November 1985 $2.75

QST

devoted entirely to Amateur Radio

Kids plus WØORE/Challenger add to a world of fun

Page 13

Ham Antennas Get a Boost!

See pages 9 and 80

the tempo S-15

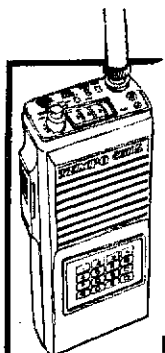
...a no nonsense radio that provides more power, broader frequency range and simplicity of operation

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

Consider these features before you decide on any hand held:

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

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



now available!

...the proven Tempo CS-15, plus three new commercial mode Tempo synthesized radios

The CS-15 is a fine quality radio with 5 watt output, 10 MHz receiver coverage, is fully synthesized, and is 10 channel internally programmable. It's also sturdy, compact and affordable.

The new Tempo FMH-15S, FMH-44S & FMT-25S (mobile)
...all feature 16 channels, CPU controlled EPROM PLL, CTCSS encode/decode programmable per channel, priority scan to Channel 1, and time-out-timer.

FMH-15S... 138-174 MHz (10 MHz) frequency coverage
1 watt (low)/5 watts (high) RF power output

FMH-44S... 400-512 MHz (20 MHz) frequency coverage
1 watt (low)/4 watts (high) RF power output

FMT-25S... 138-174 MHz (10 MHz) frequency coverage
25 watts RF power output

Available at your local Tempo dealer or from..

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KENWOOD

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The Smallest HT!

TH-21AT/31AT/41AT

Kenwood's advanced technology brings you a new standard in pocket/handheld transceivers!

- **High or low power.** Choose 1 watt high—enough to "hit" most local repeaters; or a battery-saving 150 mW low.
- **Pocket portability!** Kenwood's TH-series HTs pack convenient, reliable performance in a package so small, it slips into your shirt pocket! It measures only 57 (2.24) W x 120 (4.72) H x 28 (1.1) D mm (inch) and weighs 260 g (.57 lb) **with batteries!**
- **Expanded frequency coverage (TH-21AT/A).** Covers 141.000-150.995 MHz in 5 kHz steps, includes certain MARS and CAP frequencies. **TH-31AT/A:** 220.000-224.995 MHz in 5 kHz steps. **TH-41AT/A:** 440.000-449.995 MHz in 5 kHz steps.

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

- **Repeater offset switch.** **TH-21AT/A:** ±600 kHz, simplex. **TH-31AT/A:** −1.6 MHz, reverse, simplex. **TH-41AT/A:** ±5 MHz, simplex.
- **Standard accessories:** Rubber flex antenna, earphone, wall charger, 180 mAH NiCd battery pack, wrist strap.

NOW! Extended-life battery pack

- **Quick change, locking battery case.** The rechargeable battery case snaps securely into place. Optional battery cases and adapters are available.
- **Rugged, high impact molded case.** The high impact case is scuff resistant, to retain its attractive styling, even with hard use.

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

Optional accessories:

- **HMC-1** headset with VOX
- **SMC-30** speaker microphone
- **PB-21** NiCd 180 mAH battery
- **PB-21H** NiCd 500 mAH battery
- **DC-21** DC-DC converter for mobile use
- **BT-2** manganese/alkaline battery case
- **EB-2** external C manganese/alkaline battery case
- **SC-8** soft case for TH-21A/31A/41A
- **SC-8T** soft case for TH-21AT/31AT/41AT
- **TU-6** programmable sub-tone unit
- **AJ-3** thread-loc to BNC female adapter
- **BC-6** 2-pack quick charger

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

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

TH-21AT and TH-31AT shown. Standard versions TH-21A/31A/41A without DTMF pad also available. Specifications and prices are subject to change without notice or obligation. Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.

NEW! ICOM HF [illegible] IC-735

Ultra-Compact

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

More Standard Features

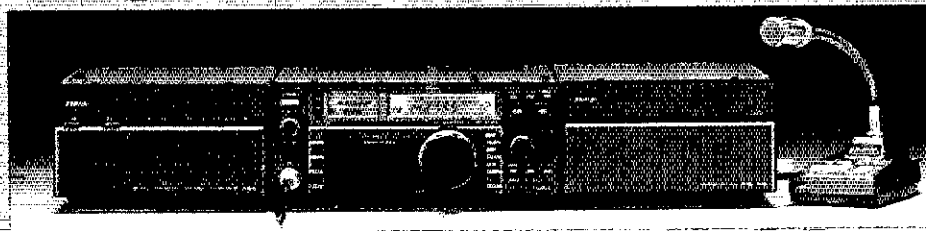
Dollar-for-dollar the IC-735 includes more standard features...FM built-in, an HM-12 scanning mic, FM, CW, LSB, USB, AM transmit and receive, 12 tunable memories and lithium memory backup, program scan, memory scan, switchable AGC, automatic SSB selection by band, RF speech processor, 12V operation, continuously adjustable output power up to 100 watts, 100% duty cycle and a deep tunable notch.

Superior Performance

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

Simplified Fron Panel

The large LCD readout and conveniently located controls enable eas operation, even in the mobile environme Controls which require rare adjustme are placed behind a hatch cover on t front panel of the radio. VOX contro mic gain and other seldom used contr are kept out of sight, but are immediat accessible.



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

See the IC-735 at your authorized ICOM dealer. For superior performan and innovative features at the right pri look at the ultra compact IC-735.

ICOM

First In Communication

ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 752

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 73

November 1985 *Volume LXIX Number 11*

QST (ISSN: 0033-4812) is published monthly as its official journal by the American Radio Relay League, Newington, CT USA. Official organ of the International Amateur Radio Union and the Canadian Radio Relay League.

Offices
225 Main St., Newington, CT 06111 USA
Telephone: 203-666-1541
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Subscription rate: $25 per year postpaid in the U.S. and Possessions, $30 in Canada, and $33 elsewhere. All payments must be in U.S. funds. Foreign remittances should be by international postal or express money order or bank draft negotiable in the U.S. and for an equivalent amount in U.S. funds. Individuals may apply for membership at the rates shown. Licensed Amateur Radio operators over 65 — $20 U.S., $25 Canada, $28 elsewhere, plus proof of age. Persons age 18 or under may qualify for special rates. Write for application. Membership and *QST* cannot be separated. Fifty per cent of dues is allocated to *QST*, the balance for membership. Single copies $2.75.

Second-class postage paid at Hartford, CT and at additional mailing offices. Postmaster: Form 3579 requested.

QST is available to blind and physically handicapped individuals on flexible discs from the Library of Congress, National Library Service for the Blind & Physically Handicapped, Washington, DC 20542.

Indexed by Applied Science and Technology Index, Library of Congress Catalog Card No.: 21-9421. Microform editions available from Xerox University Microfilms, Ann Arbor, MI 48106.

OUR COVER

Groups of young people got their first taste of Amateur Radio through the most-recent Ham-in-Space mission—and a memorable one it was! Bottom photos of some members of a Scout group in Prescott, Arizona, courtesy K7PRS; top photo courtesy NASA.

CONTENTS

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NEWS AND FEATURES

OPERATING

DEPARTMENTS

PACKET EVOLUTION

ANOTHER BREAKTHROUGH FROM AEA

Packet + RTTY= Pakratt™ PK-64.

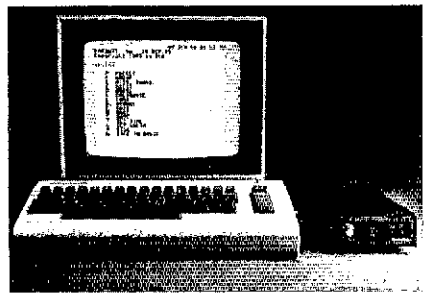
If you 've read about packet, or are already into it, you know how exciting it is. With the hot new Pakratt PK-64 we've just brought a new dimension to packet. The Pakratt PK-64 is a complete, fully assembled and tested packet radio controller which, together with a Commodore 64 or 128 computer, can convert your shack into a packet operations center.
And we've included a new version of our advanced MBA-TOR™ software to make it the first packet controller with AMTOR, Baudot, ASCII and Morse. But an even more exciting part of the Pakratt controller is its great price.

Incredibly Simple To Set Up

Just plug the Pakratt controller into the C-64's game cartridge slot, add a mic connector for connecting to your particular transceiver, and you're set.
If you're anxious to try it out, our new "quickstart" manual section can get you on the air in under ½ hour.

Simply Powerful

The versatile Pakratt controller shows messages and connect status simultaneously on your Commodore with a unique split-screen display. And it lets you



PK-64 shown with HF modem option. Computer not included.

send letter-perfect text from the text editor software while monitoring incoming messages. The 20K byte QSO buffer stores more than 20 video screens of text! Disk commands let you save specific operating parameters for quick set-up for emergency services, clubs, and multiple frequency use. And the Pakratt controller's standard, TAPR style modem gives you 300 and 1200 baud operation with great HF/VHF performance.

We can't possibly list all of the important features of Pakratt here. But the absolutely best part of the Pakratt PK-64 is that it's at your dealer now. So stop reading, run down to your local dealer, and check Pakratt out. Because the real challenge will be to find one after the other hams see it.

Pakratt PK-64. Packet Power from AEA. At amateur radio dealers everywhere.

Advanced Electronic Applications, Inc.
P.O. Box C-2160
Lynnwood, WA 98036-0918
(206) 775-7373
Telex: 6972496 AEA INTL UW

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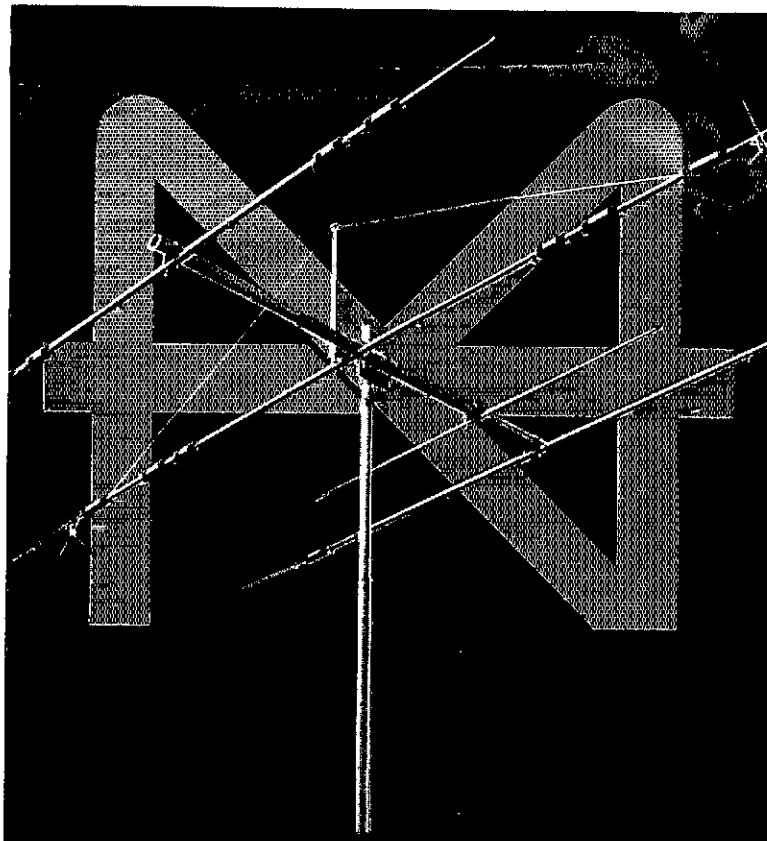


cushcraft
CORPORATION

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

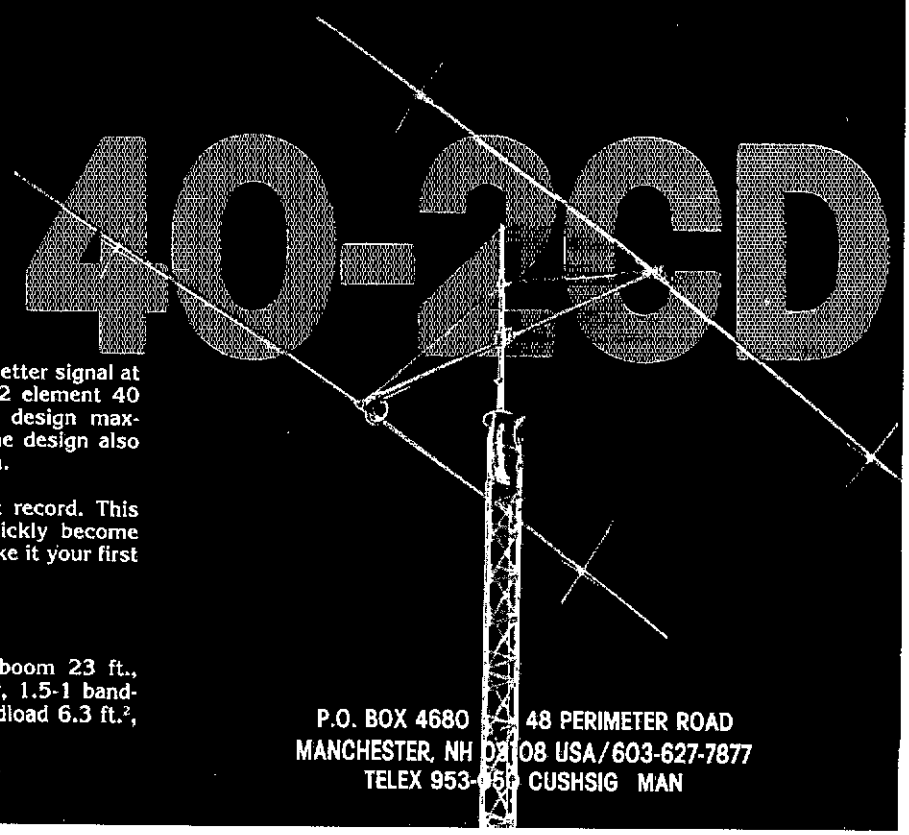
A4 is designed with you in mind because it has fewer parts to assemble, less weight and minimum wind load on your tower. With the 18 ft. boom, A4 gives excellent gain and front-to-back ratio. If your interest is rag chewing, DX-ing or contesting, A4 is the perfect 4 band beam for you.

MODEL A4 10, 15, 20 METERS

MODEL A744 40 METER ADD ON KIT

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

MORE CONTACTS, MORE SATISFACTION WITH *CUSHCRAFT BEAMS*



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

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

MODEL 40-2CD 40 METERS

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

P.O. BOX 4680 48 PERIMETER ROAD
MANCHESTER, NH 03108 USA/603-627-7877
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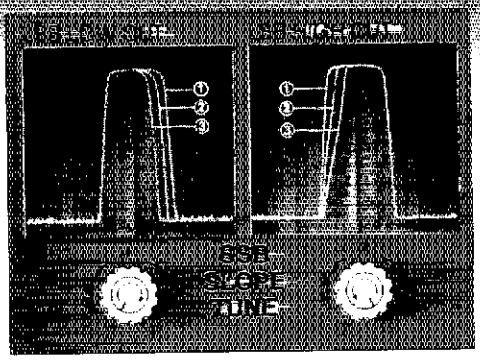
"DX-traordinary"

TS-930S

All band HF transceiver/ general coverage receiver.

The TS-930S (with or without automatic antenna tuner) is a high performance DX and contest transceiver delivering superior features and field-proven performance. Compare the TS-930S with other HF rigs in its price class and see why no other rig comes close!

- **160-10 meters, with 150 kHz-30 MHz general coverage receiver.** An innovative, quadruple "UP" conversion digital PLL synthesized circuit provides superior frequency accuracy, stability, plus greatly enhanced selectivity.
- **Non-volatile operating system.** Kenwood transceivers retain all micro-coded operating functions even when the lithium memory back-up batteries fail.
- **Easily modified for HF MARS and CAP operation.**
- **All solid-state, 28 volt final amplifier for lowest intermodulation distortion.**
- **Power input rated at 250 watts on SSB, CW, FSK, and 80 watts on AM.**
- **Full break-in or semi-break-in CW.**
- **CW VBT and pitch controls.** CW Variable Bandwidth Tuning control tunes out interfering signals. The CW pitch control shifts the IF passband and simultaneously changes the beat frequency pitch.

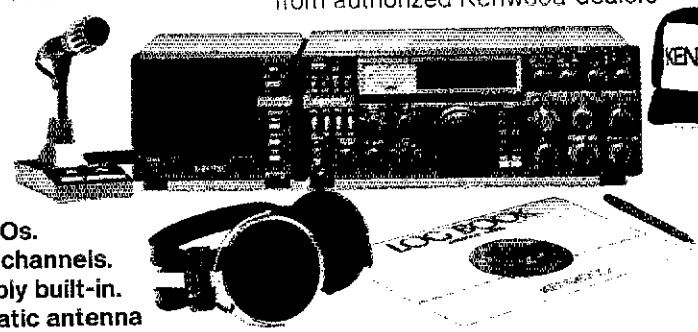


- **SSB slope tuning—Another Kenwood First!** Allows independent adjustment of the low and/or high frequency slope of the IF passband, for best interference rejection.
- **IF notch filter.**
- **Tunable audio filter built-in.**
- **RF speech processor.**
- **Dual mode noise blanker.**
- **Dual digital VFOs.**
- **Eight memory channels.**
- **AC power supply built-in.**
- **Built-in automatic antenna tuner (optional).** Covers 80-10 m. *Another industry first by Kenwood!*
- **Fluorescent tube digital display.**
- **Excellent receiver dynamic range.**
- **One year limited warranty.**

Optional accessories:

- AT-930 automatic antenna tuner
- SP-930 external speaker, with selectable audio filters
- YG-455C-1 (500 Hz) CW filter
- YG-455CN-1 (250 Hz) CW filter
- YK-88C-1 (500 Hz) CW filter
- YK-88A-1 (6 kHz) AM filter (all plug-in type)
- SO-1 commercial stability TCXO
- MC-60A, MC-80, MC-85 desk microphones
- TL-922A linear amplifier (not for CW QSK)
- SM-220 station monitor
- PC-1A phone patch
- SW-2000, SW-200, SW-100 SWR meters
- HS-4, HS-5, HS-6, and HS-7 headphones.
- LF-30A low-pass filter

More TS-930S information is available from authorized Kenwood dealers



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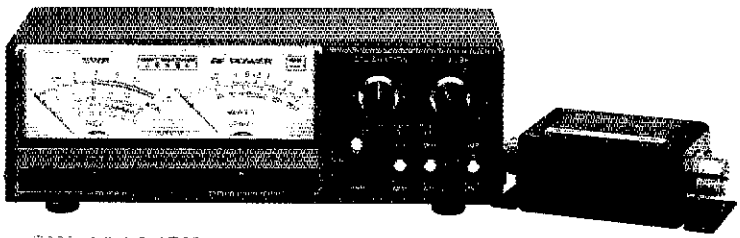
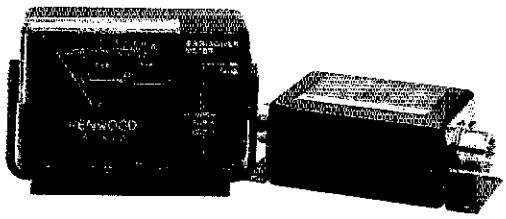
SWR/Power Meters





SW-200A/SW-200B/SW-2000

Base station SWR/power meters

SW-200A supplied with SWC-1, SW-200B supplied with SWC-2, SW-2000 supplied with SWC-3

Selectable Peak-reading/RMS, SWR/POWER meters cover 1.8–150 MHz (SW-200A), 140–450 MHz (SW-200B), 1.8–54 MHz (SW-2000) in range of 0–20/200 W (SW-200A/B), 0–200/2000 W (SW-2000) full scale for base station use

SPECIFICATIONS

• Impedance: 50–52 Ω • Frequency range: 1.8–150 MHz (SW-200A), 140–450 MHz (SW-200B), 1.8–54 MHz (SW-2000) • Power measuring range: 0–20/200 W (SW-200A/B), 0–200/2000 W (SW-2000) • Accuracy: Less than ± 10% of full scale • Sensitivity: Less than 2 W (SW-200A/B), 20 W (SW-2000) • Power supply: 12 VDC 100 mA • Dimensions: 193 (7.6) W x 62 (2.4) H x 79 (3.1) D mm (inch).

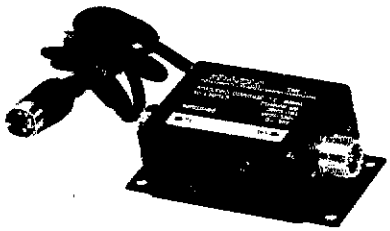
SW-100A/SW-100B

Compact SWR/power/volt meters

1.8–150 MHz (SW-100A), 140–450 MHz (SW-100B) in range of 150 W full scale for mobile use.

SPECIFICATIONS

• Impedance: 50–52 Ω • Frequency range: 1.8–150 MHz (SW-100A), 140–450 MHz (SW-100B) • Power measuring range: 0–150 W • DC VOLT meter: 0–20 V • Accuracy: Less than ± 10% of full scale • Meter illumination: 12 V 50 mA • Dimensions: display 92 (3.6) W x 64 (2.5) H x 36 (1.4) D mm (inch), coupler 62 (2.4) W x 50 (2.0) H x 30 (1.2) D mm (inch).



SWC-1/SWC-2/SWC-3/SWC-4

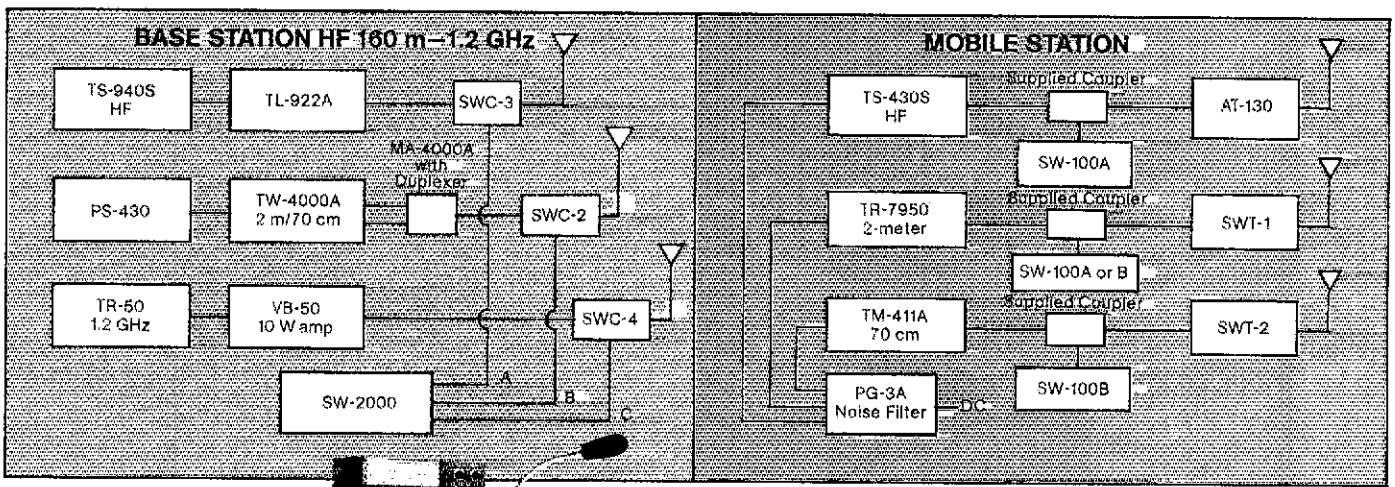
Optional couplers

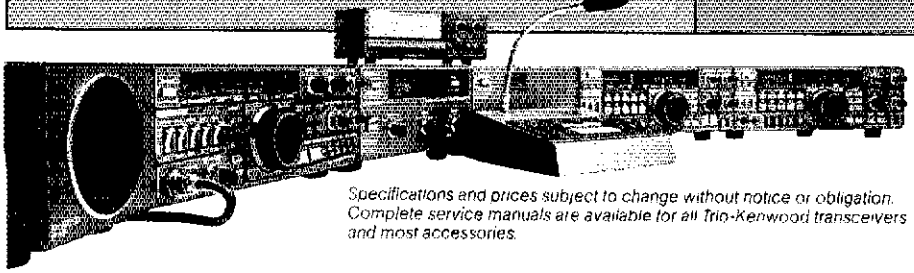
SWC-1 (1.8–150 MHz): Coupler for SW-200A/B, SW-2000
SWC-2 (140–450 MHz): Coupler for SW-200A/B, SW-2000 } SO-239 connectors
SWC-3 (1.8–54 MHz): Coupler for SW-2000
SWC-4 (1200–1300 MHz): Coupler for SW-200A/B, SW-2000—Type N connectors

SWT-1/SWT-2

Compact antenna tuners

• Frequency Range: SWT-1 (144–148 MHz), SWT-2 (430–450 MHz) • Input Impedance: 50 Ω (unbalanced) • Output Impedance (Matching range): 25–100 Ω (unbalanced) • Insertion Loss: Less than 0.3 dB • Max. Input Power: FM/AM 100 W, SSB 200 W (PEP) • Connector: SO-239 • Dimensions: 68 (2.68) W x 32 (1.26) H x 50 (1.97) D mm (inch) (Projections not included)





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Vice Director: Marshall Quiat, AGØX, 1624 Market St., Suite 200, Denver, CO 80202 (303-333-0819)

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323 Elliott Rd. S.E., Fort Walton Beach, FL 32548 (904-244-5425)

Vice Director: Mrs. Evelyn Gauzens, W4WYR, 2780 N.W. 3rd St., Miami, FL 33125 (305-642-4139)

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Vice Director: Wayne Overbeck, N6NB, 900 Avenida Salvador, San Clemente, CA 92672 (714-492-8025)

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Vice Director: Thomas W. Comstock, N5TC, 1700 Dominik, College Station, TX 77840 (409-693-1181)

*Executive Committee Member

Section Managers of the ARRL

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Quebec — Harold Moreau, VE2BP, 80 Principale, St. Simon Co., Bagot J0H 1Y0 (514-798-2173)
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New Hampshire — William Burden, WB1BRE, 11 Briand, Nashua 03063 (603-882-0021)
Rhode Island — John Vota, WB1FDY, 41 Brookside Ave., Centerdale 02911 (401-231-1934)
Vermont — Ralph T. Stetson, III, KD1R, P.O. Box 123, Milton 05468 (802-893-4856)
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Montana — L. C. "Les" Belyea, N7AIK, P.O. Box 327, Belgrade 59714 (406-388-4253)
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Santa Clara Valley — Rodney J. Stafford, KB6ZV, 5155 Shadow Estates, San Jose, CA 95135 (408-274-0492)

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Northern Florida — Phillip O'Dwyer, WF4X, 543 Mooney Rd., N.E., Fort Walton Beach 32548 (904-862-2353)
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Oklahoma — Dave Cox, NB5N, 1812 S. Umbrella Ct., Broken Arrow 74012 (918-250-2285)
Southern Texas — Arthur R. Ross, W5KR, 132 Sally La., Brownsville 78521 (512-831-4458)

THE AMERICAN RADIO RELAY LEAGUE, INC

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

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

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

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

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

"It Seems to Us . . ."

Preemption: Two Down, One To Go

On September 16, the FCC did us a very good turn. In response to an ARRL request submitted last year, and after providing ample opportunity for public comment in the PRB-1 proceeding, the Commissioners adopted a declaration of limited preemption of local and state regulation of Amateur Radio. Amateurs now have a powerful tool to use in battling unreasonably restrictive local antenna ordinances. While these ordinances won't disappear with a wave of a magic wand, and while it remains for the line between "unreasonable" and "reasonable" to be determined on a community-by-community basis, there no longer can be any question but that the federal government has a strong interest in our having effective antenna systems. The tide, which had been running against us with dismaying force in the courts, has now turned.

Eighteen months ago on this page, we talked about federal preemption in three contexts: interference, antennas, and public exposure to RF energy. Congress fully preempted the field of interference regulation in the course of adopting Public Law 97-259, in 1982. Now, the FCC has declared limited preemption of antenna regulation—all we could reasonably expect, since local governments clearly have a legitimate interest in certain aspects of antenna installations.

The last of the trinity remains to be achieved: a clear statement of federal preemption of regulations designed to protect the general public from overexposure to RF energy. As discussed here last month, this is an issue on which League volunteers and staff have spent countless hours assembling and evaluating data. It is a complex issue, difficult even for the experts to deal with. Municipalities and states, no matter how well-meaning, seldom are equipped to handle it on a rational basis; even in the best of circumstances, addressing the issue at the local level is a horribly inefficient process that ultimately raises the cost of government and of providing telecommunications services.

Unfortunately, just a month before taking its farsighted action in PRB-1, the Commission once again put off action on preemption of regulations governing exposure to RF energy. In a Memorandum Opinion and Order in General Docket 79-144, the Commission stated that the issue was " . . . beyond the scope of this proceeding. We remain concerned about nonfederal actions that may improperly affect telecommunications services, and we reaffirm our intention to consider on an ad hoc basis nonfederal RF radiation standards adversely affecting a licensee's ability to engage in FCC-authorized activities. However, we are not prepared here to define the basis for preemption or intervention."

We hope the Commission's reluctance to address this important matter is only temporary.—*David Sumner, K1ZZ*

The Club Challenge

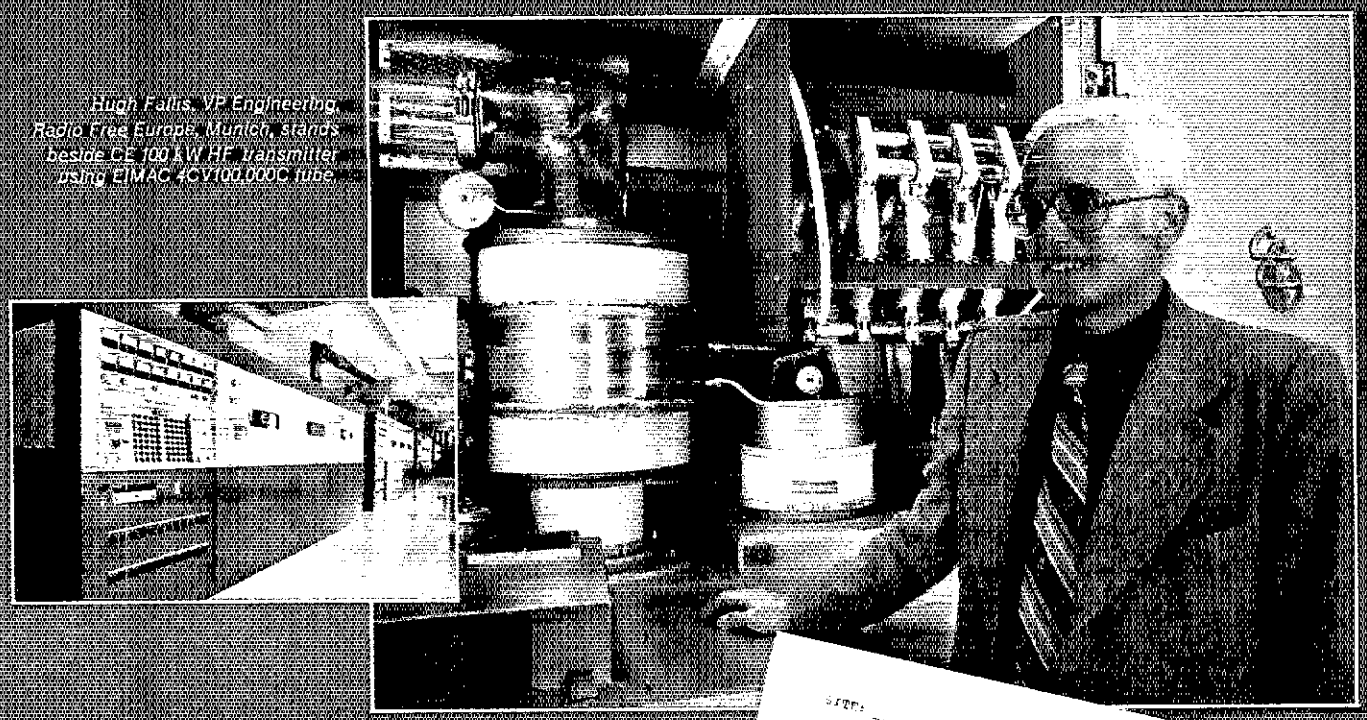
By the time you receive this issue, the League's affiliated clubs will have surpassed the 1000 mark in our new-member recruiting campaign, the Club Challenge for the '80's. Only 60 days remain for clubs to get the applications in to be counted for 1985, and to win the awards and recognition awaiting them—perhaps even a brand-new HF transceiver!

The way the program works is simple. Each affiliated club has been assigned a special four-digit number. When a membership application bearing that number is submitted to Headquarters, and the applicant isn't already in our computer records as a present or recent member, the club gets credit for recruiting a new League member. It doesn't matter whether the application comes via the club, or directly from the applicant; as long as the four-digit code is on the form, the club will be credited.

What's in it for clubs? First of all, a five dollar commission for each new member! That can add up in a hurry, to help finance club projects! Next, there are recognition awards for attaining progressively higher achievement levels. Finally, at yearend the leading large, medium and small clubs each will receive a brand-new HF transceiver, courtesy of Heath, ICOM and Kenwood. Thanks to the generosity of Yaesu, there may also be a "special achievement" award of a transceiver for other outstanding groups.

How can you help your club? Talk to your friends about joining the League, and give them a membership application with the club's four-digit code on it. Your club officers should know what it is; if not, badger them into finding out from the Club Branch at Headquarters, or from your section Affiliated Club Coordinator or Section Manager.

At the end of September, League membership was 10,000 ahead of the same point last year, and 7700 ahead of yearend 1984. That's a big improvement, but with your help it can be bigger—and with more members, we can do an even better job in the protection, promotion, and advancement of Amateur Radio.—*David Sumner, K1ZZ*



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

EIMAC tubes provide long life for Radio Free Europe Service.

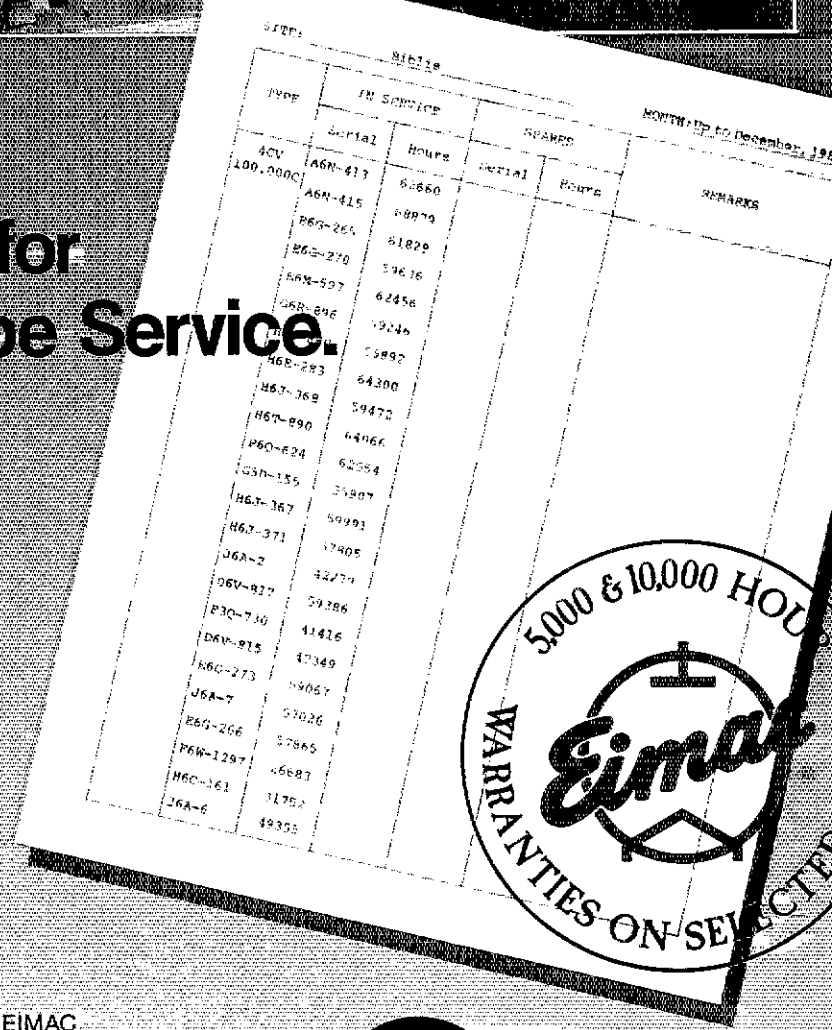
Radio Free Europe transmitters in Biblis and Lampertheim, West Germany, use EIMAC 4CV100,000C power tubes in 12 Continental Electronics 100 kW HF transmitters.

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

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

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

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



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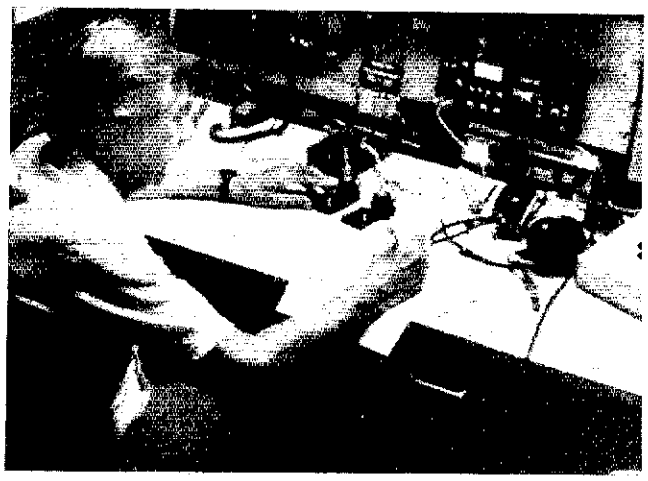
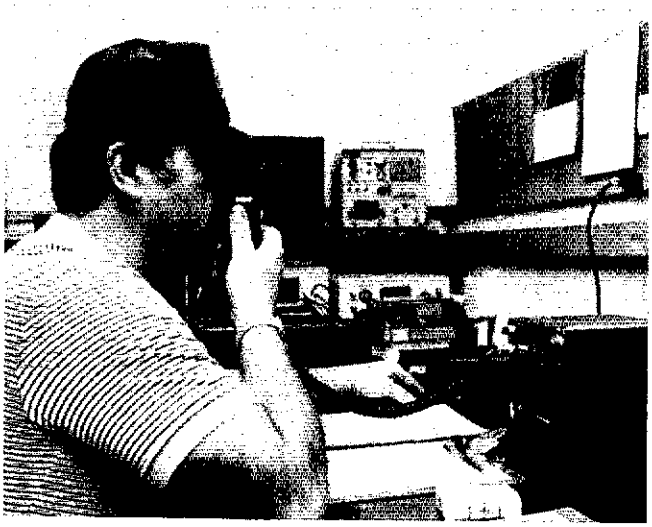
UP FRONT in QST



On September 19, an earthquake measuring 7.8 on the Richter scale unmercifully tore through the heart of Mexico, causing heavy damage to coastal areas and the capital, Mexico City. In response, amateurs across North America and elsewhere handled countless pieces of health-and-welfare traffic. Among the groups to lend assistance was the Houston Echo Society, whose members—such as Carl Muller, W3UBQ, shown here—worked around the clock for several days relaying messages for people seeking information about friends and relatives who may have been caught in the quake. See this month's Public Service column and next month's *QST* for details. *(photo courtesy Houston Echo Society)*

Another Ham-Astronaut Chosen For a Shuttle Mission

NASA has announced that Ron Parise, WA4SIR, of Silver Spring, Maryland, is scheduled to be a member of the crew for the ASTRO-1 Shuttle mission, 61-E, in March 1986. ASTRO-1 is the first of three related astronomy missions. Ron is an active member of AMSAT, and there is a possibility of Amateur Radio operation from the Shuttle once again being approved by NASA.



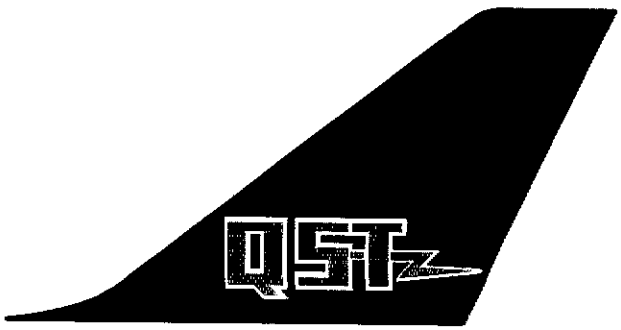
It's not too often that hurricanes make their way to Connecticut, so when Hurricane Gloria sidestepped most of the Eastern Seaboard and hit the state head-on with 100-mi/h-plus winds, no one knew for sure what to expect. But that didn't stop Connecticut hams from jumping into the thick of it to help local and state emergency-preparedness officials track the storm and later assess the damage. Here, ARRL Section Emergency Coordinator Steve Grouse, KA1ECL, checks into an area civil defense net from WC1AAX, located in the basement of Danbury City Hall. Operators there manned 2 and 80 meters, RTTY and packet during and after the hurricane. *(KA1FJR photo)*

IARU Now 124 Strong

The international Amateur Radio family continues to grow. On October 3, the IARU welcomed the Association Gabonaise des Radio-Amateurs as a member-society, bringing the total membership to 124. Gabon is a country in West Africa.

New U.S. 24-GHz Record Established

After two weeks of trying, a new U.S. 24-GHz distance record was apparently attained by a group of Colorado hams on August 24. Calls used during the 74.077-mile QSO were KXØO/WØMXY, at Northglen, Colorado, and WAØVSL/NKØP, at the summit of Pikes Peak. A 65-mW Gunnplexer and a 2-foot dish were used at each end of the contact. The 30-MHz wideband IF transceiver, manufactured by Advanced Receiver Research, provided broadcast-quality duplex audio. At the time of the contact, signals were 8 to 12 dB above the noise. The new record bettered the old mark of 53 miles, set by W2SZ/1.



ARRL publications keep reaching new heights. Beginning with this issue, *QST* will be available to passengers traveling on Piedmont Airlines. The airline will receive 800 copies of each issue from ARRL and will distribute them among its various flights. By the way, Piedmont President William R. Howard is better known to hams as W4BLM. Since the July issue, *QST* has also been riding high aboard Ransome Airlines, whose president, J. Dawson Ransome, is also a ham—K3MBF.

League Lines

Do you make use of an antenna in your Amateur Radio pursuits? We'll bet you do! Having a hassle with local zoning restrictions in putting that antenna where you want it? Big news: ***FCC has released its Memorandum Opinion and Order in PRB-1,*** declaring that "state and local regulations that operate to preclude amateur communications in their communities are in direct conflict with federal objectives and must be preempted." The full text begins on page 61.

The VHF-Repeater Advisory Committee needs your opinion concerning 70- and 23-cm band plans as they relate to repeater use. If you're a repeater user, get involved! See FM/RPT, page 82, for details.

Two FCC District Offices have new addresses. FCC's Anchorage District Office has moved to 6721 West Raspberry Rd., Anchorage, AK 99502, tel. 907-243-2153. The Honolulu Office has moved shop as well; their address is Waipio Access Road, Next to the Ted Makalena Golf Course, P.O. Box 1030, Waipahu, HI 96797, tel. 808-677-3318.

Both offices are open from 8 A.M. to 4:30 P.M. Public inquiries concerning telecommunications matters, complaints of electronic interference and schedules of commercial radio operator examinations should be directed to these addresses.

Effective November 8, ***FCC has amended the amateur rules to eliminate the 30-day wait before an applicant for an amateur examination can retake a failed examination element.*** See Happenings, this issue, for details. From the ARRL/VEC office comes this reminder for all ARRL-accredited Volunteer examiners: Don't forget that the thirty-day wait rule remains in force until November 8. Don't risk your license by breaking the rule while it is still on the books. Each VEC entity may set its own waiting period, according to FCC. Once the ARRL Board has determined the cost impact of this rules change, ARRL/VEC Volunteer Examiners will be advised as to what the ARRL/VEC retest policy will be.

Canada's Department of Communications had good news for Canadian amateurs at the Radio Society of Ontario's convention in London, Ontario, at the end of September. Effective Friday, September 27, Canadian amateurs are allowed CW and phone at the maximum legal power on the entire 160-meter band, 1.8-2 MHz. Repeater use at 10 meters was authorized. And for video experimenters came the news that amateur television with a 6-MHz bandwidth was authorized—and slow-scan television operation no longer requires a special endorsement. Congrats! DOC declined to comment on the restructuring of the Amateur Service, which is likely to propose a Canadian novice license. DOC did indicate its intention to proceed with the proposal for deregulation of mode subbands, which would allow Canadian amateurs to operate any mode anywhere in their amateur allocations, relying only on voluntary adherence to recommended band plans.

An opening exists in the Technical Department at Hq. for a laboratory engineer. We are looking for a licensed amateur with a BSEE or ASEE degree or equivalent experience. Contact Chuck Hutchinson, K8CH.

On October 8, the Earth passed through the orbit of Comet Giacobini-Zinner just 25 days after the comet's passage. Experts had been estimating that this might have produced 6,000 to 10,000 meteors per hour—quite an increase over the annual Perseids shower we've considered a high producer with its "mere" 40 to 60 meteors per hour! Packet radio was to have been used to gather data on meteor-scatter propagation during our pass through Giacobini-Zinner's orbit. If you took part in such experiments, or if you have any information bearing on enhanced MS propagation on October 8, send your report to: Wake Digital Communications Group, c/o Ed Stephenson, AB4S, 700 Madison Ave., Cary, NC 27511. A summary and report will be prepared for *QST*.

"I guess you had to be there..." The best-told jokes sometimes elicit that response. But it also applies to HF propagation. Sure, we're in the depths of a solar minimum, but there's good use to be made of the HF bands yet—*if* you're there when the bands open, making your presence known. W1HDQ put it well in a recent W1AW propagation forecast: "We are moving into the best months of the year, but activity is the key. Nobody ever worked DX with a receiver."

W0ORE: The Call Kids Saw 'Round the World

You may know it as the Ham in Space project, or as SAREX, but the kids knew it as something *fun!*

By Paul Courson, WA3VJB
Public Information Officer, ARRL

Thousands of young people across the country were indeed attracted to the Shuttle Amateur Radio Experiment on the August flight of the Space Shuttle *Challenger*. Tony England, W0ORE (shown in the title photo), the astronaut whose calls were heard around the globe, specifically wanted any spare time he had to spend operating his amateur station from space to involve young people. He saw it as repayment for the countless hours he enjoyed as a youngster when he first became a ham—an avocation, he says proudly, that helped shape his career.

Youth Groups and Ham Clubs

Tony's wish was to recruit young people into the fascinating world of Amateur Radio by giving them an opportunity to talk directly with an orbiting spacecraft. Some groups of young people are already established, with motivational goals in mind: the Scouts, with their Merit Badge for Amateur Radio; groups of young computer users; school electronics clubs; and a national group called the Young Astronaut Program (YAP).

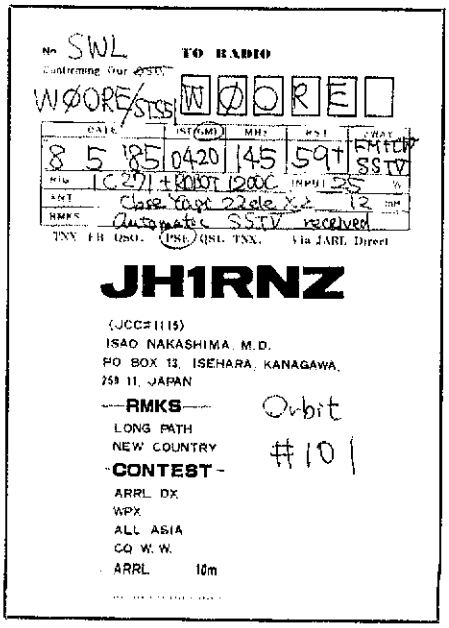
Nationally syndicated columnist Jack Anderson is the chairman of this last group, which is part of the White House Office of Private Sector Initiatives. YAP is made up of hundreds of groups across the country, each with 10 or more young people enrolled. "This is an exciting way to stimulate, to attract and to interest kids—to permit them actually to communicate with real astronauts in space, to teach them the fundamentals of telecommunications," said Anderson during an interview before the *Challenger* launch.

Community ham clubs had an incentive to seek out a youth group, since W0ORE would have limited two-way opportunities. Tony's available time to operate was to be very limited, so he asked that some mechanism be set up to encourage youth participation. This mechanism was the use of "dedicated" uplink frequencies that were not generally published. A simple application process to get information about the ham club and the youth group was all that was needed to acquire information about these special frequencies.

Participation Exceeds Estimates

As ham clubs applied, they estimated how many young people would take part in their activity. In nearly all cases, these estimates had *doubled* by the time the mis-

International participation helped make SAREX a worldwide success. In Japan, for example, a group of young medical students at a hospital in Kanagawa—JG1QPT, JH1RNZ and JG1SZH (l-r)—successfully made contact with W0ORE/Challenger using slow-scan TV. Their reception of W0ORE SSTV signals is shown in the title photo.



It may not have been Saturday morning cartoons, but some young Scouts in Prescott, Arizona, got quite a thrill when members of the Prescott Amateur Radio Association introduced them to amateur slow-scan television during the WØORE/Challenger operation from space.

The Mid-Willamette ARC, W7QLC, in Oregon used the split-memory feature of the ROBOT 1200 scan converter to send up a multiple image for Tony. The kids belong to a group called Ships Log, which usually uses Amateur Radio to track vessels *sailing* around the world. Students' questions to Tony were penned on poster board in case no audio QSO could be arranged.

sion got underway. Part of the reason was the delayed launch of *Challenger*, which actually allowed more time for hams to spread the word to area youngsters.

More than 250 applications—pairings of youth groups with ham clubs—were received for this mission. Most involved groups of more than 10, which in most cases grew to 20 or more! Simple math shows at least 5000 young people in some way were introduced to ham radio thanks to WØORE/Challenger. This is the biggest organized effort ever made to bring young people into Amateur Radio. If half of them enroll in an instruction class with those ham clubs, local recruitment efforts will have been given a significant boost.

Some groups staged huge events involving hundreds of young people in each case. One of the largest was the one organized by teacher Carole Perry, WB2MGP, who arranged to have the auditorium at her school on Staten Island, New York, converted into a ham station for the duration of the mission. She said nearly 1000 young people took part at some point in the flight.

