-C
W1RFQ	15,810-	85-	62-B
K1VSJ	6480-	60-	36-C

Vermont

W1KQ	5994-	74-	27-C-15
K1IK	2109-	37-	19-C-15

Western Massachusetts

K1BW	1,741,476-	1738-	334-C
AI1S	279,786-	442-	211-C
KR1R	131,781-	403-	109-C
W1MM	19,398-	106-	61-C
K1IJU	13,983-	79-	59-B
W1RED	9350-	65-	46-C
WA1CQF	1638-	26-	21-B
W1GG	137,172-	644-	71-C-20

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Eastern New York

K2RD	1,064,280-	1267-	280-C
NA2N	942,756-	1004-	313-C
K2XA	509,184-	832-	204-C
W2XL	486,396-	708-	229-C
K2QF	448,797-	709-	211-C
KN2Q	412,056-	776-	176-C
N2JJ	287,232-	544-	176-C
N2AIF	237,168-	488-	162-C
W2NC	212,058-	378-	187-C
KF2O	205,770-	361-	180-C
W2AWF	104,145-	285-	131-C
W2KHQ	81,534-	214-	127-B
W2DW	79,461-	243-	109-C
N2DRR	54,809-	187-	109-C
W2HES	31,185-	135-	77-B
KW2D (KC2KK, opr.)	16,461-	93-	59-B
W2PTF	13,338-	78-	57-A
W2KZN	108-	6-	6-B
K2EK	60,264-	324-	62-C-80
KJ2V	2475-	33-	25-B-80
W2YV (KQ2M, opr.)	238,800-	796-	100-C-40

NYC & Long Island

W2GGE	555,282-	819-	226-C
KA2AEV	349,401-	527-	221-B
KK2E	333,030-	653-	170-C
K2MFY	267,057-	471-	189-B
K2YGM	253,839-	443-	191-C
W2AYJ	134,316-	287-	156-C
W2HLI	111,612-	284-	131-B
W2GKZ	104,247-	243-	143-C
K2TV	72,963-	201-	121-B
W2LPA	63,135-	183-	115-C
W2AFM	41,952-	152-	92-B
W2KTF	30,360-	115-	88-B
K2HVN/M	18,972-	93-	68-C
WA2EFU	17,442-	102-	57-B
WB2DLA	12,324-	78-	52-B
N2UN	15,900-	108-	50-C-40
K2ES	1140-	20-	19-B-40
WB2ENW	12,987-	111-	39-B-10
WB2AMU	10,989-	99-	37-B-10

Northern New Jersey

N2LT	1,671,381-	1803-	309-C
W2VJN	1,104,705-	1189-	315-C
K2NJ	600,795-	845-	237-C
N2FT	249,504-	452-	184-C
KR2Q	122,244-	244-	167-C
WA4PFN/2	52,599-	197-	89-B
W2HTX	37,674-	138-	91-B
KT2D	13,272-	79-	56-B
K2DI	9900-	60-	55-C
KT2B	9450-	75-	42-C
W2LPV	9306-	66-	47-B
KC2X	10,209-	83-	41-C-80
W1GD	13,932-	108-	43-C-40
WA2ASQ	13,680-	95-	48-B-20

Southern New Jersey

W2REH	1,143,135-	1337-	285-C
W2YC	449,793-	617-	243-C
WA2VYA	289,278-	487-	198-C
WA2OOS	285,714-	481-	198-C
N2MR	197,802-	407-	162-C
W2EA	126,540-	285-	148-B
K2FL	119,880-	270-	148-C
N2SS	91,440-	240-	127-C
K2MK	48,825-	175-	93-B
W2PAU	40,698-	133-	102-C
N2IT	31,350-	110-	95-B
K2JLA	19,110-	98-	65-C
W2FGY	12,243-	77-	53-C
ND2P	10,800-	72-	50-B
N2CQ	9300-	100-	31-B
N2DZY	4995-	45-	37-B
W2XN	4902-	43-	38-B

Western New York

W2TZ	648,018-	973-	222-B
K2VV	459,405-	747-	205-C
W2HPF	312,375-	595-	175-C
W2FTY	154,035-	315-	163-B
KZ2E	135,660-	340-	133-A
KW2J	67,041-	191-	117-B
N2EAW	35,211-	121-	87-B
W1PHT	29,382-	118-	83-B
K2ZR	20,736-	108-	64-B
KK2B	18,786-	101-	62-B
W2FUI	15,840-	88-	60-B
W2HG	15,435-	105-	49-C-40
WA2LOG	73,188-	321-	76-C-20

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Delaware

W3XU	1,139,688-	1439-	264-C
AA1K	3306-	38-	29-C-160

Eastern Pennsylvania

W3GU	490,752-	756-	213-C
W3UM	459,762-	703-	218-C
W3OV	337,986-	569-	198-C
K3WW	247,242-	463-	178-C
W3KV	227,772-	444-	171-C
W3ARK	224,640-	480-	176-B
K4JLD/3	172,914-	322-	179-C
N3HW	138,620-	345-	132-C
W3EVW	123,954-	283-	146-C
K3II	118,992-	268-	148-C
WA3IMY	105,324-	262-	134-C
W3MA	83,835-	243-	115-C
KH6GP/3	82,080-	228-	120-A
K3TX	64,581-	209-	103-C
WA3SPJ	58,200-	200-	97-C
W3QIR	52,323-	163-	107-B
KC3AF	32,292-	138-	78-C
N3RW	27,540-	135-	68-B
KM3T	24,963-	157-	53-C
W3EHZ	23,484-	103-	76-B
KB3YY	11,340-	70-	54-B
KR3I	7134-	58-	41-B
W3EAN	4650-	50-	31-C
K3IK	2784-	32-	29-C
W3AP	297-	11-	9-C-160
K3WGR	14,061-	109-	43-C-80
K3ND	6552-	56-	39-C-80
N3CZB	6039-	61-	33-B-20
W3HMR	540-	15-	12-C-15

Maryland-DC

K3SA	870,687-	1087-	287-C
K3ZZ	856,170-	1059-	270-C
N3AM	678,654-	1019-	222-C
KJ3L	469,248-	752-	208-C
W3UJ	466,371-	751-	207-C
N3CXV	420,210-	690-	203-B
K3TC	288,108-	453-	212-C
K3NCO	227,766-	406-	187-B
W3AZ	193,599-	439-	147-C
KD3U	178,028-	345-	172-B
K3WS	167,184-	344-	162-A
W3ICM	162,162-	351-	154-C
W3GN	126,684-	308-	138-C
WB8IOJ	114,615-	283-	135-B
N7IR	92,928-	242-	128-A
W3GNQ	81,081-	231-	117-C
W3FQE	58,752-	192-	102-C
W3HVM	57,015-	181-	105-C
K2ITG	43,095-	169-	85-C
W3CY	10,428-	79-	44-B
N3API	2106-	27-	26-B
N3RL	10,395-	81-	45-C-80
W3GG	62,580-	298-	70-C-40
W3HVQ	29,529-	193-	51-C-40
KK3C	429-	13-	11-B-20
W3TUX	624-	16-	13-B-15
NN3SI (W4KM, opr.)	1224-	24-	17-C-10

Western Pennsylvania

K3LR	1,130,058-	1231-	306-C
N8DH	238,173-	403-	197-B
W9KTP	132,756-	299-	148-C
AD8J/3	72,504-	228-	106-C
W3KYN	29,154-	113-	86-B
W3KWH	6075-	75-	27-C
KA3HGR	2040-	34-	20-B
K3WGA	960-	20-	16-B
K3UA	301,644-	831-	108-C-20
N3BJ	156,621-	629-	83-C-20
WA3WYQ	48-	4-	4-A-15

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Alabama

NN4R	328,740-	610-	178-C
KF4FN	305,316-	514-	198-C
W4NTI	240,141-	383-	209-C
WM4M	3420-	38-	30-C
KC0ET	432-	12-	12-B

Georgia

K4BAI	661,770-	817-	270-C
NQ4I	632,064-	823-	256-C
KX4R	276,000-	460-	200-C
N4HHZ	104,580-	249-	140-B
K4BAM	63,342-	207-	102-C
W4MGX	6045-	65-	31-C-80
N4FD	24,696-	196-	42-C-40
WB4ZOJ	10,488-	92-	38-C-40
W4DXI	30,624-	176-	58-C-15
W4JFL	24,288-	176-	46-B-15
W8ZF	12,690-	90-	47-C-10

Kentucky

N4AR	1,537,164-	1548-	331-C
KF4AV	46,851-	161-	97-C
K4FU	51,948-	234-	74-C-40
WB4PRU	71,355-	335-	71-C-15
KA4JMZ	24,336-	158-	52-C-15

North Carolina

NK4Q	87,600-	200-	146-B
W9TS	27,120-	113-	80-B
W1FTX	8784-	61-	48-B
W4DGJ	3240-	40-	27-B
N4SU	3192-	38-	28-C-160
AA4S	20,286-	138-	49-C-80
WD4OHD	3510-	45-	26-B-15

Northern Florida

WC4E	401,172-	662-	202-B
NX4N	292,962-	622-	157-C
W4WKQ	85,239-	231-	123-C
N4VQ	24,804-	156-	53-C-40
N4ES	7956-	78-	34-C-40

South Carolina

W3VT/4	969,616-	1088-	294-C
WK4O	8100-	60-	45-B
AA4V	3042-	39-	26-C-80
W4NL	80,640-	384-	70-C-10

Southern Florida

W4BV	268,230-	421-	210-C
K4KUZ	261,870-	406-	215-C
W4KO	81,371-	229-	133-C
K8PXG	80,811-	219-	123-C
K8UNP	147,015-	297-	165-C
N4XZ	71,760-	208-	115-C
W4YN	33,069-	151-	73-C
KA4YAE	24,069-	113-	71-A
KB4FQ	9555-	65-	49-C
WA4XXQ	6903-	59-	39-B
K5OTI	2754-	34-	27-C
W1ESN/4	2700-	36-	25-C
WA4LLQ	108-	6-	6-B
N4IN	2250-	30-	25-C-160
W4OO	28,710-	174-	55-C-40
WB4TDH	169,752-	643-	88-C-15
W2SDB/4	9768-	88-	37-C-15

Tennessee

W4XJ	848,562-	1118-	253-C
WM4Z	70,059-	183-	121-C
WB4LHO	46,350-	150-	103-B
NX4C	31,752-	128-	84-A
W5RUH	17,680-	92-	64-B
W4VOS	8460-	60-	47-B
W4ZZ	969-	19-	17-B
K4XO	5346-	54-	33-C-80
K4CXY	1224-	24-	17-C-40
N4ZZ	133,905-	565-	79-C-15

Virginia

N4RV (WB3JRU, opr.)	903,189-	1049-	287-C
K4GKD	806,130-	1014-	285-C
KG4W	408,755-	855-	207-C
K4OD	388,722-	629-	208-B
WG4B	179,478-	338-	177-B
K4FPF	176,352-	352-	167-C
W4YE	117,276-	337-	116-C
N3OS	65,772-	189-	116-B
W4EZ	62,160-	185-	112-B
W4XR	56,811-	187-	111-C
WB4LNT	47,790-	177-	90-C
W4NM	38,088-	138-	92-B
KA4RLJ	31,980-	130-	82-B
N4RA	17,523-	99-	59-B
N3RC	13,359-	73-	61-B
WA4BKD	17,550-	117-	50-C-40
W4FOA	3120-	40-	26-B-40
N4XD	780-	20-	13-C-40
KC4HN	29,760-	160-	62-C-15
N4MM	11,583-	99-	39-C-15

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Arkansas

W5EIJ	20,874-	98-	71-C
NC5K	1008-	21-	16-C
K5UR	2052-	36-	19-C-160
AF5M	4650-	50-	31-C-40

Louisiana

W5OB	125,715-	289-	145-C
WA5IGD	110,559-	269-	137-C
KA5OEU	6237-	63-	33-B
W3GW	5922-	47-	42-B
W5MMU	178,200-	675-	88-C-40

Mississippi

K5FA	347,160-	526-	220-C
WA5OYU	82,500-	220-	125-C
KA5KWX	37,224-	141-	88-B

New Mexico

W5FKP	14,274-	78-	61-B
N5EPA	7680-	64-	40-C
NC5O	26,445-	215-	41-C-15
W5TVX	4956-	59-	28-B-15

Northern Texas

AF5K	466,170-	758-	205-C
KA5W	347,211-	669-	173-C
K5LP	289,323-	527-	183-C
W5VGX	92,400-	275-	112-A
N5UA	52,332-	178-	98-C
KB5UW	24,864-	112-	74-B
W5QF	9744-	58-	56-B
W9PL/5	9120-	76-	40-B
NN5T	1776-	37-	16-A
K5NW	55,986-	301-	62-C-40
N5CR	188,640-	655-	96-C-20
W5FO	138,323-	459-	99-C-20
KD5IA	20,016-	139-	48-B-20
N5JB	81,900-	390-	70-C-15
WB5UDX	35,550-	237-	50-C-15
NI5M	28,050-	170-	55-B-15
WB5CRG	2331-	37-	21-C-15
N5UD	125,828-	451-	93-C-10

Oklahoma

N5CG	163,818-	479-	114-C
K7CW	6580-	62-	30-C-80
K5WE	429-	13-	11-C-20

Southern Texas

N5AW	467,088-	592-	263-B
W5PWG	80,892-	214-	126-C
K3ZMI/5	74,763-	213-	117-B
NJ5O	65,772-	203-	108-C
N5HB	61,242-	173-	118-B
K5DB	54,438-	211-	86-C
N5DEE	46,659-	151-	103-C
W5OSJ	39,600-	165-	80-C
W5KCR	38,801-	141-	87-C
K5SNO	22,770-	110-	69-B
K5TSQ	9690-	89-	38-C-80
N5BA	5655-	65-	29-C-80
K5BZU	5208-	62-	28-C-40
W5JC	4896-	48-	34-C-20

6

East Bay

WB6FDQ	170,973-	471-	121-C
N6DA	164,304-	489-	112-B
N6ICV	150,732-	474-	106-C
K6ATV	129,960-	368-	115-B
AK6T	83,675-	283-	75-C
N6HK	53,922-	209-	86-C
K6CSL	15,480-	120-	43-B
W6BSY	32,148-	228-	47-C-15

Los Angeles

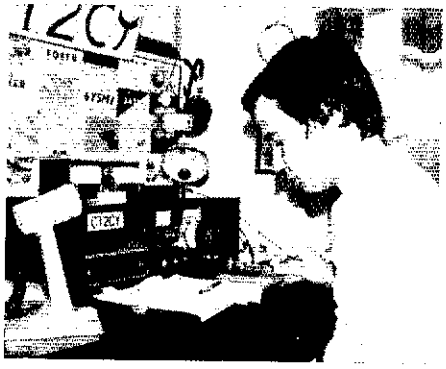
W6AQ (WA6OTU, opr.)	309,573-	649-	159-C
NE6I	64,200-	200-	107-C
K6EID	39,150-	174-	75-C
N6AA	20,196-	102-	66-C
W6OES	5301-	57-	31-B
K6SE	651-	31-	7-C-160
N6IC	23,856-	142-	56-C-20
W6DN	17,934-	122-	49-C-20

Orange

W6TMD	425,040-	820-	154-C
K6LEB	182,040-	410-	148-C
NW6S	57,375-	225-	85-C

This is IØMGM, half of the IØMGM-IØJX team. They operated multi-single on both modes in a multi-million point effort.

LA6ZV was a welcome multiplier for 35 statesiders on 15 meters.



CT2CY pounded the brass to make 57,405 points in the only 80-meter CW entry from the Azores.

W6VLD (N6KN, opr.) 69,851- 327- 71-C-20
W6HJ 12,084- 108- 38-C-20

Santa Barbara

N6TR 96,654- 362- 89-C
WA6FGV 51,975- 231- 75-B
W2KVA/6 22,842- 162- 47-C
AA4Q 19,602- 121- 54-B
N6GAU 12,480- 104- 40-B
W6OUL 9801- 99- 33-B

Santa Clara Valley

K6DC 173,625- 463-125-C
N6AN 136,610- 414-110-C
W6OKK 49,302- 198- 83-C
N6UW 44,820- 180- 83-C
WA6TKT 22,869- 121- 63-C
W6RFF 16,085- 65- 63-C
W6YMH 7047- 61- 28-A
W6ISQ 4350- 50- 29-C
AJ6V 1980- 33- 20-C
KJ6Z 840- 20- 14-B
W6SC 540- 20- 9-C
KE6PQ 44,835- 245- 61-C-20
W6ATO 12,540- 110- 38-C-20
K6OMB 31,326- 227- 46-B-15

San Diego

KD9E/6 149,634- 326-153-C
K6MG 118,008- 264-149-C
KW6Q 43,878- 206- 71-A
AA6EE 13,350- 89- 50-C
W6ABT 7488- 52- 48-B
K6TQ 4650- 62- 25-C
N6CW 186,150- 730- 85-C-40
W6ZT 17,514- 139- 42-C-15
WA6VNR 8190- 105- 26-C-15
KM6K 1848- 28- 22-C-10

San Francisco

K6ANP 394,632- 648-203-C
N6OJ 133,226- 334-113-C
W6WB 130,005- 321-135-C
K6ZUR 32,640- 170- 64-C
KB6HT 13,986- 126- 37-C
WA6LLY 2079- 33- 21-B
K4TKM 12,768- 112- 38-C-15

San Joaquin Valley

W6BYH 29,172- 143- 68-C
W6SX 9640- 72- 40-B
KA6BIM 867- 17- 17-B

Sacramento Valley

AI6V (WA6VEF, opr.) 1,037,628-1406-246-C
K6SG 238,944- 524-152-C
K6DR 180,600- 430-140-C
W6NKR 38,250- 150- 85-C
N6DM 2700- 45- 20-C-80
N6GG 121,260- 470- 86-C-20
K6RN 18,450- 123- 50-C-20

7

Arizona

W7IR 715,122- 969-248-C
W2GGL/7 69,495- 205-113-C
N7BJX 53,406- 207- 86-C
N7MW 25,740- 132- 65-C
KX7J 14,355- 87- 55-C
WA7KLK 6534- 66- 33-C
W7AYY 8928- 124- 24-C-15

Idaho

KN7W 70,848- 246- 98-C
KU7Y 19,176- 188- 34-B-40

Montana

KE7X 320,214- 643-166-C
K7ABV 104,229- 313-111-C
KS7T 59,280- 260- 76-C

Nevada

NF7P 225,522- 581-134-C

Oregon

W7YAQ 202,275- 435-155-B
AD7T 53,460- 198- 90-B
W7TC 38,016- 198- 64-C
KA7FEF 16,884- 134- 42-B
W7GUR 182- 9- 6-C
W7MI 5103- 63- 27-C-20
KS7P 4752- 66- 24-B-20

Utah

W7HS 75,366- 237-108-C
N7CJO 6699- 77- 29-B

Washington

W6RR 649,194-1056-203-C
N7TT 549,351-1023-179-C
W7TS 209,802- 479-146-C
W7IIT 96,051- 317-101-C
KS7L 59,616- 268- 69-B
W7IEU 41,109- 193- 71-B
W7QN 23,958- 121- 66-C
K7UU 14,112- 96- 49-C
KA5GIS/7 7752- 76- 34-A
W7ERH 1920- 32- 20-B
K7LXC 405- 15- 9-C
W7DRA 147- 7- 7-C-80
KB7G 149,031- 571- 87-C-20

Wyoming

KC7KC 18,810- 114- 55-B
KW7L 17,649- 159- 37-C

8

Michigan

W8UA 859,464-1038-276-C
W8VSK 121,535- 265-153-A
K8CV 75,063- 191-131-C
KS8Q 57,000- 190-100-C
N8CQA 28,137- 113- 83-A
W8WVU 21,300- 300- 71-B
W8SCW 10,812- 88- 53-B
W8FEM 3380- 35- 32-B
K8QWG 1620- 27- 20-B
W8CD 810- 18- 15-C-160
W8TWA 74,646- 319- 78-C-20
WB8NYV 4800- 50- 32-C-15

Ohio

WD8IXE 434,778- 622-233-C
W8RSW 350,811- 549-213-C
N8BJQ 280,908- 459-204-C
KR8Y 268,224- 508-176-B
N8BC 237,691- 443-179-C
KF8K 175,875- 335-175-B
W8ZCQ 133,962- 269-168-C
W8GOC 125,664- 272-154-B
W8UPH 125,136- 316-132-C
K8EF 81,396- 228-119-C
W8NPF 76,320- 212-120-B
W8YGR 68,265- 185-123-B
W8DWP 63,360- 176-120-C
W8EX 58,266- 166-117-C
W8BO 31,878- 138- 77-C
KI8B 10,656- 74- 48-B
KB8IZ 8208- 76- 36-C
N8DPD 8127- 63- 43-B
K8PYD 6426- 51- 42-C
AI8S 5733- 49- 39-A
W8IDM 5550- 56- 37-B
KA8PTT 4284- 42- 34-C
W8PN 3050- 34- 30-B
W8VZE 504- 14- 12-C
KC8JH 2139- 31- 23-C-80
KZ8Y 40,365- 207- 65-C-40
K8NZ 287,472- 904-106-C-20
KV8Q 52,668- 231- 76-B-20
KA8DJZ 41,535- 213- 65-C-15
N8EKS 8658- 78- 37-B-15
W8CY 8190- 70- 39-C-15
WB8JBM (KW8N, opr.) 45,018- 246- 61-C-10

West Virginia

N8II 981,360-1160-282-B
K8CQL 48,069- 147-109-C
W8UMR 28,665- 147- 65-B-20

9

Illinois

K9DX 1,077,654-1226-293-C
K9UIY 224,064- 389-192-B
K9ZO 208,280- 382-180-C
N9TI 197,784- 402-164-C
K9YAX 166,257- 377-147-C
K9FD 143,766- 326-147-C
W9CD 73,566- 201-122-C
WB9JKI 66,246- 181-122-C
W9OA 49,104- 176- 93-A
W9AG 47,223- 159- 99-C
KM9L 37,350- 150- 83-C
W9MKL 17,415- 135- 43-C
W9TNZ 13,992- 88- 53-B
W9REC 8142- 59- 46-B
KG9Z 6765- 55- 41-C
W9DQV 4662- 42- 37-B
WB9EIE 4278- 46- 31-B
W9QWM 2700- 36- 25-B
KB9PY 2070- 30- 23-B
WA9MRU 1380- 23- 20-B
KG9N 966- 23- 14-A
W9PNE 7437- 67- 37-C-80
K9QVB 100,710- 373- 90-C-20
KE9Y 18,768- 136- 46-C-15

Indiana

W9RE 1,189,899-1363-291-C
W9PC 22,422- 101- 74-B
K9VQK 13,104- 78- 56-C
WA9CYG 1026- 19- 18-C
KJ9D 17,784- 114- 52-C-80
W9XD 945- 21- 15-B-80
N8DE 18,207- 119- 51-C-40
KM9S 5022- 54- 31-C-40
N9ACD 10,413- 89- 39-B-15

Wisconsin

W9OP 436,407- 731-199-C
K9CAN 274,620- 460-199-B
W9XT 229,320- 455-168-C
W9GIL 205,800- 392-175-C
W9GXR 118,590- 335-118-C
W9RRT 41,652- 178- 78-C
KZ9K 27,903- 131- 71-B
WB9HRO 14,352- 92- 52-A
N9KS 10,320- 80- 43-B
W9HE 8190- 65- 42-C
W9CBE 7590- 55- 46-C
KW9N 7434- 59- 42-A
KF9U 4305- 41- 35-B
W9YCV 2496- 32- 26-C
K9GDF 1071- 17- 21-C
K9PBV 507- 13- 13-C
N9CPW 396- 12- 11-C
K9BIL 2850- 38- 25-C-80
WB9HGS 462- 14- 11-C-80
WB9NOV 1386- 22- 21-C-20
W9WAQ 50,820- 242- 70-B-15

0

Colorado

K0RF 1,235,061-1341-307-C
KY0S 480,384- 834-192-C
KJ0G 138,321- 327-141-C
KI0U 93,225- 275-113-B
N0ZA 58,650- 225-102-C
K0ZFL 65,682- 178-123-B
W0GOR 45,360- 189- 80-C
KS0E 35,550- 150- 79-B
KG7Z 35,478- 146- 81-B
K0IYF 22,950- 153- 50-C
W0JF 15,555- 85- 61-C
W0KEA 4265- 49- 29-C
KI0G 3588- 52- 23-A
W0RSG 1848- 28- 22-C
AC0S 16,764- 127- 44-C-40
W0ZV 195,300- 651-100-C-20
N2IC 145,512- 516- 94-C-20
K0ZX 59,772- 293- 68-C-20

Iowa

W0WP 883,514- 897-254-C
W0EJ 369,630- 555-222-C
K0CF 63,504- 189-112-C
KC0XK 53,948- 222- 81-C
W0MJN 7980- 70- 38-C
W0SML 2349- 29- 27-C-40
W0FO 61,479- 253- 81-C-20
KD0Q 118,604- 492- 79-C-15
W0IZ 64,152- 324- 66-C-15

Kansas

K0UR 230,958- 423-182-C
W0IYR 85,188- 229-124-C
KS0U 39,780- 170- 78-B
W0UY 25,704- 126- 68-C
WA0CFZ 23,391- 113- 69-C
W0WPL 22,572- 99- 76-B
W0MO 9348- 76- 41-C
KD0JM 5244- 46- 38-A
N7DF 16,416- 114- 48-C-80
AB0X 8466- 83- 34-C-40
KB0U 4752- 48- 33-C-10

Minnesota

N0AT 247,080- 580-142-C
N0BSH 107,640- 276-130-C
WB0B/P 66,126- 206-107-B
W0LP 29,394- 142- 69-C
WA2HFI/0 21,000- 100- 70-B
W0HW 60- 5- 4-C-160
KI0F 147- 7- 7-C-80
K0SR 56,658- 266- 71-C-20

Missouri

W0JLC 225,036- 399-188-C
WD0AUT 75,600- 225-112-B
K0IFL 28,944- 134- 72-C
WB0IUN 11,760- 80- 49-C
AK0M 2808- 36- 26-B
KA0P 2415- 35- 23-B
W0JU 1938- 34- 19-C-80
K0CS 27- 3- 3-A-80
K9HF 2475- 33- 25-B-40
KM0R 1275- 25- 17-C-40
N0TT 35,376- 178- 67-C-20

Nebraska

K0SCM 93,534- 262-119-C
KB0YK 5184- 48- 36-B
W0MCP 11,223- 87- 43-B-20

North Dakota

K0QQ 58,479- 193-101-C
KI0E 13,416- 86- 52-C
W0LHS 1008- 21- 16-C
KC0CU 4128- 43- 32-C-20

South Dakota

K5LZT 315- 15- 7-B

VE

Maritime-Newfoundland

VE1FH 596,070- 895-222-C
VO1MP 458,595- 711-215-B
VO1AW 158,732- 353-148-C
VE1FW 50,403- 317- 53-B-15
VE1BNN 4263- 49- 29-C-10

Quebec

VE2AYU 421,971- 673-209-C
VE2DPO 104,922- 261-134-B
VE2FFE 3159- 39- 27-C

Ontario

VE3IY 635,795- 801-265-C
VE3DZV 332,529- 557-199-C
VE3LDT 132,753- 323-137-C
VE3NBE 116,586- 306-127-C
VE3LFJ 9102- 74- 41-C
VE3CUI 11,868- 92- 43-C-40
VE2AEJ/3 10,800- 90- 40-C-10

Manitoba

VE4YO 1311- 23- 19-C

Saskatchewan

VE5RA 189,600- 395-160-C

Alberta

VE6OU 65,400- 218-100-C

British Columbia

VE7AAQ 247,968- 574-144-C

Multioperator

Single Transmitter

1

K1ZZ (+ K1TO) 2,214,354-2039-362-C
KM1C (+ W1PH,WB8BTH) 1,624,590-1641-330-C
K2LE/1 (+ K2SX) 1,372,293-1443-317-C
KG1D (+ KA1VC) 397,992- 721-184-C
AK1L (+ KA1X) 295,356- 604-163-C
K8CH/1 (+ W1OD, WB2TRN) 172,050- 370-155-C

2

KY2P (+ N3DAY) 754,560- 980-262-C
WA2LQO (K2s DOD,UAT,W2DKM, WB2FMP,oprs.) 441,000- 735-200-C
W2UI (+ N3KR) 315,666- 494-213-C
K2TD (+ NET) 147,630- 370-133-C
K2MME (+ N2DL, WA8MAZ) 62,796- 328- 64-C

3

W3BGN (+ K2BMI,WA2ZKY) 1,951,362-1822-357-C

W3GRF (+ K4FJ,W3ZZ,KØDQ)
1,454,112-1584-306-C
K3UEI (+ NET)
596,700- 780-255-C
K3TM (+ K3KA,KK3C)
582,120- 682-220-C
KF3R (+ N7BIT, WB2YOF)
396,060- 644-205-C
N2MA (+ W2UP)
162,000- 360-150-C

4

N4KG (+ KC4ZV,WA4s CTA,QHI)
880,821- 969-303-C
KB4EMI (+ K4IZN,N4AU,WA4MTG,WX4I)
121,824- 288-141-C

5

K5RX (+ KM5R)
725,040- 912-265-C
K5DX (+ K5GA)
183,876- 398-154-C
N5OK (+ WB5TFM)
155,376- 332-156-C
K2TNO (+ KA5PJG)
45,792- 159- 96-C

6

W6BIP (+ WA6DJI)
437,532- 722-202-C
WB6ZHT (+ WB9QPO)
200,880- 496-135-C
KJ6V (+ Net)
136,080- 315-144-C

7

W7NI (KD7LA,ND7T,W3XY,oprs.)
699,132-1189-156-C
N7NG (+ WA6AUE)
558,558- 806-231-C

8

W8GWC (+ W8JGU, WA8s DXB,DXG, RCN)
1,129,662-1294-291-C
K8DD (+ AC8W,KA8APL,KZ8K,N8CJX, WA8BSF)
710,028- 978-242-C
WD8LLD (+ KC8KI,N8FLS,WB8KKI, WD8AUB)
544,782- 763-238-C
W8LT (KJ3T, K8EM, KD8NS, WD8LLX, oprs.)
168,810- 331-170-C

9

N9WA (+ WD9GYX)
103,275- 255-135-C
N9AX (+ KA9KDZ, KV8AC, N9AG)
62,400- 200-104-C
N9EJL (+ KC9XF)
56,277- 169-111-C
W9YB (KX9S, WB9CEJ, oprs.)
13,728- 88- 52-C

0

K4VX/Ø (+ KM9P,KRØY)
1,477,074-1423-346-C
KØRWL (+ KØs FPC,TLM,UAA,VBU,Wøs JLC,UO,KBØG,KMØL)
535,002- 722-247-C
KNØV (+ K1HZ,Wøs KZV,OGJ)
511,488- 768-222-C
KØUK (+ KD7EY)
352,170- 903-130-C
WØHBH (+ AAØA,KAØDOI,WBØIUN)
178,095- 383-155-C
WØNA (Wøs AR,CY,YR, oprs.)
97,200- 270-120-C

Multioperator

Two Transmitter

W3GM (+ K3s GM,ND,N3s ATQ,VV, W3FV)
2,582,712-2174-396-C
N2RM (+ N2MM,KB3TN,WA2HGM)
2,282,544-2096-363-C
N3BB (+ N3ED)
2,078,427-1781-389-C

Multioperator

Unlimited

KN3O (+ K1PT,K2s BU,UU,K3s JLT,WJV, N2BA,N3s AD,RD,RS)
5,495,535-3777-485-C
W3LPL (+ AE3Y,AI3M,K3s EST,RV, KA1GD,WA3KCY,WB4SGV,WD4AXM)
4,758,075-3339-475-C
N9MM 3,378,672-2607-432-C
W4MYA (+ K3RZR,KA3DTE,N4BLX, W4DR,WB4BVY)
2,045,144-2178-313-C
K3ZUF (+ K3s NZ,OO)
2,106,054-1814-387-C

W8AIH/9 (+ KØFVF,KMØO,NØNO, Wøs UC,ZZ,WAØRBW)
1,797,744-1742-344-C
N6ND (+ K1LL,K6XT,N6ZI,WA6DBC)
1,508,463-1693-297-C
N4ND (+ K4JM,N4EHJ,W4HJ,WU4G)
794,352- 988-268-C
NE8I (+ KB8TI)
57,024- 192- 99-C

DX — CW

Single Operator

Africa

EA8AGH	78,396-	278-	94-B
EA5YU/EA8	85,260-	580-	49-B-40
EA8QE	135,099-	883-	51-C-20
EA8ZS	6825-	91-	25-C-10
J28DM	21,534-	184-	37-B-20
ZS6BCR	13,382-	131-	34-B-10
5Z4JR (OH2BAH,opr.)	18,699-	127-	49-B
9U5JB	274,134-	749-	122-B

Asia

HL4XM	14,763-	133-	37-C-20
HZ1HZ	137,970-	438-	105-C
HZ1AB (W7SE,opr.)	42,780-	310-	46-C-40
JI1QPU	735,552-	1277-	192-C
JA7FWR	682,551-	1257-	181-C
JH7DNO	654,723-	1233-	177-C
JP1DYZ	561,372-	1148-	163-B
JA1BWA	357,504-	784-	152-C
JH8JYV	183,261-	481-	127-B
JA5EGX	143,418-	451-	106-B
JA1ELY	96,726-	329-	98-C
JF3CCN	65,853-	271-	81-B
JA7YWD	56,283-	257-	73-B
JA1NLX	53,568-	248-	72-B
JA1DFQ	53,217-	243-	73-B
JR3BOT	52,272-	264-	66-B
JA6LDD	45,045-	231-	65-C
JH1MTR	25,404-	146-	58-B
JA4ESR	18,144-	126-	48-C
JE1GPX	16,726-	136-	41-B
JH7AJY	13,680-	114-	40-B
JA1KFX	11,424-	119-	32-A
JH3LCU/1	11,220-	111-	34-A
JH1KLN	11,130-	106-	35-C
JR3XEX	7056-	84-	28-C
JH7XGN	6688-	82-	28-B
JA1YWX (JA8-9330,opr.)	6552-	91-	24-A
JA7FFN	5025-	67-	25-B
JM1VTJ	3360-	56-	20-B
JA9FT	3300-	50-	22-C
JA1CE	2754-	51-	18-B
JA1VZM	2193-	43-	17-B
JE2MFE	1638-	42-	13-B
JA1BSU	1230-	41-	10-B
JA9RPU	1092-	26-	14-B
JA1KWC	720-	20-	12-B
JA2FKG	486-	18-	9-B
JG2LOR	408-	17-	8-B
JA1AAT	312-	13-	8-B
JA7NI	1020-	34-	10-C-160
JA1GTF	675-	25-	9-C-160
JR6LJO	12-	4-	1-C-160
JA2YKA	21,090-	190-	37-C-80
JH7LVK	11,790-	131-	30-C-80
JG1RVR	9114-	98-	31-B-80
JA7YAL (JH7VXM,opr.)	23,283-	199-	39-B-40
JR7BTI	19,880-	164-	40-B-40
JH7BDS	12,000-	125-	32-C-40
JH3WKE	3120-	65-	16-B-40
JG2LGM	1425-	45-	11-B-40
JJ1QAH	1404-	36-	13-B-40
JA2SAP/1	1254-	38-	11-B-40
JA1OZT	1152-	32-	12-B-40
JL1IEO	648-	27-	8-B-40
JA1KEG	462-	22-	7-B-40
JI2NQS	441-	21-	7-B-40
JA6GGD	288-	16-	6-B-40
JR4PPW	225-	15-	5-A-40
JA3BCT	1776-	37-	16-B-40
JA7DAH	75,330-	465-	54-C-20
JG1NBD	66,864-	398-	58-C-20
JA1HGY	46,818-	306-	51-C-20
JA9LJS	34,686-	246-	47-C-20
JA7XBG	15,444-	132-	39-B-20
JA1PS	13,542-	122-	37-B-20
JH2JUK	9270-	103-	30-C-20
JA2DN	5103-	63-	27-A-20
JG1GGF	4071-	59-	23-B-20
JF1MYI	3588-	52-	23-B-20
JH1APK	3120-	52-	20-C-20
JA1UPO	1092-	28-	13-B-20
JH2XTV	840-	20-	14-B-20
JA2MIM	627-	19-	11-A-20
JR2AQP	480-	16-	10-B-20
JA7EC	5742-	66-	29-B-20
JK1JQQ	90,480-	580-	52-B-15
JL1BLW	74,256-	476-	52-B-15
JL1MUT	62,886-	448-	47-B-15
JI1RXQ	48,438-	351-	46-B-15
JN1GQK	46,650-	311-	50-B-15
JM1LRQ	19,539-	167-	39-B-15
JA8CJY	11,397-	131-	29-B-15
JO1ACW	9810-	109-	30-B-15
JI1QLB	7425-	99-	25-B-15
JG3NKP	7161-	77-	31-B-15
JA1JGP	1770-	59-	10-B-15
JE7JVZ/7	972-	36-	9-B-15
JR4ISK	858-	22-	13-B-15
JJ1OSP	825-	25-	11-A-15
JF7BZY	210-	10-	7-B-15
JA9MJR	165-	11-	5-A-15
JA2KPV	153-	17-	3-A-15
JA6HJP	132-	11-	4-A-15
JM1NMB	24-	4-	2-A-15
JA8AQ	792-	33-	8-B-10
JA7HMZ	552-	23-	8-B-10
JR7CDL	240-	16-	5-B-10
JR3WXA	90-	10-	3-B-10
UA0BBN	152,994-	583-	86-B
UA9YE	127,818-	526-	81-B
UA0JAD	24,021-	157-	51-B
UA0CDM	9918-	87-	38-B
UA0CDA	819-	21-	13-B
UA0ZBP	10,833-	157-	23-B-40
UA0LFN	420-	20-	7-A-40
UA0SAU	111,321-	651-	57-B-20
UA0BCR	58,245-	353-	55-B-20
UA0SGL	5394-	62-	29-A-20
UA9COC	5394-	58-	31-B-20
UA0SBQ	2346-	34-	23-B-20
UA9NP	1824-	32-	19-B-20
UA0SLN	1530-	34-	15-B-20
UA9HDT	1050-	25-	14-B-20
UA0SGJ	570-	19-	10-B-20
UA0JEH	180-	10-	6-B-20
UL7QF	9315-	115-	27-B-20
UH8BO	1296-	54-	8-B-15
UM8MCF	621-	23-	9-B-20
UM8MCY	1008-	24-	14-B-10
VU2JXO	19,440-	162-	40-C-20
4X6FR	53,724-	242-	74-B

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CT1BOH	12,192-	127-	32-B-40
CT4CP	17,820-	135-	44-B
CT4BD	1209-	31-	13-C-160
CT2BQ	20,424-	184-	37-B-160
CT2CY	57,405-	445-	43-B-80
CT2CQ	118,800-	792-	50-B-40
DLØEJ (DJ8VG, opr.)	161,001-	603-	89-C
DL8CM	92,367-	311-	99-A
DL4AAE	72,450-	322-	75-B
DJ4OE	56,871-	267-	71-B
DK9MB	37,800-	200-	63-C
DL1QT	20,664-	123-	58-C
DL1OW	13,392-	93-	48-B
DL9DU	6984-	97-	24-A
DK7OB	6237-	63-	33-B
DL2HBX	5918-	58-	34-C
DF3QN	4500-	60-	25-B
DL4MCX (OE2VEL, opr.)	47,847-	389-	41-C-40
DJ8YI	81,324-	502-	54-C-20
DL5LAW	10,980-	122-	30-C-20
DK3BN	1014-	26-	13-A-20
DF4ZL	17,604-	163-	36-C-15
DL2OM	16,524-	162-	34-C-15
DL1HBT	10,608-	104-	34-B-15
DL1RB	9730-	97-	30-B-15
DL1AM	240-	10-	8-C-15
DL6RAI	13,950-	150-	31-B-10
EA1CDF	284,064-	632-	134-B
EA2IA	127,203-	389-	109-C
EA7OH	72,900-	270-	90-C
EA2CR	54,288-	208-	87-C
EA7BDK	36,084-	194-	82-C
EA1NZ	33,507-	153-	73-B
EA4CJZ	23,250-	125-	62-C
EA7CIX	16,650-	75-	74-B
EA7NV	11,100-	100-	37-B
EA4BV	1710-	38-	15-B-80
EA3AQS	25,596-	237-	36-B-40
EA7CJM	29,820-	284-	35-B-20
EA4AYD	8787-	101-	29-B-20
EA1OJ	1824-	38-	16-A-20
EA7LM	1785-	35-	17-B-20
EA5BSC	858-	26-	11-C-15
EI9J	434,826-	833-	174-C
EI4DW	35,640-	165-	72-B
EI3DP	61,410-	445-	46-C-15
F9YZ	124,605-	355-	117-A
F6EQV	70,770-	337-	70-B
F6HDI	64,260-	238-	90-B
F6ERZ	35,571-	167-	71-B
F3AT	13,992-	106-	44-B
F6CCI	6039-	61-	33-A
F8VJ	702-	18-	13-B-160
F8IQ	810-	54-	18-B-80
F6GLA	6762-	98-	23-B-20
F8DKV	58,788-	426-	46-B-15
F8TQ	15,228-	141-	36-B-15
F6CXJ	11,880-	120-	33-B-15
G3UFY	544,644-	1107-	164-B
G2QT	317,832-	846-	164-A
G4UPS	237,948-	502-	158-B
G3ESF	198,465-	505-	131-B
G4VGK	114,540-	332-	116-B
G3APN	110,544-	329-	112-B
G3CWW	94,581-	339-	93-B
G3CRF	26,152-	138-	68-B
G4EBO	27,150-	181-	50-A
G3VMY	26,700-	178-	50-A
G6QQ	24,534-	141-	58-B
G6NK	10,656-	96-	37-B
G2AJB	7488-	78-	32-B
G4CNY	35,862-	278-	43-B-80
G3TXF	4536-	63-	24-B-80
G3XWZ	30,510-	226-	45-B-40
G5DSD	1512-	28-	18-B-40
G4QTY	1404-	39-	12-B-40
G3CWL/A	1050-	35-	10-A-20
GM8SP	11,562-	94-	41-B
GU3HFN (GU3MBS, opr.)	509,880-	1214-	140-B
GW3JI	186,000-	400-	155-B
HA2PP	256,620-	611-	140-B
HA8ZC	164,076-	484-	113-B
HA8ZO	118,989-	351-	113-B
HA1ZG	94,446-	318-	99-B
HA8GZ	73,140-	265-	92-B
HA7KLJ	55,404-	228-	81-B
HA7RB	46,110-	265-	58-B
HA3HO	41,580-	198-	70-B
HA7PX	21,462-	146-	49-B
HA4XX	18,360-	136-	45-B
HA6NW	16,698-	121-	46-B
HA8KQX (HA8IE, opr.)	14,130-	157-	30-B-80
HA4KYB (HA4XT, opr.)	49,632-	376-	44-C-40
HA5KDB	42,960-	358-	40-B-40
HA8DT	9048-	104-	29-B-20
HA4YG	7725-	103-	25-B-20
HA4ZX	2700-	50-	18-B-20
HA4ZZ	65,088-	452-	48-B-15
HA4XG	3933-	57-	23-B-15
HA5BA	9240-	110-	28-B-10
HA3GJ	1260-	30-	14-B-10
HB9AGA	400,500-	890-	150-C
HB9AGH	127,980-	395-	108-B
HB9KC	66,555-	261-	85-C
HB9AYZ	8214-	74-	37-B
HB9DX	46,845-	347-	45-C-15
I2UBI	1,148,796-	1934-	198-C
IO3RN	22,344-	133-	56-B
IO3FIY	118,872-	762-	52-C-40
I1XPQ	58,953-	457-	43-B-40
I2MQP (I2VXJ, opr.)	111,537-	729-	51-C-20
I2UIY	108,864-	672-	54-C-20
IK4BLV	37,797-	293-	43-B-15
JW6MY	297-	11-	9-B-20
LA8DY	47,870-	227-	70-B
LA6VM	1056-	22-	16-C-40
LA7ZAA	4422-	67-	22-B-20
LA5XDA	2622-	38-	23-C-20
LA8SDA	9270-	103-	30-B-15
LA9SN	5112-	71-	24-B-15
LA6ZV	1890-	35-	18-B-15
LZ2KRU	109,296-	368-	99-C
LZ1YG	34,922-	216-	54-B
LZ1KVV (LZ1G-40, opr.)	31,080-	259-	40-B-80
LZ1QV	20,181-	217-	31-C-40
LZ1KWS	7728-	92-	28-C-20
LZ1WL	3519-	51-	23-C-20
LZ1FM	2016-	42-	16-B-20
LZ1KKA	1953-	31-	21-C-20
LZ1WY	1092-	28-	14-B-20
LZ1AG	7176-	104-	23-B-10
OH3RF	88,266-	313-	94-C
OH2BYS	4590-	45-	34-B
OH3NM	1350-	30-	15-B
OH7NW	147-	7-	7-C-40
OH8AA	199,650-	1210-	55-C-20
OH1AA (OH1JD,opr.)	73,920-	448-	55-C-20
OH1ZAA	10,200-	100-	34-B-20
OH6QU	5292-	63-	26-C-20
OH6CD	570-	19-	10-B-20
OH8PF	125,664-	748-	56-C-15
OH2BJG	11,712-	122-	32-B-15
OH6TN	4836-	62-	26-B-15
OH6YF	2679-	47-	19-A-15
OH1PY	1566-	29-	18-C-15
OH3WS	504-	14-	12-C-15
OHØAP	23,712-	152-	52-B
OK1ALW	1,133,846-	1826-	207-C
OK3CSC	710,304-	1208-	186-B
OK3WW	233,082-	583-	138-B
OK1DBM	113,322-	374-	101-B
OK1AES	169,104-	542-	104-C
OK3TCF	49,713-	227-	73-B
OK2KOZ	41,535-	213-	65-B
OK1KZ	67,920-	283-	80-B
OK2YN	59,718-	269-	74-B
OK3BA	53,550-	238-	75-C
OK3IF	49,140-	252-	65-B
OK2BHQ	17,556-	133-	44-B
OK1DKR	15,369-	109-	47-A
OK2FD	5037-	73-	23-C
OK1AXB	31,683-	179-	59-B
OK2KUU	23,769-	139-	57-B
OK1EP	19,728-	137-	48-B
OK2PBG	14,364-	114-	42-B
OK1MZO	1170-	26-	15-B
OK2BCI	2016-	42-	16-C-80
OK2HI	627-	19-	11-B-80
OK1TN	56,166-	408-	48-C-40
OK2PGG	10,080-	129-	28-B-40
OK2SPS	1104-	23-	15-B-40
OK1AOR	966-	23-	14-C-40
OK2ABU	840-	20-	14-B-40
OK2BWH	50,028-	379-	44-B-20
OK2PO	27,594-	219-	42-B-20
OK2SGW	16,200-	135-	40-B-20
OK2BGR	14,874-	134-	37-C-20
OK3CAU	6075-	81-	25-B-20
OK1DMA	2496-	49-	17-B-20
OK1MIZ	2385-	53-	15-B-20
OK2BMA	1935-	43-	15-A-20
OK1DZD	1890-	45-	14-A-20
OK1JDJ	1287-	33-	13-B-20
OK3YCA	15,093-	129-	39-B-15
OK2QX	6336-	96-	22-B-10
ON6FT	495,936-	1008-	164-C
ON6TJ	32,886-	174-	63-B
ON4XG	31,857-	259-	41-B-15
OZ1LO	633,708-	1214-	174-C
OZ5KU	152,475-	475-	107-C
OZ1FGS	102,600-	342-	100-B
OZ7BW	36,654-	149-	82-B
OZ1W	30,624-	178-	58-B
OZ1FFG	15,300-	100-	51-B
OZ1DTF	105,576-	664-	53-C-20
OZ1EUO	11,322-	102-	37-B-15
OZ1FTE	2652-	52-	17-C-10
PA9LOU	171,069-	449-	127-B
PA2JDB	61,503-	247-	83-B
PA3BLU	32,256-	168-	64-B
PA9SOL	26,250-	175-	50-B
PA3BDK	21,000-	125-	58-B
PA9ADT	12,546-	102-	41-A
PA3AGC	9804-	70-	38-B
PA3BTH	9348-	82-	38-B
PA2REH	6696-	52-	36-B
PA3BUD	5022-	54-	31-B
PA3AFF	855-	19-	15-A
PA9CF	3234-	49-	22-B-20
PA9VLA	10,989-	111-	33-B-15
PA3CEF	3150-	50-	21-B-15
SK6AW (SM6DED,opr.)	227,919-	697-	109-C
SM5CAK	69,750-	310-	75-C
SM5DAC	58,764-	238-	83-C
SM5ACQ	55,770-	286-	65-C
SMØBDS	25,110-	135-	62-C
SM1DIE	23,595-	143-	55-B
SM6BGA	15,744-	128-	41-C
SM7LAZ	15,318-	111-	46-B
SMØBTS	13,899-	113-	41-B
SMØEEJ	12,513-	97-	43-B
SM6NWL	8177-	71-	29-C
SMØMLL	5850-	65-	30-B
SM4KL	1512-	28-	18-A
SM7CZC	648-	18-	12-A
SMØAJU	115,920-	890-	56-C-20
SLØT	37,752-	286-	44-C-20
SM5IMO	18,240-	160-	38-C-20
SM6LWH	5325-	71-	25-B-20
SM2BUW	3900-	52-	25-B-20
SM3CBR	450-	15-	10-B-20
SM6BZE	22,484-	192-	39-B-15
SM6CPY	10,710-	105-	34-C-15
SM5RE	9600-	100-	32-C-15
SM7TV	8352-	87-	32-B-15
SM2NTU	6300-	75-	28-B-15
SM4AXL	561-	17-	11-B-15
SK6AW	4209-	61-	23-C-10
SP3BYZ	35,502-	194-	61-C
SP9DLY	17,280-	144-	40-B
SP9AKD	9396-	87-	36-B
SP6IXO	3465-	55-	21-C
SP2BLC	720-	20-	12-C
SP8MJ	210-	10-	7-C-80
SP9CVY	1296-	27-	16-B-40
SP8EMO	405-	15-	9-B-40
SP4EEZ	13,770-	135-	34-B-20
SP2AYC	11,979-	121-	33-B-20
SP5MBA	5850-	78-	25-B-20
SP7FAH	2655-	59-	15-B-20
SP2JUJ	648-	24-	9-B-20
SP5BR	15,206-	146-	37-B-15
SP5JTR	15,606-	153-	34-B-15
SP2JKC	11,016-	108-	34-C-15
SP4GFG	2160-	48-	15-B-15
SP2UU	1653-	29-	19-B-10
SV1RP	64,800-	270-	80-B
W3TB/ITF	12,900-	100-	43-B
TF3CW	38,736-	269-	48-B-20
UA6PAA	21,870-	135-	54-A
UA3AQR	17,028-	129-	44-B
UA3DQS	13,264-	106-	41-B
UA3QOQ	10,980-	122-	30-B
UA3QKZ	10,200-	100-	34-B
UA3QOF	2520-	40-	21-B
UA3EAL	1755-	39-	15-B-80
UA6LJE	3381-	49-	23-A-40
UA3PAZ	1680-	28-	20-B-40