Orientation and Follow-Up

A young audience might not fully appreciate the WØORE experiment unless they understood what was to happen. It was suggested that hams in a local club invite their young people over for get-acquainted sessions ahead of the mission—

Two students from Philadelphia Northeast High School's Project Space Research Capsule (SPARC) program mount a turnstile antenna on the roof of the Franklin Institute in preparation for the WØORE/Challenger mission. With the help of local Amateur Radio operators, the students made audio and video contact with the Space Shuttle *Challenger* during a four-day vigil at the museum.

The Challenge of *Challenger*

Our college radio club, K8ORW, had met with only limited success during the December 1983 (STS-9) flight of W5LFL on the Shuttle *Columbia.* We had received quite a bit of publicity and had learned a lot about the basics of Amateur Radio and orbital flight; but we did not complete that two-way contact with space.

The club is centrally located in our building at the OMI College of Applied Science, the Technical College of the University of Cincinnati, and has served for years as a beacon attracting those students and faculty members who enjoy the RF spectrum. The news that hams were going aloft on the STS-51F mission was all we had to hear. Astronaut Tony England, WØORE, had expressed a desire to speak with youth groups, so why not go all the way and invite local Boy Scouts to help out? Troop 98 enthusiastically agreed to our offer, with the provision that we conduct a combination Novice license/merit badge course after the flight.

The other necessary preparations were made. A new 20-element antenna was purchased to work with the 10-element one used in the 1983 effort. Students developed an ingenious support system for the new one. Some of us brushed up on the basics of SSTV, and we registered as a youth group with the ARRL. Permission was granted to use the University of Cincinnati Observatory, an excellent radio location. New computer software was purchased, and enabled the public to graphically see the exact Shuttle location. Preliminary orbital data were fed into all the computers. Press releases were issued through the University public information office. Preliminary photographs were taken by the afternoon newspaper, *The Cincinnati Post,* for a radio article to be published the day the *Challenger* passed over. The July 29 liftoff would soon be here, and we were ready.

Orbit 48 (a non-prime orbit of a Shuttle contact) proved to be a good warmup for us on August 1. The Scouts were given tasks in all aspects of the operation—except, of course, control operator. As orbit 49 approached Cincinnati, we were astonished by the press response. Both major newspapers were present, several local radio stations were running taped interviews dealing with our project in every newscast, and all three major TV stations had teams at our location—two stations even did live remote telecasts during the prime newscasts.

The SSTV came in, but lack of that elusive two-way contact did not dampen our spirits. Better SSTV equipment was graciously loaned to us by Tom Para, WA8ZAH, and K8ORW meticulously went to work every time the *Challenger* broke our horizon. Regular visitors to the observatory were treated to an excellent view of the Shuttle on Thursday evening. On orbit 83, at 9:14 PM August 3, we made what was probably the first youth-group radio contact with *Challenger.* Daniel R. Wolking, N8FRY, a student at the college, was the control operator during this contact with L. Gordon Fullerton, the Shuttle commander.

"This is WØORE aboard the spaceship *Challenger* . . . I copy WA9er Bravo Zulu Whiskey in Wisconsin . . . also Kilo 8ORW the College of Applied Science, Cincinnati, Ohio . . . How you doing down there? We're doing great up here."

We danced, we yelled, we shouted. It is rumored that "high fives" took place at the antenna sites. The tape was replayed and replayed. Not only did we contact WØORE, but we did it with only 80 W!

Elissa Erven, N4KPG, an employee of the University, was the first control operator when K8ORW again contacted WØORE, at 9:33 PM Sunday, on orbit 99. After only one call on her part, the reply was "K8ORW, this is WØORE . . . Read you loud and clear." Elissa handed the mike to Joseph T. Connett, KA8KIE, a recent graduate of the College of Applied Science, who informed WØORE that a Boy Scout was at our transmitter. Tony England replied, "Okay, put him on." Andy Johnson, a 13-year-old First Class Scout took the mike and said, "Hi, I'm Andy Johnson, Troop 98. My question is, "What do you think is the most important project of the flight?" Tony returned and stated, "Okay, K8ORW . . . I would say studying the sun is our most important project . . . small features of the sun and, of course, the sun's responsible for everything that works the way it does on earth. K8ORW, WØORE." Wild joy and jubilation (again) at K8ORW!

More SSTV, always identified with the now-familiar "WØORE/Challenger" was received during the afternoon of August 5. Visitors were still amazed by the pictures that were coming down from space, but several of us became intrigued by another aspect of this project. The K8ORW team was made up of students from our college, Boy Scouts from Troop 98, other interested hams and members of the public. We had, without consciously realizing it, fused into an extremely efficient and versatile group. As one member put it: "Given a 20-minute notice, we could now set this entire operation up from scratch—and make a contact."—*James F. Sullivan, NG8T*

Fellow members of the Chaminade College Preparatory Radio Club, WA6BYE, watched as club president and chief operator John Lulejian, KA6TCY (seated), received slow-scan pictures from Tony England during orbit 101. Lead by teacher Dave Reeves, KF6PJ, the Simi Valley, California, club made its own television debut—a story on the Cable News Network about their attempts to contact WØORE that reached more than 50 million homes.

not only to introduce one another, but also to explain what ham radio is. It brought a nice atmosphere of anticipation that developed into unbridled excitement as QSO time neared.

Can We Top This?

Now that the mission is over, most clubs plan to follow up by organizing or expanding instruction classes. It's a good idea to offer your young people their own classes. Since the time of the one-room schoolhouse, it's been known that people of different ages tend to learn at different rates. Plus, if you make a big to-do over young people, you can gain their trust and friendship.

New members are the lifeblood of any club, and young members guarantee that your club will keep growing! Why not take advantage of the SAREX mission's public relations success and redouble your club's efforts to attract young people. There's no better club activity than one that guarantees the vitality of the Amateur Radio Service for decades to come.

The Principles and Building of SSB Gear

Part 3: This installment treats the SSB-generator mixer and subsequent low-level, class-A amplifier stages. Practical circuits for these portions of our sideband generator are included.

By Doug DeMaw, W1FB
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All parts of an SSB transmitter must be designed to minimize spurious responses and to enhance linear amplification at the transmitter output frequency. This is a matter of special concern in the design of the stages that follow the mixer in an SSB generator.

This month we'll examine the function of a mixer and learn methods for obtaining the best mixer performance at reasonable cost. We'll also consider low-power class-A RF amplifiers that can be used to increase the signal amplitude after the mixer stage. Next time, we'll focus on the VFO that serves as the main-tuning module for our little SSB transmitter. Later, we'll discuss a 10-W linear amplifier for the system we're building.

Transmitting Mixers

In effect, a transmitting mixer is no different from a mixer that is designed for receivers. Most mixers are intended for

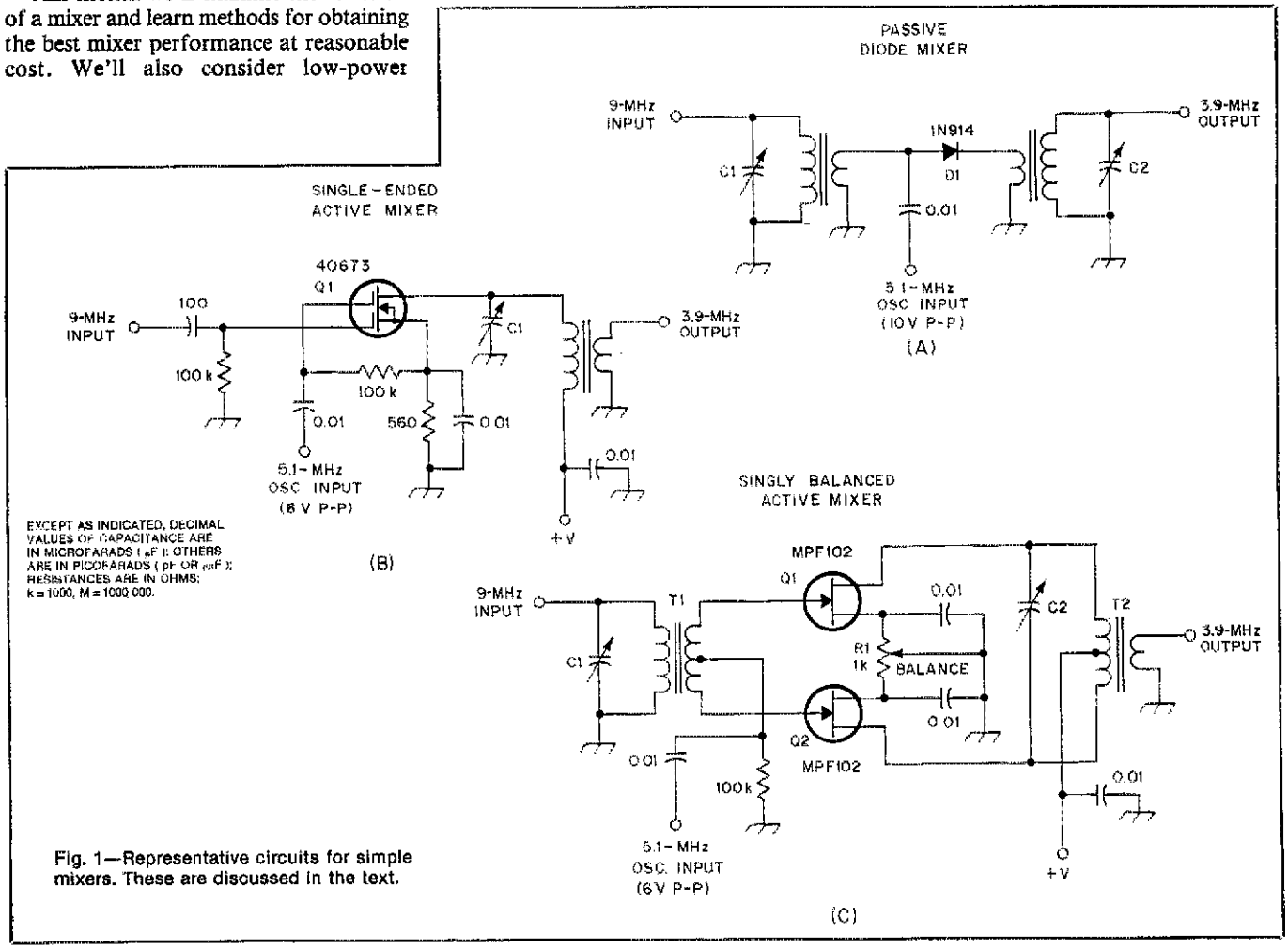

Fig. 1—Representative circuits for simple mixers. These are discussed in the text.

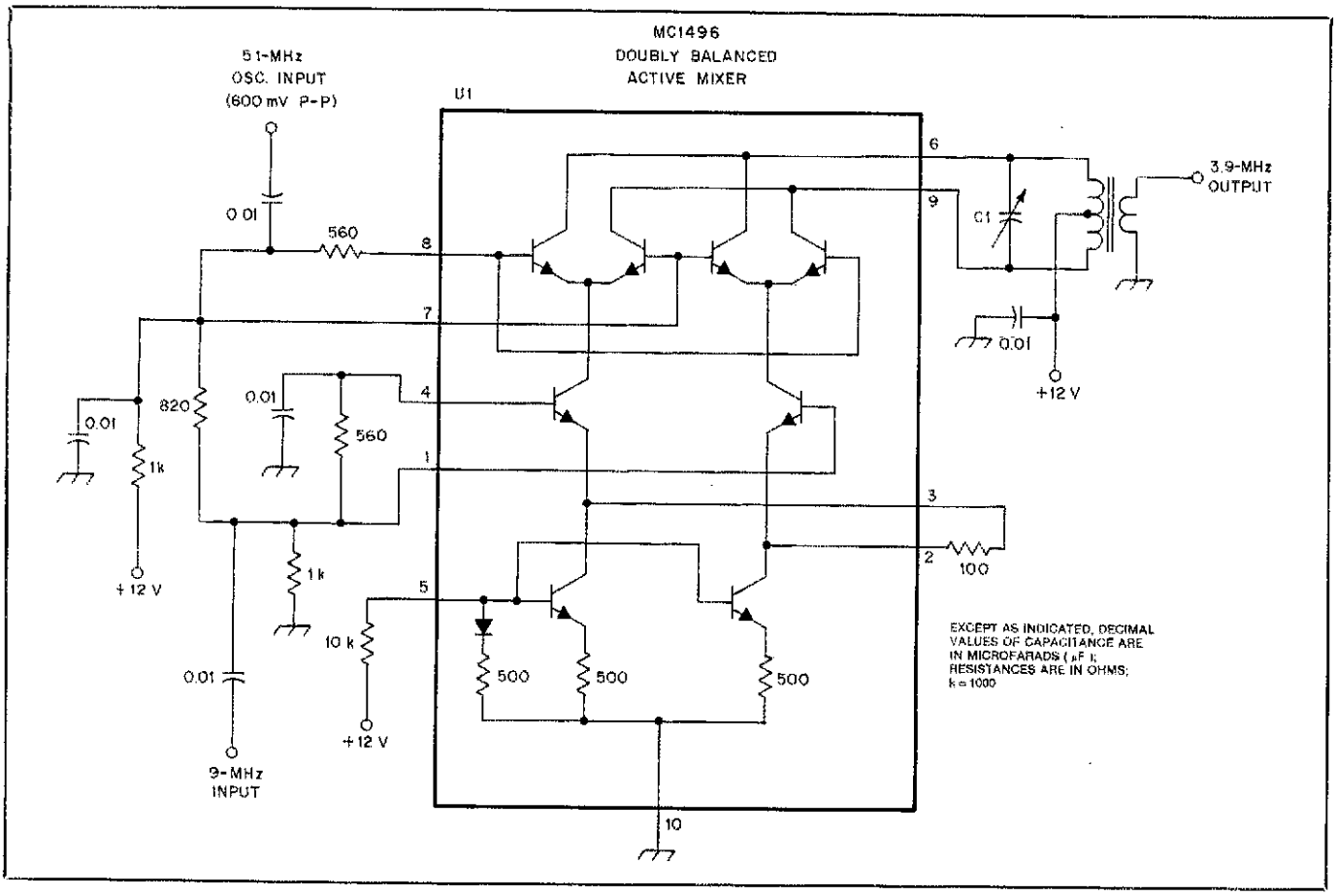

Fig. 2—Internal workings of an MC1496 doubly balanced-mixer chip. A pair of differential amplifiers are cross-connected to provide the doubly balanced format that aids in cancelling the two input frequencies. This leads to greater purity of the output (IF) signal.

low-power use (milliwatts of output power), but certain applications call for power mixers that produce watts of output energy. A disadvantage of power-class mixers is that spurious responses (sum-and-difference frequencies, plus the two input frequencies) are difficult to suppress because they are relatively powerful. A low-power mixer, on the other hand, may have the same percentage of spurious energy, as referenced to peak output power, but the succeeding RF-amplifier stages can provide the necessary filtering (selectivity) to greatly reduce the level of unwanted energy. Another advantage of low-power mixers is that the two input signals need not be high in amplitude to make the mixer function properly. This reduces the complexity of the VFO, or local-oscillator section, and minimizes the driving power needed at the remaining port of the mixer.

Examples of Mixers

Fig. 1 contains three circuits for simple mixers. Acceptable mixer-injection levels (5.1 MHz) are noted for each circuit. The most basic of mixers is seen at A of Fig. 1. D1 functions as a *passive* mixer because it requires no operating voltage. We may think of this mixer as being lossy: The 3.9-MHz output signal will be lower in power than the 9-MHz input signal. The single-diode mixer is not recommended for high-performance receivers or transmitters.

An *active* single-ended mixer is shown at B of Fig. 1. Circuits A and B do not cancel the 5.1- or 9-MHz input circuits. Therefore, we will find that energy appearing with the desired 3.9-MHz signal at the mixer output. This requires some filtering at the output of the mixer to ensure a relatively pure 3.9-MHz component for the succeeding RF or IF amplifiers. Circuit B, however, is quite popular with amateurs who build simple equipment. An operating voltage is required for the dual-gate MOSFET (Q1), and this mixer can provide 10 dB or greater gain.

Balanced mixers offer us greater rejection of the two input signals. This reduces the filtering requirements after the mixer. Fig. 1C shows a simple *singly balanced mixer* that uses two JFETs. Considerable cancellation of the 5.1-MHz energy takes place, but there is no appreciable rejection of the 9-MHz signal at the mixer output. The output tuned circuits of all three mixers provide some selectivity, and this aids in rejection of the two unwanted input signals. R1 of Fig. 1C is adjusted for minimum 5.1-MHz energy at the mixer output. It is used as a balance control. C1 and C2 are adjusted for peak output while observing the 3.9-MHz energy at the mixer output. It is essential that the exact electrical center of T1 and T2 (Fig. 1C) be used for the tap points if we are to ensure good balance. This is the reason many hams prefer to use trifilar-wound transformers at T1 and T2: Electrical symmetry is easier to achieve with trifilar transformers. The circuit layout in general, when working with balanced mixers, must also be symmetrical if we are to enhance the balanced condition.

ICs are available for mixer service, and they offer excellent performance in terms of low IMD (intermodulation distortion) and good balance. Fig. 2 illustrates the circuit for a *doubly balanced mixer.* A Motorola MC1496 mixer IC is the heart of this circuit. The internal workings are shown in order to reveal how the transistors are connected to provide the doubly balanced format. Owing to the superb electrical balance of the devices on an IC chip, there is no need for an external balancing control, such as that of Fig. 1C. A doubly balanced mixer cancels *both* of the input signals (9 and 5.1 MHz in this example), which leads to a cleaner mixer-output signal. This feature minimizes our need for elaborate filtering at the mixer output. The MC1496 mixer provides *conversion gain,* as do the active mixers of Fig. 1B and 1C. Numerous mixer ICs are available today,

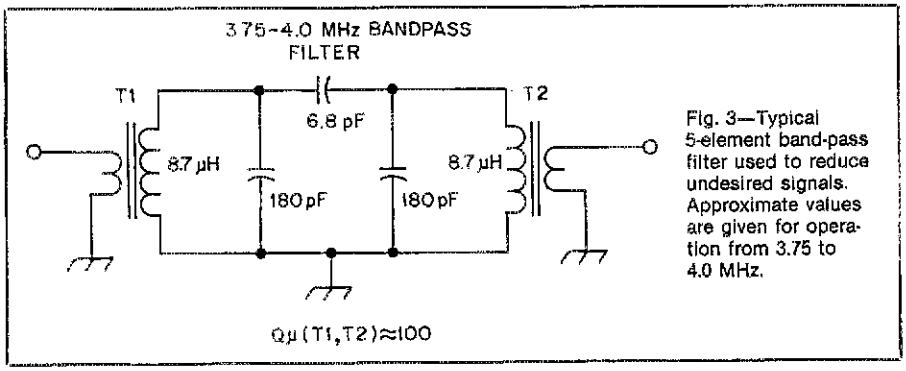

Fig. 3—Typical 5-element band-pass filter used to reduce undesired signals. Approximate values are given for operation from 3.75 to 4.0 MHz.

and the choice of brand and part number is arbitrary.

Post-Mixer Amplification

It is a matter of good design practice to "launder" the mixer-output signal before amplifying it. Generally, a simple band-pass filter will suffice for this duty. Filtering is especially important when the circuits of Fig. 1 are used. When working with receiver mixers, we can rely on the IF crystal filter to do this job. In transmitter circuits it is common practice to employ a filter of the type shown in Fig. 3. Data concerning these filters is given in *The ARRL Handbook*. The mixer filter should have ample bandwidth to cover the spread of the transmitter.

Post-mixer amplification is not casual if we are to preserve the linearity of the signal: Nonlinearity causes distortion. Therefore, we can't use a class-C amplifier for SSB work. Class-C amplifiers are suitable for FM work, however. Class-A or -AB amplifiers are required for SSB amplification. Vacuum-tube class-B amplifiers are also used for SSB circuits. Class-A operation is used for transistor amplifiers at low power levels. The trade-off between class C and class A or AB is *amplifier efficiency*. A 70- or 80-percent efficiency is common for class-C service, whereas 33- to 50-percent efficiency is the usual spread for class-A and -AB amplifiers. Hence if the dc input power to a given amplifier is 2 W, the RF output power will be in a range of 0.66 to 1 W in a typical case. The class of amplifier service is determined by the external bias applied to the active device in the amplifier circuit. A positive bias is used for solid-state amplifiers, as shown in Fig. 4.

Linear amplifiers must be free of self-oscillations. Such oscillations may occur at HF, VHF or UHF, and may even take place in the AF region. The cause of unwanted-signal generation of this type is related to poor layout and feedback from the amplifier output to the input section, or from feedback energy that migrates from other amplifier stages that operate on the same frequency as the unstable amplifier. Therefore, the voltage-supply bus should contain decoupling resistors and capacitors that isolate one stage from another. Short leads in the signal circuits are necessary. Also, the components of the amplifier input and output circuit need to be physically isolated from one another to minimize feedback.

Fig. 4 demonstrates the principles we are discussing in connection with amplifier-instability correction. For example, if VHF or UHF parasitic oscillations occur, we may insert R1 to damp the oscillations. Alternatively, we may add a 900-μ ferrite bead (Z1) near the base terminal of Q2. A bead can be used in place of R1 if we wish. Beads are preferred in circuits in which substantial current is flowing: The bead causes no voltage drop, whereas a resistor (R1) can lower the effective operating voltage of the amplifier. More than one bead (in series) may be necessary to suppress self-oscillation.

C1, C2, C3, C4, R2 and R3 form decoupling networks that prevent RF energy from following the +V line from one amplifier to the other. Without these RC networks the two stages might self-oscillate at or near the 3.9-MHz operating frequency. C4 serves as a bypass capacitor for low frequencies, including the audio region. In some designs, we may find a 1-kΩ resistor (or similar value) bridged across the primary winding of broadband transformer T2. The resistor will help to ensure stability, but it will dissipate some

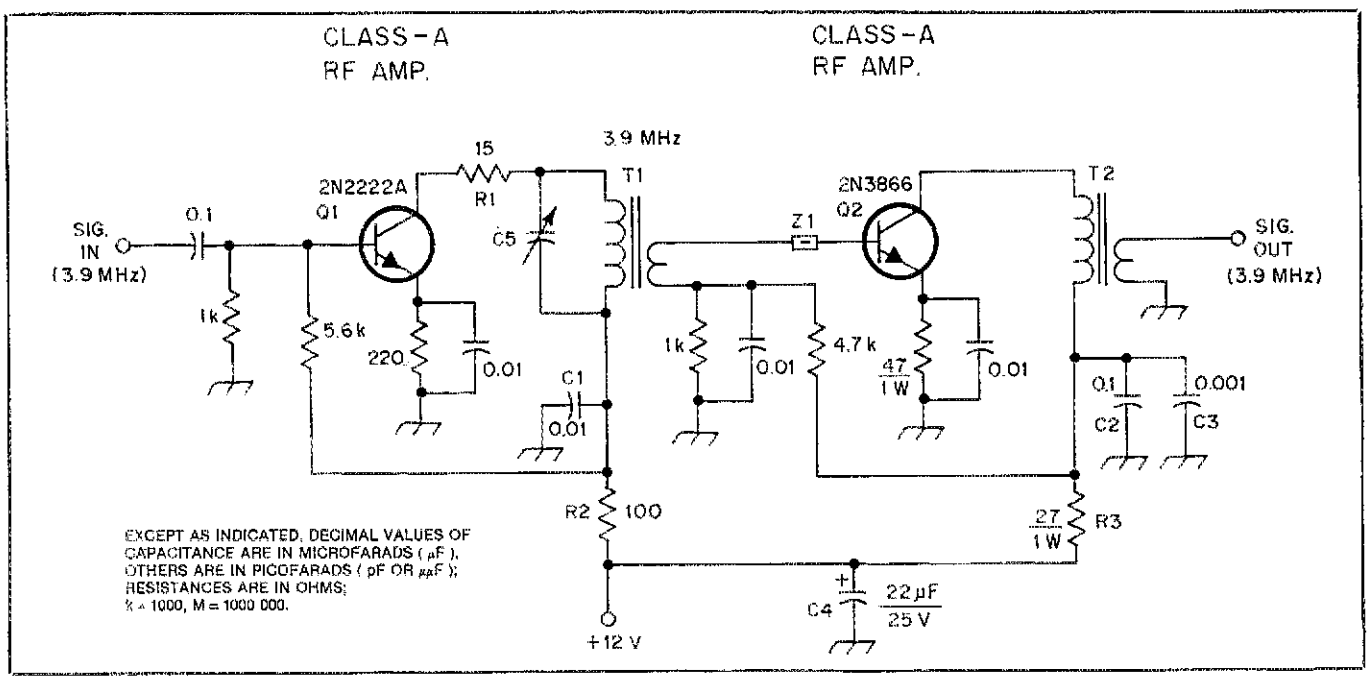

Fig. 4—Two-stage representative IF or RF amplifier for use after a transmitting mixer. See text for pertinent information about this linear-amplifier circuit.

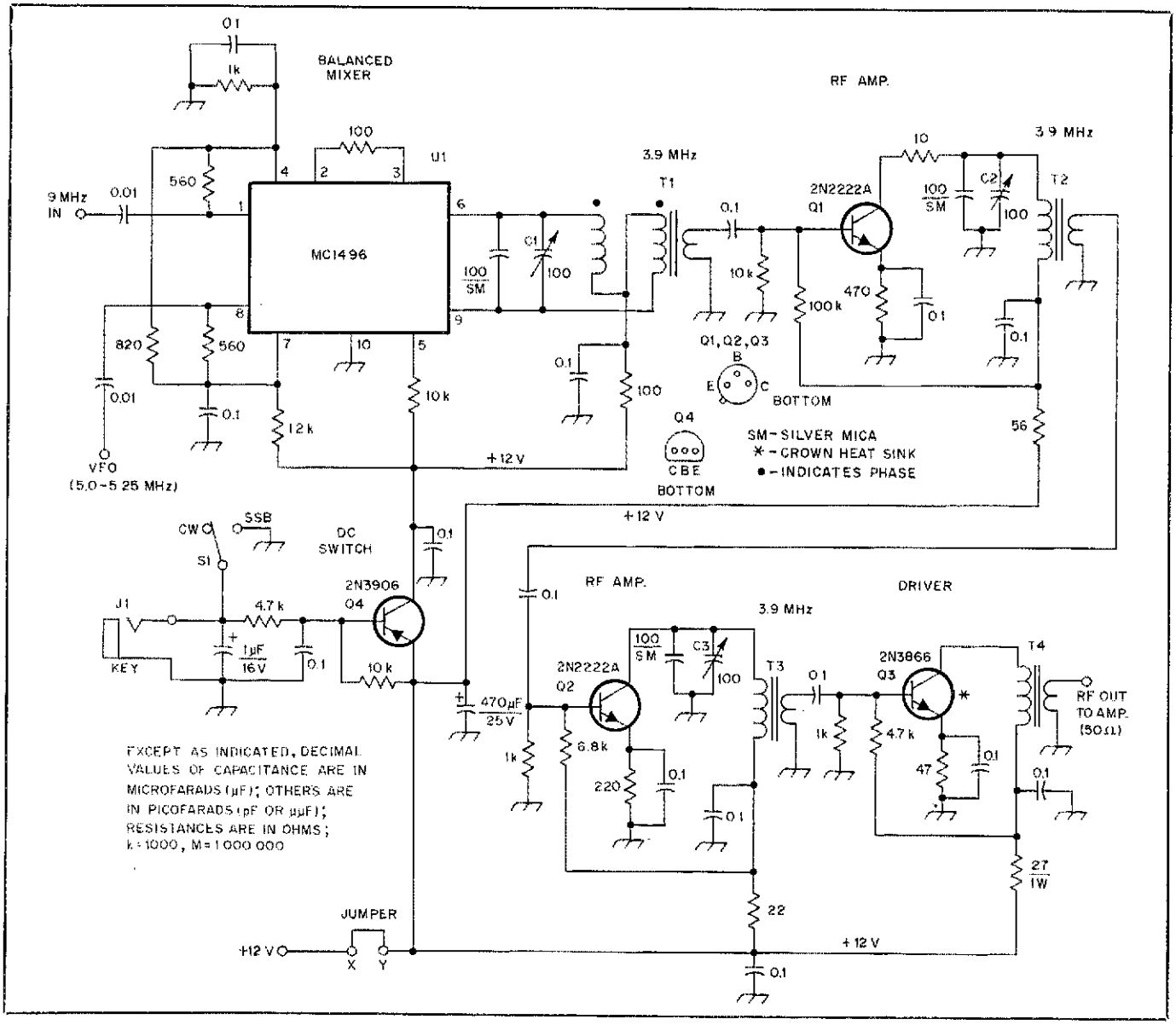

Fig. 5—Practical circuit for a mixer and three RF amplifiers. This circuit is designed for use with the practical circuits given earlier in the series. Fixed-value capacitors are disc ceramic unless otherwise indicated. Polarized capacitors are electrolytic or tantalum. Resistors are ¼- or ½-W carbon composition, except those with wattage notations.

C1, C2, C3—Miniature PC-mount trimmer, 100 pF max. capacitance.
J1—Key jack of builder's choice.
S1—SPDT toggle or slide switch.
T1—11-μH bifilar-wound primary. 13 turns of no. 26 enam. wire, 8 twists per inch (parallel wires) on an Amidon Assoc. FT-50-61 ferrite toroid (μ_i = 125). Secondary is 3 turns of no. 26 enam. wire over primary winding.
T2—11-μH primary, 13 turns of no. 26 enam. wire on FT-50-61 toroid. Secondary has 9 turns of no. 26 enam. wire.
T3—11-μH primary, 13 turns of no. 26 enam. wire on FT-50-61 toroid. Secondary has 4 turns of no. 26 enam. wire.
T4—15 turns of no. 26 enam. wire on an Amidon Assoc. FT-50-43 (950μ_i) ferrite toroid. Secondary has 7 turns of no. 26 enam. wire.

of the available RF power. Q1 and Q2 are biased for class-A operation.

Practical Mixer-Amplifier for 3.9 MHz

The circuit details for this month's module are provided in Fig. 5. U1, the doubly balanced IC mixer, follows the same circuit shown in Fig. 2. To simplify the diagram we have used the block form for the MC1496. A tuned transformer, T1, is used at the mixer output to provide an impedance transformation between U1 and Q1. It serves also as a selective element to help reduce spurious energy.

During CW operation, the mixer is keyed by means of a PNP dc switch, Q4. When S1 is set for the CW mode, the key or keyer shorts the base of Q4 to ground, which causes the transistor to conduct. This allows current to flow to U1. During SSB operation it is necessary to keep Q4 in a saturated state by closing S1.

Q1 operates as a class-A RF amplifier. Another tuned transformer, T2, provides impedance matching and additional selectivity. The next RF amplifier, Q2, operates linearly also, but draws more current than Q1. This yields sufficient power to drive Q3. T3 provides additional selectivity, which ensures Q3 is driven by a relatively clean signal.

Q3 also operates as a class-A linear amplifier, but the output contains a broadband transformer, T4. This adds to the stability of the overall amplifier section, and aids the bandwidth of the SSB generator. C1, C2 and C3 need to be stagger-tuned (peaked at the high, center and low frequencies of the operating range desired). This type of tuning reduces the maximum available output power, as opposed to peaking the three capacitors for

(continued on page 43)

The Loop Skywire

Looking for an all-band HF antenna that is easy to construct, costs nearly nothing and works great DX? Try this one!

By Dave Fischer, WØMHS
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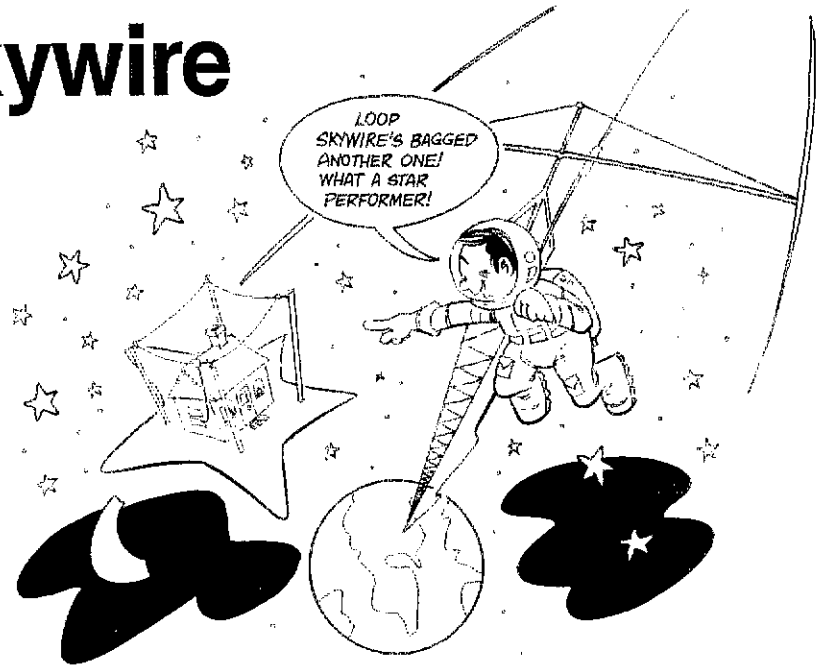


There is one wire antenna that performs exceptionally well on the HF bands, but relatively few amateurs know about it or use it. The purpose of this article is to present what one user has described as the "best kept secret in the amateur circle."

The Loop Skywire antenna is simple and easy to construct, costs nearly nothing, and eliminates the need for multiple antennas to cover the HF bands. It is made of only wire and coaxial cable, and often needs no Transmatch. An efficient antenna, it is effectively omnidirectional over most real earth, and exhibits a good signal-to-noise ratio. The antenna operates on all bands (harmonics) above the design or fundamental frequency and fits on almost every amateur's lot. It also works DX better than any other antenna I have had in the past.

You're suspicious? No antenna does all that? Since 1957, I have used this antenna in many locations with great success every time. There is, of course, no such thing as a "best" antenna. One operator's dream can become another's nightmare. Antennas are very sensitive to their environment. Yet, out of the numerous amateurs I have known who put up this Skywire, not one took it down because of poor performance. Invariably, other antennas, including beams, were dismantled when the Skywire became their main antenna.

It is curious that many references to this antenna are brief pronouncements that it operates best as a high-angle radiator and is good for only short-distance contacts. Such statements, in effect, dismiss this antenna as useless for most amateur work. This is not the case!

The Antenna

It is quite possible that the Loop Skywire has not been fully studied, analyzed and researched. Those who are able and curious should investigate the polarization of this one. This article does not offer a technical explanation of its performance or operation. Rather, it is a description of the antenna accompanied by construction hints and actual user comments. Take some time to erect the Skywire and decide for yourself whether it works.

Novices and Extras take note: Here is a simple, single antenna that *really* works all bands without the need for special stubs or tuning and pruning procedures. A Transmatch in the shack is helpful, but is often unnecessary, especially with tube-final rigs.

The Loop Skywire is a "magnetic" version of the old super SKYBUSTER—the open-wire, center-fed "electric" Zepp that has performed extraordinarily well for many decades. Yet, this one is less difficult to match and use. It can quickly displace that myriad of wires that many have erected in an attempt to work all HF bands. Besides the improvement in appearance, mutual coupling is greatly reduced. Antennas really do not like neighbors: The more antennas erected, the poorer they all generally work.

The Loop Skywire is shown in Fig. 1. It is simply a loop antenna erected horizontal to the earth. The horizontal position is its secret. Maximum enclosed area within the wire loop is the fundamental rule. The antenna has 1 wavelength of wire in its perimeter at the design or fundamental frequency. If you choose to calculate L_{total} in feet, the following equation should be used:

$$L_{total} = \frac{1005}{f} \qquad \text{(Eq. 1)}$$

where f is frequency in MHz

Given any length of wire, the maximum possible area the antenna can enclose will be with the wire in the shape of a circle. Since it takes an infinite number of skyhooks to hang a circular loop, the square loop (four skyhooks) is the most practical. Reducing the area enclosed by the wire loop further brings the antenna closer to the properties of the folded dipole and both harmonic impedance and feed-line voltage problems can result. Dipole (electric) antennas are only reasonably resonant at their odd harmonics. A little known fact in the amateur community is that loops are reasonably resonant at all harmonics of the design frequency. Loop geometries other than a square are thus possible, but remember the two fundamental requirements for the Loop Skywire: its horizontal position and maximum enclosed area.

Construction

Antenna construction is simple. Generally, a minimum of four skyhooks are required. Fig. 2 shows the placement of the insulators at the loop corners. There are two methods used to attach the insulators: Lock or tie the insulator in place with the loop wire tie shown, or leave the insulator "free" to float or slide along the wire. Most loop users float at least two insulators. This allows pulling the slack out of the loop once it is in the air and eliminates the need to have all the skyhooks exactly placed for proper tension in each leg. I recommend floating two opposite corners. The feed point can be positioned anywhere along the loop that you wish. However, most users corner-feed the skywire. Fig. 3 depicts a method of doing this. It is advantageous to keep the feedpoint mechanicals away from the corner support. I usually feed a foot or so off one

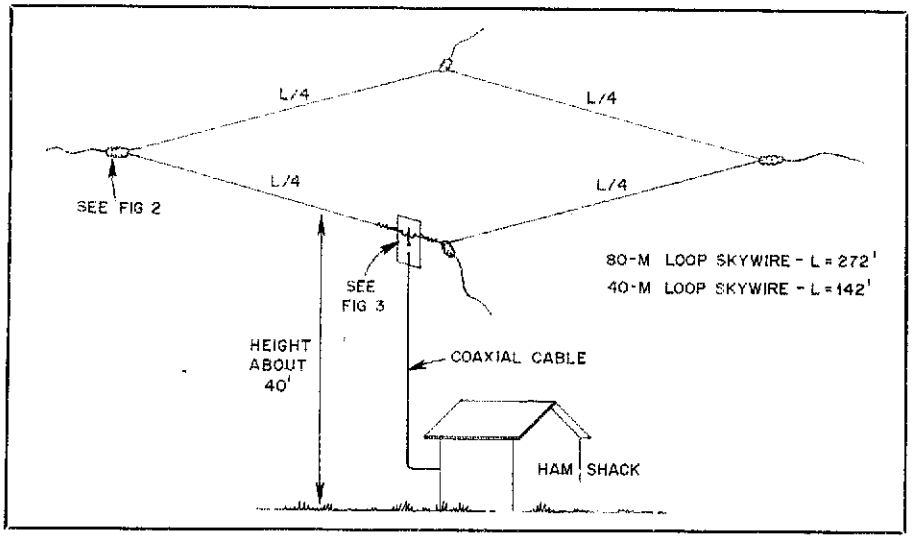


Fig. 1—A complete view of the Loop Skywire. The Loop is erected horizontal to the earth.

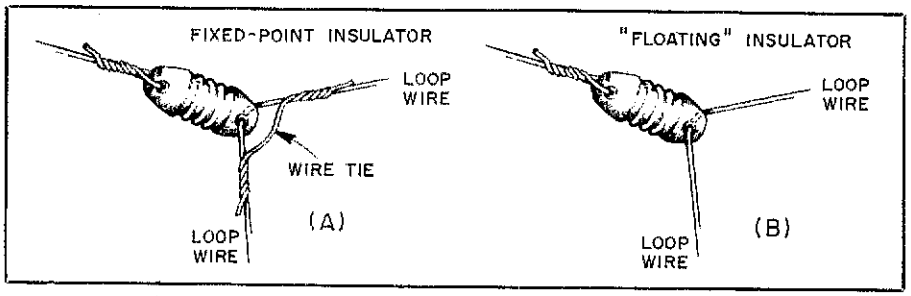


Fig. 2—Two methods of installing the insulators at the loop corners.

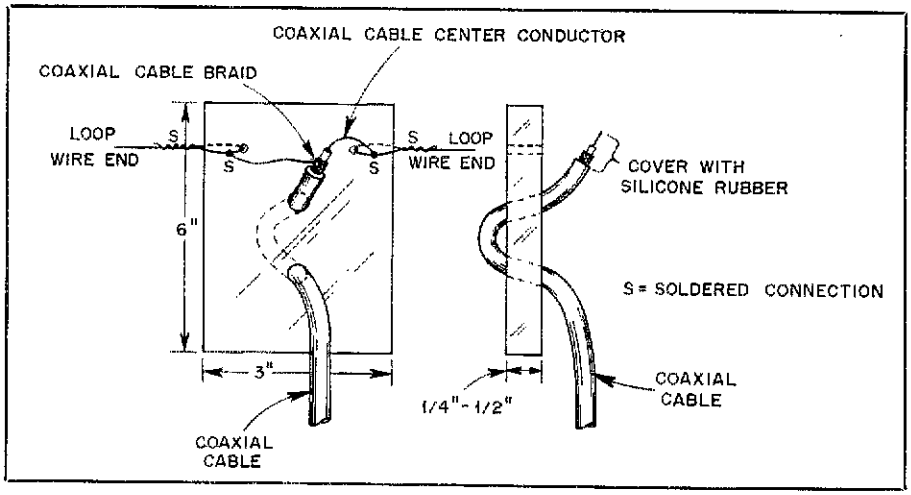


Fig. 3—Most users cornerfeed the Skywire. A high-impedance, weather-resistant insulant should be used for the feed-point insulator. Cover the end of the coaxial cable with silicone rubber for protection from the weather and added electrical insulation. Dimensions shown are approximate.

corner, allowing the feed line to exit more freely. This method keeps the feed line free from the loop support.

If the skyhooks (e.g., trees) move, then at least two of the ropes or guys used to support the insulators should be counterweighted and allowed to move freely. The feed-line corner is almost always tied down, however. Very little tension is needed to support the loop (far less than that for a dipole). Thus, counterweights are light weights. Several loops have been constructed with the use of bungie cords tied to three insulators and the attached ropes tied fast. This eliminates the need for counterweighting.

There is another great advantage to this antenna system. It can be operated as a vertical antenna with top-hat loading on all bands as well. This is accomplished by simply keeping the feed-line run from the antenna to the shack as vertical as possible and clear of objects. Both feed-line conductors are then tied together (via a shorted SO-239 jack, for example), and the antenna is fed against good ground. This method allows excellent performance of the 40-meter Loop Skywire on 80 meters, and the 80-meter Loop Skywire on 160 meters. When constructing the loop, connect (solder) the coaxial feed-line ends directly to the loop wire ends. Don't do anything else. Baluns or choke coils at the feed point are not to be used. They are unnecessary. The feed arrangement for operating the loop as a vertical antenna is shown in Fig. 4.

Some skeptics have commented that the Loop Skywire is actually a vertical antenna in disguise. Yet when the loops have been used in on-the-air tests with both local and DX stations, on those bands where loop operation is possible, the loop operating as a loop consistently "outsignals" the loop operating as a vertical.

Although the loop can be constructed for any band or frequency of operation, the following two Loop Skywires are the star performers. The 30-meter band can also be operated on both.

80-meter Loop Skywire (80-100 meter loop + 160-meter vertical)
Total Loop perimeter: 272 feet
Square Sidelength: 68 feet

40-meter Loop Skywire (40-10 meter loop + 80-meter vertical)
Total Loop perimeter: 142 feet
Square Sidelength: 35.5 feet

Actual total length can vary from these dimensions by a few feet. Do not worry about tuning and pruning the loop to resonance physically. No signal difference was detected on the other end when that method was used. Let the Transmatch do the necessary mop up.

Copper wire is usually used in the loop. Lamp or "zip" cord and Copperweld can also be used. Several loops have even been constructed successfully with steel wire, but soldering is difficult.

Recommended height for the antenna is 40 feet or more. The higher the better, especially if you wish to use the loop in the vertical mode. Successful local and DX operation has been reported, however, in several cases with the antenna at 20 feet.

If you are preoccupied with SWR, the reading will depend on your operating frequency and the type of feed line used. Coaxial cable is sufficient; open wire does not appear to make the loop perform any

User Responses to the Loop Skywire

W8BO (40-meter Loop Skywire at 20 feet): "This antenna has to be the best-kept secret in the hambook! I had been using the loop vertical for three years when, one day, I worked an HA4 in Europe. He said his loop was in the horizontal configuration, and I immediately took mine down and repositioned it horizontally. The height was 20 feet above ground. Here is what I found. The radiation results in a blanket coverage throughout the USA. What was surprising, though, was the effective coverage at low angles. This horizontal loop listens to the DX in an amazing fashion. What you have here is the complete backyard antenna that not only ragchews, but also DXs. Europe can be worked easily on all bands with 100 W. On 20, 15 and 10 meters, the sky is the limit. While the 'big boys' are bringing their beams around, you can work anybody within 360 degrees. You can almost see the tears running down their faces. If a station within the States does not come back to me, I immediately look out the window to see if the antenna has blown down. I hold 5BWAS and 5BDXCC. If I say an antenna works, you'd better believe it!"

K4SSW (40-meter Loop Skywire at 53 feet): "The 40-meter Loop Skywire is my only antenna now. I work 40, 20 and 15, and my enjoyment is ragchewing with DX ops. I work anyone I can hear, and I hear lots! My average QSO time working DX is 10 to 15 minutes per contact, so the signal has to be decent to withstand changing conditions, the "rat race" and the alarming increase in every frequency you work being used as the national tune-up spot! My rig is a TS-530S with an MFJ-941C antenna matching network and 90 W out, and I get a 1:1 SWR with ease. DX stations are very curious about the loop and request information about it.

"The following statistics are taken from my log over a time span of 16 months of operation (November 1983, when the loop went up, until March 1985). Total QSOs = 1350, with 739 as DX and 611 as local (USA and Canada). Using the RS/RST system, these are my received signal reports:

	R5	*R4*	*R3*	*S9*	*S8*	*S7*	*S6*	*S5*	*S4*
DX	685	39	15	96	44	118	98	232	151
Local	592	16	3	215	92	115	45	99	45
Total	1277	55	18	311	136	233	143	331	196
Percentages									
DX	93%	5%	2%	13%	6%	16%	13%	31%	21%
Local	97%	2%	1%	36%	15%	19%	7%	16%	7%
Total	95%	4%	1%	23%	10%	17%	11%	25%	14%

"These data show that the loop is a very good performer. Those who expect 599+ 40 dB are dreamers. Overall, the signal was perfectly readable (R5) 95% of the time. DX-wise, the signal was moderate or better in strength 79% of the time; and locally, 93% of the time. Of course, the RS/RST system is not scientifically based, but it *is* the system we use. Hams really do jump up and down at 599s, but then take the other guy as honest or a "lid" when it's 339! This antenna works great! Represented in these 739 DX QSOs are 90% DXCC and multiple WAC. Locally, the 611 QSOs are WAS several times. The first signal heard on this antenna when it was put up in November 1983 was a UK2 on 80 CW, and the sun was still shining. The loop was loaded as a vertical on 80 meters. I heartily claim the Loop Skywire a real winner!"

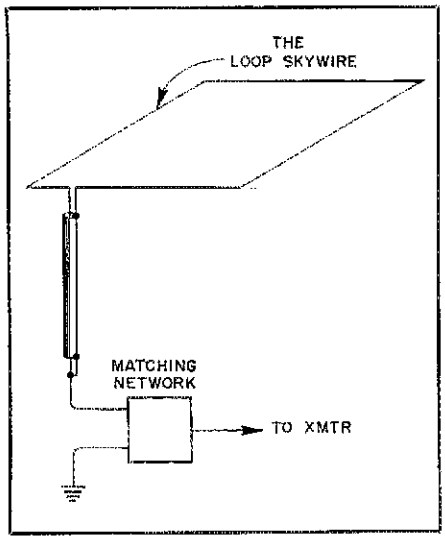


Fig. 4—The feed arrangement for operating the loop as a vertical antenna.

better or matching to it any easier. Most users feed with RG-58, RG-59 or RG-62. RG-8 and RG-11 are generally too cumbersome to use. With full power and coaxial cable feeding these loops, feed-line problems have not been reported to me. The SWR from either of these loops with approximately 100 feet of feed line is rarely over 3:1. For those who understand SWR, the use of a Transmatch will eliminate all concern for power transfer and maximum signal strength. The SWR in my shack is always 1:1. The highest line SWR usually occurs at the second harmonic of the design frequency and all other frequencies above that. The Loop Skywire is somewhat more broadbanded than corresponding dipoles, but the loop is efficient: The SWR curves are not "dummy load" flat!

Since the loop is high in the air and has considerable electrical exposure to the elements, proper methods should be employed to eliminate the chance of induced or direct lightning hazard to the shack and operator. Some users simply employ a three-connector (PL-259/PL-258/PL-259) weather-protected junction in the feed line outside the shack and completely disconnect the antenna from the rig and shack during periods of possible lightning activity.

The antennas just described are in daily use, and I estimate at least several hundred are working well throughout the world at the present time. Comments offered by some users appear in the accompanying sidebar. They are representative of comments received from the numerous amateurs polled by the author who use the Loop Skywire. There were no dismal or negative results reported with this antenna, which the textbook-touters dismiss as a useless antenna for the HF ham bands. The Loop Skywire is truly a real Loop Skywalker! Try it; you'll like it! I welcome your comments on its use.

WØMHS has been active on the HF bands for nearly 40 years. Working CW exclusively, Dave participates in the NTS, chases DX, enjoys contesting and ragchewing, and is a member of the QCWA. He holds a degree in Applied and Pure Mathematics and Mathematical Logic from the University of Missouri at Rolla and the University of Kansas, respectively. He earned his PhD from the University of Nebraska. Dave has worked with electromagnetics, antennas and transmission lines while both an engineer and technical consultant at Hy-gain in Lincoln, Nebraska. He has also taught at the Universities of Nebraska and Kansas, founded a radio astronomy and radio science observatory at Earlham College, Kansas, and has authored numerous technical papers. His most recent work is in the area of fiber-optic cables for long-haul telecommunication services. Dave is presently director of engineering for Superior Cable Corporation.

Strays

I would like to get in touch with...

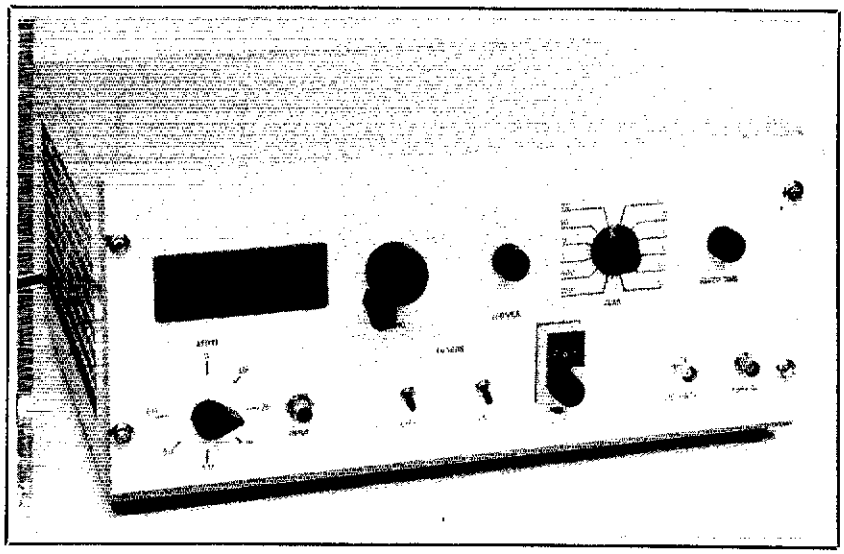
☐ anyone with a manual and schematic diagram for a Hallicrafters transmitter, Model HT-40. Merlin Koellen, KB6FQP, 5851 Snead Dr., Huntington Beach, CA 92649.

☐ anyone with a circuit for automatic restart of the scanning mode for the Yaesu FT-207R 2-meter hand-held. Dan Council, WB9UKL, 5819 N. Rosemead, Peoria, IL 61614.

☐ anyone with any information on a Western Electric regulator circuit identified by J87214A-1L1, J87211A-1L7, SD81541-01. Lynchburg ARC, P.O. Box 4242, Lynchburg, VA 24502.

☐ anyone having a service manual or schematic for a General Radio pulse generator, Model 1340. Elwood Blose, WA4AYC, 7245 Chilton La., Riverdale, GA 30296.

An Inexpensive Spectrum Analyzer for the Radio Amateur



Like Alice's looking glass, the spectrum analyzer allows you to enter another world. It's your window on the world of RF.

By Al Helfrick, K2BLA

ARRL TA and TC
RFD 4, Box 87
Boonton, NJ 07005

The spectrum analyzer is an indispensable tool for the RF designer. Although the radio amateur could benefit from the use of such a tool, few if any can afford the stiff price tag of a commercially made unit. Home construction of a spectrum analyzer appears to be an awesome task. Note that I said *appears*. With the help of some readily available building blocks, the task is made easier and inexpensive. Before describing the design and construction of our homemade analyzer, let's review some of the basics of their operation.

How a Spectrum Analyzer Works

Basically, the spectrum analyzer is an up-converting superheterodyne receiver outfitted with a visual display. Several years ago, the concept of up-conversion would require considerable discussion, but with practically all HF receivers being designed that way today, we'll only touch on the subject.

Up-Conversion

In up-conversion, the input frequency is converted to a first IF that is above the highest input frequency to be received. This places the image frequency well beyond the range of desired input frequencies so that a fixed-tuned preselector filter can be used. There are some advantages to using up-conversion in a communications receiver, but in a spectrum analyzer, in which the entire input range of frequencies must be swept, it is an absolute necessity. The low-pass filter used in the front end of the analyzer does not need to be frequency swept, so only the local oscillator (LO) frequencies determine the frequency to which the spectrum analyzer is tuned. It is usually difficult to obtain the required selectivity at the high first IF, so a second frequency conversion is required. Because the first IF of a VHF or UHF spectrum analyzer is well into the UHF region, it is often necessary to perform a third frequency conversion as well.

Refer to Fig. 1. In this block diagram of our spectrum analyzer, the input frequency range is chosen to be from 0 to 400 MHz. The first IF, which is required to be above the highest input frequency, is 516 MHz. The frequency chosen for this IF is a compromise between one that will not produce serious spurious responses and some "nice round number" that might permit the use of an electronic frequency readout. Our analyzer will have an ultimate IF bandwidth of about 10 kHz, and so a second, and possibly a third, frequency conversion is required. The second IF should be high enough so that the first IF filter can remove the image frequency. For this purpose, a 61.5-MHz IF has been chosen. The image, removed from the desired frequency by twice the IF, is 123 MHz. It may appear that a much lower second IF may be sufficient, but at the 516-MHz first IF, it is not easy to create high-Q resonators or provide a high amount of ultimate attenuation.

The 61.5-MHz second IF makes it difficult to provide a selectivity on the order of 10 kHz, so a third conversion is required. For our example, this IF is 10.7 MHz. At this frequency, it is not dif-

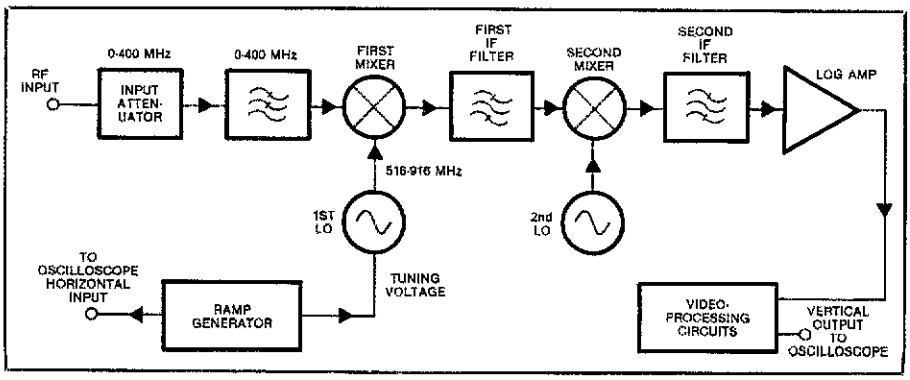
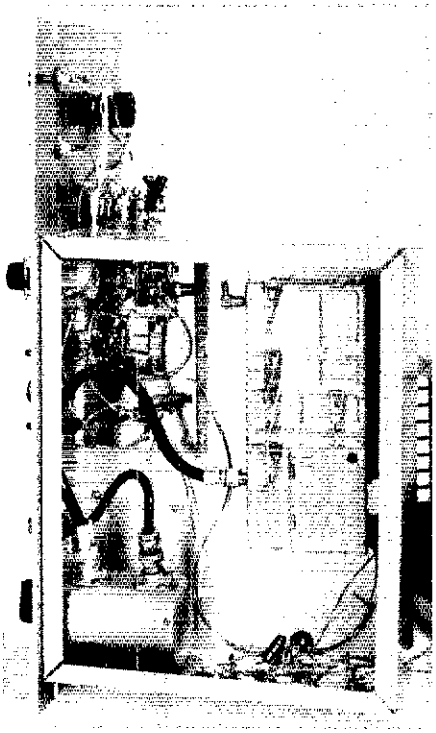


Fig. 1—Block diagram of our spectrum analyzer.



A bottom view of the homemade spectrum analyzer. At the bottom left of the chassis is the input attenuator. The CATV converter module is the large box at the right-hand side of the chassis; small clips secure the cover (see text).

ficult to obtain crystal filters with passbands on the order of a few kilohertz.

Unlike the communications receiver, the spectrum analyzer must be tuned rapidly and electronically so the entire input spectrum can be displayed. This is done by simply making the first LO voltage tunable while the frequencies of the second and third LOs are fixed. This permits the entire spectrum analyzer input-frequency range to be swept by varying the frequency of a single oscillator.

The information displayed by the spectrum analyzer is the amplitude of the input signal vs. frequency. It is in this respect that the spectrum analyzer again deviates from the communications receiver—no demodulation of the input signal is required. The power range of the input signal can span a wide range, typically 60 dB or more. This implies a power range of a million to one! If this range were displayed in a linear fashion, although large signals would be easily visible on the screen, the smaller signals would be practically invisible. To alleviate this problem, a logarithmic display calibrated in decibels is desired. In order to convert the linear signals to a logarithmic display within the analyzer, special IF amplifiers known as "log amps" are used.

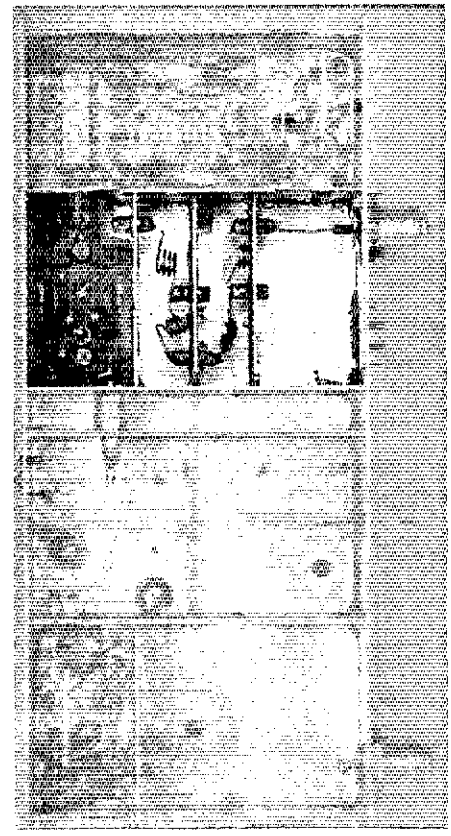
Perhaps the two largest stumbling blocks to a home-constructed spectrum analyzer are the RF circuits and the log amp. If these two hurdles can be overcome, the remaining circuits—power supplies, display amplifiers, sweep voltage generators and so on—are relatively simple, low-frequency circuits that could be built easily in the home shop.

The spectrum analyzer to be described provides you with a source for these difficult-to-build components and reduces the required construction to that of the low-frequency circuits. Our source for the RF circuits is a common cable-television (CATV) set-top converter. The frequencies used as an example in the discussion in the previous paragraphs were selected to reduce spurious responses, but also are those commonly used in a CATV converter! With the proliferation of CATV, these set-top converters will eventually become available as inexpensive items on the new, surplus and scrap markets. Practically any oscilloscope worth its place on your workbench can be used for the display.

Building Blocks

The RF module used for the spectrum analyzer described in this article is a Jerrold 400, often found for sale as a new item as well as a surplus unit. The input-frequency range of the '400 is 54-400 MHz, and can be used as the basis for a 400-MHz spectrum analyzer. For the RF module to be used in a spectrum analyzer, some minor modifications are required. The converter covers frequencies from 54 to 400 MHz for a total of 62 channels. As shown in Fig. 2, the input filter consists of a low-pass filter with a 400-MHz cutoff frequency and a high-pass filter with a 54-MHz cutoff frequency. The high-pass filter is removed, resulting in an effective input-frequency range of from 0 to 400 MHz. The first IF tuned circuit is 6 MHz wide to cover the width of an entire television channel and spans 512.5 to 518.5 MHz. The output tuned circuit is also a 6-MHz wide filter and is tuned to TV Channel 2 or 3 depending on which channel is assigned to the area in which the converter is used. Both filters are left intact, although they are wider than necessary for use in a spectrum analyzer. This way, only minimal retuning of the circuits in the RF module is required. With the removal of the input high-pass filter, the CATV converter RF module is capable of converting all frequencies from almost 0 to 400 MHz to Channel 2 or 3. A third conversion is added externally to the module to convert the output to 10.7 MHz where standard receiver IF filters are used.

Building a spectrum analyzer of this sort depends on your ability to obtain the CATV converter.[1] The Jerrold 400 seems to be a widely distributed converter, and there should be a good supply of parts. The RF module is produced by at least two manufacturers, which further enhances the



This is an inside view of the CATV module with the high-pass filter removed.

chance of the unit becoming available. In addition to the Jerrold unit, there are several other manufacturers of CATV converters, and many of the newer units cover frequencies in excess of 450 MHz. Regardless of the manufacturer or the vintage of the converter, all of the CATV converters operate on the same principle. Although the frequencies are different, the converters fit the block diagram of Fig. 1. Some of the very early converters are not frequency synthesized and do not contain a frequency prescaler.[2] In many of these units, the input-frequency range does not extend beyond 300 MHz. These early units are available at low prices and can be used to cover up to 300 MHz with a mechanical dial rather than the frequency counter. Also, practically all CATV converters use the same odd, negative 22-V power supply.

Once the output of the CATV RF module is converted to 10.7 MHz, a log amplifier is required to create the desired display. An excellent and simple device for the purpose is a Motorola IC, the MC3356. This device is designed to function as an FSK receiver for input frequencies in the VHF range for use in radio-control receivers and RF modems.

The IC consists of an oscillator, a mixer, a limiting IF amplifier, a detector, and data shaping and squelch circuits. An interesting feature of this chip is that it has an output designed to be used in a relative signal-

[1]Notes appear on page 29.

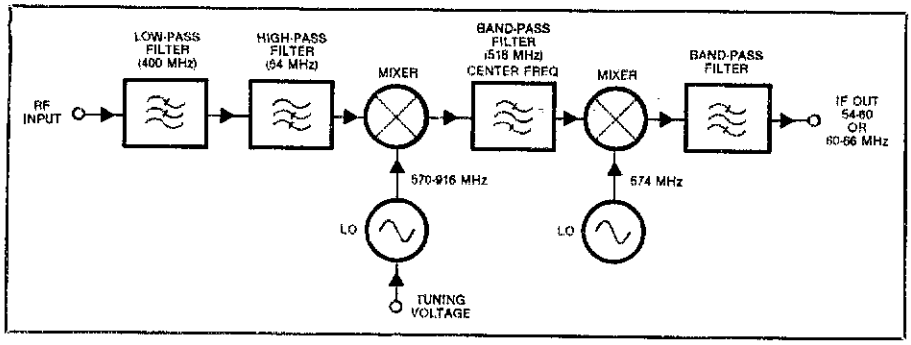


Fig. 2—Block diagram of a CATV converter.

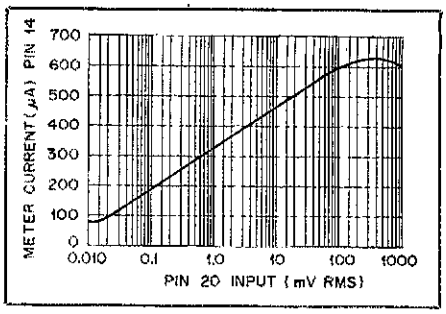
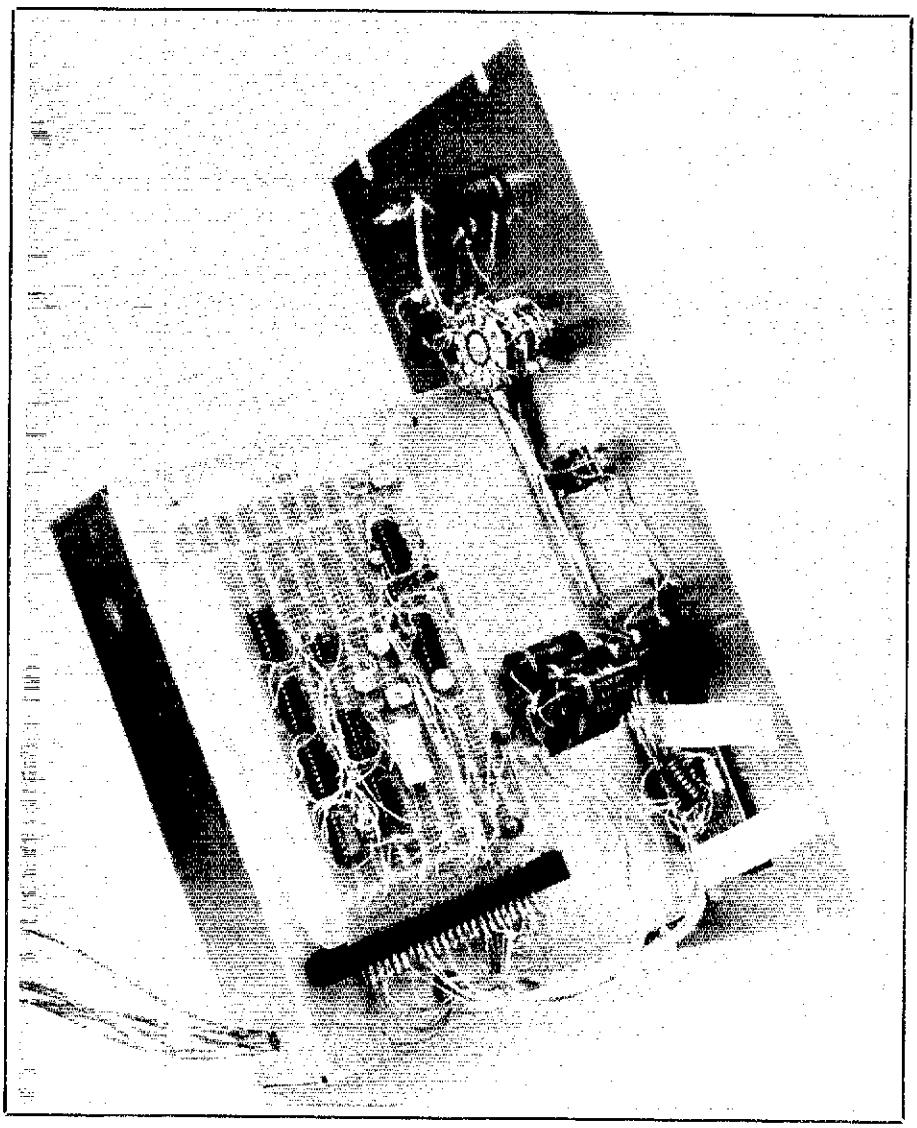


Fig. 3—Meter current vs. signal input of the MC3356 wideband FSK receiver. Notice that the meter current is proportional to the log of the input signal.

strength indicator circuit (see Fig. 3). The output current is proportional to the log of the input-signal amplitude. Although designed to drive a meter, the frequency response of this output is high enough to drive an oscilloscope display in a spectrum analyzer. Using the CATV converter and the MC3356 requires only a sweep-voltage generator and signal-processing circuits to make a complete spectrum analyzer.

Nuts and Bolts

Figs. 4 and 5 show the schematic diagram of the spectrum analyzer. As explained previously, the converter is modified so that the input to the first mixer passes the entire frequency range and is accomplished by removing the high-pass filter at the input. Although the input impedance of the converter module is 75 ohms, it is not necessary to decrease it. Because an attenuator will be used ahead of the RF module, a good 50-ohm match can be obtained simply by providing 10 dB or more of attenuation. It may be necessary to lower the LO frequency to provide complete "0-MHz" coverage, as the lowest input frequency of the original converter is 54 MHz. I did this by heating the solder at one end of the oscillator inductor and pulling approximately 1/8th of an inch of wire from the feedthrough capacitor used as an anchor for the inductor. With a tuning voltage from about 1.5 V to 22 V, the first LO easily covers 516 MHz, or what will appear on the screen as 0 MHz.



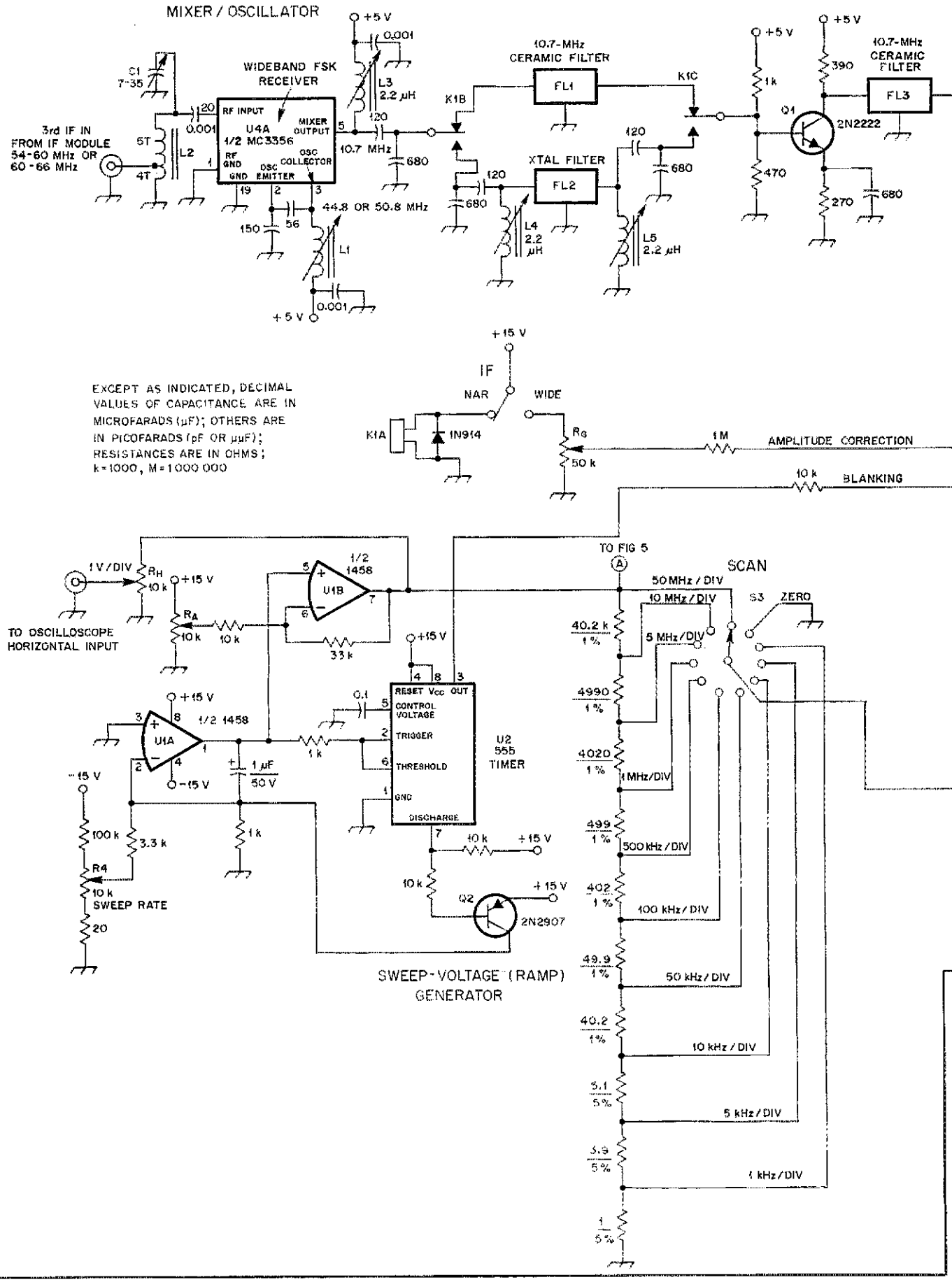
Top view of the prototype spectrum analyzer. The prototyping board carries the frequency divider circuit. Immediately behind the LED display is the counter/driver IC. The power supply is mounted on a separate chassis in the enclosure and is not shown in the photos.

Ramp Generator

The frequency change relative to the tuning-voltage change for the first LO is not constant, and a variable-slope input voltage must be provided. A ramp generator is used to provide the sweep voltage for the oscilloscope and the tuning voltage for the first LO. Before being applied to the LO, the ramp voltage is attenuated by the SCAN (MHz/division or dispersion) control and added to a voltage from the front-panel frequency control, then fed to a variable-slope generator. Another significant advantage is evident here. The CATV converter uses a hyperabrupt varactor tuning diode that provides a nearly linear voltage versus frequency slope for the tuning diode, and only one "breakpoint" or change in slope is required. It is not unusual for a spectrum analyzer to use as many as 10 breakpoints in the variable-slope generator, and the simple single-breakpoint slope generator shown in Fig. 4 provides reasonable frequency linearity for the analyzer.

Spurious Responses

While making the converter modifications, do not disturb any of the components within the box even though they may look


MIXER / OSCILLATOR
WIDEBAND FSK RECEIVER
U4A 1/2 MC3356
RF INPUT
MIXER OUTPUT
RF GND
OSC COLLECTOR
OSC EMITTER
3rd IF IN FROM IF MODULE 54-60 MHz OR 60-66 MHz
C1 7-35
L2
5T
4T
0.001
L3 2.2 µH
10.7 MHz
680
44.8 OR 50.8 MHz
150
56
L1
+5 V
10.7-MHz CERAMIC FILTER
FL1
K1B
K1C
XTAL FILTER
FL2
L4 2.2 µH
L5 2.2 µH
120
1k
390
470
270
Q1
2N2222
FL3
EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (µF); OTHERS ARE IN PICOFARADS (pF OR µµF); RESISTANCES ARE IN OHMS; k=1000, M=1 000 000
+15 V
IF
NAR
WIDE
K1A
1N914
Rg
50 k
1M
AMPLITUDE CORRECTION
10 k
BLANKING
TO FIG 5
SCAN
1 V/DIV
RH
RA
TO OSCILLOSCOPE HORIZONTAL INPUT
1/2 1458
U1B
U1A
33 k
0.1
1 µF 50 V
U2 555 TIMER
RESET Vcc OUT
CONTROL VOLTAGE
TRIGGER
THRESHOLD
GND
DISCHARGE
100 k
3.3 k
R4
SWEEP RATE
20
Q2
2N2907
SWEEP-VOLTAGE (RAMP) GENERATOR
S3
ZERO
50 MHz / DIV
10 MHz / DIV
5 MHz / DIV
1 MHz / DIV
500 kHz / DIV
100 kHz / DIV
50 kHz / DIV
10 kHz / DIV
5 kHz / DIV
1 kHz / DIV
40.2 k 1%
4990 1%
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499 1%
402 1%
49.9 1%
40.2 1%
5.1 5%
3.9 5%
1 5%

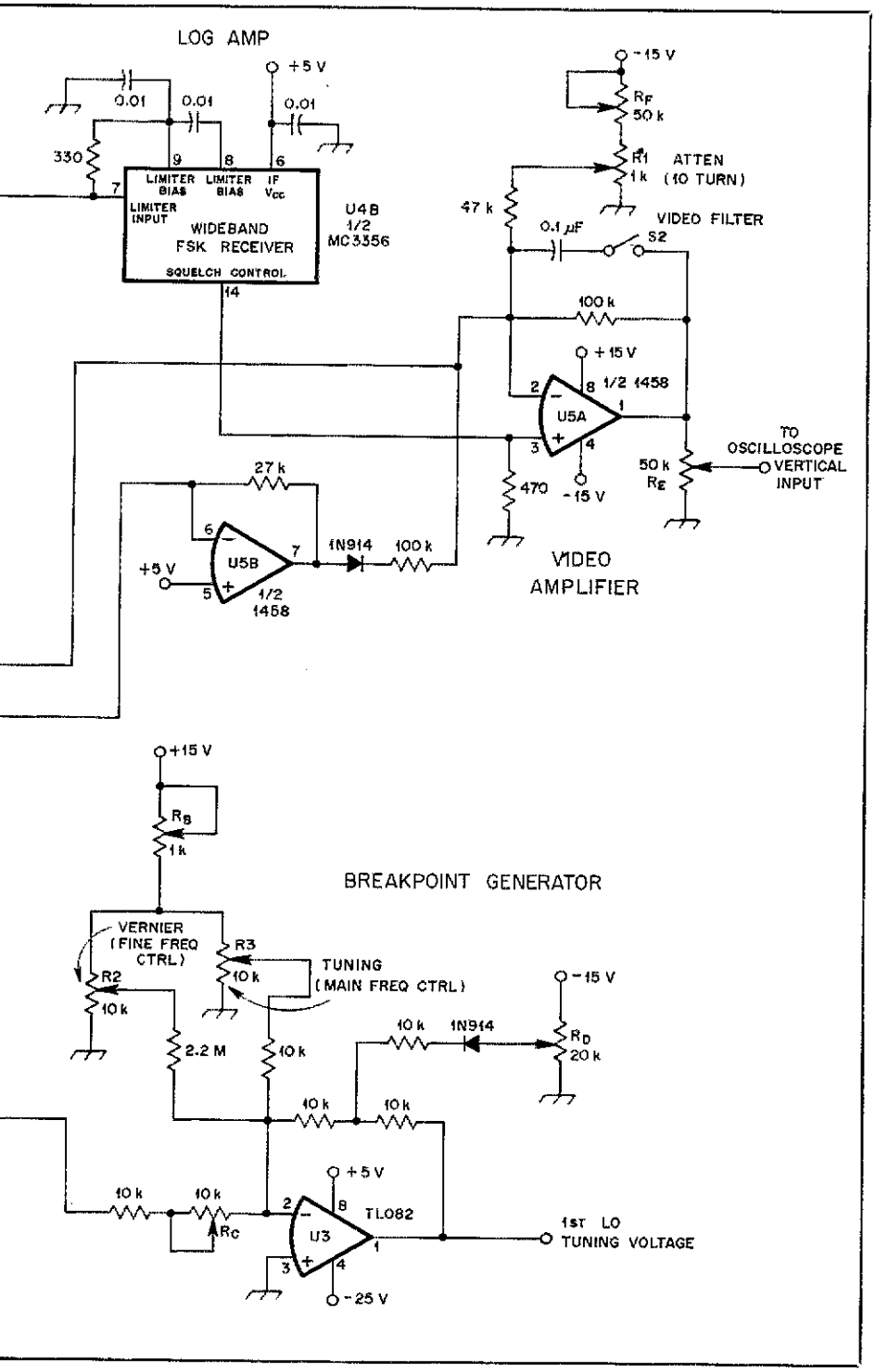
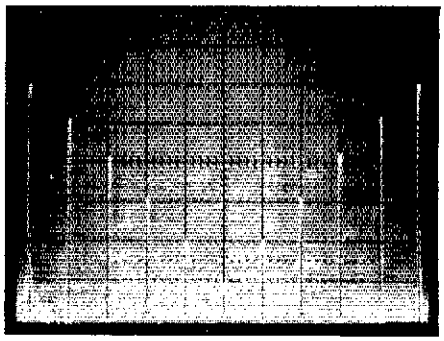


Fig. 4—Schematic diagram of the main portion of the homemade spectrum analyzer.
C1—7-35 pF miniature ceramic variable.
FL1, FL3—Ceramic IF filter, 10.7 MHz, Murata or Kyocera SFE 10.7-MA or equiv.
FL2—Crystal filter, 10.7 MHz, Piezo Technologies 2195F or equiv.
L1—250 nH; 5½ turns, 3/16-diam ferrite slug, Coilcraft 142-05J0.
L2—9 turns on a Micrometals or Amidon T37-10 core tapped 4 turns from ground end.
L3-L5, Incl.—10.7-MHz IF transformer (Mouser Electronics, 42IF124).
R1—1-kΩ, 10-turn potentiometer (see text).
R2—10-kΩ, single-turn, panel-mount potentiometer.
R3—10-kΩ, 10-turn, panel-mount potentiometer.
R4—10-kΩ, single-turn or multiturn panel-mount potentiometer.
R_A—10-kΩ trimmer.
R_B—1-kΩ trimmer.
R_C—10-kΩ trimmer.
R_D—20-kΩ trimmer.
R_E—50-kΩ trimmer.
R_F—50-kΩ trimmer.
R_G—50-kΩ trimmer.
R_H—10-kΩ trimmer.
S1—SPDT toggle.
S2—SPST toggle.
S3—Single-pole, 11-pos. rotary.
U1—MC1458 op amp.
U2—555 timer.
U3—TL082 op amp.
U4—MC3356 wideband FSK receiver.
U5—MC1458 op amp.



A display produced by the homemade spectrum analyzer. Each horizontal division is 10 MHz; vertical divisions are 10 dB each. The large pip to the left is at 110 MHz; the one to the right, 210 MHz. Two H-P 8640B signal generators were connected to the analyzer, each stepped in 10-MHz increments from one end of the frequency range. At each step, the signal amplitude was decreased 10 dB. The photo shows the excellent amplitude and frequency linearity of the homemade analyzer.

as if they have been mistreated. Many of the tuned circuits, especially the higher-frequency ones, are tuned at the factory by bending and crushing. When the necessary modifications have been made, the converter cover must be replaced to prevent spurious signals from appearing. This analyzer is capable of viewing signals as low as −105 dBm, and even the smallest gaps can cause spurious responses to appear. Because the cover uses bend-over fasteners, the number of times the cover can be removed and replaced is limited. In my unit, the cover is fastened with small alligator clips (see the accompanying photo). One method of securing the cover is to wrap bare copper wire around the exposed clips.

Frequency Conversion

The TV Channel 2 or 3 output from the converter is mixed with the oscillator of the MC3356 operating at either 50.8 MHz for Channel 3 or 44.8 MHz for Channel 2, and converted to 10.7 MHz. The mixer output feeds a switchable 10.7-MHz filter. The wider of the two filters uses two 10.7-MHz ceramic filters such as those found in FM broadcast receivers. The 3-dB bandwidth of this filter is approximately 200 kHz. A second filter uses a two-pole monolithic filter, like those found in VHF FM receivers such as amateur and monitor receivers. This filter bandwidth is 13 kHz and provides the narrow bandwidth for the analyzer.

The vertical output for the display is derived from the meter output of the MC3356. An op amp circuit provides three functions for the output. First, a dc voltage is summed into the input to provide an IF attenuator function that can be used for small level-difference measurements. Second, a correction voltage is added to compensate for the difference in loss between the narrow- and wide-IF filters.

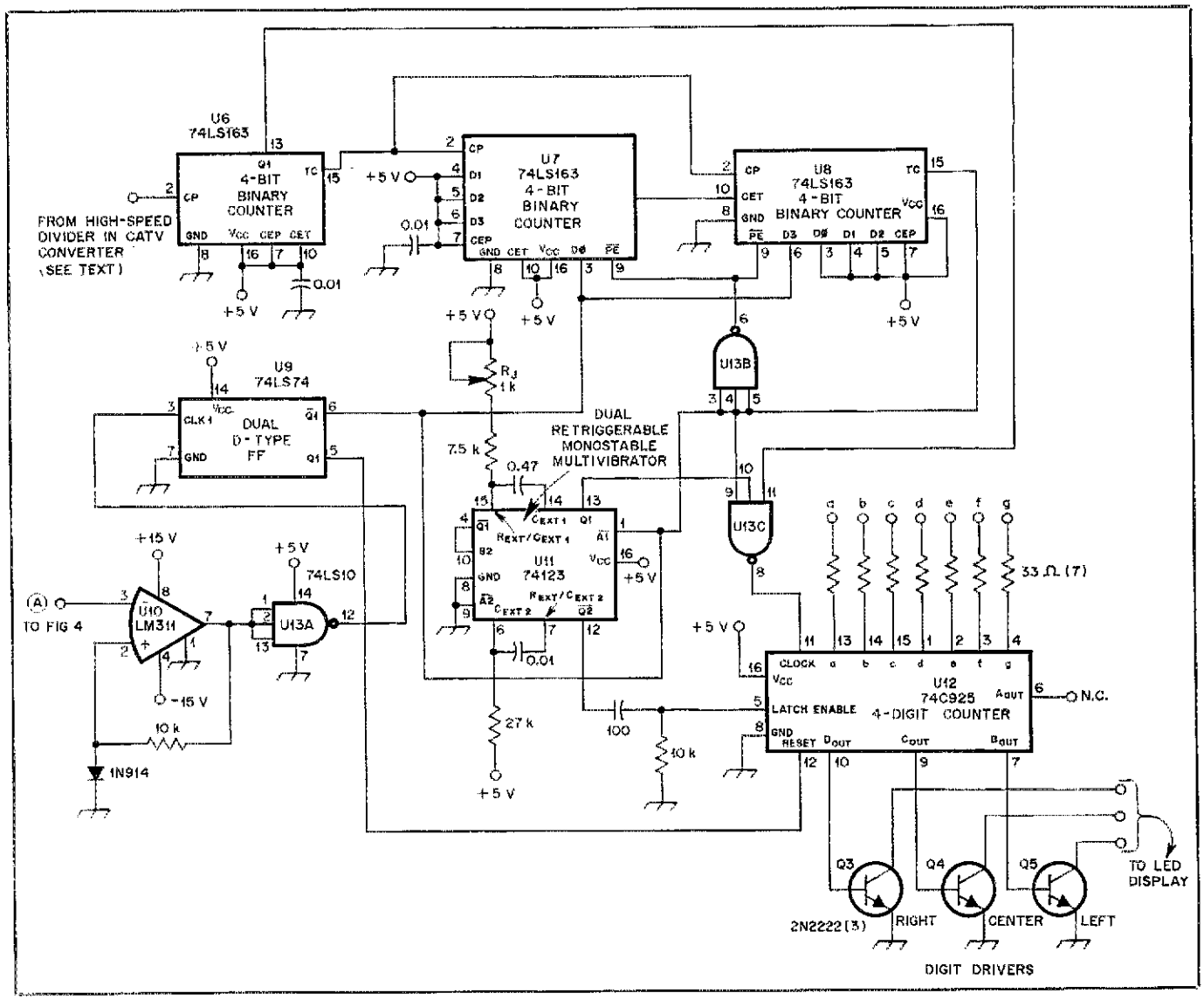


Fig. 5—Schematic diagram of the frequency-divider chain and display section of the spectrum analyzer.
Q3-Q5, incl.—2N2222.
R_J—1k-Ω trimmer, preferably Cermet.
U6-U8, incl.—74LS163 4-bit binary counter.
U9—74LS74 dual D-type flip-flop.
U10—LM311 voltage comparator.
U11—74123 dual, retriggerable monostable multivibrator.
U12—74C925 4-digit counter with multiplexed 7-segment output drivers.
U13—74LS10 triple 3-input positive NAND gate.
Misc.—National NSB5881 multiplexed, common-cathode LED display or equiv.

Finally, a feedback capacitor can be added to provide a video filter for the vertical output.

Attenuator

The input attenuator used in my analyzer was removed from an old sweep generator and provides 60 dB of attenuation in 10-dB steps. The attenuator is accurate to 2 GHz, and is used as a part of the calibration procedure. Not all signal generators have step attenuators and those that do command a high price. A homemade attenuator can be used; such a unit is described in Chapter 25 of *The 1986 ARRL Handbook*.[3]

Frequency Display

Most of the CATV converters are frequency synthesized, and most have high-speed prescalers mounted within the RF module. The divided output can be used for a variety of purposes, the most obvious being to interface a frequency synthesizer. Frequency synthesizing a spectrum analyzer is a difficult task as one of the analyzer LOs must be frequency swept. Rather than devise a complex system to allow the analyzer to be synthesized and frequency swept, the output from the high-speed prescaler is used for a frequency counter to display the center frequency. Only three digits of frequency are displayed: 0 to 400 MHz with 1-MHz increments, requiring an accuracy of about 0.25% to be accurate to the last digit. This is accomplished with a simple one-shot multivibrator as a simple count gate. The frequency is counted "on-the-fly," which means the frequency is counted as the analyzer is being frequency swept. Even though the frequency is constantly changing, the counting period, 1.024 ms, is short compared to the total sweep time and provides a reasonably accurate frequency measurement.

The spectrum analyzer center frequency is not the actual frequency of the first LO, but the oscillator frequency minus 516 MHz. Thus, to display the actual operating frequency of the analyzer, 516 must be subtracted from the frequency display. This is done by inhibiting the first 516 pulses from the frequency counter by using a presettable counter. The frequency-measurement period is set to occur at the center of the display by comparing the ramp voltage to zero with a comparator

that starts the measurement period.

The analyzer requires several regulated positive and negative voltages. Fortunately, these voltages can be generated by using components from the original converter power supply.

Calibration

Although it is not a difficult procedure, setting up the spectrum analyzer requires some care; an oscilloscope and a frequency counter must be used. The oscilloscope used during alignment can be the same one used as the spectrum-analyzer display, since the display does not have to be connected during alignment. First, determine if all of the analyzer circuits are operating. Check that a ramp voltage of approximately 15 V P-P is available at pin 7 of U1 and that a similar, but inverted, ramp is available at pin 1 of U3, with a maximum amplitude of about 22 V P-P. The ramp amplitude at the latter point should be variable by changing the SCAN switch; the dc offset should be variable depending on the setting of the front-panel frequency control. When the SCAN switch is in the zero position, the output of U3 should be varied with the center frequency control from about −2 V to about −22 V. Check the output voltage at pin 1 of U5. There should be some noise visible at this output where the amplitude is a function of the IF and FILTER switches.

Place an oscilloscope probe on pin 7 of U1 and set the SCAN switch to the widest frequency sweep. Adjust R_A so that the voltage swing in the positive direction is exactly the same as in the negative direction. Set the frequency of the third LO by adjusting L1 to 50.8 MHz for a Channel 3 converter or 44.8 MHz for a Channel 2 converter. Precise adjustment is not required. A frequency counter can be used to set the third-LO frequency; however, a simple technique, such as listening for the LO on a monitor receiver, is sufficient.

Connect an oscilloscope to the analyzer. Use the X-Y mode with a sensitivity of 1 V per division in the horizontal mode and 50 mV per division in the vertical mode; observe the display. Adjust R_H so the horizontal scan is slightly more than the width of the oscilloscope tube. With no input signal, there should be several peaks to the left of the scan. It may be necessary to adjust the front-panel frequency control (TUNING) to observe these peaks. There should be one main peak and a few smaller peaks within a few megahertz of the main peak. This is the IF zero beat and some low-frequency spurious responses, and corresponds with "zero" frequency. Apply a 200-MHz input signal and adjust the input level so the signal is visible. Set the TUNING control to exactly five turns from either end and adjust R_B so the 200-MHz signal is exactly at the center of the screen. Adjust the scan-amplitude potentiometer, R_C, so the zero-frequency signal is on the left side of the screen. Apply a 400-MHz input signal, which should be close to the right-hand side of the screen. Adjust R_C and R_D for the best compromise between the 0, 200 and 400-MHz settings.

Attach a frequency counter to the output of the high-speed prescaler. Turn the SCAN control to zero and adjust the TUNING control until the output is exactly 2.797 MHz. Adjust the time-base multivibrator, R_J so the frequency counter reads 200.

Set the SCAN switch to 50 kHz per division and adjust L1 so the 200-MHz signal is centered on the screen. Monitor the output of the high-speed prescaler to be sure that the counter is exactly 2.797 MHz. Sweep the spectrum analyzer slowly and use a short gate time so that the frequency counter will follow the actual frequency of the analyzer. By observing the counter, the precise center frequency can be determined.

Place the SCAN switch in the 10-kHz-per-division position, place the IF switch at wide, and adjust L3 and C1 for greatest amplitude of the output display. Set the bandwidth to narrow, and adjust L4 and L5 for the best amplitude with only one peak.

Set the IF attenuator to zero, vary the input attenuator in 10-dB steps and adjust R_E so the output changes exactly 50 mV for each 10-dB change. Adjust R_G so there is no change in the amplitude of the peak of the display between the narrow and wide IF bandwidths. Adjust R_F so each turn of the IF attenuator corresponds to a 10-dB change in the displayed-signal level.

Conclusions

The performance of this homemade spectrum analyzer is quite respectable, but it does not have the level of performance that would be available in laboratory instruments. The dynamic range of the instrument is quite good for signals separated by more than about 6 MHz. Signals closer than this fall into the IF-amplifier passband and the second mixer, where the intermodulation is generated. This could be improved by substituting a higher-level IF amplifier transistor and a doubly balanced mixer for the second mixer. I'm sure you'll agree, however, that this analyzer is excellent for almost all Amateur Radio requirements. It will be a welcome addition to your workbench.

Notes

[1] A limited number of CATV converters and schematic diagrams are available from the author. Send him a large s.a.s.e. for details. PC boards, parts kits and converters for the spectrum analyzer are available from A & A Engineering, 7970 Orchid Dr., Buena Park, CA 90620; tel. 714-521-4160.

[2] A future article will describe the construction of a matching tracking generator. The tracking generator requires the presence of a prescaler in the spectrum analyzer.

[3] See pp. 25-43 to 25-45. Complete attenuator kits are available from Circuit Board Specialists, P.O. Box 969, Pueblo, CO 81002; tel. 303-542-5083.

Strays

COMMUNICATE USING MICROWAVES!

☐ Do *you* know how to do it? If so, how about telling other *QST* readers about it? Put some words on paper—typewriters and computers make that easy to do—and send that paper to Chuck Hutchinson, Technical Editor, *QST*, ARRL Hq., 225 Main St., Newington, CT 06111, or give us a call at 203-666-1541.

LU BEACON JOINS NCDXF NET

☐ Beacon stations LU4AA began operation September 3 as part of the Northern California DX Foundation's 14.1-MHz CW beacon net. LU4AA will key for one minute every 10 minutes in the 0008 time slot following ZS6DN/B.

LU4AA is the first South American beacon in the net to become operational. A beacon with the call HK4LR/B has been shipped by NCDXF to Liga Colombiana de Radioaficionados for installation in Medellin. It will key in the 0009 time slot following LU4AA. HK4LB/B is expected to be on the air soon.

Other beacon stations operating in the 14.1-MHz net are (in order of keying) 4U1UN/B, W6WX/B, KH6O/B, JA2IGY/B, 4X6TU/B, OH2B, CT3B, ZS6DN/B and, soon, HK4LR/B.

Each beacon station transmits the same 1-minute CW message, which consists of four 9-second dashes at power levels decreasing from 100 W to 0.1 W.

For further net operation information, refer to the article in June 1983 *QST*.

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 October issue were:

- Simplify control of your remote base station with a high-performance DTMF decoder, by Eric Grabowski, WA8HEB
- Advice on a "Cheap Moonbounce" system, by Rick Wilson, WØKT
- A view of a sunrise-sunset program on a Mercator map of the world, by W. Conley Smith, K6DYX.

QEX is edited by Paul Rinaldo, W4RI, and Maureen Thompson, KA1DYZ, and is published monthly. The special subscription rate for ARRL members is $6 for 12 issues; for nonmembers, $12. There are additional postage surcharges for mailing outside the U.S.; write to Headquarters for details.

A 902-MHz Loop Yagi Antenna

Join in the fun on the newest Amateur Radio band with this fine performer that's also easy to build.

By Donald L. Hilliard, WØPW
ARRL Contributing Editor
P.O. Box 563, Boulder, CO 80306

Several years ago, M. H. Walters, G3JVL, designed and published information on a loop-Yagi antenna for 1296 MHz.[1] Since that time, numerous modifications to his design have been published in the RSGB journal, *Radio Communication*.[2-4] These changes have mostly been minor ones. For some time, I have used one of the variants of G3JVL's design on 1296 and have been pleased with the results.

A few years ago, while studying various designs for 902-MHz antennas, I decided to scale the dimensions from the 1296-MHz loop Yagi and build one to check its performance. This article describes the results of my efforts and provides all of the information needed for you to build one for yourself.

Making the Boom

One of the first things to consider is the boom. I decided to make the antenna from readily available materials as much as possible. In most areas of this country, building-materials stores have various sizes of moderately priced aluminum tubing in 6- and 8-foot lengths. I decided to use two 6-foot lengths of 1-inch-OD tubing spliced to give me a 12-foot-long boom. The splice is made from a 2-foot length of 7/8-inch-OD tubing that extends 1 foot inside each of the two 1-inch-OD pieces. This technique yields a strong boom that is adequate for this application. Although I have not tried it, I think a 12-foot length of 1-inch-square aluminum tubing would work as well and would make drilling the element-mounting holes much easier.

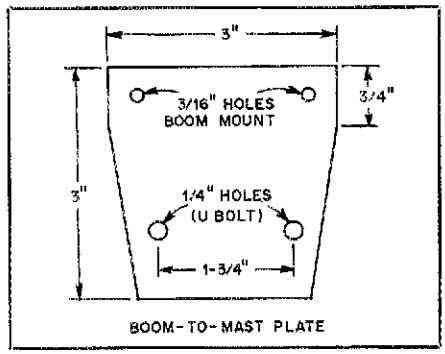


Fig. 1—Boom-to-mast details.

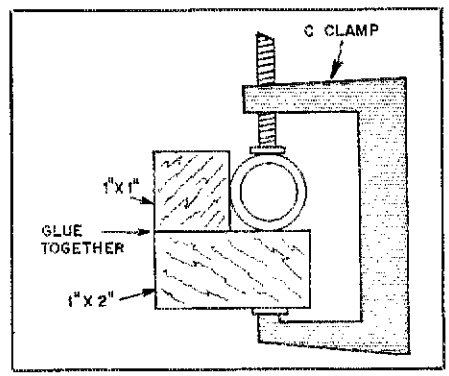
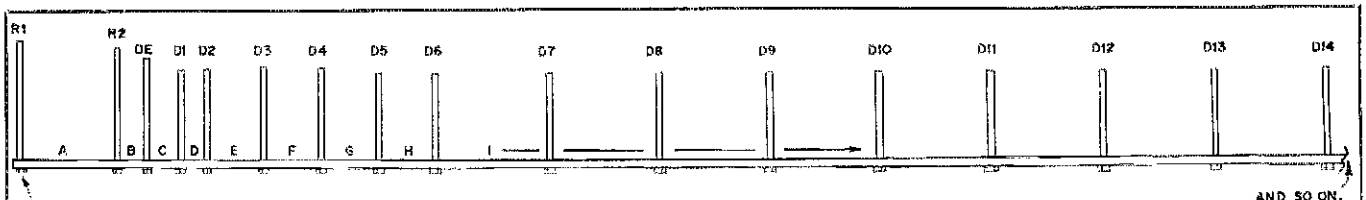


Fig. 2—A jig for drilling the boom can be made from some lumber and C clamps.

The antenna is mounted to the mast with a gusset plate. This plate mounts at the boom splice, and its mounting bolts also secure the splice (see Fig. 1). Drill the gusset-plate mounting holes perpendicular to the element-mounting holes, assuming the antenna polarization is to be horizontal.

Once you have a 12-foot boom and mounting plate, you need some method of securing the boom while you drill the element-mounting holes. It's important to make the elements line up as closely as possible. Many gadgets that make this process easier than it might have been several years ago are available today. I use a jig constructed of two 12-foot lengths of pine lumber; one is a standard 1 × 2 and the other a standard 1 × 1. The boom is secured to the jig with three or four C clamps, and the holes are made with a

[1]Notes appear on page 32.

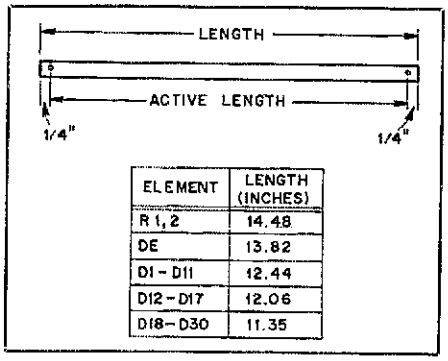


DIMENSION	SPACING (INCHES)
A	4.45
B	1.36
C	1.60
D	1.19
E	2.55
F	2.55
G	2.55
H	2.55
I	5.11
REMAINING DIRECTORS	5.11

Fig. 3—The spacing between elements along the boom varies near the rear of the boom, but remains the same for elements D6 through D30. See Table 1 for more information on element location.