UA6LUE 792- 24- 11-A-40
UA3DQZ 31,740- 230- 46-B-20
UA6HON 23,739- 193- 41-B-20
UA3EZ 21,660- 190- 38-B-20
UA1QBV 5220- 60- 29-B-20
UA3TFO 3828- 44- 29-B-20
UA3AJK 3036- 44- 23-B-20
UA4NBD 2961- 47- 21-B-20
UA6ALV 2451- 43- 19-B-20
UA3AMB 28,560- 280- 34-B-15
UA3ECF 11,970- 133- 30-B-15
UA3DCX 6231- 67- 31-B-15
UK3DAW (UA3-170-998,opr.)
2205- 35- 21-B-15
UA6AJG 180- 12- 5-B-10

UA2EC 819- 21- 13-B-40
UA2FFD 27,405- 203- 45-B-20

UT5RW 5292- 49- 36-B
UB5HEQ 2100- 35- 20-B
UB5LEE 528- 16- 11-B
UB5VK 504- 14- 12-B
UB5IFN 2280- 40- 19-B-80
UT5QG 114,840- 696- 55-B-20
UB5NQ 93,168- 647- 48-B-20
UB5VAP 11,832- 136- 29-B-20
UB5PBM 2754- 51- 18-B-20
UB5GGD 1080- 24- 15-B-20
UB5ZEL 13,104- 104- 42-A-15
UB5UGO 10,440- 120- 28-B-15
UB5QAE 6600- 100- 22-B-15
UB5QIP 4104- 72- 19-B-15
UB5UKD 756- 36- 7-B-10
UB5IOF 456- 19- 8-A-10

UC2WBI 51,168- 328- 52-B-20
UC2AA 4752- 66- 24-B-15

UO5OHH 1512- 36- 14-B-40

UP2BAR 23,184- 161- 48-B
UP2BKZ 22,440- 170- 44-B
UP2BKA 4425- 59- 25-B-40
UP2PCU 4899- 71- 23-B-20
UP2BBF 315- 15- 7-B-20
UP2PBM 4224- 64- 22-B-15

UQ2GLW 120- 8- 6-B-40
UQ2PC 2904- 132- 22-B-20
UQ2PP 2550- 50- 17-B-15

UR2RLR 312- 13- 8-B-40
UR2RKS 3042- 39- 26-B-15

YO3CD 214,884- 508-141-B
YO8ACF 1680- 31- 20-B
YO2GZ 5796- 69- 28-B-40
YO2ADQ 540- 18- 10-B-40
YO8DDP 351- 13- 9-B-40
YO5BEU 120- 8- 5-B-40
YO3CFF 792- 22- 12-B-20
YO5AAT 1209- 31- 13-B-10
YO6DDF 720- 20- 12-C-10

YU2OG 237,240- 659-120-B
YU3JS 61,965- 255- 81-B
YU7SF 55,002- 206- 89-B
YU3TOJ 52,377- 221- 79-B
YU1OVY 49,572- 243- 68-B
YU7PXT 49,416- 232- 71-B
YU1NYY 43,719- 247- 59-B
YU2WJ 42,624- 192- 74-B
YU3TOJ 19,881- 141- 47-B
YU4DIJ 4275- 57- 25-B
YU3TBG 7350- 98- 25-C-80
YT3M (YU3EW, opr.)
123,930- 810- 51-C-40
YU7AD 110,397- 751- 49-C-40
YU2KDE 59,856- 464- 43-C-40
YU4CBC 6318- 81- 26-B-40
YU3NP 3360- 56- 20-C-40
YU1RL 151,200- 900- 56-C-20
YU3GW 68,830- 485- 46-C-20
YT3L (YU3EV, opr.)
136,890- 845- 54-C-15
YU3TDM 109,233- 687- 53-C-15
YU1DW 94,668- 644- 49-C-15
YU3UPI 51,612- 374- 46-B-15
YU5XTC 2040- 34- 20-B-15
YU7AF 24,831- 267- 31-C-10

Y24RL/A 168,525- 525-107-C
Y47YN 155,001- 427-121-B
Y37UF 58,050- 258- 75-B
Y24IF/P 43,566- 274- 53-B
Y24YH 26,676- 156- 57-B
Y36VM 24,522- 122- 67-B
Y51ZE 25,575- 155- 55-B
Y22DK/4 16,611- 113- 49-B
Y56ZA 16,758- 114- 49-B
Y58SA 15,498- 123- 42-C
Y23CM 12,825- 95- 45-B
Y59VA 10,296- 104- 33-B
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Y22HF 6324- 62- 34-B
Y39JA 4500- 60- 25-C
Y21TL 4410- 49- 30-B
Y24DG 2160- 36- 20-A
Y23TL 1500- 25- 20-A
Y49RF 660- 22- 10-B-80
Y51XE 2475- 55- 15-C-40
Y52XF 11,886- 113- 35-B-20
Y23RJ 9240- 110- 28-B-20
Y22BK 8019- 99- 27-B-20
Y58ZA 6804- 87- 27-C-20
Y51YJ 6638- 80- 28-B-20

Y75XH 6003- 87- 23-B-20
Y34SE 46,620- 370- 42-C-15
Y38YE 13,158- 129- 34-B-15
Y71ZL 11,583- 117- 33-B-15
Y59UN 10,416- 112- 31-B-15
Y55ZF 7140- 85- 28-B-15
Y24SG 6642- 82- 27-B-15
Y27ML 6399- 79- 27-B-15
Y38VL 1176- 28- 14-B-15
Y22WF 4275- 75- 19-B-10

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W1HHV/C6A
319,548- 859-124-B
C6ABA (KØGVG, opr.)
33,138- 263- 42-B-160

VE3LKU/HI8
1,219,158-1899-214-B
HI8LC 24,600- 200- 41-B-20

HP1AC 254,592- 544-156-B
HP1XEK 21,060- 180- 39-C-80

HR1DAP (K8CC, opr.)
3,772,680-4220-298-C
W9NXD/HR2
82,080- 570- 48-B-80

KL7PK 9765- 93- 35-B
KL7Y 9600- 100- 32-C-160

K5NA/KP2 3,044,934-3651-278-C

KP4BZ (NP4Z, opr.)
2,963,346-3566-277-C
KP4EQF 247,296-1472- 56-C-20

OX3KM 49,770- 210- 79-B

K2KTT/PJ7 43,080- 359- 40-B-10

P47LTA (K4LTA, opr.)
1,338,855-2177-205-B

VP2EEH (W2KN, opr.)
30,492- 242- 42-B-40

VP2KBZ (VE3KZ, opr.)
3,384,945-3959-285-C
K4FW/VP2K
133,857- 417-107-B

K8WW/VP9 1,949,985-2549-255-B

8P6G (N8DCJ, opr.)
3,149,820-3684-285-C
8P6NX (WØSA, opr.)
2,105,566-2949-238-C

Oceania

DU6JM 60,048- 278- 72-C
N7ET/DU6 26,730- 182- 55-B

K7SS/KH6 1,079,299-1579-227-A
KH6WT 32,805- 243- 45-B-15
W7PSO/KH6
330- 11- 10-B-15

KX6DS (K4TO, opr.)
59,094- 402- 49-B-40

VK3DXI 679,875-1225-185-B
VK2BQQ 235,092- 548-143-B
VK2GW 121,368- 389-104-C
VK3AEW/1 30,528- 159- 64-B
VK3DNC 17,010- 105- 54-B
VK3AGX 26,676- 288- 39-B-20
VK3FY 10,080- 105- 32-B-20
VK4ANY 6930- 77- 30-B-20
VK2WU 21,867- 197- 37-C-15
VK4XA 21,423- 193- 37-B-10

YB8ARA 14,994- 147- 34-C
YB2ARH 11,760- 98- 40-B

ZLØAJW 1,086,825-1685-215-C
ZL1AIZ 8184- 88- 31-B-40

5W1DC 622,914-1054-197-C

South America

K3ZO/HK3 1,499,040-2082-240-B
HK1AMW 762,570-1145-222-C

LU8DQ 2,154,900-3265-220-C
LU1EWL 186,816- 556-112-B
LU4DLH 113,850- 690- 55-C
LU7CW 26,163- 153- 57-B
LU1BCE 89,925- 545- 55-B-15

OA4SS (W9SI, opr.)
641,187-1119-191-C
OA8CP (KE4EW, opr.)
108,558- 326-111-B

PY2RRG 191,142- 574-111-B
PY1VT 62,928- 437- 48-B-20
PY1PL 23,028- 202- 38-B-15
PY2PPU 1800- 30- 20-B-15

P42J (W1BIH, opr.)
3,368,016-3693-304-C

KC2GE/PJ3 623,310-1315-158-C

VP8KF (G3VPW, opr.)
180,960- 520-116-B

YV1OB 41,328- 336- 41-C-160
YV2IF 1104- 23- 16-C-160
4M7QP 223,776- 592-116-B-40

ZP5XGG (KD3F, opr.)
23,754- 214- 37-B-20
ZP5XDW (N4PW, opr.)
134,400- 800- 56-C-10

9Y4TP 6960- 80- 29-B-15

Multioperator

Single Transmitter

Africa

ZS1CT (+ ZS1QM,DK3GI)
238,070- 610-129-C

Asia

JA7YFB (JE7MLJ,JH7XMO,JJ1GXY,JR7s JLU,JVO,LCI,OEF, oprs.)
437,517- 843-173-C
JA1YCL (JE2RQU,JG1GQB,JH8MHZ, JHØDUG,JK1s JSS,STT,JL1QOC, oprs.)
317,460- 740-143-C
JA6YAI (+ JE5MQW,JH8VLF,JHØFKC, JR6s EZE,GAG)
184,128- 548-112-B
JA7YCQ (JHØCZQ,JN1RPG,JR7MZC, oprs.) 148,506- 467-106-C
JA7YAI (JK1CYV,JO1QNO, oprs.)
147,888- 474-104-C
JA1YXP (JHØNPR,JL1ROT,JM1AQU, oprs.)
39,816- 237- 56-C
JA6YBR (+ JE6s QFE,UXS,JF6DEA)
10,206- 126- 27-B

UKØQAH (UAØs QDC,QDL,098-113, oprs.)
338,688-1008-112-C
UK9FER (UA9s FAL,FAR,FDW, oprs.)
199,755-1737-115-B
UKØCAA (UAØs CAR,CBO,CBW,CCD, CDM,CDT,DAA,100-300, oprs.)
167,640- 508-110-B
RØK (UAØs KAD,KAV,KCL, oprs.)
84,645- 495- 57-B
UKØKAC (UAØs KBD,KCY,KCZ, oprs.)
66,105- 339- 65-B
UKØQBE (UAØs QWJ,098-107,096-121, oprs.) 44,958- 254- 59-B
UKØCBI (UAØs CDG,CGL, oprs.)
44,118- 258- 57-B
UK9CBD (UA9s COB,CPE, oprs.)
19,278- 153- 42-B
UKØCBE (UAØs CAF,CCU,CFF, oprs.)
12,075- 115- 35-B
UKØQBE (UAØs QWJ,098s -107,-121, oprs.)
4368- 56- 28-B
UKØLAB (UAØs LDF,LDP,LEL,LH,LJ,LS, 107-65, oprs.)
1656- 552-101-B
UK9CAC (UA9s CNA,CWN,-154-1743, oprs.)
450- 15- 10-B

UK7PAL (UL7s PAE,PBY,PCZ, oprs.)
14,040- 120- 39-B

Europe

DK7ZT (+ DK7s FP,ZT,DK5OZ)
181,764- 581-109-C

F3TV (+ F6s ARC,BEE)
2,198,502-2979-246-C

G3FXB (+ G3SXW)
1,770,390-2490-237-B
G3ASR (+ G3s PSP, SHY,SJE,ZDJ,G4s DUS,HKA,HMD,IUZ,oprs.)
429,420- 842-170-B
HG6A (HA5s FN,FM,OM,GF,ML,UA,PP, WE,HA7s RY,SU, oprs.)
1,319,760-2115-208-C
HG6V (6 oprs.)
980,508-1618-202-C
HG1Z (6 oprs.)
832,500-1500-185-C
HA1KSA (6 oprs.)
675,432-1272-177-C
HA7KSR (HA7s FL,OV,SH,UG,UL,UO, oprs.)
526,932-1071-164-B
HA3KNA (HA3s OV,OG,NS,NU, oprs.)
292,815- 723-135-B
HA7KLG (HA7s MY,LD,LC,MK, oprs.)
242,064- 658-123-B
HA8KAX (4 oprs.)
218,313- 573-127-B
HA2KMR (6 oprs.)
221,136- 542-136-B
HA3KMA (7 oprs.)
209,064- 562-124-B

HA8KVK (4 oprs.)
144,270- 458-105-B
HA5KFZ (6 oprs.)
116,748- 414- 94-B
HA6KNI (+ 6 oprs.)
61,542- 263- 78-B
HA7KPW 60,690- 238- 85-B
HA5KKG (6 oprs.)
45,567- 249- 61-B
HA5KFL (10 oprs.)
99,687- 329-101-B
HA3KGC (6 oprs.)
8544- 89- 32-B

HB9CIP (+ HB9BLQ)
67,239- 241- 93-B
I8JX (+ I8MGM)
1,832,985-2645-231-C

LX1PD (+ DF5GX,DKs 5GB,6QI,DL4EBY, DL7s NF,WC,ZN)
1,566,006-2362-221-B

OH3AA (OH3s IQ,XS,OH6DO, oprs.)
511,680-3198-160-C
OK2KMR (+ OK2s BQZ,SSS)
85,680- 340- 84-C
OK3KEX (OK3s 17760,26928, oprs.)
55,080- 255- 72-B
OK1ORA (+ OK1s 22310,AYD)
19,668- 149- 44-B
OK1KTW (+ OK1s AEM,DKA)
17,112- 124- 46-C
OK1KLV/P 1728- 36- 16-B

ON6BR (9 oprs.)
632,460-1270-168-C

PAØGN (+ PA3s ABA,BFM,PAØs ERA, GIN)
477,360-1020-156-C

SK3AH (+ SM3s AJL,CDW,COL,OII,OWZ, RL)
175,512- 568-103-C

SP6PST (2 oprs.)
123,900- 413-100-B

UK1ZZZ (UA1s ZCR,ZCZ,ZX,143281,1435, oprs.)
569,685-1165-163-B
UK3ABC (3 oprs.)
178,365- 517-115-B
UK6LFZ (UA6s HLP,LCJ,LCN,LTI, oprs.)
120,960- 420- 98-B
UK4FAV (UA4s FDS,148-558, oprs.)
183,573- 523-117-B
UK4ACE (2 oprs.)
8058- 79- 34-B

UK2ABC (EZ2WAA,UC2s 006-105,009-743, oprs.)
118,260- 438- 90-B
UK2WAR (3 oprs.)
25,344- 176- 48-B
UK2WAY (3 oprs.)
10,848- 113- 32-B
UK2LAN (3 oprs.)
1428- 28- 17-B

UK2PRC (UP2s BBM,BIL, oprs.)
585,234-1066-183-B
UK2PAP (UP2s BLR,BLW, oprs.)
260,958- 713-122-B
UK2BBK (UP2s BLJ,038-1052, oprs.)
239,112- 648-123-B
UK2BCC (UP2s BDW,BJK,038s 1656,346, oprs.)
131,544- 522- 84-C

UK2GKO (UQ2s GCT,PP, oprs.)
2400- 50- 16-B

UK5QBE (UB5s QBG,064s 866,1362, oprs.)
138,351- 431-107-B
UK5HCF (3 oprs.)
147- 7- 7-B

UK5OAR (3 oprs.)
3480- 58- 20-B

YT3T (+ YU3s BQ,DE,EIJ)
646,275-1231-175-C

North America

N5RM/C6A (+ K5MM)
3,540,135-3869-305-B
N4BP/C6A (+ N4UM)
2,613,648-3203-272-C

XE2EBE (+ AA6DP,N6RW)
1,437,948-2031-236-B

4U1UN (AF1U,KC2QF,WA1GSO, oprs.)
269,280- 680-132-C

Oceania

AH6AZ (+ VE7QO)
1,288,656-1884-228-C

South America

W6QL/ZP5 (+ W6KG)
874,146-1601-182-B

Multioperator

Two Transmitter

Asia

JA9YBA (JA9s LNJ,NFO,OTX,QCE,QWJ, VBW,VDA,JHØCAZ, oprs.)
1,107,540-1758-210-C

Europe

YU4EZC (4 oprs.)
107,868- 356-101-C

North America

HH2B (+ N4WW,HH2VP,HH2S,N4SA)
6,668,004-6818-326-C
KL7RA (+ AL7CQ)
1,479,222-2382-207-C

Multioperator

Unlimited

Asia

JA7YAA (JE7HLZ,JH7s CUO,HWR,UJN, JJ1MVV,JR7OMD, oprs.)
1,025,010-1627-210-C
JA3YKC (JE3MAS,JF3RAL,JG3s HJG, HLV,LLB,JI3s DNR,ERV,JK3GRR, JH4RHF,JR4s BSM,IMK,JH5s EML,EZP, JR8NWN, oprs.)
840,402-1422-197-C

Europe

LZ2KTS (LZ1A310,LZ2s CC,DF,E33,HE, PO, oprs.)
918,195-1493-205-C

North America

XE2FU (AK5B,K5s GN,IY,LZO,RC,TU, VWW,KBSFU,KC5CP,KC5M,KD5SP, KG5U,KN5H,KZ5M,N5AF,N5DU,N5JJ, NA5R,NM5L,NM5M,W5s ASP,SJS,BZN, VAH,WA5PQK,WA5QOK, oprs.)
8,084,153-8121-331-C

Oceania

ZL2AH 71,712- 249- 96-B

CHECKLOGS

Special thanks to the following amateurs who submitted logs to assist in cross-checking entries:

ACØE, CE4BQO, CT1BWN, DL4TH, EA1AWW, EA1CDF, EA3ALV, EA3DBU, EA7AIN, G3URA, GB4ANT, GM3DPK, HA1XR, HA2NI, HA4YO, HA5FA, HA5KFV, HA7LC, HA7PW, HA7UJ, HB9KC, HL4XM, JE1ARQ, JO1TTC, JR3WXA, K1RM/M, K2SCU/5, K4OP, KA2MYJ, KC8UM, KF4MA, KK2E, KX6DS, LA4IAA, LA5BS, LA5VAA, LA7SI, LA7XB, LA8CE, LA8DY, LA9SN, LZ1KAU, LZ1KHY, LZ1KKR, LZ1RU, LZ2KAF, N2BXV, N6ADK, N8DE, NØBXW, NH6R, OA4ZV, OH1XX, OH2KI, OH2NL, OH6XA, OK1AWC, OK1DHB, OK1FAI, OK1US, OK3KKF, OX3BJ, OX3ZM, OZ1FGG, OZ1GHS, OZ1JNR, OZ4ZT, PAØTV, PA3BFH/M, PA3BWQ, SMØBFJ, SMØNJJ, SM5GA, SM6FGP, SM6KMD, SM6LL, SM6OTO, SM7KWE, SP2LQC, SP2PIK, SP5JTR, SP6BEN, SP6CZ, SP6DMJ, SP6ZFU, UAØBCK, UAØDAE, UAØQWO, UA1ZGP, UA3AGL, UA3AGW, UA6ECY, UA8HSN, UA8PCH, UA9AQR, UB5CBA, UD5DBC, UD5OHH, VE1RH, VE4AAU, W8JSN, W1OR, W1RWR, W2BBK/PJ7, W2HAZ, W2QFC/4, W4LEP, W5XZ, W8GWC, W9PNE, W9YDP, WB2GYS, WD5IFR, WD8KTM, Y2-11249/F49, Y22UB, Y23ZE/A, Y24FH, Y33ZB, Y47XN, Y49RF, YO2BBT, YO5ALH, YU2AKL, YU4AYZ, AKØW, DL5LAW, JA8WLG, JG3NKP, K2KTT, K6FM, KA9JOW, KA9KUH KC2GE/PJ3, KW2J, LA1WCA, LA2TO, LA5BS, LA7ZAA, LA8BN, KA8CJ, LA9VDA, LZ1CW, LZ1GD, LZ2GS, LZ2RS, N7BJX, OH1RY, OH3UJ, OH6XT, ON5FV, OZ1ACB, PAØBDO, PA3BNH, PA3CNY, SM6KMD, SM7GGK, SP2BMI, SP5AIG, SP7EJS, SP9JPA, UAØCED, UAØSGT, UA3ADO, UA3DFV, UA3DJS, UA3DQS, UA3DTR, UA3TAM, UA4BSW, UA9CGP, UA9MQ, UA9URF, UA9XEQ, UB5EES, UB5FDF, UB5RAF, UB5SBM, UC2LBE, UK9OAE, UL7GDH, UP2BLQ, VE5XV, VY1CW, W8LP, W2HAZ, W8JQR, Y22YO, Y23FK, Y26WM/A, Y27DL, Y35RK, Y35ZK, Y39JA, Y75YL, YO2BEH, YU3TUW, YU7AJP, YU7AZ, YU7BCD, YV5JEM.

51st ARRL November Sweepstakes Announcement

The rules for this year's contest are identical to last year's. Remember that there is a three-QSO penalty for unremoved duplicate contacts and for miscopied call signs. Take a few seconds to make sure you have the call right before you move on. At four QSOs each (including the original QSO), bad calls reduce scores quickly.

Another point to remember is that you must receive a *complete exchange* for each claimed QSO. If you get everything except the check, that's not good enough. You must copy it *all* for a complete contact. QSOs with stations "not in the contest" are fine, too — *if* you can get all of the required information.

Official log sheets, summary sheets and dupe sheets are available from ARRL Hq. Send an s.a.s.e. with one unit of First Class postage (U.S.) for each five sheets requested. You'll need one summary sheet and one dupe sheet for each mode. Log sheets hold 100 QSOs each, so order accordingly. Order your official entry forms now; they not only make it easier on the log checkers, but also help make sure you submit all of the required information.

Logs must be postmarked by December 18, 1984. You should send them via First Class Mail to ensure timely delivery. Entries not postmarked by the deadline *will* be classified as checklogs; no exceptions. If you want to make sure your entry arrived safely, include a self-addressed stamped postcard. We'll return it to you when we get the log.

Club officers: Remember to send us a membership roster as detailed in the club competition rules (January *QST*, page 80). CU in SS!

Rules

1) **Object:** For stations in the United States and Canada (including territories and possessions) to exchange QSO information, as detailed in Rule 4, with as many other U.S. and Canadian stations as possible on 160 through 10 meters.

2) **Contest Period:**

(A) **CW** — First full weekend in November.

(B) **Phone** — Third full weekend in November.

(C) **Time** — Begins 2100 UTC Saturday and ends 0300 UTC Monday. Operate no more than 24 of the 30 hours. Off periods may not be less than 30 minutes in length. Times off and on must be clearly noted in your log, and listening time counts as operating time.

3) **Categories:**

(A) *Single operator.* One person performs all transmitting, receiving, spotting and logging functions.

(B) Multioperator, single transmitter only. Those obtaining any form of assistance such as relief operators, loggers or use of spotting nets.

4) **Exchange:** A consecutive serial number, precedence ("A" if you run 150-W output or less, "B" if more than 150 W), your call sign, check (last two digits of the year you were first licensed), and your ARRL Section. For example, K5ZD answers W1AW's call by sending W1AW NR178 B K5ZD 73 NTX for QSO number 178, more than 200 W, first licensed in 1973 and North Texas Section.

5) **Scoring:**

(A) *QSO points.* Count two points for each complete two-way QSO. No cross-mode contacts. Work each station only *once*, regardless of the frequency band.

(B) Multiplier. Each ARRL Section (listed on page 8 in this issue) plus VE8/VY1 — maximum of 74. KP4, KV4/KP2 and KG4 stations are in the West Indies Section, while KH6 and other U.S. possessions in the Pacific count as the Pacific Section.

(C) *Final score.* Multiply QSO points (two per QSO) by the number of ARRL Sections (plus VE8/VY1).

6) **Miscellaneous:**

(A) A transmitter used to contact one or more stations may not subsequently be used under any other call during the contest period (with the exception of family stations where more than one call is assigned by FCC/DOC).

(B) One operator may not use more than one call sign from any given location during the contest period.

(C) The use of two or more transmitters simultaneously is not allowed.

7) **Reporting:** Contest forms (log sheets, summary sheet, dupe sheet) are available from ARRL Hq. for an s.a.s.e. Official forms are recommended. Any entry claiming more than 200 QSOs must submit duplicate-checking sheets (check sheets). Incomplete or late entries will be classified as checklogs. Logs must include dates, QSO times, exchange sent/received, band and mode. Postmark your entry within 30 days after the phone portion of the contest (December 18, 1984).

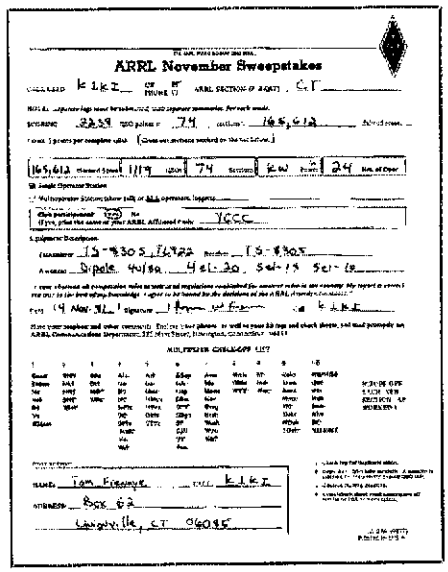
8) **Club Competition:** ARRL-affiliated clubs for club gavels and awards in the local, medium and unlimited categories as described in January 1984 *QST*, page 80.

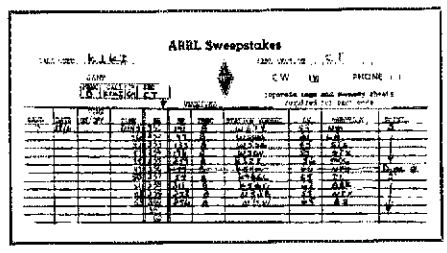
9) **Awards:** Certificates to the top single operator CW and phone scorers in both the "A" and "B" categories in each ARRL Section, and the top multioperator entry in each ARRL Division.

10) **Conditions of Entry:**

(A) Each entrant agrees to be bound by the provisions as well as the intent of this announcement, the regulations of his licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications. See January 1984 *QST*, page 80.


ARRL November Sweepstakes


ARRL Sweepstakes

Suggested Frequencies

CW	Novice	Phone
1800-1810		1855-1865
3550-3650	3710	3850-3950
7050-7100	7110	7200-7250
14,050-14,100		14,250-14,300
21,050-21,100	21,110	21,300-21,400
28,050-28,100	28,110	28,550-28,650

Contest Period

	Starts	Ends
CW	Saturday, Nov. 3 2100 UTC	Monday, Nov. 5 0300 UTC
Phone	Saturday, Nov. 17 2100 UTC	Monday, Nov. 19 0300 UTC

Explanation of Exchange

	Number	Precedence	Call	Check	Section
Exchanges	Consecutive serial number	Power input more than 150 W PEP	Send your station call	Last two digits of year first licensed	Your ARRL Section
Sample	NR178	B	K5ZD	73	NTX

Section News

The ARRL Field Organization Forum

Coordinated By Jim Clary, WB9IHH

CANADA

ALBERTA: SM, E. Roy Ellis, VE6XC — SM: VE6XC. SEC: VE6XC. A/SM: VE6AMM. STM, DEC, NM (APSN & ATN): VE6ABC. The Papal visit in Sept. is proving to be a larger undertaking than first thought. We need more volunteers; please help. The hot wx and poor sigs have slowed down net opns this month. No reports in this month so take it that very little is taking place. Still no volunteer for NCS for the AARCS net; it's still open so give me a call. Traffic: VE6ABC 13. (June) VE6ABC 32, VE6CHK 16, VE6CPE 6, VE6YW 1.

BRITISH COLUMBIA: SM, Ernie Savage, VE7FB — British Columbia Public Service Corp Net, VE7QC Net Manager, since early 1950. Has been in hospital. ASM VE7DDF has been in the saddle during Sil's absence most of the month. VE7WT, a faithful NCS for the net, is in serious condition in Kelowna Hospital. VE7LC has returned from motor trip to the East. QCWA Dogwood Chapter had their annual meeting in Clearbrook; VE7AYN is President and VE7TE is our Vice. The same weekend was the Maple Ridge Hamfest. We attended and enjoyed ourselves QSOs, but they say the long weekend holiday cut into the attendance. VE7JY was in hospital heard him often on 34/94. Mayor Doug Baker of Duncan declared June 25 to 30 Amateur Radio Week. He listed all the things Amateur Radio has done for the good of the community. BCENet come fall will be changing their roll call format. Traffic: VE7BNI 231, VE7CDF 168, VE7FB 29, VE7FPM 25.

MANITOBA: SM, Peter Guenther, VE4PG — ASM: VE4AJE. SEC: VE4FK. Congratulations to Mac, VE4TE for becoming the Ham of the Year at the Peace Garden Hamfest. Our thanks to Ron and Cathy VE4NM for their help in furthering the best interest in MEPN. Our SEC, VE4FK, has moved and is now located on an ideal antenna farm. His box number remains the same. MEPN QNI 889, sess. 31. QTC 12. MMN QNI 633, QTC 34, sess. 31. WRIN QNI 250, QTC 1, sess. 9. MTN QNI 111, QTC 16, sess. 18. Traffic: VE4PG 42, VE4JA 39, VE4TE 32, VE4AJE 22, VE4AAD 20, VE4LB 9, VE4DT 8, VE4ADS 4, VE4RO 4, VE4AEY 3, VE4NE 3, VE4CF 2, VE4CR 2, VE4GB 2, VE4JF 2, VE4FK 1, VE4JK 1, VE4UF 1.

ONTARIO: SM, Larry Thivierge, VE3GT — BM: VE3LST. PGL: VE3AR. SEC: VE3GV. A/STM: VE3GT. TC: VE3EGO. As we head into the fall operating season, the following is an update of the NTS nets operating within the Section:

Net	Freq	Time/Day	Mgr
OSN*	7045	2100 Dy	VE3FGU
OLN	7.66/.06	2230 Dy	VE3GFN
OPN*	3770	2300 Dy	VE3BDM
OSN*	3667	2300 Dy	VE3CYR
KTN	7.96/.36	0200 Tue/Thur/Sat	VE3AJN
OSN*	3667	0300 Dy	VE3KK

*denotes Section Net, all times shown are in UTC. VE3AZJ in Orangeville is now VE3NN and VE3DWL previously from the Belleville area, is now located in Greenwood, NS, as VE1BJT. VE3GFN managed to get lots of sailing in with a new 14 foot dinghy. CCWA members are encouraged to check in on 3.773 and 7.090 MHz respectively. Regretfully I report that VE3IDO has become a Silent Key. Special thanks to VE3GOL for her help this month in picking up the Section's activity and net reports while I was on holidays in the east coast. Traffic: VE3KK 177, VE3GOL 154, VE3BCZ 124, VE3GT 120, VE3GNW 87, VE3DPO 78, VE3AJN 55, VE3BDM 51, VE3KXB 49, VE3CYR 45, VE3WV 45, VE3FGU 37, VE3KCZ 23, VE3EWD 17, VE3DZH 16, VE3KLX 8, VE3WM 6, VE3BAJ 4. (June) VE3AWE 63.

QUEBEC: SM, Harold Moreau, VE2BP — STM: VE2EDO. BM: VE2ALE. PIO: VE2YW. TC: VE2ED. NMs: VE2EDO VE2FSA. I hope that everyone enjoyed a good summer. With the return of fall, activities will resume. QSN will return to normal schedule. News from clubs are needed for the "Section News," contact your SM. The following appointments are open: SEC, ECs and DECs. VE2ZZ a opere sur un voilier au cours d'un voyage Gaspe-Quebec. Si vous avez des nouvelles pour le SECTION NEWS, contactez votre SM. Les appointments suivant sont ouverts; SEC, ECs et DECs. Si interesse me contacter. Traffic: VE2EDO 80, VE2EC 51, VE2BP 50, VE2EKC 40.

SASKATCHEWAN: SM, W. C. Munday, VE5WM — STM: VE5HG. SEC: Vacant. TC: VE5GF. NMs: VE5EX VE5HG VE5NJ VE5AEJ VE5AEM VE5BAF. A welcome is extended to VE5IF and VE5RU who recently moved to Regina. The 100th anniversary of Regina Exhibition kicked off with a 5K and 10K Buffalothon. Communications were handled by members of the R.A.R.A. SK nets held up well during July with NMs reporting QNI — PWXN 525, RARA2 430, MJARC2 230. The Nittany ARC of State College, Pennsylvania, invites Canadian amateurs to participate in the Pennsylvania QSO Party, Oct. 13th and 14th. A restructuring of ARES is pending and a special meeting will be held in early October. Traffic: VE5AGM 8, VE5WM 4.

ATLANTIC DIVISION

DELAWARE: SM, John Hartman, WA3ZBI — STM: W3DKX. SEC: W3PQ. PIO: N3DIP. PSHR: K3JL W3DKX. I am sad to report a Silent Key, WA3EPC. The AWARE club displayed and promoted Amateur Radio at the Concord Mall in conjunction with Concord Mall Days. SKYWARN, a function of AWARE, was activated 3 times this season during severe storms. W3KET acted as net control. Congrats to newlyweds, Ed N3DJH and Gladys N3DXW, and Hardy W3DND and Judy N3DXU. DTN: QNI 367, QTC 57 in 22 sessions. DEPN: QNI 62, QTC: 6 in 4 sessions. SEN: QNI 45, QTC 0 in 5 sessions. Traffic: W3QQ 163, W3DKX 64, KC3FW 42, WB3DUG 34, WA3ZBI 25, K3JL 17, WA3WIY 15, WA3DUM 9, KC3JM 8, K3ZXP 8.

EASTERN PENNSYLVANIA: SM, Mark J. Pierson, KB3NE — ACC: KB3NE. PIO: W3AMQ. SEC: WA3PZD. SGL: N3GJP. STM: KB3LF. DECs: K3QXC AA3C W3EEK KB3UD N3BFL KB3LR N3AfA.

Net	Time	Freq.	QNI	QTC	Sess.
EPA	7/10PM Dy	3610	448	201	59
EPAEPTN	6PM Dy	3917	442	168	31
PTTN	6:30PM Dy	3810	228	85	31

Local and VHF net reports (QNI/QTC/sess.): MARCVHF 228/31/14; CVSARES 65/1/5; PWAARES 82/5/5; D6ARES 25/7/4. OO reports: K3UWJ W3KEK W3GTN. OBS reports: W3CL W3VA KC3LY K3EBZ. Congrats to the RRC for their efforts put forth at the recent Limerick Power Plant Drill held on July 25th; another fine job done by those who care about the community. I wish to acknowledge this fine job being done by Bill H. Moyer, W3AMQ, the PIO for EPA area. He had the week of June 19th thru the 26th declared "Amateur Radio Week" in Pennsylvania by Gov. Thornburg. The presentation was also attended by Atlanta Division Director, Hugh Turnbull, W3ABC. Bill is always busy getting ham radio in the "news." I hope everyone helps him in this important part of our hobby. I will soon be turning the SM job over to Jim Post, KA3A, from Wilkes Barre. I do hope those appointees now serving the EPA section will continue to do their fine jobs for him as well as they did for me. Traffic: N3COY 233, KA3DLY 202, W3IPX 121, AA3B 101, KB3FW 76, N3CD 73, WB8KPE 73, W3AQN 33, KC3LY 30, W3CL 17, W3ADE 15, WA3CKA 14, W3TWV 14, W3HK 13, W3FAF 12, W3VA 8, W3SD 6, K3EBZ 3.

MARYLAND-DISTRICT OF COLUMBIA: SM, Karl R. Medrow, W3FA — SEC WA3TAI recommends ECs and ARES register with the organization for which you are prepared to provide communication services. How else will they know you? ACC KA3DRO reports So. Md ARC is a SSC. Congrats. KA3SWV relieves K3IOG as editor of LARC's *Feedback*. K3YLG and W3DRG have joined the Chesapeake RA. The Columbia ARA provides a good public service with their monthly Siren Test operations for Howard Co. The Goddard ARC will broadcast shuttle audio as available. Big interesting SMARC newsletter. Tnx. KA3R was on the gate at the BRATS hamfest. Congrats to KC3EK, president of BARC with over 400 members. KG3M plans bulletins on 80 meters when conditions improve. W3OYY WB3BFK and WA3VDX run nets. WA2ERT is back from his vacation. W3ZNW is traveling in the northwest. WB3KJT vacationing in Delaware and KC3D to Arizona. W3FA in Maine. Nobody stays home! VK3LC visits W3CDQ and W3QDI's XYL and the Rock Creek ARA. W3JPT is making satellite contacts to Europe on the RS series! The MDD/MEPN picnic has W3FA W3YVQ KB3NL K3ORW K3TNM WA3IHW K4AWJ KJ3E W3FZV KK3F W3VBM N3IT W3DKX N3AGM KC3Y WA2ERT W3LDD W3SOG NY4X KB4ISP WB3GZU and N4DR present. K3MR is a welcome ORS. KA3EWV was father of the bride. KJ3E was radio contact with AG3L/MM solo 30-day trip to Grenada. KK3F's rig didn't last! WB3FUE says eastern shore is slow this time. KC3DW coming along fine after eye surgery. W3DQI missed the picnic. The NRL club (W3NKF) enjoyed the presentation of N4GHI on the NTS. K3NNI is having a busy month. KC3AV is ready for resupply; W3UT is about ready for more hamming. RACES W3YVQ. PIO KA3DBN. SGL KA3ERP. STM WB3GZU. W3FA needs OO/RFI, TC and BM coordinators! With the nets: MEPN/KJ3E 30/149/23, (top five KA3CDQ W3DKX W3FA KJ3E and WA2ERT); MDC PON/W3OYY 4/4/12.5; WR PON/WB3BFK 20/13/11; WC 2-Mtr/WA3VDX 5/1/12; MSN/KC3AV 31/63/8.1. MSN June honors to KC3Y KC3AV N3IT N3CZM and KA1KML. Traffic: KJ3E 357, K3NNI 143, KC3Y 131, KC3DW 129, KC3AV 121, W3FA 123, W3YVQ 109, KK3F 100, WA2ERT/3 53, N3IT 40, W3DQI 34, KA3EWV 34, K3MR 32, WB3BFK 31, W3FZV 22, W3LDD 14, W3UT 12, WB3FUE 11, W3ZNW 11, KC3D 6, WB3KJT 6.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB — SEC: K2QIJ. STM: WB2UVB. ACC: K2IXE. TC: W2IJX. BM: WB2UVB. PIO: WB2RVE. SGL: W2XQ. Please try to set a little time aside during the weekend of the 20th, because it's Simulated Emergency Test (SET) time again. This is the one weekend every year when amateurs nationwide conduct planned (simulated) disasters. Even though this is a "canned" exercise, it gives local ARES groups an opportunity to not only work with local emergency management officials, but with emergency management officials in other locales. It also tests the capabilities and limitations of the National Traffic System (NTS). I can assure you that it's a very interesting weekend and everyone should feel free to help out. We need YOU! For details on how you can help, please contact your county EC or the SEC. For information on what traffic nets will be active during this weekend, contact our STM. Let's make SNJ's collective voice heard during the SET. Thank you. If your group or Volunteer Examiner Team is planning a test session, please drop me a line so I can help spread the word. It would be appreciated. 73. Traffic: WB2UVB 258, WA2HEB 34, KA2CQX 15, WA2MGV 10, KA2ANJ 6, WB2IQJ 4.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA — SEC: W2BCH. ACC: N2EH. PIO: WA2PUU. TC: K2QR. OO/RFI: W2AET. SGL: KO2X. BM: W2GLH. Club Officers: RAGS — K2SDD N2CQE W2BCH WB2HGO WA2PUU; Tompkins Co. ARC — KO2X W2CFP KA2TVM; STARS — WA2ZFU WB2GIM KA2MJX KA2DDP WB2RAV; Otsego Co. ARA — WB2PEE WB2PEF KD2AO WA2SAF NC2C. Congrats RARA on 2nd year as Special Service Club. Welcome: Chautauqua Co. AFMA as a Special Service Club; newly affiliated clubs Black River Valley ARC, Squaw Island ARC, Tryon ARC. COMMS: Owego Y-Athalon, W2EWO; Lewis Co. Fair Booth, WA2OEP; Oswgo Nine Mile Point, WA2KOJ and KA2BHR. Western District Net celebrated eighth year of operation with thanks to all, especially to founder WA2AIV. Lots of new Novices, thanks to GRAM, LARC, RARA and others. APPTS: (DEC) WB3CUF Mohawk, (EC) KD2AJ Clinton, KA2OOA Chautauqua. Thanks for many years of service to WA2HSB and to WB2PID and K2DHR who must step down as Emergency Coordinators. PSHR: W2AET KA2BHR KG2D KA2DQA WA2FJJ VE2FMQ W2GJ WB2IDS WA2KOJ W2MTA KU2N WB2OWO WB2PID ND2S.

NYS/1*	3677	1000/Dy	WB2EAG	376-155-31
WDN/M*	04/64	1100/Dy	KC2QQ	306-057-31
Mike Farad	3925	1300/Dy	VE2FMQ	168-030-26
NYPON*	3913	1700/Dy	WA2KOJ	627-370-31
NYSPTEN	3925	1800/Dy	WB2HKU	546-070-31
ESS	3590	1800/Dy	W2WSS	417-065-30
OCTEN/E*	34/94	1830/Dy	WB2HLY	607-068-31
Q Net	31/91	1830/Dy	KA2CMQ	346-011-31
WDN/E*	04/64	1830/Dy	KC2QQ	603-149-31
Blue Line	93/33	1900/Dy	WA2SEF	265-021-24
NYS/4*	3677	1900/Dy	WB2MCO	470-197-31
JCARCN	10/70	2000/Dy	WA2WAX	—
OARCN	25/85	2000/Wd	K2VTT	056-001-04
BRVSN	055/655	2100/Dy	WB2OFU	381-013-31
CNYTN*	90/30 +	2115 Dy	WA2PUU	365-057-31
OCTEN/L*	28/88	2130/Dy	WB2HLY	242-029-31
STAR*	99/39	2130/Dy	N2BLX	—
WDN/L*	04/64	2130 Dy	KC2QQ	681-151-31
NYS/5*	3677	2200/Dy	WB2MCO	401-251-31

*NTS Net. June: CNYTN 368-60-30, NYS/E 426-224-30, NYS/L 401-317-30. ARES: WNYECN 2000 3rd Sunday 3955; Central EC Net 2030 3rd Sunday 40/00; LCARES; SLVARES; NARA Net — See *Net Directory*. THIN 1600 Sundays 3913 kHz. VHF THIN 2000 Tuesdays 04/64. HAMFESTS: Elmira Sept. 29, Syracuse Oct. 13. Congrats to Fifty-Year League members W2LOG and W2PHQ. Traffic: W2MTA 353, WB2IDS 315, WB2OWO 289, WA2FJJ 274, W2AET 180, KA2DBD 146, ND2S 123, WB2QIX 116, VE2FMQ 112, KX2T 93, W2ZOJ 74, KA2BHR 65, KU2N 65, WB2PID 64, W2GJ 62, KA2DQA 52, AF2K 52, WA2OEP 52, KG2D 48, KA2OIK 44, K2YAI 24, W2UYE 23, W2PPS 22, KA1YE/2 19, K2IUT 12, WB2KCT 12, WB2NAO 12, W2FR 11, WA2RXO 10, KC2SJ 8, KA2HRS 5, K2VR 3. (June) WA2NKC 85, K2RN 5.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB — SEC: AB3Q. STM: AC3N. ACC: N3EE. OO/RFI: KN3B. PIO: WB3IZJ. TC: W3FE. BM: WN3VAW. SGL: K3HWL. We have one Silent Key to report WA3EGI. He was the Radio Officer for Butler Co. Our sympathy is passed to his family. New Novices are KA3MWS KA3MYP KA3MYQ KA3MYS & KA3MYR; To General N3DYB (was KA3MLC); to Advanced W3HJT W3KYN & N3DKO. Congrats to all. From Indiana ARA club's *Sine of the Times* newsletter comes the announcement that W3FVU, the editor, is retiring. He has been one of the finest editors in the section. I don't remember ever reading any article that hurt any individual. He is a gentleman. He will still be involved with the Amateur Radio News Service as President. Good luck, Shel. Remember Amateur Radio Week in PA Oct. 13-21 preceded by the SET and followed by the PA QSO Party. New officers for the Breezershooters of WPA are K3SDL, pres.; KA3AVB, K3HSE, checker; wind gaugers K3SJD KA3JMU K3VSL K3SMB W3UHM & W3EHR wind gaugers. Indiana Co. ARA helped as communicators for the Yellow Creek boat regatta. Erie PA of Erie supplied communications for the AMSCO Fit Run, Barber Center Bike and Hike, Hahman Fun Run & Albion Quad Bike Race. We still have areas in the section where we do not have good outlets for traffic. If you are in an area that has a low amateur count, why not check into our traffic nets? Maybe you can pick up and deliver some tfc. Even get your neighbors to give you some to send to friends elsewhere. Tfc handling can be a very rewarding project and the comments received are great. Traffic: W3EGK 305, AC3N 135, W3OKN 133, K3CR 110, N3FM 81, K3NPW 64, K3SMB 56, WA3UNX 51, WA3DBW 49, WA3QNT 49, KC3JQ 36, KA3COX 24, N3CYV 23, W3RUL 23, W3DGUR 21, W3MML 21, W3NGO 15, KB3NV 12, W3KMZ 7, W3TTN 5, W3KUN 5, KN3B 4, K3NPX 4, KN3B 4, K3LTV 3, W3ZX 2, N3KB 1. (June) N3WS 25, WA3HJC 1.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ — SEC: W9QBH. STM: KB9X. OO/RFI: K9MX. BM: K9ZDN. PIO: WD9EED. SGL: W9KPT. ACC: WB9SFT. ASM: K9ORP.