Table 1
Distance of Element-Mounting Holes from Reflector End of Boom

Element	Distance (inches)	Element	Distance (inches)
R1	0.50	D14	60.18
R2	4.95	D15	65.29
DE	6.31	D16	70.40
D1	7.91	D17	75.51
D2	9.10	D18	80.62
D3	11.65	D19	85.73
D4	14.20	D20	90.84
D5	16.75	D21	95.95
D6	19.30	D22	101.06
D7	24.41	D23	106.17
D8	29.52	D24	111.28
D9	34.63	D25	116.39
D10	39.74	D26	121.50
D11	44.85	D27	126.61
D12	49.96	D28	131.72
D13	55.07	D29	136.83
		D30	141.94



ELEMENT	LENGTH (INCHES)
R 1, 2	14.48
DE	13.82
D1 - D11	12.44
D12 - D17	12.06
D18 - D30	11.35

Fig. 4—The active length of each element is ½ inch less than the length of the element strap. Lengths given here are the overall length of the element straps, not the active length.

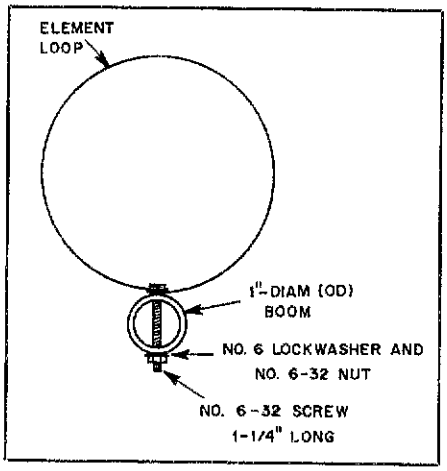


Fig. 5—Element-to-boom mounting details.

drill press (see Fig. 2).

Table 1 indicates the distances of the element-mounting holes from the reflector end of the boom. Fig. 3 shows the relationship of the various elements in the finished antenna. The element-mounting holes are made with a no. 28 drill to clear no. 6-32 mounting hardware. After you drill all of the holes, drill out the hole for the driven-element assembly to ¼ inch.

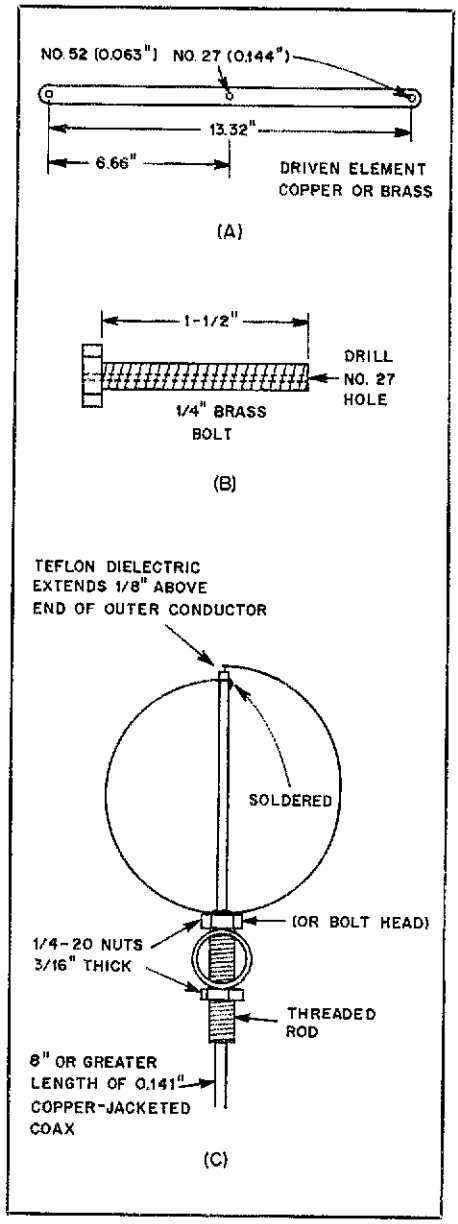


Fig. 6—Driven-element details. The element strap is shown at A. At B is the brass mounting fixture. Part C details the driven element assembly.

Making the Parasitic Elements

The reflectors and directors are cut from 1/32-inch (0.03125-inch) aluminum sheet and are 5/16 inch wide. Fig. 4 indicates the lengths for the various element straps. They should be cut with a shear. Although the elements could be cut with tin snips, amateurs who have tried this have been disappointed in the results—badly distorted straps. It's much better to locate a friend with a shear, or have the job done at a machine shop.

Once you have the straps in hand, drill the mounting holes as detailed in Fig. 4. The holes are made with a no. 28 drill, ¼ inch in from each end of the element strap. After the holes are drilled, you must form each strap into a circle. This is done easily by wrapping the element around a round form. I used a 3-inch-diameter propane bottle.

Mount the loops to the boom with no. 6-32 machine screws, lock washers and nuts (see Fig. 5). It's best to use stainless-steel or plated-brass hardware for everything. Although the initial cost is higher than for ordinary plated-steel hardware, stainless or brass hardware won't rust and need replacement after a few years. When you mount the elements, make sure they are perpendicular to the boom.

Making the Driven Element

Read this entire section carefully and study Figs. 6 and 7 before you start assembly of the driven element. The driven element is cut from 1/32-inch (0.03125-inch) copper or brass sheet and is 5/16 inch wide. Drill three holes in the strap, as detailed in Fig. 6A. Trim the ends to form a semicircle, leaving very little metal outside of the end holes. Form this strap into a loop similar to the other elements.

To mount the driven element to the boom, you need to make a brass mounting

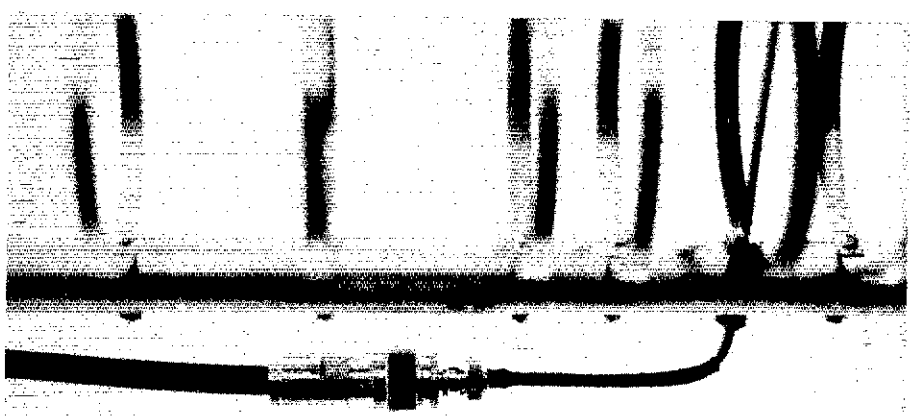


Fig. 7—A crimp-on BNC connector is soldered to the 0.141-inch Hardline that attaches to the driven element. An adapter is used to make the connection to the cable that runs down the boom to the main feed line.

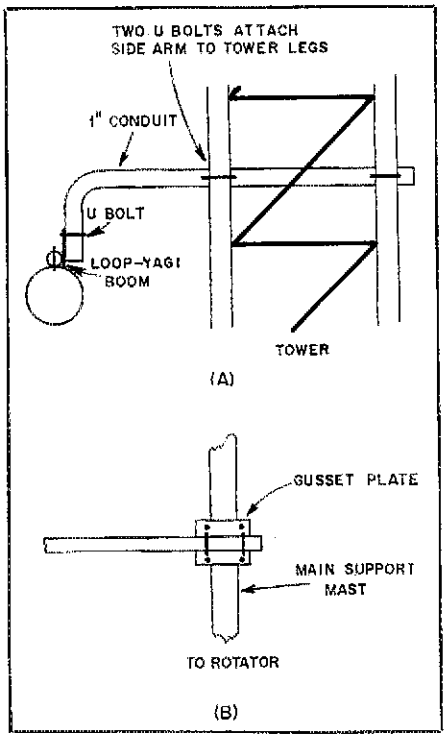


Fig. 8—Suggestions for a fixed (A) or rotatable (B) mounting.

fixture, as shown in Fig. 6B. The mounting fixture can be made from a 1½-inch brass bolt or from a piece of ¼-20 threaded brass rod. Bore a 0.144-inch (no. 27 drill) hole lengthwise through the center of the rod. A piece of 0.141-inch semirigid Hardline will mount through this hole and connect to the driven loop. Fig. 6C shows how the driven element is assembled and mounted to the boom. The point at which the 0.141-inch Hardline passes through the copper loop and brass mounting fixture should be left unsoldered at this time to allow for matching adjustments when the antenna is completed.

The 0.141-inch semirigid Hardline, RG-402 or equivalent, is available in short lengths from varied sources. One source that sells this cable in foot lengths is J. Smith and Associates, Inc., 3540 N. Academy Blvd., Colorado Springs, CO 80907.

I use a jeweler's saw to prepare the cable ends. Only a few inches of this line are required, enough to get through the boom and mount a connector on it. At this frequency, you should use a minimum number of connectors or adapters; they frequently cause problems. Type-N cable connectors for RG-402 are available from various sources. One (Model no. 2707F) is made by Midwest Microwave, 3800 Packard Rd., Ann Arbor, MI 48104. Another source is Pasternack Enterprises, Coaxial Products Division, P.O. Box 26759, Irvine, CA 92713. A catalog that lists several suitable connectors for this application is available.

Or you may wish to make a connector the way I did, with a BNC connector and BNC-to-N adapter. I used a BNC crimp connector designed for use with RG-59 cable. The RG-402 outer conductor slips tightly inside the crimp body. The connector center pin may need to be drilled out to accept the RG-402 center conductor, or you can use the center pin from a BNC connector designed for RG-58 cable. The center conductor of RG-58 is the same size as that of RG-402, so an RG-58 center pin will work without modification. Solder the RG-402 copper jacket to the BNC crimp body and place a piece of heat-shrinkable tubing over the soldered joint to keep moisture and contaminants away. Fig. 7 shows the finished connection.

A low-loss RG-8 cable may be run down the boom and mast to the main feed line. For best results, your main feed line should be the lowest-loss 50-ohm cable obtainable. This cannot be overemphasized!

Tuning the Driven Element

Check the SWR of the antenna. You may realize some improvement by making the driven element more oblong. The antenna shown here exhibited an excellent match with no adjustment to the relative shape of the driven element. When you have obtained the desired match, solder the point where the RG-402 jacket passes through the loop and brass mounting fixture.

Mounting the Antenna

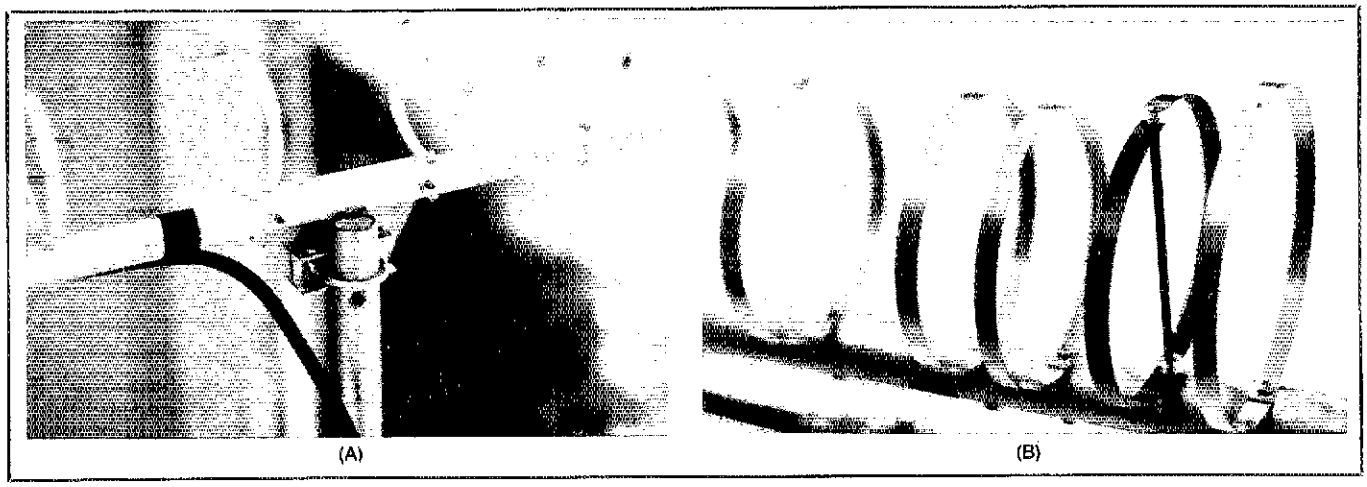
Now that the antenna is complete, it is ready to be mounted for use. You've probably noticed that the loops are not inherently strong. If you live in an area where there are no large birds, you may be able to mount it as shown in the photographs. I mount the single loop Yagi as shown in Fig. 8. The inverted loop Yagi provides a less desirable perch for birds. Other deterrents have been tried, such as attaching toy snakes so that they move in the wind. A U-shaped (inverted) length of conduit will allow two of these antennas to be stacked horizontally for additional gain. The stacking distance should be 26 to 32 inches.

The loop Yagi may be used as a vertically polarized antenna. Simply rotate the boom on the gusset plate until the loops are horizontal. Be careful when you mount—any mounting member that is of the same polarization of the antenna must be kept a couple of wavelengths away from the antenna itself.

The gain of loop Yagis of this design has been measured at between 17 and 18 dBi. Stacking two of them will yield another 2.5 dB, approximately. Similar designs have used up to 16 stacked loop Yagis at 1296 MHz; these arrays have performed well enough to make EME contacts. It is an antenna whose performance is proven. I have the antenna shown in the photographs installed at my Missouri location (near Joplin). Look for me on 902-MHz CW!

Notes

[1]G. R. Jessop, ed., *VHF/UHF Manual*, 4th ed. (Hertfordshire: RSGB, 1983).
[2]D. Evans, "A Long Quad Yagi for 1296 MHz," *Radio Communication*, Jan. 1975, pp. 24-25.
[3]D. Evans, "The G3JVL Loop Yagi," *Radio Communication*, July 1976, p. 525.
[4]C. Suckling, "The G3JVL Loop Yagi Antenna," *Radio Communication*, Sept. 1978, pp. 782-783.



Details of the boom-to-mast plate and element mounting may be seen at A. A view of the driven-element assembly is shown at B.

Direction Finding with the Interferometer

Radio direction finding can be a sport or it can be serious business. Successful RDFing requires getting accurate fixes. Here's how.

By Robert E. Cowan,* K5QIN and Thomas A. Beery,** WD5CAW
*191 Zuni, Los Alamos, NM 87544
**3706 Gold St., Los Alamos, NM 87544

Is radio direction finding an activity you might enjoy? For many hams it is a challenging sideline to their other Amateur Radio activities. Perhaps you'd like to join in on a Sunday afternoon fox hunt. Or maybe you want to locate the jammer on your repeater, or find a downed aircraft by DFing its ELT (emergency location transmitter). If so, here is a direction-finding technique that may win you the trophy—or save a life.

In New Mexico, the interferometer is used by the National ELT Location Team to aid in locating downed aircraft. The method can be used for other VHF RDF activities as well. With a little practice, you can take long-distance bearings that are accurate to within one degree. That's an error of less than 2000 feet from 20 miles away. The interferometer isn't complicated: It consists of a receiver, two antennas and two lengths of coaxial cable.

Interferometer Basics

The theory of interferometer operation is simple. Signals from two antennas are combined out of phase to give a sharp null in signal strength when the antennas are located on a line of constant phase. Fig. 1 shows that if you know the location of two points on a line of constant phase, you can get an accurate fix on the transmitter.

Most DF bearings are taken several miles from the transmitter. At these distances, the equal-phase circles appear as straight lines. As shown in Fig. 2A, if we put antennas at points A and B on a line of equal phase and connect them to a receiver with equal lengths of transmission line, the signals from the two antennas will add. By moving either one of the antennas back and forth across the equal-phase line, we will notice a broad peak in signal strength. Now, if antenna B is moved halfway between two lines of equal phase, as shown in Fig. 2B, the signals arriving at the receiver will be exactly out of phase; they will cancel each other completely. A sharp null in signal strength will be noted when either antenna is moved even slightly. This null is very easy to find just by listening to the receiver.

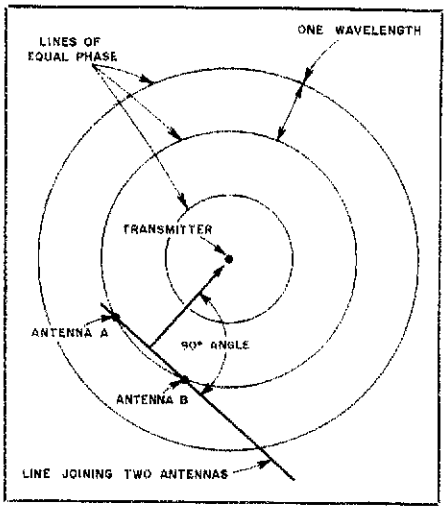


Fig. 1—The transmitter is at a right angle to the center of the line that joins two points of equal phase.

It is this sharp null that we always look for when using the interferometer. However, the setup shown in Fig. 2B doesn't put us on a line of equal phase. To do that, we must make the signals at the receiver 180° out of phase. This can be done by having one feed line a half wavelength shorter than the other, as shown in Fig. 3A. Now we will get a sharp null when the two antennas are on a line of equal phase. Another way of getting the phase reversal is shown in Fig. 3B. If the gamma arms of the antennas are reversed (one pointing up, the other pointing down)

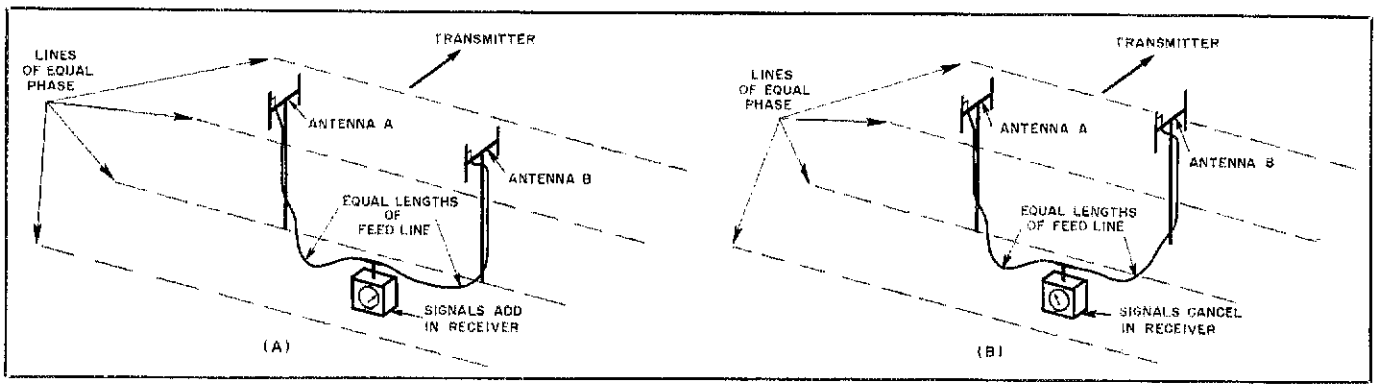


Fig. 2—At A, placing two antennas on a line of equal phase and connecting them to a receiver with equal lengths of transmission line causes the signals to add. If the two antennas are placed a half wavelength apart in the direction of the transmitter, as shown at B, the signals cancel to form a null.

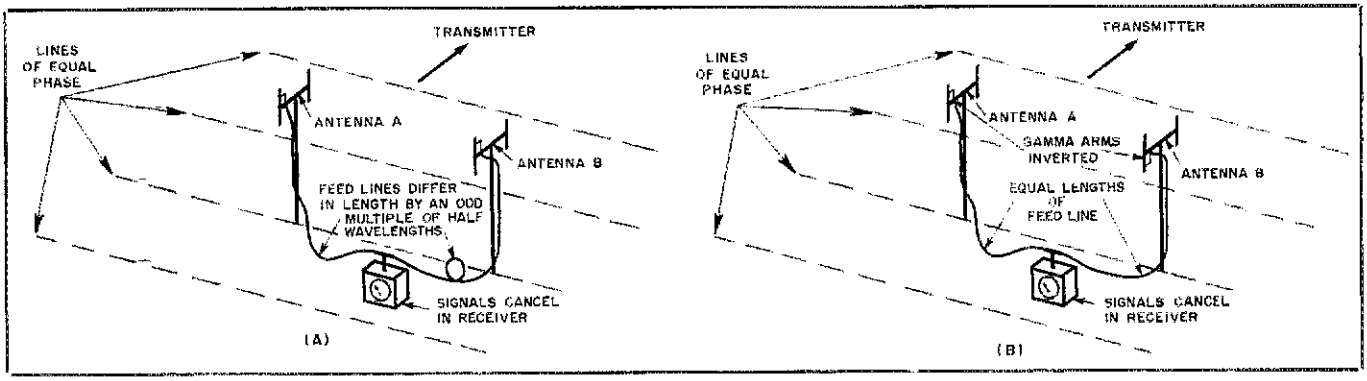


Fig. 3—At A, placing two antennas on a line of equal phase and connecting them to a receiver with feed lines that differ in length by an odd multiple of half wavelengths causes the signals to cancel. Another way to obtain signal cancellation, shown at B, is to use equal-length feeders and invert the gamma arm on one of the antennas.

and equal lengths of feed line are used, the signals will cancel.

After we have located two or more points of equal phase, we can draw a straight line through them. The transmitter will be 90° from this line. By locating an equal-phase line that is 30 to 50 feet long, we can take an accurate compass bearing down the line. This long base line is the secret of the interferometer's accuracy. Other DF systems have a much narrower aperture, and their accuracy is poorer than the interferometer. (Going much beyond 50 feet doesn't improve accuracy unless you have a transit for taking the bearing.) Fig. 4 shows a typical interferometer setup in the field.

Using the Interferometer

To use the interferometer, first connect a receiver to one directional antenna. Rotate it for maximum signal strength to get an approximate bearing to the transmitter. Then add the second antenna to the system using a T connector. Its feed line must be a half wavelength shorter (or longer) than the one connected to the first, unless one of the gamma arms is inverted as shown in Fig. 3B. Set up the second antenna about a wavelength away from the first one. The base of the second antenna mast should be at a right angle to the direction in which the first antenna is pointing. Now move the second antenna back and forth in the direction of the transmitter you are hunting, always keeping the mast vertical. As you do this, you will notice a sharp drop in signal strength from the receiver. Find the spot where the signal is weakest and mark its position on the ground.

Now move the second antenna a few steps farther from the first one and on a line with the first null. Find the null again and mark its position. Continue "walking out the nulls" for 30 to 50 feet. Next, take a compass bearing between the two antenna masts or down the line of nulls. The hidden transmitter will be on a line exactly 90° from the bearing. Now, move to another location a few miles away and take another interferometer bearing. Plot your locations and bearings on a map. The point where the bearings cross is the transmitter location.

Fig. 4—Typical field setup of an interferometer. One antenna is mounted on a stand, while the second is moved to find the null locations. A compass bearing is taken down the line of nulls that is marked with surveyor's flags.

Equipment for the Interferometer

Having an S meter on the interferometer receiver is handy, but by no means necessary. The nulls are a little easier to find if you have a meter to watch. You should have some way of adjusting the receiver sensitivity. An RF or IF gain control is convenient, but an RF attenuator in the feed line also works well. The sensitivity should be adjusted so the maximum incoming signal is about 20 to 30 dB above the noise. If the signal in the receiver is too strong, you may have trouble finding the first null. If it is too weak, the null will be broad, and you will find it difficult to position the antenna precisely on the line of constant phase.

Almost any kind of antenna can be used to make an interferometer. Simple dipoles will give the correct null, but because you need to first get an approximate bearing to the transmitter, some sort of directional antenna is preferred. A two- or three-element Yagi has adequate directivity, yet is small enough to be carried to the field. It is important that both antennas be constructed alike. In this way, their phase centers are the same, and you may take a compass bearing between any two similar features on the antennas—the masts, for example.

Reflected signals can cause problems when you are trying to find a good null. We have found that having the interferometer antennas 10 feet or more above the ground helps eliminate reflections from nearby objects such as rocks, cars and people.

Unless you use your antennas with one of the gamma arms inverted, the feed lines that connect the antennas to the receiver must differ in length by an odd multiple of half wavelengths. Don't forget to include the velocity factor of the cable in your calculations. You may want to set your receiver on the ground halfway between the two antennas, as shown in Fig. 4. In this case, the feeder lengths need be only a half wavelength different.

It is sometimes more convenient to mount your receiver on the mast of the second antenna. In this case, one feed line will be only a few feet long and the other may be 40 feet long. This is fine as long as the difference in feed-line length is an odd multiple of half wavelengths. Having one feeder longer than the other creates some amplitude imbalance, but this will not affect your bearing. It is not necessary to be extremely precise when cutting your cables to give a length difference of an odd multiple of half wavelengths. At 146 MHz, a cutting error of a few inches will result in a bearing error of less than one degree.

The two feed lines are connected to the receiver input terminal with a coaxial T connector. Purists will argue that you need an impedance-matching device at this junction. We have experimented with both resistive power combiners and Wilkinson hybrids—neither works better than a T connector.

To take full advantage of the interferometer's accuracy, you must be able to take reliable compass bearings. Sighting compasses are the best compromise between hand-held transits and inexpensively priced lensatic compasses. With a moderately priced sighting compass, you can take bearings that are accurate to within one degree. Don't forget to account for the magnetic declination of your area when plotting the bearings on a map. If you are unfamiliar with map and compass techniques, consult your local library or bookstore for references on the subject.

Some Fine Points on Interferometer Use

With a little practice, you will find that the interferometer is very easy to use. There are a few things to watch out for, though. Here are some that are based on our experience.

Pick your DF site carefully. Although the interferometer works extremely well when reflected signals are present, you can get fooled. The best DF sites are in open terrain and well away from reflecting objects, such as buildings, cars, fences and power lines.

Mark your null points on the ground as you find them. Use surveyor's flags, rocks or other markers to indicate the null points. When you are done, look at this line of nulls. The markers should be in a straight line. Take your compass bearing down this line, and the accuracy will be better than sighting between the antenna masts. This is because you will be averaging several null readings when you take a bearing on the line, whereas a sighting between the masts gives you only a single null reading. Take compass bearings from both directions and average them for best accuracy. If the line has a periodic wiggle to it, this means you have some reflections at your site. We will go into this later, but the correct sighting line will be down the center of the wiggles.

Beware of DFing pure reflections! Sometimes the only signal to be heard will be a reflection from a mountain or a building. Take two (or more) bearings, go to the area where they cross, and take more bearings to confirm the location. If you are in a critical situation, such as locating a downed aircraft, don't commit all your resources until you know for sure that you are not DFing a pure reflection.

The most important thing to remember is that you must get a definite null at each point along the phase front. "Null all the way—okay," is our rule. If you can't find a null, a strong reflection is entering the system. Inevitably it will give you bad information. The best recourse is to pack up the interferometer and move it to a new location. You may need to go a few hundred yards or perhaps a mile, but you will get a good bearing for your efforts. Remember: Good nulls give good bearings, and good bearings will locate the transmitter.

Interferometer Radiation Patterns

At this point, you have enough information to assemble and operate an interferometer, but some additional information may provide an insight into how it works. When you connect two antennas to a receiver (or transmitter), the two antennas and an out-of-phase feed line combine to form unique radiation patterns. These change dramatically as the two antennas are moved apart. There is always one null that faces the incoming signal. Other nulls are also present, and their location depends on the distance between the antennas. The equation that is used to calculate the antenna pattern is as follows:[1]

$$E = \left|\cos(180\ d \cos\theta + \phi/2)\right| \quad \text{(Eq. 1)}$$

where

E is relative field strength
d is the spacing between antennas, wavelengths
θ is the angle at which the field strength is calculated, degrees
ϕ is the difference in phase between the two antennas, electrical degrees

Fig. 5 shows the relationship of the terms in Eq. 1. Antenna patterns for an interferometer using vertical dipole antennas are shown in Figs. 6 and 7. Note that one null always faces the incoming signal. This null becomes sharper as the antenna spacing is increased. The pattern also contains lobes and other nulls. These change position as the antenna spacing is changed. Interfering signals that arrive at an angle from the main signal will be attenuated differently as these lobes and nulls change position when the antennas are moved apart. If directional antennas are used in the interferometer, the pattern will be modified by the pattern of the individual antennas.

Effect of Reflected Signals on the Interferometer

All RDF systems are affected by multipath signals. The interferometer works better in multipath situations than any other system we have used. Two effects are noticed when reflected signals are present. The first is a periodic curvature, or wiggle, of the apparent phase front. The second is a change in the depth of the nulls that are encountered. These two effects are caused by vector addition of the main signal and a reflected signal in the interferometer system.

[1]H. Jasik, *Antenna Engineering Handbook* (New York: McGraw-Hill, 1961), page 2-16.

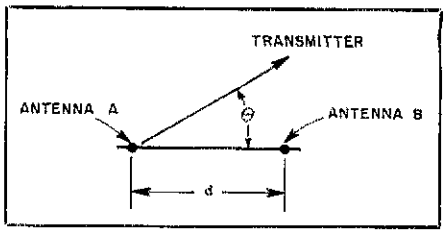


Fig. 5—The relationship of the terms used in Eq. 1 to calculate interferometer patterns. θ is expressed in degrees; d in wavelengths.

If the amplitude of the reflected signal is low, you will be able to find the nulls and mark their positions on the ground. This is shown in Fig. 8. The nulls are marked with surveyor's flags, and a compass bearing is being taken down the center of the wiggles. Surveyor's tape is used to mark the exact line of bearing. A drawing of the null locations obtained with multipath signals is shown in Fig. 9.

If you can successfully find all of the nulls in a multipath situation, you can easily determine the direction from which the reflecting signal is arriving. To do this, first measure the period of the wiggle with a tape measure (the value of P as shown in Fig. 9). The angle of the reflected signal with respect to the main signal can then be calculated from

$$\theta = \arcsin P/\lambda \quad \text{(Eq. 2)}$$

where

θ is the angle of reflected signal with respect to main signal, degrees
P is the period of the wiggles, feet
λ is the length of 1 wavelength at the frequency you are using, feet:
$\lambda = 984/\text{frequency (MHz)}$

This equation doesn't tell you whether the reflected signal is to the right or left of the main signal. Generally, though, you can resolve this because your directional antenna will point somewhere between the two signals.

If you try to use the interferometer in a location where the reflected signal is very strong, there will be certain antenna spacings at which you just can't find a null; yet at other spacings, the nulls will be quite deep. To illustrate this situation, we have used computer simulation to plot signal strengths as antenna B is moved to various locations. Fig. 10 is a three-dimensional plot of antenna locations and signal strengths. In the area marked "shallow nulls" it will be nearly impossible to find the proper location of the minimum signal. A short distance away, in the area marked "deep nulls," you will find the nulls to be quite pronounced. If you take lots of time, you might be able to figure out the proper bearing in the case of severe multipath; but generally it's not worth the effort. Moving the interferometer a short distance may

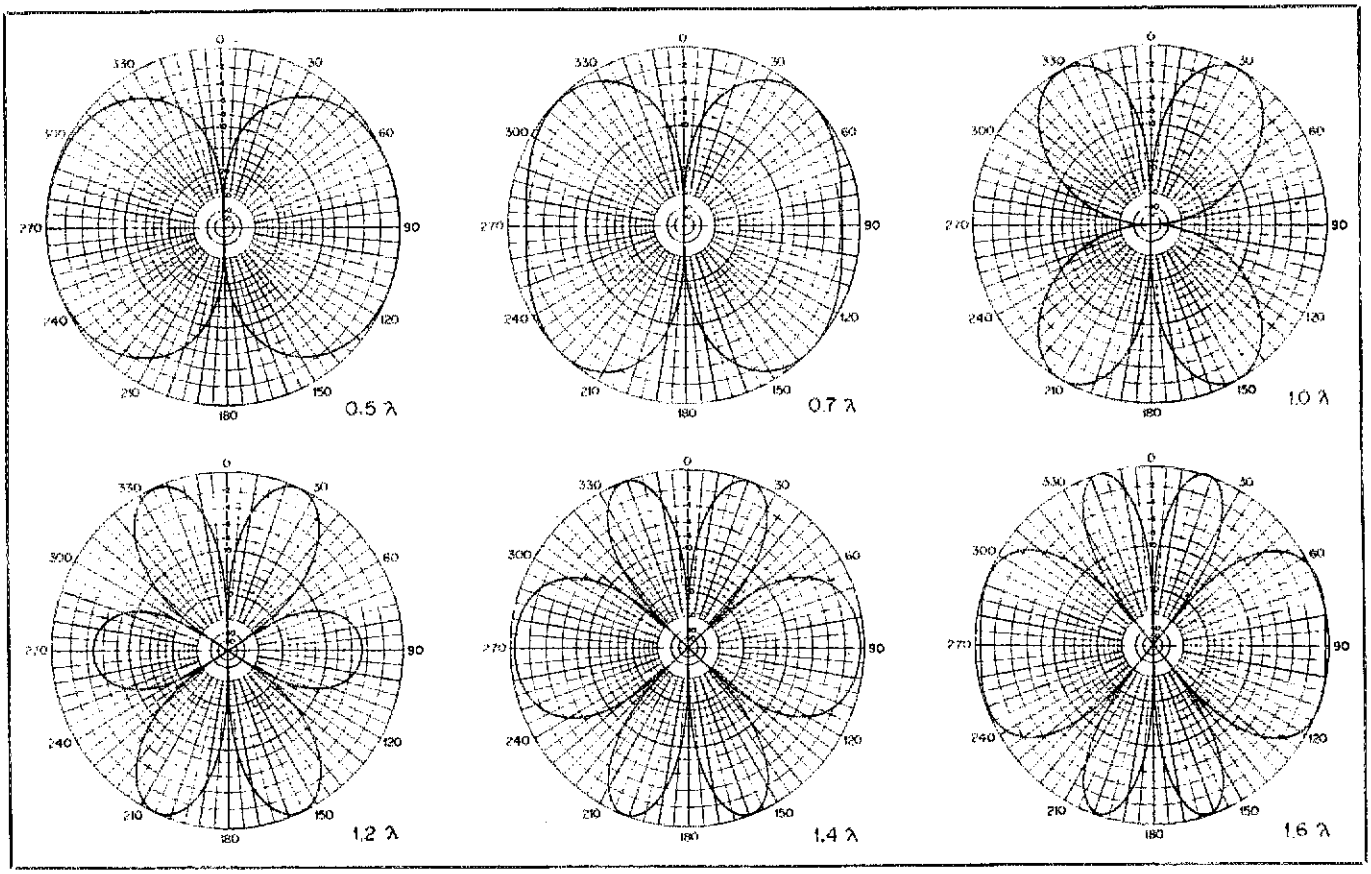


Fig. 6—Interferometer radiation patterns with vertical dipole antennas spaced ½ to 1.6 wavelengths apart. The antennas are placed on the horizontal axis.

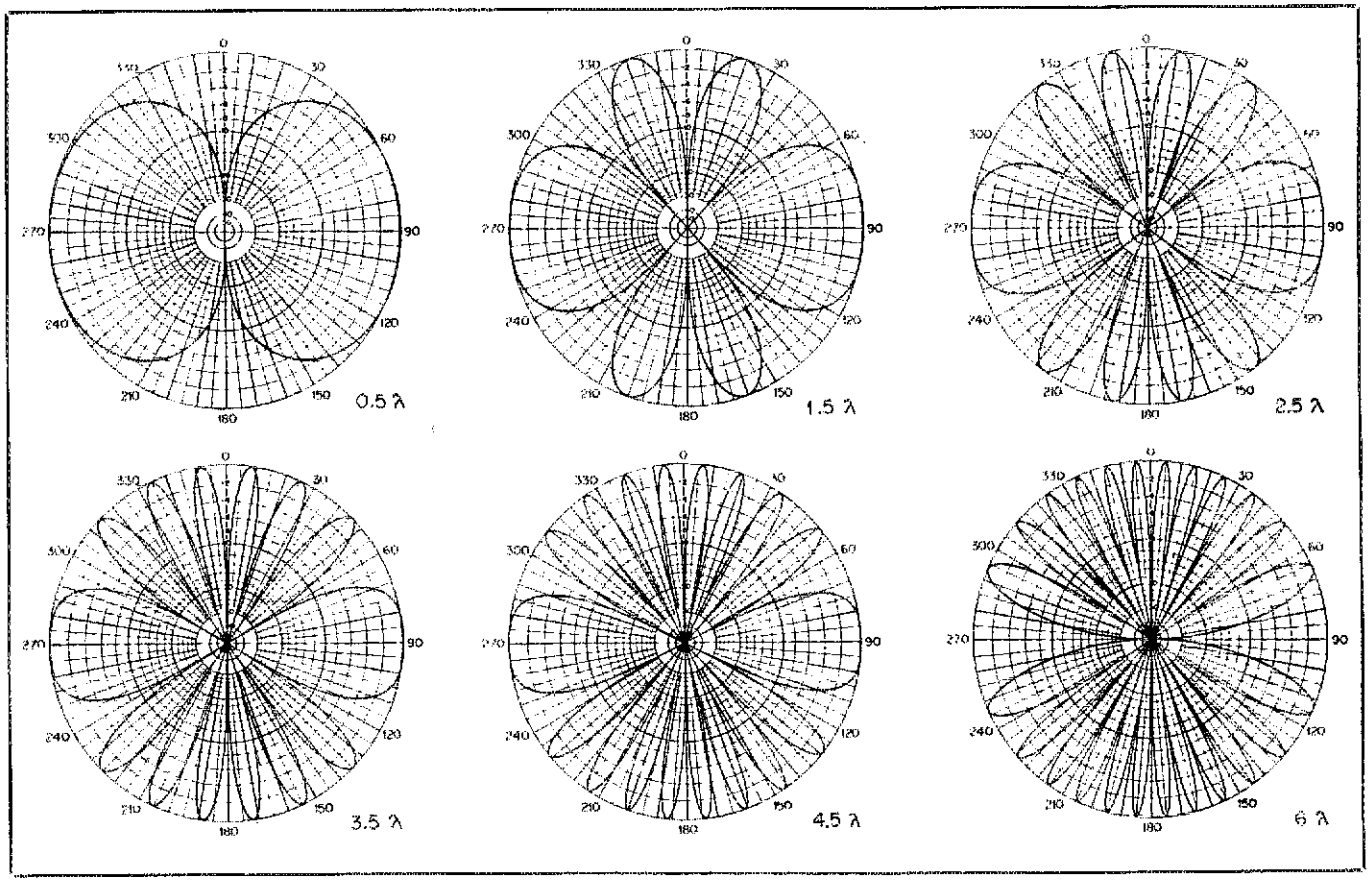


Fig. 7—Interferometer radiation patterns with vertical dipole antennas spaced ½ to 6 wavelengths apart. The antennas are placed on the horizontal axis.

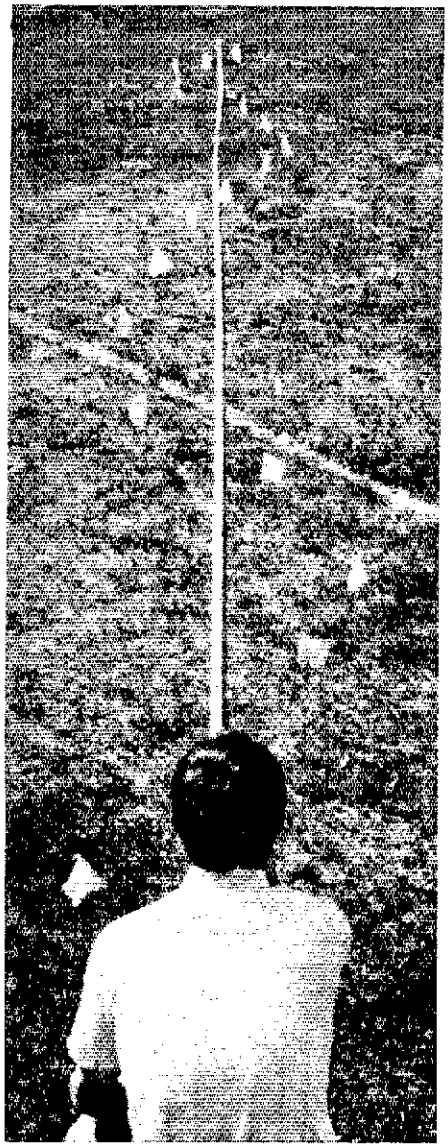


Fig. 8—Null locations obtained with a reflected signal are marked with flags. A compass bearing is being taken on a line through the center of the wiggles, marked with a surveyor's tape.

allow you to find a "null all the way" and to take a good bearing.

DF Strategy Using the Interferometer

Locating transmitters with the interferometer is best done as a team effort. Several two-person teams can take bearings and send their data to one location where plotting is done. The person doing the map plotting can then direct the teams to the area where the bearings cross. This point will usually be within a half mile or less of the transmitter location. You can then home in on the transmitter using signal-strength techniques or hand-held DF units.

The interferometer is a very useful tool to add to your collection of DF techniques. With a little practice, it can provide long-distance bearings that will quickly lead you to the hidden transmitter.

Acknowledgments

The use of the interferometer to take long-distance bearings was first suggested to us by John D. Moore, W5UUM, of Southwest Research Institute. Early development of the technique for ELT location was done by Rick Goodman, W5ALR, Roger Chaffin, W5RGX, and other members of the National ELT Location Team.

Robert E. Cowan was first licensed in 1958 as KN5QIN, and he has held an Extra Class license since 1969. He is trustee for the Los Alamos Amateur Radio Club, W5PDO, and for the Field Communications Club of Los Alamos, WD5JRO. Bob's main interests are communications for search and rescue, radiolocation of ELTs on downed aircraft, and the use of computers in search and rescue. He is employed as a hybrid microelectronics engineer at the Los Alamos National Laboratory in New Mexico. He holds BS and MS degrees in Ceramic Engineering from the University of Illinois.

Thomas A. Beery was first licensed as WNØTBW in 1976, and now holds an Extra Class license. He received a BS in Electrical Engineering from Kansas State University in December 1976. He is employed as a staff member at the Los Alamos National Laboratory.

New Products

HIGH-PERFORMANCE 8-POLE CRYSTAL FILTERS FOR THE KENWOOD TS-940S

☐ Two high-performance 8-pole crystal filter sets have been announced by International Radio Inc. for the Kenwood TS-940S transceiver.

TS-940S SSB 2.1-kHz Matched Set

Consists of one 8.83-MHz, 2.1-kHz, drop-in 8-pole crystal filter, and one wired-in 455-kHz, 2.1-kHz, 8-pole crystal filter. The manufacturer claims an overall system selectivity of 2.0 kHz at 6 dB, and a shape factor of 1.25.

TS-940S CW-400-Hz Matched Set

Consists of one drop-in 8.8 MHz, 400-Hz, 8-pole crystal filter, and one drop-in 455-kHz, 400-Hz filter. The set provides a claimed system selectivity of 400 Hz at 6 dB, and 700 Hz (or less) at 60 dB.

All filters are guaranteed for two years to the original purchaser. Price class: SSB or CW-400 matched set, $139; both sets, $260. Available from International Radio Inc., 364 Kilpatrick Ave., Port St. Lucie, FL 33452, tel. 305-335-5545.—*Bruce O. Williams, WA6IVC*

NEW QUICK-GUIDE COVERS MINIATURE ALUMINUM CAPACITORS

☐ The *Quick-Guide to Miniature Aluminum Electrolytic Capacitors*, ASP-627, is available from Sprague Electric Company. This four-page booklet covers the complete Sprague miniature aluminum line, including the latest product introductions. Copies of the *Quick Guide* are available from Technical Literature Services, Sprague Electric Co., 87 Marshall St., North Adams, MA 01247.—*Bruce O. Williams, WA6IVC*

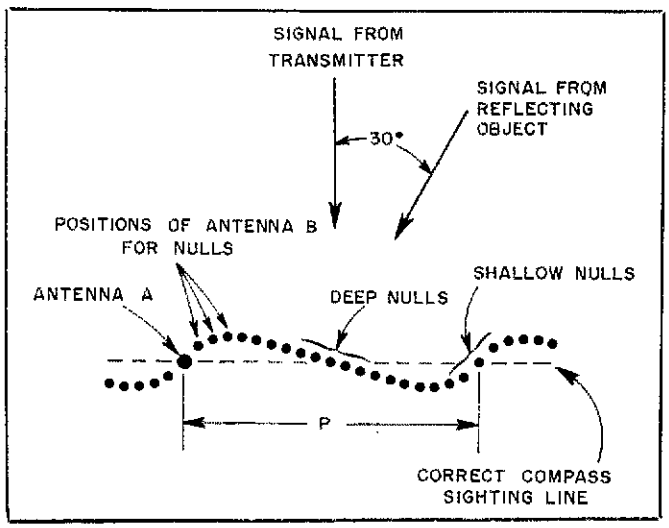


Fig. 9—The interferometer pattern of the null markers, obtained in the presence of a direct signal and a reflected signal.

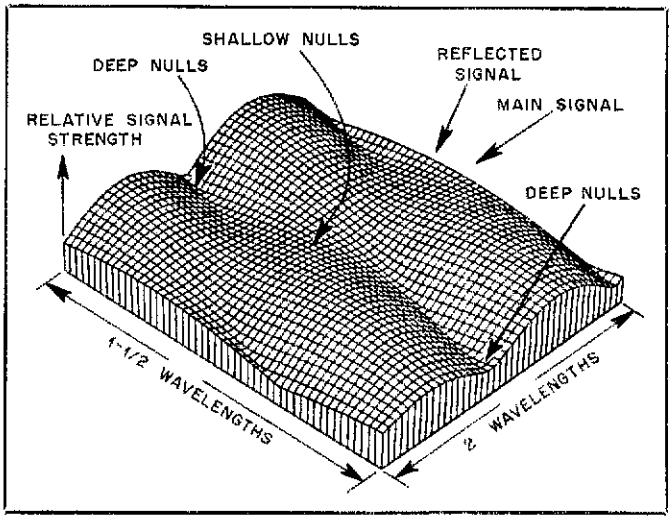


Fig. 10—Three-dimensional plot of signal strengths obtained in the presence of a strong reflected signal.

• *Under Construction*

Ham Radio Workshop Essentials

For many of us, Amateur Radio starts in the workshop. Let's begin this series by considering the setup and tools we need for building and servicing our own gear.

By Doug DeMaw, W1FB
ARRL Contributing Editor
P.O. Box 250
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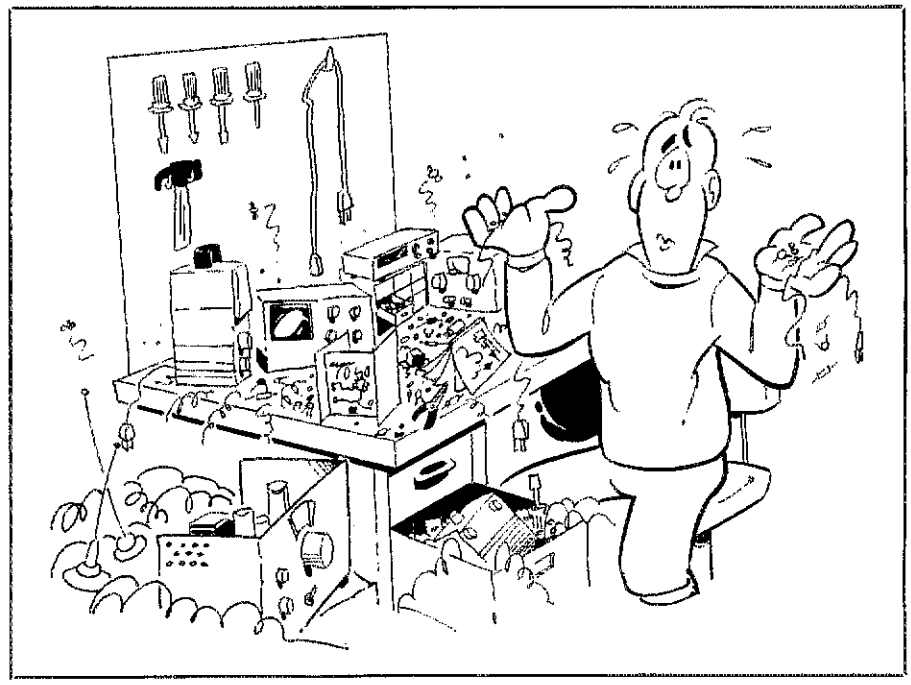


Now that we have completed the 19 installments of First Steps in Radio, let's turn our attention to putting our knowledge from that series to work in a practical manner. Under Construction will deal each month with workshop techniques, shortcuts and methods for making our component parts from low-cost materials, at least some of the time.

Many amateurs have recognized the practical aspect of our hobby—building and repairing ham gear—as being as much fun as operating if not more. Numerous reasons are offered for not designing gear or duplicating circuits found in the amateur literature. Some say it's too costly to build equipment. Others claim that parts are too hard to find. Also, there are those who feel that the technology has passed them by. The fact is that none of these reasons is valid if you develop an interest in the art of "home brewing," as it is frequently called. Although you may not comprehend every last detail when you wire a circuit from *QST* or *The Handbook*, the thrill of experimenting (a key word) should stimulate you toward greater goals in our enjoyable pastime. In the vernacular of the commercial engineering world, experimenting is called empirical engineering, but the procedures for both methods are the same. An important side benefit results: You will learn how circuits operate, and you will gain valuable experience from your failures. The trial-and-error concept has long been the companion of radio amateurs, and it's nothing to be ashamed of.

Where Do We Start?

A workshop, large or small, is the core of our home-construction adventure. How elaborate it might be, in terms of assorted tools and machinery, will be dictated essentially by what we plan to build. For example, if amplifiers are your pet projects, you'll need metal-working equipment such as drill presses, power saws, bending brakes and the like—assuming you want to make all the parts from scratch. On the other hand, most solid-state circuits require very few hand tools, and although a small drill press is a convenience, it is not essential.