Net	Freq.	Times (Z Win)	QNI	QTC	Sess.
ILN	3690	0030/0400 Dy	581	205	61
ITN	3705	0100 Dy	260	77	31
ILPN	3915	2230 Dy (X Sn)	509	63	25
NCPN	3915	1300 Dy (X Sn)	412	50	26
NCPN	7270	1815 Dy (X Sn)	223	107	26
IEN	3940	1500 Sn	138	2	5
IARES	3915	2230 1+3 Sn	38	—	2
ISN	3905	0000 Dy	522	178	31

Illinois was represented 100% to 9RN by stations K9AZS K9BVE K9CMO N9DR N9EM KA9FEZ KZ9I KW9J KD9K N9NA WB9NVN W9NXG K9QEW K9SW KW9T N9TN and KB9X. Illinois was represented 100% to D9RN by stations KA9FEZ W9HOT K9EHP KW9J K9AZS WB9NVN W9NXG and WB9ODN. D9RN was represented 100% to CAND. Illinois stations were K9EHP W9NXG WB9NVN W9HOT KW9J KA9FEZ and K9AZS. It is with regret that I report the resignation of KA9MLL as the ESDA coordinator of the City of Carbondale. Steve has decided to go back to college to pursue a degree in meteorology. While we wish him all the best in his future pursuits, Amateur Radio has lost a fine ally in the ESDA organization. W9QBH reports a new EC for the northwest part of Cook Co., WB9URA. The problems of leading ARES in a county the size of Cook are such that a number of ECs are justified. WB9URA has been active with the NWARES group in the Schaumburg area. SEC W9QBH will be attending the national APCO conference in the first part of August. QBH is a long time APCO member, and is a past Illinois president and secretary-treasurer. One of the sessions he'll be attending will be on the recent ARRL-APCO agreement, and we should have a report for next month. As this will appear in the Oct. *QST* (even though it's being written in early August concerning the events of July), this is the last chance I'll have to remind you to attend the 3rd Annual Illinois ARES seminar which will be held on Saturday, Oct. 27th. This year the meeting will be held in Monticello, and we will be the guests of PIO (and EC) WD9EED. This year the main topic of the seminar will be earthquake preparedness. Siesmologists tell us that southern Illinois/southeast Missouri will be the site of a devastating earthquake sometime within the next few decades. Emergency Services planners indicate that reliable communications to, from and within the affected area in the first 72 hours after the event will be critical, and that Amateur Radio MUST play the major part in providing these services. On smaller scale local disasters, Amateur Radio has often been able to provide important communications support to emergency and disaster agencies with a minimum of advance preparation. Owing to the scope of an emergency caused by a quake in the New Madrid Siesmic Zone, advance planning is a must. The Missouri Section has set the pace for amateur planning in this regard, and Illinois will be following their lead at this year's ARES seminar. All ECs and NMs as well as all other interested amateurs should plan to attned. Local ARES units should begin their planning now for the 1984 SET if you

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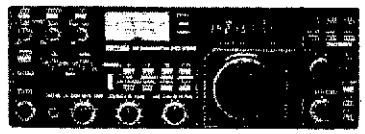

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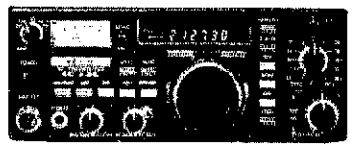

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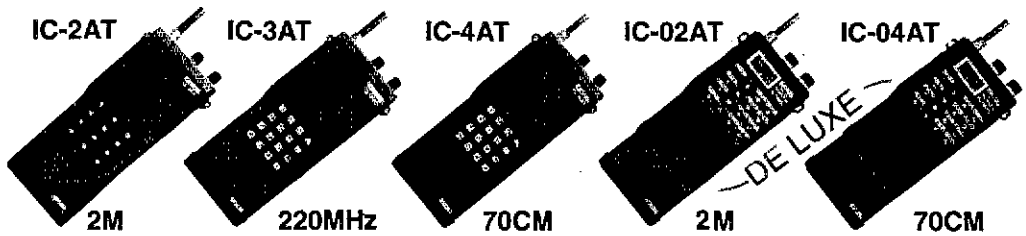

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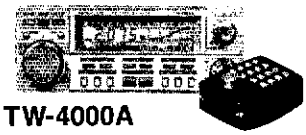
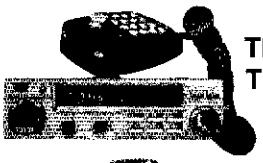

TW-4000A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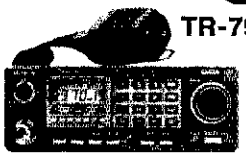
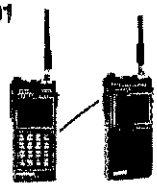
TM-401


TR-7950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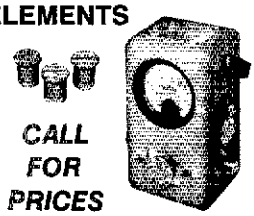

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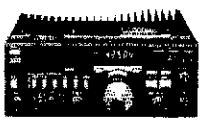
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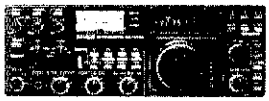

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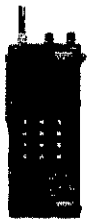

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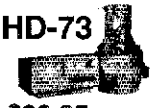
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have not done so already. If you haven't heard anything about SET '84 by the time you read this, ask your EC. No EC in your county? Then contact W9QBH or any other Section Cabinet member. Traffic: W9JIJ 367, KW9J 354, KA9FEZ 273, K9BVE 226, WB9NVN 174, W9NXG 139, KB9X 123, WB9UEA 120, W9HOT 111, K9AZS 110, W9QBH 82, KD9K 81, WA9SHE 68, WB8RFB 44, W9DBO 40, K9QEW 39, KA9EWN 34, KZ9I 28, N9DR 26, K9EHP 24, KA9RUH 21, W9KR 20, WA9SID 12, KB9QX 9, WB9CJB 8, WA9RUM 7, W9VEY/M 7, WD9EED 6, WD9IBH 6, W9LNQ 6, W9RTD 5, KA9PKG 3, KA9BBV 2.

INDIANA: SM, Bruce Woodward, W9UMH — SEC: WB9ZQE. STM: W9JUJ. ACC: K9TUS. TC: WD9ADB. SGL: WA9VQO. BM: KC9TA. PIO: K9DIY. SRC: N9WB. SHC: WA9FUD. OO/RFI: KJ9G. NMs: ITN-KD9DU; QIN-KJ9J; ICN-KA9CZD; IRN-KB9SU; VHF-W9PMT; IWN-KA9ERC.

Net	Freq.	Time (UTC)/Dy	QNI	QTC	QTR	Sess.
ITN	3910	1330/2130/2300	3081	330	2295	93
QIN	3656	1430/0000/0200	677	344	1910	93
ICN	3708	2315	107	41	749	31
IRN	3629	0000	178	83	891	31
IWN	3910	1310	1812	—	730	31
IWN VHF	Kokomo		1099	—	231	21
IWN VHF	Bloomington		1123	—	305	31

Hoosier VHF nets QNI 3955, QTC 201, QTR 4637, bulletins 27 for 19 nets. 9RN/cycle 4 QNI 376, QTC 541, QTR 1028 for 62 sessions. IN 98%; stns N9AEI W9EI N9HZ KJ9J W9JUJ W9MR WA9QCF WB9UYU K9WWJ W9XD. D9RN 363 messages in 1263 minutes. IN 100% stns W9JUJ W9PRD K9CGS W9XD. CAND 996 messages in 31 sess. D9RN 100% stns W9XD W9JUJ. Appts.: ORS WB9ZQE W9ZGC W9XD W9WEI WB9IJYU W9UEM WA9RDF WA9QVH WB9QZZ W9OZJ K9OUP W9KT W9KMY KG9K W9JUJ WA9JNC WD9JAA KJ9J W9IOH K9FHQ W9FC WD9EPU KC9DZ WD9DWD K9DIY KK9D WD9CIV WB9AWI WD9ART WB9AJY K9PS N9DYC. OOs WA9VQO KA9RBY WB9VPG; ECs W9ISO Bartholomew, N9AZC Crawford, WB9SBI Fayette, N9AWM Hamilton, K9FVN Henry, WB9TYJ Kay, WA9JWL Madison, KB9DE Marshall, KA9ENN Martin, W9UNI Perry, W9VJX Randolph, N9DER Washington, WD9BDZ Wabash. Silent Keys: W9GJG W9CGD W9IFV. I now know of three groups acting as VEs in Indiana: Fort Wayne, Jeffersonville and Lafayette. At this time information is very sketchy and hard to come by. If you are planning to give amateur exams, I think it only fair you keep people informed. If you have a TRS-80 and a Crown interface, N9HZ has some interesting programs for both RTTY and mailbox. The new Allen Co. Sheriff's Tactical Communications Team (ACSTCT) seems to be a fresh approach to emergency communications I wish them the best. I just do not like closed groups. Governor Robert D. Orr has signed a proclamation declaring the week of October 14-20 "Amateur Radio Appreciation Week." It is planned in cooperation with the SET exercise. Copies of the proclamation are available. I hope you use the proclamation in your public releases. Traffic: W9JUJ 1042, WB9UYU 213, WA9QCF 159, W9EI 123, W9PRD 75, KA9FFO 63, N9HZ 62, W9XD 62, N9AEI 48, WD9HII 47, W9UMH 45, KB9HH 41, W9UEM 41, W9JZV 34, WB9ZQE 30, N9DYC 29, KW9D 27, W9PMT 26, WD9GET 22, WD9DWD 18, K9BRF 13, N9DHX 13, WB9AWI 12, W9URS 12, K9KTB 10, WA9OKK 10, K9TKE 10, WD9CIV 9, K9FW 9, KK9N 8, W9RTH 8, W9ZGC 8, KQ9K 7, K9SBW 7, W9BDP 6, KK9D 6, WB9OZZ 6, K9PS 6, K9DIY 5, K9OUP 4, N9DOK 3, W9KMY 3, WD9ART 2, KA9LAU 2, W9UPI 2, KW9C 1, KD9DE 1, W9IOH 1.

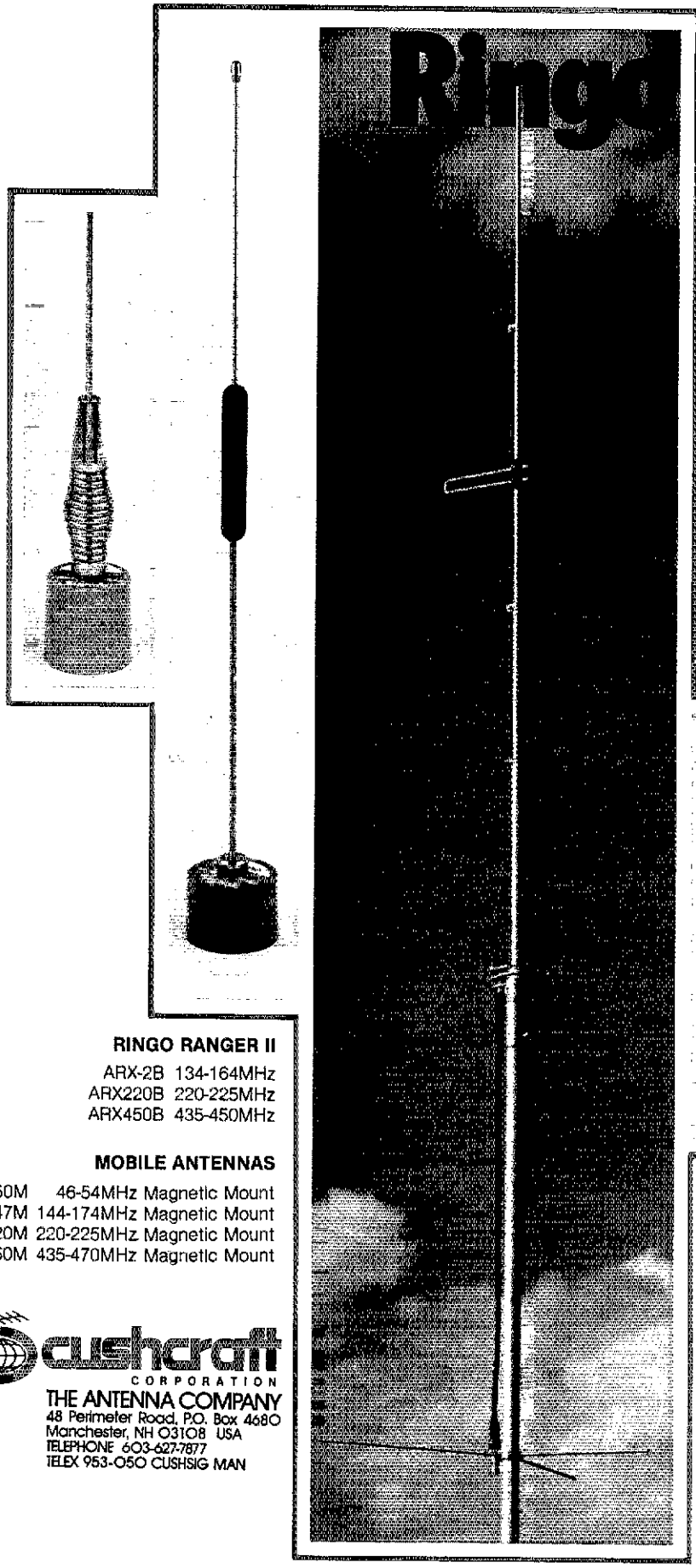
WISCONSIN: SM, Richard R. Regent, K9GDF — SEC: W9OAK. STM: K9UTQ. ACC: AE9K. BM: KA9CPA. OO/RFI: KA9IKR. PIO: K9ZZ. SGL: AG9V. TC: K9GDF. Thanks Roy, K9FHI, for your 11 years as SCM/SM, and best of good luck during retirement.

BWN	3984	6 A.M.	WD9IID	1191	1401-26
BEN	3985	Noon	WB9ESM	799	211-31
WSBN	3985	5:30 P.M.	WA9ZTY	738	227-31
WIN-E	3662	7 P.M.	WB9ICH	256	147-30
WIN-L	3662	10 P.M.	K9LGU	192	100-29
WSSN	3645	6:30 P.M.	KC9CJ	192	49-31
WNN	3723	6:00 P.M.	KA9OBP	136	33-30
XPO	3925	12:31 P.M.	WA9YVC	254	15

Welcome to new State Government Liaison, AG9V, who helps with antenna height and related legal problems. Thanks to former SGL WB9NYG. N9EEE new VHF/UHF Awards Manager, explains grid-squares. QCWA, Oct. 6th, Hwy. 18 Holiday Inn, Waukesha; visitors welcome. WVRA, Oct. 27th, 50th anniv. banquet and OT night, Wausau. Terrific weather, plans and food brought to 1353 South Milwaukee ARC swapfest. Congrats to WB9SMM and 75 ARES amateurs' success with 2nd Milwaukee Festival Parade. Now they're ready for Halloween Pumpkin Patrol. Red Cross meeting, with W9OAK WA9ZTY N9BYK and others, complements Barneveld communications. Portable repeater used for Baraboo Circus Parade. Oshkosh ARC has traffic program. West Allis RAC awarded AC9C 1984 QSO Party winner. W9KU and W9CBE finally met after 40 years of QSOs. N9AW visited W1AW and needs 3 QSLs for 5BDXCC. W9CXY and W9DND copied AFD msg. WD9DNQ now Extra. KA9CPA BPL. Sincere sympathy to friends of WB9QMX and XYL KA9AAH, both killed in auto accident. Traffic: KA9CPA 2422, KC9CJ 350, W9CXY 266, W9CBE 265, W9IEM 186, WA9WYS 172, K9GDF 142, W9YCV 141, K9FHI 137, W9UCL 120, WB9ICH 112, KA9BHL 105, WD9IID 102, KA9OPB 99, KA9RHN 96, WA9ZTY 86, AG9G 76, K9AKG 76, N9EDL 71, KA9FAB 70, WD9ESM 60, WD9FRI 58, K9UTQ 54, WD9JSW 42, K9LGU 39, KG9B 38, W9DND 33, N9BGE 31, WA9YVC 27, N9DCF 26, KZ9V 23, N9BCX 23, W9UW 23, W9IHW 21, KN9P 21, K9BED 20, KY9P 9, KA9NOT 8, KA9BHK 6. (June) W9CXY 216.

DAKOTA DIVISION

MINNESOTA: SM, Helen Haynes, WBØHOX — ASM: KCØT. SEC: KAØARP. STM: KDØCI. I'm very pleased to announce that the ARRL has appointed George Frederickson, Jr., KCØT to the post of Section Manager by proclamation effective Oct. 1. It will be a pleasure to work with him in his new position, and I know he will provide us excellent leadership as SM. He is well qualified having worked in various levels of leadership within the section. I'm sure I'm joined by many others in saying CONGRATULATIONS GEORGE! I also want to recognize our outgoing SM WBØHOX. We wish her the best in her endeavors and our hopes are that she will remain active from the Rochester area. I'm sure there will be some appointment changes coming, I hope to have a complete list of section appointments in the near future. Watch for it in this column. It was a pleasure to see many of you at the Iron Range Hamfest held July 8th. Don't forget the Waseca Area Hamfest is coming up in October, as well as the big SET weekend. It would be nice to see NTS filled to the rim and beyond with traffic during SET so let's go for it. Also coming up is the Minnesota QSO Party. Listen for details on



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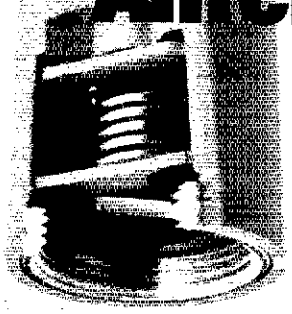

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MSPN. Net News: I'm encouraged by the increased activity on MSSN, both in QNI and QTC. All Novices are especially encouraged to check in. Our effort to combine all our SSB nets to one frequency has been partially successful. Effective Sept. 1, MSPN/N moves to 3929 kHz after having operated on 3945 kHz for many years. Piconet elected to remain on 3925 kHz. With our ARRL-sanctioned SSB traffic nets and the MNAMWXNT all on one frequency, we have decided to advise you that 3929 kHz will be the Minnesota Section Emergency Frequency. Remember this frequency in the event of a statewide emergency as it will be the center of our section traffic activity. If 75 meters is unworkable owing to conditions, etc., our alternate 40-meter frequency will be 7232. All ARES, EC and DEC people should especially take note of this! The MNAMWXNT starts up again on Sept. 1. Congrats to new Novice KAØTGW. He is a French citizen who came to the U.S. for a visit this summer. Congrats also to NØFKO who upgraded from General to Advanced. Remember: if you want to take an upgrade exam at FCC, be sure you contact them by Oct. 15 for the November exams. This will be the last time FCC will directly administer exams as the VEC program will be implemented. Finally in closing, we will have a guest columnist writing the August "Section News" (for November *QST*) as I will be taking a little vacation. More on that when I return with the September news. Net mgrs: MSN/1 WØEHI, MSN/2 KAØEPY, MSSN KAØODQ, MSPN/N KAØJUX, MSPN/E WDØBGS, MNAMWXNT WDØBAC, PICONET WØHZU.

Net	Freq.	Time	QNI	QTC	Sess.
MSN/1	3685	6:30P	301	127	31
MSN/2	3685	10:00P	261	63	31
MSSN	3710	6:00P	179	22	31
MSPN/N	3945	12:05P	571	87	31
MSPN/E	3929	5:30P	1052	141	31
MNAMWXNT	3929	6:15P	—	—	—
PICONET	3925	9:00A	2315	140	26

Traffic: KAØARP 387, WAØTFC 376, WØEHI 188, KAØEPY 181, WØHZU 164, KAØJUX 108, NØCLS 68, KAØODQ 59, KDØCI 50, KØCVD 41, WØDM 37, WDØBGS 32, KT9I 31, KCØT 28, KAØBFP 22, KØOGI 20, WØGRW 17, KTØR 17, KAØAJF 13, NØEXP 12, KN9U 10, KZØH 5, KQ9F 4. (June) WØHZU 80, KTØR 17.

NORTH DAKOTA: SM, Ron Roche, KØALL — The BARC operated from the Far West River Boat on the Missouri River during July. KNØA and KØALL flew to the Central States VHF Conference in Cedar Rapids. KØQQ has upgraded his OSCAR station with an FT-726R. KAØNUQ is now NØFPR. The Minot club will host next year's Peace Garden Hamfest. WØZCM was voted Ham of the Year at this year's affair. North Dakota's oldest net, the Goose River Net, is still active every Sunday at 9 A.M. on 1990. WØCDO does an excellent job of keeping interest alive. Goose River 58 QNI, 2 QTC. DATA Net 141 QNI, 4 QTC.

DELTA DIVISION

ARKANSAS: SM, Joel M. Harrison, WB5IGF — SEC: N5BPU. STM: AE5L. TC: W5FD. ACC: AD5M. PIO: K5DW. SGL: W5LCI. Repeater Coordinator: WB5FDP. Don't forget that OZK CW Net has changed frequency to 3745 kHz effective Sept. Reports were slim this month. Remember that I cannot put your activity or news in this article unless I hear from you. Let me know if some of your would be interested in a state-wide computer net to pass along information or helpful hints. I had the pleasure of visiting the ARRL Hq. in August and was very impressed with things. I also had a very nice visit with Jim Clary, WB9IHH, and Arline Bender, WA1VMC. I highly recommend a visit if you are going to be in that area. Traffic: W5TUM 98, WD5FCE 54, W5OK 24, W5UAU 20, WB5IGF 18, WB5GWU 16, W5MYZ 14.

LOUISIANA: SM, John Wondergem, K5KR — SEC: KD5SL. Delta DX Assn. election: K5PP, pres.; WB5SSD, v.p.; KV5E, secy.; WA5YFQ, treas. An outstanding hamfest at Shreveport. Lots of dealers and fleas. W5AU received the Golden Key Award for service to the Shreveport Amateur Radio community. KD5QS, who coordinated the hamfest, received the Golden Mike Award for service to the Shreveport ARA. There wasn't a dry eye at the Banquet as deceased Mike Lewis, KA5GJX, and deceased Frank Kincaid, WB5NVE, both received tribute for their tireless and unselfish service to Amateur Radio. If all volunteer FCC exams are administered as well as evidenced at Shreveport, we have no worries. Congrats to Ralph Rusca who joined the DXCC Honor Roll. The Louisiana Amateur Radio Exhibit at the World Fair has a new look with the Marconi exhibit being replaced by an Amateur Radio display of historical equipment borrowed from the ARRL Museum. There is still plenty of time to work the World Fair station K5WF and receive a special event QSL card. Be sure to send a business size SASE with your QSL. Traffic: W5GHP 505, K5TL 117, WB5LBR 66, KE5PP 56, N5JM 34, N5BFV 33, N5ANH 23, KA5LMZ 18.

MISSISSIPPI: SM, Tom Hammack, W4WLF — SEC: N5DDV. STM: KB5W. VHF Coord: NF5Q. With exams now available in the field, we are all obligated to protect the security of the system. Plans are to coordinate the test sessions within the state in order that they will be available on a timely basis. Let's all do our share to make the program a success. Congrats to NA5Y who has a new grandson. N5DOK KA5ROA & KK5Z recently was heard marine mobile on the Ms. K5RU has new tower up. Rptrs now on RTTY Gulfport 147.075 (+600), Tupelo 147.39 (+600). KA4MEI now N5HBB. K5DMD moved to Purvis. Good to hear KD5P back on air after stay in the hospital. CAND (W5KLV) 31 sess. QTC 996. MS rep 100% DRN5 (WB5YDD) 62 sess., QTC 802, MS rep 100%. MTN (K5OAF) 31 sess., QNI 117, QTC 31. MMN (WB5RMW) 27 sess., QNI 382, QTC 10. GCSSB (W5JHS) (June) 30 Sess. QNI 876, QTC 13. MSBN (KW5T) 31 sess., QNI 2066, QTC 52. Traffic: N5AMK 546, K5OAF 331, KT5Z 98, WD5JXT 52, KW5T 28, N5CCU 12.

TENNESSEE: SM, John C. Brown, NQ4Q — ASM & ACC: WA4GLS, OO/RFI: W9FZW, PIO: WA4GZQ, SGL: WA4GZZ. STM: NG4J. TC: W4HHK. Those of you that attended the Crossville hamfest had a chance to see two fine people as well as two very active amateurs win the selection s the Tennessee Section Amateur of the Year award. It also seems that they were a unanimous choice through the section. It is with much pleasure that we congratulate the very fine and active couple in real life of WA4FMQ and WA4FMR. Amateur Radio in Tennessee is the better in having them in their number. This selection was the handiwork of the Tennessee Council of Amateur Radio Clubs. It is suggested that all the Clubs in Tennessee become an active and participating member of the Council. NG4J is the present S/T of the Council. The Sunday night net is conducted as the forum for the free exchange of club information. This Sunday night meeting is used to pass along important information to all clubs. Participation in the net is not limited to just council members. At least one member of each club in the section should meet the

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net to bring information to the net and obtain new information for the clubs on a timely basis. The section traffic for the period was slow as could be expected for the season. The CW net Honor Roll had two recipients this time, K9IMI and W4ZJY. Good work, fellows. Net summaries are: phone nets sess. 82, QNI 3526, QTC 158; VHF nets sess. 93, QNI 2142, QTC 493; CW nets sess. 51, QNI 223, QTC 69; RTTY net sess. 26, QNI 95, QTC 6. Looks like the RTTY net is starting to roll. Pass the word along to other possible participants. We need them and besides you might really like it. Fine work with station activity. Some new calls this time and some are missing. Traffic: W9FZW 207, KA4RSC 178, K4WWQ 93, W4DDK 59, W4ZJY 57, W4MRD 30, WV4E 30, W4PFP 22, W4TYV 19, KE4LS 15, K4JGW 14, K4WOP 12, NV4Z 12, WB4YPO 11, NN4S 10, WD4GYT 8, W4PSN 8, W4EWR 7, WA4HKU 7, WA4GZQ 6, KB4GLB 2. (June) W4DDK 27, KE4LS 16. (May) W4DDK 91.

GREAT LAKES DIVISION

KENTUCKY: SM, Ann Jackson, KA4GFU — SEC: WA4JAV. STM: KA4BCM. OO/RFI: N4GD. BM: WA4AGH. PIO: K4TAJ.

MKPN	3959	1230Z	KA4SAA	1114	102
KTN	3959	2300Z	KA4SKV	883	69
KYN	3600	0230Z	KZ8Q	112	57
KNTN	3727	2300Z	KB4QZ	274	66

BARES 103/19, CARN 130/16, KYPON 52/10, NKARC 38/1, PAWN 47/0, TSTMN 536/43, WTEN 30/2, 3ARES 40/2, 4ARES 40/3, 7ARES 34/0, 11ARES 35/8. SEC relocated to 2021 Mark Ave., Lexington 40511. WB4YXW new DEC 4ARES and net manager in Bowling Green. Seventeen Lexington hams provided comms for 10k meber run on July 4. Owensboro hams coordinated many events during their summer festival. NU4O of Livermore scored over 1 million points portable CW in the County Hunters Contest operating from 17 KY counties, ILL and IN. Last year's winner had a little over 100,000 points. Watch for the results! Excuse us, Joe, the call W4RUZ in August *QST* was of course Covington's W4RHZ. Traffic: WA4JTE 285, KA4SAA 96, KA4BCM 76, WD4IYI 57, KB4QZ 53, WB4ZDU 45, KA4SKV 44, WD4BSC 33, WD4IXS 24, KA4MTX 24, WA4AVV 19, WD4CJQ 18, WA4SWF 16, WA4AGH 12, WD4CQF 11, K4ZWB 9, WK4D 8, K4MHL 8, W4PKX 7, KA4YIV 7, WA4YPQ 6, WB4AUN 5, KA4GBZ 5, N4HZT 5, K4HOE 1, WD4IYH 1.

MICHIGAN: SM, James R. Seeley, WB8MTD — ASM: WA8DHB. SEC: WA8EFK. STM: WD8RHU. ACC: K8SB. PIO: KC8K. SGL: N8CNY. TC: WB8BGY. BM: KZ8V.

Net	Freq.	Time/Day	QNI	Tfc	Sess.	Mgr.
MITN*	3953	1900 dy	576	233	31	WD8EIB
QMN*	3663	1800 dy**	733	211	62	W8UE
MNN*	3722	1730 dy**	292	82	61	KA8NCR
GLETN	3932	2100 dy	782	82	31	WB8AXI
UPN*	3922	1700 dy	642	78	36	WA8DHB
MACS*	3953	1100 dy**	398	60	31	K8LNE
VHF nets	19 reports		1852	22	97	W8CUP

*NTS nets. Times local. **QMN late net, 2200; MNN late net, 2000; MACS Sn, 1300. ARES net Sn, 3932, 1730. ARRL info net, Sn, 3953, 1500. Traffic Workshop, Sn, 3953, 1600. 3932 is MI HF emer. freq. Silent Keys with deep regret: WD8EBP W8IIA K8RFM. New ORS: K8HAP. The trek north this year all the way to Houghton for the U.P. Hamfest was, as always, an enjoyable experience. U.P. Net "Ham of the Year" award went to WB8SYA. WA8DHB graciously accepted the annual railroading into the NM job for the U.P. Net, and the announcement of her official appointment as ASM for the U.P. was made. The hamfest itself was well planned and nicely executed. Having Michigan Tech's W8YY open for visitors was a neat touch, and the banquet was excellent. Manistique, you have taken on a real challenge for next year! K8OCP has taken on the job of asst. mgr. for the MACS net. K8LNE continues as manager, K8ZJU as secretary. New manager for GLETN is WB8AXI. WD8AUL, CMARA pres., reports that they did a "red letter job" on the Midland Swap. Gee, it looked to me like they were making money. . . (Joke) In the same report we see the new Farwell repeater up and running on 147.81/21 and getting high marks for performance and service. FB, gang! I am extremely pleased with the way the MI gang has launched into the volunteer examination program, especially in light of all the complexity and confusion. With spirit such as has been shown in this area, the future of Amateur Radio is very much assured. Traffic: W8QHB 350, KA8NCR 193, AF8V 184, W8UE 176, K9KQJ 132, WD8RHU 106, KA8QVH 85, WD8OUO 79, WB8MTD 78, K8GXV 60, WD8EIB 59, WB8YDZ 55, WA8DHB 54, WA6YMH 53, KA8OID 52, K8UPE 45, W7LVB 38, W8CUP 33, K8HAP 32, WD8KQC 32, W8IHX 31, KI8Q 31, N8CNY 28, W8YIQ 26, KA8POH 22, WB8TTA 21, K8ZJU 21, WD8MJB 18, W8YZ 18, KS8P 15, W8VIZ 14, N8EBN 12, WB8SYA 11, WB8BHP 9, W8MOF 9, WB8YRY 8, N8CQA 4, WB8ITT 3, W8SCW 3, W8URM 3. (June) K8ZJU 28.

OHIO: SM, Allan L. Severson, AB8P — SEC: K8AN. STM: K8OZ. ACC: K8US. PIO & SGL: N8CVK. TC: KB8MU.

Net	QNI	QTC	Sess.	Time (local)	Freq.
BN	272	224	62	6:45/10 P.M.	3.577
BNR	278	94	31	6:00 P.M.	3.605
BSSN	387	195	56	9:45 A.M./7:15 P.M.	3.927
ONN	96	24	25	6:30 P.M.	3.708
OSN	311	114	31	6:10 P.M.	3.577
OSSBN	1894	728	93	10:30 A.M., 4:15 & 6:45 P.M.	3.9725
OSSN	160	55	31	6:45 A.M.	3.577
O6MN	294	13	31	9:00 P.M.	50.160

I've noticed much interest in the new volunteer examination system in our section. A surprising number of amateurs are already qualified with DARA or are awaiting League qualifications procedures. Many tests have already been given and many more are scheduled. Most gratifying to me is the high motivational level of the people involved. Folks, we won't fail to handle this new important responsibility properly! The number of public service activities appears to be up substantially this summer after seeming to wane last year. Many clubs and individuals were involved with three or more activities a day over the recent holiday weekends. Good going, folks! Let's all remember how necessary public service is to our image. (This might seem uncomfortably like a "Madison Avenue" approach, but if WE don't "sell" Amateur Radio and our "right" to our frequencies, who will?) As in previous summers, I've had a great time at the various hamfests, club functions, and meetings, talking to so many of you. This is the part of the SM function that I will miss most when my term is over. Club elections: Milford ARC W8SDL, pres.; N8FFQ, v.p., WB8LXB WD8MCH, secys.; WB8RRR, treas. Appointments, to EC: NF8N, Licking Co.; KA8EEH, Wyandot Co.; WB8BWY, Trumbull Co. Congrats all!

Local Nets	QNI	QTC	Sess.
ALERT	75	6	4
BRTN	261	132	31
COTN	93	30	8

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GROUND WAVE
HARMONIC INTERFERENCE
SWR READINGS
SIGNALS AND EMISSIONS
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MASER	108	1	4
Medina Co.	354	40	31
NEON	79	29	20
RARA	47	---	4
TSRAC	1102	74	38
VWCEN	38	1	4
Wayne Co.	185	34	31

Traffic: WD8MIO 757, WD8KFN 395, W8PMJ 291, K8OZ 261, K8JDI 191, W8BO 184, N8FCQ 166, AB8P 162, W8QZK 159, WB8DMF 154, W8EK 146, KA8GJV 133, N8AKS 119, WB8JGW 105, N8AEH 100, WA8HGH 100, WA8GMT 91, KF8J 81, W8SKP 81, KA8CGF 78, KD8KY 78, KA8KHS 74, K8TVG 74, WB8KWD 70, W8SZU 68, WA8SSJ 59, NE8X 58, N8EVC 51, K8ND 46, KV8Q 46, WB8MEK 40, K8VOY 39, WD8KBW 38, K8AN 36, N8FPH 28, WB8HHZ 25, W8CXM 24, KA8ICB 24, WD8RGS 24, WB8MRL 23, W8BHL 22, WD8IKC 22, K8DXZ 21, WB8HMI 20, WA8HED 17, K3RC 17, K8CMR 15, WA8DYX 15, WD8RGP 15, K8NJQ 14, WB8NHV 11, NC8Q 11, K8CKY 9, N8CW 8, K8BXT 7, WD9HDZ 7, WD8LLD 7, W8OQL 7, N8AJU 6, WA8ETW 6, WD8EKI 5, WD8OYK 5, W8RG 5, N8CGM 4, N8CJS 4, WB8SRC 4, W8LZE 2. (June) N8CJS 15, NC8Q 8, WB8NTR 5.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK — SEC: AK2E. STM: WB2MCO. SGL: KB2HQ. ACC & TC: N2BFG. BM: WB2EAG. TC: KC2ZO. ASM: K2ZM. Newsletter Editor WA8MAZ. Net Reports: AESN: QNI 75, QTC 1; ATEN: QNI 20, QTC 1; EPN: QNI 122, QTC 67; ESS: QNI 417, QTC 65; CDN: QNI 659, QTC 59; SDN: QNI 339, QTC 85; NYPON: QNI 627, QTC 370; NYS/M: QNI 378, QTC 155; NYS/E: QNI 243, QTC 197; NYS/L: QNI 401, QTC 251. CLUB NEWS: very little this month - most are taking summer recess. Albany ARA will be holding VE exams on 12 October in conjunction with Hamfest meeting. They will be among first in country to conduct exams at other than conventions. Don't forget, with fall, more public service activities. Get out and help your local club! Congrats to KC2ZO appointed as TC for ENY and K2ZM appointed as Asst. SM for ENY. Also WA2JWL DEC for central ENY area. TNX to AA2Y for job well done. Nice to see traffic handlers at W2MTA's picnic. Don't forget SET in October. Contact AK2E for information. Congrats to N2BFG on his wedding to Susan Shedd. Best of luck for many years of happiness! Please - if you want to see your call in QST, get your monthly activity report into WB2MCO on time, by the fifth of the month! July PSHR: KC2TF KC2ZO WB2VUK WB2MCO K2ZVI W2PKY KA2MYJ W2BIW WB2KCR AK2E K2ZM WA8MAZ KA2OPG N2EQM. Traffic: KC2TF 265, WA2JWL 191, WB2VUK 152, KC2ZO 150, W2PKY 138, K2ZM 98, WB2KCR 96, WB2MCO 82, K2ZVI 82, W2BIW 72, KA2MYJ 68, WA8MAZ 48, AA2Y 45, WA2JBO 44, AK2E 28, WA2CJY 19, N2EQM 19, N2AWI 16, KA2TOC 13, N2BFG 12, WA2YBM 11, N2CWV 6.

NEW YORK CITY — LONG ISLAND: SM, John H. Smale, K2IZ — SEC: WA2SUB. ACC: WB2IAP. OO/RFI: NB2T. TC: W2JUP. PIO: W2IYX. The following are traffic nets in and around the section:

NLI CW*	3630	1900/2200	N2AKZ
NCVHF	6.145/745	1930 M-F	K2MT
SCVHF	4.77/5.37	2030 M-F	W2GZD
BAVHF	6.07/67	2000 M-F	WB2BNA
ESS	3590	1800	W2WSS
NYS/M	3677	1000	WB2EAG
NYS	3677	1900/2200	WB2EAG

*Denotes section net, all times are local, please try and help out by checking in whenever possible. If you are an Advanced or Extra class operatpr, have weekends free, and would like to give some time towards being a "Volunteer Examiner", send an **SASE** to Metroplex, P.O. Box 237, Leonia, NJ 07603. Congratulations to N2AKZ on receiving the "Bill Shaw WB2VEJ Memorial Award" for 1983, this award is made in recognition of outstanding service by a station/operator who provided significant and dependable service to the 2nd region during the year. Welcome to Tu-Boro ARC which has been officially designated a Special Service Club. WB2BNA reports that the Big Apple VHF traffic net observed its 5th anniv. in June. WB2IAP and K2IZ both enjoyed a week's rest and relaxation with their XYLs on the "Oceanic" with stops in Bermuda and the Bahamas. Len, KB2HQ, Principal of Seaside School, P.S. 225 has retired. Wantagh RC honored WB2DPP, Hank, for his many years of service to Ham Radio. N2BGP, EC for the Bronx has a new Asst. EC: NB2D. N2BGP also flew to Phoenix, AZ to see his granddaughter graduate from H.S. first in a class of 600. N2EUT joins WB2FXN and KA2MUM on 2 mtr SSB. KA2ITS has written a program for the Atari 400/800 to send out random groupings of letters and then asks you to name them in the order sent, contact him or K2RPZ for a copy. Radio Central ARC received a nice letter of thanks from Mather Memorial Hosp. for the service provided by their members during the cut over of the communications system. Please keep track of the expiration date of your license, nobody likes the unpleasant surprise of finding out that your license has expired. Traffic: K2YQK 132, K2GCE 61, W2GKZ 56, N2BQD 36, N2BGP 26, WB2BNA 5.

NORTHERN NEW JERSEY: SM, Robert Neukomm, KB2WI — SEC: WB2VUF. STM: W2XD. BM: N2BOP. ROC: W2CC. SGL: W2KB. PIO: WB2NQV. TC: AD7I. ACC: KY2S. NMs: W2CC KB2HM WB2RMJ WB2ANK WB2IQJ KY2D N2XJ W2PSU.

Net	Freq.	Time	Sess.	QNI	QSP
NJM	3695	1000 Dy	31	159	48
NJPN	3950	1800 Dy	36	380	99
		0900 Sn			
NJSN	3735	1830 Dy	31	241	83
NJN/E	3695	1900 Dy	31	251	120
NJN/L	3695	2200 Dy	31	186	129
TCETN	147.855/255	1930 Dy	27	117	39
OBTTN	147.72/12	2000 Dy	---	---	---
NJVN	49/49	2230 Dy	31	251	106

News has been received from only three clubs this month. *Neptune* reports that Past President of QCWA International, Frank A. Gunther, W2ALS gave a slide presentation at the Middletown Howard Johnson's on the very earliest beginning of commercial two-way radio mobile design and the installation of the first police mobile two-way radio system. On 21 June the American Teleconference Net was being aired via the OMARC repeater. Cliff, WB2YZJ, reported that VE2CV led a very informative discussion on Multiband, Broadband and Frequency Independent Antennas. Ramapo Mountain ARC held a very successful "flea market." BARA reports that Taizo Arakawa, N2ATT/JA3AER, has received a citation from the Radio Club of America which reads: "For outstanding accomplishments in bettering relationships between American and Japanese Amateur Radio operators!" Elected to the grade of "Fellow," Taizo will be presented with a plaque at the club's 75th anniversary dinner in November. Calling all Amateur Radio operators: In the

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Find an easy chair. Turn on your *Bearcat* 20/20 and you're in an airplane cockpit. Listening to all the air-to-ground conversations. Maybe you'll pick up an exciting search and rescue mission on the Coast Guard channel. In a flash, you're back on the ground listening as news crews report a fast breaking story. Or hearing police and fire calls in your own neighborhood, in plenty of time so you can take precautions. You can even hear ham radio transmission, business phone calls and government intelligence agencies. Without leaving your easy chair. Because you've got a *Bearcat* 20/20 right beside it.

The *Bearcat* 20/20 monitors 40 frequencies from 7 bands, including aircraft. A two-position switch, located on the front panel, allows monitoring of 20 channels at a time.

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List price $349.95/CE price **$209.00**

6-Band, 18 Channel • Crystalless • AC/DC

Frequency range 32-50, 144-174, 421-512 MHz.

The *Bearcat* 210XL scanning radio is the second generation scanner that replaces the popular *Bearcat* 210 and 211. It has almost twice the scanning capacity of the *Bearcat* 210 with 18 channels plus dual scanning speeds and a bright green fluorescent display. Automatic search finds new frequencies. Features scan delay, single antenna, patented track tuning and more.

Bearcat® 260-E

List price $399.95/CE price **$249.00**

8-Band, 16 Channel • Priority • AC/DC

Frequency range 30-50, 138-174, 406-512 MHz.

Keep up with police and fire calls, ham radio operators and other transmission while you're on the road with a *Bearcat* 260 scanner. Designed with police and fire department cooperation, its unique, practical shape and special two-position mounting bracket makes hump mounted or under dash installation possible in any vehicle. The *Bearcat* 260 is so ruggedly built for mobile use that it meets military standard 810c, curve y for vibration rating. Incorporated in its rugged, all metal case is a specially positioned speaker delivering 3 watts of crisp, clear audio.

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NEW! Bearcat® 180-E

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Frequency range: 30-50, 138-174, 406-512 MHz.

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The *Bearcat* 100 produces audio power output of 300 milliwatts, is track-tuned and has selectivity of better than 50 dB down and sensitivity of 0.6 microvolts on VHF and 1.0 microvolts on UHF. Power consumption is kept extremely low by using a liquid crystal display and exclusive low power integrated circuits.

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Frequency range 10 kHz to 30 MHz.

The *Bearcat* DX1000 shortwave radio makes tuning in London as easy as dialing a phone. It features PLL synthesized accuracy, two time zone 24-hour digital quartz clock and a built-in timer to wake you to your favorite shortwave station. It can be programmed to activate peripheral equipment like a tape recorder to record up to five different broadcasts, any frequency, any mode, while you are asleep or at work. It will receive AM, LSB, USB, CW and FM broadcasts.

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The *Uniden* PC22 is a 40 channel AM remote mobile CB radio. It's the answer for today's smaller cars which don't always provide adequate space for mounting. Since all the controls are on the microphone, you can stash the "guts" in the trunk. The microphone has up/down channel selector, digital display, TX/RX indicator and external speaker jack. Dimensions: 5¾" W x 7⅞" D x 1½" H. 13.8 VDC, positive or negative ground.

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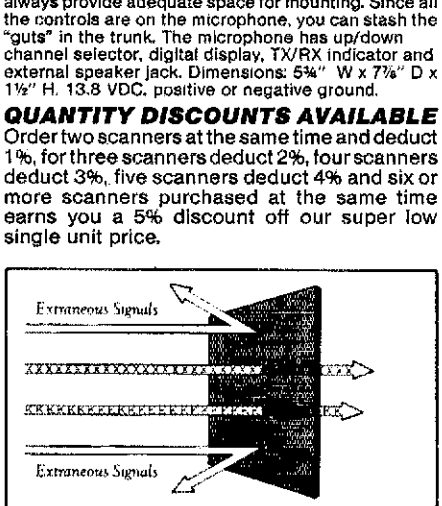

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The *Uniden* PC33 boasts a super-compact case and front-panel mike connector to fit comfortably in today's smaller cars. *Controls:* Power & Volume, Squelch; *Switches:* ANL. Other features of the PC33 include Graduated LED "S"/RF Meter, Digital channel indicator. Dimensions: 6" W x 6" D x 1⅞" H. ±13.8 VDC.

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The full featured *Uniden* PC55 front-panel mike connector makes installation easier when space is a factor. It has ANL, PA-CB, Channel 9 and RF Gain switches. LED "S"/RF meter, TX lite, PA & external speaker jacks. Dimensions: 6" W x 6" D x 1⅞" H. ±13.8 VDC.

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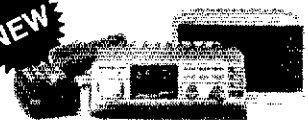

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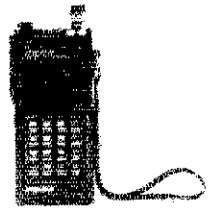

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RS-12M	RS-12A w/switchable volt and Amp meter		111.95	85.9
RS-20A	16	20	115.95	89.9
RS-20M	RS-20A w/switchable volt and Amp meter		137.95	109.9
RS-35A	25	35	174.95	139.9
RS-35M	RS-35A w/switchable volt and Amp meter		194.95	159.9
RS-50A	37	50	253.95	199.9
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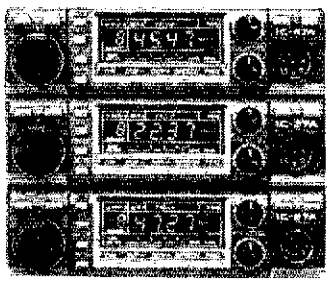

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Northern New Jersey section it is vital that we have more "Auxiliary Official Observers." Anyone interested, please contact KB2WI or W2CC for further information about joining this very valuable service. We are also in further need of additional Extra Class and Advanced Class amateurs for the "volunteer examiners" program. Please contact Jim Greer, KK2U, for information on joining this program. Traffic: KB2HM 526, W2VY 207, AG2R 180, N2XJ 145, K2VX 85, W2ZEP 58, WB2ANK/T 49, W2RRX 46, W2XD 36, WB2GHN 34, KA2SPH 32, N2DZZ 29, W2UH 29, W2CC 23, KA2OIW 8.

MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, KØCY — SEC: WA4VWV, STM: KAØX. PIO: KBØZP. BM: KØIR. SGL: AKØQ. ACC: WBØQAM. TC: KAØDAS.

Net	Freq.	Time	Day	QNI	QTC	Sess.
75-Mtr Phone	3970	1830/2330	M-S	1878	454	52
TLCN (CW)	3560	0030/0400	Dy	393	354	62
ICN (CW)	3713	7 P.M.	Dy	111	65	19

Hope that all the ECs and NMs have figured their SET reports, we need 100% reports from all ECs and nets this year. If your area would like to host next year's Iowa State Convention, let me know. Things looking good for RTTY section net, MSO now in Council Bluffs and Denison; any interest? New EC, KAØBTE. New RTTY OBS KAØJRQ. VE program going strong with exams in Soo Cy and CR. If you are interested in Vol Monitoring program let me know. KEEP UP THE GREAT WORK!!! Outstanding participation in the RAGBRAI Message Relay. As a result the following is a record number of reports and traffic count for IOWA (NICE JOB). Keep up those reports! Traffic: KAØJQG 576, WAØAUX 508, KØCY 501, NØSM 450, WA4VWV 430, NØBKB 333, WBØIGI 322, KØGP 321, WØSS 222, KAØJRG 200, WDØENR 161, WDØDDK 144, NØCWW 135, AEØR/KAØX 126, KØJGH 121, KAØADF 116, NØAHP 113, WØYLS 110, KAØJZF 102, WØAK 98, NCØR 94, WØLFF 88, KDØBG 75, KAØBTE 75, KAØGOA 72, W4JL 66, NØFIB 57, WBØJFF 54, WBØBHF 50, NEØP 47, WØHTP 45, KIØQ 40, KDØPY 37, KCØI 33, KCØXL 32, KØBRE 30, KAØQAH 29, KØTFT 25, KØKQJ 25, WBØAVW 23, WBØSTB 22, WØBW 21, KØEVC 18, KCØSC 16, WØFQ 14, KAØJPN 10, NØFNP 10, KAØNSW 8, NØEFG 8, WDØFOY 8, WDØELK 8, WBØSWQ 7, WØZTP 4, KAØGSC 4, KØVJO 2.

KANSAS: SM, Robert M. Summers, KØBXF — First of all — WBØZHH is out of the hospital. Good news always first! The next is not so bad, except I didn't get to go. WØPB fresh back from a trip to Western Europe. Harry visited the ITU station 4U1ITU at Geneva. The Bad News, the club station trustee was on his day off and no operation. Can you beat that? It's not too often we get to welcome back to the fold one of our lost — Kevin Cook, harmonic of WØOYH, is a ZERO again, NØFNL. WØKL reporting the ARES membership status has dropped a point or two. Seems like maybeeeee our ECs need to start recruiting again. I KNOW THERE ARE NEW HAMS IN OUR MIDST. KDØJM, our PIO, hopes to have out the first club report of activities in the state by Sept. If your club editor has not been in contact with Tim yet, make contact with the SPUR!!! Newcomer to the traffic crew is NBØZ from Atchison. We welcome you. It's nice to hear from the NE corner of the state. WØMYM, our net manager for the Slow Speed net, has extended the invitation to all. Join the QKS-SS net and help build CW activity. It's on MWF 3735 kHz @ 7:30 P.M. Net activity: KSBN QNI 952, QTC 130; KPN 410/16; KWN 714/544; KMWN 637/547; CSTN 1848/92; QKS 320/128; QKS-SS 42/12. Traffic: WØFRC 381, WØFIR 316, WØKL 217, ACØE 211, KSØU 142, WAØLBB 130, WØHI 128, WBØZEN 109, WØOYH 96, WØFDJ 86, KDØJM 67, KØBXF 33, KØGSC 26, NBØZ 19, WØQMT 18, WØCHJ 14, WØMYM 11, WØRBO 10, WAØOWH 4, KAØE 2. (June) KAØE 4.