Apartment dwellers have been known for using the kitchen table or a card table for a temporary workbench. Those with greater space available may be inclined to opt for a 6- or 8-foot permanent workbench. These larger work areas are often situated in the garage or basement. I have seen workbenches located on patios with roofs over them (in those regions where winter never comes to call!). Ideally, a permanent bench should be your objective. This will enable you to keep the important day-to-day tools and test equipment arranged for immediate use. The major shortfall of a large, permanent bench is that some of us tend to litter it with parts

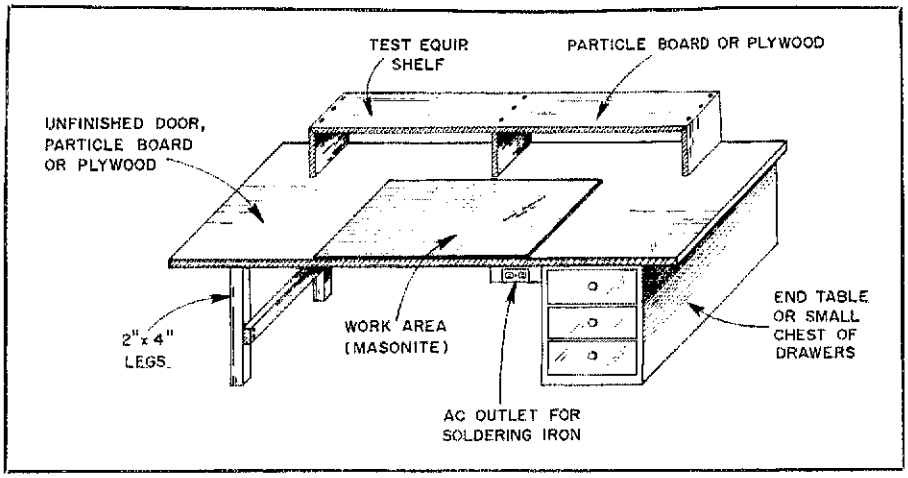


Fig. 1—Pictorial drawing of a suggested workbench. The size will depend on personal preference and available space (see text).

and equipment until we have, perhaps, a square foot of work area left! Therefore, benches with drawers and shelves are a grand luxury for those who have materials to store.

The Workbench Personality

Let's assume that you have the room for a medium-size bench. How might you set it up at reasonable cost? Fig. 1 illustrates an approach that I have used. The arrangement is good also for an operating table in the ham shack.

There are a number of materials that are suitable for the bench in Fig. 1. Particle board is probably the least expensive of the sheeting we can purchase, and ¾-inch-thick plywood is second in line for cost. Wrecking yards often have used interior doors from houses, so you may wish to check that source for an inexpensive bench top.

If you desire drawers for your bench, a secondhand end table or small chest of drawers can be used to support one end of the bench. Unfinished wooden chests are available at modest prices, if you choose to take that route. If you don't want to include drawers under your bench, you may duplicate the legs shown at the left in Fig. 1, then use them in place of the drawer-cabinet support.

A small shelf is seen atop the bench. It is handy for placing your test equipment out of the way of your central work area. It can be built to include two shelves, should you have a lot of test apparatus in your shop.

A piece of Masonite® or similarly smooth material is ideal for a protective surface in the main work area. I not only use Masonite (coated with polyurethane varnish) as a work surface, but I place a 2 × 2-foot piece of carpeting over the Masonite. The carpeting prevents cabinets and panels from being scratched when they are being worked on. The carpet section is set aside during routine work at the bench.

Not illustrated in Fig. 1 is a multiple ac-outlet strip. It should be placed along the back edge of the bench top, under the shelf. It is a good practice to run a ground strip along the rear edge of the bench. The ground strip can be made from RG-8 coaxial cable shield braid or copper flashing. A large conductor should be routed from the ground bus to an earth ground or cold-water pipe (or both). There will be times when you will want to connect the chassis or ground bus of the equipment you are testing to this earth ground.

The ac outlet seen near the front edge of the bench top (Fig. 1) is a convenience I cannot do without. This outlet box is intended mainly for the soldering-iron cord. Soldering-iron cords that are plugged into outlet strips at the rear of the bench tend to get in your way and are easily burned by the soldering iron. Of course, you will also want to use a soldering-iron holder on your bench. Safety first!

The dimensions of the workbench are a matter of personal choice. Mine is 6 feet long and 4 feet deep. Longer benches will need reinforcement at the center to prevent sagging. If you aren't squeamish about spending, say, $60, it might be worth considering the purchase of a folding office table. These have sturdy metal frames, and the top surface is made from a durable laminate, with a wood-grain finish. Quill Corp.[1] lists them in their mail-order catalog.

Tools and Sundry Items

We could discuss the matter of appropriate tools from sunrise to sunset, but rather than do that let's consider only the most essential of hand tools for a typical ham workshop. Some of the items are rather obvious, such as assorted sizes of screwdrivers (blade and Phillips). Pliers, a set of nut drivers (spin-tights), large and small diagonal cutters, an 8-inch crescent wrench and a small vise comprise some of the other routine tools. A standard item that no ham should be without is a jackknife.

We have three choices for another vital tool—the drill. Many builders have for years succeeded using the old-fashioned "egg-beater" hand drill. Such drills are fine for light work, but a motorized drill with a 3/8-inch chuck is required for holes that are ¼ inch or greater in diameter. I like to use a small hobbyist's motorized drill for making holes in PC boards. You will need a no. 59 or 60 drill bit with a 1/8-inch shank if you choose this kind of drill (most small components for PC mounting require a no. 60 hole). My hobby drill is a Black and Decker unit, and it has a motor-speed control that really comes in handy. I use the drill also with assorted abrasive wheels for smoothing rough edges and modifying the foil patterns on PC boards.

The Cadillac of drills is a bench-size drill press. I also have one of these, which I bought for less than $100. Many stores sell similar units for as little as $70. A drill press is a must if you need to drill many holes accurately.

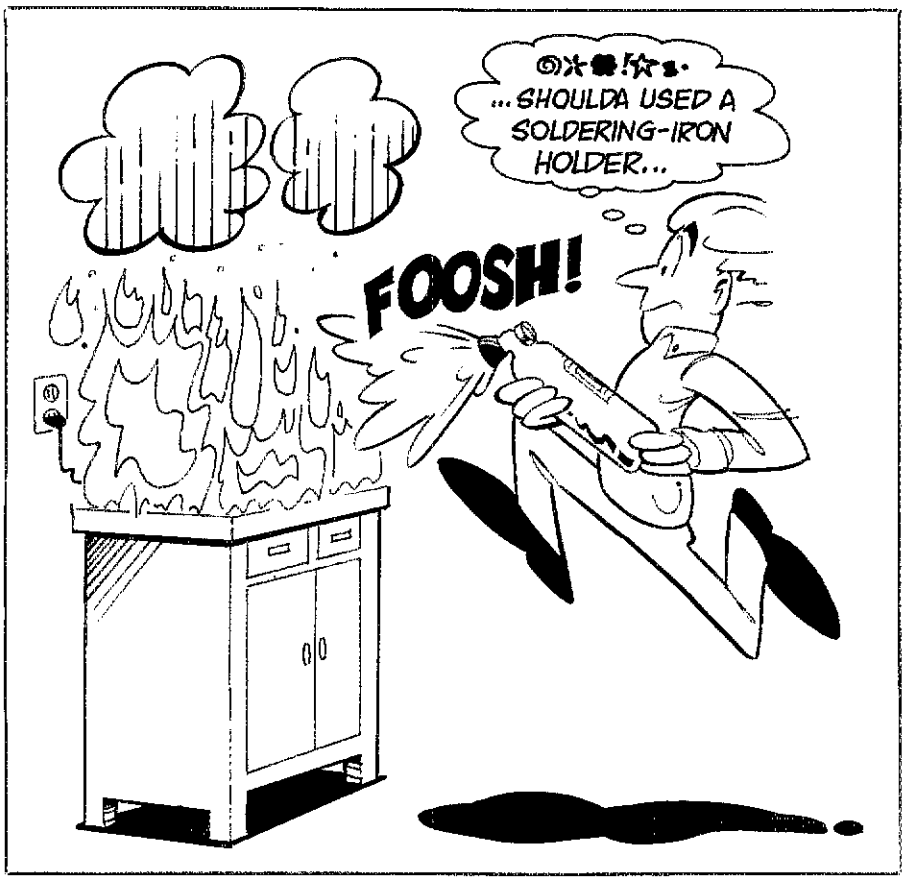
Soldering Equipment

Here we need to consider two situations: Low heat and a fine soldering-iron point are necessary for PC work, and a high-heat iron with a large tip is mandatory for soldering large metal surfaces. Do not use a soldering gun for PC-board work. The tip is too large, and unwanted bridges between PC foils will result. Also, the heat is too great for PC foils. They may lift from the board material if a gun is used. A 40-W pencil iron is my choice for PC-board work. I use a plated tip that is pointed. Plated tips cost more, but in the long term you will be money ahead by using them, since they last longer than plain copper tips.

A 100-W soldering gun is great when you need to do short-term soldering at moderate heat. The waiting period for a "hot copper" is short with a gun. My preference (even though I have two guns) is the old-fashioned, large, 100-W pencil iron. I use this for making boxes from PC-board material and when additional heat is needed. I also have a 500-W iron for truly heavy work, but you won't have too many occasions to use such a brute-size iron. Generally, a propane torch can be used for those big jobs. A can of resin flux is useful for soldering objects that are oxidized or cadmium plated: Some of the hardware from overseas seems to defy soldering, owing to some unusual plating material. The flux helps in these instances.

Beware of bargain-price pencil irons. Many of them will burn out after a few hours of use. Buy a name-brand unit, even

[1]Quill Corporation, 100 S. Schelter Rd., P.O. Box 4700, Lincolnshire, IL 60069. A catalog is available.



if it costs more than you feel is appropriate. I prefer Ungar soldering irons.

Specialty Tools

There will be times when you need to enlarge holes, or when you do not have the proper size drill bit. Here is where the T-handle tapered reamer comes into play. Most reamers of this type are capable of enlarging a 1/8-inch hole to a size as great as ½ inch. A reamer is a nice addition in the workshop.

A small- and a medium-diameter round file is also a useful tool for "fudging" when you drill a hole off center. The small file is called a "mouse-tail," and the larger ones are known as "rat-tail" files. Many sins can be corrected with these tools.

Most builders own a nibbling tool. These devices are great for cutting PC board and thin metal stock. Special designs are possible by nibbling the prescribed pattern in thin sheet stock. You may wish to add this tool to your list.

Socket punches are expensive, but if you can obtain a set of them at a flea market or surplus-tool outlet, you'll be ever grateful for the opportunity. Sizes from ½ inch to 1½ inches in diameter are most common for amateur work. I have had my set of punches since 1948, and despite regular use they are in excellent condition.

A quality set of jeweler's screwdrivers will prove invaluable when you can't find a small enough screwdriver to tighten the setscrews of some of the smaller knobs. A set of Allen wrenches is similarly handy.

Although some may not consider a hacksaw a specialty tool, it is an item that finds frequent use in the shop. Hacksaws are necessary when we need to shorten a switch or control shaft. They may be needed also for cutting plastic tubing and sheeting. I own a hacksaw, but also have a saber saw for this type of work. Most of my work, however, is done with a hobby-style table saw.

How about cutting PC board material? If you don't mind rough edges, use your hacksaw or saber saw, then file the edges. I use a heavy-duty, secondhand paper cutter I acquired at a surplus office-supply outlet. The cutter has a thick blade and a platform that is 15 inches on a side, and is rugged enough to permit cutting thin brass, aluminum and copper sheet.

A solder sucker is a vital tool in any modern ham workshop. This tool enables you to remove solder from PC boards when a circuit change is necessary. Similarly, solder-sipping braid (sold on small reels) is excellent for cleaning up PC-board areas when replacing components. Radio Shack sells these items at reasonable cost.

Tweezers, used medical forceps, dental mirrors, a soldering aid and a small magnifying glass or jeweler's loupe are items found in many amateur workshops. Likewise with a hobby knife and a supply of sharp replacement blades. And of course, who could do without a roll or two of black vinyl electrical tape?

How About Solder?

Solder is used more than anything else in the shop. *Never use acid-core solder!* Be certain you buy resin-core solder for electrical work. The trend these days is toward the light-gauge solder instead of the older large-diameter solder. The light-gauge material is best suited for PC-board work. Good results will be obtained only when a quality, name-brand solder is used. Be prepared to pay approximately $12 per pound for good solder. A pound of solder will last a long time.

Other Shop Items

Steel wool, sandpaper and rubbing alcohol (for cleaning) are useful things to keep on hand. Instant-adhesive glue is also handy at times. The 5-minute class of epoxy cement is another adhesive that will find many uses in your workshop.

A set of metal files (flat, half round, triangular and square) is useful for a number of applications. I keep a set of small model-maker's files for those special jobs that larger files can't accomplish. Avoid bargain-price imported files. Most of them will become dull after a single use, and the shanks may bend easily.

Tag Ends

I'm sure that many avid builders will think of items that should be listed in this article. The extra goodies are a matter of personal choice. Use what you feel is necessary when setting up your shop. I'm willing to bet that you'll take a keen interest in building and experimenting once you have a convenient place to carry out your work. QST

Next Month in *QST*

While cooler weather descended on the U.S., amateur public-service activities heated up. In December *QST*, you'll read about the amateur response to the earthquakes that rocked Mexico, and about how hams in the Northeast U.S. greeted the unwelcome visit of Hurricane Gloria.

Also in the issue will be the first of a two-part article on how to link your IBM® PC to a color slow-scan converter for SSTV and WEFAX, a construction project for a 220-MHz antenna installation, and a novel receiving aid that will enable you to hear CW better. Wondering what to do about poor operating conditions? Try Dr. VHF's Cure for the Low Sunspot Blues. And, to get in the holiday spirit, enjoy the heartwarming story of a special Christmas gift.

Simple Conversion of Complex Networks

With a basic understanding of some simple diagrams, you can easily form equivalent series and parallel circuits.

By Bob Schetgen, KU7G
Assistant Technical Editor

The Element 4B license examination requires amateurs to transform parallel RCL networks to their series equivalents. Ladder-network analysis usually requires several conversions between equivalent series and parallel circuits. The equations needed to complete the conversion appear in *The ARRL Handbook*, but they are difficult to remember.[1] A short study of impedance and admittance diagrams makes it easy to remember a conversion procedure.

Series Circuits

Most amateurs are familiar with the formula for impedance of an RCL series circuit:

$$Z = \sqrt{R^2 + X^2} \qquad \text{(Eq. 1)}$$

where

Z = magnitude of the impedance
R = resistive component of the circuit
X = reactive component of the circuit (capacitive reactance is negative)

Many hams, however, are not aware that Eq. 1 is a mathematical statement of an impedance diagram (Fig. 1). The impedance diagram is a right triangle in which the two legs correspond to the resistive and reactive components of the circuit, and the hypotenuse to the impedance. In most cases, hams are concerned only with the magnitude of Z, but the complex impedance can be defined completely by the value of Z and its orientation, theta (θ).

Theta is the phase angle measured from the resistive leg to the hypotenuse. The impedance diagram is based on the assumption that the voltage across the resistive component is the phase reference: When voltage (E) leads current (I), θ is positive (on an impedance diagram). Cosine θ is the power factor of the circuit. Theta is determined by the ratio of reactance to resistance:

$$\theta = \arctan \frac{X}{R} \qquad \text{(Eq. 2)}$$

If Z and θ are known, trigonometry allows us to find R and X easily:

$$R = Z \cos(\theta)\ \Omega \qquad \text{(Eq. 3)}$$

$$X = Z \sin(\theta)\ \Omega \qquad \text{(Eq. 4)}$$

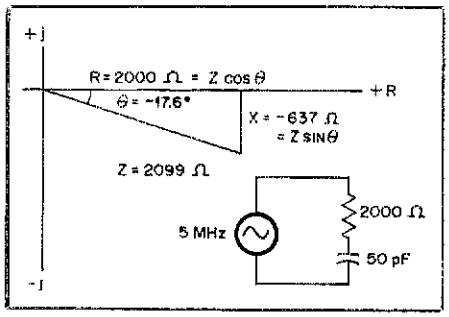


Fig. 1—An impedance diagram and schematic diagram of the example series network.

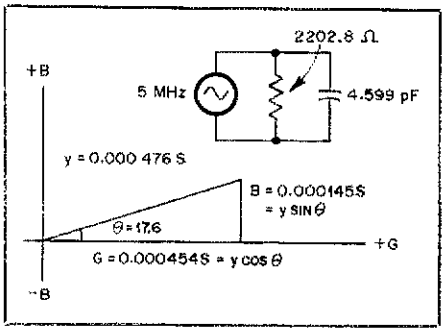


Fig. 2—An admittance diagram and schematic of a parallel network equivalent to the series network in the example.

Parallel Circuits

There is an equation similar to Eq. 1 for parallel circuits. The relation holds for the circuit conductance, G, susceptance, B, and admittance, Y:

$$Y = \sqrt{G^2 + B^2} \qquad \text{(Eq. 5)}$$

where

$$Y = \frac{1}{Z}$$

$$G = \frac{1}{R}$$

$$jB = -j\,\frac{1}{X}$$

Eq. 5 is a mathematical representation of an admittance diagram (Fig. 2). The sides of the triangle correspond to G, B and Y. Admittance can be specified by magnitude Y and orientation θ. Theta in the admittance diagram, however, holds the opposite sign of theta in an impedance diagram. (This is so because an admittance diagram assumes that the current through the conductive element is the phase reference:

[1] C. L. Hutchinson, ed., *The 1985 ARRL Handbook for the Radio Amateur* (Newington: ARRL, 1984), p. 2-22.

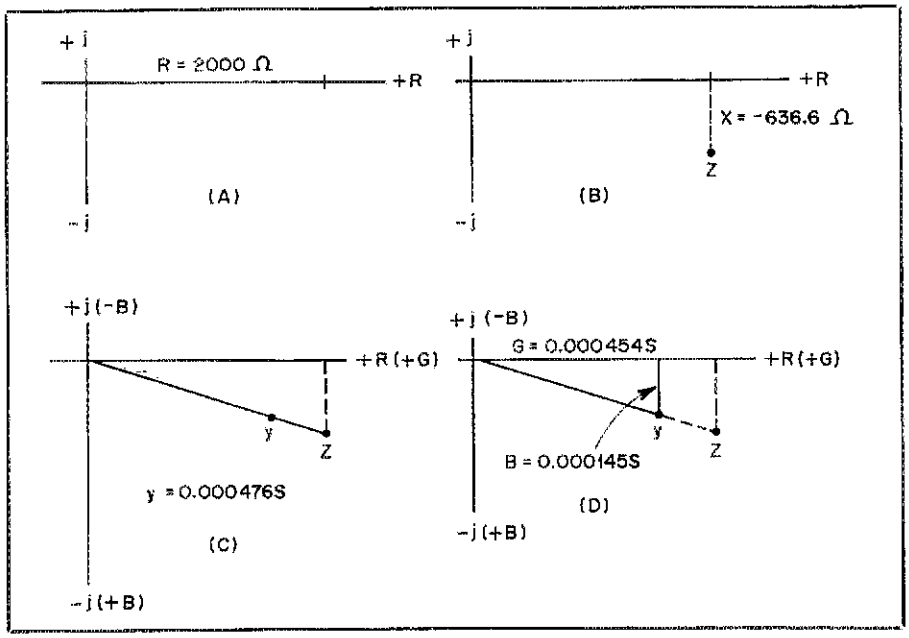


Fig. 3—Steps in the graphic conversion of a series circuit to an equivalent parallel circuit. The process is explained in the text. Note that the labels on the *j* axis have been changed for drawings C and D.

When E leads I in the admittance diagram, θ is negative.) Thus, susceptance has the opposite sign of reactance.

If Y and θ are known, G and B are easily found:

$$G = Y \cos(\theta)\ S \qquad \text{(Eq. 6)}$$

$$B = Y \sin(\theta)\ S \qquad \text{(Eq. 7)}$$

Parallel and series networks are equivalent when Y is the reciprocal of Z and the phase relationship is the same. With this knowledge, the conversion from series to parallel (and vice versa) can be accomplished quickly by three methods: (1) graphically, (2) by trigonometry and (3) by conversions between polar and rectangular coordinate systems (on calculators that perform the conversions).

Let's consider an example: Determine an equivalent parallel network for a given series network comprising a 5-MHz generator, 2000-Ω resistance and a 50-pF capacitor (see Fig. 1).

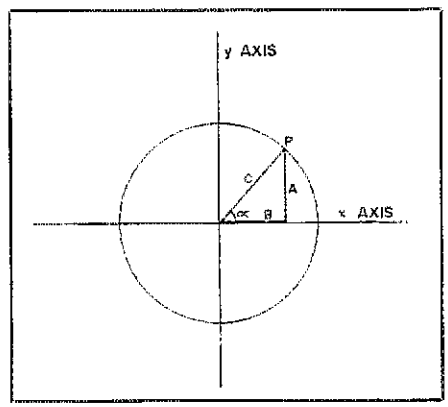


Fig. 4—Trigonometry allows us to determine the coordinates of any point, P, on a Cartesian (rectangular) coordinate system, when the distance and orientation of a line segment from the origin to the point are known. A line segment, C, from the origin to point P is shown, with its orientation angle, α. (α is positive for counterclockwise rotation, negative for clockwise rotation from the axis.) All possible locations of P, for all possible angles appear as a circle. The line segment A, from P to the x axis, corresponds to the y coordinate of P. Line segment B corresponds to the x coordinate of P.

$$X_c = \frac{1}{2\ (3.14)\ (5 \times 10^6)\ (50 \times 10^{-12})}$$

$$= 636.9\ \Omega$$

$$Z = 2000 - j636.9 = 2099.0\ \Omega\ \angle -17.7°$$

An equivalent parallel circuit must have:

$$Y = \frac{1}{2099.0} = 0.000476\ S\ \angle 17.7°$$

A Graphic Approach

A graphic solution to the problem requires some paper, a right triangle or square and an engineer's scale. First, draw the R and *j* axis at right angles to each other. Then choose a convenient scale and plot point Z (Fig. 3). Measure Z from the origin to point Z.

If we change some reference labels on the drawing, the admittance diagram (which is a similar triangle to that of the impedance diagram) can be constructed on the same drawing. Change the *j*-axis labels so that negative values of *j* are plotted at the top and positive values of *j* are at the bottom of the sheet. Mentally note that negative angles are now above the R axis, while positive angles are below the R axis.

The angle, θ, on our Z diagram is now $-\theta$ of an admittance diagram. Choose an appropriate scale and plot Y on the

Terms Used in Circuit Conversion

admittance—a quantity, indicated by the variable Y, that measures the ability of an RCL circuit to pass current.

arctan—The prefix "arc" (or the exponent −1) on the name of a trigonometric function indicates that the angle corresponding to a given value of the function is required. Arctan (0.666) indicates the angle for which 0.666 is the value of the tangent function—33.69°.

conductance—a quantity, indicated by the variable G, that measures the ability of a resistive circuit element to pass current.

cosine—a trigonometric function that relates the length of a line segment to its projection on the x axis, as determined by the angle, α, (Fig. 4):

$$\text{cosine}\ (\alpha) = \frac{B}{C}$$

j—the *j* axis is drawn at 90° to the real (resistive or conductive) axis in impedance and admittance diagrams. It is the scale for location of reactance or susceptance values. In complex mathematical notation, the *j* operator appears in front of the *j* coordinate. (The sign of the coordinate precedes the *j* operator.)

siemens—inverse ohms, abbreviated "S". The unit of measure for admittance, susceptance and conductance.

sine—a trigonometric function that relates the length of a line segment to its projection on the y axis, as determined by the angle, α, (Fig. 4):

$$\text{sine}\ (\alpha) = \frac{A}{C}$$

susceptance—a quantity, indicated by the variable B, that measures the ability of a reactive circuit element (such as a capacitor or inductor) to pass current. Capacitive susceptance is plotted at $+jB$ on admittance diagrams, while inductive susceptance is plotted as $-jB$.

tangent—a trigonometric function that relates the projections of a line segment onto two orthogonal axes as determined by the angle, α, (Fig. 4):

$$\tan\ (\alpha) = \frac{A}{B}$$

hypotenuse to determine the admittance triangle: (Measure from the origin along the hypotenuse and mark the end point Y.) Conductance is then measured from point Y to the *j* axis, and susceptance from point Y to the R axis. Note the sign of B (distances above the R axis are negative; those below the R axis are positive), and convert G and B to R_p, X_p and C_p:

$$R_p = \frac{1}{G} \quad \text{(Eq. 8)}$$

$$X_p = -\frac{1}{B} \quad \text{(Eq. 9)}$$

$$C_p = \frac{1}{X_p(2)\ 3.14(f_o)} \quad \text{(Eq. 10)}$$

where

f_o = operating frequency.

The equations yield:

$R_p = 2202.8\ \Omega$
$X_p = -6917.3\ \Omega$
$C_p = 4.604$ pF.

A Trigonometric Approach

Those having access to a calculator with trigonometric functions can apply equations to Y and θ:

$G = Y \cos(\theta) = 0.000454$ S
$B = Y \sin(\theta) = 0.000145$ S

The results are the same, but more accurate than those obtained through graphic analysis.

A Coordinate-Conversion Approach

A calculator that performs rectangular/polar coordinate conversions makes the solution almost trivial:

1) Enter X as the y coordinate (capacitive reactance is negative).
2) Enter R as the x coordinate.
3) Convert rectangular to polar coordinates.
4) Take the reciprocal of the polar magnitude.
5) Change the sign of the polar angle.
6) Convert polar to rectangular coordinates.
7) The x coordinate is now G, while the y coordinate is B: Use equations 8, 9 and 10 to obtain R and X.

The Memory Trick

The next time you need to perform a series-to-parallel or parallel-to-series network conversion, remember the relationships:

- Y and Z are reciprocals of each other
- The sign of θ is opposite for Z and Y diagrams

and the variables involved:

- An impedance diagram shows R, X, Z and θ
- An admittance diagram shows G, B, Y and θ

(continued from page 19)

maximum power output at a single frequency.

Each section of the circuit in Fig. 5 contains a decoupling network of resistors and capacitors in the +12-V line. A 10-ohm parasitic resistor is shown at the collector of Q1. Depending on the PC-board layout used, the resistor may or may not be necessary. Furthermore, a layout that encourages VHF oscillation may necessitate inclusion of a 10-ohm resistor at the collectors of Q2 and Q3. VHF or UHF self-oscillation can be detected with a scope, or you may observe it by listening to the 3.9-MHz signal: VHF oscillation usually shows up as a hiss or hash noise superimposed on the desired signal.

Terminals X and Y may be opened for use as a control line for push-to-talk operation. Generally, a small 12-V dc relay is triggered by the mic control switch, and the standby line (X and Y) is actuated by the relay contacts. A slip-on crown heat sink is recommended for Q3 to reduce the operating temperature during the SSB duty cycle.

Construction Notes

Parts kits and PC boards for this series are available.[1] If you prefer to make your own circuit board, be sure to keep all conductors as short and wide as possible. This will discourage the formation of unwanted VHF resonant elements. Double-sided PC board should be used for this module. The ground-plane side (component surface) will help to ensure stability; it should be grounded to the negative foil on the etched side of the board at several points.

A dab of Silastic® compound may be used to affix each toroid to the PC board. This will prevent the transformer leads from breaking because of vibration and similar stress.

In Summary

Upon completion of this and the previously described practical circuits for our SSB generator, it is only necessary to have a VFO to make this unit function as a low-power SSB transmitter. Do not put it on the air unless a harmonic filter is used between T4 of Fig. 5 and the antenna. However, it is okay to operate the system into a dummy load and monitor the output with your receiver.

Our next installment will address VFOs and some of their maladies. A practical VFO for this project will be included in the article.

[1] A & A Engineering, 7970 Orchid Dr., Buena Park, CA 90620, tel. 714-521-4160.

Strays

BEGINNER'S BENCH PC-BOARD TEMPLATES AVAILABLE

☐ If you've been following "The Principles and Building of SSB Gear" series under the Beginner's Bench banner (the series debuted in September 1985), we have good news for you. PC-board templates and parts overlays are available from the ARRL for the material covered in the September and October issues. Other templates will be available as the series progresses.

The template package includes two PC-board patterns, two parts overlays and two schematic diagrams. You may order these templates from the Technical Department secretary. Please include $4 with your order. Request the October SSB Series Templates.

I would like to get in touch with...

☐ anyone with a service manual and schematic for a Teledialer automatic dialer, Model 32T-02, Part no. 201566-2, manufactured by American Telecommunications Corp. Sheldon Daitch, WA4MZZ, Box 8091, Greenville, NC 27835-8091.

☐ anyone with a manual for a Johnson Transceiver Tester. J. Sandberg, K6HE, 1138 E. Rustic Rd., Escondido, CA 92025.

Feedback

☐ The September Beginner's Bench article, "The Principles and Building of SSB Gear," contains a misstatement on page 19. The text—center column, 16th line from the bottom—reads: "(the sidebands become inverted when switching from the difference to the sum frequency)." As pointed out by Walt Schwarz, K3WNX, sideband inversions will never occur when sum frequencies of the mixer stage are selected, nor will they occur even when the difference frequencies are selected, unless the injection frequencies are *higher* than that of the SSB signal introduced to the mixer stage.

☐ In last month's It Seems to Us ... there are two typographical errors. The first sentence in the fourth paragraph should read " ... is of the opinion that most modern Amateur Radio facilities are safe ..." In the third to last sentence in paragraph three, the word "total" should be "tool."

The Super Duper

Part 2: Use the programming techniques discussed last month to build a super duping program.

By George Allison, K5IJ
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Now that you've seen how a dupe checker and logger work, in Part 1, it's time to look at the Sup'r Dup'r program (Listing 1) and see how these two simple programs can become your contest assistant.[1] We'll go through it in blocks.

The dimension statement in line 1000 creates three matrices needed by the program. The GOTO statement in line 1010 jumps around 12 subroutines to the start of the program to line 3540.

Lines 3670 through 4020 initialize the program by taking operator inputs on whether the contest is the Sweepstakes, whether all-band or single-band dupe checking is desired, whether the auto-save function should be switched on and whether there is a disk file of call signs to load. If the Sweepstakes switch is set "on" (SW$ = "Y"), then a list of ARRL Sections not worked will be displayed. The Sections are either loaded from the disk file or from the DATA statements in lines 5150-5220. If there is no disk file to load, the program gets information for the first call, starting at line 4100.

The main program display is printed by lines 4250 through 4490, and the next call for input is at line 4500. You can see error checking after each INPUT command; if a typed entry does not conform to what the program is looking for, the program jumps back for another try, while either displaying an error message or echoing the original input.

Lines 4560 through 4610 test the entry to see if it is a command instead of a call. You recall from the dupe-checking program that if you type QUIT at the ENTER NEXT CALL prompt, the program would stop execution. In the Sup'r Dup'r, you can type one of six commands instead of a call sign. Depending on the command, the program will jump to one of the subroutines at the beginning of the listing. I've used the GOTO statement instead of GOSUB in some of the commands to save memory when the program is running.

The program can accept a band change at the call-sign prompt; lines 4620 through 4700 test for proper band entries. If a non-amateur band is entered, or a call sign is

[1]This program is available on the Ham Radio Net bulletin board. Call 203-665-1114.

Listing 1
Sup'r Dup'r Program

```
790 REM        ***  QSO DUPE CHECKING AND SORTING PROGRAM ***
800 REM
810 REM       COPYRIGHT (C) 1985 BY GEORGE ALLISON, K5IJ
820 REM
830 REM      Released to the public domain by the author
840 REM
850 REM    THIS PROGRAM IS PROVIDED ON AN `AS IS' BASIS, WITHOUT
860 REM    WARRANTY OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING BUT
870 REM    NOT LIMITED TO THE IMPLIED WARRANTY OF FITNESS FOR A
880 REM    PARTICULAR PURPOSE.  THE ENTIRE RISK AS TO THE QUALITY AND
890 REM    PERFORMANCE OF THIS PROGRAM IS WITH YOU.  SHOULD THE PROGRAM
900 REM    PROVE DEFECTIVE, YOU (NOT K5IJ) ASSUME THE ENTIRE COST OF
910 REM    NECESSARY REPAIR, SERVICING, OR CORRECTION.  IN NO CASE WILL
920 REM    K5IJ BE LIABLE TO YOU FOR ANY DAMAGES, INCLUDING INCIDENTAL
930 REM    OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY
940 REM    TO USE THIS PROGRAM, EVEN IF K5IJ HAS BEEN ADVISED OF THE
950 REM    POSSIBILITY OF SUCH DAMAGES.
960 REM
970 REM      This program can accept a maximum of 500 calls.  For
980 REM    information on how to increase this number, see QST.
990 REM
1000 DIM Q$(500,7),P$(500),SE$(74)     'INITIALIZE MATRICES
1010 GOTO 3540                         'JUMP TO START
1020 REM  *** ALL-CAPS SUBROUTINE ***
1030 IF D=1 THEN V=LEN(Q$(C,D)) ELSE V=3
1040 FOR I=1 TO V
1050     H$=MID$(Q$(C,D),I,1)
1060     IF H$ > "z" OR H$ < "a" THEN GOTO 1080
1070     MID$(Q$(C,D),I,1)=CHR$(ASC(H$)-32)
1080 NEXT I
1090 RETURN
1100 REM *** DATE, TIME AND BAND SUBROUTINE ***
1110 Q$(C,7)=BA$                                'CURRENT BAND
1120 Q$(C,2)=LEFT$(DATE$,6)+RIGHT$(DATE$,2)     'LAST TWO DIGITS OF YEAR
1130 Q$(C,3)=LEFT$(TIME$,5)                     'HOURS AND MINUTES ONLY
1140 LOCATE 15,1
1150 FOR I = 1 TO 8
1160    PRINT STRING$(70," ")
1170 NEXT I
1180 LOCATE 15,3
1190 PRINT "HIS RST   MY RST   COMMENT"
1200 PRINT "  -------   ------   -------"
1210 LOCATE 17,3
1220 INPUT">",Q$(C,4)
1230 LOCATE 17,13
1240 INPUT">",Q$(C,5)
1250 LOCATE 17,22
1260 INPUT">",Q$(C,6)
1270 PRINT:PRINT "   HIT `C' TO CORRECT, ANY KEY TO CONTINUE";
1280 AN$ = INPUT$(1)
1290 IF (AN$="C" OR AN$="c") THEN GOTO 1140
1300 REM *** SECTION CHECKER ***
1310 D = 6               ' INDEX FOR CAPS CORRECTION
1320 GOSUB 1020
1330 D = 1               ' RESET CORRECTION
1340 IF SW$ <> "Y" THEN GOTO 1440
1350 FOR I=0 TO (N-1)
1360    IF SE$(I) <> LEFT$(Q$(C,6)+" ",3) THEN GOTO 1430
1370    N=N-1            ' REDUCE SECTION MATRIX
```

entered with numbers as the first two characters, the program will not accept it as valid and will query you.

Lines 4760 through 4900 contain the dupe checker. You can see the similarity to the simple dupe checker discussed earlier. This one, however, has two different paths: one for all-band searching and one for single-band dupe checking.

The logging subroutine is called by line 4920. The logger was made a subroutine because the same function is also called when the program is initialized. At line 4970, the main program ends. It is followed by the QUIT/SAVE routine in lines 4980 through 5130.

The Subroutines

Certain functions are designated as subroutines, either because they are needed at several different points in the program (making them subroutines saves you from having to type them several times) or to make it easier for you to eliminate unwanted program functions. We'll go through the subroutines one at a time.

First, the ALL-CAPS subroutine (lines 1020 through 1090) changes all lower-case entries into upper case. Without this subroutine, the dupe checker would treat "w1aw" and "W1AW" as different calls.

The DATE, TIME AND BAND subroutine in lines 1100 through 1440 is called when there is a contact to add to the file. The date, time, band, RST and comments are added to the call-sign matrix, then the program jumps back for the next entry.

The DISK SAVE subroutine in lines 1450 through 1620 is called by the SAVE command and the auto-save function. The auto-save function, when switched on during initialization, calls the DISK SAVE subroutine after every 10th contact. A data disk in drive B of the computer is used to store the call-sign data.

The long DELETION subroutine is in lines 1630 through 2290. If you want to erase a call sign and its data from the file, this subroutine performs the erasure, then adjusts all the matrices to reflect that the station was not worked. In addition to the main call matrix, Q$, the Sweepstakes matrix may also have to be altered and the number of Sections not worked increased.

Two subroutines in lines 2300 through 2390, HEADER and PRINT, set up a header and format for displaying the list of stations. These are followed by the BUBBLE_SORT subroutine, lines 2400 through 2640, which arranges the calls alphabetically. To do this, a separate matrix, P$, is used for sorting calls rearranged for proper sorting. The rearrangement is carried out in lines 2430 through 2500, and the value entered in P$ varies, depending on whether the number in the call occurs in the first, second or third position. It is the P$ matrix that is actually sorted; changes in the order of P$ are then repeated in the Q$ matrix.

```
1380    SF = 1    'SET SECTION CHANGE FLAG
1390    FOR J=I TO (N-1)
1400        SE$(J) = SE$(J+1)
1410    NEXT J
1420    RETURN          ' BREAK EARLY IF MATCH
1430 NEXT I
1440 RETURN
1450 REM *** DISK SAVE SUBROUTINE ***
1460 PRINT:PRINT "  PUT DATA DISK IN DRIVE B AND HIT ANY KEY WHEN READY"
1470 X$=INPUT$(1)
1480 LOCATE 20,45:PRINT"       . . . Saving"
1490 OPEN "O", #1, "B:LOG.DAT"
1500 IF SW$ <> "Y" THEN GOTO 1550
1510 PRINT #1,N
1520 FOR I=0 TO N-1
1530    WRITE #1,SE$(I)      'SAVE SWEEPSTAKES INFO
1540 NEXT I
1550 FOR I=0 TO C-1
1560    FOR J=1 TO 7
1570       WRITE #1, Q$(I,J)
1580    NEXT J
1590 NEXT I
1600 CLOSE
1610 LOCATE 20,45:PRINT TAB(65)
1620 RETURN
1630 REM *** DELETION SUBROUTINE ***
1640 LOCATE 15,3:PRINT TAB(40)
1650 LOCATE 15,3:INPUT "CALLSIGN TO DELETE: ",Q$(C,1)
1660 IF Q$(C,1) = "" THEN GOTO 1640
1670 GOSUB 1020
1680 LOCATE 17,3:INPUT "WHAT BAND? (CR IF BAND NOT IMPORTANT) ",B$
1690 IF B$ > " " THEN GOTO 1770
1700 FOR I=0 TO C-1       'FIND THE CALLSIGN
1710     IF Q$(I,1) = Q$(C,1) THEN GOTO 1850
1720 NEXT I
1730 LOCATE 19,3
1740 PRINT "CALLSIGN ";Q$(C,1);" NOT FOUND.  PRESS ANY KEY TO RESUME"
1750 X$=INPUT$(1)
1760 GOTO 4300
1770 FOR I=0 TO C-1
1780     IF Q$(I,1) = Q$(C,1) AND B$ = Q$(I,7) THEN GOTO 1850
1790 NEXT I
1800 LOCATE 19,3
1810 PRINT "CALLSIGN ";Q$(C,1);" NOT FOUND ON ";B$;" METERS";
1820 PRINT "  PRESS ANY KEY TO RESUME"
1830 X$=INPUT$(1)
1840 GOTO 4390
1850 LOCATE 19,3
1860 PRINT "ARE YOU SURE YOU WANT TO DELETE ";Q$(I,1);" ? (Y/N) ";
1870 AN$ = INPUT$(1)
1880 IF AN$="N" OR AN$="n" THEN GOTO 4390
1890 IF AN$ <> "Y" AND AN$ <> "y" THEN GOTO 1850
1900 LOCATE 19,55:PRINT". . . Deleting"
1910 IF SW$ <> "Y" THEN GOTO 1940
1920 T$ = LEFT$(Q$(I,6),3)          'SAVE SECTION
1930 IF LEN(T$) < 3 THEN T$ = T$ + " "
1940 FOR K=I TO C-1                 'DELETE CALLSIGN AND INFO
1950     FOR J=1 TO 7
1960         Q$(K,J) = Q$(K+1,J)
1970     NEXT J
1980 NEXT K
1990 SE$(N) = "Z"
2000 C=C-1
2010 IF SW$ <> "Y" THEN GOTO 2280
2020 FOR I=0 TO 73           'DETERMINE IF SECTION IS VALID
2030    READ SN$
2040    IF T$ = SN$ THEN RESTORE:GOTO 2090
2050 NEXT I
2060 RESTORE
2070 IF C = 0 THEN GOTO 4100    'RESTART IF NO CONTACTS
2080 GOTO 4390      'COMPLETE LOOP IF NOT VALID
2090 FOR I=0 TO C            'DETERMINE IF SECTION WAS WORKED
2100    IF T$ = LEFT$(LEFT$(Q$(I,6)+" ",3),3) THEN GOTO 4390  'WAS WORKED
2110 NEXT I
2120 N=N+1           'SECTION NOT WORKED; INCREASE MATRIX SIZE
2130 IF N=1 THEN GOTO 2190
2140 IF T$ > SE$(N-2) THEN SE$(N-1)=T$:GOTO 2280
2150 IF T$ > SE$(0) THEN GOTO 2210
```

```
216Ø FOR I=N-1 TO 1 STEP -1
217Ø     SE$(I) = SE$(I-1)
218Ø NEXT I
219Ø SE$(Ø) = T$
22ØØ GOTO 228Ø
221Ø FOR I=Ø TO N-2
222Ø     IF T$ > SE$(I) AND T$ < SE$(I+1) THEN GOTO 224Ø
223Ø NEXT I
224Ø FOR J=N-1 TO 1+1 STEP -1
225Ø     SE$(J) = SE$(J-1)
226Ø NEXT J
227Ø SE$(I+1) = T$
228Ø IF C=0 THEN GOTO 41ØØ
229Ø GOTO 429Ø
23ØØ REM *** HEADER SUBROUTINE ***
231Ø PRINT "STATION";TAB(13);"BAND";TAB(21);"DATE";TAB(29);"TIME";TAB(36);
232Ø PRINT "HIS RST";TAB(45);"MY RST";TAB(53);"COMMENT"
233Ø PRINT "----------";TAB(13);"-----";TAB(19);"---------";TAB(29);"-----";
234Ø PRINT TAB(36);"--------";TAB(45);"------";TAB(53);"---------------"
235Ø RETURN
236Ø REM *** PRINT SUBROUTINE ***
237Ø PRINT Q$(I,1);TAB(14);Q$(I,7);TAB(19);Q$(I,2);TAB(29);Q$(I,3);
238Ø PRINT TAB(38);Q$(I,4);TAB(46);Q$(I,5);TAB(53);Q$(I,6)
239Ø RETURN
24ØØ REM *** BUBBLE SORT ***
241Ø PRINT:PRINT:PRINT:PRINT " ","   . . . Sorting"
242Ø LOCATE 2Ø,35:PRINT "PASS ="
243Ø FOR J=Ø TO C-1              'REARRANGE CALL FOR PROPER SORTING
244Ø   IF Q$(J,7)="16Ø" THEN Q$(J,7)="99"     'SORTING CORRECTION
245Ø   IF LEFT$(Q$(J,1),1) < ":" THEN P$(J)=Q$(J,7)+Q$(J,1):GOTO 249Ø
246Ø   IF MID$(Q$(J,1),2,1) > ":" THEN GOTO 248Ø
247Ø   P$(J)=Q$(J,7)+Q$(J,1) + "," :GOTO 249Ø
248Ø   P$(J)=Q$(J,7)+LEFT$(Q$(J,1),1)+MID$(Q$(J,1),3,1)+MID$(Q$(J,1),4,9)
    +MID$(Q$(J,1),2,1)
249Ø   IF Q$(J,7)="99" THEN Q$(J,7)="16Ø"
25ØØ NEXT J
251Ø K=Ø                         'PASS COUNTER
252Ø F=1                         'SORTING FLAG
253Ø K=K+1
254Ø LOCATE 2Ø,41:PRINT TAB(45)
255Ø LOCATE 2Ø,41:PRINT K
256Ø FOR I=Ø TO (C-2)
257Ø    IF P$(I) < P$(I+1) THEN GOTO 263Ø
258Ø    SWAP P$(I),P$(I+1)
259Ø    FOR J=1 TO 7
26ØØ        SWAP Q$(I,J),Q$(I+1,J)
261Ø    NEXT J
262Ø    F=Ø                      'SET FLAG IF ANOTHER PASS REQUIRED
263Ø NEXT I
264Ø IF F=Ø THEN GOTO 252Ø
265Ø REM *** DISPLAY SUBROUTINE ***
266Ø CLS:PRINT:PRINT:PRINT
267Ø PRINT " ","Stations worked as of ";TIME$;" on ";DATE$:PRINT:PRINT
268Ø GOSUB 23ØØ
269Ø FOR I=Ø TO C-1
27ØØ GOSUB 236Ø
271Ø     IF Q$(I,7) <> Q$(I+1,7) THEN PRINT
272Ø NEXT I
273Ø PRINT:PRINT " "," TOTAL STATIONS = ";C
274Ø REM *** PRINTING SUBROUTINE ***
275Ø PRINT:PRINT:PRINT"  DO YOU WANT A HARD COPY PRINTOUT? (Y/N) ";
276Ø AN$ = INPUT$(1):PRINT AN$
277Ø IF AN$="N"OR AN$="n" THEN GOTO 425Ø
278Ø IF AN$<>"Y" AND AN$<>"y" THEN GOTO 275Ø
279Ø PRINT:PRINT"  CHECK PRINTER IS ON AND PRESS ANY KEY TO START"
28ØØ X$=INPUT$(1)
281Ø LPRINT " "," * * * * * * * * * * * * *"
282Ø LPRINT " "," S U P ' R   D U P ' R  "
283Ø LPRINT " "," * * * * * * * * * * * * *":LPRINT:LPRINT
284Ø LPRINT " "," Copyright 1985 K5IJ Sup'r Software":LPRINT:LPRINT
285Ø LPRINT " ","Stations worked as of ";TIME$;" on ";DATE$
286Ø H=44:K=44                    'LINES ON FIRST PAGE
287Ø FOR I=Ø TO C-1
288Ø    IF (H/K-INT(H/K)) > .ØØØØØ1 THEN GOTO 295Ø   'HEADER/FEED CONTROL
289Ø    REM  *** PAGE HEADER SUBROUTINE ***
29ØØ    IF I=Ø THEN GOTO 293Ø      'FIRST PAGE ONLY
291Ø    H=55:K=55                  'INITIALIZE NUMBER OF LINES ON PAGE
292Ø    LPRINT:LPRINT:LPRINT" "," ","   PAGE ";PA:LPRINT CHR$(12)
```

The bubble sort exits directly to the DISPLAY subroutine, in lines 265Ø through 273Ø. This is used with HEADER and PRINT to display the calls on the computer screen.

The PRINTING, PAGE HEADER, PRINTING HEADER and PRINTER subroutines in lines 274Ø through 312Ø will control the printer, start each page with a header, format the data and number each page. Printing can be ordered after the data is viewed on the screen, after a bubble sort, or after a data selection.

The PICK subroutine, in lines 313Ø through 3530, selects call-sign data from the file. When this command is typed, the program requests the data field, such as MY RST or BAND, which it must scan. It then requests the value of the field. With these two parameters, it then steps through the entire call-sign file, picking out the calls that have these attributes. For example, if you select MY RST and 599, the subroutine will pick out and display all data on the stations that gave you an RST of 599.

Operating the Program

Put the program disk in drive B and load your BASIC interpreter. Type RUN "B:SUPRDUPR" (or whatever name you gave it), and look for the screen to clear and the SUP'R DUP'R header to appear. The first question asked is, IS THIS THE SWEEPSTAKES? (Y/N). Try typing anything other than a Y or N and verify that the entry is not accepted. Now type a Y.

The next question, DO YOU DESIRE ALL-BAND OR SINGLE-BAND DUPE CHECKING? (A/S) can be answered A or S, as you desire, then answer Y to the question, DO YOU DESIRE AUTO-SAVE? (Y/N). Since you have no old data, answer N to IS THERE A DISK FILE TO INPUT? (Y/N).

You will now be asked to enter the initial band. If you do not enter a valid amateur band, 160-10 meters, the program will not accept the entry and will ask you again. When the band is entered correctly, the next prompt will ask you to enter the first call. The first character of the call *must* be a letter. If you enter a number as the first character, the program assumes you changed your mind about the band and will jump back to ask you to enter the band again. The call sign can be up to 11 characters long; any longer and the program will echo the input and ask again.

Now the RST and COMMENT prompts will appear. Under HIS RST you will see a > prompt. Type in the RST and press the carriage return key, which causes the > to appear under MY RST. After your RST is entered and the carriage return key is pressed, the > appears under COMMENT. When in the Sweepstakes mode, the program expects to see an ARRL Section abbreviation entered as the first two or three characters of the COMMENT field. For example, if W1AW is the first station worked, enter the COMMENT as CT THE

GANG IN NEWINGTON. The program looks only at the first three characters to check against the section files; you can type in whatever you want to for the remainder of the COMMENT. When not in the Sweepstakes mode, enter whatever you like for a COMMENT.

You are now given a chance to examine your entry and make changes. If everything looks good, press the carriage-return key and you will return to the main menu. Fig. 1 shows how the main menu will appear if you entered W1AW as the first call.

The first line of the menu shows the commands (Dele, Pick, SOrt, SAve, Quit and View) and the allowable bands, 160 through 10 meters. One of these commands or a valid amateur call should be typed in response to the ENTER NEXT CALL: prompt. The commands may be entered as four-letter words, or by the abbreviations that are capitalized on the screen. Thus, to select the PICK command, type PICK or P and to select SORT, type SORT or SO. Of course, you can type in capital or small letters, or any combination.

The next lines contain the Sweepstakes Section block, showing how many selections have not been worked and what they are. Since you worked W1AW in the CT Section, the block shows that you have not worked 73 Sections, and CT does not appear on the list.