MISSOURI: SM, Ben Smith, KØPCK — ACC/PIO: KT5Y. SEC: WBØKUW. STM: KØSI. TC: K4CHS. SGL: KA6CSJ. OO/RFI Coord.: WBØRHK. KØBVB has been appointed C.D. Director of Saline Co. Congrats to the PHD ARA, Inc. on being officially designated a Special Service Club. I am sure we have many more clubs in the Missouri Section that could qualify for this recognition. Contact ACC KT5Y, for more information. WBØROQ received PIA Field Appointment this month. Newly elected club officers of the Jefferson Co. ARC are; WBØTOK, pres.; KAØRIN, v.p.; WDØFWP, treas.; KGØJ WBØWRK KAØDCQ KØQPL KA6NBL W0KSR, directors. Eighty-five amateurs from Missouri, Kansas, Illinois and Indiana along with officals from the Missouri State Highway Patrol and Missouri State Emergency Preparedness Agency attended an earthquake preparedness conference at Jefferson City on June 30. The amateurs of Missouri have been asked to participate in earthquake planning and assisting in communications. KA6CSJ, Missouri SGL, was coordinator of the conference. Our sympathy to the families and friends of the following Silent Keys: AKØH WØTT WDØCTJ WØUAC.

Net	Sess.	QNI	QTC	Mgr.
MON	62	375	219	KØSI
MOSSB	31	614	117	KT5Y
MEOW	31	490	24	KØDSQ
MTTN	23	136	23	KAØPGN
HBN	21	309	21	KØDSQ
PHD	5	121	11	WAØKUH
RRBN	27	258	8	KAØBKR
PTN	13	43	6	WBØROQ
LOZFM	4	103	2	WØRTL
JCCC	3	30	1	WØORI
CMEN	5	79	0	KØPCK
SARN	5	60	0	WØENW
ACAN	4	40	0	NØEHU
LOZCW	4	24	0	WØRTL
IFN	4	24	0	WØKNF

Traffic: KT5Y 260, KØSI 211, KØPCK 160, WØBMA 148, NDØN 137, NØEVC 136, AIØO 84, KØBM 78, KCØAS 69, KØDSQ 44, WØOUD 43, K2ONP 35, WAØYJX 31, WBØHOP 30, KØORB 30, KYØU 18, WAØKUH 8, WAØHDQ 4, K9CU 2.

NEBRASKA: SM, Vern Wirka, WBØGQM — Packet Radio continues to expand in Nebraska. Congrats to NFØN and WBØIBT for their efforts at the Sioux City Rivercade demonstration booth. 107 pieces of traffic were originated and sent via packet to NFØN for relay to NTS, which qualified him for BPL. KCØDA of Albion is the new Affiliated Club Coordinator for the section. The newest ARRL affiliated club is the "Trails End ARC of Ogallala. Welcome to the ARRL and the Nebraska section. KCØXT of Omaha has resigned as Public Information Officer owing to demands on his time. Thanks to KCØXT for all your efforts on behalf of Amateur Radio in the Nebraska section. Please send all of your reports to SM Vern Wirka, WBØGQM, RR 81, Capehart Road, Papillion 68133. Traffic: WBØTED 244, KØDKM 222, NFØN 217, WØKK 160, KØGND 28, KØIXY 22, KAØBWM 17, WDØBOX 6, WAØBOK 4.

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A3219 2m Boomer	89.95
410B 10-element 432-435 MHz	54.95
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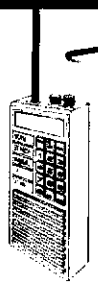

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CK-2 Contest Keyer	149.95
KT-2 Trainer/Keyer	114.95
KT-3 Trainer/Keyer	114.95

TELEX HEADPHONES

Procom 250 Headset/Mic	99.95
Procom 350 Headset/Mic	84.95
C1210 Headphones	27.50
C1320 Headphones	38.95

BENJAMIN MICHAEL CLOCKS

173B 24-hour Digital	30.95
173C 24-hour Digital	24.95
963A 10" 24-hour Wall Clock	29.95
973A 12" 24-hour Wall Clock	38.95

CABLE BY SAXTON

RG213 Mil Spec	29¢/ft
RG8/U Foam 95% Shield	25¢/ft
8-wire Rotor 2 #18, 6 #22	17¢/ft
Mini-8 95% Shield	13¢/ft

CABLEWAVE HARDLINE ... CALL

MFJ PRODUCTS

989 3 kW Antenna Tuner	285.95
962 1.5 kW Tuner switch/meter	185.95
949B 300 watt Deluxe Tuner	122.00
941D 300 watt Tuner switch/meter	89.95
940 300 watt Tuner switch/meter	68.95
202 Noise Bridge	48.95
752B Dual Tunable SSB/CW Filter	79.95
Keyers—401, 406, 408, 422, 482, 484	CALL

B & W

375 6-position Coax Switch	22.50
376 5-position Coax Switch	22.50
425 1 kW Low Pass Filter	25.50
593 3-position Coax Switch	24.75
595 6-position Coax Switch	28.95
AP-10 5-band Apartment Antenna	39.95
370-15 All-band Dipole Antenna	129.95

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CN-520/CN-540 Meters	59.95/69.95
CN-620B/CN-630 Meters	110.00/130.00
CN-720B 2kW HF Watt Meter	150.00
CNW-419 Antenna Tuner 500 W	174.95
CNW-518 Antenna Tuner 2.5 kW	279.95

ROTATORS

Alliance HD73	94.95
Hy-Gain CD45 II	138.95
Hy-Gain Ham IV	220.95
Hy-Gain Tailtwister T2X	265.95
Hy-Gain Heavy-duty 300	515.95
Kenpro KR500 Elevation Rotator	185.95

Buy any HF Beam and get an HD73 for $89.

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Virginia Orders and Quotes Call Toll Free: 800-572-4201

ege, inc.

K1EIC. BM: K3ZJJ. ACC: N1AZF. OO/RFI: KA1ML. TC: W1HAD. SGL: K1AH. PIO: WB8TDA.

Net	Freq.	Local Time	QTC	QNI	NM
CN	3640	1900/2200	265	325	K1EIR
CPN	3965	1800/1000 Sn	156	336	KA1BHT
NVTN	28/88	2130	31	246	WA1EMI
WCN	78/18	2030	92	411	WB1GXZ
RTN	13/73	2100	67	306	KA1JAN

Upgrades: Extra-WA1HFE. A BIG WELCOME to the section is extended to 9N1MM, who is visiting KB1BE. Happy Halloween, good luck to all of those groups participating in Goblin Patrols. The Simulated Emergency Test is coming. BE PREPARED. The new OO/Amateur Auxiliary program is in firm place under the direction of KA1ML. Amateurs of integrity and responsibility are encouraged to apply. 145.01 is the meeting spot for CT Packet Radio enthusiasts. AB1U K1HOP KE3Z K1ZZ and WA1LOU. The 145.29 machine in Killingly has an additional input frequency of 147.59 servicing the Old Saybrook area. The Tri-City ARC sponsored a special events station to draw attention to Highway Safety over the Labor Day weekend. KA1EX is a Silent Key. The expanded phone frequencies are now in effect. The last round of FCC Amateur Radio exams will be conducted in November. Be sure to apply on a 610 Form directly to the Field Office conducting the testing session. After this exam the VEC program will be in full effect. The Bethel Middle School ARC has changed its name to the Bethel Educational Amateur Radio Society (BEARS), in order to encourage student participation from all area schools and the community. The Bridgeport area office of the National Weather Service has issued a letter to all CP offices requesting assistance for WX spotters and ops to develop a SKYWARN system. This column was written by KA1KD. OBS Reports: KA1XG 14, KA1XZ 2, W1LUH 6, WA1HFE 5, Traffic: WB1GXZ 487, W1EFW 310, K1EIC 129, KA1JAN 121, WA1HFE 116, K1EIR 111, KA1GWE 90, K1UQE 79, KA1XG 77, KA1EGE 63, KA1BHT 55, N1BOW 48, K1AQE 31, KA1KD 24, WB1ESJ 9, W1CUH 8, W1QV 3.

EASTERN MASSACHUSETTS: SM, Rick Beebe, K1PAD — STM: KA1GBS. SEC: W1IAY. ASM: K9HI. ACC: K1AZE. BM & OO/RFI: WA4STO. TC: KA1IU. PIO: WA1IDA. SGL: K1BCN.

Net	Mgr.	Freq.	Time(loc)/Dy	QNI	QTC
EMRI	WA1LPM	3.658	1900/2200/Dy	364	389
EMRIPN	N1BGW	3.959	1730/Dy	318	296
EM2MN	KA1AMR	23/63	2000/Dy	523	231
NEEPN	K1BZD	3.945	0830/Sn	69	6
HHTN	WB1CMQ	04/64	2230/Dy	459	326
EMRISS	N1AJJ	3.715	2030/Dy	254	106
CI2MN	N1BYS	045/645	1930/Dy	194	64

I hope you all saw the smiling face of our OO Coordinator (WA4STO) in the Aug issue of *QST*. Beyond the smiling face I hope that you took time to read the article. The Amateur Auxilary is the second park of the Goldwater Bill passed a few years ago (the first part is the Volunteer Examining Program of course). I hope this enhanced program will be of interest to some of you because it is an opportunity for us to increase our participation in getting the really bad offenders of the air. Please give it some thought. By the time you read this, the Simulated Emergency Test will be upon us. Contact our Emergency Coordinator or Net Manager for details. Also the STM or SEC listed above can help if needed. See you on during the drill. Don't forget to send me a radiogram if you participate. Congrats to N1AJJ and WB1CMQ as new net managers, ant tnx to N1BHH and KA1MI for your service in the past. WA1ORP and AI1W report that the Falmouth club had a very successful exhibit at the Barnstable Co. Fair with 12 volunteers obtained by using a telephone tree. Over 100 messages were originated also. Whitman Club is preparing for their annual Plymoth Plantation Exhibit now in (I think) its 5th year. Chelmsford club held a Constructor's Competition with prizes for the best homebrew gear in four classes. The Billerica club had its annual summer bash at the Lowell Sportsman's Club their Field Day site. Cape Ann club is holding informal clubhouse coffee meetings on Sunday mornings. Massasoit member N1COP along with other members provided communications for parade in Halifax. Traffic: KA1GBS 976, KA1EXJ 421, W1AF 413, N1BGW 235, KA1AMR 180, N1AJJ 178, KA1EPO 175, WA1TBY 166, K1CB 137, N1BHH 122, N1ER 118, WA4STO 112, K1ABO 110, K1GRP 90, W1CE 79, WA1DXT 76, WA1SNH 69, N1BYS 61, WA1LPM 61, WA1FNM 44, KA1KVI 34, K1BZD 18, N1CKN 12, KI1I 10, W1ZHC 10, KA1EID 9, K1LCQ 6, W1MJ 5, K1OGF 5.

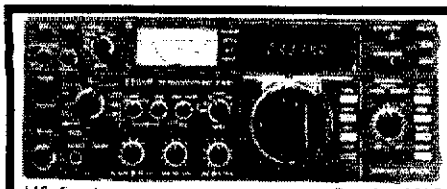
MAINE: SM, Cliff Laverty, W1RWG — SEC: KL7IJG. STM: AK1W. PIO: KA1TJ. TC: KQ1L. OO/RFI: W1KX. BM: W1JTH. ACC: KB1JF. SGL: K1NIT. W1GKJ, PAWA, received an award for faithful support of public srevice events during 50 years in ham radio from Sac Valley RA and York Co. CEP. Congrats Norm. Repeaters 146.61, Auburn & 146.82, Augusta have tone patches. Merrymeeting ARA supported Bath Shipbuilders Triathalon with comms.

Net	Sess.	Checkins	Traffic	NM
SeaGull	26	953	189	K1GUP
Pine Tree	53	348	135	AC1G/ WA1YNZ
Aroostook	5	64	—	WA1YNZ
Central ME	9	171	28	W1WCI
ME Public Service	5	74	3	KL7IJG

PSHR: WB1GLH 100, AK1W 94, N1BJW 89, KL7IJG 85, W1RWG 78, WA1YNZ 72. Traffic: WB1GLH 124, W1BMX 110, W1ISQ 107, W1KX 104, W1RWG 90, N1BJW 89, AK1W 87, KL7IJG 46, WB1CBP 39, W1JTH 37, KA1JOJ 26, WA1YNZ 24, N1BLZ 21, W1EZR 16, W1WCI 14, KA1BPJ 12, WA1POZ 12, KA1ENL 10, KA1JPR 10, W1OTQ 10, KA1FTL 9, KA1TJ 9, KA1KFC 7, KA1ENM 5, N1BME 4.

NEW HAMPSHIRE SM, Robert C. Mitchell, W1NH— STM: W1TN. SEC: Open. NMs: N1NH KI1M KK1E. New ORS is KA1HPO W1ENE & KA1JDJ operated Field Day for GSARA. K1ACL looking for checkins on Seacoast Emergency Net, Thurs at 9 P.M. on 146.805 and sometimes 147.57. Nashua Area RC will give amateur exams Nov. 3. Contact KI1M for details. WB1BRE NH PIO chatted with astronaut W5LFL at New York convention. Don't forget the new phone band privileges began Sept 1. Traffic: N1CPX 226, K1UWB 225, W1FYR 207, KK1E 193, K1PQV 163, N1NH 162, W1TN 135, K6UXO 82, KI1M 74, W1ALE 49, WB1GXM 47, W1VTP 47, K1TQY 40, KV1S 38, W1CUE 35, N1AKS 29, W1MHX 27, KA1HPO 20, N1ALM 11, KA1HRH 6.

RHODE ISLAND: SM, Gordon F. Fox, W1YNE— A/SEC: KB1G. STM: W1EOF. TC: AB1D. NM: WA1OSL. ACC: N1BEE. SGL: K1DA. EMRI Slow Speed Net (EMRISS) has awarded certificates to K1AOS N1DED KA1KML and WB1DEZ. Public Service Honor Roll certificate has been issued to KA1KML for making PSHR for 12 consecutive



HF Equipment — Regular — SALE

IC-740* 9-band 200w PEP xcvr w/mic — $1099.00 — **899.95**

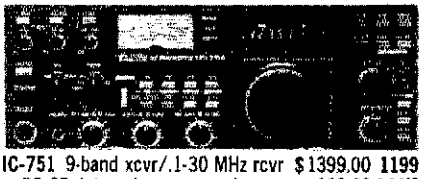
***FREE PS-740 Internal Power Supply & $50 Factory Rebate** - until gone!

PS-740 Internal power supply	159.00	**149.95**
***EX-241** Marker unit	20.00	
***EX-242** FM unit	39.00	
***EX-243** Electronic keyer unit	50.00	
***FL-45** 500 Hz CW filter (1st IF)	59.50	
***FL-54** 270 Hz CW filter (1st IF)	47.50	
***FL-52A** 500 Hz CW filter (2nd IF)	96.50	**89.95**
***FL-53A** 250 Hz CW filter (2nd IF)	96.50	**89.95**
***FL-44A** SSB filter (2nd IF)	159.00	**144.95**
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-12 Mobile mount	19.50	

**Options also for IC-745 listed below*

IC-730 8-band 200w PEP xcvr w/mic	$829.00	**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	**899.95**
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 kHz AM filter	49.50	
SM-5 8-pin electret desk microphone	39.00	
MB-5 Mobile mount	19.50	
IC-745 9-band xcvr w/.1-30 Mhz rcvr	$999.00	**769.95**
PS-35 Internal power supply	160.00	**144.95**
CFJ-455K5 2.8 kHz wide SSB filter	4.00	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	

**See IC-740 list above for other options (*)*



IC-751 9-band xcvr/.1-30 MHz rcvr	$1399.00	**1199**
PS-35 Internal power supply	160.00	**144.95**
FL-32 500 Hz CW filter (1st IF)	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	**89.95**
FL-53A 250 Hz CW filter (2nd IF)	96.50	**89.95**
FL-33 AM filter	31.50	
FL-70 2.8 Khz wide SSB filter	46.50	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	
CR-64 High stability reference xtal	56.00	
RC-10 External frequency controller	35.00	
MB-18 Mobile mount	19.50	

Options: 720/730/740/745/751 — Regular — SALE

PS-15 20A external power supply	$149.00	**134.95**
EX-144 Adaptor for CF-1/PS-15	6.50	

ICOM

Options - continued — Regular — SALE

CF-1 Cooling fan for PS-15	45.00	
PS-20 20A switching ps w/speaker	229.00	**199.95**
CC-1 Adapt. cable; HF radio/PS-20	10.00	
CF-1 Cooling fan for PS-20	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**
MT-100 Manual antenna tuner	249.00	**224.95**
AH-1 5-band mobile antenna w/tuner	289.00	**259.95**
PS-30 Systems p/s w/cord, 6-pin plug	259.95	**233.95**
GC-4 World clock	99.95	**94.95**

HF linear amplifier — Regular — SALE

IC-2KL w/ps 160-15m solid state amp	1795.00	**1299**

VHF/UHF base multi-modes — Regular — SALE

IC-251A* 2m FM/SSB/CW transceiver	$749.00	**549.95**

***$50 Factory Rebate** - until gone!

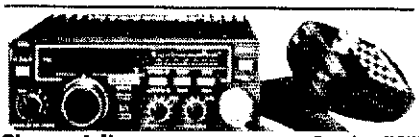
IC-551D 80 Watt 6m transceiver	$699.00	**599.95**
PS-20 20A switching ps w/speaker	229.00	**199.95**
EX-106 FM option	125.00	**112.95**
BC-10A Memory back-up	8.50	
SM-2 Electret desk microphone	39.00	
IC-271H 100w 2m FM/SSB/CW xcvr	899.00	**799.95**
IC-471H 75w 430-450 SSB/CW/FM xcvr	1099.00	**Call**
PS-35 Internal power supply	160.00	**144.95**
PS-15 20A power supply	149.00	**134.95**
IC-271A 25w 2m FM/SSB/CW xcvr	699.00	**619.95**
AG-20/EX-338 2m preamplifier	56.95	
IC-471A 25w 430-450 SSB/CW/FM xcvr	799.00	**699.95**
PS-25 Internal power supply	99.00	**89.95**
EX-310 Voice synthesizer	39.95	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	

VHF/UHF mobile multi-modes

IC-290H 25w 2m SSB/FM xcvr, TTP mic	549.00	**489.95**
IC-490A 10w 430-440 SSB/FM/CW xcvr	649.00	**579.95**

VHF/UHF/1.2 GHz FM — Regular — SALE

IC-22U 10w 2m FM non-digital xcvr	299.00	**249.95**
EX-199 Remote frequency selector	35.00	



Closeout item — Regular — NOW

IC-25H 45w, 2m FM w/up-dn TTP mic	389.00	**299.95**
BU-1H Memory back-up	38.50	†10.00

† BU-1H $10 purchased with IC-25H, otherwise $38.50

IC-27A Compact 25w 2m FM w/TTP mic	369.00	**329.95**
IC-27H Compact 45w 2m FM w/TTP mic	409.00	**369.95**
IC-37A Compact 25w 220 FM, TTP mic	449.00	**399.95**
IC-47A Compact 25w 440 FM, TTP mic	469.00	**419.95**
UT-16/EX-388 Voice synthesizer	29.95	
IC-120 1w 1.2 GHz FM transceiver	499.00	**449.95**

6m portable — Regular — SALE

IC-505 3/10w 6m port. SSB/CW xcvr	$449.00	**399.95**
BP-10 Internal Nicad battery pack	79.50	
BP-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	

Hand-held Transceivers

Deluxe models	Regular	SALE
IC-02A for 2 meters	$ 319.00	**289.95**
IC-02AT w/DTMF	349.00	**299.95**
IC-04A for 440 MHz	TBA	
IC-04AT w/DTMF	379.00	**339.95**

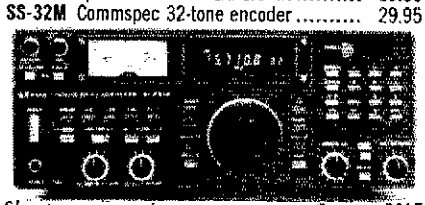
Standard models	Regular	SALE
IC-2A for 2 meters	$ 239.50	**214.95**
IC-2AT with TTP	269.50	**219.95**
IC-3A for 220 MHz	269.95	**234.95**
IC-3AT with TTP	299.95	**239.95**
IC-4A for 440 MHz	269.95	**234.95**
IC-4AT with TTP	299.95	**239.95**

Accessories for Deluxe models — Regular

BP-7 800mah/13.2V Nicad Pak - use BC-35	67.50	
BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50	
BC-35 Drop in desk charger - all batteries	69.00	
BC-16A Wall charger - BP7/BP8	10.00	

Accessories for both models — Regular

BP-2 425mah/7.2V Nicad Pak - use BC35	39.50	
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	29.50	
BP-4 Alkaline battery case	12.50	
BP-5 425mah/10.8V Nicad Pak - use BC35	49.50	
CP-1 Cig. lighter plug/cord - BP3 or Dlx	9.50	
DC-1 DC operation pak for standard models	17.50	
LC-2AT Leather case for standard models	34.95	
LC-14 Soft case for Deluxe models	17.95	
HM-9 Speaker microphone	34.50	
HS10 Boom microphone/headset	19.50	
HS-10SA Vox unit for HS-10 (dlx only)	19.50	
HS-10SB PTT unit for HS-10	19.50	
ML-1 2m 2.3w in/10w out amplifier	**SALE**	**79.95**
ML-25 2m 2.3w in 20w out amplifier	**SALE**	**179.95**
3A-TTN Optional TT Pad - 2A/3A/4A	39.50	
SS-32M Commspec 32-tone encoder	29.95	



Shortwave receivers — Regular — SALE

R-71A 100 Khz-30 Mhz digital receiver	$799.00	**689.95**
FL-32 500 Hz CW filter	59.50	
EX-310 Voice synthesizer	39.95	
RC-11 Wireless remote controller	59.95	
CR-64 High stability oscillator xtal	56.00	
R-70 100 Khz-30 Mhz digital receiver	749.00	**599.95**
EX-257 FM unit	38.00	
IC-7072 Transceive interface, 720A	112.50	
FL-44A SSB filter (2nd IF)	159.00	**144.95**
FL-63 250 Hz CW filter (1st IF)	48.50	
SP-3 External speaker	49.50	
CK-70 (EX-299) 12v DC option	9.95	
MB-12 Mobile mount	19.50	

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LA-1000A 1200 WATT AMPLIFIER

LA-1000A

The LA-1000A is a portable kilowatt now covering 160-15 meters. Typical drive requirement is 100 watts PEP yielding 1200 watts PEP SSB 800 watts CW. The compact linear uses four 6MJ6 tubes, has a tuned input and QSK built in and comes in an attractive gray-on-gray finish.

This is a super linear for all purposes, the LA-1000 excelled during the Heard Island DX pedition with over 30,000 contacts. The rugged design lends itself to continual use during contests and users are even running it on RTTY at 500 watts input.

LA-1000A **$449.50***

AT-1200 TUNER

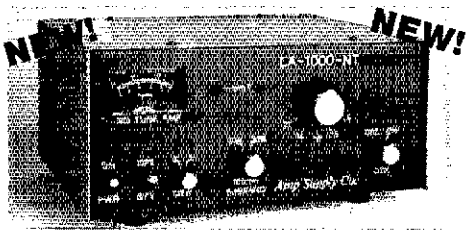
AT-1200

The AT-1200 antenna tuner is the perfect companion for the LA-1000A or any amplifier running up to 1200 watts input. It covers 1.8 to 30 MHz, has an antenna selector switch for 3 coax positions and 1 long wire or balanced feedline, and a built in SWR bridge and meter.

AT-1200 ..... **$189.50***

BL-1500 9:1 5 KW Balun **$29.50***

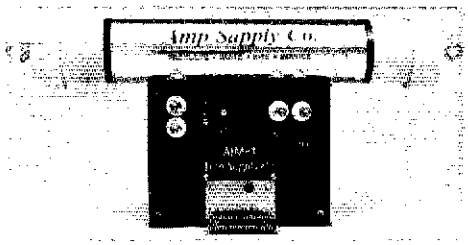
THE NEW NO TUNE — LA-1000-NT



More contacts, eliminate tune-up time, and less tune-up interference are yours with the NEW LA-1000-NT. The NO TUNE LA-1000 offers full coverage of the 160-15 meter amateur bands. A powerful 1200 watts PEP input and 800 watt DC input is the power rating of the LA-1000-NT. As with all Amp Supply Amplifiers, the NO TUNE LA-1000 features QSK, full break-in CW. Computerized CW and Keyboard Operators will love conversation-like full break-in (QSK) CW.

If you desire a compact killowatt amplifier that needs no tuning and you have a transceiver capable of delivering 100 watts PEP—The LA-1000-NT is the perfect addition to your radio station!!

LA-1000NT No Tuneup **$529.50***



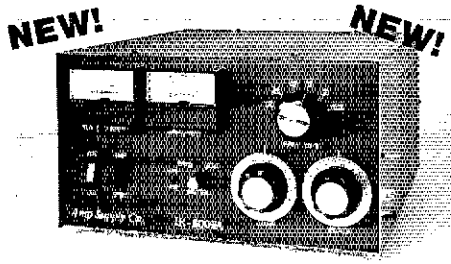
AIM-1™ *Major Antenna break through!*

The AIM-1 is an antenna impedance matching network for random, long wire or loop antennas. It provides continuous coverage from 500 KHz - 30 MHz, is completely *automatic*, no knobs to turn or coils to tap. Installation is simple; hook on wire antenna, ground, coax cable to station and balancing module at opposite end of wire. The antenna is ready for transmission from 1.8 - 30 MHz at up to 3KW PEP

- SWR max 2:1, 1.5:1 average
- wire lengths should be 1/2 wave on lowest frequency for maximum efficiency.
- inverted V, inverted L, rombic, random wire or loop antennas
- weatherproof • 2 year warranty

AIM-1 ..... **$139.50***
with 130' antenna wire and insulators $149.50*
Stranded Ant. Wire $.08 ft.

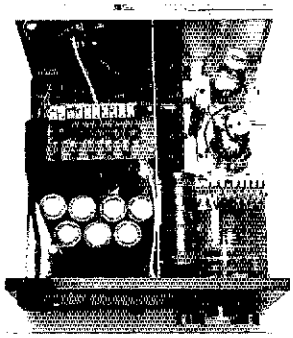
LK500ZA 2.5 KW AMPLIFIER



The all new Amp Supply LK-500ZA 2.5 KW Inpu Amplifier is the right amplifier, with the right feature at the right price. The LK-500ZA comes completel assembled and covers 160-15 meters. Two Eima 3-500Z triodes in grounded grid are featured with dual cooling system, one for the power supply and th other cooling the 3-500's. There's only one 2.5 KW amplifier with a pair of 3-500Z tubes in the world tha sells for under $900.00.

The Amp Supply LK-500Z!

- 2.5 KW SSB PEP Input: 1500 Output
- 1.5 KW Input CW :900 Output
- 1 KW SSTV, RTTY Input: 600 Output
- QSK Full Break-in CW
- 9" H x 15" W x 15" D
- 117/234 AC 50/60 Hz
- New Improved Bridge Power Supply with Computer Grade Electrolytics
- 1500 Watt Output with Hipersil Transformer



Interior view of LK-500ZA with "Peter Dahl" Hipersil Transformer

LK-500ZA

Wired and Tested **$889.00**
1500 Watt Output
All Mode with Hipersil Transformer . $1099.50

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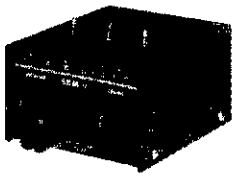
Let your fingers do the talking! Nye Viking Iambic Keyer plus built-in form-fitted paddles. Nicad battery operated CMOS IC's work with positive or negative keyed xmtrs. Charger included. Automatic 5 - 50 WPM speed and volume controls. Can also use as "bug", or straight key.

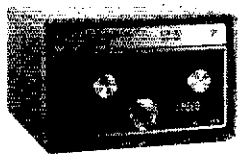


$195

SKM-001

MEMORY KEYER

Nye Viking Iambic Memory Keyer — The Pro's Choice! Combines Super Squeeze Key, CMOS IC's, practice oscillator and speaker — including Nicad battery with charger. Automatic 5 - 50 WPM speed and volume controls plus choice of (4) 256 bit, (2) 512 bit or (1) 1024 bit memories, switchable.

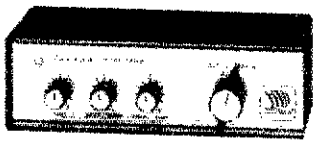


$65

ESK-001

IAMBIC KEYER (LESS PADDLES)

Discover Iambic Keying! Nye Viking Keyer with jack for external squeeze key. Superb reliability of CMOS IC's. Audio oscillator and speaker included for monitoring and practice keying. Automatic 5 - 50 WPM speed and volume controls.

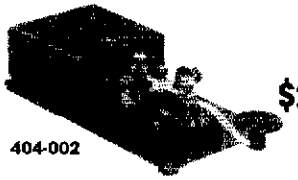


$65

046-001

HYBRID PHONE PATCH

FCC Approved! PTT or VOX use. Null, receiver and transmitter gain controls. Nye Viking Model 046-003 has speaker built-in for use with transceivers. Model 046-006 compatible with ICOM Models 720, 730, 740 and 751.



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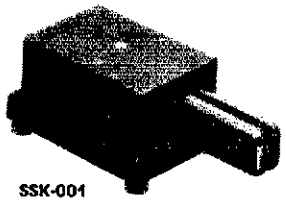
404-002

CODE PRACTICE SET

Perfect for beginner! Uses NYE VIKING Standard Key (Model No. 310-001), oscillator and amplifier, built-in 2" speaker—all mounted on a base with non-skid feet. Gives chirp free keying. Key is ideal for re-use with any xmtr.



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SSK-001

MASTER SQUEEZE KEY

Discover the pro's choice in keys for electronic keying. Long, finger-fitting molded paddles for fast, comfortable easy action! Uses gold-plated silver contacts, nickel-plated brass hardware and heavy die-cast base with non-skid feet.

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Model 310-003

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Model 320-001

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months. W1EOF is running a TCC sked to West Coast. Applications for SEC are still being accepted. An opening for OO/RFI Coordinator exists. This position is a very important post now that OOs are part of the Amateur Auxiliary to the FCC Field Operations Bureau. Traffic: KA1KML 553, W1EOF 532, WA1CRY 48, WA1CSO 34, K1AOS 11.

VERMONT: SM, Ralph Stetson, KD1R — Well folks, here it is October, and time to think about getting our antenna farms in shape for the winter. Vermont winters being the true test of Skyhook Engineering. Hopefully every one got through the summer, and got all those new goodies in the house with little difficulty. Congrats to *W1ELH, KT1Q* on appointments as ORS, welcome aboard. Anybody else wanting to be an ORS, OBS, OO, DEC or whatever. Please drop me a line and will get info out to you. Something else to thing about now that Fall is upon us: It is a good time to learn CPR and First Aid from your local Rescue Squad you never know when you will need these skills, especially if you are involved with ARES. Let's hear about your activities (Novice classes, station, club, and other doings). Nets: VTN (NTS) 31/137/74; VSBN 31/512/119; VFMTN 31/484/67; GMN 26/320/34; VPN 5/71/9; Carrier 26/733/34; RFD 4/55/12 Traffic: AE1T 197, N1ARI 77, W1KRV 62, KD1R 58, KT1Q 40, N1COB 37, N1YBC 3.

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T — SEC: WB1HIH. STM: W1UD. TC: KA1JJM. OO/RFI: N1CM. PIO: WB1CJH. Big Guns and Little Pistols greet Mt. Tom ARA as new W1-QSL Bureau sponsors. HCRA members active in becoming Volunteer Examiners. Lots of opportunity for all to help as VEs, Amateur Auxiliary, ARES, traffic, bulletins. W1PUO made BPL with super total. And in between they received 125 country endorsement. K1BE visited WCC and Marconi site on Cape Cod. KA1T now on 2-meter packet. W1COI received 50-year member plaque. KA1KPH operated on European vacation. Look for all of you in Simulated Emergency Test, Oct. 20-21. PSHR: W1KK WB1HIH W1PUO KA1T. Traffic: W1PUO 893, KA1T 177, W1SJV 165, W1UD 124, WB1HIH 108, KA1EKQ 63, K1PUG 62, W1KK 49, WA1OPN 36, K1IJV 22, KR1R 19, W1ZPB 19, W1JP 17, WB1HKN 4.

NORTHWESTERN DIVISION

ALASKA: SM, David W. Stevens, KL7EB — STM: KL7T. SEC: KL7QS. PIO: NL7CP. OO/RFI: AL7FL. Congrats and thanks goes to KL7JDR for his many years of faithful service to the Snippers Net. KL7JKW is the new net manager. AL7FL is looking for new Official Observers. KL7EB has the paperwork to be accredited VE for Alaska. With the summer activities over, GET INVOLVED and help a friend become and Amateur Radio operator. Traffic: AL7FJ 34, KL7VL 17.

IDAHO: SM, Lem Allen,W7JMH — SEC: KD7HZ. STM: W7GHT. PIO: WB7PFQ. OO/RFI: KU7Y. CLUB NEWS: Members of KARS who participated in 4th of July Parade were WA7DDO WB7WUB KC7ETJ WA7HPB K7TWZ N7CZD WA7BTA WA7MMG KA7RDN and WD7VKA. ARRL Matters: Rick Palm, K1CE of Hq. visited most Idaho Clubs during July, telling us about ARRL, Volunteer Exams, etc. All of us welcomed him and were grateful for the information from Hq. Rick then attended WIMU. PEOPLE AND THINGS: KA7T has his 40m 2-el Yagi up 80 ft., with help from W7ZRC WB7WCY W7IGE and KU7Y. KU7Y nearly moved into new house, has 20m beam up 25 ft. again. W7JE has new 2m rig — Kenwood TR-7930. N7FEG upgraded to Gen. W7FOF is back from 3-week trip to Eastern US and Canada.

Net	Freq	Time	Sess.	QNI	QTC
FARM	3935	8 P.M. DT	31	1902	49
ICD	3990	8:10 A.M. DT	22	771	17
IMN	3635	9 P.M. DT	22	228	93

General: Prepare your outside antennas and equipment for winter. Don't get caught short. Traffic: W7GHT 183, KA7GQP 57, W7JMH 40, N7DHM 4, WB7CYO 2.

MONTANA: SM, Les Selyea, N7AIK — Please see "Happenings" column in this issue and note the Section Manager for Montana is up for grabs. The SM has nominating petition form CD-129, will be glad to send to anyone qualified. Several upgrade candidates took code and theory exams with varying degrees of success under the new Volunteer Exam program, and K9PP traveled over 850 miles to give a hand as a VE. Bozeman expects to schedule exams every three months. KE7X made a summer trip to the East Coast and made 654 QSO's from 126 different counties on the "County Hunter's Net". Congrats goes to the Flathead Valley ARC for being designated a Special Service Club by the ARRL which brings our section total to three. The Northwestern Division Net has a new freq of 3893 kHz, the first Monday evening each month at 10:00 P.M. local time, do check in.

Net	QNI	QTC	Sess.	Mgr.
IMN	228	93	22	KY7I
MSN	33	0	3	K9PP

Traffic: KA7NMA 80, WB7WVD 66, N7AIK 40.

OREGON: SM, William R. Shrader, W7QMU — STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. ACC: WB7WTD. RFI: AK7T. OO: N7SC. TC: N7ENI. Upgrades: KA7TDY (Tech); KA7OXW KA7OXV WA7OIP (General); KD7VY (Adv); KA7KIS/NI7E (Extra). Ray, W7HKE is probably one of the country's oldest DJs. Check his operation at KGRV, Winston, at 700 kHz AM. W7TC was 3rd in Jan. 84 ARRL QSO PARTY. ND7T was multi-op winner in NW Division of ARRL Ten-Meter Contest. KA7KDU is on the road across country with OPERATION SALT MARSH, which is sponsored by Gandhi Foundation. Amateur Radio Week was declared in Silverton by the mayor during mid June. The local club celebrated by public participation in Field Day with lots of publicity. How many other clubs have tried that trick to boost Amateur Radio? Portland ARC (PARC) new officers are: KC7MY, pres.; AL7W, v. pres.; WA7SDY, membership secy.; W7VBH, treas. Oregon High Noon Net is going full-blast at 11:45 A.M. daily on 7233 kHz. Give them your support and learn how to properly handle traffic on SSB. Plans are underway to form a Crater Lake Chapter of QCWA for southern Oregon (Roseburg and south). For info contact NB7J. W7VSE lost favorite guitar when it was run over by auto at Eugene Hamfest. Traffic: W7VSE 528, AL7W 178, W7ZB 146, K7OVK 126, N7FLC 92, WB7OEX 67, KA7AID 53, N7BGW 35. (June) WB7OEX 38, W7DAN 2.

WASHINGTON: SM, Joe Winter, WA7RWK — STM: K7GXZ. SEC: W6IIH. PIO/SGL: W7CKZ. ACC: WB7QNS. OO/RFI Coord.: KB6WC. BM: KD7G. TC: K7UU.

Net	Freq.	Time(Z)	QNI	QTC	Mgr.
WARTS	3970	0200	3237	270	W7SFT
WSN	3590	0245/0545	551	193	N7CSP
PSTS	145.33	0130/0630	187	123	W7IEU
NTN	3970	2000	926	65	W7UU
EWTN	146.04	0130/0630	55	48	WA7CBN
NWSSB	3945	0230	642	43	K7WNE

Clallam Co. ARC is hosting the International Picnic on Aug. 19th in Port Angeles. This will be the 50th anniver-

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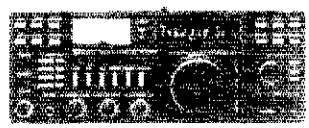
VHF TRANSCEIVERS



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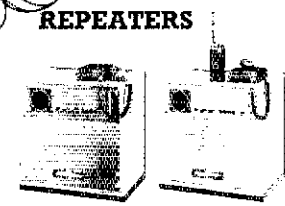

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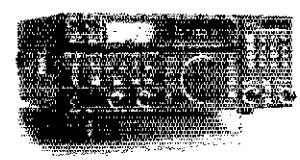

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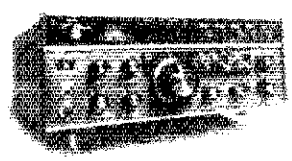

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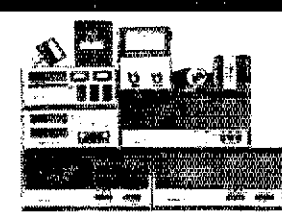

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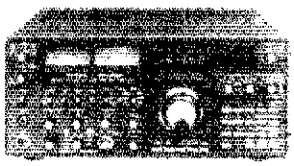

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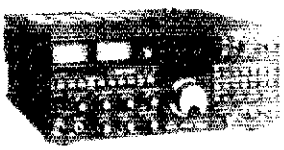

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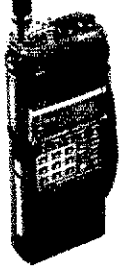

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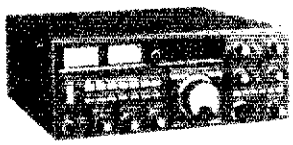

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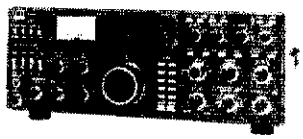

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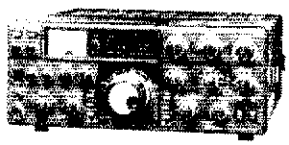

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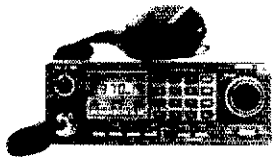

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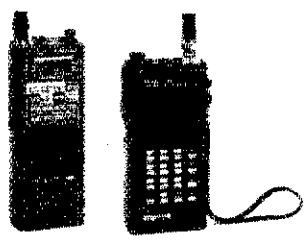

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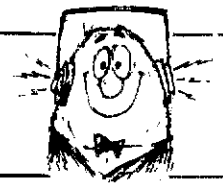

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Crystal Controlled AFSK Modulator: A transceiver without FSK function can transmit in RTTY mode by utilizing the high stability crystal-controlled modulator controlled by the computer.
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Large Capacity Display Memory: Covers up to 1,280 characters. Screen Format contains 40 characters x 16 lines x 2 pages.
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Printer Interface: Centronics Para Compatible interface enables easy connection of a low-cost dot printer for hard copy.
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WORD-WRAP-AROUND operation: In receive mode, WORD-WRAP-AROUND prevents the last word of the line from splitting in two and makes the screen easily read.
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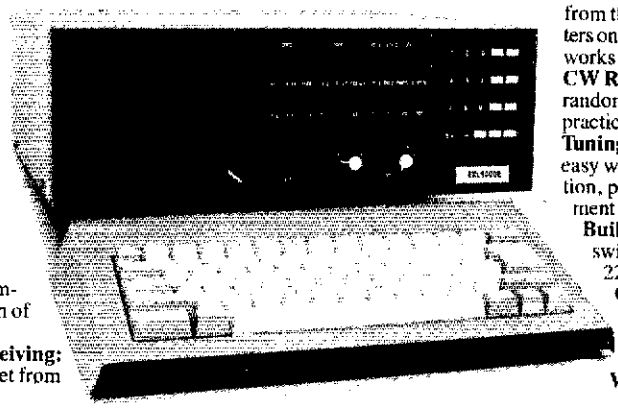
Cursor Control Function: Full cursor control (up/down, left/right) is available from the keyboard. Test Message Function: "RY" and "QBF" test messages can be repeated with this function.
MARK-AND-BREAK (SPACE-AND-BREAK) System: Either mark or space tone can be used to copy RTTY.
Variable CW weights: For CW transmission, weights (ratio of dot to dash) can be changed within the limits of 1:3-1:7.
Audio Monitor Circuit: A built-in audio monitor circuit with an automatic transmit/receive switch enables checking of the transmitting and receiving state. In receive mode, it is possible to check the output of the mark filter, the space filter and AGC amplifier prior to the filters.



CW Practice Function: The unit reads data from the hand key and displays the characters on the screen. CW keying output circuit works according to the key operation.
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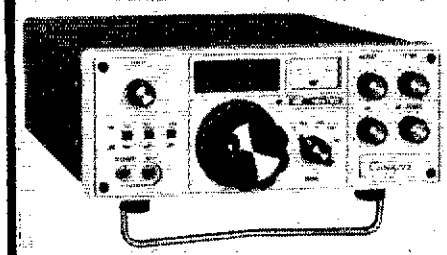

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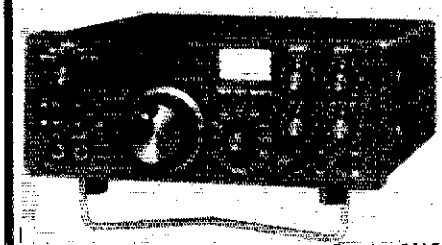
226 Crystal calibrator	29.00	
279 Mobile line filter/ckt breaker	TBA	
679 Internal keyer kit	27.00	
1179 DC circuit breaker	10.00	



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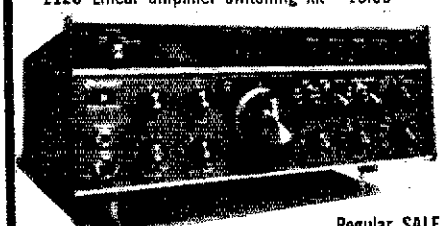

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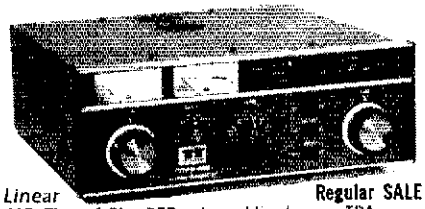

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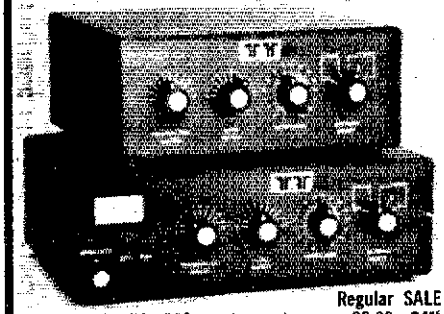

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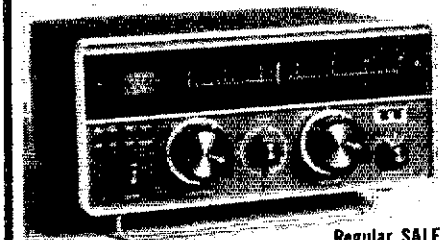

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229 1.8-30 MHz 2kw PEP tuner/SWR	279.00	249.95
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670 Single paddle keyer	39.00	
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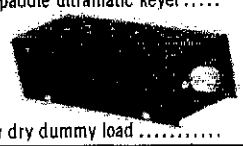

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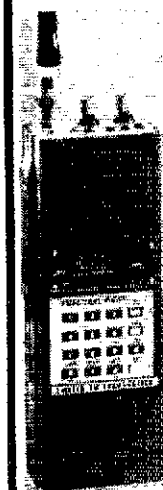

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sary of the event. No one in the CCARC was around more than 30 years to remember, but our VE7 friends have recorded the history of this international good will. Congrats! N7FTP teaches a hi-school science course in PA. He has the OK to include Amateur Radio in the course. The club will consider a change in the by-laws to reduce the dues for these students to foster a desire to become and remain Hams. From the *Idaho-Montana Net* news, W7GHT, ed. A new Traffic Handlers Net has started to pass leftover ttc, to stations going to the first session of DRN7. Using CW & SSB the net meets on 3944 kHz at 10:15 PDT. This will expedite some ttc, Tri-City ARC: DEC KA7SZ reports 46 area hams provided communications for the Columbia Cup Hydroplane Races. They worked with the Red Cross' eight First Aid stations, official patrol boats for course safety, referee boats, etc. The hams did a great job in their biggest event of the year. Congrats! Boeing BEARS: King Co. ARC is putting together a pool of volunteer examiners to administer tests once a month in a fixed location in King Co. Other clubs are also planning to take on this responsibility in their counties. I urge clubs and Amateurs to form teams in their areas in order to make amateur exams available and convenient to all. Write Curt Holsopple, K9CH at League Hq. for ARRL Info. CVARS: It was a pleasure for me to visit the members of the club and see the progress of the club room remodeling. The July picnic at KA7PIZ's home was reported as a nice event. Low. Col. ARA: More than 20 mbrs helped to paint their club house and change the guy wires on the tower. Talked with K7WF on their rptr on my way south. He was getting materials and calling "volunteers." Radio Club of Tacoma: Field Day was reported a success though scores were down due to poor conditions. Putting on 11 xmtrs and a Novice station is a big job but there were 50 + operators to go around. Tacoma Hamfair broke all records this year. RCT mbrs are now known by their club jackets, worn for the first time at Hamfair. Pls. read Aug. 84 *QST* pg. 11 on the new Amateur Auxiliary. I am building up the organization and need your help. Pls. contact me! Traffic: W7DZX 447, WB7WOW 381, KD7ME 383, K7GXZ 257, KS7I 209, W7LG 144, N7CSP 123, KR7L 91, KR7F 72, N7ANE 66, K7CTP 62, W7GB 61, W7HNA 54, W7IEU 47, WA7BDD 36, W7APS 22, KD7MW 16, W7LUP 14, N7FXM 13, K7AJT 10, KD7G 10, W7AIB 2.

PACIFIC DIVISION

NEVADA: SM, L.M. Norman, W7PBV — SEC: WB5VDV, STM: W7BS. Elko has a repeater on 443.575. WA7BWF and WA7VVC have the 91 repeater back on the air working FB. KD7QJ proding members to check into the net, eleven showed up, guess who didn't. K7ZOK has his computer on RTTY. N7RH received some publicity in the newspaper. Now that summer vacations are over, less QRN and better band conditions, more check-ins are needed from the Sagebrush Net on 3980. Weather net on 3992. WADG Saturday breakfast or brunches, details on 147.330. Las Vegas group still meet every other Tuesday for dinner at the 76 Truck Stop. Boulder City group meet on Saturdays for coffee at 1000, check 146.49 for details. WA7GAE is putting Round Mtn on the map with his activities. Traffic: W7BS 53, WA7GAE 3, W7PBV 3.

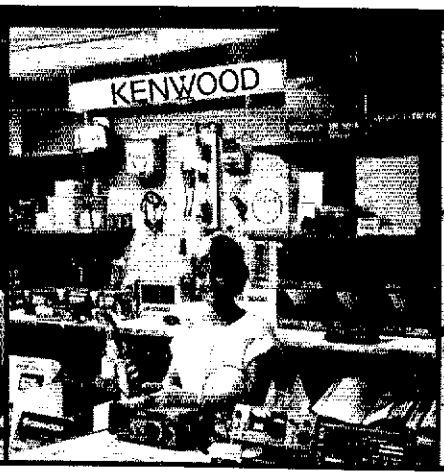
PACIFIC: SM, James Wakefield, AH6CO — Oahu Packet Club includes WH6AMX KH6GMP KH6WY AH6AC KH6PS KH6FMT KH6NP KH6FIC and KH6GPI. QSYing to Seoul is NH6AY of Kailua-Kona. KH6JCC is in charge of awards for Kauai ARC. BIARC of Hilo and Kauai ARC are actively holding radio classes, thanks to KH6HU and KH6AFS. All who desire VE appointments should do so immediately. Contact ARRL, HARC, *W5YI Report* or BIARC for the Pacific Section or the SM for possible VECs in your immediate area. Maui ARES handled communications for the Wailuku Junior Tennis Tourney and also Run To The Sun events. This section shows 130 ARES members. We need more. Contact KH6B or SM for info. Info bulletins are run at 0155UTC on 7290 kHz and Hawaii Afternoon Net at 0200 on 7290 had QNI 298 for July. Just under record of 302 set in Feb. 84. Where's Guam? Need it to print it! Traffic: KH6S 73, KH6B 56, KH6H 33, KH6HIJ 31, KH6RQ 29.

SACRAMENTO VALLEY: SM, Ron Menet, N6AUB — SGL: WB6WGF. STM: KY6Q. OO/RFI: NY6Z. SEC: WA6ZUD. I have now been SM for about a year and, though I have heard many criticisms of the League, I have yet to receive or hear any suggestions about how it can be meaningfully improved from anyone in the Section. Is it that none of you care? Are you content to have your membership be no more than a magazine subscription? UPGRADES: Extra-NY6Z; Advanced-WA6ZGS N6JYG; Novice-WB6FWS KB6FSX. VIP Members throughout the state are meeting the last Sunday of each month at 1400 PDST, on 7242 kHz, LSB. Net Control is located in Amador County. Listen for WB6RFI. June 18-24 was "Amateur Radio Week" in Davis, proclaimed by Davis Mayor. Don't forget, send your traffic reports to STM KY6Q, who will record totals for Section Report and mail cards to me. Fall is coming; thank Heaven. Traffic: K6SRF 214, WA6WJZ 135, N6CVF 97, KY6Q 17, WB6SRQ 5.

SAN FRANCISCO: SM, Bob Smith, NA6T — July was the best month so far for the Public Service Honor Roll (PSHR) in the Section: SIX amateurs made the LIST: KK1A/6 W6RNL WB6RTE W6IPL K6TP and K6TWJ. Congrats to the loyal traffic handlers in the Section!! Sonoma County Radio Amateurs Inc. (SCRA) is the section's FIRST Special Service Club (SSB). Let's not let them be the last — EVERY CLUB CAN BE AN SSC!! Early info has it that MARC X-Mas Party will be at HAFB Club House on Sat., Dec. 8, check with WB6OVH for further info. MARC is also setting up its VE Program for upgrading — stay tuned for further info. SFRC participated in the Democratic National Convention by providing PUBLIC SERVICE COMMUNICATIONS for the safe movement of people within the SF Area with great success. Watch the *Public Service* Column in *QST* for the entire story as told by N6DGM and K6TP. SFRC also scored another first by a tree to club members annual Picnic for all SFRC Club Members. VOMARC had a successful Hot Dog Roast-Swapmeet in Sonoma County with the usual good attendance. Hope I was able to talk to everyone at the Pacific Div. Convention this year. Traffic: W6IPL 410, W6RNL 248, K6TWJ 134, KK1A/6 95, K6TP 62, WB6RTE 21, KE6LF 18. (June) W6IPL 213, K6TP 99, KK1A/6 95, WB6RTE 27.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD — SEC: WA6YAB. STM: N6AWH. TC: WA6EXV. N6IWD is the new EC for Mono Co. WA6IDO is President of the Central California SSB Assn. It is my sad duty to report that K6CZO WB6TUV W6INP and WA6LYB are Silent Keys. Congrats to W6IFC on his 50 years as an ARRL member. KD6QA has an IC-730. W6ZNX has a TR-7950. KE6JZ and WA6DEA have IC-37As. WA6BUH and KA6QPB have TR-7500s. WA6U has a TR-7800. K6QOK has a TS-520. NB6Q and K6PBT are on RTTY. K7SQG is now active from Lodi. K6YK has a Model 35 Teletype. I hope that all amateurs support the VE program. This should help the growth of Amateur Radio. Hopefully there can be amateur

Rob, WA3QLS



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exams given in most communities of the section. The 1985 Fresno Hamfest is scheduled for May 3-5. Traffic: N6AWH 105, WA6YAB 17, W6DPD 16, W6SX 6.

SANTA CLARA VALLEY: SM, Rod Stafford, KB6ZV — SEC: K6ITL, TC: K6HLE, STM: W6PHT, ACC: W6MKM. Is your club looking for a speaker for an upcoming meeting. Take a look at the list of section-level appointees at the beginning of this column. Each one of those individuals is capable of giving a presentation to your group. W6PHT gives a very nice talk on traffic handling. K6ITL can tell your about the ARES structure in the section. W6MKM is willing to tell you just what it takes to become a Special Service Club. K6HLE can tell you about the ins and outs of FM and a number of other technically related subjects. If all else fails, ask your friendly Section Manager to give a talk. We are very lucky in the SCV Section to be so close to so much technically oriented industry. There are many companies (and colleges) in this area with public affairs offices that have speakers just waiting to go out into the community to speak on what their companies are doing. Once you have a good speaker lined up, make sure you get the word out. Make announcements on your club nets and also on the Section Managers Net on Tuesdays at 9:00 PM on 146.76 and at 9:30 PM on 146.925. West Valley ARA had its annual BBQ-Wine Testing at the Novitiate Winery in Los Gatos. W6TWO WB6WSA KU6U & W6YLL, just to name a couple, deserve a hand for putting on such a fun event. K6GZK has 3 repeaters on 220 MHz. Freqs are 224.60, .62 & .64. The system is linked a great deal of the time with repeaters in Central and Southern California. K6GZK and WB6FIY repeater systems had a joint BBQ recently that was very well attended. WA6KRA continues to handle a lot of traffic through the NTS each month as does W6YBV. If you're interested in becoming an Official Relay Station (ORS), contact W6PHT and get the details on how traffic handling can be fun and worthwhile. KA6TGE, the EC for the City of Santa Clara, has just returned from 4 months vacation. K6TEH has been active as an Official Bulletin Station in the southern portion of the Section by giving reports of bulletins and QSTs on the K6JE/R on 145.47. WA6NIL has spent a lot of time and effort to make sure the Palo Alto area has effective and responsive Amateur Radio emergency communications aid if the need should arise. All ECs who are interested in establishing a good system should check will WA6NIL for some ideas on what he has been doing in the area of assignments to fire stations, telephone trees, etc. K6AYB has been busy listening to the amateur frequencies in his capacity as an Official Observer. If he hears anyone operating a piece of gear that is causing any problems on the air, he sends out a nice note pointing out just what he observed with some helpful suggestions about how to cure the problem. W3VS, a relatively new arrival from the East Coast, is very knowledgeable about what it takes to get onto computer bulletin boards and gain access to amateur related information and would be a good choice for a speaker for a club meeting. ECs should be sure to get their monthly reports to K6ITL so that he can complete the reports that go to ARRL Headquarters. Reports can be given over the air on the ARES Section Net on Wednesday nights at 7:00 PM. All DEC,s ECs, AECs and ARES members are encouraged to check into that net. If your club participants in a public service event, be sure to fill out ARRL for CD-157 so that I can include it in this column. EC WD6EKR reports that several amateurs in the Salinas area participated in the Olympic Torch Run and a Biathalon Race including: (Biathalon) KB6AAB, WD6EKQ, WD6EKR, N6IBO, WA6STN, K6TEH: (Torch Run) WB7EHM, WD6EKQ, WD6EKR, W6GHS, N6JL, K6TEH & KB6FI. WD6GYH has a new controller on his repeater system which includes 443.125 & 224.46 plus a 2-meter remote. Traffic: W6YBV 257, W6KZJ 33, W6RFF 18, K6TEH 2.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN— SEC: AB4W, STM: K4NLK, BM: K4IWW, PIO: WA4OBR, SGL: AB4W, ACC: K4SWN, New appointments: OBS WB4N; OES WB4HRR; ORS K4JHF KA4EYF. As Fall approaches the CSN will move to 3715 kHz. The net needs your help with more checkins and liaison stations. KB4IVV can attest to CSN and the training that it offers. Clubs, encourage your Novices/Technicians to check in. Enjoyed super fine hamfest at Asheville with Division Director W4UG in attendance. Concord Hamfest will be Nov. 4 with FCC exams. New site is Central Cabarrus High School on NC 49. No walk-ins will be accepted. The VEC program is up and running. The Piedmont section is well represented with VEs. Suggestion made that cities work with all VEs and come up with an excellent schedule. Winston-Salem VEs will have Saturday tests per WF4I. WW4O reports that 36 upgrades at Asheville hamfest with 15 Technicians, 8 Generals, 6 Advanced, 7 Extra, with overall passing rate 39%. The K4/N4/W4 QSL Bureau advises that 5 × 7 envelopes a must with extra postage included so that more than 1 ounce of cards can be mailed. KE4I advises he sill be operating as SVØDI for next 2-3 years; QSLs to WA4DAN. I would like to acknowledge the fine newsletters received: WCARS-W4MOE; Charlotte ARC-W4BFB; Brightleaf ARC-W4AMC; Raleigh ARS-W4DW; Shelby ARC-W4NYR; Forsyth ARC W4NC; Alamance RC-K4EG. Congrats to NJ4L for a job well done as NM of CSN, to WØIKT new NM CSN, to WA4TTS for being nominated and receiving the Certificate of Merit. Welcome to AK1E and KB1A to Tarheel State. Reference tornado T-shirt offer in August column, State of NC has dropped program. N4KEE has NWS nets well organized. With loss of satellite, we must be more alert weather spotting. Now is hurricane season. Volunteer Amateur Auxiliary program is a new ARRL/FCC effort. Need OOs in section. DON'T FORGET SET Oct. 20-21. Statewide all-amateur effort. Traffic: K4NLK 297, NJ4L 167, WB4WII 157, WB4HRR 110, K4JHF 86, WA4OBR 86, KA4EYF 76, WD4LRG 76, NT4K 72, K4IWW 60, KB4FWL 56, WA4MNR 47, WB4N 44, K4DDY 43, WA4SRD 41, K4SWN 28, WB4DAR 22, WD4CEB 20, WB4CYN 20, WA4TTS 18, W4TWD 16, KB4IVV 15, WA4PID 11, WD4HTE 10, W4ZCV 8, N4CJJ 7, W4PRG 7, K4GI 5, AK1E 2. (June) WD4HTE 10.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ — And the nets go on! Even with the significant drop in message traffic during the non-holiday months, our nets continue to meet and net members continue to check in. Liaison stations continue to be willing to bring traffic to and take traffic from our SC nets and the CN, 4RN, D4RN and EAN continue to function. With "not a thing to do" many net stations speak of losing interest and eventually may become inactive. So let's help the nets and keep them busy! If you don't already do so, originate several messages each month to family or friends anywhere in SC, the U.S. or Canada. Originate traffic from friends and neighbors to their family or friends. Possibilities are almost endless. A short "ARL FIFTY" or "Have not heard from you recently X please write" will be welcome. Start the traffic on your local net, SCNT or SCSSB. Traffic: K4ZN

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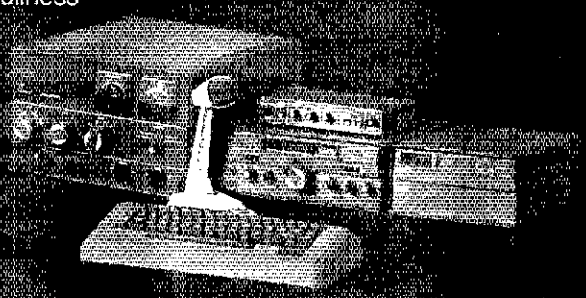

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223, K4WJR 137, W4FMZ 93, W4ANK 77, W4NTO 76, WØIKT 75, K4FRX 52, WB4UDK 45, WD4FJP 26, WJ4P 24, KA4AUR 24, KA4LRM 19, WA4MIY 17, K4ZB 16, WA4JWS 8, W4DRF 2.

VIRGINIA: SM, Claude Feigley, W3ATO — STM: WD4ALY. SEC: WB4UHC. ACC: WD4KQJ. OO/RFI: W4HU. OBS: AB4U. PIO: WN4VAU.

Virginia Traffic Net (VTN)	1 P.M.	7260/3907
Virginia Sideband Net (VSBN)	8 P.M.	3947
Virginia Slow Net (VSN)	6:30 P.M.	3680
Virginia Net (VN)	7:10 P.M.	3680
Virginia Late Net (VLN)	10:15 P.M.	3947

I am sorry to announce that K8LGA has become a Silent Key. WBØIC has moved back to Ohio, K4MR to North Carolina and WA4UAF to Florida. It was good to see W3BBN along with many others at the Berryville hamfest. WB4AXY N1BDU WD4MIZ KA4NME W4SDQ WD4ILU and WA4KXV supplied communications for their local Soap Box Derby. N4VG is a new OBS appointee and KB4PW WA4JUO and W4PVA report OBS activity. AB4U, section Bulletin Manager, is looking for additional stations to perform this important job. If interested contact AB4U or the SM. My records indicate that there are 52 "active" ARRL affiliated clubs in the section. Of these, only 6 clubs have 100% of their voting membership as ARRL members. How does your club stack up? The League's new volunteer monitoring program called the "Amateur Auxiliary," which is the result of an agreement between ARRL and the FCC's Field Operations Bureau, is underway. If you are interested in becoming a part of this effort contact OO/RFI Coord. W4HU or the SM W3ATO for details. Those who have registered with ARRL as Volunteer Examiners please complete your exam and return it to League Hq. N4GHI and AA4AT again lead the traffic handlers with N4GHI, K4KDJ and WA4CCK leading the pack in the PSHR. Total monthly traffic, 3844 with 43 stations reporting. Traffic: N4GHI 815, AA4AT 597, WA4CCK 370, W3ATQ 289, N4EXQ 194, WD4FTK 186, WD4ALY 180, KR4V 165, KA3DTE 159, K4KDJ 118, KB4WT 114, K4JM 101, WB4PNY 88, WD4OCW 68, K4ECD 65, WB2RBA 64, NT4S 60, K4JST 58, KB4PW 42, KB4OG 41, KI4LO 35, KA4IUM 27, K4VWK 27, K3RZR 26, WB4UHC 24, K4MLC 14, W4LXB 12, W4TZC 12, WB4DQZ 12, K4GR 11, N6ANQ 10, WA4TVS 9, N4IBY 8, WB4KIT 8, WB4EDB 7, NW4O 7, N4FNT 6, WB4RDV 4, WA1VRL 3, W4PVA 3, N4LE 2, N3RC 2, W4DM 1.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT — SEC: K8QEW. STM: KD8G. SGL: K8BS. TC: K8CG. ACC: WA8CTO. Rptr. Coord.: WA4KHL. K8JQ is active on 8RN and EAN. Recent upgrades N8FXH N8FXG KA8RGQ and others are active on WVFN. St. Albans area hams provided communications for the Scarlet Oaks Golf Classic. Chas. area hams once again assisted with the Sternwheel Regetta.

Net	Freq.	Time	QNI	QTC	Sess.	NM
WVFN	3900	6:00	705	130	31	N8AJC
WVMD	7235	11:45	622	41	31	W8FZP
WVNN	3730	6:15	137	29	31	KD8RD
WVN	3567	7:00	175	53	31	W8LYV
Hillbilly	14290	Noon Sn	198	22	5	KC8YU
KFC 2M	87/47	8:30 M	27	5	3	KA8RGQ

Traffic: KZ8Q 129, WA3NUI 92, KD8G 86, K8TPF 50, K8UQY 48, N8AJC 45, K8QEW 44, K8KT 35, W8HZA 28, W8FZP 26, KA8OGF 25, WA8KCJ 23, NC8G 8, KC8YU 7.

ROCKY MOUNTAIN DIVISION

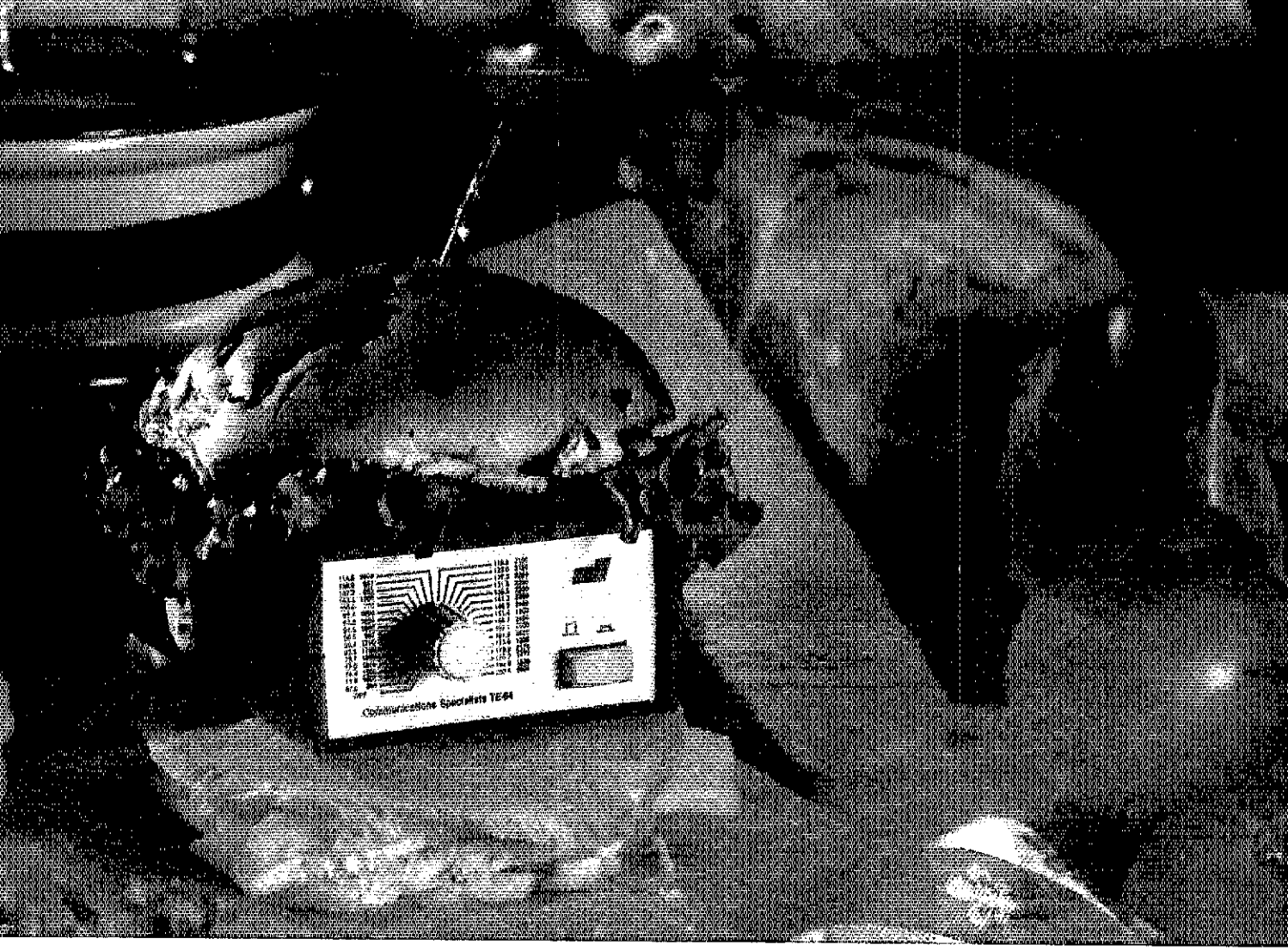
COLORADO: SM, Bill Sheffield, KQØJ — SEC: WBØFQB. STM: WDØGQL. BM: WØMDT. PIO: KAØPYH. DECs: WBØTUB KCØWR. Oct brings a number of thoughts to mind, we are reminded that the swapmeets are over till next year. Others are thinking this is SET month ... hunting season is about to begin, the bands should be opening up, not to mention here comes the snow. Remember that we need a SET exercise held with all ARES districts participating, try to include NTS. Send your reports asap to the SEC. Ski Country Hamfest was excellent & great to see old friends on the W. Slope. The Jerry Ford Golf Tournament in Vail produced very high amateur visibility & interest this year, as communications were coordinated by the Eagle Co. ARC with WØRSG as chairman. Amateurs from all areas participated and this year handled up-to-the-minute score boards along with communications. Equipment has been ordered for our Section repeaters. Frequencies are 443.375/8.375, 222.74/4.34, 146.205/805. Hopefully we will get it sort of flying before the snow. If all goes well we will have statewide communications and surrounding states as well. If you are willing to help drop me a line. Name droppers: KCØHW K9MWM KL7IPV. 73, KQØJ. NETS: Col no totals. CWN QTC 70, QNI 116, Time 465, 26 sess., CWXN QTC 2990, QNI 3377, Time 2790 31 sess. HNN QTC 105-257 inf. QNI 1422, Time 13 11, 31 sess. NCTN QTC 98, QNI 408, Time 245, 27 sess. Traffic: NØBQP 3010, WAØHJZ 1349, KØJAN 667, KØRXK 420, WØACH 376, NØDZA 229, WDØAIT 130, KBØZ 124, WØLAE 108, WBØNHA 84, WØEJD 54, WØNFW 46.

NEW MEXICO: SM, Joe T. Knight, W5PDY — ASM: W5HD. DEC: KB5XD. STM: KV5U. NMs: WA5UNO K5LL W5VFQ. TC: W8GY. ACC: W5HD. Southwest Net (SWN) meets daily on 7083 at 1930 local and handled 190 msgs with 205 stations in. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 54 msgs with 950 stations in. New Mexico Breakfast Club meets daily on 3939 at 0630 local and handled 80 msgs with 898 stations in. Yucca 2-Mtr Net, 78/18 & 93/33, handled 12 msgs with 409 checkins. Caravan Club 2-Mtr Net 66/06 handled 8 msgs with 131 checkins. SCAT 2-Mtr Net 66/06 handled 4 msgs with 394 checkins. Early Birds 574 checkins with 23 msgs. Vy sorry to report the passing of W5HAG and W5HAF. They will certainly be missed. Flagstaff was a great success. We are all looking forward to Northern NM Hamfest, Oct. 6-7, near Pecos. Traffic: W5DAD 216, K5DUV 180, N5EXC 61.

WYOMING: SM, Dick Wunder, WA7WFC — ASM: KA7AWS. SEC: W7TVK. STM: WØOGH. As we settle into the fall routines and are looking forward to time for radio activities, you may enjoy becoming a leadership official with the League. I have a number of positions available. So join up. Here is a belated Field Day activity roster: Casper ARC, University ARC, High Plains ARC, Sheridan AR League, Casper Outlaws & Cedar Mountain ARC. Many thanks to all participants. KC7AR reports the Wyo. Cowboy Net held 22 sessions with 635 QNI & 16 QTC. Traffic: WB7NHR 266, W7HLA 68, WØOGH 22.

SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph Smith, Jr., WA4RNP SEC: N4DMA. STM: N4JAW. SGL: KA4WVU. PIO: WO4W. BM: KF4VU. OO/RFI: K4ELV. It's time for SET '84, and I hope all of you are planning to test our net skills, our emergency preparedness and our ability to interface with the other professionals that are called on in time of need, i.e. Red Cross, Civil Defense, Firemen, Policemen, Salvation Army, National Weather Service, etc. The dates of SET '84



Food for thought.

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- All tones in Group A and Group B are included.
- Output level flat to within 1.5db over entire range selected.
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74.4 WA	97.4 ZB	127.3 3A	167.9 6Z
77.0 XB	100.0 1Z	131.8 3B	173.8 6A
79.7 SP	103.5 1A	136.5 4Z	179.9 6B
82.5 YZ	107.2 1B	141.3 4A	186.2 7Z
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2805			1800	2100	2350	

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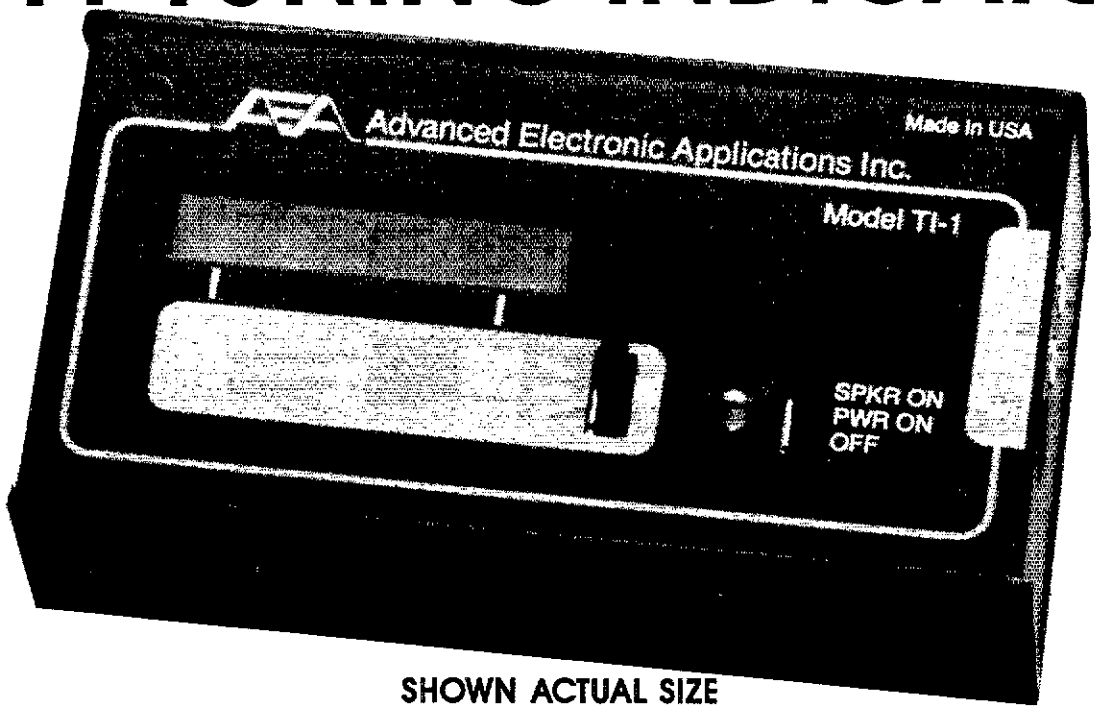

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are Oct. 20-21. Also for you contesters, the ARRL QSO Party dates are Oct. 6-7 CW and Oct. 13-14 phone. Try it, you might like it. Dr. James W. Underwood of B'Ham has joined the Silent Keys. His call was WA4FOD. The new Amateur Auxiliary is coming along nicely. If you are interested, contact Mike Lord, K4ELV, our OO/RFI Coordinator, at 1620 Belvedere Dr., B'Ham 35226. Nets: CAND reports 998 messages passed in 31 sessions, with DRN5 rep 100% by NW4X WX4I and W4CKS. DRN5 reported 802 messages passed in 62 sessions, with Alabama rep by W4WJF wa4JDH WA4RNP W4CKS. 73, Joe. Traffic: WA4JDH 733, WX4I 117, W4CKS 104, NW4X 76, WB4IXA 64, WA4LXP 62, WA4PAJ 43, WA4RNP 32, K4AOZ 28, KF4VV 16, KB4GPN 13, W4DGH 9, KC4GS 6, WB4TVY 4.

GEORGIA: SM, Eddy Kosobucki, K4JNL — SEC: WB4ABY. STM: K4VHC. ACC: WA4ABY. BM: W4BIA. OO/RFI: W4RZI. PIO: WA4PNY. SGL: W4BTZ. TC: K4UDR. NWS: WA4PZD. Coastal Plains ARC 1984-85 officers: KF4BI, pres.; WD4RTG, v.p., W4PVW, secy/treas. Congrats to WO4U, new YLRL secy, & WI4K, 4th Dist. Chmn. Don't know whether it was hot WX or not but section FD activities way down. How abt turning out for SET in Oct. Hamfest at Warner Robins is Oct. 13th & 14th. GSSBA & GCN will be electing new officers on that weekend. BGMRC on the 4th of July turned out in big numbers looking for 3 lost children. The club also qualified for being an SSC. Did U know that it was the Kennehoochee ARC who pushed legislation to first get our Georgia Ham Tags in the early 1950s? Columbus ARC elected: WD4GRR, pres.; KC8DC, v.p.; KA4VHJ, secy.; treas.; N4AGO, act. mgr. Dixie DXers Contest Club meet on Sun nites on 3805 at 8:05 P.M. local & invite all to join them. Their new officers are: K4JPD, pres.; WI4R, v.p.; WD4IKI, secy/treas.; W5VUX NC4I, chmn. Wish all cud read AA4RM's view of the hobby in Aug. *Atlanta Ham*. See if U can borrow a copy. The Albany ARC's FD was a great success as they made it a real family affair. Maybe this is the new trend for outdoor activities. All net & traffic reports are to be sent to STM K4VHC by the 5th of each month. Bob compiles all the reports & then sends them into League Hq. One item of real importance is the new VOLMON PROGRAM. We need applications from members as this Volunteer Monitoring program is of vital need to the hobby. If U are interested, please let me know & it will send U an application. Our hobby has made many strides during the past few years, let's keep the ball rolling. Traffic: W4PIM 207, W4JWO 28, K4VHC 28, K4NM 27, WB4NTW 26, W4BIA 16, W4HON 14, K4EV 9.

NORTHERN FLORIDA: SM, Phil O'Dwyer, WF4X — STM: WB4GHU. SEC: W4UEA. ACC: N4ADI. PIO: WA4PUP. BM: W4GUJ. Many thanks to Billy, N4UF, our SM for last four years of outstanding work. Glad to report that our leadership officials are staying aboard although Ron, WB4GHU, is taking my place as STM. He is looking for ways to initiate more new VHF traffic and training nets. In the same way, Rudy, WA4PUP, is looking for editors of newsletters and other public info people for appointment as his public information assistants. Congrats to the group in Jacksonville on the excellent job they did on holding one of the first volunteer exams sessions in Florida, and to Pete W4PTT for heading up that tough job. The number of SARs received is surely gratifying, so keep up the good work as the number of reports — net volume of messages — is the figure used to represent our public service efforts to the FCC. Keep sending reports on your efforts to solve CATVI problems to ARRL Hq., as the FCC denied our request to have them vacate 145.25. Maybe the joint group of ARRL, FCC and Cable Industry members can help. Traffic: N4PL 591, WF4X 521, WA4QXT 319, WF4Y 312, WB4ADL 235, WB4GHU 184, WA4EYU 172, N4EDH 164, KC4VK 158, KB4LB 144, KB9LT 132, WD4IIO 123, WX4H 112, K4VND 104, WB4TZR 101, W4GUJ 87, WX4J 82, N4GMU 72, WD4IUI 70, WB4YQP 69, KD4KK 59, WD4MLQ 52, N4ADI 43, WB4HBP 43, N4JAQ 34, W4DTV 31, NS4C 27, NF4O 20, NQ4P 19, KB4HI 15, WB4FJY 13, W8IM 13, N4CIJ 12, WB4AWG 7, KF4GY 6, NA4F 4, WD4EQB 2. (June) KF4U 27.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK — SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WA4EIC. ACC: AA4WJ. PIO: W4WYR. SGL: KC4N. OO/RFI: W4SS. WA4EIC reports total bulletin activity of 238 bulletins received and transmitted this month. Bulletin stations reporting were: WA4EIC 58, WD4KBW 16, AA4MI 37, K4IEK 17, W4DL 48, WT4F 38, AA4BN 14, W4ESH 10. N2WX said that the Brevard Packet Roundtable meets Sundays 2000 local in voice on 147.06, up 600. K4ZK stated that during their emergency excercise July 30 that the Martin Co. EOC was connected by Packet Radio to the National Hurricane Center in Miami. They were also connected to the EOC in Miami, West Palm Beach and St. Lucie Co. as well as to digipeater in Melbourne for a first time history making event. He said that Red Cross and county officials were very impressed by the demonstration. KA4BBA reports that she is now in Air Force MARS. W4MPV said he served as NCS four times for the SWFTN. W4JM hopes that the Lakeland RC will be holding exams by Thanksgiving. The Florida Repeater Council met in Jacksonville at the hamfest in early August. Elections were held, and the following were elected: VE3DGV, pres.; W4CF, v.p.; N4BBZ, treas. Frequency coordinators are WB4ILH and WA4QQR. Noted that WD4AWN AA4BN and W4VF worked the CW portion of the ARRL QSO Party — W4VF was also on the phone portion along with W4JM. The recent list of affiliated clubs lists Central Florida Cypress Chapt, Platinum Coast ARS, American RC, Fellowship ARC, North Dade Repeater, West Palm Beach ARC, Martin Co. ARS, Metropolitan RA, Sarasota ARS, Cape Kennedy Area ARC, Indian River ARC, Hollywood ARC, Dade Radio Club, Broward ARC, IBM ARC of Boca Raton, Manatee ARC, South Hillsborough ARC, Brandon ARS, Space Center ARS, Brevard RA, Key West ARC, Radio Club De Cuba Exile, Tamarac ARA, Fort Pierce RC, Clearwater ARS, Sun City Center ARC, Tamiami RC, Florida Institute of Tech ARS, Vero Beach ARC, Pompano Beach ARA, South Florida DX Assn., Palm Beach AR Council, St. Lucie RA, Winterset RC of Florida, Sarasota Emergency RC and Tampa ARC. 73 de WA4PFK. Traffic: W3CUL 3356, W3VR 870, WA4PFK 352, K4ZK 320, K4IA 266, K4SCL 243, WB4WYG 171, KA4GUS 168, WA4EIC 158, K4EUK 145, KA4AMC 126, W4DL 101, KJ3T 81, WB4AID 74, AF3S 62, W4DVO 58, WD4KBW 56, W4ESH 54, KF4RL 53, W3TLV 45, KA4NXF 42, AA4MI 37, KA4BBA 36, N2WX 35, KA4FZI 35, KB4KB 34, NJ4O 32, W4PKP 31, K5IHH 31, K4JI 30, KF4JA 29, K4FQS 27, AA4BN 25, W3IJR 23, W4SS 23, WD4CHO 20, KA4YHS 20, KF4AX 19, N4ILN 14, K4FQU 14, K4IRT 12, W4WYR 12, WT4F 12, KA9AKY 10, WK4F 10, WV4F 10, KA4SIH 9, K7LCA 7, K4VSN 7, K4JLL 7, WD4MCC 5, KA4KDD 5, W4MFD 5, W4MPV 5, WO4D 4, WB8SNT 4, KE4O 4, KA4RWV 3, KM4G 3, KD4GR 3, KA4GDU 3, KB4ABT 2, NX4X 2, K4KKP 1, KA4EBO 1. (June) N2WX 27.

WEST INDIES: SM, Gregorio Nieves, KP4EW— West Indies Net Slow (WINS) daily 7 P.M. (2300 UTC) on 3,710

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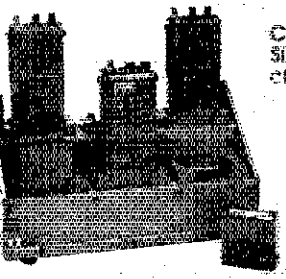

CM-60 Six-position charger

Scanning systems are priority scan, memory scan and programmable band scan. Increments of 5, 10, 15, 20 or 25KHz are front panel selectable for band scan.

Keyboard entry with the 16-button pad allows easy access to all frequencies, duplex modes, memories, scanning, dial lock, PL tones, priority and DTMF.

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Accessories for the IC-02AT and IC-04AT include all accessories for the IC-2A series plus the new long-life IC-BP8 and high power (13.2 volt) IC-BP7 battery packs, HS-10 boom headset, HS-10SA VOX unit, HS-10SB PTT switchbox and CM-60 six-position charger.

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See the IC-02AT and IC-04AT handhelds at your nearest ICOM dealer.

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Standard Features. FM, FL-44A 455KHz high-grade SSB filter, SSB, and FM squelch, built-in marker unit, convenient large controls, a new high-visibility fluorescent display and HM-12 Hand Mic.

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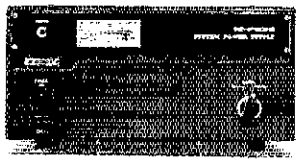

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The IC-PS30 25 Amp Switching Power Supply consolidates your power requirements by supplying up to four pieces of ICOM equipment, eliminating the need for independent AC power supplies for each. The IC-PS30 is designed to match all of ICOM's amateur equipment.

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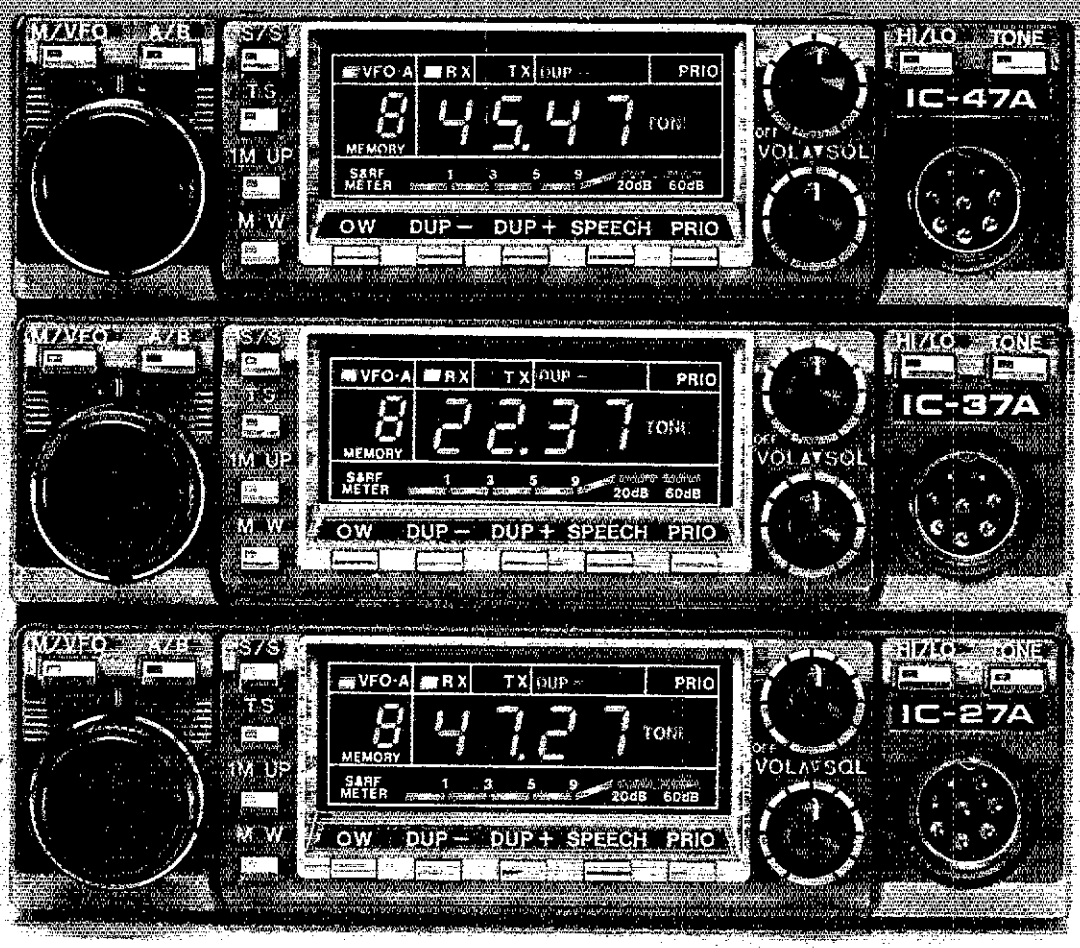

IC-47A
440MHz
25 Watts

IC-37A
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2 Meter
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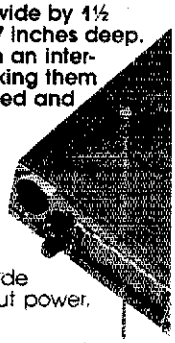
ICOM presents three ultra compact mobiles..the IC-27A 2meter, the IC-37A 220MHz and the IC-47A 440MHz. The smallest mobiles available, the IC-27A/37A/47A series measure only 5½ inches wide by 1½ inches high by 7 inches deep. Yet, they contain an internal speaker making them fully self-contained and easy to mount.

25 Watts. In each an incredibly small package, the IC-27A/37A/47A are able to provide 25 watts of output power.



Internal Speaker

32 PL Frequencies. The IC-27A/37A/47A come complete with 32 PL frequencies ready to go. Each PL frequency may be selected by the main tuning knob and stored into memory for easy access along with frequency.

9 Memories. The IC-27A/37A/47A have 9 memories available to store receive frequency, transmit offset, offset direction, and PL tone. Memories are backed up by a lithium backup battery, which will store memories for up to seven years.

Speech Synthesizer. As an added plus, the IC-27A/37A/47A feature an optional speech synthesizer to verbally announce the receiver frequency of the transceiver through the simple push of a button. This allows the operator to hear which frequency he is operating on without looking at the transceiver.

Scanning. The IC-27A/37A/47A series has a scanning system which allows scanning of memories or scanning of the band.

Priority Scan. Priority may be selected to be either a memory channel or a VFO channel. By using sampling techniques, the operator can determine if a frequency which he wants to use is free or busy.

Microphone. Each IC-27A/37A/47A comes complete with a microphone with a 16-button pad for access to your favorite repeater or for dialing through an autopatch.

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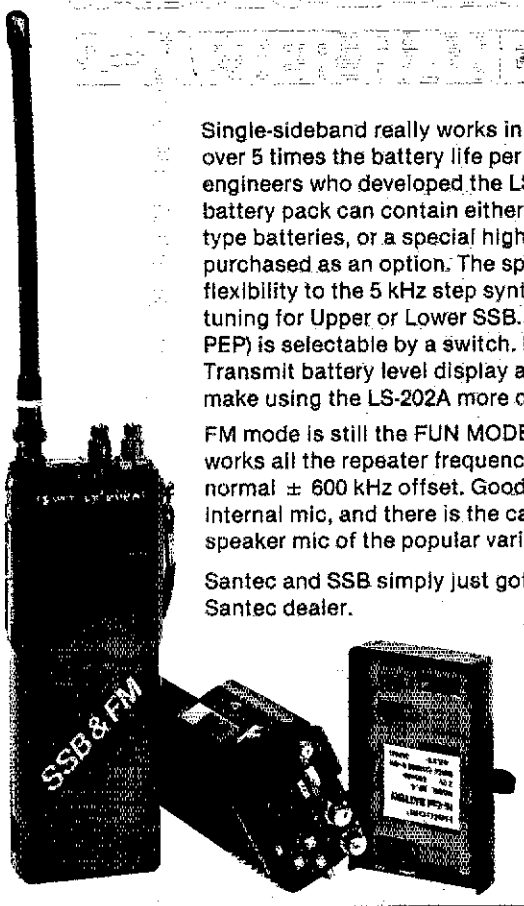

Single-sideband really works in nonrepeater situations and has over 5 times the battery life per battery charge according to the engineers who developed the LS-202A. The slide-on, locking battery pack can contain either Ni-Cd 'AA' cells or 'AA' alkaline-type batteries, or a special higher voltage Ni-Cd pack can be purchased as an option. The special VXO and RIT circuits add flexibility to the 5 kHz step synthesizer to provide continuous tuning for Upper or Lower SSB. High (2.5 W PEP) or Low (0.5 W PEP) is selectable by a switch. Lighted receive 'S-Meter' with Transmit battery level display and thumb-wheel switch lighting make using the LS-202A more comfortable.

FM mode is still the FUN MODE to many people, and the LS-202A works all the repeater frequencies from 144 to 148 MHz with the normal ± 600 kHz offset. Good, crisp audio comes from the internal mic, and there is the capability of using an external speaker mic of the popular variety.

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SPECIFICATIONS	SSB/FM
Freq. Range	144.000–147.995 MHz
Synthesizer	5 kHz Steps + VXO
Modes	USB (A3J), LSB (A3J), FM
Voltage Range	6–12 VDC
Current Drain	30 mA RX Standby 750 mA TX Peak
Power Output	2.5 W PEP (9 V) 3.5 W PEP (10.8 V)
Receiver Bandwidth	2.4 kHz (– 6 dB) SSB 15 kHz (– 6 dB) FM
Sensitivity	0.25 uV (12 dB S/N) SINAD
IF Frequencies	10.695 MHz SSB, 10.695 MHz and 0.455 MHz FM
Spurious	– 60 dB

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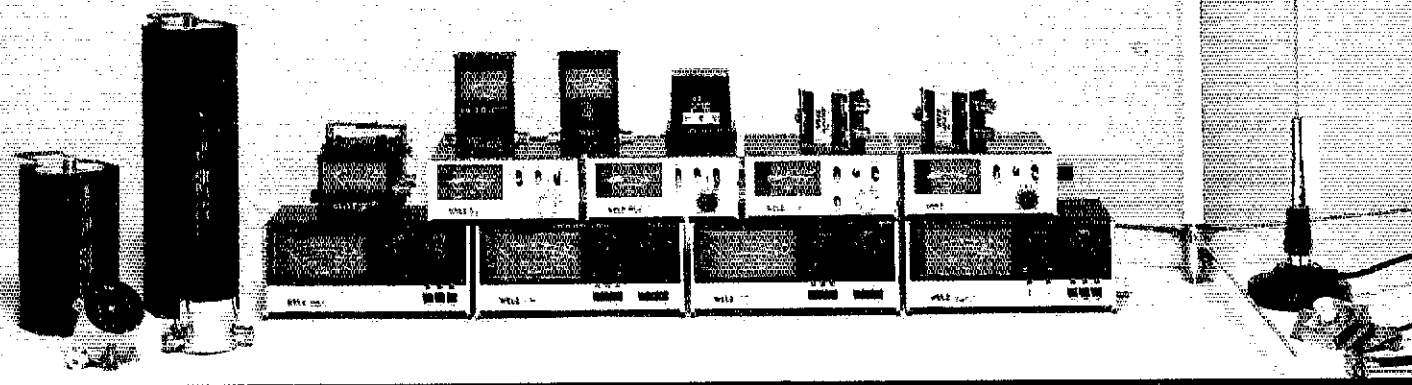
THE WELZ CORPORATION LINE OF STATION ACCESSORIES

WELZ specializes in WATTS. Measuring Watts and switching Watts, radiating Watts and dissipating Watts is what the WELZ line of winners is all about. Welz is the source for top quality, superior performing, affordable products to compliment your mainframe radio equipment from any source. Increase the versatility of your measuring capability with WELZ WIDE-Z Sensor (TM) power and V.S.W.R. meters, precision 50 ohm terminations. Conserve your coax dollars with the dual band Diamond Antennas for 144/430–440 MHz for base and mobile applications. Welz dual band duplexers let you feed two antennas on two different bands with one feed line with no switching or two transmitters onto one dual band antenna simultaneously. WELZ has wattmeters and V.S.W.R. bridges from 200 mW to 2000 Watts from 500 kHz to 500 MHz frequency range. When you need to measure in RF Watts WELZ has a winner for you. The full line of Wattmeters encompasses many different models, some of which are shown in this family portrait. In addition to both in-line and terminating type wattmeters the WELZ line of Winners includes several high quality dummy loads for testing and tuning plus applications requiring precision 50 Ohm terminations. Frequency ranges of the WELZ loads are typically wider than similarly priced items from other sources. WELZ has winners in the economy circle also. The performance value of the economy line of Wattmeters from WELZ is really superior. The instruments from WELZ are extremely well built and very easy to view. The portable units such as the SP-10x and the SP-380 provide reliable service in the field as well as in the fixed station. Send QSL type card for complete catalog of WELZ products.



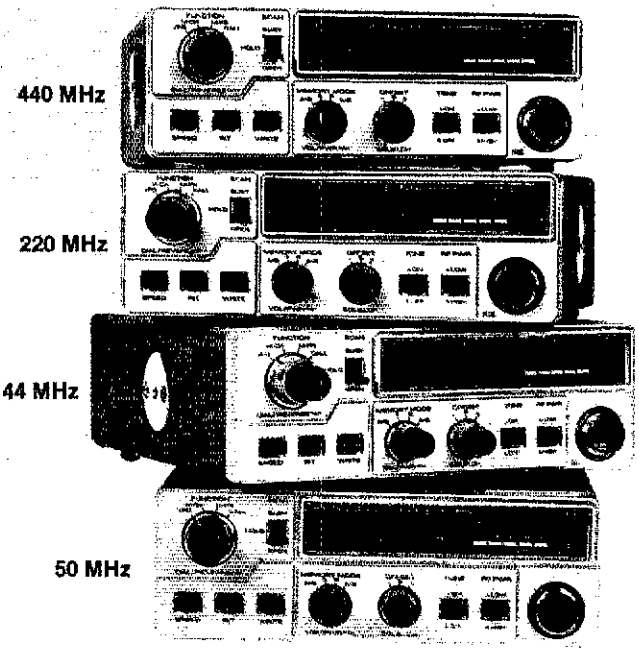
MOBILE RADIOS

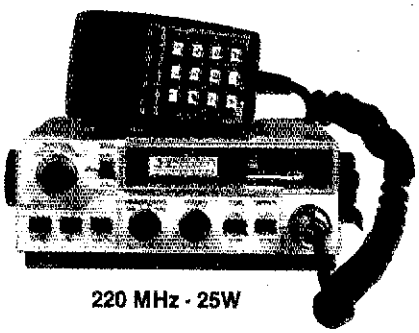
Quality Value Performance

KDK presents THREE NEW MODELS to join the FM-2033. Now ONLY KDK has One model for each of the amateur bands from 50 MHz to 440 MHz. The FM-6033 for 50 MHz is an FM radio for the 6-meter FM enthusiast. The FM-4033 is the 220 MHz radio just about everybody has been waiting for, and the FM-7033 is the 440 MHz UHF band model. All of these fine radios are models of simplicity of operation. One-hand single-knob tuning and memory recall provide the most convenient method of operating FM mobile. All models have automatic recall of the repeater offset from memory, subaudible tone encoders standard, small size for easy mounting (but big enough to be comfortable to use). The KDK FM-2033 (2M) and FM-4033 (220 MHz) are both a full 25 watts output. The FM-6033 (6M) and FM-7033 (440 MHz) are 10+ watts output. KDK radios are the most value-packed line of FM mobiles around. See your local KDK dealer and compare price and performance. You will be very glad you bought a KDK.