After the Section block is the status line, showing the last station worked and the time, the total number of contacts, the percentage of computer memory remaining for entering data and the current band in use. Finally, the ENTER NEXT CALL: prompt is displayed.

To change the current band, type the band at the prompt and watch the band in the status line change. If you type a string of characters that begins with a two-digit or greater number that is not a band, the program assumes you are entering a weird DX call, but will ask you to verify this. A one-digit number only brings back the ENTER NEXT CALL: prompt.

Try typing a new call sign at the prompt. The screen will flash " . . . Looking," then tell you that no dupe has been found and ask if you want the call added to the file. If not, enter N and you'll be back to the call-sign prompt. If yes, type Y or press the carriage return key, and the RST-COMMENT field comes on and you enter the data.

Now enter W1AW again. The program will inform you that W1AW is a dupe, and tell you the date, time and band on which it was worked. If you are in the single-band dupe-checking mode and you have changed bands since W1AW was first entered, the program tells you that it is not a dupe. Type in about 10 or 15 call signs on different bands to provide a large-enough data base for demonstration of the commands. If you enter different ARRL Sections at the start of the COMMENT fields, you will see the Sweepstakes Section block change ac-

```
2930    GOSUB 3010
2940    PA=PA+1
2950    GOSUB 3090
2960    IF Q$(I,7) <> Q$(I+1,7) THEN H=H-1:LPRINT   'BAND SEPARATION
2970 NEXT I
2980 LPRINT:LPRINT " "," ","TOTAL STATIONS =";C
2990 LPRINT CHR$(12)              'FORMFEED
3000 GOTO 4250
3010 REM *** PRINTING HEADER SUBROUTINE ***
3020 LPRINT:LPRINT:LPRINT "STATION";TAB(13);"BAND";TAB(21);"DATE";
3030 LPRINT TAB(29);"TIME";TAB(36);"HIS RST";TAB(45);"MY RST";
3040 LPRINT TAB(53);"COMMENT"
3050 LPRINT "----------";TAB(13);"----";TAB(19);"---------";TAB(29);
3060 LPRINT "------";TAB(36);"-------";TAB(45);"------";
3070 LPRINT TAB(53);"---------------"
3080 RETURN
3090 REM *** PRINTER SUBROUTINE ***
3100 LPRINT Q$(I,1);TAB(14);Q$(I,7);TAB(19);Q$(I,2);TAB(29);Q$(I,3);
3110 LPRINT TAB(38);Q$(I,4);TAB(46);Q$(I,5);TAB(53);Q$(I,6)
3120 RETURN
3130 REM *** PICK SUBROUTINE ***
3140 FL=0                 'COMMENT FLAG
3150 LOCATE 15,3:PRINT TAB(40)
3160 LOCATE 15,3:INPUT "FIELD TO SELECT (X TO EXIT): ",Q$(C,1)
3170 GOSUB 1020
3180 SL$=Q$(C,1)          'SL$ IS SAVED FOR HEADER DISPLAY
3190 IF Q$(C,1)="STATION" THEN PI=1:GOTO 3280        'Q$(C,1) IS A
3200 IF Q$(C,1)="BAND" THEN PI=7:GOTO 3280           'DUMMY VARIABLE
3210 IF Q$(C,1)="DATE" THEN PI=2:GOTO 3280           'SO THE ALL-CAPS
3220 IF Q$(C,1)="TIME" THEN PI=3:GOTO 3280           'SUBROUTINE WILL
3230 IF Q$(C,1)="HIS RST" THEN PI=4:GOTO 3280        'WORK
3240 IF Q$(C,1)="MY RST" THEN PI=5:GOTO 3280
3250 IF Q$(C,1)="COMMENT" THEN FL=1:GOTO 3280
3260 IF Q$(C,1)="X" THEN GOTO 4390
3270 PRINT "  NO SUCH FIELD, TRY AGAIN":GOTO 3150
3280 PRINT:INPUT"  VALUE TO SELECT: ",Q$(C,1)
3290 GOSUB 1020
3300 L=LEN(Q$(C,1))
3310 CLS
3320 PRINT:PRINT " ","SELECTION FOR ";SL$;" = ";Q$(C,1):PRINT
3330 GOSUB 2300
3340 FOR I=0 TO (C-1)
3350    IF FL=0 THEN SO$=Q$(I,PI) ELSE SO$=LEFT$(Q$(I,6),L)
3360    IF SO$ <> Q$(C,1) THEN GOTO 3380
3370    GOSUB 2360
3380 NEXT I
3390 PRINT:PRINT"   SELECTION COMPLETE. DO YOU WANT A HARD COPY? (Y/N) ";
3400 AN$ = INPUT$(1):PRINT AN$
3410 IF AN$="N" OR AN$="n" THEN GOTO 4250
3420 IF AN$<>"Y" AND AN$<>"y" THEN GOTO 3390
3430 PRINT:PRINT"   CHECK PRINTER IS ON AND PRESS ANY KEY TO START"
3440 X$=INPUT$(1)
3450 LPRINT:LPRINT " ","SELECTION FOR ";SL$;" = ";Q$(C,1)
3460 GOSUB 3010
3470 FOR I=0 TO (C-1)
3480    IF FL=0 THEN SO$=Q$(I,PI) ELSE SO$=LEFT$(Q$(I,6),L)
3490    IF SO$ <> Q$(C,1) THEN GOTO 3510
3500    GOSUB 3090
3510 NEXT I
3520 LPRINT:LPRINT:LPRINT
3530 GOTO 4250
3540 REM *** START PROGRAM ***
3550 C=0
3560 FR = FRE(0)/100
3570 N=74
3580 PA=0                         'PAGE NUMBER
3590 D=1
3600 CLS
3610 KEY OFF                      'TURN OFF FUNCTION KEY PROMPTS
3620 PRINT:PRINT:PRINT
3630 PRINT " "," ","* * * * * * * * * * * * * *"
3640 PRINT " "," ","  S U P ' R   D U P ' R  "
3650 PRINT " "," ","* * * * * * * * * * * * * *":PRINT:PRINT
3660 PRINT " ","       Copyright (C) 1985 K5IJ Sup'r Software":PRINT:PRINT
3670 LOCATE 11,3:PRINT TAB(50)
3680 LOCATE 11,3:PRINT "IS THIS THE SWEEPSTAKES? (Y/N) ";
3690 SW$ = INPUT$(1):PRINT SW$
3700 IF SW$ = "y" THEN SW$ = "Y"
```

```
3710 IF SW$ = "N" OR SW$ = "n" THEN GOTO 3730
3720 IF SW$ <> "Y" AND SW$ <> "N" AND SW$ <> "n" THEN GOTO 3670
3730 LOCATE 13,3:PRINT TAB(65):LOCATE 13,3
3740 PRINT "DO YOU WANT ALL-BAND OR SINGLE-BAND DUPE CHECKING? (A/S) ";
3750 SA$ = INPUT$(1):PRINT SA$
3760 IF SA$="s" THEN SA$="S"
3770 IF SA$ <> "S" AND SA$ <> "a" AND SA$ <> "A" THEN GOTO 3730
3780 LOCATE 15,3:PRINT TAB(40):LOCATE 15,3
3790 PRINT "DO YOU WANT AUTO-SAVE? (Y/N) ";
3800 SV$ = INPUT$(1):PRINT SV$
3810 IF SV$ = "y" THEN SV$ = "Y"
3820 IF SV$ <> "N" AND SV$ <> "n" AND SV$ <> "Y" THEN GOTO 3780
3830 LOCATE 17,3:PRINT TAB(50):LOCATE 17,3
3840 PRINT "IS THERE A DISK FILE TO INPUT? (Y/N) ";
3850 AN$ = INPUT$(1):PRINT AN$:PRINT:PRINT
3860 IF AN$="N" OR AN$="n" THEN GOTO 4050
3870 IF AN$<>"Y" AND AN$<>"y" THEN GOTO 3830
3880 PRINT "  PUT DISK WITH FILE <LOG.DAT> IN DRIVE B AND PRESS ANY KEY"
3890 X$=INPUT$(1)
3900 PRINT:PRINT"          . . . Loading"
3910 OPEN "I", #1, "B:LOG.DAT"
3920 IF SW$ <> "Y" THEN GOTO 3970
3930 INPUT #1,N
3940 FOR I=0 TO N-1
3950    INPUT #1,SE$(I)      'LOAD SWEEPSTAKES INFO INTO MEMORY
3960 NEXT I
3970 IF EOF(1) THEN GOTO 4020
3980 FOR J=1 TO 7
3990    INPUT #1, Q$(C,J)        'LOAD DISK FILE INTO MEMORY
4000 NEXT J
4010 C=C+1:GOTO 3970
4020 CLOSE
4030 BA$=Q$(C-1,7)
4040 IF C<>0 THEN GOTO 4250      'CHECK FOR FIRST CALL
4050 IF SW$ <> "Y" THEN GOTO 4100
4060 FOR I=0 TO N-1
4070    READ SE$(I)
4080 NEXT I
4090 RESTORE
4100 CLS
4110 LOCATE 9,3:PRINT TAB(40)
4120 LOCATE 9,3:INPUT "  ENTER BAND: ",BA$
4130 IF BA$ = "" THEN GOTO 4110
4140 IF BA$<>"10" AND BA$<>"15" AND BA$<>"20" AND BA$<>"30" AND
     BA$<>"40" AND BA$<>"80" AND BA$<>"160" THEN PRINT "  ";BA$;" IS
     NOT A VALID BAND":GOTO 4110
4150 LOCATE 10,1:PRINT TAB(40):LOCATE 12,3:PRINT TAB(40)
4160 LOCATE 12,3:INPUT "  ENTER FIRST CALL: ",Q$(C,1)
4170 IF Q$(C,1) = "" THEN GOTO 4150
4180 IF LEN(Q$(C,1)) < 12 THEN GOTO 4210
4190 PRINT:PRINT "  CALLSIGN TOO LONG, TRY AGAIN"
4200 GOTO 4150
4210 GOSUB 1020
4220 IF VAL(Q$(C,1)) > 9 THEN GOTO 4100    'JUMP TO START IF BAND ENTERED
4230 GOSUB 1100
4240 C=1
4250 CLS:PRINT
4260 PRINT "  Dele  Pick  SAve  SOrt  View  Quit";TAB(43);
4270 PRINT "BANDS:  10  15  20  30  40  80  160"
4280 PRINT STRING$(79,"-")
4290 IF SW$ <> "Y" THEN GOTO 4430
4300 LOCATE 4,1
4310 PRINT " "," ","SECTIONS NOT WORKED = ";N
4320 IF N=0 THEN PRINT TAB(34) "CLEAN SWEEP!!!":GOTO 4370
4330 FOR I=0 TO N-1
4340    PRINT " ";SE$(I);" ";
4350 NEXT I
4360 PRINT TAB(79) " "
4370 LOCATE 10,1
4380 PRINT STRING$(79,"-")
4390 LOCATE 14,1
4400 FOR I = 1 TO 6
4410   PRINT TAB(70) " "
4420 NEXT I
4430 LOCATE 11,1
4440 PRINT "  ";Q$(C-1,1);" ENTERED AT ";Q$(C-1,3);
4450 PRINT TAB(33)"CONTACTS =";C;TAB(50)INT((FRE(0)/FR)+.5)"% MEM";
```

cordingly. With auto-save on, you should hear the B drive whirring after every 10th call entered.

With every few calls entered, the memory percentage displayed in the status line will decrease slightly. If it looks like you are using up memory too fast, don't panic. Later, I'll tell you how to reduce the data size.

Type VIEW or V. The screen will clear and you will see a list, in chronological order, of the contacts you have made. At the end of the list, you are asked if you want the list printed. If so, be sure your printer is on, and type Y; if not, just type N.

Enter DELE or D. You are asked for the call sign to delete and the band (if applicable). Before making the deletion, the program will query you again, just to be sure you really mean it.

With the ENTER NEXT CALL: prompt back, type PICK or P. A line will come on, asking the FIELD TO SELECT: Type in COMMENT, then, when asked VALUE TO SELECT: type an ARRL Section. The screen will again clear and you should see the data on the contacts that are in the selected section. Try it with other fields, such as BAND or MY RST.

The SAVE or SA command will cause all data on file to be preserved on the B disk. Use this command whenever you want to take a break (or at least every few calls if not using auto-save), and the program creates a file on the B disk, called, "LOG.DAT." This is the file that is read when you start the program and you are asked if there is a disk file to input.

Use the SORT or SO command only when you finish operating and have made a printed copy of the data (with the VIEW command). This function sorts the calls alphabetically, writing the new data over the old. Warning: Once data is sorted it cannot be unsorted unless you change the program for a chronological sort! When the sort is complete, you will see a display of the calls and again you can select a hard copy. If you continue operating, the new calls will be added chronologically to the sorted calls.

Saving to a disk after a sort will write the sorted file on top of the original file; you may want to change disks before you do this. It's a good idea to make a backup copy of the chronological log.

Finally, the QUIT or Q command lets you exit the program. Before actually quitting, you are asked if you want to save the data. This is your last chance. Data not saved is lost forever!

Memory Compression

Because of the way data is stored, more memory is used than required for the character strings which comprise the call-sign data. As you enter calls, you will see the memory percentage decrease rapidly, and it will look as if your machine will run

out after about 300 calls. To regain the space, use the SAVE command to store the data, then exit the program with QUIT. Restart the program with the RUN command in BASIC, and reload the data disk when asked. You will see a significant increase in the percentage of memory available. Admittedly, this is the Rube Goldberg method; perhaps this will be solved when I finish version two.

Performance and Modification

This program is a memory hog; before any calls have been entered, it will gobble up about half of your 64 kbytes of memory. To determine how it reacts to actual input, I ran some experiments measuring storage capacity and execution time.

I tested the program in a simulated contest and found that after 500 calls, RSTs and sections had been entered, 52% of the memory remained. There was a 5.5-second dupe-search time for the 500th call, and sorting took 1 hour 40 minutes. Twelve percent of the memory remained after the sort, showing that some room existed for more contact information.

Since 500 contacts may not be enough for an active contester, I began to investigate ways to increase the available memory. With some reduction in program capability, I've been able to increase the storage to almost 1000 calls.

The easiest way to improve the memory size is to delete all comments from the program. I added comments to aid in your understanding: When you enter the program, you can eliminate them and gain a lot of storage. Begin typing at line 1000, then only type the word REM on the comment lines to preserve numbering. All comments after an apostrophe (') may also be deleted.

After making these modifications and increasing the size of the matrices in line 1000 to 600, I was able to load 600 calls, RSTs and sections, and have 46% of the memory remaining. The sort took 2 hours 21 minutes and left 2% of the memory. This indicates that 600 calls may be the limit for sorting. The dupe search time for the 600th call was 6½ seconds.

Since the sort routine is limited to 600 calls, I eliminated it and the P$ matrix in line 1000 to see if more calls would fit. More did. With Q$ set to 800, I was able to load 800 calls and still have 16% of the memory left. The dupe search time for the 800th call was 8.3 seconds.

If 800 is still not enough for you, try removing the DELETION and PICK subroutines. These are relatively large pieces of the program and may put you over the 1000 mark. When you delete a command function, be sure to also delete the applicable line (between 4560 and 4610) that tests for the command.

Some other suggestions for increasing storage are:

- Eliminate the DATE field for call-sign

```
4460 PRINT TAB(63)"BAND: ";BA$;" METERS  "
4470 LOCATE 13,1
4480 PRINT TAB(70) " "
4490 LOCATE 13,1
4500 INPUT "  ENTER NEXT CALL: ",Q$(C,1)
4510 IF LEN(Q$(C,1)) < 2 AND Q$(C,1) < "A" THEN GOTO 4470
4520 IF LEN(Q$(C,1)) < 12 THEN GOTO 4550
4530 PRINT:PRINT "  CALLSIGN TOO LONG, TRY AGAIN"
4540 GOTO 4430
4550 GOSUB 1020
4560 IF Q$(C,1)="DELE" OR Q$(C,1)="D" THEN GOTO 1630
4570 IF Q$(C,1)="PICK" OR Q$(C,1)="P" THEN GOTO 3130
4580 IF Q$(C,1)="SAVE" OR Q$(C,1)="SA" THEN GOSUB 1450:GOTO 4390
4590 IF Q$(C,1)="SORT" OR Q$(C,1)="SO" THEN GOTO 2400
4600 IF Q$(C,1)="VIEW" OR Q$(C,1)="V" THEN GOTO 2650
4610 IF Q$(C,1)="QUIT" OR Q$(C,1)="Q" THEN GOTO 4980
4620 IF VAL(Q$(C,1)) <= 9 THEN GOTO 4760      'TEST FOR BAND CHANGE
4630 REM *** BAND CHANGE ROUTINE ***
4640 IF Q$(C,1)="10" THEN BA$ ="10": GOTO 4430
4650 IF Q$(C,1)="15" THEN BA$="15": GOTO 4430
4660 IF Q$(C,1)="20" THEN BA$="20": GOTO 4430
4670 IF Q$(C,1)="30" THEN BA$="30": GOTO 4430
4680 IF Q$(C,1)="40" THEN BA$="40": GOTO 4430
4690 IF Q$(C,1)="80" THEN BA$="80": GOTO 4430
4700 IF Q$(C,1)="160" THEN BA$="160": GOTO 4430
4710 PRINT "  ";Q$(C,1);" IS NOT A BAND -- ENTER AS CALL? (Y/N) ";
4720 AN$ = INPUT$(1):PRINT AN$
4730 IF AN$="N" OR AN$="n" THEN GOTO 4390
4740 IF AN$<>"Y" AND AN$<>"y" THEN GOTO 4710
4750 Q$(C+1,7)=Q$(C,7)
4760 PRINT:PRINT "  . . . Looking"TAB(40):PRINT:PRINT
4770 FOR J=0 TO (C-1)
4780     IF SA$ = "S" THEN GOTO 4800
4790     IF Q$(J,1) <> Q$(C,1) THEN GOTO 4850 ELSE GOTO 4810
4800     IF Q$(J,7)+Q$(J,1)<>BA$+Q$(C,1) THEN GOTO 4850
4810     PRINT " ","DUPE ON "Q$(J,7);" METERS AT ";Q$(J,3);", ";Q$(J,2)
4820     PRINT:PRINT "  PRESS ANY KEY TO CONTINUE"
4830     X$=INPUT$(1)
4840     GOTO 4390
4850 NEXT J
4860 LOCATE 18,3:PRINT TAB(55):LOCATE 18,3
4870 PRINT "NO DUPE FOUND. ENTER CALL IN FILE? (RETURN/Y/N) ";
4880 AN$ = INPUT$(1):PRINT AN$
4890 IF AN$="N" OR AN$="n" THEN GOTO 4390
4900 IF AN$<>"Y" AND AN$<>"y" AND AN$<>CHR$(13) THEN GOTO 4860
4910 SF=0                          'SECTION FLAG
4920 GOSUB 1100
4930 C = C+1                       'ADVANCE COUNTER
4940 IF INT(C/10)<>C/10 THEN GOTO 4960
4950 IF SV$="Y" THEN GOSUB 1480
4960 IF SF=0 THEN GOTO 4390
4970 GOTO 4300
4980 REM *** QUIT/SAVE ROUTINE ***
4990 CLS:PRINT:PRINT:PRINT:PRINT:PRINT
5000 PRINT " ","      *** WARNING  WARNING  WARNING ***":PRINT:PRINT
5010 PRINT:PRINT " ","   IF NOT SAVED, DATA MAY BE LOST FOREVER!":PRINT
5020 PRINT:PRINT:PRINT "  DO YOU WANT TO SAVE THE CALLS? (Y/N) ";
5030 AN$ = INPUT$(1):PRINT AN$
5040 IF AN$="N" OR AN$="n" THEN GOTO 5070
5050 IF AN$<>"Y" AND AN$<>"y" THEN GOTO 5020
5060 GOSUB 1450
5070 PRINT:PRINT "  DO YOU WANT TO CONTINUE? (Y/N) ";
5080 AN$ = INPUT$(1):PRINT AN$
5090 IF AN$="N" OR AN$="n" THEN GOTO 5120
5100 IF AN$<>"Y" AND AN$<>"y" THEN GOTO 5070
5110 GOTO 4250
5120 PRINT:PRINT:PRINT:PRINT " "," ","HAPPY DX-ING":PRINT:PRINT
5130 KEY ON                        'RESTORE SCREEN
5140 REM *** SECTION DATA ***
5150 DATA "AB ","AK ","AL ","AR ","AZ ","BC ","CO ","CT ","DE ","EB "
5160 DATA "EMA","ENY","EPA","GA ","IA ","ID ","IL ","IN ","KS ","KY "
5170 DATA "LA ","LAX","MAR","MB ","MDC","ME ","MI ","MN ","MO ","MS "
5180 DATA "MT ","NC ","ND ","NE ","NFL","NH ","NLI","NM ","NNJ","NTX"
5190 DATA "NV ","OD ","OH ","ON ","OR ","ORG","PAC","PQ ","RI ","SB "
5200 DATA "SC ","SCV","SD ","SDG","SF ","SFL","SJV","SK ","SNJ","STX"
5210 DATA "SV ","TN ","UT ","VA ","VT ","WA ","WI ","WIN","WMA","WNY"
5220 DATA "WPA","WV ","WY ","YNT"
5230 END
```

data. You can write the date on the printed sheets when the contest is over. This change will decrease the memory needed for each contact by about 10%.

• Eliminate the ALL-CAPS subroutine and make all your entries in capital letters.

To retain the command capabilities, make up another disk with the original program, without the dupe checker, logger and DATA lines. Load the data file with this program when the contest is over and you will be able to sort, print, pick and delete all you like, but you won't be able to do any logging.

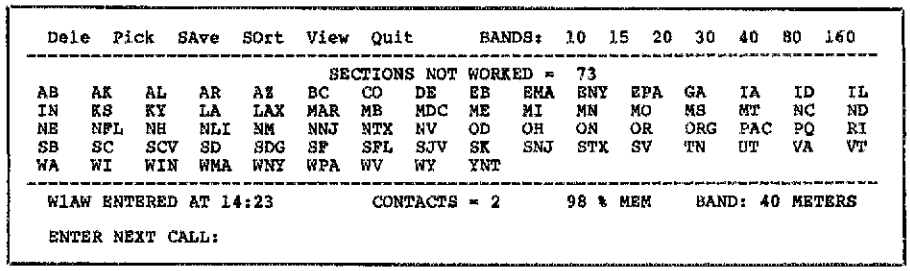


Fig. 1—The screen looks like this after a contact with W1AW. Notice that CT doesn't show up on the list of Sections not worked. Valid commands are printed in the upper-left corner of the display, with minimum abbreviations capitalized.

Operating Hints and Suggestions

1) Use the SAVE command liberally. If Mr. Murphy is reliable, a power failure will occur about 10 minutes before the end of the contest, wiping out your computer memory. Saving to disk will protect the data.

2) Don't SORT until the contest is over. Sorting takes time and memory and erases the chronological file, although it would be simple to change the program to save the sorted data to a different file.

3) The program does no error checking on RSTs or COMMENTs. These fields may be as long or as short as you like. To enter no comment, simply press the carriage return key.

4) Before the contest begins, enter the call AAA at the call-sign prompt, with no RSTs. For the comment field, type in the emission type and power output. This data will appear first in both the chronological listing and alphabetical sort, and can serve as a log header. The number of contacts will be one too high (as in Fig. 1), but a programming patch can fix this.

5) With several hundred calls on file, the SAVE function takes about a minute. You may want to change the parameter on the auto-save feature to a 25- or 50-call interval. The interval is set in line 4940; change the two occurrences of "10" to whatever you like.

6) If you are not in the Sweepstakes mode, the Section block is blank. The first three letters in the comment block are still capitalized, for proper operation of the PICK command, which looks only at the first three characters of the COMMENT field.

7) Try adapting the Sup'r Dup'r for contests other than the Sweepstakes. The 40 zones in the CW WWDX contest can be put into the DATA fields, and with a little modification to some other lines, you'll have a zone checker.

Conclusions

I hope I have whetted your appetite not just for this program, but for programming in general. Try this one out, change it around, and make it do what you want it to do. As long as you have a backup copy, you can't hurt anything by experimenting.

Keep on customizing, and it eventually becomes "your" program. Then you can throw away your written logs and join the ranks of the Sup'r Dup'r Troop'rs!

Acknowledgments

I'd like to thank Andy, WB4YZC, who suggested this project and numerous improvements. Thanks go also to the radio clubs in San Antonio, Texas, and at the Naval Postgraduate School, Monterey, California, whose members tested the program in several preliminary forms.

Strays

VIDEOTEX

☐ Do you know what it is? Its applications in Amateur Radio? Share your Videotex knowledge with your fellow amateurs. *QST* is always looking for good articles. Send your outline or manuscript to Chuck Hutchinson, *QST* Technical Editor, ARRL, 225 Main St., Newington, CT 06111, or give us a call at 203-666-1541.

I would like to get in touch with...

☐ anyone with a manual for a Measurements Corp. Model 82 signal generator, or information on its two-barrel attenuator. Jack Geist, N3BEK, 2205 Henderson Ave., Silver Spring, MD 20902.

☐ anyone owning Hammarlund radio equipment, such as the HQ-110, HQ-170 and HQ-500. Roger H. Runnels, WA5WCY, 11706 Wolf Run La., Houston, TX 77065.

☐ anyone with a schematic diagram or manual for an Olson Model KB-141 signal generator and tracer. John E. Gercken, KA9EPO, RR 1, Box 27, Bellflower, IL 61724.

☐ anyone with information, personal or published, on radio engineers, inventors and operators. W. Clem Small, KR6A, 26530 Parkside Dr., Hayward, CA 94542.

☐ anyone with a schematic diagram or manual for a Hallicrafters Model SX-104 receiver. Howard S. Robbins, KA8JIX, 15 Stonington Dr., Pittsford, NY 14534.

☐ anyone who has modified an ICOM IC-27H to cover frequencies outside the amateur band. Stanley A. Sines, WA3QGA, 15703 Bradford Dr., Laurel, MD 20707.

☐ anyone with information on software for an Apple computer for packet radio that will edit, make block transfers and permit remote control. W. F. Keleher, KA2ASL, 56 Robin St., Rochester, NY 14613.

☐ anyone with a circuit diagram for a programmable memory keyer for a 10-meter beacon. J. Mahagan, WB4JHS, 220 Covington Ave., Apt. 73, Thomasville, GA 31792.

A CW Receive Program for Atari Computers

Program your Atari to decode Morse.

By Stephen Stuntz, NØBF
1656 S. California St.
Loveland, CO 80537

Are you interested in adding CW receive capability to the CW keyboard program described in my previous article?[1] This article will tell you how to modify the program and interface circuit to turn your Atari® computer (400, 600XL, 800, 800XL or 1200XL) into a complete CW sending and receiving keyboard terminal.

The program is written in assembly language for maximum speed. The computer can copy Morse code at speeds from 5 to 70 words per minute (WPM), and it can track speed changes automatically. The Morse code characters are displayed in a conversational format rather than on a "split screen." In other words, characters sent and received are displayed on the same screen, in the sequence they occurred. Received characters are displayed in inverse video (dark letters on a light background), to distinguish them from transmitted characters. The messages scroll upward as they fill the screen. A word-wrap routine prevents received words from splitting across two lines.

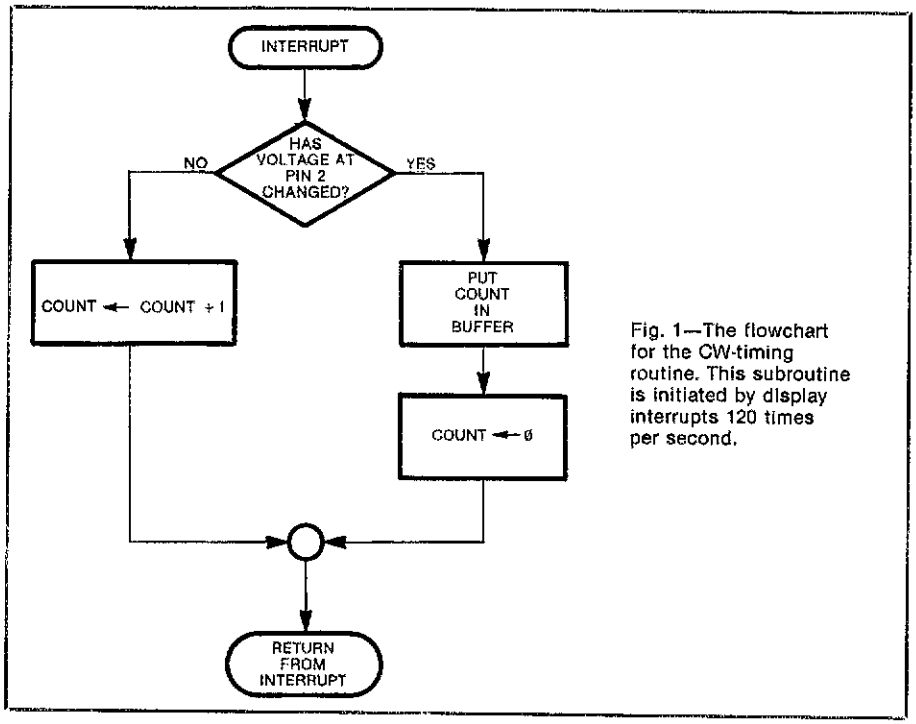


Fig. 1—The flowchart for the CW-timing routine. This subroutine is initiated by display interrupts 120 times per second.

The Program

The CW-receiving program consists of two important routines. The timing routine (Fig. 1) times the length of code elements (dots, dashes and spaces). The CW character-assembly loop (Fig. 2), determines what character has been received, and displays the character.

Timing Routine

To time the CW elements accurately, the timing routine must be executed periodically, interrupting whatever else the computer is doing. This is accomplished by having the timing routine be an *interrupt-service routine*. The Atari generates an interrupt 120 times per second. Whenever this interrupt occurs, the computer suspends execution of the current program and executes the timing routine. When the routine finishes, the computer returns to execution of the interrupted task. The timing routine monitors the output of the Morse receiving interface, which is connected to pin 2 of controller port 1. When this pin is grounded, the interface is receiving a dot or dash. When the pin is at 5 V, a space is being received. The timing routine compares the current state of the input to the previous state. If the state has not changed, the routine simply increments a counter. If the state of the pin has changed, then a Morse code element has just been completed. In this case, the counter value is placed into a buffer. The counter is set to zero, to time the next CW element.

The Character-Assembly Loop

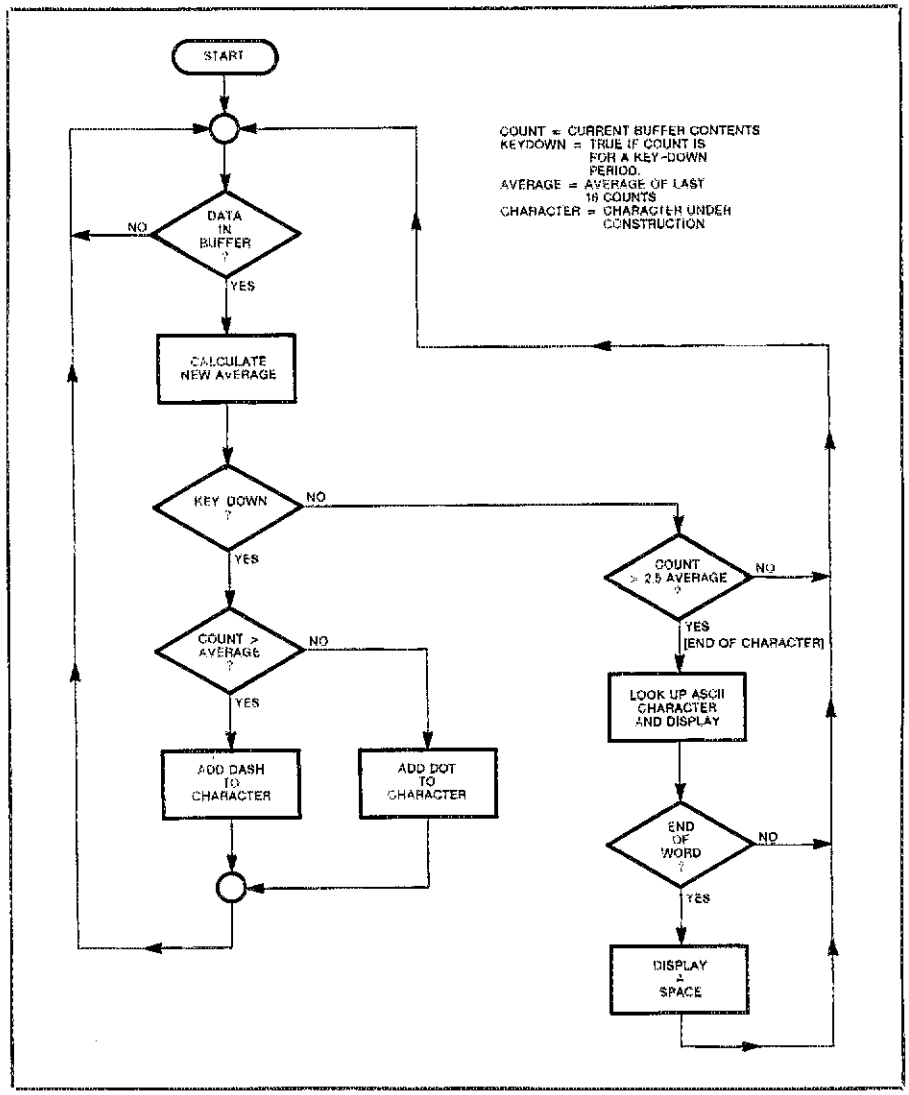
The received characters are interpreted and displayed by the character-assembly routine (Fig. 2). This is the task that is interrupted by the timing-interrupt routine. The character-assembly loop determines whether the buffer is empty or contains a new code element (dot, dash or space). If there is a new element in the buffer, the character-assembly routine determines whether it is a dot, dash, word space, character space or element space. If the element is a dot or a dash, the new element is added to the character "under construction." The character is stored as a byte with the following format: A 1 represents a dash, a Ø represents a dot, the character is formed from right (least-significant bit, or LSB) to left (most-significant bit, or MSB) and the last 1 encountered when reading from right to left indicates the end of the character. The letter "C" is stored as ØØØ1Ø1Ø1. When the character-assembly routine encounters a character space in the buffer, it interprets and prints the character it has been constructing. If the space is a word space, the character is interpreted and printed with a blank after it. There are also some instructions to make sure that a word does not wrap from one line to the next.

How Fast Is the Code?

The procedures just outlined will work

[1]Notes appear on page 53.

Fig. 2—The flowchart for the character-assembly loop. This subroutine tracks receiving speed and interprets, and displays received characters. →



well only if we can determine the length of dots, dashes and various spaces. We must somehow find out how fast the other station is sending. The program described here uses a simple strategy for determining the receiving speed. The average length of the last 16 code elements is proportional to the speed, and is used to find the speed in words per minute. Any key-down period greater than this average is a dash. Any key-down period less than the average is a dot. Key-up periods greater than 2.5 times the average are considered to indicate the end of a character. This simple technique yields good results, but you can experiment with it if you like.

Entering and Running the Program

For a complete discussion of how an assembly-language program like this is generated, see my previous article.[2] Like the transmit-only program discussed there, this program can be loaded from a cassette, a disk or a PROM cartridge. The PROM is the fastest way to load the program. If you want to enter and assemble the program yourself, listings are available from ARRL Headquarters.[3] Otherwise, you can purchase a disk, cassette or PROM cartridge.[4]

The Interface

To receive CW, we must have a filter to select a single signal and a detector to change the audio signal to a series of dc

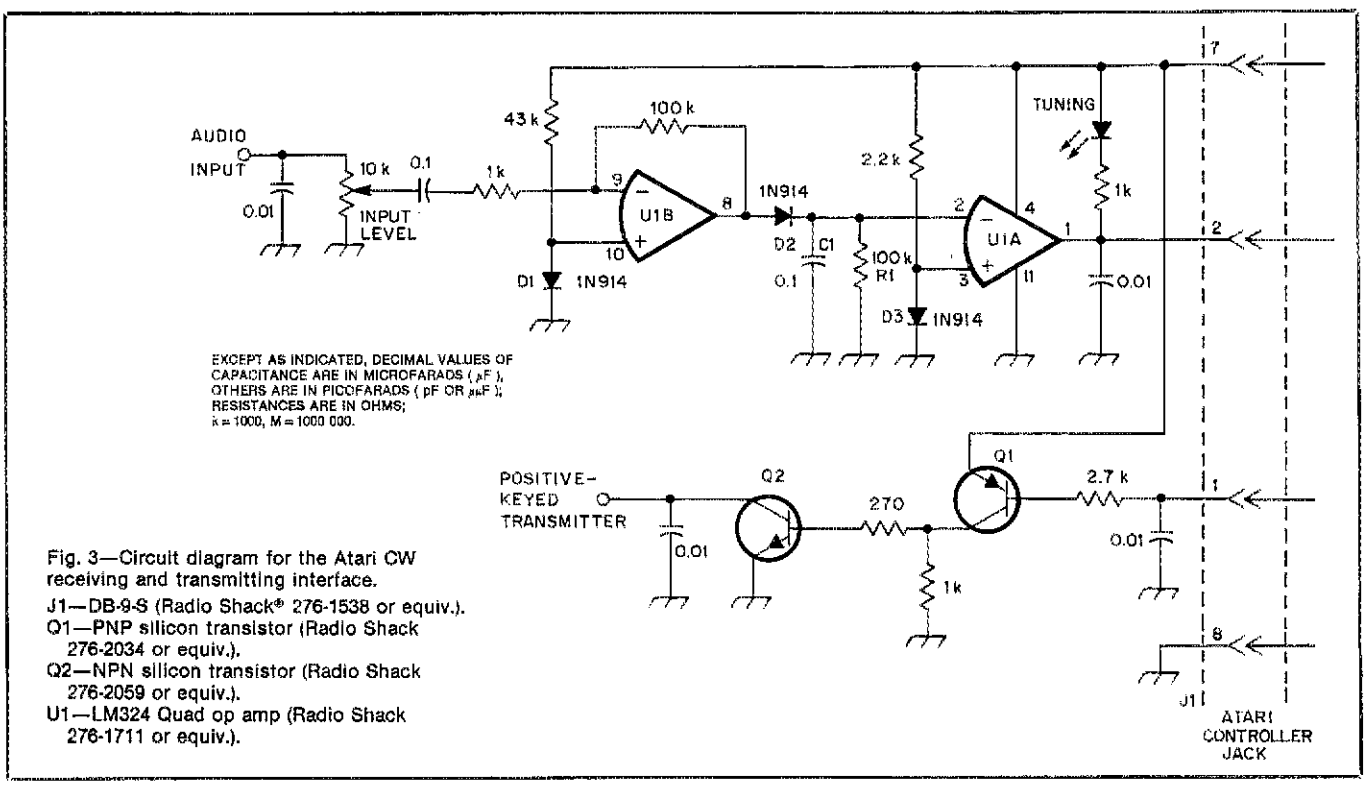


Fig. 3—Circuit diagram for the Atari CW receiving and transmitting interface.
J1—DB-9-S (Radio Shack® 276-1538 or equiv.).
Q1—PNP silicon transistor (Radio Shack 276-2034 or equiv.).
Q2—NPN silicon transistor (Radio Shack 276-2059 or equiv.).
U1—LM324 Quad op amp (Radio Shack 276-1711 or equiv.).

pulses. The circuit presented here does not include a filter. You can use a CW filter between your receiver and this interface. Amplifier U1B drives a peak detector formed by D2, R1 and C1. Inverter U1A provides a signal that is low when CW is present and high when there is no signal. The output of the inverter is supplied to the Atari and also drives an LED tuning indicator. When a signal is tuned correctly, the LED follows the received CW. The CW-sending circuit is the same as that presented in my previous article. Circuit layout is not critical, so you can build the interface dead-bug style.

Conclusions

Adding the receive capability to the CW keyboard program makes the computer a complete send/receive terminal that can be used to carry on a two-way conversation quite effectively. I have found that the conversational format used is easier to read than the split-screen format because the messages sent and received are displayed sequentially in the order they happen. The received text is easy to distinguish from transmitted text because of the inverse video. The receive portion of the program reacts quickly to changes in code speed and locks onto a new speed within two or three characters.

I have enjoyed developing this program, and I am enthusiastic about the capabilities of today's home computers applied to Amateur Radio. I would encourage any CW fan interested in computer applications to try this program. There are several modifications one might make, such as providing printer capability, adding message storage on disk and expanding the program to include RTTY. Experimenting with and adding to programs is part of the fun of programming.

Notes

[1]S. Stuntz, "A CW Keyboard Program for Atari Computers," *QST*, Feb. 1985, p. 32.
[2]See note 1.
[3]Program listings are available from the ARRL Technical Department. Send an s.a.s.e. to ARRL-TD, 225 Main St., Newington, CT 06111, and ask for "Atari CW."
[4]This program is available from the author for $10 on cassette or disk and $40 on EPROM cartridge. The ARRL and *QST* in no way warrant this offer.

New Products

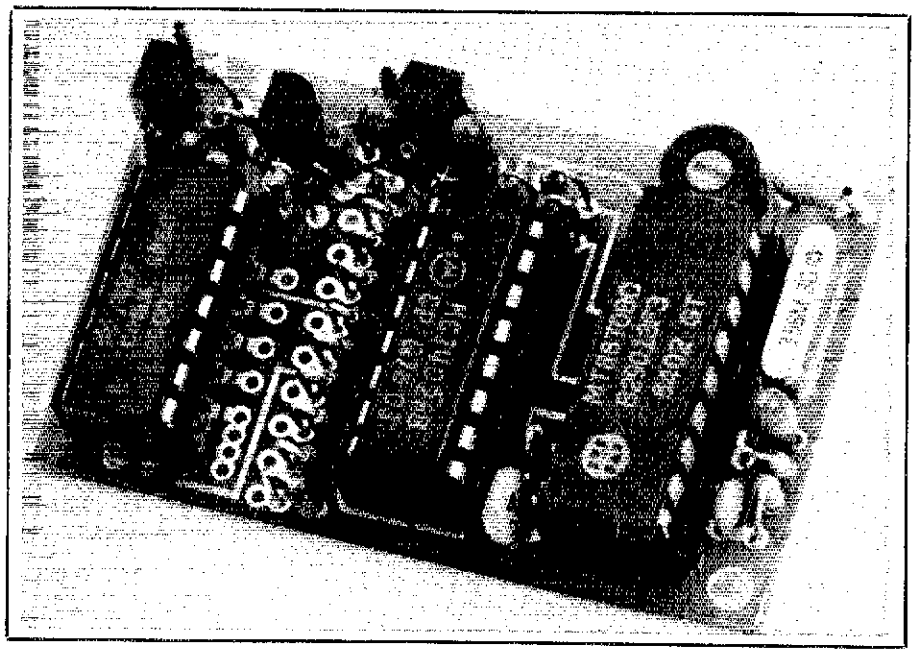
COMMUNICATIONS SPECIALISTS DTD-1 DTMF DECODER

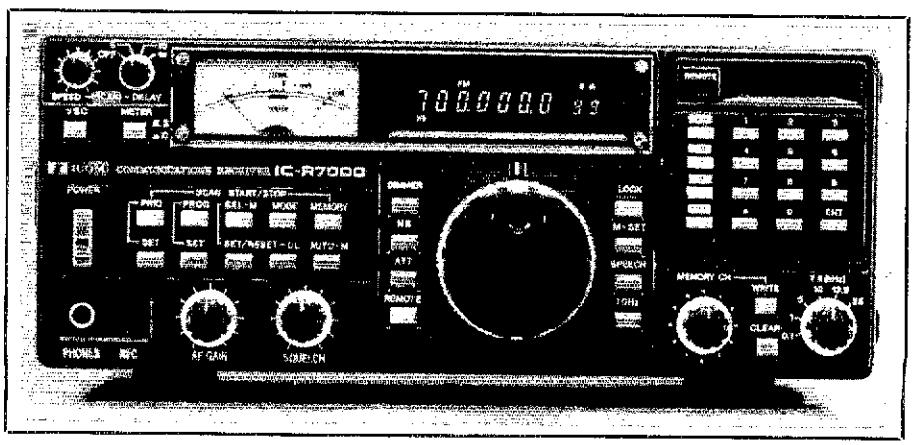
☐ The DTD-1 is a small (0.4 × 1.25 × 2 in HWD), simple, high-quality DTMF (dual tone multifrequency) decoder. It will provide a latched or momentary open-collector output for single-function operations. The DTD-1 is capable of decoding any one of 5040 four-digit codes, and operates well in bad signal-to-noise environments. Price class: $60. For more information, contact Communications Specialists, Inc., 426 West Taft Ave., Orange, CA 92665, tel. 1-800-854-0547 or 714-998-3021. A free catalog is available on request. — *Paul K. Pagel, N1FB*

ICOM IC-R7000 RECEIVER

☐ The IC-R7000 receiver provides continuous coverage from 25 MHz to 2000 MHz, with specifications guaranteed from 25-1300 MHz. Features include 99 memory channels, direct keyboard or main tuning knob frequency access, and five switch-selectable tuning speeds. Scanning speed is adjustable, and scan selection is by memory, mode, programmable or priority. Operation is provided in FM, AM and SSB modes. The unit includes an S meter, dial lock, noise blanker, attenuator, narrow-wide filter selector and a fluorescent display with dimmer switch. The radio is conveniently sized at 4-3/8 in high × 11-1/4 in wide × 10-7/8 in deep.

An RC-12 infrared remote controller and a voice synthesizer are available as options. The IC-R7000 is available from ICOM America, Inc., 2380 116th Ave., NE, Bellevue, WA 98009-9029, tel. 206-454-8155. Suggested list price is $899. —*Bruce O. Williams, WA6IVC*





Product Review

Conducted By Bruce O. Williams, WA6IVC
Assistant Technical Editor

TAPR, Heathkit® and AEA Terminal-Node Controllers

Every so often, Amateur Radio discovers and embraces a new communications mode. In the late '40s there was the introduction of SSB, in the 70s 2-meter-repeater operation came into vogue and now in the mid '80s there is the rapid growth of amateur packet radio. We will explain the use of the terminal-node controller (TNC) as we review the the Heathkit HD-4040 and the AEA PKT-1 TNCs. Both are based on the original kit designed and marketed by the Tucson Amateur Packet Radio Corporation (TAPR), but they represent different approaches: The Heathkit unit is available only in kit form, while the AEA PKT-1 is available only assembled and tested. TAPR has produced two different TNCs. The original TAPR-1 is used as the baseline for the TNCs reviewed here. The TAPR-1 is no longer in production, but the two designs considered here follow the TAPR-1 kit so closely, we will use the term "TAPR" to describe any features that are common to all of the designs (for example, the TAPR software . . .). Differences among the three units will be described as well. The TAPR-2 is currently available. It reflects a complete change in design and configuration, as it uses Z80® technology and is considerably smaller.

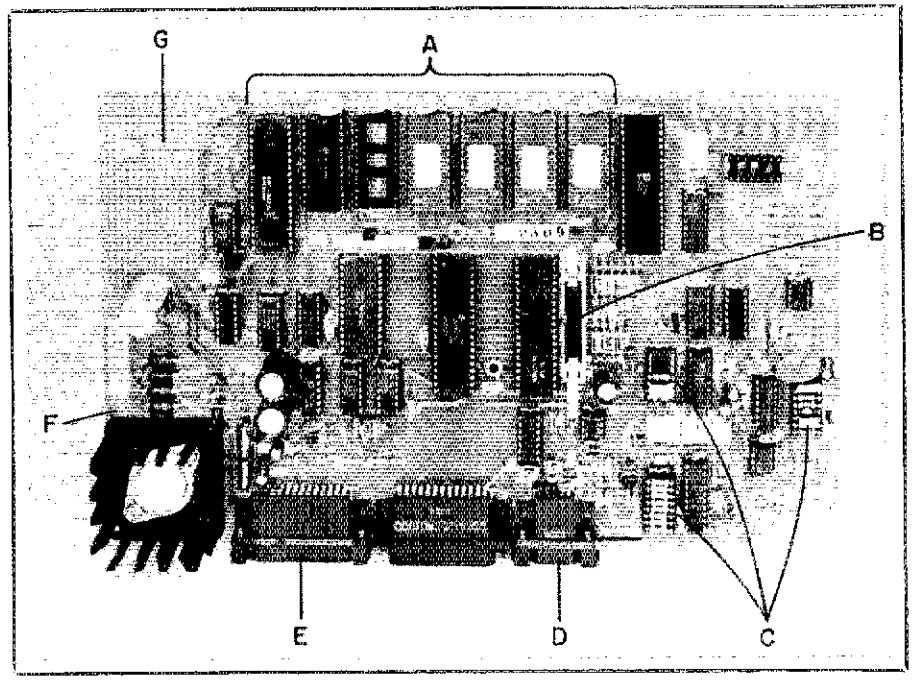


Fig. 1—The TAPR TNC board. The HD-4040 PC board, Fig. 3, is essentially the same. A marks the CPU and memory ICs. The modem disconnect header at B is used to connect an external modem. Component headers, C, make it easy to change the tones and frequency shift of the internal modem. The radio connects at D, and the terminal or computer connects at E. Power-supply components are shown at F. The wire-wrap field at G allows small circuits to be added to the TNC.

While it is outside the scope of this review to provide a complete introduction to packet radio, we must explain what a TNC does. Briefly, a TNC receives data from a computer or terminal, divides that data into small "packets" of information, and sends the packets to a transmitter. In the other direction, the TNC accepts packets from a receiver, converts them into data, and sends the data to a computer or terminal. The transmission and reception of packets, the detection and correction of errors in packets, and the exact format of each packet is managed by a *protocol*. The protocol can be thought of as a program that runs on a microprocessor in the TNC.