KDK

MAXPAC STACK





220 MHz - 25W

NOW ALL KDK MODELS HAVE THE ENCOMM TWO-YEAR EXTENDED SERVICE PERIOD IN ADDITION TO THE 90-DAY LIMITED WARRANTY.

THL CORP.

AMPLIFIERS • PREAMPS • COUPLERS

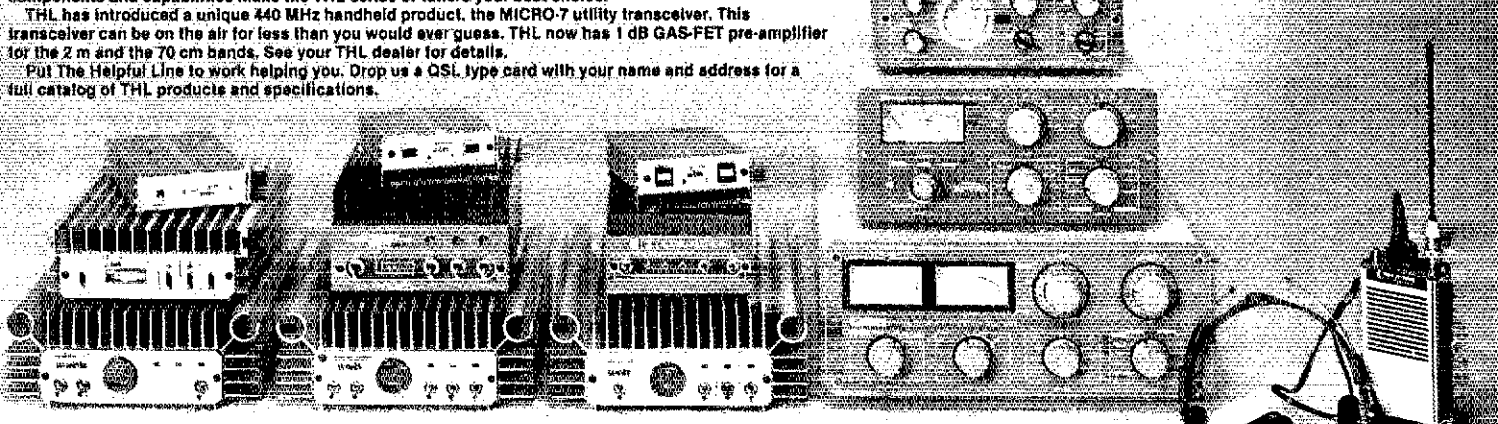
The helpful line of handsome products.

The THL line of amplifiers, pre-amps, antenna couplers and transceivers provides a broad line of solutions to help solve life's problems of needing "just a little more." Whatever it might be, look to THL helpful products to aid in solving the problem. THL can make your signal stronger, your receiving better and can make your HF transmitter happier with the match to the antenna. THL amplifies to a level of 160 Watts on VHF and 90 Watts on UHF. Using THL amplifiers, handy radios can talk like mobiles with low power input models which provide 30, 100 or 160 Watts of output. Models for 10-14 Watts input power or 25 Watt output mobiles are available.

The THL line of antenna couplers provides fine quality hand crafted antenna matching networks for both low power applications and larger power amplifiers running the legal limit. The THL antenna coupler series has full features like built-in antenna switching for changing antennas or by-passing the coupler and an accurate V.S.W.R./power output indicator on all models. Sturdy construction and honestly rated components and capabilities make the THL series of tuners your best choice.

THL has introduced a unique 440 MHz handheld product, the MICRO-7 utility transceiver. This transceiver can be on the air for less than you would ever guess. THL now has 1 dB GAS-FET pre-amplifier for the 2 m and the 70 cm bands. See your THL dealer for details.

Put The Helpful Line to work helping you. Drop us a QSL type card with your name and address for a full catalog of THL products and specifications.

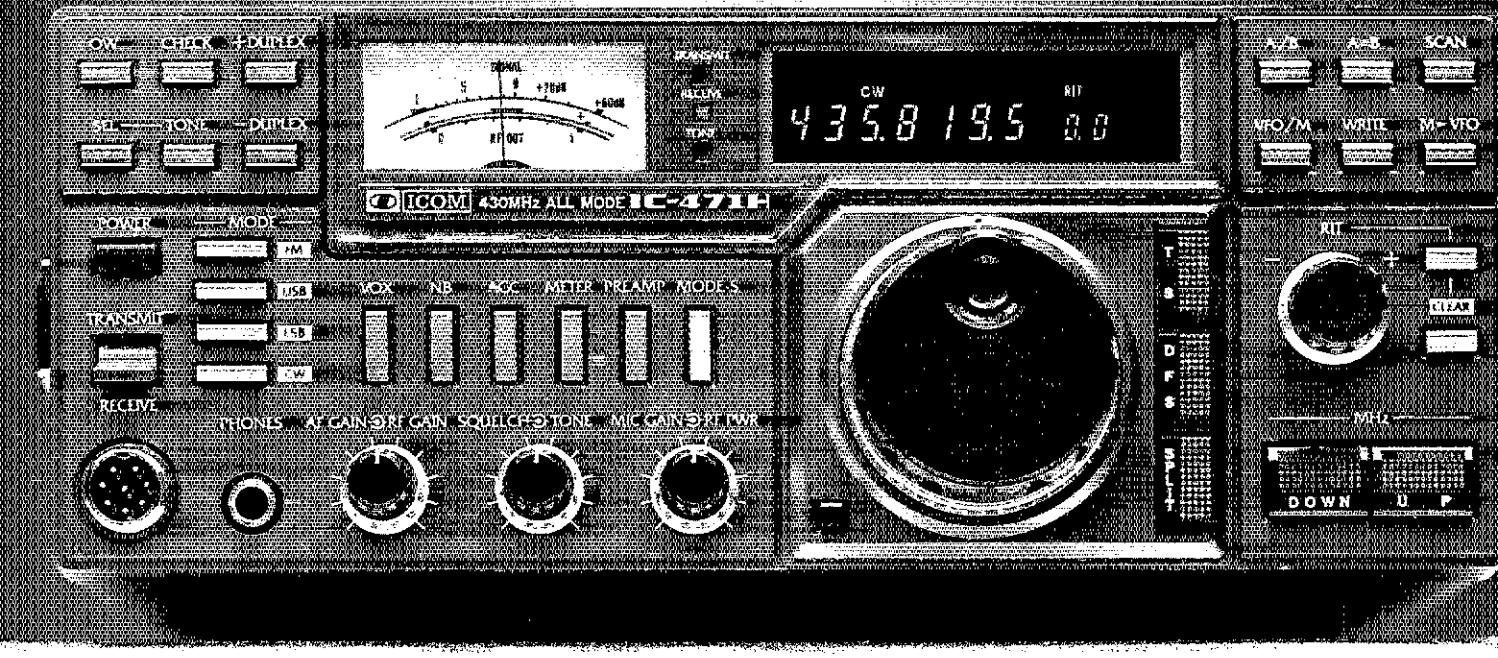


Bottom row: HL-160V25 25W in 150W out 2m • HL-160V - 3 or 10W in for 160W out 2m • HL-90U 10W in 90W out UHF • HC-2000 2KW antenna tuner • Second Row: HL-110 3 or 10W in 100W out 2m • HL-82V 10 in 80W out 2m • HL-45U 10W in 45W out UHF • HC-400 200W antenna tuner and VSWR Power Meter • Third Row: HL-30V economy HT amp 3W in 30W out 2m • HL-32V 3W in 15 or 30W out 2m SSB or FM portables • HL-200 ,2 or 3W in 20W out UHF • HC-200 the Economy-With-Quality HF antenna tuner. An HRA2 GAS-FET preamp sits atop the HC-200 • Also shown is the MICRO-7 Utility UHF transceiver and headset.

ENCOMM
2000 Avenue G, Suite 800, Plano, Texas 75074
Phone (214) 423-0024 TLX 79-4783 ENCOMM DAL

ICOM IC-471H

75 Watt 430-450MHz Base



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

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

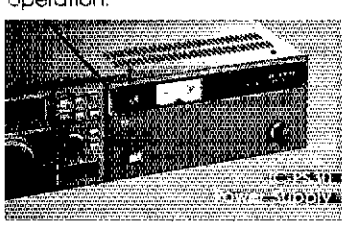
Receiver. An extremely low-noise, professional-grade receiver and a high signal-to-noise ratio PLL which allows the IC-471's synthesizer to lock to 10Hz, provide receiver performance unparalleled by other UHF receivers. A mast-mounted preamp is switchable from the front panel and provides an easy-to-use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

Mast-Mounted Preamplifier

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

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

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

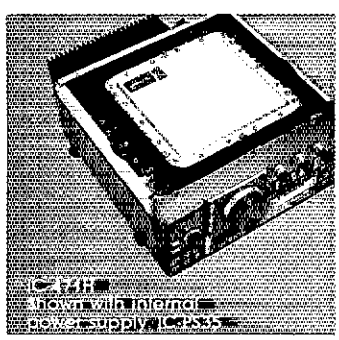


Scanning. The IC-471H can scan its 32 memories sequentially or selectively by mode and by programmed sections of the band. Mode-S scan can be used to scan only memories with a particular mode.

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

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

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



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

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

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

ICOM

The World System

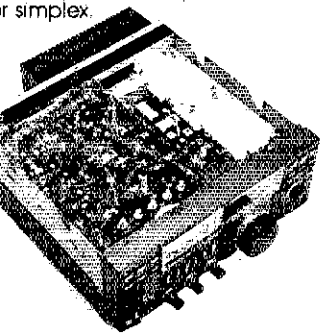
ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234

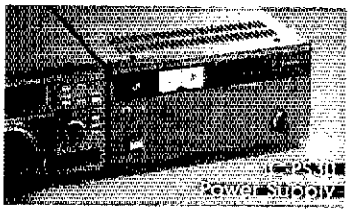
IC-271H

Now a 100 Watt, 2 Meter Base!

For the ultimate in two-meter communications, ICOM presents the IC-271H transceiver with a high dynamic range receiver and a 100 watt transmitter. Operating from the IC-PS30, IC-PS15, or the internal IC-PS35 (optional), the IC-271H brings all the advanced functions of the latest CPU controlled radios to your shack.

100 Watts. Now a two-meter base station with 100 watts of internal power! The IC-271H provides all the power required for operation from remote places to repeaters, or for simplex.





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

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

PLL Locked at 10Hz. An extremely low-noise, professional receiver and a good signal-to-noise ratio PLL allows the IC-271H's synthesizer to lock to 10Hz providing receiver performance unparalleled by any other VHF receiver.

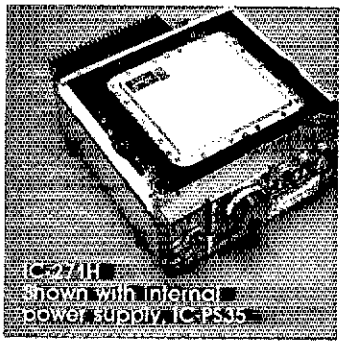
Fluorescent Display. ICOM's high-visibility, multicolor display gives easy-to-read display of all information necessary for logging a contact. Frequency, mode, duplex, offset direction, RIT frequency, memory channel and PL tone can be displayed.

Scanning. The IC-271H can scan memories and programmed sections of the band or modes. Mode-S scan can be used to scan only memories with a particular mode or lock out frequencies continuously busy so the receiver will not stop at that memory channel while scanning.

Other Standard Features. To facilitate the operation of the IC-271H, ICOM has incorporated a duplex check switch, all-mode squelch, receive audio tone control, S-meter, center meter, seven-year lithium battery memory backup, accessory connector and microphone.

Optional Features. IC-271H options are: switchable preamplifier, CTCSS encoder/decoder (encoder is standard), computer interface and voice synthesizer.

Size. Only 11¼ inches wide by 4⅜ inches high, the IC-271H is styled to look good and engineered for ease of operation.



The IC-271A. The IC-271A with 25 watt output is available and has the same features as the IC-271H, plus an optional IC-PS25 internal power supply to make it a compact, go-anywhere two-meter base station. See the IC-271A(H) and other fine ICOM equipment at your ICOM dealer today.

ICOM

The World System

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

MHz, West Indies Net Central (WINC) daily 6:30 P.M. (2250 UTC), West Indies Net Borinquen (WINB) on 3.930 MHz. LSB (2250 UTC). The Desecheo Island DX-pedition was made as planned except with some changes in the operation schedule. The operation was a success and more that 7,000 contacts were made. The group arrived on the island on Sunday morning and began operations at approximately 0400 UTC, Monday, July 23. Their operating time was limited by unstable propagation, which sometimes kept them inactive for some hours. Finally they received some warning from the Coast Guard of a tropical disturbance being formed south in the Caribbean. The operation was shut down on Wednesday evening, and they left the island about noon Thursday, leaving some of the tents and equipment which the boat picked up the next day. They had some poles bent and tent damage because of heavy winds and tides and some dizziness on the way back, but they enjoyed a wonderful experience and the satisfaction of a job well done. The group was finally composed of NP4Z HI3RST/KP4 NP4KA WP4D NP4C KP4HC and WP4ATF. Congrats to all of you. The PRARC will be celebrating its annual convention on the weekend of Sept. 28-30 at the Copa Marina Hotel at Guanica, PR. KP4DJ reports the following totals for WINS: QND 57. QNI 14 4 in 5 sessions. KP4DJ was enjoying a very deserved vacation in New Jersey from the 6th to the 25th of July. Traffic: KP4DJ 14.

SOUTHWESTERN DIVISION

ARIZONA: SM, Erich J. Holzer, N7EH — STM: W7EP. NMs: WA7FDN WA7KQE K6LL. ACC: N7ECE. Well the highlight for July was another fine ARCA sponsored hamfest at Ft. Tuthill. Many thanks to SW Division Director WA6WZO for attending along with SM WA6WZN of the Orange Section and W5PDY, SM of New Mexico Section. I would like to extend my congratulations to "Mac" K7CET on being awarded the prestigious Arizona Ham of the Year award. I would also like to extend congratulations to the following winners of special service awards: KB7JM KC7AQ K7KYW K7SEC K7HQF W7WGW KA7DTT WA6HRX WA6III N7DEU KD7DX K7VCI. Special thanks go to K7SP for being the ramrod behind the volunteer exams that were given at Ft. Tuthill. Indeed it was a very professional job. Well, pretty soon the vacation season will be over and amateur public service will again start to increase as the daily temps. go down. Congrats are in order for the Green Valley ARC on becoming the first Special Service Club in the section. KA7JLV has been appointed EC for the Kingman area. N7BUL participated in a mine shaft search. W7KAX assisted in locating a downed aircraft. It is with regret I report WB7RSU ass Silent Key. PSHR: KB7FE. SWN: QNI 205, QTC 190. ATEN: QNI 780, QTC 190. Traffic: KB7FE 248, W7EP 166, K6LL 165, W7KCM 118, W7AMM 62, WA7KQE 35, K7NMQ 20, KA7HEV 14, W7KXE 14, K7POF 7, K7JKM 6, WA7NXL 4.

LOS ANGELES: SM, John Walsh, N6UK — STM: W6INH. SEC: N6ZH. ACC: NF6D. At this writing, the Summer Olympics in Los Angeles have become a part of history. Amateur support was extensive and will be reported in detail when it's all over. KF6E coordinated FCC exams at the Tricounty ARC Hamfest on 4 August. KF6E was wed following the administering of more than 80 exams. NG6AO, the official Olympic station at UCLA was heard roving among the Social repeaters in addition to the HF activities. The station was operated from July 14 to August 15 with more than 7500 QSO's and over 100 messages to various countries. Forty operators kept the station on the air 12 hours each day. Notable among the participants were K6LAE, Station Manager; N6VI, Chairman of the Executive Committee; WB6UIA, Traffic Manager; and W6EJJ, ARRL Rep and International Liaison. Visitors to the station included Shozo Hara, JA1AN, President of JARL and Bill Lippman, W6SN, Trustee for W6USA, the amateur station at the Olympic village in 1932. Seven operators from Long Beach area - KD6BX K6PQZ N6EHC N6EHB WA6SZK and AK6Y - escorted the Olympic torch from Long Beach to Westwood. There were 235 operators over a period of 7 days providing communications for the support and management vessels in the Olympic Sailing venue. The Queen Mary and the Olympic Sailing Venue issued a special commemorative Olympic card from 4 August to 12 August with about 800 contacts. On 25 August KE6B coordinated a 26-mile triathlon. Also on the 25th the ARALB sponsored a booth and communications for a 10K run celebrating the 60th birthday for the city of Signal Hill. News from the traffic gang is that N6DZQ has had to reduce his operating time due to XYL being in hospital. K6UYK made BPL again - Ted is very active and sure tops the list for BPL. Chapter 130 of the QCWA had a picnic recently, attended by a large crowd, celebrating their 200th meeting on the air. W6PHE now has new QTH and is getting up new antennas. Would like more reports fellows. Traffic nets are slow now due to summer vacations, but the SCN gang is still in there punching it out. Congrats! Traffic: K6UYK 644, K6YBV 344, W6INH 278, KT6D 117, WA6COM 116, W6NKE 18, K6CL 17, W6ORF 4. (June) K6UYK 643, K6YBV 370, W6INH 216, KT6D 53, K6CL 11, W6ORF 2, N6DZQ 2.

ORANGE: SM, Sandra Heyn, WA6WZN — SEC: W6UBQ. STM: WA6QCA. ACC: KA6NLY. BM: W6DXL. OO/RFI Coord: W6RE. PIO: NS6W. SGL: N6HIQ. TC: AA6DD. DECs (by countries): WB6JBI (Orange); W6LKN (Riverside); WA6IKH (San Bernardino); KA6HII (Inyo). Don't forget the ARRL Southwestern Division to be held Oct. 12-14 in Santa Maria headed by chairman WB6HJW, Santa Barbara SM. We will have a open meeting for the section leadership immediately following and in the same room as the ARRL Forum on Saturday. The Simulated Emergency Test (SET) will be conducted starting the morning of Oct. 20th, in which the main scenario will be based on a volcano. If you would like to take an active part in preparing for the SET, contact your DEC or EC. At least send a message by NTS to me (SM) of your participation. Last year we were first in California; lets do it again. Club office — Citrus Belt Citrus Belt ARC (C-Bar-C): KE6HR, pres.; WB6OGL, v.p.; WA6TRI, secy.; WB6MQQ, treas. The new traffic net California Novice Net (CNN), managed by KA6JGF, needs your support. They meet on 3740 kHz 7:30 P.M. daily. All clubs are encouraged to be a representative check into the Club to Club Net each Wed 7:30 P.M. on 147.705 (-600). WA6MFS and WA6ZUF were interviewed by the Red Baron of the breakfast show on KCHV 93.7 FM. Bishop ARC have been asked by the National Weather Service to provide support communications. Because of the resignation of WA6LVO, K6UYK has taken interim net manager of Daytime Region Net 6 (DRN 6). N6IHQ has started new RTTY net on 145.70 MHz simplex, held 8 P.M. Thurs. WB6ZIR/R operates RTTY 145.12 (-600) MHz in Crestline with link on 224.72 (-1.6) MHz on Palos Verdes. Their nets are 8 P.M. Mon. (ARES), 7 P.M. Tues. (pictures), 8 P.M. Wed. (ASCII), and daily nets at 9 A.M. (traffic) and 6 P.M. (ARRL bulletins). So. Counties Amateur Teleprinters Society

Cards and plaque courtesy W6TC

EIMAC's new DX champion! The 3CX800A7.

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

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

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

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

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

varian

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.

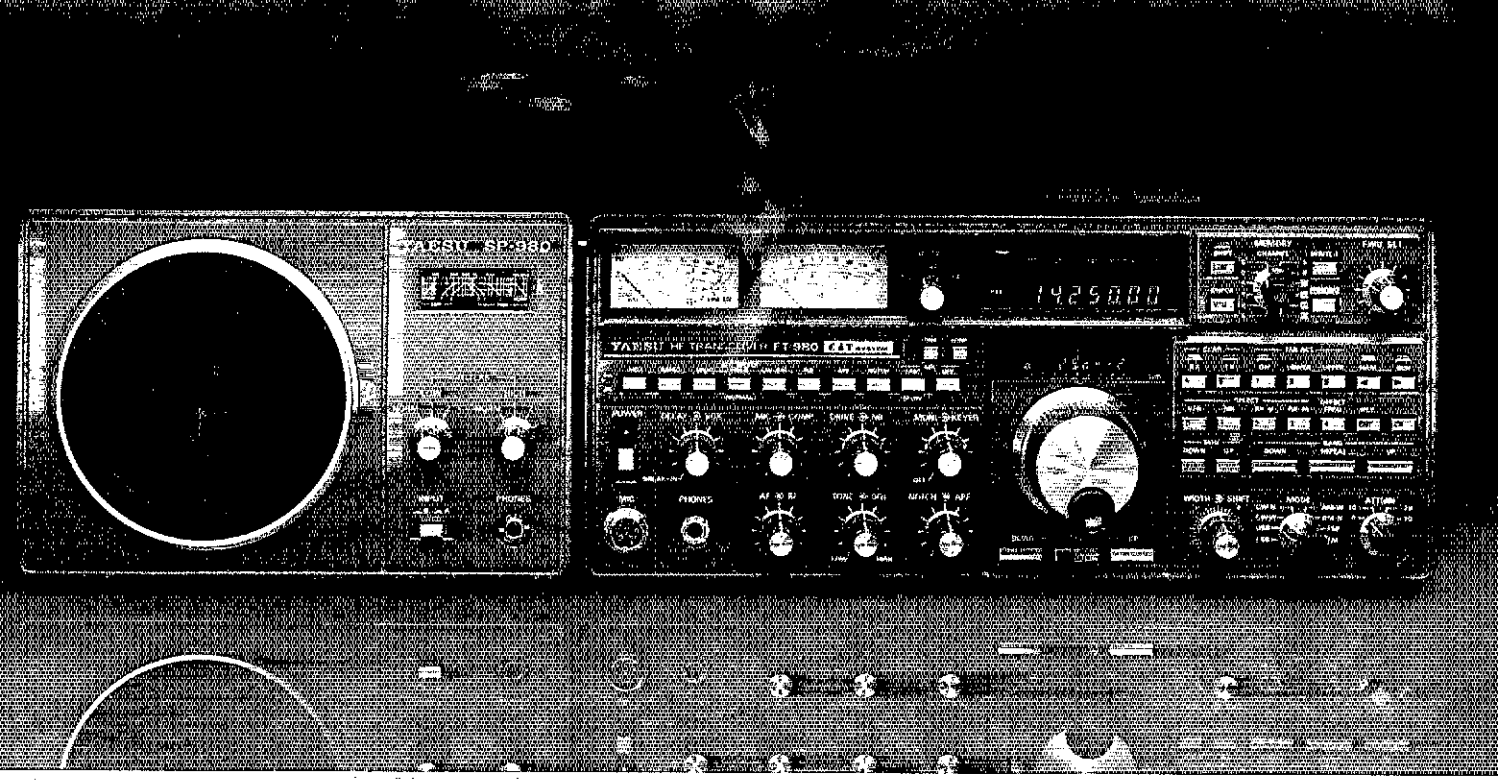
For base-station use, the space-saving FP-757GX flatpack power supply shown in the photo is ideal. With this supply, the rig delivers 100 watts output on sideband, FM and CW.

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.

(SCATS) maintains RTTY repeaters on 146.7 (-600) and 224.76 (-1.6) with nets conducted 8 P.M. Tues. (pictures) and 8 P.M. Wed. (information). The Queen Mary will have special QSL cards for WB4RO, and St. Judes Rehab radio station will have special QSL cards for club station call WD84BPT. Thanks to all who helped with the Olympics that included support of the Torch Run, UCLA Olympic Village Station (NG840), LA Police Dept., Red Cross, and various events including the yacht races. PSHR: WB8QBZ KA6BNW WB6TIF W6NTN WA6QCA KA6HJK/T.

Net	Freq	Time	QNI	QCT	NM
SCN/1 (20+)	3598	7 P.M.	322	245	AI6E
SCN/2 (13–)	3598	8:15 P.M.	319	83	AI6E
SCN/V (FM)	146.645	9 P.M.	556	434	WA6QCA
RTTY/VHF	145.12	9 P.M.	464	69	KA6HJK

Traffic: WB6QBZ 226, W6CPB 173, WA6QCA 151, AD0A 112, KA6BNW 111, WB6TIF 89, W6RE 89, AI6E 76, K6GGS 72, N6GOT 70, K6DD 70, KA6HJK 58, W6NTN 40, K6ZCE 27, KA6HMS 4, WA6WZO 2.

SAN DIEGO: SM, Arthur R. Smith, W6INI — STM: N6GW. SEC: W6INI. PIO: WA6CUP. ACC: WA6COE. TC: N6NR. BM: WA6HJJ. Eighteen members of the Coronado Police ARES and South Bay ARS assisted the City of Coronado with communications during its annual Fourth of July parade, air sea show and fireworks. An immediate police and ambulance response to a serious traffic accident resulted when witnessed by KB6ZT and reported to Asst EC N6ATV who was accompanying the police watch commander. The success of the Fairbanks Rance Olympics Equestrian Endurance event, on Aug. 1, was owing largely to 80 Amateur Radio operators and 20 non-amateurs. The operation was coordinated by WA2NNT. WA6QQQ provided valuable technical assistance ensuring compatibility of six nets terminating at the control center. Operators were stationed at 33 course obstacles, with 17 medical teams, Life Flite help, accompanied 18 officials and staffed the control center. Two 2-meter, one 220, one 450 and 2 commercial (non-amateur) nets were integrated into the emergency medical system. New ARES members: KB6FDE KA6GDY N6JFV N6JUA N6KHQ K6MBN KF6NW KA6RUX KA6TJJ. Traffic: KT6A 569, KU6D 140, KB6AI 120, N6AT 75, N6GW 15, KF6TF 14, WA6IIK 4.

SANTA BARBARA: SM, Ernest L. Kapphahn, WB6HJW — Oct. 12 - 14 are the dates for the Southwestern Division convention at Santa Maria. Exhibits will be open on Saturday from 9 to 5 and on Sunday from 9 to 1. The banquet will be held at 1:30 Sunday. ARRL President Larry Price will participate in the ARRL Forum. FCC exams will be given. See you there. New address for SM: 14715 Morningside Dr., Atascadero CA 94322. W6POE sends bulletins on 146.28/.88 TU 1900, Wed 0900, TH 1800 L (Ventura area). Short column this time owing to moving and convention. Will catch up next month. 73.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC — ASM/ACC: NI5V. STM: AE5I. SEC: W5GPO. BM: W5QXK. OO/RFI: WB5JBP. SGL: W5UXP. PIO: N5FDL. I am sorry to report the Silent Keys of two very fine and dedicated amateurs in our Section. John Haerle, WB5IIR, Technical Coordinator for our Section, was tragically killed in an auto accident while returning home from a Dallas ARC meeting where he had represented the League as guest speaker for the evening, with a talk on one of his favorite subjects, antennas. John had just completed a book on this and other subjects, and it should be available soon. It should be a part of every amateur's technical library. John left us a legacy of mammoth proportions. His accomplishments in the field of electronics and his service to his fellow amateur would fill volumes if documented. He was an "Elmer" to literally thousands, and a cherished friend to us all. Bruce M. Bartee, WA5BHF, known to us all as "Bo" passed away Aug. 6th, in Hamilton. Bo was a regular on many traffic nets, and a dedicated public servant. I cannot think of a time when a communications emergency occurred in this section in my lifetime when Bo was not there to assist. We will deeply miss them both. A wise man once said: a truly great man is remembered not for what he has received, but for what he has given. Traffic: KD5RC 270, N5BT 229, N5GRZ 142, WB5CIC 105, AE5I 98, KD5FR 90, W5QU 90, KA5AZK 84, WA5EZT 18, N5GKF 7, N5EZM 6, K5PC 5.

OKLAHOMA: SM, Ray Miller, W5REC — SEC: W5ZTN. STM: KV5X. ACC: K5CAY. BM: W5AS: PIP: NJ5Y. SGL: W5NZS. TC: W5QMJ. *Lawton Constitution* paper featured the work of KA5HQL. KA5STB won the ARRL gift at ham holiday for youngest Novice and W5HXL featured on TV spot news. NF5H commended by NCS for his work on Public Switch Network. KB5EK was awarded the Director's Plaque at the ARRL OK State Convention and Director Wanger, W5EDZ, received a "Thank You" Plaque at the ARRL OK State Convention and Director Wangler, W5EDZ, received a "Thank You" plaque from the OK Section. W5QMJ, Tech. Coordinator, is open for suggestions to beter serve our technical needs. W5KY honored at dedication of the John Zink International Research Center. WD5IFB's Spot News Story "CQ from Outer Space" won 2nd place in the UPI Region Southwest Broadcast Contest. All Emergency Coordinators should be getting their ARES Members ready for drill training to handle winter storms. SEPT. 30 DEADLINE for Amateur Call Auto Plate application. Congrats to WA8KPY for winning November QST Cover Award! Traffic: K5CXP 294; W5AS 247; WB5OHK 152; W5RB 137; KV5X 110, KB5EK 94; KI5P 90, W5REC 90; WA5OUV 77; WD5IFB 71; WA5IMO 64; W5VXU 60; NQ5W 43; S5SUG 34; K5CAY 27; WA5OGC 27; W5VLW 26; W5VOR 26; NG5G 24; WD5JCE 24; KC5OU 21; W5FW 19; K5GBN 12; W5UYH 6; K5ENA 5; W5JJ 2.

SOUTHERN TEXAS: SM, Arthur R. Ross, W5KR — ASM: N5TC. SEC: KA5KRI. STM: K5QEW. BPL: WB5YDD. OOs reporting: KD5L W5VRF. As noted above, KA5KRI has been appointed SEC for STX; ECs and others direct reports and inquiries to him at *Callbook* address. KA5PEX reports Guadalupe Valley RA Emergency Net in regular operation: first Sundays, 1500 local time. It's also included in Seguin PD communications plan. DRN5 Mgr WB5YDD reports Southern Texas represented 100% by N5AMH W5KLV WB5EPA WB5FQU K5SV N5DFO W5CTZ KD5KQ W5URN N5CRU K5OWK N5EFG WB5YDD. Beaumont ARC Bulletin (BARN) reports the club will take part in the annual Gladys City Boom Days celebration of the Spindletop oil boom. Houston ARC has arranged with National Weather Service for a SKYWARN class; all area clubs have been invited. CAND Mgr W5KLV reports DRN5 represented in Texas 100%; Southern Texas stations were WB5FQU KD5KQ W5KLV N5EFG N5DFO N5CRU WB5YDD. K5SV reports Comal Co. Emergency Net operating in the New Braunfels area on 147.75/.15. Hill Country ARC (Kerrville) reports a 2-meter net operating on 146.37/.97 at 7 P.M. on Sundays. SEC KA5KRI reports heavy activity preparing for VE program; about 50 students, ranging in age from 9 to 60 years, enrolled in Novice class, and a good number enrolled in upgrade classes in the Lake Jackson/Missouri City area. Traffic: WB5YDD 506, W5CTZ 447, W5KLV 325 N5DFO 210, N5TC 179, WB5MMI 137, K5OWK 126, WB5EPA 58, WD5GKH 28, W5BGE 26, K5HZR 23, W5KR 20. (June) N5BB 147, N5BB 28.

DOCTOR DX™ BY AEA

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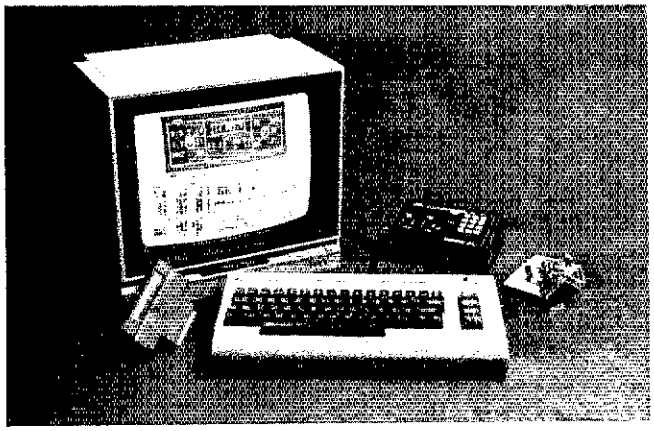

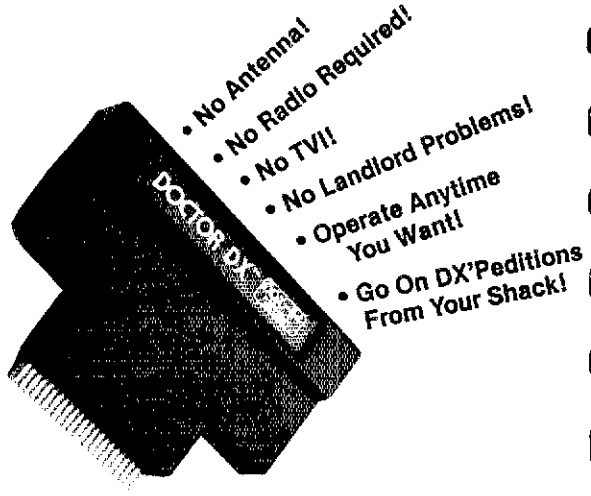

For the active CW operator, there is nothing more fun than operating with the "Doctor DX" CW DX simulator. For the person who has never liked CW, Doctor DX will show you what real fun is. Doctor DX has something for everyone from the aspiring Novice to the experienced Amateur Extra Class licensee. And you need no FCC license to operate Doctor DX!

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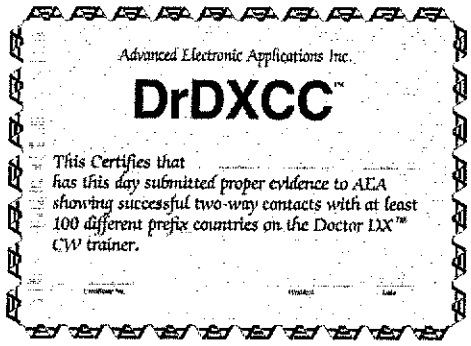
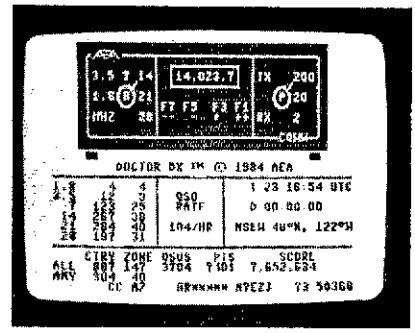


DOCTOR DX CONTEST BOX

TOP SPRINT SCORES	TOP MARATHON SCORES
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____
5. _____	5. _____

WILL YOUR CALL APPEAR HERE?



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AEA also has two on-going CW contests that you can enter with Doctor DX as your own schedule permits. The AEA SPRINT CONTEST is a timed non-stop eight hour event and the AEA MARATHON CONTEST is a timed 24 hour non-stop event. The top 5 contest scores will be published in our future advertisements and upgraded periodically as new higher scores are achieved.

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DON'S CORNER

Well, I just came back from the Shreveport La. Hamfest. (August 11 & 12). I watched for the results of the volunteer exams given during the Hamfest. Boy the pass rate was low. Probably the worst I have ever seen. The problem appears to be the lack of study materials for the testing. Remember that the BASH BOOKS are good for the FCC exams but not for the V.E. Program. For the V.E. tests used the ARRL study guide or the Ameco License guides. Good luck on the upgrade. 73 for now.

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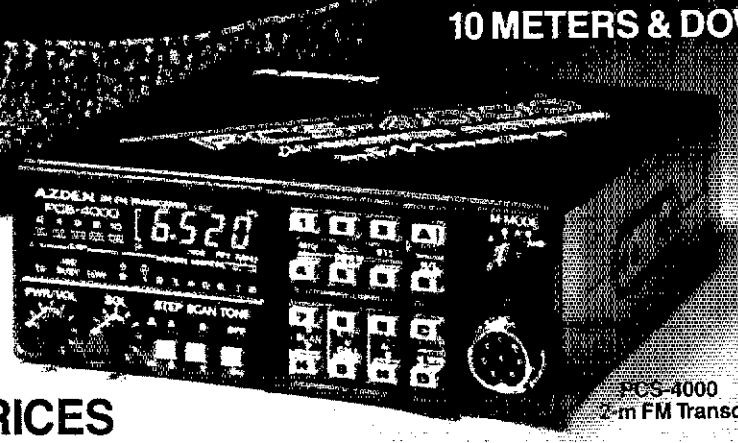

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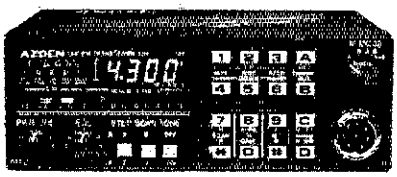

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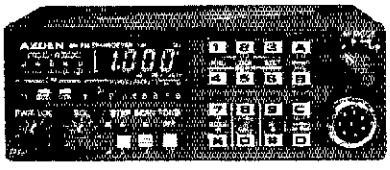
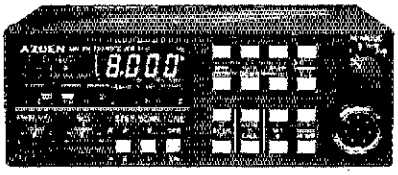


PCS-4500 6-m FM Transceiver



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- **NICAD MEMORY BACKUP:** Never lose the programmed channels!
- **FREQUENCY REVERSE:** The touch of a single button inverts the transmit and receive frequencies.
- **ILLUMINATED KEYBOARD WITH ACQUISITION TONE:** Unparalleled ease of operation.
- **BRIGHT GREEN LED FREQUENCY DISPLAY:** Easily visible, even in direct sunlight.
- **DIGITAL S/RF METER:** Shows incoming signal strength and relative power output.
- **BUSY-CHANNEL AND TRANSMIT INDICATORS:** Bright LEDs show when a channel is busy and when you are transmitting.
- **FULL 16-KEY TOUCHTONE® PAD:** Keyboard functions as autopatch when transmitting (except in PCS-4800).
- **PL TONE:** Optional PL tone unit allows access to private-line repeaters. Deviation and tone frequency are fully adjustable.
- **TRUE FM:** Not phase modulation. Unsurpassed intelligibility and audio fidelity.
- **HIGH/LOW POWER OUTPUT:** 25 or 5 watts selectable in PCS-4000; 10 or 1 watt selectable in PCS-4200, PCS-4300, PCS-4500, and PCS-4800. Transmitter power is fully adjustable.
- **SUPERIOR RECEIVER:** Sensitivity is 0.2 uV or better for 20-dB quieting. Circuits are designed and manufactured to rigorous specifications for exceptional performance, second to none. COMPARE!
- **REMOTE-CONTROL MICROPHONE:** Memory A-1 call, up/down manual scan, and memory address functions may be performed without touching the front panel! COMPARE!
- **OTHER FEATURES:** Dynamic microphone, rugged built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, fuses, and hardware are included.
- **ACCESSORIES:** CS-7R 7-amp ac power supply, CS-4.5R 4.5-amp ac power supply, CS-AS remote speaker, and Communications Specialists SS-32 PL tone module.
- **ONE YEAR LIMITED WARRANTY!**

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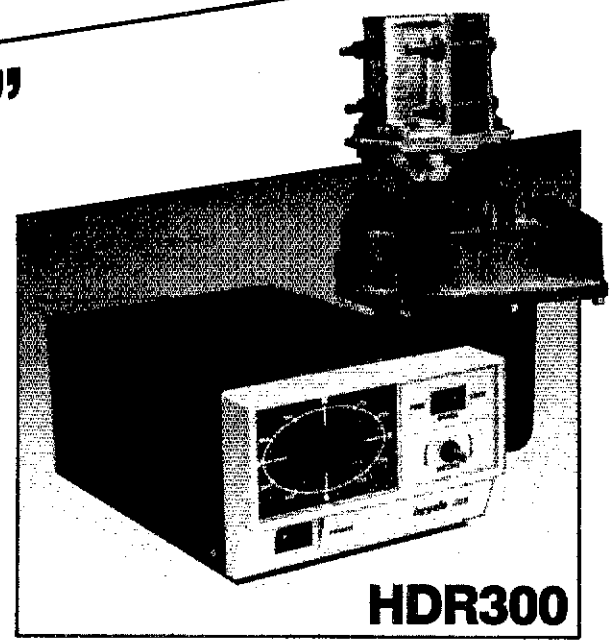
hy-gain®

"Heavy Duty" is Relative!



In our lineup of rotators, the CD45 II is rated as medium duty. Some of our worthy competitors offer similar rotators which they rate as "heavy duty" and, within their product line, they are. But if you compare all rotators, it's a different picture. Here is a comparison of our CD45 II, our HAM IV and the Alliance HD73 (Specifications as stated by the manufacturer).

	HD73	CD45 II	HAM IV
Output Torque	400 in. lbs.	600 in. lbs.	800 in. lbs.
Gears	Plastic and Steel	All Steel	All Steel
Control Box Weight	3.8 lbs.	6.8 lbs.	6.8 lbs.
Rotor Unit Weight	6.5 lbs.	8.5 lbs.	10.5 lbs.
Direction Indicator Potentiometer	Carbon	Precision wire wound	Precision wire wound
Rotation Limiter	Mechanical stop only	Limit switches with mechanical stop	Limit switches with mechanical stop
Braking Power	1600 in. lbs. "Windmilling"	800 in. lbs. "Holding"	5000 in. lbs. "Holding"
Antenna Size Rating	10.7 sq. ft.	8.5 sq. ft.	15 sq. ft.

Wind load rating is an important specification too. Unfortunately, there is no standard method of measurement. For example, a long boom antenna with an unbalanced wind load is a much tougher problem than the calculated square area of the antenna would suggest. So we take a conservative "worst case" approach and rate the CD45 II at 8.5 square feet. Yet, the HD73, a lighter unit, is rated at 10.7 square feet. You be the judge.

Here is a complete listing of Hy-Gain rotators and the typical antenna systems that each will comfortably and reliably manage.

AR40—Primarily used for small to medium size VHF and UHF beams. Can also be used with a 10 or 15 meter, 3 element Yagi.

CD45 II—Recommended for a 3 element tribander such as our Explorer 14. Will also manage a medium sized VHF stack and is a good choice for the Azimuth rotator on a good sized satellite system.

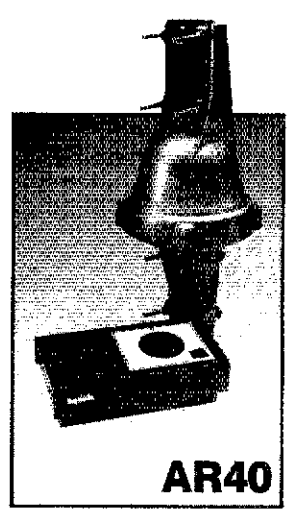
HAM IV—A favorite for long boom tribanders such as our TH7DX. Would also be a good choice for an Explorer 14 stacked with a VHF DX antenna or a satellite system.

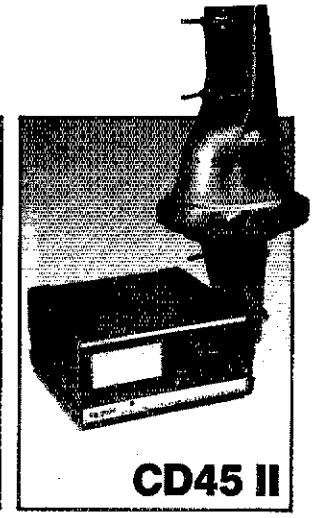
HAM SP—A modified Ham IV with a special control unit for a blind operator. Single knob directional control system includes a compass rose with braille markings. An audible beep indicates rotator start and stop.

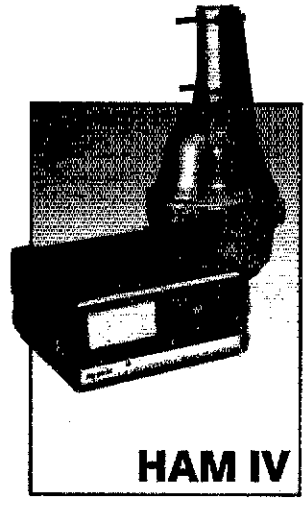
T2X—The well-known Tail Twister manages combinations such as a TH7DX stacked with a small 2 element 40 meter beam. Also a great choice for a substantial VHF "weak signal" array. Of course, the ever popular stack of 3 or 4 element 10, 15, and 20 meter monobanders is a safe match for the T2X.

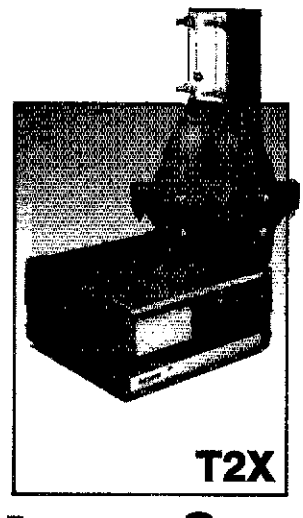
HDR300—This 5000 inch pound torquer is our idea of heavy duty. This is the choice for stacked HF "Long Johns" or the full sized 3 element 40 meter monsters. A favorite too for the giant VHF "weak signal" systems where the 1° rotator control and indicator accuracy is a must.

CHOOSING THE RIGHT MODEL—The mistake most commonly made is selecting a rotator for the antenna being installed at the time and not looking forward to the antenna system that you ultimately plan. A rotator that is not over-loaded will deliver many years of reliable service. So, when you choose yours, plan ahead and buy the model that will handle the ultimate load. If in doubt, drop us a note. We will share our experience with you. Long term, you will save money.









TELEX hy-gain

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Europe: Le Bonaparte—Office 711, Centre Affaires Paris-Nord, 93153 Le Blanc-Mesnil, France.

UPGRADING: EASY AS . . . .

1 THE RADIO AMATEUR'S LICENSE MANUAL

A change in format! Whether you plan to take an FCC supervised exam or one administered by volunteers, you'll find the material needed to pass the technical and operating portions with ease. Covers the Technician, General, Advanced and Extra Class exams, and includes sample study questions and answers. Also included in this *new* 79th Edition is the pool of questions released to the public by the FCC for use by volunteers. The big change is that the regulatory material is now covered separately in the *FCC Rule Book* so that the most up-to-date material can be presented.

2 THE FCC RULE BOOK

Contains complete FCC rules with explanations in the popular "Washington Mailbox" format adapted from *QST*. Covers FCC rulemaking, the Communications Act of 1934, and international regulations. Chapters include topics on technical standards, basic and specialized operating practices, "Thou Shalt Nots", and Part 97 — The Amateur Radio Service Rules.

3 THE ARRL CODE KIT

Boost your code speed from 5 to 13 words-per-minute quickly and enjoyably. Two C-60 cassettes provide practice at 5, 7½, 10 and 13 wpm. The booklet included in the package is packed with proven suggestions and hints for increasing your ability to copy the code. If you have already mastered 13 wpm, we have a separate C-60 cassette available with practice at 15 and 20 wpm.

79th Edition of the **License Manual:** $4.00
2nd Edition of the FCC Rule Book: $3.00
The ARRL Code Kit: $8.00 **15/20 wpm cassette** $5.00
Available from: **A.R.R.L.**
225 Main Street
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THE MICROWAVE NEWSLETTER TECHNICAL COLLECTION FROM RSGB

Packed with microwave construction projects and information organized on a band-by-band basis. Begins at 1.3 GHz and covers up through 24 GHz plus millimetric bands. 40 pages are devoted to 10 GHz alone! This book was compiled by Julian Gannaway, G3YGF and Steve Davies, G4KNZ. It is a reprint of the technical material contained in the **Microwave Newsletter** from April, 1980 through May, 1983. There are 140 pages including bibliography. $10.00.

THE AMERICAN RADIO RELAY LEAGUE
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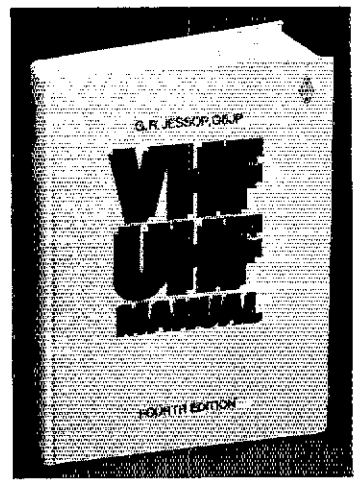
NEWINGTON CT 06111



You'll find the ***RSGB VHF-UHF Manual*** packed with theory and construction projects for 30 MHz to 24 GHz. Covers: cavity amplifiers, converters, transmitters, receivers, waveguides, directional couplers and antennas, space communications, test equipment plus a handy data section. 512 pages © 1983, Hardbound. **$17.50** available from:

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hy-gain®

Rediscover 40 meters with the DISCOVERER SERIES

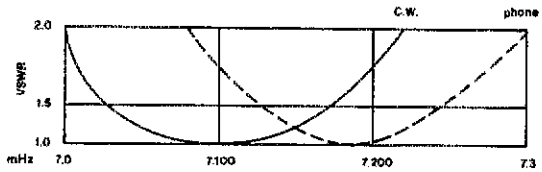
Rotatable Dipole or Monoband Beams

This 40 meter antenna series gives you three choices. The Discoverer 7-1 which is a rotatable dipole. Or the Discoverer 7-2, a two-element beam you can upgrade to three elements with a kit.

Whichever you choose, you'll get Hy-Gain's superior mechanical design. Such as tapered tubing to reduce weight and wind surface area. Maintenance-free stainless steel hardware and preformed clamps for an easy, rugged assembly.

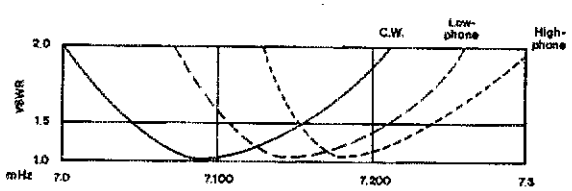
You also get superior performance. Wide bandwidth with SWR of 1.5:1 or less at resonance. High-Q efficiency because there are no high-loss coils. A low voltage feed point that eliminates insulator failure and assures that the antenna can handle twice the new legal power limit.

The Discoverer 7-1 dipole can be added to most existing rotatable beam installations. This model can be tuned to either 30 or 40 meters.

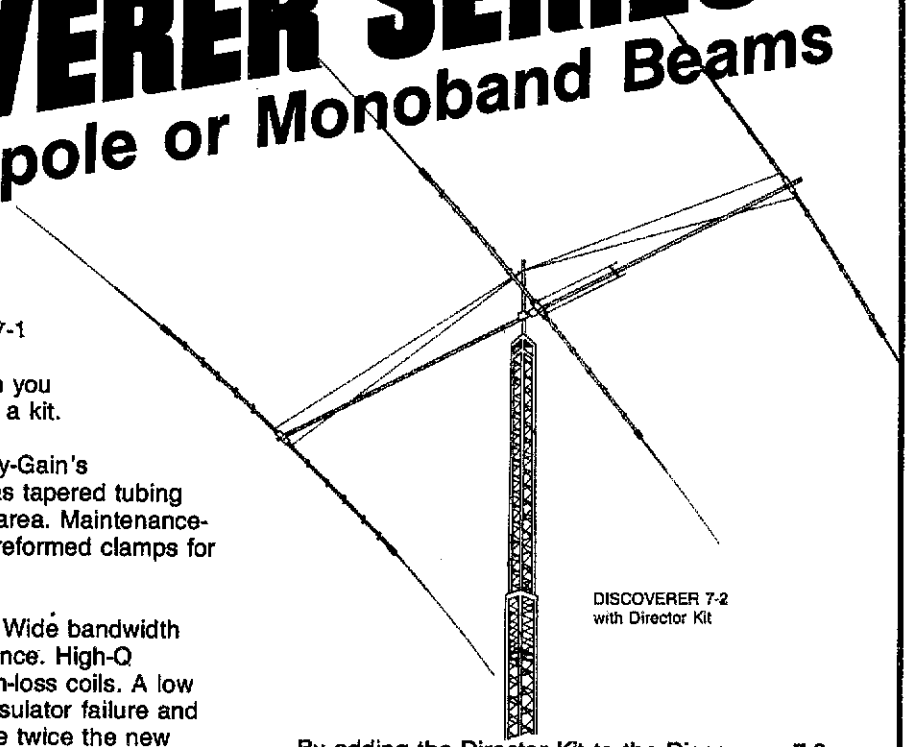


DISCOVERER 7-1

The Discoverer 7-2 requires only a 25 ft. (7.6 m) turning radius and opens communication doors you previously thought possible only on 20 meters. Combining the advantages of high forward gain and a high front-to-back ratio lets you hear and work stations you couldn't read on a dipole or vertical antenna. Best of all, you can upgrade this antenna anytime with the 373S Director Kit.

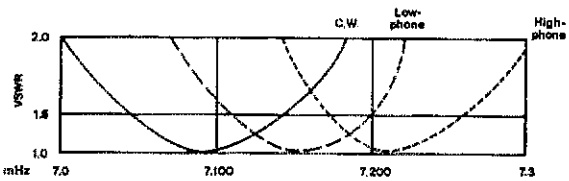


DISCOVERER 7-2



DISCOVERER 7-2 with Director Kit

By adding the Director Kit to the Discoverer 7-2 you create a three-element beam on a boom of only 35 ft. (10.7 m), that outperforms many of the heavy-weight giants with much longer booms. In fact, the kit doubles the effective radiated power of the Discoverer 7-2, and nearly doubles the front-to-back ratio. And, because the antenna is still more compact than a "giant", you only need a medium-duty tower such as the HG52SS. All of which saves you money and space without compromising safety or performance.



DISCOVERER 7-2 WITH 373S KIT

The Hy-Gain Discoverer series gives you three choices, just when declining sunspot activity lends renewed importance to the 40 meter band.

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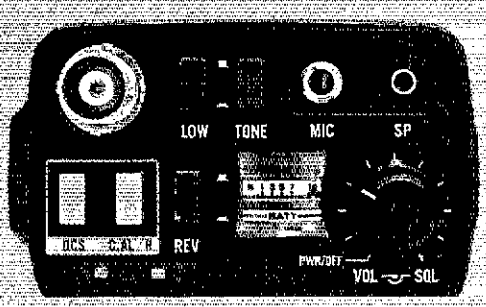
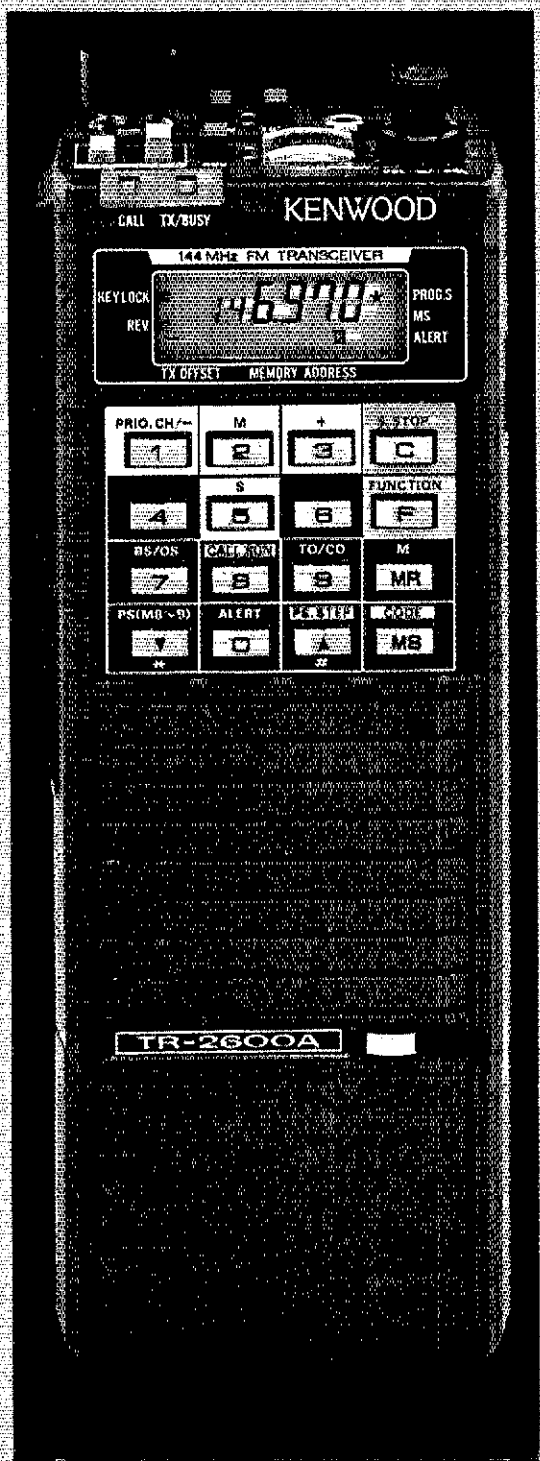
Digital Code Squelch...

TR-2600A





Kenwood's TR-2600A introduces DCS (Digital Code Squelch) circuitry, a signaling concept developed by Kenwood. DCS allows each station to have its own "private call" code or to respond to a "group call" or "common call" code. There are 100,000 different 5-digit ASCII code combinations possible. You can program in call signs up to 6 digits in the ASCII code. When operating in the DCS mode, this information can then be automatically transmitted each time the transmit key is depressed. This revolutionary feature is only the beginning! The TR-2600A also sports a high impact plastic case, that is extra rugged and scuff-resistant. The molded-in color adds to the attractive appearance. The large L.C.D. display is easy to read in direct sunlight or in the dark with a convenient lamp switch. It displays transmit/receive frequencies, memory channels, and five arrow indicators for "F LOCK" frequency lock, "REV" repeater reverse, "PROG.S" programmed scan, "MS" memory scan, "ALERT.S" alert scan. A star indicates "MEMORY LOCK-OUT" is activated, and repeater offset indicated by "+, -, S and M." The TR-2600A has 10 memories: nine for simplex or transmit with frequency offset ±600 kHz and one (memory 0) for non-standard split frequencies. Memory scan and programmable band scan have the added convenience of "Time operated Resume" that stops on busy channel and holds for approximately 5 seconds, then resumes scanning, or "Carrier Operated Resume" that stops on busy channel and resumes when signal ceases. Memory scan, scans only those memories in which data is stored, and memory lock-out allows you to skip selected memory channels without loss of data previously stored! Manual Scanning UP/DOWN in 5-kHz steps and programmable automatic band scan are also useful features. The TR-2600A has a built-in "S" meter on the top panel which also indicates battery level when in transmit mode. Extended frequency coverage, 142.000-148.995 MHz allows transmit capability in 5-kHz steps for simplex or repeater operation on most MARS and CAP frequencies. Receive frequency coverage includes 140.000-159.995 MHz.

These features only tell part of the story. The TR-2600A also has keyboard frequency selection, built-in 16-key autopatch encoder, "TX STOP" switch, HI (2.5)/LOW (300 mw) power switch, REV switch, "SLIDE-LOC" battery pack, high efficiency speaker, BNC antenna terminal, and all of this in an extremely compact and lightweight package!

Kenwood's TR-2600A, with D.C.S., leads the way in high technology handheld transceivers!

Optional accessories:

- TU-35B built-in programmable sub-tone encoder
- ST-2 Base Stand
- MS-1 Mobile Stand
- PB-26 Ni-Cd Battery
- DC-26 DC-DC Converter
- HMC-1 Headset with VOX
- SMC-30 Speaker Microphone
- LH-3 Deluxe Leather Case
- SC-9 Soft Case
- BT-3 AA Manganese/Alkaline Battery Case
- EB-3 External C Manganese/Alkaline Battery Case
- RA-3, 5, Telescoping Antenna
- CD-10 Call Sign Display

More information on the TR-2600A is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, CA 90220.

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

KENWOOD

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TM-211A DCS...a new turn in 2 meters/70 cm.

TM-211A/411A

The TM-211A 2 meter and the TM-411A 70 cm mobiles combine ultra compact size with the added feature of a 7 position adjustable front panel, allowing you maximum flexibility in both home and automotive installations! These compact transceivers also feature Kenwood's innovative DCS (Digital Code Squelch) circuit, that allows you to program your transceiver to respond only to transmissions from stations whose radios transmit a pre-selected digital code. Both radios deliver 25 big watts of R.F. power on HI and 5 watts (approximately) on LO power. Dual digital VFO's, built-in, highly visible yellow LED display, five memories plus COMM Channel add to this impressive array of features. The TM-211A and TM-411A each boast high performance receive and transmit specifications and an external high quality speaker that provides unsurpassed sound quality. Mounting flexibility is also a feature. Yes, all these features, plus priority watch, memory and programmable band scan, microphone test function, audible "beeper" for operation confirmation, repeater offset switch and reverse switch. The TM-211A and TM-411A offer you the best in 2 meters and 70 cm operations!

Subject to FCC approval.

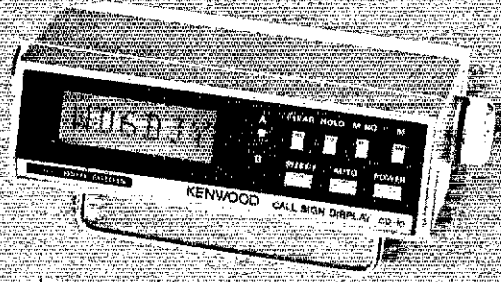
Optional accessories:

- CD-10 Call Sign Display
- PS-430 D.C. Power Supply
- KPS-7A Power Supply
- MC-55 Mobile Microphone with Time-Out Timer
- MA-4000 Dual Band Mobile Antenna with Duplexer
- SW-100A/B SWR/Power meters
- PG-3A Noise Filter

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

CD-10/DCS

The optional CD-10 helps maximize your use of Kenwood's revolutionary new signalling concept, DCS (Digital Code Squelch). DCS uses digital code information to open squelch on a receiver that has been programmed to accept the specific code being transmitted. Up to 100,000 different 5-digit codes are possible, allowing each station to have its own "private call" code or



to respond to a "group call" or "common call" code. Program your call sign (up to 6 digits) in the ASCII code and it is automatically transmitted when the transmit key is depressed. The CD-10 stores the calling station's call sign in its memory for future reference, and it is also displayed on the L.C.D. readout. The CD-10 can store call sign data of up to 20 stations, allowing you to quickly check for calls if you have been absent from your station, and review your contacts for logging purposes. The DCS/call sign data transmission system uses mark and space frequencies within the normal speech band width (compatible w/most repeaters).

TM-201A/401A

The extremely popular TM-201A 2 meter FM (25 watts, 142.000 to 149.000 MHz) and the TM-401A 70 cm FM (10 watts, 440-450 MHz) ultra compact mobile transceivers are also available.

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

KENWOOD

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TS-711A

TS-711A Multi-function all-mode 2 m transceiver.

The TS-711A 2 m all-mode transceiver is the perfect base station unit. It features Kenwood's innovative D.C.S. circuitry that allows your TS-711A to respond only to signals that include a pre-selected digital code. The system recognizes 100,000 different 5-digit codes, making it possible for each station to have its own "private call," "group call," or "common call" code. Built-in dual digital VFO's provide commercial-grade frequency stability through the use of a TCXO (Temperature Compensated Crystal Oscillator). The new fluorescent multi-function display shows frequency, RIT shift, VFO A/B, SPLIT, ALERT, repeater offset, digital code, call sign code, and memory channel. 40 multi-function memories store frequency, mode, repeater offset and tone. It has programmable scan, memory scan, and mode scan. The Auto-mode function automatically selects the correct mode for the frequency being used. When a mode key is depressed, an audible "beeper" announces mode identification in International Morse Code.

The TS-711A has all-mode squelch, noise blanker, speech processor (SSB, FM), IF shift, RF power control, alert, and a unique channel Quick-Step tuning that varies tuning characteristics from conventional VFO feel, to stepping action when CH.G switch is depressed.

Optional accessories:

• CD-10 Call Sign Display • SU-5 CTCSS Tone Unit • VS-1 Voice Synthesizer • MC-60A Deluxe Desk Mic • MC-80 Desk Mic • MC-85 Desk Mic • SP-430 External Speakers • MB-430 Mobile Mount • PG-2J DC Cable

...subject to FCC approval

TS-670

TS-670 All-mode "Quad Bander."

The TS-670 "Quad Bander" is a unique all-mode transceiver that covers the 6 meter, VHF band and the 10, 15 and 40 meter HF bands. FM operation may be added with the optional FM-430. Key features include dual digital VFO's, 90 memory channels, memory scan, and programmable band scan. Direct keyboard frequency selection allows you to enter a frequency to either VFO or to a memory channel using the 10-button key pad on the front panel. The 2-color fluorescent tube display indicates frequency to the nearest 100 Hz (10 Hz modifiable) and includes LED indicators that signal the specific functions in use. The optional GC-10 general coverage receiver unit allows continuous tuning from 500 kHz to 30 MHz. The VS-1 voice synthesizer unit is another popular option available. All this, plus IF shift, all-mode squelch, CW semi-break-in with side tone, narrow-wide filter selection, noise blanker, and R.F. attenuator make the TS-670 "Quad Bander" the next transceiver you should own.

Optional accessories:

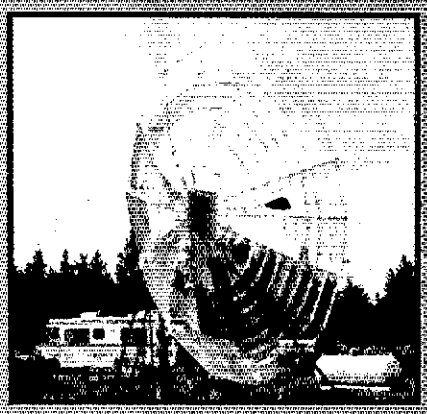
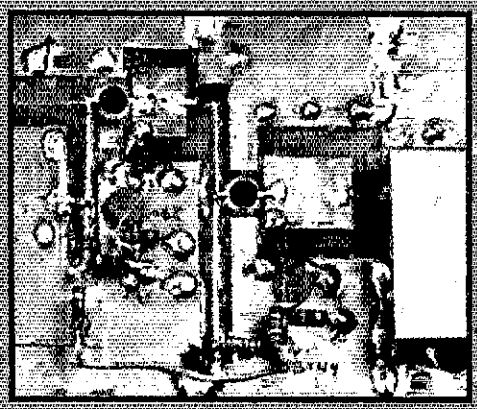
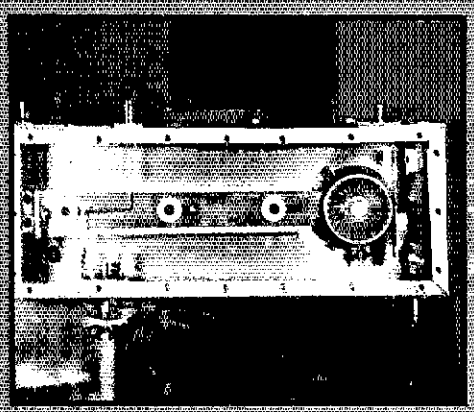
• SC-10 General Coverage Unit, 500 kHz to 30 MHz • VS-1 Voice Synthesizer • FM-430 FM Unit • YK-88C 500 Hz CW Filter • YK-88CN 270 Hz CW Filter • YK-88A 6 kHz AM Filter • PS-430 DC Power Supply • KPS-7A DC Power Supply • MC-60A Deluxe Desk Mic • MC-80 Desk Mic • MC-85 Multi-Function Desk Mic • VOX-4 VOX Unit

More information on the TS-711A and TS-670 is available from authorized dealers of the Kenwood Communications, 1111 West Walnut Street, Compton, CA 90220.

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

One of the most significant announcements in many years concerning an Amateur Radio publication follows on the next pages . . . . . .

PUBLISHED BY:
THE AMERICAN RADIO
RELAY LEAGUE

THE ARRL 1985 HANDBOOK

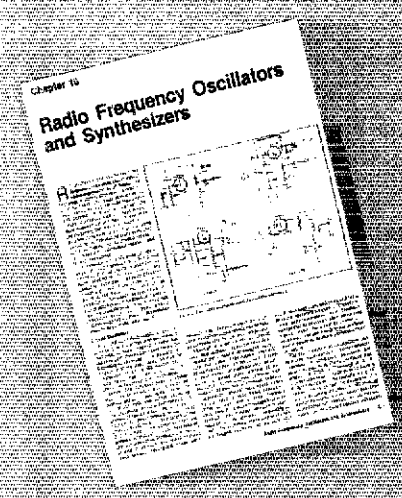
FOR THE RADIO AMATEUR

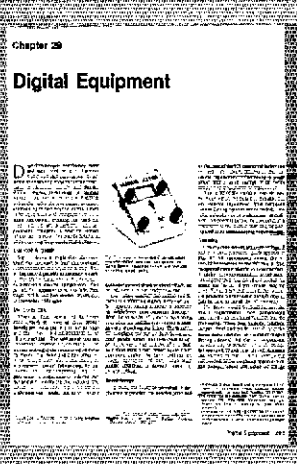

Take thousands-upon-thousands of hours of work in front of the word processors and personal computers. Add to that the editing both on and off line of over 3,000 pages of rough manuscript. Send the final result —mostly electronically— to typesetting and production. Paste up the final copy and send it to the printer. The final result?

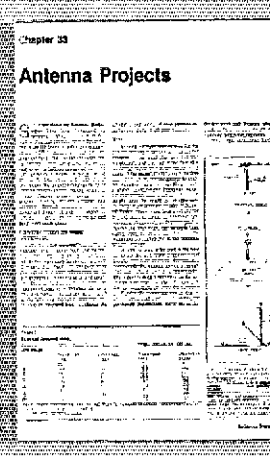
THE 1024 PAGE ARRL 1985 HANDBOOK FOR THE RADIO AMATEUR

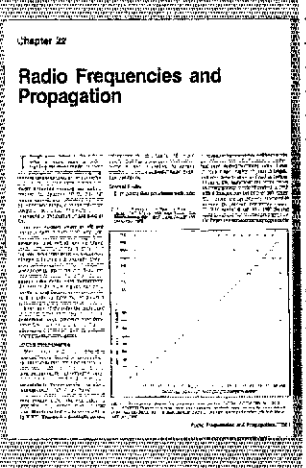
- **376 MORE PAGES THAN LAST YEAR**
- **17 MORE CHAPTERS**
- **OVER 1700 CIRCUIT DIAGRAMS AND ILLUSTRATIONS**
- **NEW NAME ■ NEW FACE**
- **NEW OUTLINE**
- **NEW TYPESETTING THROUGHOUT**
- **MORE CONSTRUCTION PROJECTS THAN EVER BEFORE**
- **PC ETCHING PATTERNS IN A SPECIAL SECTION ON SPECIAL PAPER WHICH CAN BE USED AS POSITIVE FILM.**

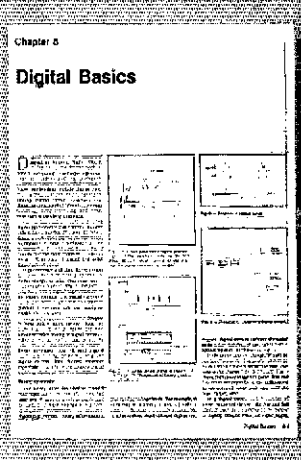
Continued . . . . . .











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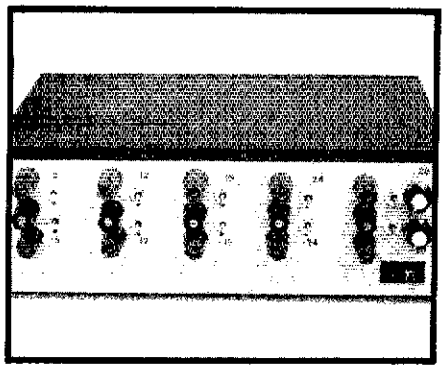

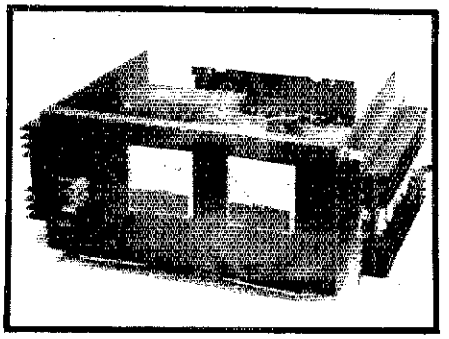

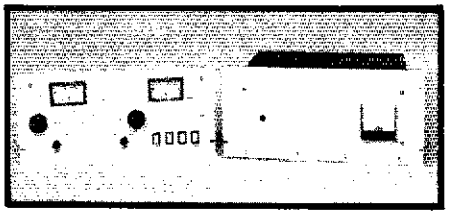

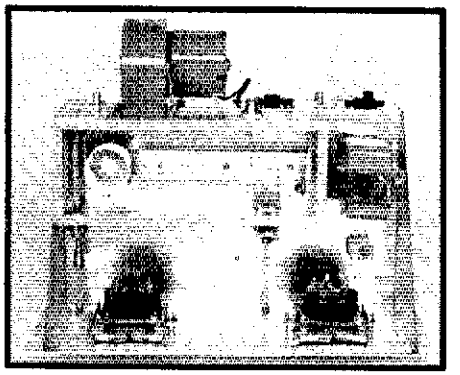

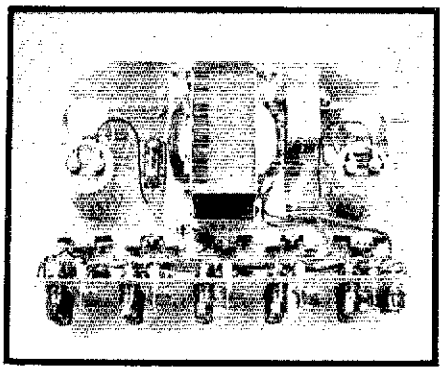

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Immediately below: 1.5-kW dummy load

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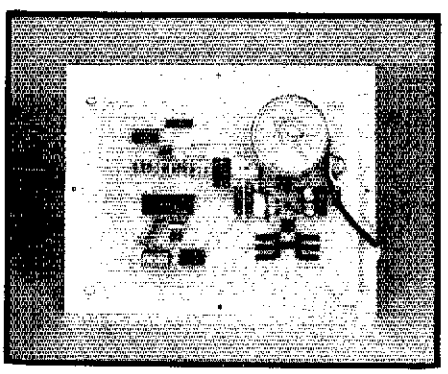

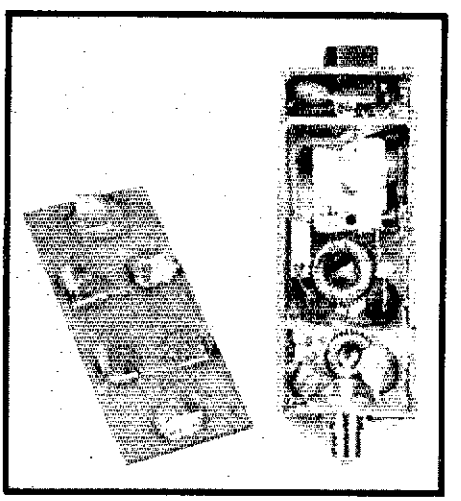

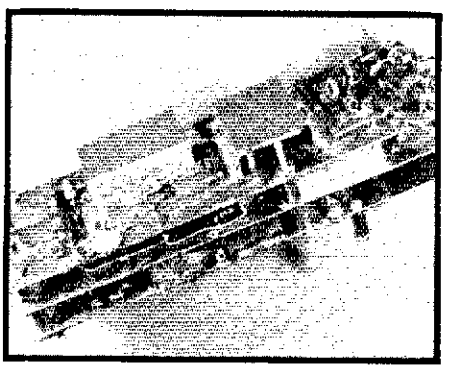

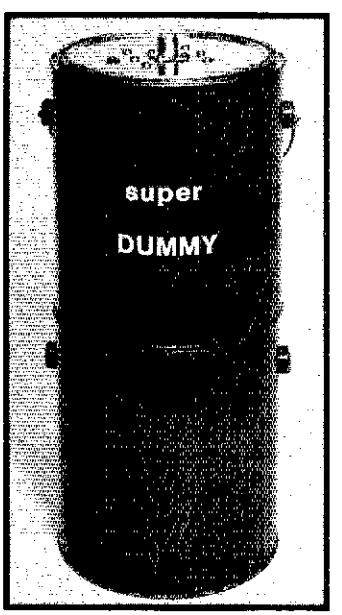

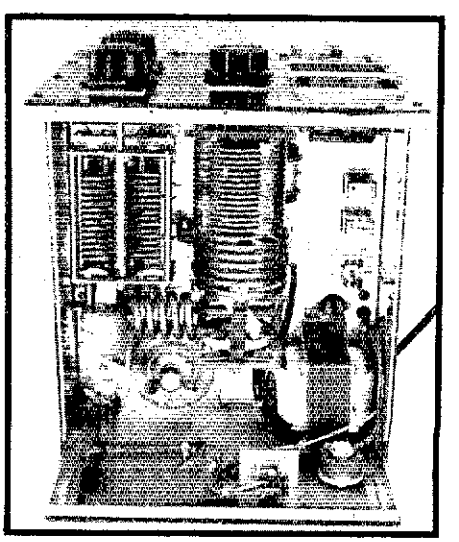

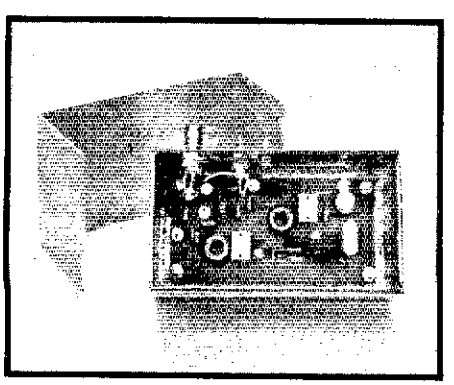

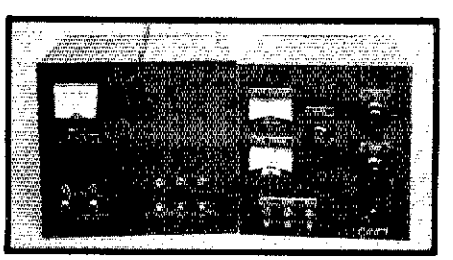

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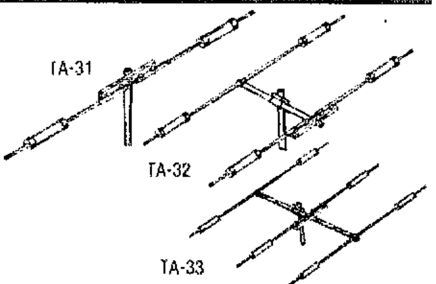

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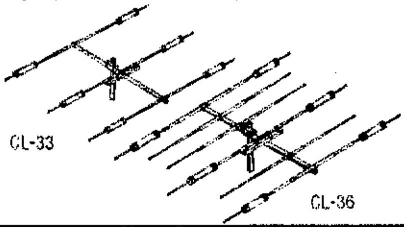

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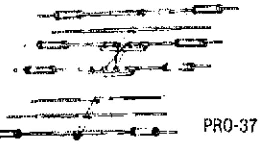

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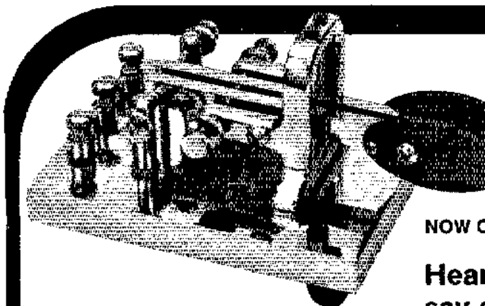

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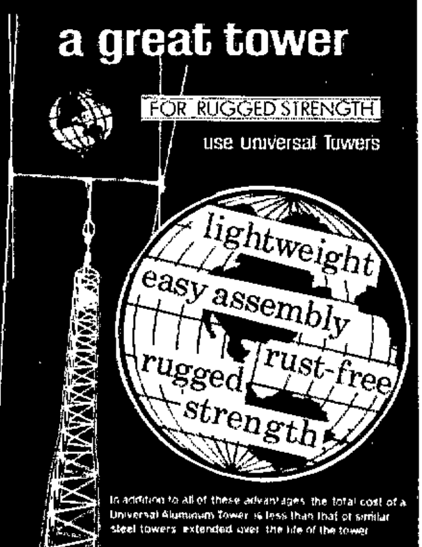

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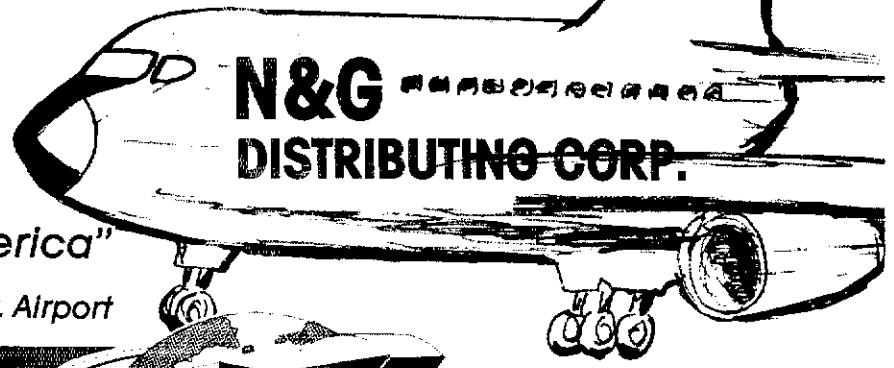

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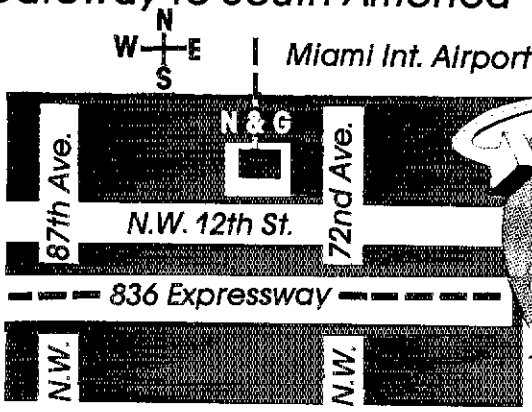

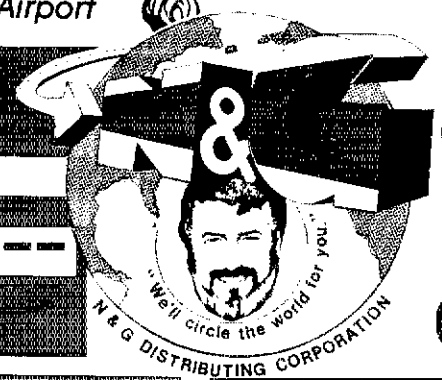

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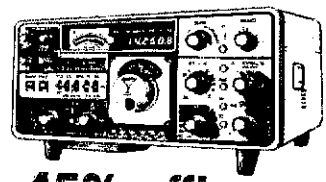

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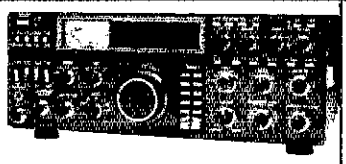

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Plus 3 Bonus Items
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- MC-60A Microphone
- SP-930 Speaker

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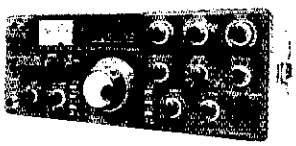

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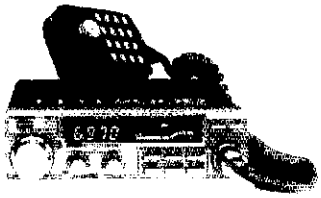
$699.95 Save $107



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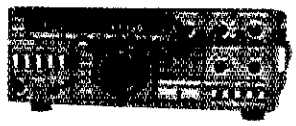

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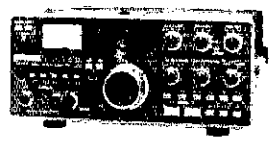

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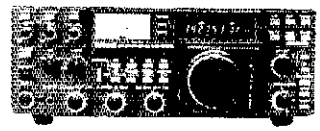

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Plus 2 Bonus Items
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Regular $1598.50
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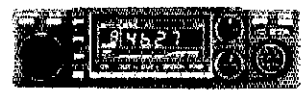

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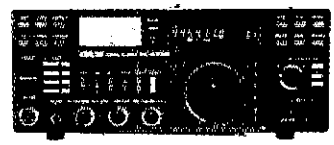

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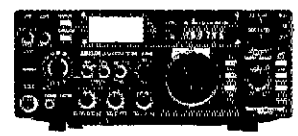

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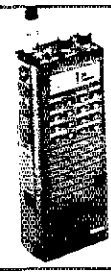

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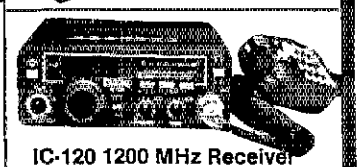

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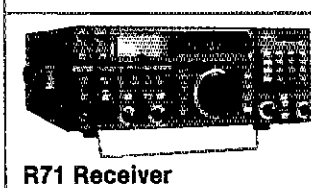

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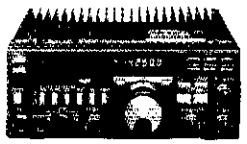

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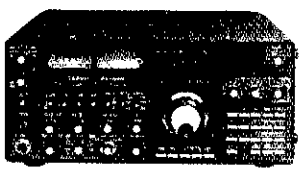

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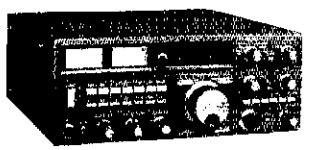

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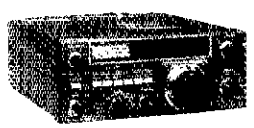

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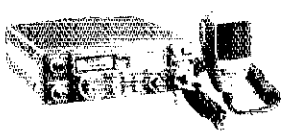

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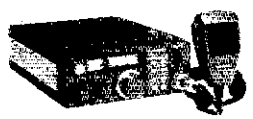

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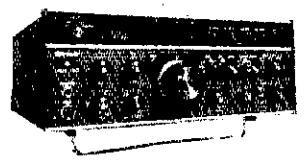

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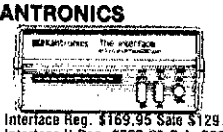

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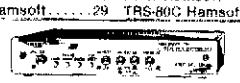

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B108	2M	Yes	10W	80W	10A	$159
B1016	2M	Yes	10W	160W	20A	$249
B1016	2M	Yes	30W	160W	17A	$199
C22	220	No	2W	20W	5A	$ 79
C106	220	Yes	10W	60W	10A	$179
C1012	220	Yes	10W	120W	20A	$259
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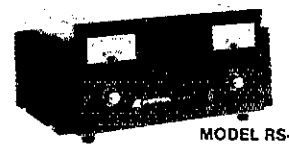
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS25A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229



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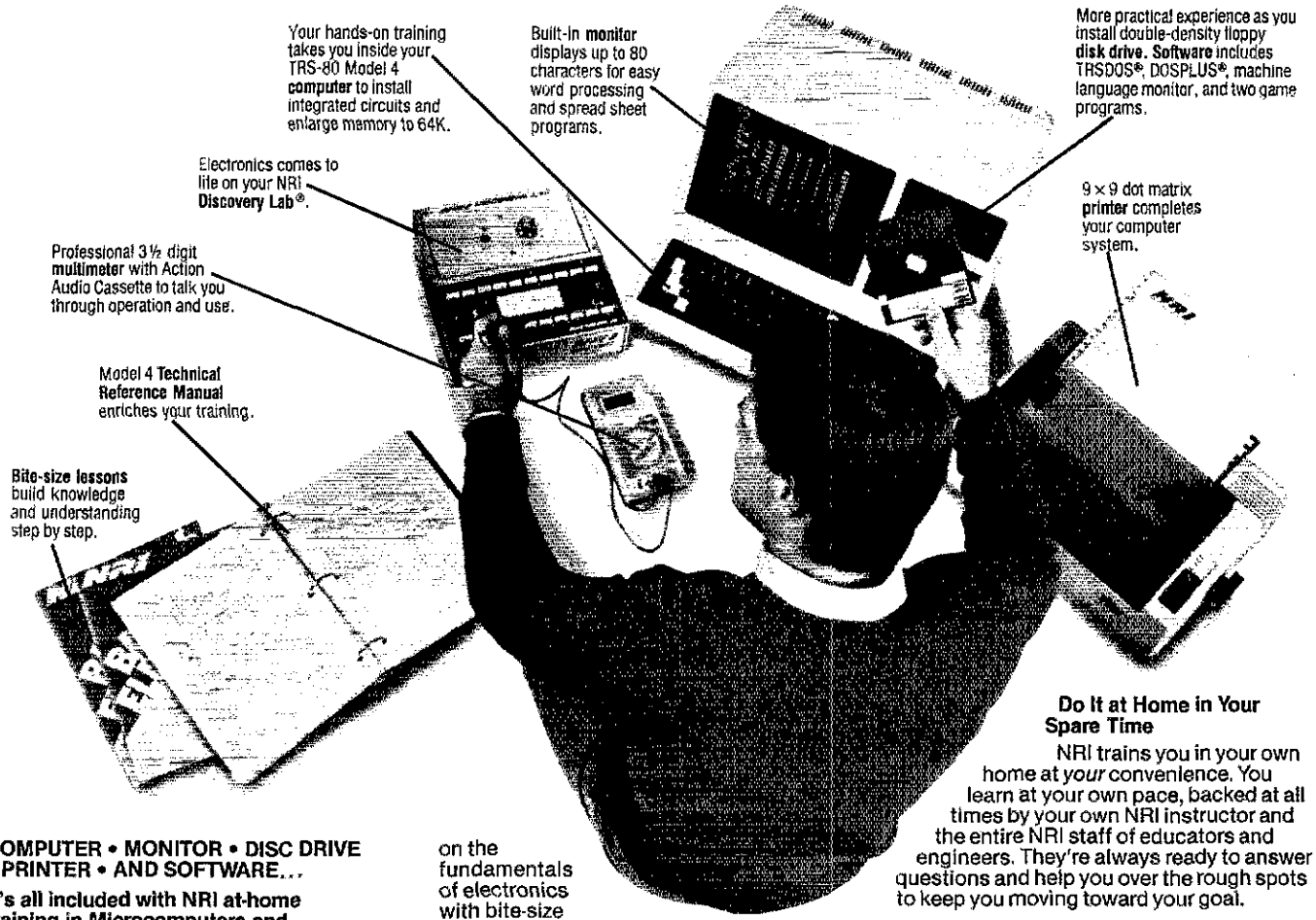

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MUSEUM for radio historians and collectors now open. Free admission. Old time amateur (W2AN) and commercial station exhibits. 1925 store and telegraph displays. 15,000 items. Write for details. Bruce Kelley, AWA, Holcomb, NY 14469.

TAMPA, FL — Hillsborough Amateur Radio and Computer Hamfest — October 20, 1984 at FT. Hesterly Armory.

JOIN MORSE Telegraph Club. $5 dues includes subscription to fine club paper "Dots and Dashes" plus handsome wall certificate plus "bonus" gift plus publication of your brief "biography." Dr. Hess, W6CK, Senior Vice President MTC, Box 19-M, Pasadena, CA 91102.

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TRAVEL-PAK QSL Kit — Converts Post Cards, Photos to QSLs. Stamp brings circular. Samco, Box 203, Wynantskill, NY 12198.

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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.

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QUALITY TUNERS THAT DELIVER MORE PERFORMANCE, MORE FEATURES, MORE VALUE FOR YOUR MONEY.

MFJ-941D 300 WATT VERSA TUNER II

$99.95 (+$4) **MFJ's fastest selling tuner packs in plenty of new features. New styling!** Brushed aluminum front. All metal cabinet. **New SWR/Wattmeter!** More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.

New antenna switch! Front panel mounted. Select 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass for dummy load.

New airwound inductor! Larger more efficient 12 position airwound inductor gives lower losses and more watts out. Run up to 300 watts RF power output.

Matches everything from 1.8 to 30 MHz: dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines.

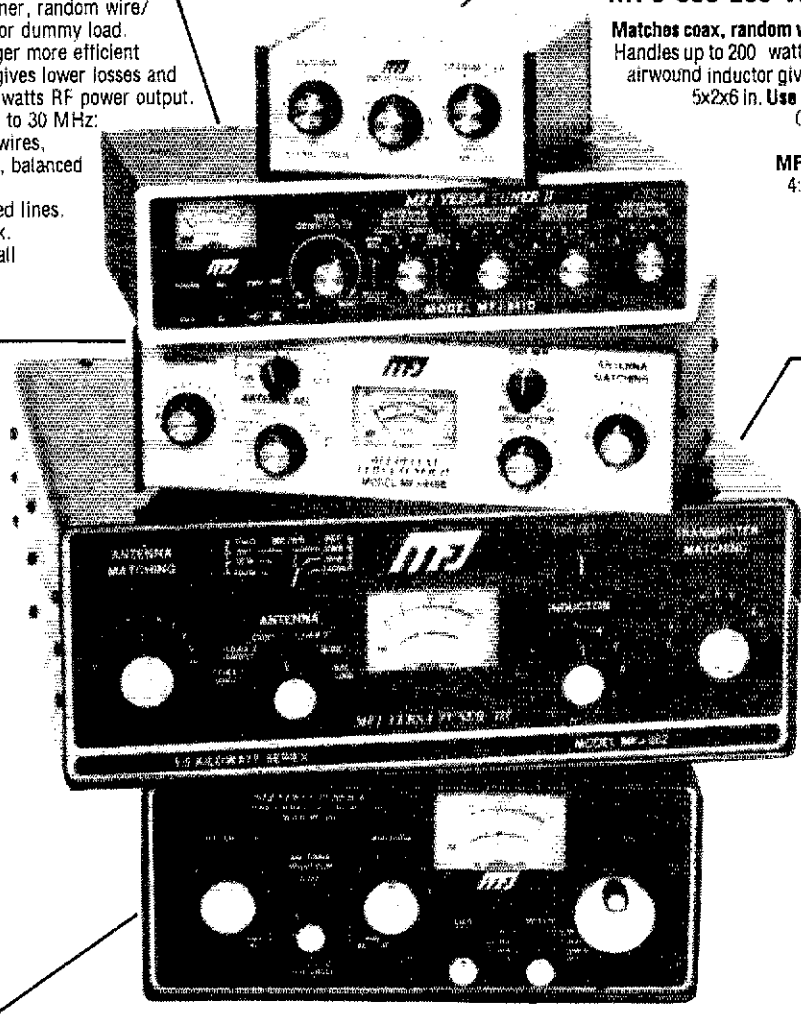
Built-in 4:1 balun for balanced lines. 1000 V capacitor spacing. Black. 11 x 3 x 7 inches. Works with all solid state or tube rigs. Easy to use anywhere.

MFJ-940B, $79.95, 300 watts, SWR/Wattmeter, antenna switch on rear. No balun. 8 x 2 x 6 in. eggshell white with walnut grained sides.
MFJ-945, $79.95, like MFJ-940B with balun, less antenna switch.
MDJ-944, $79.95, like MFJ-940B with balun, antenna switch on front panel, less SWR/Wattmeter.
Optional mobile bracket for 940B, 945, 944, $5.00.

MFJ-900 200 WATT VERSA TUNER

Matches coax, random wires 1.8-30 MHz. Handles up to 200 watts output; efficient airwound inductor gives more watts out. **$49.95** (+$4) 5x2x6 in. **Use any transceiver,** solid state or tube. Operate all bands with one antenna.

OTHER 200 WATT MODELS:
MFJ-901, $59.95, like 900 but includes 4:1 balun for use with balanced lines.
MFJ-16010, $39.95, for random wires only. Great for apartment, motel, camping, operation. Tunes 1.8-30 MHz.



MFJ-949B 300 WATT DELUXE VERSA TUNER II

$139.95 (+4) **MFJs best 300 watt Versa Tuner II. Matches everything** from 1.8 - 30 MHz, coax, randoms, balanced lines, up to 300W output, solid state or tubes.

Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.

Built-in 4:1 balun. 300W, 50-ohm dummy load, SWR meter and 2 range wattmeter (300W and 30W).

6 position antenna switch on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case. 10 x 3 x 7 in.

MFJ-962 1.5 KW VERSA TUNER III

Run up to 1.5 KW PEP **$229.95** (+$10) and match any feedline continuously from 1.8 to 30 MHz; coax, balanced line or random wire. Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected power. 2% meter movement. **6 position** antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines. 4:1 balun 250 pf 6 KV variable capacitors. 12 position inductors. Ceramic rotary switch. All metal black cabinet and panel gives RFI protection, rigid construction and sleek styling. Flip stand tilts tuner for easy viewing. 5 x 14 x 14 inches.

MFJ-989 3 KW ROLLER INDUCTOR VERSA TUNER V

$329.95 (+$10) **Meet "Versa Tuner V". It has all the features you asked for,** including the new smaller size to match new smaller rigs - only 10 3/4"W x 4 1/2"H x 14 7/8"D.

Matches coax, balanced lines, random wires — 1.8 to 30 MHz. 3 KW PEP- the power rating you won't outgrow (250 pf-6KV caps).

Roller inductor with a 3-digit turns counter plus a spinner knob for precise inductance control to get that SWR down to minimum every time.

Built-in 300 watt, 50 ohm dummy load, built-in 4:1 ferrite balun.

Built-in 2% meter reads SWR plus forward and reflected power in 2 ranges (200 and 2000 watts). Meter light requires 12 VDC. Optional AC adapter MFJ-1312 is available for $9.95.

6-position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.

Deluxe aluminum low-profile cabinet with sub-chassis for RFI protection, black finish, black front panel with raised letters, tilt bail.

MFJ-981, $239.95. 3 KW, 18 position switched dual inductor. SWR/Wattmeter. 4:1 balun.

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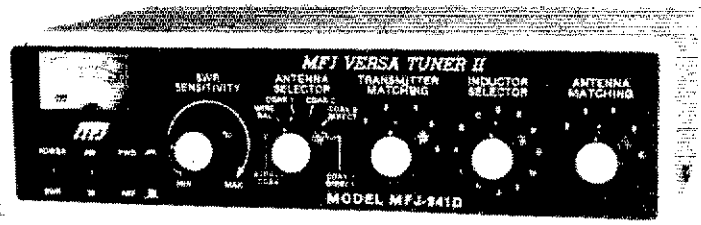
300 WATT ANTENNA TUNER HAS SWR/WATTMETER, ANTENNA SWITCH, BALUN. MATCHES VIRTUALLY EVERYTHING FROM 1.8 TO 30 MHz.