While there are many diverse applications of packet radio, they can be roughly divided into two categories: *conversational operation*, in which the operator types at a terminal as though in a standard RTTY QSO; and *block-oriented operation*, in which large blocks of data (computer programs, messages, pictures, and so on) are exchanged. Each of these modes of operation makes different demands on a packet radio system, and these demands must be kept in mind when selecting a TNC. More information on the ins and outs of packet radio may be found in the July and August 1985 issues of *QST*.[1]

The Heathkit HD-4040 TNC Kit

The HD-4040 kit includes a good-quality PC board, identical to the TAPR original, complete with silk-screened component locations and solder mask; bags of parts; a painted and labeled cabinet; a couple of hundred pages of documentation, including an assembly manual, a user's manual and loads of pictorial diagrams; and software in programmable-read-only memory (PROM). The only significant departure from the TAPR kit is that the RESET, BANK SELECT, SOFT/HARD RESET and RAM/ROM switches are not brought out to the front panel in the Heath version. The '4040 was assembled in a couple of evenings by Mark Wilson, AA2Z. Total construction time, including the initial calibration and test procedures, was just under 10 hours. Almost all of the components mount on the PC board, and anyone who can solder and follow directions should be able to complete this kit with no trouble.

Assembly Instructions

Although our kit was one of the first TNCs produced by Heath, the 72-page assembly instruction book is clearly written, thoroughly illustrated, logically structured and—perhaps most important—free of major errors. We found a few minor typographical errors, but only one error in the Operational Checks section that could lead a builder astray. More on that later. Heath had an advantage in that they could draw extensively on the outstanding documentation prepared for the original TAPR kit.

The instructions provide not only a parts list, but also hints on how to identify uncommon parts or parts with ambiguous numbers (for example, some of the ICs used can be identified by more than one part number, depending on the manufacturer). Most components come grouped in labeled envelopes, and static-sensitive ICs come in antistatic pouches. Many of the diodes, resistors and capacitors are taped together on a reel in the order that they are to be placed on the board. This thoughtful idea saves much time that might be spent locating the right part in a pile of loose components, and it eliminates any questions about which part is which. In our kit, all parts were present and accounted for.

As is usual with Heathkit, the manual devotes several pages to assembly hints and gives a short course on soldering. If you are unfamiliar with proper soldering techniques, take a few minutes to read this section carefully, and practice on junk-box parts. Many of the problems that inexperienced builders encounter are the result of poor soldering practices.

After finishing the kit, we feel that Heath has done an excellent job with their version of the TAPR kit. The one disappointment is the way the front-panel LEDs are mounted: First you solder the LEDs to the PC board, and then you must very carefully bend them so that each red lens fits through the appropriate hole in the front panel. This operation is a bit scary because of the fragile nature

[1]H. Price, "What's All This Racket About Packet?" *QST*, July 1985, pp. 14-17, and "A Closer Look at Packet Radio," *QST*, Aug. 1985, pp. 17-20.

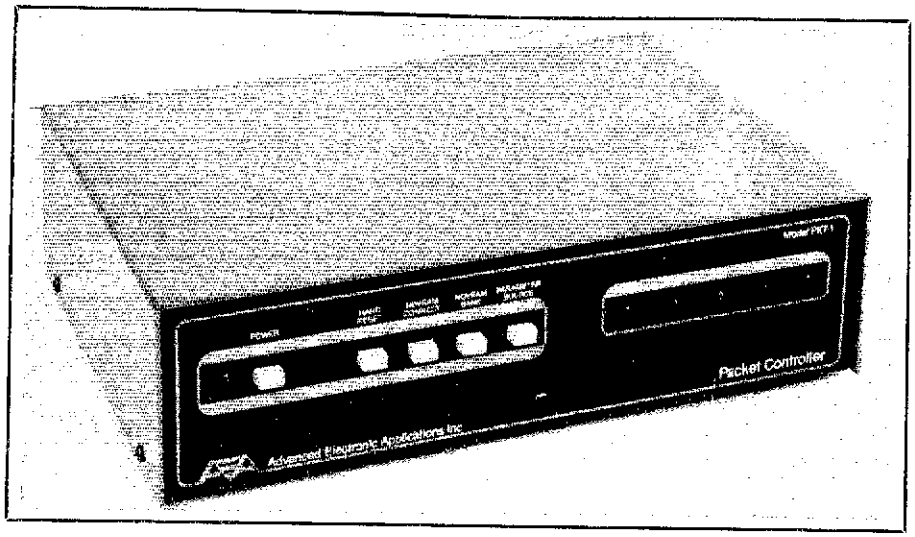


Fig. 2—The AEA PKT-1 comes completely assembled and tested. All that is required is connection to a radio and terminal, and it's ready to go.

of the components. A better approach might be to preform the leads before soldering them in place.

Checkout and Troubleshooting

Initial checkout of the TNC is straightforward, but there is one error that can leave you scratching your head. Under Step 2 of the Operational Checks, Heath tells you that when you switch the power on, the CW ID LED (D2) will light and then go out after one to two seconds. In fact, the opposite is true! After one to two seconds, D2 will light up and stay on.

Chances are good that your TNC will "come up running" if you follow directions and solder carefully. If not, refer to the troubleshooting section in the assembly manual. If you still have a problem, Heath has a technical assistance number you can call for help.

Calibration

The TNC includes a modem based on the popular EXAR 2206 and 2211 ICs. This modem must be calibrated before the TNC can be used on the air. Normally, you would need a frequency counter or oscilloscope to calibrate the modem. The TNC contains a computer and an accurate clock, however, so the TNC can be used to calibrate the modem. A CALibrate command is sent from the terminal to the TNC, and the TNC software provides calibration instructions and feedback on the terminal screen. Modem tones are adjusted using trimmer potentiometers on the PC board. LEDs on the board indicate which way the controls should be turned. Modem calibration, using the TNC computer and built-in software, is a 10-minute procedure.

The Terminal Interface

To communicate, a TNC must be connected to a terminal or a computer. The information on interfacing that appears in this section, and the section that follows, applies to the AEA TNC as well as the Heathkit. The TAPR design uses the RS-232-C interface standard for this TNC-to-computer connection. The RS-232-C interfaces are available for most home computers, and stand-alone terminals usually employ the RS-232-C standard.

The TAPR terminal interface software accommodates terminals running between 50 bauds and 19.2 kbauds. When a terminal is first connected to the TNC, an "autobaud" program determines how fast the terminal is transmitting. Terminals can use either 7- or 8-bit ASCII, with one or two stop bits.

Radio Interfacing

The TNC sends packets through the modulator to the radio transmitter and receives packets from the receiver through the demodulator. The TNC must be connected to the transmitter microphone input and the PTT line, and to the receiver output. For most radios, this is as easy as hooking up a microphone and a speaker. Several exceptions to this rule are listed in the TNC manuals, and hookup procedures for the exceptions are provided. We have used the TAPR TNCs with several different radios, from small hand-held radios to computerized HF rigs, and have never had any trouble getting the TNC to transmit and receive properly. The modem circuit is well designed and does not rely on critical receiver and transmitter adjustments.

The AEA PKT-1

One reason TAPR designed the TNC was to make packet radio popular. To induce commercial manufacturers to enter packet radio, TAPR sold, for a nominal fee, nonexclusive commercial rights to the TNC design. The PKT-1 resulted from the purchase by AEA of TAPR's "OEM package." This TNC runs the same software as the TAPR TNC and employs almost the same hardware. It comes assembled, tested and warranted. If you want a factory-supported TNC, or do not have the time, inclination or ability to build a kit, the PKT-1 is a way to get the TAPR TNC.

The differences between the TAPR/Heath TNC and the PKT-1 are:

1) The PKT-1 is powered from an outboard 12-V dc supply (not included with the unit), while the TAPR and Heath versions contain an ac-operated supply.

2) Some components on the TAPR and Heath TNCs are mounted on DIP headers and, being easily removable, allow the modem to be quickly reconfigured. These same components are soldered to the board in the PKT-1 (although a header could be installed).

3) The TAPR and Heath TNCs provide a "modem disconnect" header that can be used to connect an external modem. The PKT-1 does not have this header, but room exists on the PC board to install one.

4) The software for all three TNCs supports a parallel input/output (PIO) chip. This chip is supplied with the TAPR and Heath TNCs, but not with the PKT-1. The PIO is not used in normal operation.

5) AEA fixed a problem with the original TAPR design. On occasion, the contents of the nonvolatile RAM (NOVRAM) would be garbled when the unit was turned off. AEA corrected this problem.

None of the above differences is critical, except the lack of DIP headers on the PKT-1. The 12-V dc supply for the PKT-1 is, in fact, useful for portable and emergency operation. You can, if you wish, add the missing headers, connectors and chip to the PKT-1.

Operation

In discussing operation, we will use the term "TNC" to refer to all three versions of the TAPR design. The question, "How does the TNC operate?" is best answered in several parts, bearing in mind how the TNC is used. On one hand, it is connected to another TNC via radio. On the other hand, it is connected through the RS-232-C interface to a computer or terminal.

The TNC Computer

The heart of the TNC is a Motorola 6809 microprocessor with its associated memory. The TNC comes with 32 kbytes of read-only memory (ROM) and 8 kbytes of random-access memory (RAM). The ROM holds the TNC operating programs. The RAM is used to hold data before it is transmitted and after it is received. The 8 kbytes of RAM have been sufficient for all packet-radio operation that we have done, including the remote operation of a computer over packet radio. There is an extra memory socket on the PC board that can be used to expand either ROM or RAM.

The Modem

The modem is the "mouth and ears" of the TNC, and the TAPR designers paid special attention to this important subsystem. During design and layout, great care was taken to make the EXAR chips perform well. A filter is included ahead of the demodulator to accommodate the audio characteristics of most FM receivers. This filter, and an extensive redesign of the demodulator during TAPR's initial testing, have produced a demodulator that is both stable and sensitive. Although the EXAR demodulator was not designed to work in a noisy radio environment, the TAPR design performs well. In the TAPR and Heath units, the components that set the modem shift and center frequency, and determine the characteristics of the pre-demodulator filter, are located on DIP headers, and can be quickly changed. Thus, these units can be used both on VHF, where the shift is 1000 Hz, and on HF, where the usual shift is 200 Hz. If you want to use an external modem, you simply plug it into the modem disconnect header.

Other Hardware

The TNC uses a WD1933 high-level data-

link controller (HDLC) to process packets. The controller checks incoming packets to make sure that they conform to the protocol and that they are error free. It then passes bytes of data and control information to the TNC computer. When transmitting packets, the HDLC chip takes addresses and data from the TNC computer and formats a packet for transmission. The HDLC chip calculates the critical *frame check sequence* (FCS), that helps to detect errors in packets, for each packet sent and received. You can build a TNC without an HDLC chip, but using one allows the computer to process input/output on a byte-by-byte basis, rather than on a bit-by-bit basis. This results in approximately an eight-fold reduction in the number of microprocessor instructions needed to simply send or receive a packet.

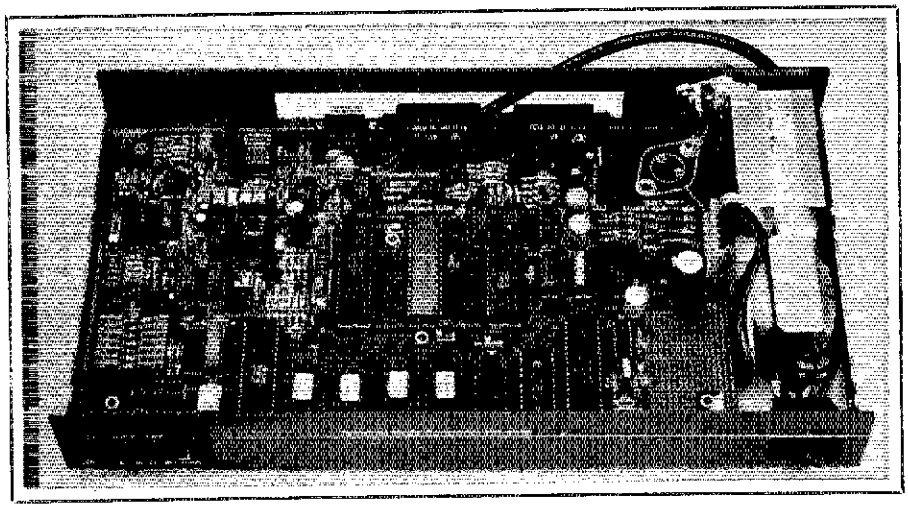


Fig. 3—The Heathkit HD-4040 is supplied in kit form, with cabinet and power supply, and can be assembled in about 10 hours. The power-supply regulator mounts to the rear cabinet panel, eliminating the heat sink.

Protocol Software

The TNC software that controls the packet radio 'connection' must adhere strictly to a protocol that specifies how packets should be addressed, how errors are to be handled, and how to "establish connection" to and "disconnect" from another TNC. These three TNCs implement both the old VADCG protocol and the ARRL standard AX.25[SM Pending] protocol. We have had experience only with the AX.25 software. Implementation of this protocol seems to be correct and bug-free, making the TNC compatible with all other AX.25 TNCs. The full AX.25 protocol is implemented, including the ability to operate through as many as eight digital repeaters ("digipeaters") and to act as a digipeater for other stations.

The AX.25 standard is mature and in widespread use. Although it is unlikely to change, replacement of four inexpensive PROMs in the TNC will allow it to change with the standard. Whenever new software becomes necessary or desirable, TAPR, Heath and AEA say they will make new PROMs available.

Command Software

In addition to protocol software, a TNC must have software to allow the user to configure the TNC and to send packets to and receive them from the protocol program. The TNC software allows many commands, is easy to use, and is free from bugs.

A list of the commands available to the TNC user takes many pages in the user's manual. Everything from packet protocol timing to the size of the terminal screen display can by changed by the user. The commands are logical and easy to remember. For instance, to connect to station KE3Z, simply type CONNECT KE3Z. To connect to KE3Z through the W1AW digipeater, type CONNECT KE3Z VIA W1AW. Simple, isn't it? Like most Amateur Radio equipment, the TNC has a few commands and controls you will use regularly, and dozens more you will seldom use.

Although we do not think that a complete list of commands is necessary here, we will discuss how the available commands facilitate the two modes of packet-radio operation mentioned earlier: conversational operation and block-oriented operation.

Conversational Operation

When most operators first get on the air with packet radio, they want to "talk" to someone; they want to sit at the keyboard and type messages to other operators on the network and have them type back. We call this "conversational operation." TAPR calls this mode the "converse mode." You can enter the converse mode by typing CONV and leave it by typing CONTROL-C.

Although conversational operation may sound simple, there are several operating parameters that you may want to customize. The TNC provides commands to change these parameters. For instance, in packet radio, it is not desirable to transmit each character as it is typed. Characters are saved and sent in groups. This means, among other things, that the "hunt-and-peck" typist doesn't have to transmit while looking for the next key, and that one frequency can accommodate several simultaneous QSOs.

If characters are not transmitted as they are typed, when are they sent? You can tell the TNC to send data several ways. Packets can be sent when the operator types a special character, after a certain number of characters have been typed, or after a fixed period of time. A combination of these methods is usually used. For instance, you might configure your TNC to send a packet after you type a CR or after you type 80 characters, whichever comes first. This will assure that packets do not become too long and that the receiving station gets each line as soon as it is complete. Adding a timer to send packets every 30 seconds assures that the receiving operator gets a steady flow of data.

We must also consider how received packets are presented to the computer or terminal connected to the TNC. We have already pointed out that the TNC can send and receive ASCII data at several speeds. In the converse mode, the operator also specifies how many characters can fit on a single screen line, whether a line-feed character should be sent after a carriage-return character, and whether the terminal will display lower-case characters. Several other parameters can be changed, but by now you should get the picture.

Much packet operation is conversational. The TAPR command set allows adjustment of operating parameters to compensate for such variables as terminal type, network congestion and typing speed. The TNC converse mode was designed and executed with both the novice and expert in mind.

Block-Oriented Operation

In view of the flexibility of the converse mode, you may wonder why any other modes are required. The need for other modes of operation stems from the desire to use packet radio for true computerized communications. A few such applications that come to mind are: program transfers, computer "time sharing," bulletin board operation and computer-graphics communications. For operations in these applications, you want the data sent by one computer to be received by another computer *unchanged*. You do not want an accidental CONTROL-C to put you back in command mode. This mode of operation is called "data transparent," and is identified as "transparent mode" in the TNC.

You put the TNC in transparent mode by typing TRANS. After this, data sent to the TNC is transmitted when a specified number of characters has been collected, or when a timer runs out. The number of characters and the length of time can be varied. To exit the transparent mode, a specially timed character sequence must be sent to the TNC. The timing and the special character sequence can be changed to suit specific applications and make it unlikely that the data being sent to the TNC by your computer will result in the TNC accidentally exiting the transparent mode.

The transparent mode is essential for many sophisticated packet-radio applications. In these TNCs the transparent mode is easy to use, and need only be used when necessary. Novice packet-radio operators ("packeteers") may never use the transparent mode, but it is available if needed. No operator is likely to outgrow the TNC.

Reading the Mail

Conversational and block-mode operation both entail transmission of data. Most amateurs do not spend as much time transmitting as they do "reading the mail." The TNC provides several commands that make it easy to monitor a network. These commands take advantage of the addresses that are sent with each packet, and allow the operator to choose

which station's packets he wishes to see. By typing MTO, followed by a list of stations, you tell the TNC to show you only packets addressed *to* those stations. MFROM does the same thing for packets *from* certain stations. If you want to read all the mail on a channel, simply type MALL-ON. These commands allow you to watch only traffic that interests you, rather than forcing you to see everything that is sent.

Other Commands

We have described a few of the TNC's commands. The designers of the TAPR software were very careful: There are commands to vary all of the important parameters of the TNC, but you need only memorize two or three commands to use the TNC. This careful design makes the TNC a joy to operate and ensures that the TNC will not limit the operator.

Conclusion

We are enthusiastic about these TNCs. They represent the beginning of a new realm of communications for radio amateurs. The original TAPR TNC was designed, implemented, debugged and marketed by a group of amateurs, and that makes it more exciting. That Heath and AEA have embraced this new mode and jumped at the chance to make TNCs available in quantity to the amateur community bodes well for the future of packet radio. If you want to join the packet revolution, take a look at these TNCs.

The HD-4040 is manufactured by Heath Company, Benton Harbor, MI 49022, tel. 616-982-3411; price class, $300. The PKT-1 is manufactured by Advanced Electronic Applications, Inc., P.O. Box C-2160, Lynnwood, WA 98036, tel. 206-775-7373; price class, $500.—*Jeff Ward, K8KA, and Mark Wilson, AA2Z*

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment "off-the-shelf" from Amateur Radio dealers. ARRL receives no remuneration for items presented in the Product Review or New Products columns.—Ed.]

The following ARRL-purchased Product Review equipment is for sale to the highest bidder. Prices quoted are minimum acceptable bids, and reflect a discount from the purchase price.

Sealed bids must be submitted by mail and be postmarked on or before November 27. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of a tie, the highest bid bearing the earliest postmark will be declared the successful bidder.

Please clearly identify the item you wish to bid on, using the manufacturer's name, model number or other identification number, if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by the successful bidder, FOB Newington. The successful bidder will be advised by mail of the successful bid. No other notifications will be made, and no information will be given by telephone to anyone regarding final price or identity of the successful bidder.

Please send your bids to Kathy McGrath, Product Bids, ARRL, 225 Main St., Newington, CT 06111.

Info-Tech M107 RTTY modem. Min. bid $130.

Info-Tech M44 AMTOR converter. Min. bid $207.

Trio-Kenwood TH-21AT 2-meter FM handheld transceiver, s/n 5042641, AJ-3 antenna adapter, SC-8T soft case, PB-21 battery pack and SMC-30 external speaker/microphone (as a package only—see April 1985 *QST*). Min. bid $172.

ICOM IC-471A 70-cm transceiver, s/n 01051, IC-SM-6 microphone (as a package only—see Aug. 1985 *QST*). Min. bid $533.

Amateur Radio Software

AEA-Soft AMTORTEXT-64, s/n 12. Min. bid $47.

New Products

CENTURION ACQUIRES EAR COM LINE

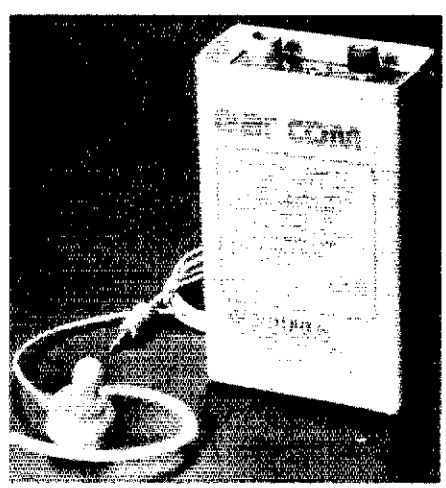
☐ Centurion International, Inc. has acquired the Ear Com product line. Ear Com is a miniature earpiece transducer that permits the user to send and receive voice communications through a radio set or intercom in high ambient-noise environments. The unit permits hands-free operation by the user, and can be used with protective gear and clothing such as a hard hat, gas mask, respirator or hearing protector.

The Ear Com functions as a remote microphone/speaker through the earpiece that picks up voice sounds through the user's otolaryngeal system. The control module amplifies, filters and conditions the voice signals, which are then passed on to the associated transceivers for transmission. Incoming audio signals are passed from the transceiver through the control unit to the earpiece. The system is compatible with AM, FM or SSB, and can be worn on a belt or installed in an automobile, motorcycle or aircraft.

For a free color brochure on the Ear Com system, contact Sales Department, Centurion International, Inc., P.O. Box 82846, Lincoln, NE 68501, tel. 402-467-4491 or 1-800-228-4563 (outside Nebraska).—*Bruce O. Williams, WA6IVC*

RADIO AMATEUR *CALLBOOK* PUBLICATIONS

☐ Three new publications—*The North American Callbook*, the *International Callbook* and the *Callbook Supplement*—have been announced for 1986 by Radio Amateur Callbook, Inc. The *North American Callbook* lists the licensed amateurs in all countries in North America plus those in Hawaii and U.S. possessions. This information is carefully screened and checked to ensure utmost accuracy. This volume contains international postal information, worldwide QSL bureaus, radio amateur census information, and much more.



The *International Callbook* lists calls, names and addresses for licensed amateurs in all countries outside North America. Coverage includes Europe, Asia, Africa, South America and the Pacific area (exclusive of Hawaii and U.S. possessions).

The *Callbook Supplement* is a new concept in Callbook updates. To be published on June 1, the new supplement will list the combined activity in both the *North American* and the *International* editions for the preceding six months. One supplement will bring you thousands of new licenses, address changes and "then and now" call changes from countries around the world.

For information or literature, contact the publisher, Radio Amateur Callbook, Inc., 925 Sherwood Dr., Box 247, Lake Bluff, IL 60044, tel. 312-234-6600—*Bruce O. Williams, WA6IVC*

Hints and Kinks

Conducted By Bob Schetgen, KU7G
Assistant Technical Editor

A BOOM MICROPHONE FOR THE KENWOOD TR-2500 HAND-HELD VHF TRANSCEIVER

☐ I had wanted a boom microphone for my TR-2500 for quite some time, but was reluctant to spend the money for ready-made accessories. Inexpensive electret microphone elements are sold by Radio Shack® and some mail-order suppliers.[1] A combination of the microphone element and an extra pair of lightweight stereo headphones seemed like the answer to my desire. The annual St. Patrick's Day parade (a big public-service event for my local club) provided motivation, and the system in Figs. 1 and 2 resulted.

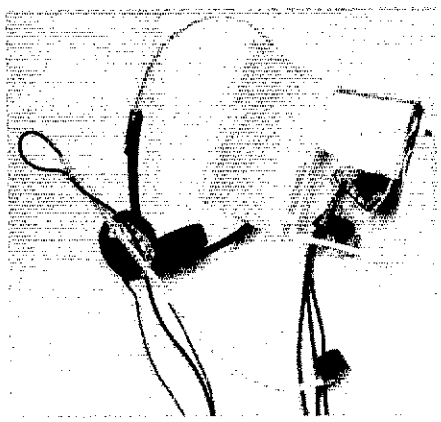


Fig. 1—The complete boom microphone, headset and connection box.

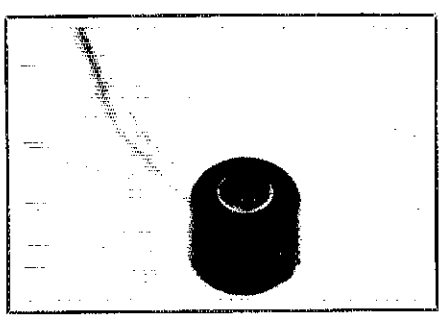


Fig. 2—The microphone element fits neatly in a common rubber equipment foot.

The TR-2500 sports an interesting PTT arrangement: There is a small voltage between the "grounds" of the SP and MIC connectors on top of the radio. The PTT feature is activated when those grounds are shorted together. Common boom-mic/headset combinations are unsuitable for use with the radio because their single ground line activates the transmitter at all times. A homebuilt accessory easily accommodates the PTT feature. My circuit also provides a miniature phone jack across the PTT line so a foot switch, VOX circuit or other transceiver control device may be connected easily.

Instructions that come with the microphone element recommend a 4.5-V dc supply with a 1-kΩ series resistor and a coupling capacitor. The TR-2500 schematic shows a coupling capacitor on the MIC input, so no external capacitor is needed. While testing the microphone and PTT, I found that the TR-2500 MIC jack supplies the necessary power for the microphone. Audio quality is good with the 3-kΩ resistor, so I left it in the circuit. A schematic for the circuit is shown in Fig. 3.

Mechanical construction details are shown in Fig. 4. First, cut a 1/16-inch-thick piece of aluminum (shown in pattern A). Drill holes to fit the mounting screw and boom as shown. Elongate the boom holes with a file or by tilting the drill once it has pierced the metal. Bend the piece on the dotted lines so that the boom holes do not quite line up with each other: The natural spring of the aluminum should cause the edges of the holes to grip the large aluminum tube when it is passed through the holes. The angles and locations of the bends may be changed as required to position the microphone.

Drill a hole in the headphone band to mount the aluminum piece. I used a 6-32 × 3/8-inch screw and a PEM™ nut (a nut that is press fit into the aluminum), but a sheet-metal screw may be used if the size of the mounting hole in the aluminum is changed accordingly.[2]

I purchased the aluminum tubes for the microphone boom at a local hobby shop. The small tube is just large enough to pass RG-174 coaxial cable easily. Choose the large tube for a slip fit over the small tube. A little digging in the junk box produced a rubber equipment

[1]The microphone elements are sold as nos. 270-090 or 270-092 from Radio Shack; nos. 25LM040 through 25LM049 from Mouser Electronics, 11433 Woodside Ave., Santee, CA 92071.

[2]PEM nuts are made by Penn Engineering and Manufacturing Corp., Danboro, PA, tel. 215-766-8853.

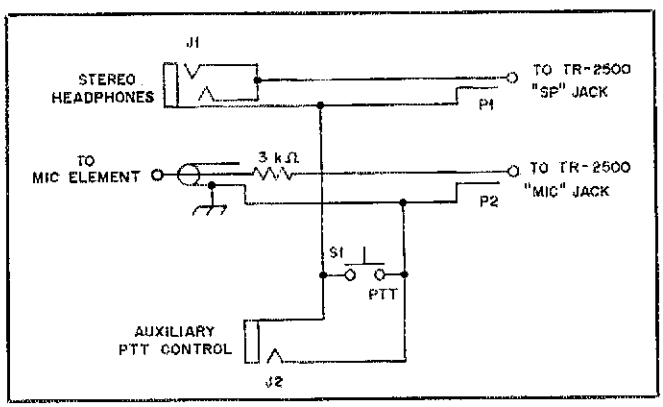


Fig. 3—A schematic diagram of the microphone, headset and PTT connections.
J1—1/8-in stereo phone jack.
J2—1/8-in phone jack.
P1—2.5-mm phone plug.
P2—1/8-in phone plug
S1—SPST, normally open, momentary-contact switch.

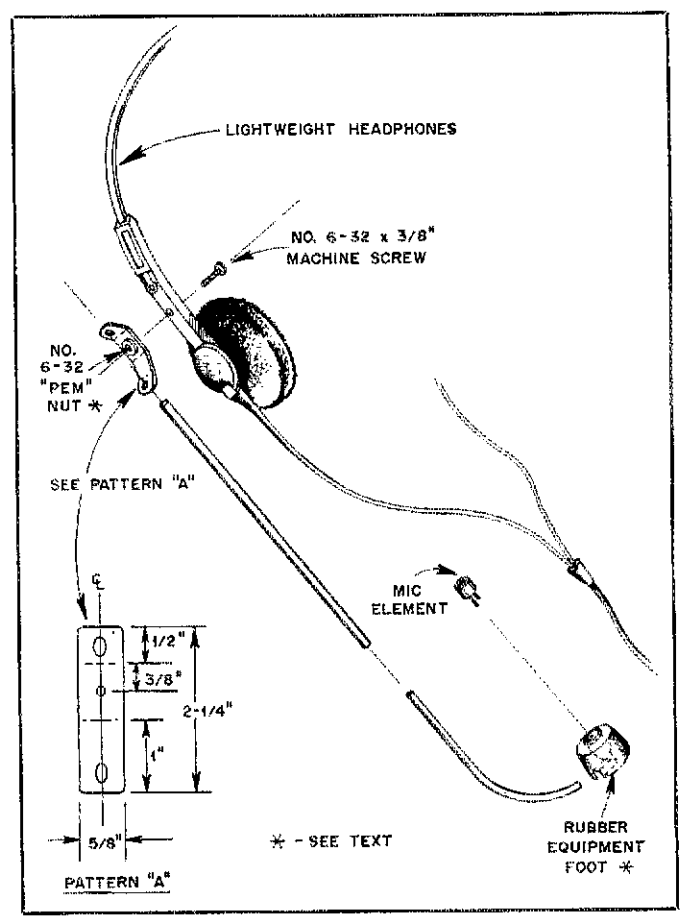


Fig. 4—Mechanical details of the boom microphone.

foot with a screw recess that fits the microphone element perfectly. Alternative element holders could be made from plastic rod or tube, grommets or numerous other materials.

Cut a slot in the back of the element holder to fit the small aluminum tube. Solder the RG-174 to the microphone element, pass the cable through the hole in the holder, and fit the microphone element into the holder. Feed the loose end of the cable through the small tube and gently bend the tube to the contour shown in the photos. (The tubing is most easily bent with a small tubing bender, but the bend can be made by hand if you are very careful.) Insert the loose end of the cable and the small tube into the end of the large tube and check the fit. If the fit is too loose, remove the small tube and bend the end very slightly for a snug fit. Fasten the aluminum piece to the headset and slip the large tube through the elongated holes. Check the microphone operation and glue the microphone assembly to the small tube. Use fast-setting epoxy to fill the back of the microphone holder to a smooth contour.

Mount the PTT switch, wiring and jacks in a small container. I used a traveler's plastic bath-soap container. It cost less than $1; and the soft plastic is waterproof and easy to work with. The box is large enough to hold a VOX circuit I want to add later. If all connections were permanent, without plugs or jacks, a much smaller case could be used. The white block in the photo is some scrap foam packing material that I shaped to hold the PTT switch in place.—*Bob Schetgen, KU7G, Assistant Technical Editor, ARRL*

SOME UNUSUAL USES FOR HOUSEHOLD CEMENT

☐ Household cement, which is sold under various trade names, has a number of special uses around the ham shack:

- As liquid "spaghetti" sleeving: A coating of cement can insulate a bare wire that is already in place or prevent two bare wires from touching. It can also be used to repair plastic insulation that has been damaged.
- As a liquid locknut: A dab of cement on a nut and bolt holds the fastener in place during vibration. (The nut is easily removed with a wrench when desired.)
- For labels: Ink or grease-pencil marks on smooth parts rub off easily. A thin coating of clear cement over the marks makes them permanent.
- To secure adhesive tape: The adhesive on plastic electrician's tape fails after a long time, especially in antenna applications. Some cement on the seam at the exposed end of the tape holds it in place, even after the tape adhesive fails.

Many antennas are built of telescoping sections of aluminum tube with sheet-metal screws to secure the sections: In time, the screws may shake loose. To prevent this problem, enclose the screw head with a couple of turns of electrician's tape around the tubing, then put a dab of cement on the exposed end of the tape.

Small pieces of white or bright-colored tape are often used on adjacent portions of symmetrical, multiconductor connectors to indicate the correct connector orientation. Small pieces, however, generally do not stay in place unless held with a dab of cement.—*Yardley Beers, WØJF, Boulder, Colorado*

TWO-CHANNEL SCANNING WITH THE TR-2500

☐ Here is a useful trick for owners of the Kenwood TR-2500 (or other hand-held transceivers with a "program scan" feature) who desire to monitor two particular frequencies without disturbing the memory assignments: (1) Enter the lower frequency to be monitored as the lower scan limit; (2) enter the higher frequency to be monitored as the scan step (channel spacing); and (3) enter the higher frequency again as the upper scan limit. When the program-scan feature is activated, the radio performs a very rapid two-channel scan.—*Elwyn A. Guest, W2BLO, Angola, New York*

A DTMF TELEPHONE HANDSET

☐ Some hams have added push-to-talk telephone handsets to their 2-meter rigs, but I went one step further and added one with an internal DTMF tone pad. The combination works great, especially in high-noise areas or when privacy is desired. The conversion is easy, although exact details depend on the model used.

First, disassemble the handset by popping out the front name plate (just above the key pad) and removing the two screws. Next, carefully remove the flexible plastic circuit board. (Do not remove the key pad or its circuit board—reassembly of those parts is very difficult). Remove the old microphone element and replace it with a dynamic element. (The plastic microphone housing may need to be trimmed to fit the new element.)

Place the PTT switch (S1) as determined by the switch size and available space. (I was able to mount it directly below the earphone after cutting away a small portion of the plastic earphone housing.) A subminiature SPST switch (S2) should be mounted on the metal plate under the front name plate. (When reassembled, this switch should fit through a hole in the name plate.) The battery, B1 (Eveready E177), fits tightly between the earphone and the tone-pad mounting frame. R1 is mounted behind S2.

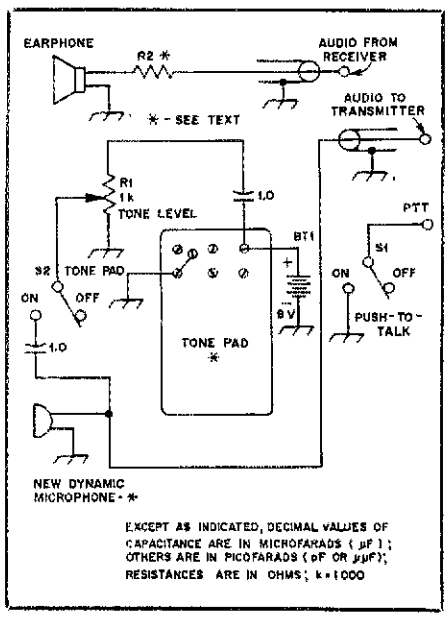


Fig. 5—A DTMF handset modified for use with amateur transceivers.

Wire the unit according to the schematic (Fig. 5). The actual hookup to the tone pad may vary with different models. Other wiring diagrams are possible and likely. I determined the one shown through experimentation.

R1 controls the output level of the tone pad and should be adjusted for a proper modulation level. R2 should be selected (if needed) to compensate for the high sensitivity of the earphone.

Since my rig (Kenwood TR-2200) had an unused pin on the microphone plug, I routed the speaker audio to that pin. The unused dial-light switch was rewired to disable the speaker when desired.

To use the tone function of the new handset, close S2, press the PTT button and key in the desired numbers. Leave S2 open when not using the key pad. With S2 closed, a slight change in transmitted audio may be noticed. (This could be eliminated by making S2 a DPDT switch with the added contacts breaking the microphone circuit.)

The battery could probably be eliminated by taking power from the rig. This seems unnecessary, though, as battery life has been over a year with the system shown.—*Dallas Williams, WAØMRG, Sedgwick, Colorado*

KENWOOD TRANSVERTERS

☐ Kenwood's late-model transceivers were not designed to work with the TV-502/S- and TV-506-series transverters. The older transverters can, however, be married to the newer transceivers with a few modifications. The TS-820, TS-830, TS-520 and TS-530 series require slight modifications to the transverter and interconnection cable, and addition of a phono jack (to carry −100 V dc) at the transceiver back panel.

Operation of the older transverters with the TS-930S or TS-430S requires either an external −100 V dc supply or both −15 V and −6 V dc supplies and a slight modification of the transverter. Write to Craig Martin, KR6T, Trio-Kenwood Communications, 1111 W. Walnut St., Compton, CA 90220, to get the modification details for your transceiver.—*Bob Schetgen, KU7G, Assistant Technical Editor, ARRL*

FT-207R SWITCH PROBLEM

☐ I recently discovered that the frequency-select function of my FT-207R (Yaesu 2-meter, hand-held transceiver) was not operating correctly: The tone pad would not enter new frequencies. At first I thought the pad was bad, but it worked fine for DTMF signaling. I suspected other electronics, but decided to check for mechanical problems first. [This is a good idea in all troubleshooting cases. Mechanical faults are far more common than failure of electronic components.—Ed.]

New frequencies could be entered if the OFF-LOCK switch was held just right. Either the switch was bad or the contacts were dirty. I squirted some contact cleaner in the front of the switch, and flipped the switch back and forth while the cleaner evaporated. The radio works just fine now, and no major surgery was required.—*Claude H. "Holly" Stewart, KD5DL, Midwest City, Oklahoma*

Amateur Antennas Get Federal Protection in PRB-1

" . . . Regulations that preclude amateur communications . . . conflict with federal objectives and must be preempted."

By Perry Williams, W1UED
ARRL Secretary and Washington Area Coordinator

The difficult is achieved. (Difficult? Some said it was impossible!) A growing threat to Amateur Radio diminishes sharply. The waiting is over. The Federal Communications Commission declares a measure of preemption over regulation of amateur antennas and their supporting structures—Hallelujah!

" . . . Local regulations which involve placement, screening, or height of antennas based on health, safety, or aesthetic considerations must be crafted to reasonably accommodate amateur communications and to represent the minimum practicable regulation to accomplish the local authority's legitimate purpose."

What was the problem? How did we travel to its solution? Is PRB-1 a miracle cure? As long ago as 1927, an amateur named Russell Whitehurst, 9ALM, ran into a "privilege tax" in the little town of Wilmore, Kentucky. ARRL and the amateur brought suit, and the United States Court for the Eastern District of Kentucky handed down the decision in *Whitehurst v. Grimes* that Amateur Radio is protected against unreasonable local control by the Commerce Clause of the Constitution. Since then, there has been dynamic tension between amateurs and the "town fathers" concerning amateur operations and antenna structures. Most of the time reasonable people have found reasonable solutions; amateurs have been able in the end to erect reasonable antenna structures. Some cases had to be fought in court, of course; titles like *The Appeal of Lord, Wright v. Vogt, St. Louis Park v. Casey, Dettmar v. County Board, Paradise Valley v. Lindberg* and *Skinner v. Cherry Hill* ring through the annals of Amateur Radio. They established that Amateur Radio crossed state lines, was incidental to residential use of property and was in the public interest. And they created at least the inference that regulation of Amateur Radio was preempted by the Federal Government.

For years, amateurs were able to cope pretty well, using these milestones and their powers of persuasion. More recently, however, there were several cases in which the community said, in effect, we don't want these antennas. The amateur raised the Federal question, and the courts said an inference of preemption is not enough: We can't find that the Federal Government has actually preempted the antenna issue! Summary judgment for the communities followed, with the amateur never getting an opportunity to present his case.

Accordingly, the ARRL Board of Directors at its meeting in Houston, Texas, October 5-6, 1983, at Minute 68 created a Federal Preemption Task Force to pursue implementation of federal preemption over amateur towers and antennas. Committee members are First Vice President Leonard Nathanson, W8RC; Delta Director Clyde Hurlbert, W5CH; Rocky Mountain Vice Director Marshall Quiat, AGØX; and ARRL Counsel Chris Imlay, N3AKD—all attorneys-at-law—and the writer. After early testing of the waters showed a reluctance in Congress to tackle the issue, a Request for Declaratory Ruling was filed by ARRL with the Federal Communications Commission on July 16, 1984.

The FCC Private Radio Bureau, recognizing that there would be a great deal of public interest in the matter, assigned the now-famous designator PRB-1 to the matter, and established a pleading cycle, which, with an extension of time, ran until January 25, 1985 for Comments and Reply Comments. By then some 1600 papers were filed with the FCC; the Department of Defense, the National Red Cross and many of its chapters, several municipal Civil Defense organizations, units of the Civil Air Patrol and hundreds of amateurs filed in support. Senator Barry Goldwater filed Senate Resolution SR-36, which would express the sense of the Senate relative to unduly restrictive state and local regulation of Amateur Radio antennas. Some additional members of Congress also expressed their support of the idea, though perhaps an equal number refused to endorse the concept. The National League of Cities, the National Association of Counties, the American Planning Association and a few municipalities all registered their opposition to PRB-1.

Members of the Task Force, President Price, Executive Vice President Sumner and other ARRL officials, and amateurs generally took advantage of "targets of opportunity" to push for PRB-1. Finally, on September 16, the Commissioners adopted the Memorandum Opinion and Order we present here.

There are some caveats. PRB-1 is a great and useful new tool, but it won't solve every problem in every community. It doesn't mean FCC will now fight our battles. Some excerpts:

"26. Obviously, we do not have the staff or financial resources to review all state and local laws that affect amateur operations . . ." but rather, "Amateur operators who believe that local or state governments have been overreaching . . . may . . . use this document to bring our policies to the attention of local tribunals and forums."

And those who live in planned tracts will find covenants, conditions and restrictions that run with the land are still a millstone:

Footnote 6: "We reiterate that our ruling herein does not reach restrictive covenants in private contractual agreements. Such agreements are voluntarily entered into by the buyer or tenant when the agreement is executed and do not usually concern this Commission." Nor will an amateur always like the local regulations on placement, screening or height that might be a condition of a building permit.

These remarks made, these cautions set forth, let us go on to say that September 16, 1985 was a great day for Amateur Radio. PRB-1 is a major milestone in our journey. Our thanks to the Private Radio Bureau personnel who constructed it, to the staffs of Commissioners who expedited it

and to the Commissioners themselves who adopted PRB-1.

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Federal preemption of state and local regulations pertaining to Amateur radio facilities.	)	PRB-1

MEMORANDUM OPINION AND ORDER

Adopted: September 16, 1985;
Released: September 19, 1985
By the Commission: Commissioner Rivera not participating.

Background

1. On July 16, 1984, the American Radio Relay League, Inc. (ARRL) filed a Request for Issuance of a Declaratory Ruling asking us to delineate the limitations of local zoning and other local and state regulatory authority over Federally-licensed radio facilities. Specifically, the ARRL wanted an explicit statement that would preempt all local ordinances which provably preclude or significantly inhibit effective, reliable amateur radio communications. The ARRL acknowledges that local authorities can regulate amateur installations to insure the safety and health of persons in the community, but believes that those regulations cannot be so restrictive that they preclude effective amateur communications.

2. Interested parties were advised that they could file comments in the matter.[1] With extension, comments were due on or before December 26, 1984,[2] with reply comments due on or before January 25, 1985.[3] Over sixteen hundred comments were filed.

Local Ordinances

3. Conflicts between amateur operators regarding radio antennas and local authorities regarding restrictive ordinances are common. The amateur operator is governed by the regulations contained in Part 97 of our rules. Those rules do not limit the height of an amateur antenna but they require, for aviation safety reasons, that certain FAA notification and FCC approval procedures must be followed for antennas which exceed 200 feet in height above ground level or antennas which are to be erected near airports. Thus, under FCC rules some amateur antenna support structures require obstruction marking and lighting. On the other hand, local municipalities or governing bodies frequently enact regulations limiting antennas and their support structures in height and location, e.g. to side or rear yards, for health, safety and aesthetic considerations. These limiting regulations can result in conflict because the effectiveness of the communications that emanate from an amateur radio station are directly dependent upon the location and the height of the antenna. Amateur operators maintain that they are precluded from operating in certain bands allocated for their use if the height of their antennas is limited by a local ordinance.

4. Examples of restrictive local ordinances were submitted by several amateur operators in this proceeding. Stanley J. Cichy, San Diego, California, noted that in San Diego amateur radio antennas come under a structures ruling which limits building heights to 30 feet. Thus, antennas there are also limited to 30 feet. Alexander Vrenios, Mundelein, Illinois wrote that an ordinance of the Village of Mundelein provides that an antenna must be a distance from the property line that is equal to one and one-half times its height. In his case, he is limited to an antenna tower for his amateur station just over 53 feet in height.

5. John C. Chapman, an amateur living in Bloomington, Minnesota, commented that he was not able to obtain a building permit to install an amateur radio antenna exceeding 35 feet in height because the Bloomington city ordinance restricted "structures" heights to 35 feet. Mr. Chapman said that the ordinance, when written, undoubtedly applied to buildings but was now being applied to antennas in the absence of a specific ordinance regulating them. There were two options open to him if he wanted to engage in amateur communications. He could request a variance to the ordinance by way of a hearing before the City Council, or he could obtain affidavits from his neighbors swearing that they had no objection to the proposed antenna installation. He got the building permit after obtaining the cooperation of his neighbors. His concern, however, is that he had to get permission from several people before he could effectively engage in radio communications for which he had a valid FCC amateur license.

6. In addition to height restrictions, other limits are enacted by local jurisdictions—anti-climb devices on towers or fences around them; minimum distances from high voltage power lines; minimum distances of towers from property lines; and regulations pertaining to the structural soundness of the antenna installation. By and large, amateurs do not find these safety precautions objectionable. What they do object to are the sometimes prohibitive, non-refundable application filing fees to obtain a permit to erect an antenna installation and those provisions in ordinances which regulate antennas for purely aesthetic reasons. The amateurs contend, almost universally, that "beauty is in the eye of the beholder." They assert that an antenna installation is not more aesthetically displeasing than other objects that people keep on their property, e.g., motor homes, trailers, pick-up trucks, solar collectors and gardening equipment.

Restrictive Covenants

7. Amateur operators also oppose restrictions on their amateur operations which are contained in the deeds for their homes or in their apartment leases. Since these restrictive covenants are contractual agreements between private parties, they are not generally a matter of concern to the Commission. However, since some amateurs who commented in this proceeding provided us with examples of restrictive covenants, they are included for information. Mr. Eugene O. Thomas of Hollister, California included in his comments an extract of the Declaration of Covenants and Restrictions for Ridgemark Estates, County of San Benito, State of California. It provides:

> No antenna for transmission or reception of radio signals shall be erected outdoors for use by any dwelling unit except upon approval of the Directors. No radio or television signals or any other form of electromagnetic radiation shall be permitted to originate from any lot which may unreasonably interfere with the reception of television or radio signals upon any other lot.

Marshall Wilson, Jr., provided a copy of the restrictive covenant contained in deeds for the Bell Martin Addition #2, Irving, Texas. It is binding upon all of the owners or purchasers of the lots in the said addition, his or their heirs, executors, administrators or assigns. It reads:

> No antenna or tower shall be erected upon any lot for the purposes of radio operations.

William J. Hamilton resides in an apartment building in Gladstone, Missouri. He cites a clause in his lease prohibiting the erection of an antenna. He states that he has been forced to give up operating amateur radio equipment except a hand-held 2 meter (144-148 MHz) radio transceiver. He maintains that he should not be penalized just because he lives in an apartment.

Other restrictive covenants are less global in scope than those cited above. For example, Robert Webb purchased a home in Houston, Texas. His deed restriction prohibited "transmitting or receiving antennas extending above the roof line."

8. Amateur operators generally oppose restrictive covenants for several reasons. They maintain that such restrictions limit the places that they can reside if they want to pursue

[1]Notes appear on page 63.

The effectiveness of the communications that emanate from an amateur radio station are directly dependent upon the location and the height of the antenna.

Since these restrictive covenants are contractual agreements between private parties, they are not generally a matter of concern to the Commission.

their hobby of amateur radio. Some state that they impinge on First Amendment rights of free speech. Others believe that a constitutional right is being abridged because, in their view, everyone has a right to access the airwaves regardless of where they live.

9. The contrary belief held by housing subdivision communities and condominium or homeowner's associations is that amateur radio installations constitute safety hazards, cause interference to other electronic equipment which may be operated in the home (televisions, radio, stereos) or are eyesores that detract from the aesthetic and tasteful appearance of the housing development or apartment complex. To counteract these negative consequences, the subdivisions and associations include in their deeds, leases or by-laws restrictions and limitations on the location and height of antennas or, in some cases, prohibit them altogether. The restrictive covenants are contained in the contractual agreement entered into at the time of the sale or lease of the property. Purchasers or lessees are free to choose whether they wish to reside where such restrictions on amateur antennas are in effect or settle elsewhere.

Supporting Comments

10. The Department of Defense (DOD) supported the ARRL and emphasized in its comments that continued success of existing national security and emergency preparedness telecommunications plans involving amateur stations would be severely diminished if state and local ordinances were allowed to prohibit the construction and usage of effective amateur transmission facilities. DOD utilizes volunteers in the Military Affiliate Radio Service (MARS),[4] Civil Air Patrol (CAP) and the Radio Amateur Civil Emergency Service (RACES). It points out that these volunteer communicators are operating radio equipment installed in their homes and that undue restrictions on antennas by local authorities adversely affect their efforts. DOD states that the responsiveness of these volunteer systems would be impaired if local ordinances interfere with the effectiveness of these important national telecommunication resources. DOD favors the issuance of a ruling that would set limits for local and state regulatory bodies when they are dealing with amateur stations.

11. Various chapters of the American Red Cross also came forward to support the ARRL's request for a preemptive ruling. The Red Cross works closely with amateur radio volunteers. It believes that without amateurs' dedicated support, disaster relief operations would significantly suffer and that its ability to serve disaster victims would be hampered. It feels that antenna height limitations that might be imposed by local bodies will negatively affect the service now rendered by the volunteers.

12. Cities and counties from various parts of the United States filed comments in support of the ARRL's request for a Federal preemption ruling. The comments from the Director of Civil Defense, Port Arthur, Texas are representative:

> The Amateur Radio Service plays a vital role with our Civil Defense program here in Port Arthur and the design of these antennas and towers lends greatly to our ability to communicate during times of disaster.
>
> We do not believe there should be any restrictions on the antennas and towers except for reasonable safety precautions. Tropical storms, hurricanes and tornadoes are a way of life here on the Texas Gulf Coast and good communications are absolutely essential when preparing for a hurricane and even more so during recovery operations after the hurricane has past.