$99.95 MFJ-941D

NEW FEATURES

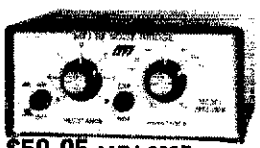
MFJ's fastest selling tuner packs in plenty of new features!
- **New Styling!** Brushed aluminum front. All metal cabinet.
- **New SWR/Wattmeter!** More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.
- **New Antenna Switch!** Front panel mounted. Select 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass for dummy load.
- **New airwound inductor!** Larger more efficient 12 position airwound inductor gives lower losses and more watts out. Run up to 300 watts RF power output. Matches everything from 1.8 to 30 MHz: dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines. Built-in 4:1 balun for balanced lines. 1000V capacitor spacing. Black. 11x3x7 inches. Works with all solid state or tube rigs. Easy to use, anywhere.

RTTY/ASCII/CW COMPUTER INTERFACE

MFJ-1224 **$99.95**

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.

RX NOISE BRIDGE

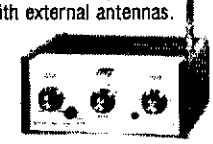


Maximize your antenna performance! **$59.95** MFJ-202B
Tells whether to shorten or lengthen antenna for minimum SWR. Measure resonant frequency, radiation resistance and reactance.
New Features: individually calibrated resistance scale, expanded capacitance range (±150 pf). Built-in range extender for measurements beyond scale readings. 1-100 MHz. Comprehensive manual. Use 9 V battery. 2x4x4 in.

INDOOR TUNED ACTIVE ANTENNA

NEW! IMPROVED! with higher gain

"World Grabber" rivals or exceeds reception of outside long wires! Unique **tuned** Active Antenna minimizes intermode, improves selectivity, reduces noise outside tuned band, even functions as preselector with external antennas. Covers 0.3-30 MHz. Telescoping antenna. Tune, Band, Gain, On-off bypass controls. 6x2x6 in. Uses 9V battery, 9-18 VDC or 110 VAC with adapter, MFJ-1312, $9.95.



MFJ-1020A $79.95

POLICE/FIRE/WEATHER 2 M HANDHELD CONVERTER

Turn your synthesized scanning 2 meter handheld into a hot Police/Fire/Weather band scanner! **$39.95** MFJ-313

144-148 MHz handhelds receive Police/Fire on 154-158 MHz with direct frequency readout. Hear NOAA maritime coastal plus more on 160-164 MHz. Converter mounts between handheld and rubber ducky. Feedthru allows simultaneous scanning of both 2 meters and Police/Fire bands. No missed calls. Crystal controlled. Bypass/Off switch allows transmitting (up to 5 watts). Use AAA battery. 2¼x1½x1½ in. BNC connectors.

MFJ/BENCHER KEYER COMBO

MFJ-422 **$109.95**

The best of all CW worlds- a deluxe MFJ Keyer in a compact configuration that fits right on the Bencher iambic paddle! MFJ Keyer - small in size, big in features. Curtis 8044-B IC, adjustable weight and tone, front panel volume and speed controls (8-50 WPM). Built-in dot-dash memories. Speaker, sidetone, and push button selection of semi-automatic/tune or automatic modes. Solid state keying. Bencher paddle is fully adjustable; heavy steel base with non-skid feet. Uses 9 V battery or 110 VAC with optional adapter, MFJ-1305, $9.95.

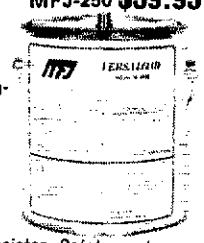
VHF SWR/WATTMETER

Low cost VHF SWR/Wattmeter! MFJ-812 **$29.95**

Read SWR (14 to 170 MHz) and forward/reflected power at 2 meters. Has 30 and 300 watts scales. Also read relative field strength. 4x2x3 in.

1 KW DUMMY LOAD

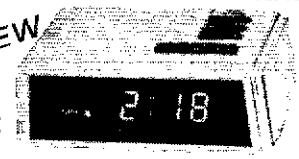
MFJ-250 **$39.95**



Tune up fast, extend life of finals, reduce QRM! Rated 1KW CW or 2KW PEP for 10 minutes. Half rating for 20 minutes, continuous at 200 W CW, 400 W PEP VSWR under 1.2 to 30 MHz, 1.5 to 300 MHz. Oil contains no PCB. 50 ohm non-inductive resistor. Safety vent. Carrying handle. 7½x6¾ in.

24/12 HOUR CLOCK/ID TIMER

MFJ-106 **$19.95** *NEW*



Switch to 24 hour UTC or 12 hour format! Battery backup maintains time during power outage. ID timer alerts every 9 minutes after reset. Red LED .6 inch digits. Synchronizable with WWV. Alarm with snooze function. Minute set, hour set switches. Time set switch prevents mis-setting. Power out, alarm on indicators. Gray and black cabinet. 5x2x3 inches. 110 VAC, 60 Hz.

DUAL TUNABLE SSB/CW/RTTY FILTER

MFJ-752B **$99.95**

Dual filters give unmatched performance! The primary filter lets you peak, notch, low pass or high pass with extra steep skirts. Auxiliary filter gives 70 db notch, 40 Hz peak. Both filters tune from 300 to 3000 Hz with variable bandwidth from 40 Hz to nearly flat. Constant output as bandwidth is varied; linear frequency control. Switchable noise limiter for impulse noise. Simulated stereo sound for CW lets ears and mind reject QRM. Inputs for 2 rigs. Plugs into phone jack. Two watts for speaker. Off bypasses filter. 9-18 VDC or 110 VAC with optional adapter, MFJ-1312, $9.95.

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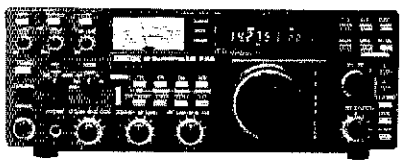

	Regular	SALE
IC-751 9-band Xcvr/.1-30 MHz Rcvr	$1399.00	Call
PS-35 Internal power supply	160.00	144.95
FL-52A 500 Hz CW filter	96.50	89.95
FL-53A 250 Hz CW filter	96.50	89.95
FL-33 AM filter	31.50	
RC-10 External frequency controller	35.00	
CR-64 High stability reference xtal	56.00	
IC-745 9-band Xcvr/.1-30 MHz Rcvr	$ 999.00	Call
PS-35 Internal power supply	160.00	144.95
CR-455K5 2.8 KHz wide SSB filter	TBA	
IC-271H 100w 2m FM/SSB/CW Xcvr	TBA	
IC-271A 25w 2m FM/SSB/CW Xcvr	699.00	Call
IC-471A 10w 430-450 SSB/CW/FM Xcvr	799.00	Call
PS-25 Internal power supply	99.00	89.95
EX-310 Voice synthesizer	39.95	
IC-290H 25w 2m SSB/FM Xcvr		Call
IC-22U 10w 2m FM non-digital Xcvr	299.00	249.95
EX-199 Remote frequency selector	35.00	
IC-37A 220MHz	449.00	Call
IC-27H 2 meter 45 watts	409.00	Call

IC-27A 25w 2m mobile Xcvr ..... TBA

IC-47A 440 MHz ..... 469.00 Call

RP-3010 10w 440 MHz FM repeater . 999.00 899.95

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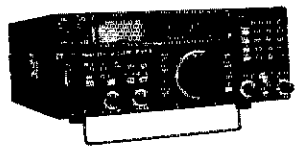
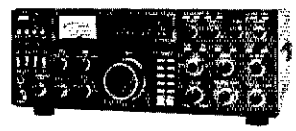
Deluxe models		
IC-02A for 2 meters	$ 319.00	289.95
IC-02AT w/DTMF	349.00	314.95
IC-04A for 440 MHz	TBA	
IC-04AT w/DTMF	379.00	Call
Standard models		
IC-2A for 2 meters	239.50	214.95
IC-2AT with TTP	269.50	219.95
IC-3A for 220 MHz	269.95	234.95
IC-3AT with TTP	299.95	239.95
IC-4A for 440 MHz	269.95	234.95
IC-4AT with TTP	299.95	239.95



New
IC-R71A Short wave receiver ..... Call



	Regular	SALE
TS-930S/AT	1799.00	Call
TS-930S	1599.00	Call

SPECIAL SALE

Buy a TS-930S W/AT for $1799.95 and get your choice of a TR-3500 or TM-201A FREE. Cashier's Check plus UPS

TS-530SP	749.00	Call
VFO-240	169.95	
AT-230	194.95	
AT-130	144.95	
TS-430	895.95	Call
PS-430	149.95	
AT-250	399.95	
TS-130SE	629.95	Call
TS-660(GM)	699.95	Call

TL-922A 2K AMP	$1229.95	Call
SM-220	359.95	

TW-4000A	599.95	Call
VS-1		
TR-9130	529.95	Call
TS-780	995.00	Call
TR-7950	399.00	
TM-401	399.00	

R-2000 Short wave receiver ..... Call

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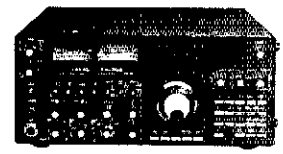
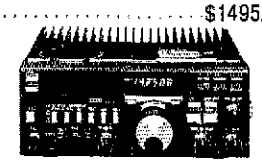


	Regular	SALE
FT-One/All Optional (except key unit)		1995.00
FT-980	$1495.00	Call



FT-757GX	829.00	Call
FT-726R	899.00	Call
Optional modules in stock		Call
FT-230R	359.00	Call
FT-730R	399.00	359.00

SPECIAL SALE

Buy an IC-751 w. p/s at the regular price of $1559 and get one FREE IC-45A worth $399! IC-745 Call!! FT-208R Call!!

FT-203R New	239.00	215.00
FT-208R	319.00	279.00
FT-708R	319.00	Call
FT-102		Call Special
FRG-7700	549.00	395.00
Short wave receiver		

MIRAGE

B-3016	239.00	199.00
B-1010	319.00	289.00
B-1016	279.00	249.00
B-23	89.00	79.00

SANTEC

ST-142	Call
ST-220	Call
ST-440	Call

AEA

CP-1/20	229.00
CP-1/64	229.00

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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.

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QSLS, Quality and fast service for 24 years. Include call for decal. Samples 50¢. Ray, K7HLR, Box 331, Clearfield, UT 84015.

NEW KID on block — for QSL free samples write Kings Grove Press, Box 9, Ellerslie, MD 21529. Also custom printing and SWL's. Stamp appreciated.

RUBBER Stamps custom made. QSL card brings Free Literature! J. Glass, WB6ZTI, 14316 Cerecita Drive, East Whittier, CA 90604.

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.

STAMP brings QSL catalog of new designs and samples, from $7 up. 22 years custom printing. WA6SOK, 4056 Acacia, Riverside, CA 92503.

NEW 3-D designs, including Space Shuttle, samples 50¢, 3-D QSL Co., P.O. Box D, Bondsville, MA 01009.

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QSL DISCOUNTS: $19.95 per 1000. White cards, black ink, one or two sides. 2-3 week delivery. S.A.S.E. for free samples. Jim's Printing Service, 2155 Young, Memphis, TN 38104.

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QSLs by K6MFE — "Customized" $24.50 per 1000. 7124 "C" Mohawk Trail, Yucca Valley, CA 92284.

COLORFUL QSL's — thirteen card colors, ten inks, Samples 50¢. Specialty Printing Box 361, Duquesne, PA 15110.

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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 1984 catalog is $1, and required for ordering. Over 2,000 models listed. Hi-Manuals, Box D802, 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 radio equipment. Tubes, books, mags-Pre 1940 T.V. any condition. Phil, Forest Hills Wireless Museum, 6761 Alderton, Flushing, NY 11374 212-896-3545.

SPY RADIOS WANTED! WW2 Historian purchases; Military Radios in Civilian Suitcases; Military Radios with prefix "SS," (example "SSTR-1"); AN/PRC-1,5,10,11; early electronic "Bugging" devices; Espionage/Cipher Equipment! Museum, Box 18521, Wichita, KS 67218, 316-684-6254.

WANTED: radios, magazines, horn speakers, pre 1930. W6THU, 1545 Raymond, Glendale, CA 91201. 818-242-8961.

MICROPHONES used in radio/TV broadcasting prior to 1960 wanted for archive. Write: James Steele, NAB, Box 39190, Washington, DC 20016.

WANTED: Old RCA, Western Electric, Cunningham, Genalex, tubes, speakers, amplifiers. Tannoy speaker, 713-728-4343, Maury Corb, 1122 Atwell, Houston, TX 77096.

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SX-28-A or Hmind. Super-Pro (SP300) wanted. KA1LJZ Box 68, S.W. Harbor, ME 04679. 207-244-7102.

COLLINS COLLECTION: KWS-1, (2) 75A4, 75S3, 75S3B, 516I. $2000. Museum item: FCC CW-testing gizmo. $200. Cobra 10M SSB $100. Johnson kW-Matchbox $200. K7SS 206-328-2847.

WANTED: 75A4, Johnson Desk-kW, other Johnson equipment. K4MOG, 184 Lake Somerset Drive, Marietta, GA 30064.

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COLLINS WANTED: Kilocycles dial for KW-1; 353C-31 and 353C-14 plug-in filter adaptors for 75A-1; 8R-1 crystal calibrator for 75A-2/75A-3; 35U-1 low pass filter for 75A-4; 35C-2 low pass filter for transmitting; turns counter assy. for tune and load controls on KWS-1; wiring duct and harness for SC-101 station control. AC1Y c/o ARRL Hq.

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SELL - MLA-2500 Dentron amplifier (w/factory 10 meters), mint condition. Less than 20 hours use. Firm. $550. KB4XU, 803-768-2831.

KLM LOG Periodic for sale ($500): 8 el., 7.0-7.3 & 10.0 - 30.0 coverage, new. Call Ray Wade, K5JCM, 918-492-1630 mornings/evenings.

TEN-TEC DELTA 580, deluxe power supply, hand mic, CW filter, mint, $650. WB9VQX, 309-829-2792.

WANTED - TOWER, free standing 50 to 100 feet in good condition. Crankup or foldover. Send offer to John Reika, 1427 Pine Vista Road, Escondido, CA 92027, or call 619-271-5000, 619-489-6982. WA6OWU.

SALE - OMNI D, Series "B" all filters, nb. No mods. Mint 252 mo. ps, $450. Omni D, Series "C" all filters, nb. 280 ps, no mods, mint, $599. K6GG, 916-934-3472 evenings.

TS-930S, SB-230 mint: Kenwood TS-930S with Fox-Tango SSB and CW i-f filters, auto tuner, MC-60 mic, other accessories $1380. Heath SB-230 1200 watt linear, used less than 100 hours $350. Harrison, KA2R, 518-371-5288.

DRAKE T-4X, R-4A, MS-4 & mic - $450. MN-2000, $165. Yaesu FT101EE w/fan with all manuals $425 mint. Will ship. 617-473-7149 WA1AWR.

LOGBOOK-V2 A complete log maintenance program consisting of seven modules to handle all phases of logging. Features multi-key and multi-level searching of thousands of records in seconds and full feature editing. Prints Station Logs, Contest Logs, Contest Dupe Sheets, QSL Cards, WAS Lists, DXCC Lists, 6-Band WAS lists. For TRS-80 Model I, Model III & Model IV. Price $39. Reviewed December QST. Supplied on 5¼" DOSPLUS formatted disk with complete documentation. Specify model/density of computer when ordering. WB8YUO, 6333 Willowdale Court, Columbus, OH 43229. 614-895-1130.

HEATHKIT HW16 transceiver and HG10B VFO with manuals. $120. WB5SRB 501-636-5387.

NEED GOOD used SPR-4 Drake receiver. Upson Howard/147 Dixie Trail, Warner Robins, GA 31093.

160/40/15 METER dipole, 115 feet long, coax-fed, NO tuning. $49.50 postpaid. Tom Evans, W1JC, 113 Stratton Brook, Simsbury, CT 06070.

DOES ANYBODY know where I can buy a 30:1 planetary drive for a receiver? WB6SKW, 8019 Whiteoak, Reseda, CA 91335.

SELL: KENWOOD R599/T599/S599 $390; R599 2M converter (new) $25; DG-5 display $115; DK-520 interface $20; VFO-520 $95; SP-520 $25; Icom HM-12 microphone (new) $25; IC720(A) notch kit $25; Transi-Trap lightning protectors LT/HT/HTN. Want Cushcraft 2mJr Boomer. WA6ERB. 14311 West Virginia Dr., Lakewood, CO 80228, 303-986-0189e (after 9/4/84).

WANTED: NEW or used HV173 unblanking regulator tube for Heath OP1 scope. N5CP, 2700 N. 7th, McAllen, TX 78501.

FOR SALE: Dentron GLA-1000 $199. MSB-1 audio filter $49. SP-820 $35. SCM 1500 Electronic Typewriter $109. W2ATM, 914-636-2829.

WANTED - TUBES - 3TF7, OA2, 6AK6, 6C4, 6DC6, 5654, 5749, 5814A. Owen Royce, P.O. Box 187, Mequon, WI 53092. 414-241-8335.

HEATH HW100 transceiver complete with power supply, speaker, microphone, manuals. Works good, looks good $200. K6BUR 818-763-1993.

K2GIN SELLING complete station less antenna $500, health reason, Long Island pickup, 516-324-6136.

YAESU FT-77, with 20/40 meter mobile antennas, 2 months old, $475, Heath SW-717, $50, Heath VTVM IM-5218 never used, $60, MFJ 1224 RTTY interface with VIC-20 cartridge, $100, KD8LF, 419-726-2467.

SALE, KENWOOD 530S original box excellent condition $450. Also Kenwood 7400A 2 meter $150. Kellick, 3119 Rollingwood, Port Richey, FL 33568, 813-862-3850.

KENWOOD TS-530S mint $500, MC-50 $35. VIC-20, Kantronics/TU, Hamsoft, C2N Datasette, Commodore model 1520 printer/plotter, my cost $633, mint, package $350. A-3 beam $140, 40/30M kit $45. W4PDT, 904-282-0749.

NEW TI Extended Basic cart/manual. $80. KQ3H/KB3CS 215-355-3073.

209 ARGONAUT, 405 linear, 251 AC Supply, 208 CW filter, 506A Calibrator, transmatch, all mint condition. $425. K4MSG, 204 S. Harrison, Sterling, VA 22170. 703-435-2994.

HALLICRAFTERS FPM-300, absolutely mint condition $325. KI4KW, 703-943-9077 will ship.

KATE KWM2A $695, 30L1 $695, new 8874's $160 each. W9ZR, 1-414-434-2938.

DIGITAL AUTOMATIC Displays for FT-101's, TS-520's, Collins, Drake, Swan, Heath and others. Write for information. Grand Systems, P.O. Box 3377, Blaine, WA 98230. 204-530-4551.

WANTED ALIVE: Instructograph Code Machine. State model, condition, and price. Norm N8FUN, 22488 Piper East Detroit, MI 48021.

MADISON USED Guaranteed: TS520 $395; TS520S $450; TS530S $525; TS820S $525; VFO820 $115; TS930S/AT $1200; Yaesu FT102 $550; FT901DM $650; new demo FT-1, filters, RAM $2000; Collins 75S3 $295; 32S3/AC $395; call Id Collins parts; Drake R7A/3 filters $1000; Johnson kW Matchbox $195; new Collins F455J05 75A4 CW filter $95. Prices FOB Houston, subject prior sale. Items guaranteed, sales price refunded. 90 day warranty, 6 month trade new unit. Madison Electronics, 1508 McKinney, Houston, TX 77010. 1-713-658-0268 (quotes) 1-800-231-3057 (orders). Mastercard/VISA.

YAESU FT-102 with CW filter, mike, manual. Mint, $550. WB7VOO, 602-298-4820.

ARG-7 RECEIVER, $150; Advanced Research pre-amp 432 MDG, $45; Trionix downconverter 2-2.3 GHz, $15; 500 MHz (501A) relay, $18; VHF 432 MHz exciter, $20; LA-45 432 amp w/sink, $45; Hamtronics 432-434 converter - 28 out, cabinet, $37; Hamtronics resonators HRF-432, $20; HRA-432, $30. W2WHK, Don, 716-692-5451.

WANTED: 10m SSB-converted CB's! Sell HW-7! WB4JHS. 33-8 U.V.S., Gainesville, FL 32603, 904-377-9595.

HEATHKIT HW2021 2-meter, 5 watt handheld 5 crystals included, $75. KI4KW, 703-943-9077.

CRYSTALS, 203-A TUBE: Write for crystal listings and circuits, 1700 to 60,000 kilocycles. See September classified. Long SASE or stamp. Made to order "Crystals Since 1933". WØLPS. Oldtimers, collectors - Shiny, unused 203-A's $9.95, postate $2.50. Technical data supplied. C-W Crystals, Marshfield, MO 65706.

SELL: CENTURY 21 (analog) mint condx., $225. Yaesu FTdx 570, needs alignment, otherwise excellent, $300. Both with manuals. Will ship. WA6SAW, 916-842-5680.

WANT DRAKE R4B receiver, have HW-101. Will trade or sell. W2RSY, Russell, NY 13684, 315-347-2228.

YAESU FT-102 xcvr mint $500, AEA CP-1 with MBA text for C-64 $100, Mirage D1010N $125, Bird 43 10W and 250W UHF slugs $100. Call Vic, KD2CX, 201-628-9319 after 6.

SWAN 350D, (digital) excellent. $295. W2GCW, 518-828-9860.

REPLACE RUSTED antenna bolts with stainless steel. Small quantities, free catalog. Elwick, Dept. 529, 230 Woods Lane, Somerdale, NJ 08083.

WANTED: MIDLAND 13-513 220 FM. Other rigs considered. Steve Mottola, WB3GUS, 712 Azalea Drive, Rockville, MD 20850.

SELL: R7A AM filter $1050. Icom 740, built-in P.S. $650. Both excellent. W1GAJ, David Schwartz, 1183 Southeast St., Amherst, MA 01002.

DRAKE R-4A, extra xtals, $85; vacuum capacitors. John, NB9D, 815-397-1122.

MOVING SALE: Triband quad and rotor, really performs, $250. 45' heavy duty crankup tower, $250. QST 1957 to 1983, $50. KF7Z, 503-884-2046.

SELL: Omni-D Series B. Modified adjustable AGC, CW filter, remote VFO & power supply. Original carton. $675. K8LZ 304-562-9171 evenings.

TI-99/4A BASIC cassettes, quality tapes: send/receive code practice, $8.95; MINIMUF propagation, $9.95; Ham Computations and Design (Yagis, PI and L Networks, Beam Heading, Line SWR and Input Impedance, Inductors, Dipoles, Ground Reflection Factors) $10.95, A C Buxton, Ham Software Co., 2225 Woodpark, Akron, OH 44313.

COLLINS PTO units — new, 70E8 $15, 70E17 $20, 70E8A, w/dial and tuning assy, $50. Icom IC451A 432-435 MHz, like new, original box, $450 plus shipping. W3ZD, 520 Centennial Road, Warminster, PA 215-675-4539.

FOR SALE - Yaesu FT-101E. Excellent condition. Blower & CW filter installed. Yaesu desk microphone. $400, you pay shipping. KB4PQ, 305-574-2496.

HEATH SB-303, CW filter, good cond.-$200; SB-400, xtals, good cond.-$125; SB-401, xtals, factory wired, exc. cond.-$200; DX-60 & HG-10B, exc. cond.-$75. Bert, WB2MFW, 201-229-0060 evenings.

YAESU FT901DM hf transceiver, C.W. filter, D.C. power cable, new pair spare finals, owner & service manuals. All excellent condition. $595 includes packing & shipping. Dave, W7BER, Tempe, AZ 602-820-9111.

COLLINS KWM-380 - Collins updated all S/B thru #18; accessory include A/C 3810 A/C 3812 filters. Asking $1750. Argosy 525 10/80 w/30 meter filters include (220-223-224-226-217) factory installed and aligned. Asking $325. Equipment all in excellent cond. Stan, KD8OL, 313-981-2302.

HF, VHF and UHF stations, test equipment and accessories of W2AZL, Carl Scheideler and W2DWJ, Bill Romanow available thru WB2ONA, Warren, 8 Gunia St., East Brunswick, NJ 08816, 1-201-257-3871 large SASE for list.

COMPLETE COLLINS system. Wing 75S-3B, 32S3, 516F2 cased with speaker, noise blanker, 312B5 round emblem. DD1C Spectronics digital display. Instruction books, cables. $965. Collins wing KWM2A, 516F2 cased, Waters notch filter $465. All equipment new condition, normal operation. Shipping FOB Bronxville. Send SASE for list of two meter gear, Heathkit 104A transceivers, variety test equipment, transmitting variable condensers, antique tubes, components. Don Whittemore, W2CUZ, 36 Masterton Rd., Bronxville, NY 10708. Phone 914-337-1059.

COLLINS crystal pack $165, 312B-5 $285, F455J05 $90, F455N40 $40, F455N160 $40, F500B14 $50. Wanted: 30L-1. K5UR, 501-988-2527.

COLLINS 75S-3C. Round late production. $525. Astro 150 transceiver sealed. $500. KA6NNR, Box 71703, Los Angeles, CA 90071, 818-795-3397.

1985 CALLBOOKS, US/DX pairs only, $35 postpaid. Avatar (W9JVF) 1147 N. Emerson, Room 10. Indianapolis, IN 46219.

WANTED: ICOM IC-505 6-meter. Steve Mottola, WB3GUS, 712 Azalea Drive, Rockville, MD 20850.

TEN-TEC SPECIALS: Latest production, sealed factory boxed 560 Corsair $995, 260 P/S $179, 263 VFO $179, 250 Hz, 500 Hz, 1.8 kHz, filters each $55, 579 Century 22 $349, 979 P/S $82, 525D Argosy digital $519, 225 P/S $120, 214 Microphones $42, 228 Antenna Tuner $99, 229 Antenna Tuner 2 kW $239, 2510 Satellite Station Mode B, SSB/CW $439, 2591 2 Meter FM handheld, digital 4W $285, 2700 Speaker/Mike $36. We pay shipping UPS, VISA, M/C or Check. For your Ten-Tec needs write or phone Bill Slep, 704-524-7519. Slep Electronics, Highway 441, Otto, NC 28763.

DRAKE L7 Linear $850, MFJ 989 Antenna Tuner $225, excellent condition. Will ship. KF8A, 1013 South Drive, Fargo, ND 58103. Ph. 701-235-8980.

FOR SALE: Complete station. Heath HX-20 xmtr, HR-20 rec, HP-20 pwr. SB-610 monitorscope, Cantenna, signal generator Knight recvr. Johnson 250-23-275 Matchbox. All manuals. Boxes of spare tubes and parts. BC-221 freq. meter. VTVM. SWR bridge. 2 speakers. MFJ CW filter. Mike, key, "bug." 3 whisper fans. For the Real Ham; fun experiment, learn. Works the world as well as any; logs prove. Home brew QSK & wave former. Windom ant. All as one sale only, as is. $500 or best offer; plus U.P.S. charge. Bill Seaver, P.O.B. 86, New London, NC 28127 704-463-7628.

ICOM SALE: IC 551D 6 meter transceiver w/PS-20 supply, ARR preamp, EX-106 FM adaptor, SM-2 desk mike, $550. IC 451A 430 MHz transceiver, $450, IC R-70 communications receiver w/EX-257 FM unit, SP-3 speaker, DC cord, $425. All radios low time, excellent condition, in original cartons. Contact D. Hawrysko, WB2JXY, Box 568 Boro Hall, Jamaica, NY 11424. Phone A. C. 212-224-2448.

HENRY 1KD5 linear amp. for sale. 1200 watts input. 10 thru 80 mtrs. New 3-500Z tube. AG2M, 40 Clinton St., Cornwall, NY 12518 or 914-534-2733.

DXPEDITION ON Montserrat for $250/week. VP2ML, Box 4881, Santa Rosa, CA 95402.

SALE: H/T ST-144μP - mint $180. Robot 400 SSTV converter $350. B/W video monitor $65. Autek-CMOS memory keyer $60. N2WA - 201-742-9438.

CALLBOOKS, 1985 Winged Horse: U.S. $19; DX $18. Four or more, any mix: $32.99/pair. Postpaid USA. Foreign Hams — Order Now! MC/VISA/personal check ok. K4VUD/5 Tall Towers, 6005 Rainier, Plano, TX 75023.

KENWOOD TS-430S HF transceiver; unused, original carton, $500, shipping, COD, 215-649-9041. Michael W. Singer.

ANTENNA SPECIALS: B&W AV25 $86.95, B&W 370-15 80-10 Folded Dipoles $125.95. Hustler 6BTV/5BTV/4BTV $123/$103.95/$87.13, two meter collinears G6144B/G7144 $75/$106.90. UPS extra, send stamp for flyer. Don, WB2RTW, Hart Eastern Communications, 1444 Darlington Drive, Derby, NY 14047.

ATLAS 210X/NB transceiver, Shure 404C mic, mobile mount $365 W1DQO, General Greene Rd., Shelburne, VT 05482, 802-985-2235.

FOR SALE: Swan 500 C, transmit/receiver direction control, Swan 508, Swan speaker, Hi-Gain #389 antenna, Tri-Ex W-51 tower. A. Galvan, 201-864-4881, 4808 Bergenline Ave., Union City, NJ 07087.

10-10ers: Mini-Quads $135. Hustler 4 element 10 mtr beams $99.75. UPS extra. Stamp for flyer. Don, WB2RTW, Hart Eastern Communications, 1444 Darlington Drive, Derby, NY 14047.

SELL: T4XC, R4C, MS-4, Magnum-6 $450; 820S, VFO $450; 520 $350. W6DZN, Dave Fraser, 707-539-6454, 1517 Manzanitos Ave., Santa Rosa, CA 95404.

ROSS $$$$ New October Specials: If this month's special is not what you are looking for send Call Letters, name & phone # for personal price quote. Over 6,000 ham related items in stock. Rohn HDBX-48 $329.90. Icom IC-02AT $298.90, IC-417A $689.90, IC-45A $309.90, IC-25A $279.90, IC-R70 $569.90, IC-R71A $639.90, Kenwood TS-430S Phone, PS-430 $129.90, TR-8400 $379.90, TR-9000 $379.90, TS-530S $539.90, TR-2500 $229.90, VFO-230 $139.90, TW-4000A $597.90, TS-780 $799.90, TR-7950 $358.90, Yaesu FT-208R $219.90, FT-757GX Phone, FT-708R $229.90, FRG-7700 $379.90, FRG-7 $239.90. All major lines stocked, L.T.O. Mention Ad. Prices cash, FOB Preston. Closed Monday at 2:00. Ross Distributing Company, 78 South State, Preston, ID 83263. 208-852-0830.

FOR SALE - Kenwood TS120S transceiver. Frank Curtis, Virgil, SD 57379.

ROSS $$$$ Used October Specials: Kenwood TR-2400 $179, LH-1 $18, R-1000 $295, R820 with four filters $699, TL922 $949, TS600 $299, VFO-180 $95. Robot 400 $299, 800 $299, Yaesu CPU2500 $187, FC2 $20, FC6 $19, FL101 $279, FRG7700 $325, FT101 $299, FT207 $139, FT221R $289, FC221 $59, Icom 245 $169, IC21A $169, IC2KL $1099, IC551D $479, IC701 $445, AT100 $259. If this month's special is not what you are looking for send Call Letters, name & phone # for personal price quote & used list. Over 6,000 ham related items in stock. Mention Ad. Prices Cash, FOB Preston. Closed Monday at 2:00. Ross Distributing Company, 78 South State, Preston, ID 83263. 208-852-0830.

FOR SALE - 3400Z $55, 4-125A $25. 5CX1500A $150. 4CX1500B $125. SK-800A socket $70. New Swan WM3000 bridge $45. Thordarson plate transformer 2000 4000 DC volts 1200 watts. $35 pickup. W6HHN, 415-494-1791.

WANTED: AED Scanner Kit for Clegg FM-28, K3HSS, 3924 Hasbrook Ave., Phila., PA 19120.

YAESU FT-980 transceiver, 600 Hz CW filter, internal keyer, SP-980 speaker (with audio filters) — like new, $1165. Jeff Ross, K2OD, 609-397-3255 evenings/weekends.

DX-ERS! Can't pull that underpowered station through the QRM? Try the HQ-FAE! No connection to or butchering of the receiver! No additional expense! Complete instructions $4.95. WA4GRZ, 1018 NW 39th Dr., Gainesville, FL 32605.

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Index of Advertisers

ANTENNA/TOWER SALE!

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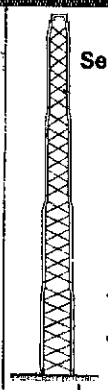
All Models Shipped Factory Direct—Freight Paid*!

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	$ 719
HG52SS	52 ft	9 sq ft	$1049
HG54HD	54 ft	16 sq ft	$1629
HG70HD	70 ft	16 sq ft	$2589

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
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- 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	$319
HBX48	48 ft	10 sq ft	303	$399
HBX56	56 ft	10 sq ft	385	$489
HDBX40	40 ft	18 sq ft	281	$379
HDBX48	48 ft	18 sq ft	363	$469

*Your Total Delivered Price Anywhere In Continental 48 States. Antenna Load Based on 70 MPH Wind.

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	$999
LM354	54.0 ft	21.0 ft	16 sq ft	$2010	$1599
LM470D (Motorized)	70.0 ft	22.0 ft	16 sq ft	$4195	$2999
DXB6 (Motorized)	86.0 ft	23.0 ft	25 sq ft	$7200	Call

BUTTERNUT ELECTRONICS CO.

- Designed to operate on all Amateur Bands at "FULL" Legal Power Input.
- Automatic Band Switching (80/10 meters).
- Automatic Band Switching (160/10 meters) with optional model TBR-160 HD.
- IN STOCK for IMMEDIATE DELIVERY & LOOK at very SPECIAL PRICES . . .
- New Model HF6V $129.00
- New Model TBR-160HD (High Power 160 meter Base Resonator) $49.00.

Model RMK-11 (roof mount kit with multiband radial kit $39.00. Model STR-2 (Stub Tuned Radial Kit) $29.00.

Delivery Anywhere In The Continental USA At No Additional Cost. (Free Shipping On Butternut Accessories Also When Purchased With Antenna.)

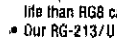
RG-213U

$.29/ft $279/1000 ft Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables.
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X

$.19/ft $179/1000 ft



- RG8X—95% Bare Copper Shield
- Low Loss Foam Dielectric
- Non-contaminating Vinyl Jacket

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE/HELIAX™

Lowest Loss for VHF/UHF!

- ½" Alum. w/poly Jacket . . . . . $.79/ft
- ½" LDF4-50 Andrew Heliax ™ $1.69/ft
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select connectors below.

HARDLINE & HELIAX™ CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
½" Heliax ™	$22	$22	$22	$22
⅞" Heliax ™	$49	$49	$49	$49

AMPHENOL CONNECTORS

Silver PL259 . . $1.25 UG23D N Female . $2.95
UG21B N Male . . $2.95

ANTENNA WIRE & ACCESSORIES

14 Ga. Stranded Copperweld . . . . . $.10/ft
450 Ohm H.D. Line . . . . . $.16/ft
18 Ga. Copper coated steel wire ¼ mile long . . . $30
H.D. End Insulators $2/ea
Van Gorden 1:1 Balun $11
Van Gorden Center Insulator $6

HUSTLER 6BTV 80-10 mtr Vert. $129

4BTV 40-10 mtr Vert $89 5BTV 80-10 mtr Vert. $109
G6-144B 2-mtr Base $89 G7-144 2-mtr Base . . $119

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$12	$12	$15	$18	$22
2KW Super	$18	$20	$22	$26	$36

Bumper Mounts - Springs - Folding Masts In Stock!

CUSHCRAFT

MULTI-BAND HF ANTENNAS

A3 3-el Tribander $219 A4 4-el Tribander $289
R3 20/15/10mtr Vert $279 A743/A744 40mtr Kit $75

HF MONO-BAND ANTENNAS

10-3CD	$ 95	10-4CD	$109
15-3CD	$119	15-4CD	$129
20-3CD	$199	20-4CD	$279
40-2CD	$289	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
A147MB	$ 29	PS4	$ 69

VHF/UHF FM ANTENNAS

A147-4	$ 29	A147-11	$ 49
214FB	$ 79	228FB	$219
A449-6	$ 29	ARX2B	$ 39

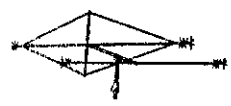
HY-GAIN

Discoverer 2-el 40-mtr Beam $319
Discoverer 3-el Conversion Kit $199

Explorer-14 . . . . . $309
QK710 30/40 mtr. Add-On-Kit $79
V2S 2-mtr Base Vertical $49
TH5MK2S Broad Band 5-el Triband Beam . . . $389
TH7DXS 7-el Triband Beam $439
TH3JRS 3-el Triband Beam $189
TH2MK3S 2-el Triband Beam $179
205BAS 5-el 20-mtr Beam $349
155BAS 5-el 15-mtr Beam $199
105BAS 5-el 10-mtr Beam $129
204BAS 4-el 20-mtr Beam $259
64BS 4-el 6-mtr Beam $89
66BS 6-el 6-mtr Beam $135
18HTS 80-10 mtr Hy-Tower Vertical $439
LC-160 160-mtr Coil Kit for 18HTS $45
214BS 14-el 2-mtr Beam $49
2BDD 80/40 mtr Trap Dipole $69
5BDD 80-10 mtr Trap Dipole $129
BN86 80-10 mtr KW Balun W/Coax Seal $22

MOSLEY

Pro37 7-el Triband Beam $469
CL-33 3-el Triband Beam $279
TA-33J 3-el Triband Beam $249
TA-33JR 3-el Triband Beam $189
TA40KR 40 mtr Kit for TA33 . . . . . $119



MINI-PRODUCTS HQ-1

LIST $182.50 SALE $159

- Wing Span - 11 ft
- Wind Area - 1.5 sq ft
- Boom - 54 in. long
- 1200W P.E.P. Input

ALPHA DELTA COMMUNICATIONS

Transi-Trap ™ Surge Protectors—In Stock Now!

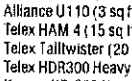
Model LT 200W UHF Type . . $19
Model HT 2KW UHF Type . . $29
Model LT/N 200W N Type . . $39
Model HT/N 2KW N Type . . $44
Model R-T 200W Deluxe . . $29
Model HV 2KW Deluxe . . . $32

KLM

KT34A 4-el Broad Band Triband Beam	$339
KT34XA 6-el Broad Band Triband Beam	$489
80m-1 80-mtr Rotatable Dipole	$595
40m-1 40-mtr Rotatable Dipole	$179
40m-2 2-el 40-mtr Beam	$309
40m-3 3-el 40-mtr Beam	$459
40m-4 4-el 40-mtr Beam	$649
2m-13LBA 13-el 2-mtr Beam	$79
2m-14C 14-el 2-mtr Satellite Antenna	$89
2m-16LBX NEW-16-el 2-mtr Beam	$99
2m-22C NEW-22-el 2-mtr Satellite Antenna	$119
432-30LBX NEW-30-el-432 MHz Antenna	$99
435-18C 435 MHz Satellite Antenna W/CS-2	$119
432-16LB 16-el 432 MHz Beam	$69

ROTORS & CABLES

Alliance HD73 (10.7 sq ft rating)	$99
Alliance U110 (3 sq ft rating)	$49
Telex HAM 4 (15 sq ft rating)	$219
Telex Tailtwister (20 sq ft rating)	$269
Telex HDR300 Heavy Duty (25 sq ft rating)	$519
Kenpro KR-500 Heavy duty elevation rotor	$189
KLM EL-3000 Moon Tracker Elevation Rotator	$349



Standard 8 cond cable $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $ 36/ft (vinyl jacket 2-#16 & 6-#18 ga)

SOUTH RIVER ROOF TRIPODS

HDT-3 3 ft Tripod . . . $19 HDT-5 5 ft Tripod . . . $29
HDT-10 10 ft Tripod . $49 HDT-15 15 ft Tripod . $69

Heavy Duty Tripods include mtg hdw-UPS Shippable

ROHN GUYED TOWERS

10 ft Stack Sections

20G $37.50 25G $46.50
45G $107.50 55G $127.50

All 20G, 25G, 45G and 55G Accessories In Stock at Discount Prices - CALL!

Foldover Towers

Model	Height	Ant Load*	Price
FK2548	48 ft	15.4 sq ft	$ 829
FK2558	58 ft	13.3 sq ft	$ 899
FK2568	68 ft	11.7 sq ft	$ 959
FK4544	44 ft	34.8 sq ft	$1159
FK4554	54 ft	29.1 sq ft	$1259
FK4564	64 ft	28.4 sq ft	$1359
25G Foldover Double Guy Kit			$199
45G Foldover Double Guy Kit			$229

*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

TOWER/GUY HARDWARE

3/16 "EHS Guywire (3990 lb rating)	$.13/ft
1/4 "EHS Guywire (6000 lb rating)	$.16/ft
5/32 " 7 × 7 Aircraft Cable (2700 lb rating)	$.12/ft
3/16 "CCM Cable Clamp (3/16 " or 5/32 " Cable)	$.35
1/4 "CCM Cable Clamp (1/4 " Cable)	$.45
1/4 "TH Thimble (fits all sizes)	$.30
3/8EE (3/8 " Eye & Eye Turnbuckle)	$5.95
3/8 "EJ (3/8 " Eye & Jaw Turnbuckle)	$6.95
1/2 "EE (1/2 " Eye & Eye Turnbuckle)	$8.95
1/2 "EJ (1/2 " Eye & Jaw Turnbuckle)	$9.95
3/16 " Preformed Guy Grip	$1.99
1/4 " Preformed Guy Grip	$2.49
6 " Diam - 4 ft Long Earth Screw Anchor	$12.95
500D Guy Insulator (5/32 " or 3/16 " Cable)	$1.39
502 Guy Insulator (1/4 " Cable)	$2.49
5/8 " Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.29/ft
HPTG4000 Guy Cable (4000 lb rating)	$.43/ft
HPTG6700 Guy Cable (6700 lb rating)	$.69/ft
9901LD Cable End (for 2100/4000 cable)	$6.95
9902LD Cable End (for 6700 cable)	$7.95
Socketfast Potting Compound (does 6-8 ends)	$12.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 in Wall	$25	$49	$59	$79
.18 in Wall	$39	$69	$99	$129
.25 in Wall	$69	$129	$189	$249

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MISSOURI RADIO CENTER

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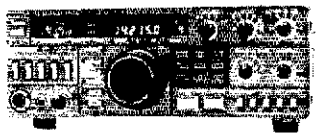

TS-430S Most Advanced, Compact HF Transceiver

• General Coverage Receiver • USB/LSB/CW/AM/Optional FM • 10Hz Dual Step Digital VFO • Eight Memories w/Lithium Back-up • Memory and Band Scan

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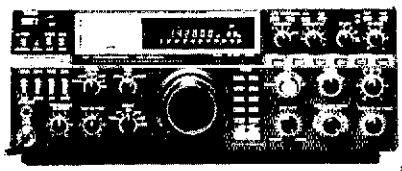

TS-930S Top of the Line HF Transceiver

• General Coverage Receiver • Superior Dynamic Range • All Solid State—28 VDC Final • QSK CW • Optional Automatic Antenna Tuner • Dual VFO w/8 Memories • Dual Mode Noise Blanker

KENWOOD

TR-7950/7930

• Large LCD Readout • 21 Multi-Function Memory • Lithium Back-up • Automatic Offset • Built-in Encoder • Memory or Band Scan

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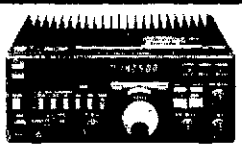
TR-2600 NEW

2.5W/300 mW (Switchable) 2 Meter Handheld Transceiver

• LCD Readout • Ten Memories w/Lithium Back-up • Band and Memory Scan • Built-in Sub-tone Encoder

YAESU



FT-757 GX

Compact General-Coverage Receiver

• General-Coverage Receiver • USB/LSB/CW/AM/FM • Dual VFOs • Memory/Band Scan • Speech Processor • CW Filter and CW Keyer included

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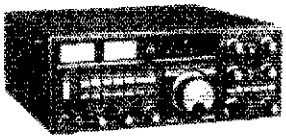

FT-726R VHF/UHF

All Mode Tri-Band Transceiver

• 50-54 Mhz • 144-148 Mhz • 10 watts output on all bands • 430-450 Mhz

YAESU

FT203R

New* Yaesu FT203R

• Compct VHF Handy Talkie • S-Meter • Small Light Weight

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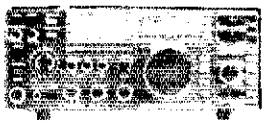
FT9

CAT SYSTEM—ComputerAided Trans

• Wide Dynamic Range • General Coverage • Low Noise Front End • 10 H 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 superg grade general coverage receiver feat keyboard frequency entry, 32 memori SSB/AM/RTTY/CW, selectable AGC a noise blanker, and wireless remote co troller (optional).

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09RH shown actual size.

FT-203R transceiver

The Yaesu FT-209RH. 5 watts that your batteries can live with.

Have the power you need when you need it with Yaesu's new 5-watt, 2-meter handheld. Power to get out in situations where ordinary HTs just won't make it.

We designed our HT with a unique user-programmable Power Saver that puts the rig to "sleep" while you're monitoring and "wakes it up" when the squelch breaks. So you can listen for hours and still have plenty of power to hit those hard-to-reach repeaters when you need to.

With the FT-209RH there's no need to fiddle with knobs when you change from one memory channel to another. That's because you can independently store everything you need in each of the ten memories: receive frequency, standard or non-standard offset, even tone encode/decode with an optional module. And then recall any channel at the touch of a button.

It's easy to hear what's happening on your favorite repeaters or simplex frequencies. Just touch a button and scan all memory channels, or selected ones. Or all frequencies between any two adjacent memories. Use the priority feature to return automatically to your special frequency when it becomes active.

Bring up controlled-access machines with the optional plug-in subaudible tone encoder/decoder, independently programmed from the keyboard for each channel. Listen for tone-encoded signals on selected channels—without having to hear a bunch of chatter—by enabling the decode function.

The FT-209RH, which covers 10 MHz for CAP and MARS use, comes complete with a 500-mAh battery, charger and soft case.

For those who want a basic radio without the bells and whistles, consider the compact, lightweight FT-203R. This economical HT features 2.5 watts of power and an optional DTMF keypad. Most all the accessories for the 209 work with the 203, including an optional VOX headset that gives you hands-free operation that's perfect for public service events.

So when you visit your dealer, let him know you won't settle for anything but the best. A radio built by Yaesu.

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Yaesu Cincinnati Service Center
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(513) 874-3100

Prices and specifications subject to change without notice.

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pacesetter in amateur radio

TS-930S "DX-traordinary"

TS-930S

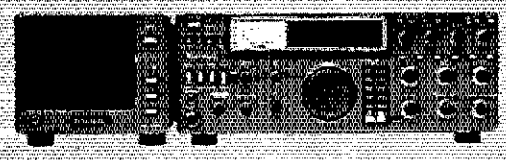
We call it "DX-traordinary" because the TS-930S has now become the favorite rig of the serious contester! Its superior capability for full break-in split-frequency operation, the speed and convenience with which its eight memory channels can be accessed, its unsurpassed receiver dynamic range and its remarkable ability to select the desired signal during periods of heavy QRM, utilizing VBT, Slope tuning, IF Notch filtering, and tuneable audio filtering, have all combined to make this the rig that gives you the EXTRA EDGE!

The TS-930S is loaded with all the special features that you always wanted in an HF transceiver. Full coverage of the 160 through 10 meter bands, including the new WARC frequencies, (easily modified for HF MARS), plus a general coverage receiver that can tune any frequency from 150 kHz to 30 MHz. Operation in the SSB, CW, FSK, and AM modes, with selectable full or semi CW break-in. All solid-state, with 250 watts PEP input on SSB, CW, FSK, and 80 watts input on AM. SWR/power meter. Triple final protection circuits plus two cooling fans built-in. 10-Hz step synthesized frequency control. Available with optional automatic antenna tuner built-in, another industry first! Dual digital VFO's. Eight memory channels that store both frequency and band information, with internal battery back-up, (batteries not supplied). Dual mode adjustable noise blankers, especially effective in eliminating "woodpecker" type interference. SSB IF slope tuning, for maximum rejection of interference. CW variable bandwidth, with pitch and sidetone control. IF notch filter. Tuneable audio peaking filter. Unique six digit white fluorescent tube digital display is easy-on-the-eyes during those long contests. RF speech processor, for higher average "talk-power" SSB monitor circuit. 4-step RF attenuator. VOX. 100-kHz marker. AC power supply built-in, 120, 220, or 240 VAC.

TS-930S Optional Accessories: AT-930 automatic antenna tuner, SP-930 external speaker, with selectable audio filters, YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filter, YK-88A-1 (6 kHz) AM filter, all plug-in type, SO-1 commercial stability TCXO, MC-60A deluxe desk microphone, MC-80 and MC-85 communications microphones, MC-42S mobile hand microphone, TL-922A linear amplifier (not for CW QSK), SM-220 station monitor, PC-1A phone patch, SW-2000 SWR/power meter, 160 ~ 6 meter, SW100A SWR/power/volt meter 160-2m HS-4, HS-5, HS-6, and HS-7 headphones.

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

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



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