13. The Quarter Century Wireless Association took a strong stand in favor of the issuance of a declaratory ruling. It believes that Federal preemption is necessary so that there will be uniformity for all Amateur radio installations on private property throughout the United States.

The American Red Cross also came forward to support the ARRL's request for a preemptive ruling—without amateurs' dedicated support, disaster relief operations would significantly suffer and that its ability to serve disaster victims would be hampered.

14. In its comments, the ARRL argued that the Commission has the jurisdication to preempt certain local land use regulations which frustrate or prohibit amateur radio communications. It said that the appropriate standard in preemption cases is not the extent of state and local interest in a given regulation, but rather the impact of that regulation on Federal goals. Its position is that Federal preemption is warranted whenever local governmental regulations relate adversely to the operational aspects of amateur communication. The ARRL maintains that localities routinely employ a variety of land use devices to preclude the installation of effective amateur antennas, including height restrictions, conditional use permits, building setbacks and dimensional limitations on antennas. It sees a declaratory ruling of Federal preemption as necessary to cause municipalities to accommodate amateur operator needs in land use planning efforts.

15. James C. O'Connell, an attorney who has represented several amateurs before local zoning authorities, said that requiring amateurs to seek variances or special use approval to erect reasonable antennas unduly restricts the operation of amateur stations. He suggested that the Commission preempt zoning ordinances which impose antenna height limits of less than 65 feet. He said that this height would represent a reasonable accommodation of the communication needs of most amateurs and the legitimate concerns of local zoning authorities.

Opposing Comments

16. The City of La Mesa, California has a zoning regulation which controls amateur antennas. Its comments reflected an attempt to reach a balanced view.

> This regulation has neither the intent, nor the effect, of precluding or inhibiting effective and reliable communications. Such antennas may be built as long as their construction does not unreasonably block views or constitute eyesores. The reasonable assumption is that there are always alternatives at a given site for different placement, and/or methods for aesthetic treatment. Thus, both public objectives of controlling land use for the public health, safety, and convenience, and providing an effective communications network, can be satisfied.
>
> A blanket ruling to completely set aside local control, or a ruling which recognizes control only for the purpose of safety of antenna construction, would be contrary to . . . legitimate local control.

17. Comments from the County of San Diego state:

> While we are aware of the benefits provided by amateur operators, we oppose the issuance of a preemption ruling which would elevate 'antenna effectiveness' to a position above all other considerations. We must, however, argue that the local government must have the ability to place reasonable limitations upon the placement and configuration of amateur radio transmitting and receiving antennas. Such ability is necessary to assure that the local decision-makers have the authority to protect the public health, safety and welfare of all citizens.
>
> In conclusion, I would like to emphasize an important difference between your regulatory powers and that of local governments. Your Commission's approval of the preemptive requests would establish a 'national policy'. However, any regulation adopted by a local jurisdiction could be overturned by your Commission or a court if such regulation was determined to be unreasonable.

18. The City of Anderson, Indiana, summarized some of the problems that face local communities:

> I am sympathetic to the concerns of these antenna owners and I understand that to gain the maximum reception from their devices, optimal location is necessary. However, the preservation of residential zoning districts as 'liveable' neighborhoods is jeopardized by placing these antennas in front yards of homes. Major problems of public safety have been encountered, particularly vision blockage for auto and pedestrian access. In addition, all communities are faced with various building lot sizes. Many building lots are so small that established setback requirements (in order to preserve adequate air and light) are vulnerable to the unregulated placement of these antennas.
>
> . . . the exercise of preemptive authority by the FCC in granting this request would not be in the best interest of the general public.

19. The National Association of Counties (NACO), the American Planning Association (APA) and the National League of Cities (NLC) all opposed the issuance of an anten-

na preemption ruling. NACO emphasized that federal and state power must be viewed in harmony and warns that Federal intrusion into local concerns of health, safety and welfare could weaken the traditional police power exercised by the state and unduly interfere with the legitimate activities of the states. NLC believed that both Federal and local interests can be accommodated without preempting local authority to regulate the installation of amateur radio antennas. The APA said that the FCC should continue to leave the issue of regulating amateur antennas with the local government and with the state and Federal courts.

Discussion

20. When considering preemption, we must begin with two constitutional provisions. The tenth amendment provides that any powers which the constitution either does not delegate to the United States or does not prohibit the states from exercising are reserved to the states. These are the police powers of the states. The Supremacy Clause, however, provides that the constitution and the laws of the United States shall supersede any state law to the contrary. Article III, Section 2. Given these basic premises, state laws may be preempted in three ways: First, Congress may expressly preempt the state law. See *Jones v. Rath Packing Co.*, 430 U.S. 519, 525 (1977). Or, Congress may indicate its intent to completely occupy a given field so that any state law encompassed within that field would implicitly be preempted. Such intent to preempt could be found in a congressional regulatory scheme that was so pervasive that it would be reasonable to assume that Congress did not intend to permit the states to supplement it. See *Fidelity Federal Savings & Loan Ass'n v. de la Cuestra,* 458 U.S. 141, 153 (1982).

The Supremacy Clause, however, provides that the constitution and the laws of the United States shall supersede any state law to the contrary.

Finally, preemption may be warranted when state law conflicts with federal law. Such conflicts may occur when "compliance with both Federal and state regulations is a physical impossibility," *Florida Lime & Avocado Growers, Inc. v. Paul,* 373 U.S. 132, 142, 143 (1963), or when state law "stands as an obstacle to the accomplishment and execution of the full purposes and objectives of Congress," *Hines v. Davidowitz,* 312 U.S. 52, 67 (1941). Furthermore, federal regulations have the same preemptive effect as federal statutes. *Fidelity Federal Savings & Loan Association v. de la Custra, supra.*

21. The situation before us requires us to determine the extent to which state and local zoning regulations may conflict with federal policies concerning amateur radio operators.

22. Few matters coming before us present such a clear dichotomy of viewpoint as does the instant issue. The cities, counties, local communities and housing associations see an obligation to all of their citizens and try to address their concerns. This is accomplished through regulations, ordinances or covenants oriented toward the health, safety and general welfare of those they regulate. At the opposite pole are the individual amateur operators and their support groups who are troubled by local regulations which may inhibit the use of amateur stations or, in some instances, totally preclude amateur communications. Aligned with the operators are such entities as the Department of Defense, the American Red Cross and local civil defense and emergency organizations who have found in Amateur Radio a pool of skilled radio operators and a readily available backup network. In this situation, we believe it is appropriate to strike a balance between the federal interest in promoting amateur operations and the legitimate interests of local governments in regulating local zoning matters. The cornerstone on which we will predicate our decision is that a reasonable accommodation may be made between the two sides.

23. Preemption is primarily a function of the extent of the conflict between federal and state and local regulation. Thus, in considering whether our regulations or policies can tolerate a state regulation, we may consider such factors as the severity of the conflict and the reasons underlying the state's regulations. In this regard, we have previously recognized the legitimate and important state interests reflected in local zoning regulations. For example, in Earth Satellite Communications, Inc., 95 FCC 2d 1223 (1983), we recognized that

> ... countervailing state interests inhere in the present situation ... For example, we do not wish to preclude a state or locality from exercising jurisdiction over certain elements of an SMATV operation that properly may fall within its authority, such as zoning or public safety and health, provided the regulation in question is not undertaken as a pretext for the actual purpose of frustrating achievement of the preeminent federal objective and so long as the non-federal regulation is applied in a nondiscriminatory manner.

24. Similarly, we recognize here that there are certain general state and local interests which may, in their even-handed application, legitimately affect amateur radio facilities. Nonetheless, there is also a strong federal interest in promoting amateur communications. Evidence of this interest may be found in the comprehensive set of rules that the Commission has adopted to regulate the amateur service.[5] Those rules set forth procedures for the licensing of stations and operators, frequency allocations, technical standards which amateur radio equipment must meet and operating practices which amateur operators must follow. We recognize the Amateur Radio Service as a voluntary, noncommercial communication service, particularly with respect to providing emergency communications. Moreoever, the Amateur Radio Service provides a reservoir of trained operators, technicians and electronic experts who can be called on in times of national or local emergencies. By its nature, the Amateur Radio Service also provides the opportunity for individual operators to further international goodwill. Upon weighing these interests, we believe a limited preemption policy is warranted. State and local regulations that operate to preclude amateur communications in their communities are in direct conflict with federal objectives and must be preempted.

25. Because amateur station communications are only as effective as the antennas employed, antenna height restrictions directly affect the effectiveness of amateur communications. Some amateur antenna configurations require more substantial installations than others if they are to provide the amateur operator with the communications that he/she desires to engage in. For example, an antenna array for international amateur communications will differ from an antenna used to contact other amateur operators at shorter distances. We will not, however, specify any particular height limitation below which a local government may not regulate, nor will we suggest the precise language that must be contained in local ordinances, such as mechanisms for special exceptions, variances, or conditional use permits. Nevertheless, local regulations which involve placement, screening, or height of antennas based on health, safety, or aesthetic considerations must be crafted to accommodate reasonably amateur communications, and to represent the minimum practicable regulation to accomplish the local authority's legitimate purpose.[6]

26. Obviously, we do not have the staff or financial resources to review all state and local laws that affect amateur operations. We are confident, however, that state and local governments will endeavor to legislate in a manner that affords appropriate recognition to the important federal interest at stake here and thereby avoid unnecessary litigation in this area. Amateur operators who believe that local or state governments have been overreaching and thereby have precluded accomplishment of their legitimate communications goals, may, in addition, use this document to bring our policies to the attention of local tribunals and forums.

27. Accordingly, the Request for Declaratory Ruling filed July 16, 1984, by the American Radio Relay League, Inc., IS GRANTED to the extent indicated herein and, in all other respects, IS DENIED.

FEDERAL COMMUNICATIONS COMMISSION
William J. Tricarico
Secretary

Notes

[1]Public Notice, August 30, 1984, Mimeo No. 6299, 49 F.R. 36113, September 14, 1984.
[2]Public Notice, December 19, 1984, Mimeo No. 1498.
[3]Order, November 8, 1984, Mimeo No. 770.
[4]MARS is solely under the auspices of the military which recruits volunteer amateur operators to render assistance to it. The Commission is not involved in the MARS program.
[5]47 CFR Part 97.
[6]We reiterate that our ruling herein does not reach restrictive convenants in private contractual agreements. Such agreements are voluntarily entered into by the buyer or tenant when the agreement is executed and do not usually concern this Commission.

New Life For Old Clubs

Here's how to rejuvenate that ole club spirit.

By Ron Koczur, K9TUS
2512 Glenwood Ave.
Fort Wayne, IN 46805

Clubs are as much a part of Amateur Radio as QSL cards and pileups. Hams like to get together, whether it's to brag or to exchange secrets. But to be successful, clubs need to be nurtured. They demand time and effort. Some clubs mature gracefully and energetically while others become feeble and survive only on inertia.

All clubs are started for a reason. Some are formed to operate a repeater; others for emergency preparedness. Still others are formed simply to give local amateurs a mutual watering hole. The latter are usually classified as general-interest clubs, and offer the most potential for membership and community service. They also demand the most care and feeding.

General-Interest Clubs

General-interest clubs typically don't have an activity around which club life revolves. Repeater clubs focus on their machines. DX clubs congregate on their simplex calling frequency. The general-interest club often has no such focal point and hence suffers an "identity crisis" sometime after the thrill of being a new club wears off. This identity crisis can lead to lack of interest, reduced participation and increased dropouts.

Let me offer three suggestions as to how you can keep your group fresh and vital. The goal of all three is the capture of that mystical entity—the new member.

1) Advertise. No one will join if they don't know you are there!

2) Offer something positive to make people come to your meetings.

3) Generate a sense of "identity" and "belonging" to keep your members interested.

Let 'em Know You're There!

All too often we rely heavily on word of mouth. Just because the Fort Wayne Radio Club exists doesn't mean that all the hams in Fort Wayne know about it. Your club needs to do something aggressive to spread the word that it is worth joining.

Contacting new licensees is one specific step that works well for many groups. New hams are usually looking for kindred spirits and will join a club if invited.

ARRL Special Service Clubs (SSC) receive a free listing of new licensees and new ARRL members in their areas every other month. Other groups can subscribe to services (for a fee) that provide periodic lists of new licensees.[1] It's easy for any club to find out who the new licensees are in their area.

Once you know who the hams in your town are, your work begins! Write and tell them about your club. An initial letter, followed by a phone call a few days before your meeting, is a very productive technique and shows that you're interested.

Hot News, Amateur Radio Style

One way to provide fodder for your club newsletter is by subscribing to one or more of these Amateur Radio periodicals. With a short lead time, each prints what's new in the world of Amateur Radio weeks before the monthlies. All of them allow their material to be quoted, as long as proper credit is given.

- *The ARRL Letter:* biweekly; $19.50 per year to ARRL members only, $10 to affiliated-club newsletter editors; order from ARRL, 225 Main St., Newington, CT 06111.
- *The W5YI Report:* 24 issues annually; $21 per year; order from W5YI Report, P.O. Box 10101, Dallas, TX 75207.
- *The Westlink Report:* 26 issues annually; $22.50 per year; order from Westlink Report, 28197 Robin Ave., Saugus, CA 91350.

Add these people to your club's newsletter mailing list for a few months. That's an *excellent* way for them to get the flavor of your group.

Try to include more than a simple invitation in your first contact with them. You can mail five or six sheets of regular size paper for the same price as one. Most new hams find a number of items useful: An ARRL Worked All States (WAS) map, an ARRL Safety Guide, a club fact sheet, an FCC Form 610 with a VE session announcement to encourage upgrading, and so on. All these handouts will make the prospective member see your club as an active source of information. The ARRL also has a pamphlet that explains the benefits of joining a local club. Its cost is minimal, and it is very effective.[2]

The point is to make the prospective member feel that you really do have something to offer if he or she joins. Your first contact should be upbeat, positive and friendly. Don't be afraid to blow your own horn ... but don't offer more than you can deliver, either!

Lure Them ... Don't Drag 'Em

Step two is crucial in turning a new member into an active long-term member. Though many clubs sport a large roster of dues-paying members, few respond when called on to attend regular meetings. The reason may not be that they're too busy to take part. Maybe the reason is simply that the meetings are boring! Another reason might be that most people don't like arguments. You need to streamline your monthly get-togethers.

Since I've been an Affiliated Club Coordinator, I've traveled to many club meetings around Indiana. I've become interested and involved in some of the meetings I've attended, and I've slept through others! Why the difference? The more successful meetings share three features. They have very short business sessions; they have specific, well-planned programs; and they have an information table. Let's look at each of these.

The Business End

Reams of paper have been written about keeping business meetings short. Still, some club officers feel that business is the major reason to hold a meeting. If there were no business (according to this line of reasoning), there'd be little reason for getting together.

But that's not true. Meetings are held primarily as a social activity for the group. Meetings answer a general need of group dynamics—the opportunity to see, touch and communicate in person with other members of the group. Talking over the air

[1]Notes appear on page 66.

Sources of Club Speakers

Here are a few people to contact when you need a club speaker:

- Your active club members
- ARRL Officials (local and section level)
- Area disaster relief officials: Red Cross, Salvation Army, local police/sheriff, state police, civil defense
- Area public relations officers: local governments, hospitals, telephone companies, utility companies, newspapers, radio/TV news departments, local businesses and industries, chamber of commerce representatives

does not bind a group together as strongly as do face-to-face meetings.

Transacting business is not the prime reason for holding meetings. It is the reason of *last* resort! Your group should allow the *officers* to transact its business. The business so transacted should certainly be reported. And officers should seek input from members on new business. And by all means, major business should be brought before the group for discussion and approval.

But don't let the discussions devour unnecessary time. Equally important: The person in charge should never let a discussion deteriorate into verbal fights—particularly at a meeting that includes nonmembers and guests. If a matter cannot be resolved in a reasonable length of time, call a special meeting and let those who are interested attend and have at it. If your group is active enough to hold regular officers' meetings, have the discussion there. If you find your club meetings becoming long and boring, and don't hold regular officers' meetings, maybe it's time to start.

Remember: If you want to attract new members (and hold onto the old ones), you have to present the image of an efficient group. Keep the business short!

The Program

Formulating meeting programs seem to be a perennial problem for clubs. Large urban clubs have a manpower reservoir that can be tapped repeatedly for new programs. The small rural clubs with limited membership usually deplete that source quickly.

The key is to find a volunteer to plan the programs in advance. Many clubs assign the Vice President this task. In one short session he or she can plan out six months of meeting programs, mixing presentations by club members with visual aids from ARRL. ARRL section-level appointees are available to give meeting programs on their volunteer roles. You can tap a number of sources. All it takes is a little planning!

When word spreads that your group has interesting programs, your meeting attendance will slowly but surely climb.

Audio Visuals

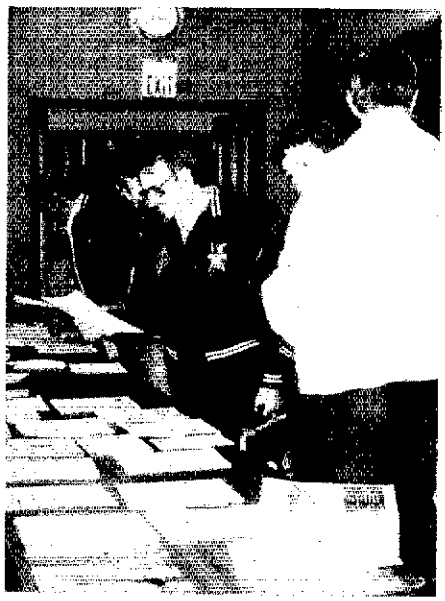
Both large and small clubs can benefit from the ARRL audio-visual library. Headquarters maintains a library of films, videotapes and slides that cover almost every topic of interest to a ham radio club. They range in topics from the old and venerable Army training films on electronics to the professional video tapes on emergency preparedness and ham radio in space.

Someone once noted that people who attend meetings remember only 20% of what they hear, but 80% of what they see. Isn't that reason enough to incorporate visual aids in your meetings?

Information Table

Another feature that makes meetings interesting is an information table. Your group can really provide a service to its members by supplying a table full of handouts and reading material at each club meeting. You can also do yourself a favor by including publicity sheets about your club and its activities for visitors.

Club code and theory classes are a good way of attracting and training new members.



The Fort Wayne Radio Club's information table is always a popular spot.

Audio-Visual Availability

About 16 slide programs are available from the ARRL on a variety of subjects. Most of them come with audio cassette commentary. The videotape collection consists of about 36 different programs running from 15 to 80 minutes in length. Topics run from the highly technical to those of general interest.

These visual aids are available to ARRL affiliated clubs; the only cost is the return postage. Order the films and tapes at least a month before they're needed. You can obtain a catalog of the available programs from ARRL Hq. Send your request to the attention of the ARRL Audio Visual Library; ask for Program Order Form CT-20.

Some clubs subscribe to the Amateur Radio biweekly general-interest newsletters, making them available to members at meetings. *The ARRL Letter, Westlink Report* and *W5YI Report* represent the most up-to-date sources of printed news about Amateur Radio. Other newsletters are available on more specialized topics that would be of interest to members of special interest groups—and don't forget the ARRL *Field Forum*.

You can easily fill a table with handouts for members to take home. Between those available from ARRL and those you generate locally, there's no reason for any member to walk away empty handed! Some clubs buy a set of *Callbooks* each year and make them available for members' use at their meetings.

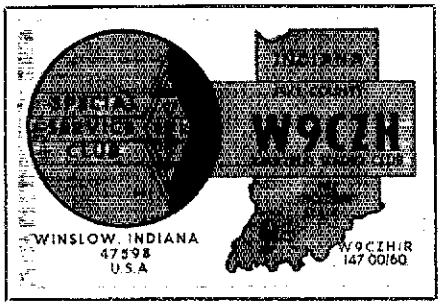
Keeping business short, using visual aids for programs and providing an information table gives your members three positive incentives to become regular attendees.

That's What Flags Are For

So you've found them, lured them to a meeting or two and think you have them hooked, right? Wrong. You still have the most important step to take before your new member becomes a card-carrying flag-waving supporter. You have to make each one feel a part of your group, and not just once a month during the meeting. You have to get your members to identify with your group constantly—between meetings, when they're operating their rigs, while filling out QSLs or net reports, whatever. Club members have to be reminded that the group is *their* group.

Reinforce Club Identity

What does it take? Well, you have to



A club QSL is distinctive and gives members a sense of group identity.

come up with a set of club identifiers for your members to use *between* club activities. Club identifiers are numerous; some have club jackets (ranging from gaudy fireman-red to subdued browns and black). Some clubs have caps, name tags, T-shirts, etc. Many groups provide a club QSL card featuring a local point of interest. The cards can be provided free to members or at a nominal cost. This offers the members something unique—a QSL design not used by 100,000 other hams around the world! It may not be the least-expensive card available; but to most hams, a distinctive design is worth a little more money.

Logo

One of the most prominent club identifiers is a club logo. Each group needs a symbol to identify itself. A logo should be used on the other club identifiers—hats, jackets, QSL cards, call badges and stationery—and serves to reinforce the distinction a club offers its members.

Unfortunately, many clubs do not have a logo. If this is the case, here is an excellent opportunity for a new club activity. How about a logo-design contest for your group? I think you'll be surprised at the artistic talent just waiting to be tapped. Offer a prize like a year's free membership to the club (or to the ARRL, for that matter) or a couple of dinners at a local restaurant. Sponsoring an art contest for the logo in your local high school will also give your club needed community visibility.

Does your club have its own stationery for correspondence? This touch adds class and a sense of permanence to the club business. (ARRL can provide basic stationery for $3/100 sheets). How about a club post office box; is your group stable enough to use one? If you want to attract people and hold on to them, it has to be.

Awards

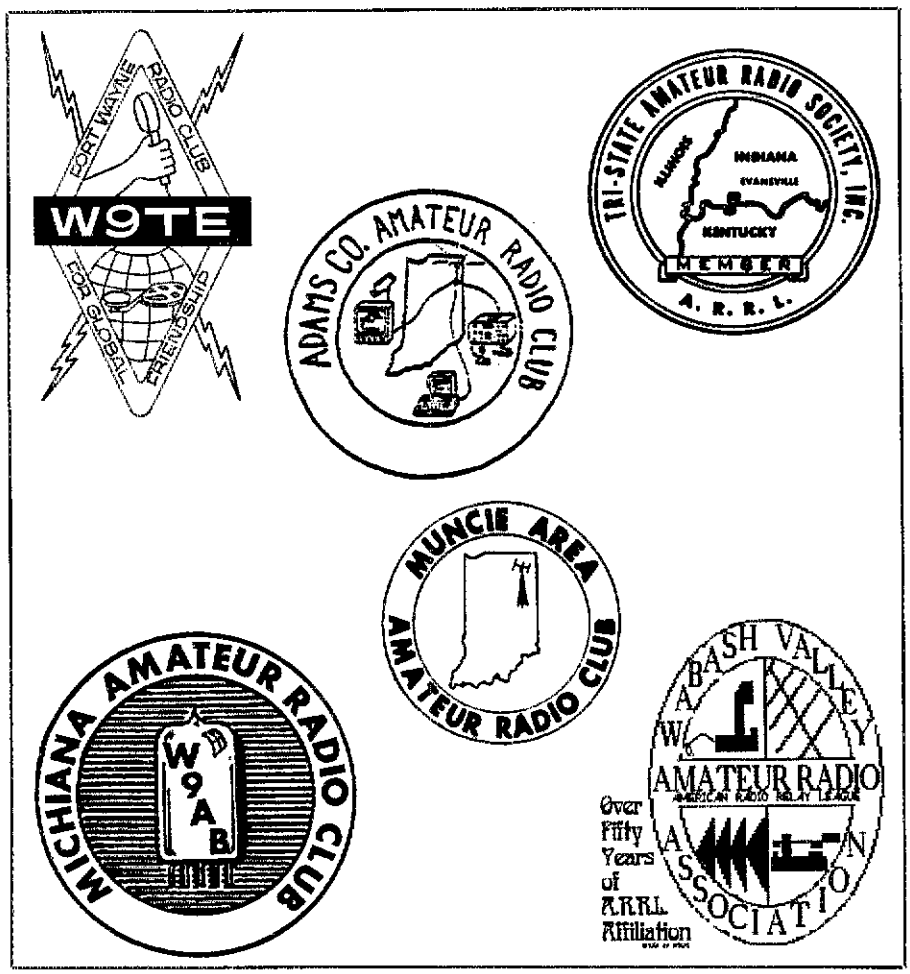
A number of active clubs set up a program of club awards and certificates for their members. You can offer an award for working members of your group, an award for the highest club score in Sweepstakes or the DX contests, or awards for service to the club. Make the awards attractive. Plaques and certificates are common; engraved cups and mugs are very effective. Be willing to spend a little of the treasury, and you'll get it back many times over in members' enthusiasm and support.

Use what works for your group. Once you decide that you want your club to grow, don't be afraid to experiment. Remember that the key is to make your members *identify* with the club between meetings. All members should have something in their shack that reminds them of their club whenever they turn on their radio! If you can get your members to identify with the club, you'll find them more likely to say "yes" when they are asked to support a club project.

There you have it. There's no reason to let your group grow old with time. Advertise, streamline and identify. You'll forestall the decline that dooms many groups. All it takes is an honest assessment of where your club is going and a few interested members to get things moving!

And remember: The ARRL will help you. When you decide to breathe new life into your group, you'll be facing problems that others have faced and overcome. If your club chooses to become a Special Service Club, you'll receive the *SSC Manual*, containing more than 120 pages of specific activities and suggestions that have proven effective over the years.

One of the values of the ARRL Affiliated Club Program is the support available to clubs. But *you* have to start the ball rolling. Your Section Affiliated Club Coordinator and Headquarters Field Services Department personnel are waiting to hear from you!



Club logos are as unique and varied as the clubs they represent.

Notes

[1]To purchase lists of amateurs tailored to your ZIP code area, write to Jean P. Tremaine, Eberle Direct Marketing Group, 8330 Old Courthouse Rd., Suite 520, Vienna, VA 22180, tel. 703-893-1095.

[2]The pamphlet *Join a Radio Club . . .* costs $7 per 100 copies. Order from the Field Services Department, ARRL Hq.

Ron is the Affiliated Club Coordinator for Indiana. Licensed for 25 years, he holds an Extra Class license and considers himself a DXer and part-time contester. He has been an active officer in the Fort Wayne Radio Club for eight years.

The Eye Emergency Net: Friends in Need

By John H. Lehman, WA8MHO
3231 Country Club Dr., Medina, OH 44256

Somewhere, USA, 20-year-old Billy sits in near darkness. He has keratoconus, a hereditary eye disease that is robbing him of sight. There is hope for renewed sight for Billy, if doctors can replace the affected tissue with healthy tissue. But a donor is needed, and finding one takes some luck and a lot of searching. Meanwhile, the airwaves are bristling with activity as radio amateurs search eye banks across the country daily for encouraging news of available donors. Today's news is good, and the Eye Emergency Net operators locate tissue that doctors can use to bring Billy's eyes back to life. This story has a happy ending, but there is little time for rejoicing. Many more wait in near darkness.

Most amateurs have at least heard references to the Eye Emergency Net, or Eye Bank as it used to be called, and know that it is one of our long-standing, valuable public services. Yet many do not know its history, purpose or details of operation.

The Eye Emergency Net started on December 20, 1962, through the combined efforts of Dr. Al Braley, WØGET, then an active eye surgeon in Iowa City, Iowa, and Ted Hunter, WØNTI, an electronics design engineer and professor at Iowa State University. The idea behind the Net activity is to provide rapid, no-cost and effective communications, once a day, to make known to participating Eye Banks any emergency requirements for eye tissue and where such tissue might be available. Medical information and shipping arrangements are discussed and made on the telephone once the tissue has been located by the Net.

Originally, there were only six cities involved: Chicago; Columbia, Missouri; Indianapolis; Iowa City; Oklahoma City and Omaha. The Net has since grown to cover emergency needs in many more cities, and sometimes outside the U.S., accounting for over 10,500 transfers of tissue.

The Net has no offices, dues, business meetings or formal organization. Membership is determined by participation, and that depends on the individual Eye Bank's desire to use Amateur Radio as a channel of communication. If a particular Eye Bank cooperates with the Eye Bank Association, they may wish to have an amateur they can call when there is an emergency and their local supply or usual contacts cannot meet the need.

We have many faithful operators who check in day after day for months without ever having any traffic until, one day, they get a request. Unfortunately, we do not get an eye for every request, and it is very easy to understand the frustration and disappointment for the operator in that case who tries so hard to be of service. We have lost some operators as a result of this. Yet, think of the wonderful feeling and gratification when you know you have played some small part in saving a person's sight.

Net Operations

The Eye Emergency Net now has sessions both morning and evening on 40 meters and 75 meters, 7.294 MHz and 3.970 MHz. A session follows on 7.294 MHz at 9 AM Eastern to carry the traffic and distribute it to the West Coast. The morning sessions change their time with the local clock, observing Daylight Savings Time.

Dr. Al Braley, WØGET, cofounder of the Eye Emergency Net, has been helping give the gift of sight for nearly a quarter of a century.

The evening sessions are on UTC, and do not change with Daylight Savings. The 40-meter group meets first at 0045Z. There will probably be activity on the frequency at 0030 in an informal manner, but the Net will be called to order at 0045. The traffic, if any, will be listed and given to the evening's relay station, who will also meet the 75-meter session. At about 0055, one of the Net operators will come on frequency and *ask* for the use of the frequency to hold a scheduled net at its listed time. It is done this way since 75 meters is so crowded in the evening and is so seldom clear that we wish to give the users the courtesy of finishing their QSO before starting a net.

The Net is called to order with a short identification and statement of purpose, followed by a request for the traffic relayed from 40 meters. Traffic originating on 75 meters is then listed and sent back with the relay station to 40. The 40-meter group operates mostly in the Western half of the U.S., with 75 meters covering the East out to about the Rocky Mountains. A number of stations check into both sessions and act as relay stations. Once the traffic is listed on 75 meters and sent back to 40, the net control will call for stations by alphabetical listing of their cities. This way, we will know what cities have received the traffic.

The Eye Emergency Net does not make the matches or final disposition of the eyes. We notify our individual Eye Banks as to where eyes are needed. They make the final decision and arrangements for shipping. The whole session on 75 meters usually takes less than 15 minutes, sometimes less than 10. Part of the year, the Country Cousins, who meet on 3.970 MHz at 9 PM Eastern, stand by for our operation before they start their fellowship group. Their cooperation is much appreciated.

How Amateurs Can Help

Amateurs wishing to participate should check with their local Eye Bank (see Eye Bank in the telephone listings) to find out if such a service is desired. If so, amateurs should supply the Eye Bank with a reliable telephone number at which they can be reached when the Bank wishes to list a request. As with any net, a potential operator should *listen* to a few sessions to become familiar with its operation first, particularly since Eye Nets try to keep their sessions very short and cannot afford the time for lengthy conversations on the air.

Every amateur contributes to the best of his ability and the requirements of the Eye Bank he represents. Some Eye Banks cover for satellite banks in their area and supply several hospitals. In this case, the traffic may be less because the bank may have a local exchange system that tends to balance out their needs. Even so, emergencies do occur, and when notified, the Net will do its best. With your support, we expect to be around for at least another 20-plus years.

A Key to the Future Is in Our Own Families

By Andrew Tripp, KA1JGG
Editorial Supervisor, ARRL

One out of every five newcomers to Amateur Radio joins as a direct result of a relative. This is one of the many conclusions of the Florida State University survey in 1980 (see March 1981 *QST*, p. 11). Since then, Amateur Radio has increasingly become a family affair, pursued and enjoyed by wives and daughters as well as by husbands and sons. No doubt, the family, with its cohesiveness and potential as a source of newcomers, provides a vital function in Amateur Radio.

No family, no matter how large or ambitious, could embrace all that Amateur Radio offers. But if you want to know about a family that lives, breathes and eats Amateur Radio, there's the Protas family of Phoenix, Arizona.

At the base of the amateur family's tree, being the first licensed, in 1958, is Dr. Stephen Protas, K7SP, an Extra Class ticket holder. Marlyne ("MJ"), NG7K, was first licensed in July 1977 as WB7TDN, and has worked her way up through Extra Class. Joshua, N7GBM, a General class, was first licensed at age 11, in June 1983, as KA7QQK. Brandon, N7GBN, also a General class licensee, followed suit that June to become KA7QQL at age 10. Steve's brother, Art, KG6AY, is an Advanced class, and his sister-in-law, Mara, a General class, holds the call N6IXJ.

When it comes to on-the-air activities, the Protas family members are chiefly DXers. Steve is on the DXCC Honor Roll and has earned 5BDXCC. Marlyne has 103 countries confirmed, Josh has 62 countries and Brandon 51. During a family trip to the annual DX convention in Visalia, California, in 1984, Josh and Brandon made friends with such notable DXers as HV2VO, 4X4NJ, VU2GDG and the late W6AM, many of whom they have corresponded with since. Steve and Art, who lives in West Covina, California, have kept on-the-air skeds with each other for years on 40 and 80 meters.

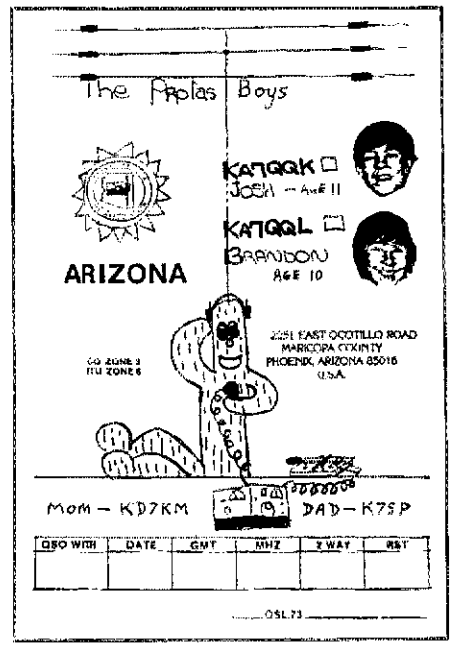
On the traffic side, Steve and Marlyne handled emergency messages during the Iranian hostage crisis, earthquakes in South America and Alaska, and local flooding. The couple also is involved in the Volunteer Examiner Program, having administered the first set of volunteer exams at the Ft. Tuthill ARCA Hamfest in 1984, kicking off the program in their state.

Josh and Brandon have done their fair share of promoting Amateur Radio. One hobby day in school, they set up a station in class and demonstrated amateur communications to about 200 6th and 7th graders. The boys' amateur activities have prompted articles about them in a local newspaper and a national family magazine, and a program on the USA Cable Network.

What's in store for the Protas family? Nothing is certain but their continued interest in and dedication to Amateur Radio. During a television interview, Josh summed up his—and the rest of the family's—thoughts about the importance of ham radio: "I think the best reason for kids to become hams is to keep Amateur Radio alive." The Protases are clearly doing more than their share.

Since Steve Protas, K7SP, first became licensed, in 1958, the Amateur Radio bug has spread rapidly throughout the family, to the point of including Steve's brother, Art, and sister-in-law, Mara. The two boys, Brandon (left) and Josh, and Steve's wife, Marlyne, have upgraded since this photo was taken.

From an early age, Josh (right) and Brandon showed an interest in Amateur Radio. At ages 13 and 12, respectively, the boys already have a sizeable list of ham achievements under their belts, including contact with the "First Ham in Space," W5LFL, and gaining publicity in the local and national media. *(Arizona Republic photo)*



Kids will be kids, and Josh and Brandon proudly show off that fact with their unique QSL card. The boys are mostly interested in DX, and have had eyeball QSOs with several notable DXers they first met on the air.

Happenings

Conducted By David Newkirk, AK7M
Manager, Regulatory Information Branch

- *League Comments on Repeater Coordination*
- *30-Day Exam-Retest Wait Abolished*
- *FAR Scholarship Winners*

VECs Meet At Gettysburg

FCC's Ray Kowalski convened a meeting of Volunteer Examiner Coordinators at the Commission's Licensing Division facility in Gettysburg, PA, on August 9, 1985. Attending for ARRL/VEC were Curt Holsopple, K9CH, and Jim Clary, WB9IHH, from ARRL Hq., with ARRL Atlantic Division Director Hugh Turnbull, W3ABC, observing. Other VEC entities present included W5YI Report/VEC, Laurel ARC/VEC, Central Alabama VEC, DeVry/VEC, Charlottle/VEC, Adirondack ARC/VEC, Sunnyvale ARC/VEC, Western Carolina VEC, Jefferson ARC/VEC, SANDARC (San Diego)/VEC, Mountain ARC/VEC, Anchorage ARC/VEC and Greater Los Angeles ARC/VEC. It was a chance to pick FCC's collective brain, and to discuss with other VECs the ins and outs of what is at once one of the most important and controversial programs in Amateur Radio. An overly dramatic statement? Not when it's considered that only through examinations administered through the VEC program can a U.S. radio amateur upgrade; *there is no other way.*

Among the topics discussed was the fact that no new VECs were being approved for the time being. If anything, FCC looks to the day when the number of VECs will decrease. How might errors on submitted FCC Form 610s (the license application) be reduced? It was agreed that most 610s are already being processed in good order. (For example, ARRL/VEC's July error rate was 0.054%—one error out of over 1800 applications!)

Exam results must be filed with FCC in a timely manner. FCC's Larry Weikert was asked to explain the criteria for counting an exam session "late." Weikert replied that the VE Team must have its results postmarked no later than 10 calendar days after an exam session. Likewise, the VEC's results must be postmarked no later than 10 days after they were received from the VE Team. Allowances for mail delays were unspecified.

On "Improving the Integrity of the VEC System, Real and Perceived," ARRL/VEC's Holsopple said that a VEC must have a good training and accreditation program for Volunteer Examiners. Test materials must be rotated frequently. FCC rules must be strictly adhered to. "If we don't like a rule, there are ways to change it, legally."

VECs were urged to share their test schedules with ARRL/VEC so their schedules may be added to ARRL/VEC's computerized test session referral system. This would assist candidates in receiving the most current information about test sessions in their areas.

What about preventing cheating? ARRL/VEC suggests that more than three VEs be involved in conducting a test session if they are available. FCC's Kowalski agreed that the VEC system has proven to be more secure than the FCC's Field Office testing had been. A resolution agreed upon by majority vote was that all VECs should use ARRL/VEC's multiple-choice question pools.

An open VEC/VE Forum at Dayton in 1986 was agreed upon as desirable, just as that held at the HamVention® in 1985. The next VEC-FCC meeting was set for Washington, DC, tentatively in August 1986.

In summarizing the meeting, Kowalski made it clear that, through the adoption of a system of examination by volunteers, Amateur Radio has traveled down a road from which there is no return. FCC's goal is a VEC system operating to a degree of accuracy such that Form 610s will pass directly from the VECs to the FCC's computer without rescreening at Gettysburg. FCC has reassigned staff and released exam space to other uses. *The examining task cannot be returned to the FCC.*

LEAGUE FILES COMMENTS ON F2A NPRM

In November 1984, the League filed a Petition for Rule Making (RM-4880) requesting that FCC authorize F2A emissions at 29.5-29.7 MHz. This would allow 10-meter-FM repeaters to identify using that mode; F2A is not allowed now on 10 meters, and until the release of the 902-928 MHz band, 29.5-29.7 MHz was the only segment authorized for repeater operation that does not include F2A emission.

In response to RM-4880, FCC proposed to allow F2A in the 29.5-29.7 MHz segment in a Notice of Proposed Rule Making (Docket 85-168) released May 31, 1985. The Commission asked for comments by August 14, 1985 on any adverse effects this proposal might have on amateur operation.

The ARRL filed its Comments on August 14. The League states that since F2A and G2A emissions are the primary emission modes used for Morse identification of amateur FM repeaters, they should be available to identify all such repeaters. (G2A, phase-modulated telegraphy for aural reception, is included because much amateur equipment used in FM repeater operation is actually phase modulated, making it necessary to authorize both types of emission.)

League Comments go on to acknowledge that authorization of F2A and G2A at 10 meters is not proposed to be limited to use for repeater identification. Says ARRL, "Normal amateur operating practice is such that there would be little, if any, use of FM Morse telegraphy in the 29.5-29.7 MHz subband for other than repeater identification. Thus, the League knows of no adverse effects on amateur communications which would occur by allowing this type of emission."

ARRL FILES COMMENTS IN PR DOCKET 85-22

If the phrases "repeater coordination" and "Docket 85-22" don't ring any bells with you, you're probably not interested in repeaters! Time was when your machine might have been the only one in town. That time is long gone, and pressures for repeater frequency "pairs" are straining nerves—and spectrum space—everywhere.

In response to rising interference in the repeater subbands, FCC released a Notice of Proposed Rule Making on repeater coordination, PR Docket 85-22, in January of this year. FCC intends to add to Part 97 the definitions of "coordinated repeater," "harmful interference" and "frequency coordinator"—and a new paragraph (h) to Section 97.85 reading, in part, that "where one repeater is coordinated and the other is not the station with the noncoordinated repeater has primary responsibility to resolve the interference." This was really bringing the question of whether one should coordinate one's machine home to roost! Further, the NPRM included a moratorium on new repeater operation in some large metropolitan areas; this moratorium was lifted in February as a result of a Request for Partial Reconsideration filed at near light speed by the League.

Another aspect of the moratorium had quickened pulses in the field when the fine print of 85-22 was read as defining "new" repeaters as those that would not be listed in the new edition of the *ARRL Repeater Directory*—unless other proof of preoperation was available. The result was a scramble to list repeaters in the *Directory* just as the book was in its final editing stage. This quickening of pulses was survived both by repeater registrants and the *Directory* editor, however, and the process of responding with comments to 85-22 continued. The original deadline for the filing of comments had been July 1, but this was extended at ARRL request to August 15, 1985. The League's Board of Directors wished that maximum time be allowed for it to consider input from those concerned. And "those concerned" were legion.

The gist of the League's August 15 filing in Docket 85-22 was succinctly put at Minute 74 of the Board's July meeting in Hartford (see September 1985 *QST*, page 57):

1) Preferred status in instances of harmful repeater-to-repeater interference should be granted to amateur repeater operators who have implemented the recommendation of their local or regional frequency coordinator and are thereby coordinated.

2) Frequency coordination should be strongly urged for all amateur stations in repeater or auxiliary operation in any geographical area that is served by a frequency coordinator.

3) The FCC should not consider alternatives to frequency coordination nor mandate methods of coordination.

4) The use of modern technological innovations, such as those cited in the NPRM, should be encouraged, but not substituted for frequency coordination.

5) The FCC should not recognize a single entity, such as a National Frequency Coordinator, for amateur repeater operation. Such coordination activities should be performed by local or regional frequency coordinators with appropriate support to these coordinators to be provided by the ARRL.

6) The ARRL also recommends that the scope of frequency coordination include all Amateur Radio stations in repeater or auxiliary operation.

7) The ARRL further recommends that consideration of the procedural framework within which frequency coordinators are recognized and conduct their operations be subject to a future FCC proceeding.

Why should coordinated machines enjoy "preferred status" with the Commission? Because, said the League,

> "... the increase in interference problems results in large measure from the failure of some amateurs to participate in frequency coordination prior to placing their repeaters or auxiliary stations on the air. Additional causes of interference include amateurs who operate outside of normally accepted band plans, uncoordinated modifications, and technological improvements that extend the range of communications. The preference for repeaters which have been coordinated over those which have not been coordinated should be continued ... in the event of interference between a coordinated and an uncoordinated repeater, the uncoordinated repeater should be held strictly responsible for the resolution of the interference problem. If the interference cannot be timely resolved, the uncoordinated repeater should be required to cease operation.

What about end-running coordination with improved technology?

> The League supports the use of technology to increase the effective use of spectrum in the repeater subbands, but such techniques do not reduce the need for a frequency coordination mechanism, because of the continued growth of the Amateur Radio Service and of repeater and auxiliary operation. Certainly, the crowded state of amateur repeater subbands below 1300 MHz will itself encourage the voluntary adoption and incorporation of such new technology by the development of appropriate equipment. However, for two reasons, frequency coordination provides the *best* option at present for interference prevention and resolution. First, narrow band technology is best suited to introduction in bands such as 902-928 MHz, which are not presently dominated by other modes of emission. Second, for the near future, the dominant mode for repeater operation in the Amateur Radio Service will be FM, and the realistic course is to plan coordination requirements with that mode in mind.

Wouldn't a National Frequency Coordinator be better than local/regional coordination?

> The frequency coordination process, the issues requiring determination, and the knowledge required to perform frequency coordination are all based on intimate acquaintance with geographical conditions, the needs of local amateurs, and local propagation characteristics, in order to permit accuracy in predicting interference parameters. The process also requires close monitoring of repeater frequencies to determine which repeaters may not have become operational or which have been off the air for extended periods, thus facilitating maximum spectrum utilization. Nothing would be gained by attempting frequency coordination at the national level as there is no assurance that a national coordinator would possess the requisite understanding of the great variety of local and regional conditions that exist. With national support for the League, including an enhanced database, a repeater directory, and a coordinator's newsletter, local or regional frequency coordination would continue to provide the best opportunity for interference protection.

What about the validity of the idea behind the original moratorium in large metro areas?

> The Commission's suggestion in the *Notice* to utilize Central Metropolitan Statistical Areas (CMSA) or Metropolitan Statistical Areas (MSA) as set forth in government census documents is not a valid means of defining coordination areas. CMSAs and MSAs are not coincident with present local coordination boundaries. They are, rather, defined by economic and political considerations, and not topographical considerations. Thus, those jurisdictional boundaries are unrelated to radio propagation. Even in remote areas, coordination provides a complete database and a means of orderly future repeater development.

Next on the agenda: reply comments, which were due by September 30. Watch this space for more on lively 85-22.

FCC SCUTTLES WAITING PERIOD FOR RE-EXAMINATION

Effective November 8, 1985, FCC has amended the amateur rules to eliminate the 30-day wait before an applicant for an amateur examination may retake a failed examination element. This action, in PR Docket 85-21, is the result of a petition filed by Phil Miller, KB8QX, in 1984. Miller had requested that the waiting period for retaking an amateur exam be reduced from 30 days to 7 days. FCC's Notice of Proposed Rulemaking proposed elimination of the waiting period altogether, and included a proposal to require public announcement only of examination sessions intended for five or more candidates. The extant rule required Volunteer Examiner Coordinators to publicize *all* exam sessions.

ARRL was one of the commenters arguing in favor of retention of a waiting period; it asked for 27 days. The idea behind this reduction by three days was that the 30-day wait often causes a person to miss the next exam where examination opportunities are offered monthly.

The Commission countered that the aim of the 30-day waiting period had not necessarily been that of guaranteeing the integrity of the examination and successful exam candidates. It was, instead, "a carry-over from the days when the Commission administered the examinations. While it may promote conscientious preparation for examinations, its purpose was to conserve Commission resources. If concerns for integrity can be satisfied, we see no need to restrict the remarkably flexible volunteer examination system with outdated prohibitions." The Commission next turned its guns on the question of whether the waiting period ever improved the quality of the knowledge of applicants who had to wait before successful retesting.

> There is no persuasive evidence in the record that an applicant who has waited 30 days between tests will be better prepared for the next test than one who has waited 27 days, or 13 days or 7 days or any other period of time. Thus, we feel that the only circumstance which must be guarded against is the administration of *the same questions* at the applicant's next examination. Our instructions to the VECs already prevent this from occurring. Different VECs can and do coordinate examination sessions at different events in the same locality. Since each VEC makes up its own test designs following our algorithm, it is highly unlikely that examination sessions coordinated by two different VECs will contain the same questions ... we conclude that the public interest will best be served by eliminating the retest waiting period altogether. This decision adds no additional burdens on VECs. They are under no obligation to give tests on demand, to hold sessions on multiple dates, to examine more people than they can plan for or accommodate, to promptly return to a locality for retesting or in any other way to alter their present procedures. Their only obligations are to maximize the number of different examinations in use and to change frequently the questions used. These obligations already exist.

ARRL had opposed FCC's proposal to require public announcement only of exam sessions intended for five or more candidates. Wouldn't unannounced "backroom" exams promote abuse or the perception of possible abuse? FCC's reply was that no matter where an exam was given, it had to be given by a team of three examiners, each of whom had to be accredited by a VEC. "This circumstance alone is calculated to preclude fraudulent examinations. Nevertheless, in view of the comments, we will continue to require that public announcement of all examinations be given." Recognizing that the number of exam candidates at any one exam session may be limited, FCC will require that public announcements of exams alert the public to any such limitation.

To update your copy of the *FCC Rule Book*, revise paragraph (a) of Section 97.26 to read:

(a) Each examination for an amateur operator license must be administered at a place and time chosen by the examiner(s). The number of candidates at any examination session may be limited. Public announcement must be made before all examinations for elements 1(B), 1(C), 3, 4(A) or 4(B).

Paragraph (h) of Section 97.26 is removed and reserved.

Be a Contributor to the Goldwater Scholarship Fund

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

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

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

Recent contributors of $25 or more include: Michigan Amateur Communication System, in memory of Hugh Gibson, W8DSE; Richard, K1PAD and Sharon Beebe; Joseph G. Chaet, W1RGH; Jackson G. Sauers, KB6JRI; Leonard Swanson, KB6TA; Clarke S. Vaughn, KH6IHY; Kansas City Amateur Radio Club; Walter L. Howard, KA9QOK; Craig E. Scott, WA9HIA; Frank H. Phillips, W6GBC; Hamcon, Inc.; Douglas E. Steele, WB4ZGR; David W. Stapleton, W1GJV; Ralph F. Bergman; Tri-State DX Association, in memory of Alice Simpson, W4ECK.

1985 FOUNDATION FOR AMATEUR RADIO SCHOLARSHIP WINNERS

The Foundation for Amateur Radio is pleased to announce the 1985 winners of the 19 scholarships it administers.

John W. Gore Memorial Scholarship ($900)—James H. Baker, KI4YN, Alexandria, VA.

Richard G. Chichester Memorial Scholarship ($900)—Eugene S. Reilly, KA8JIG, Cincinnati, OH

Edwin S. Van Deusen Memorial Scholarship ($350)—Richard K. Soper, KA2IKV, Syracuse, NY.

QCWA Memorial Scholarships ($600 each)—Francis P. Horan, KA3CJR, Drexel Hill, PA; Hai T. Nguyen, KAØALZ, Colorado Springs, CO; Carl H. Puckett, KA7BWC, Great Falls, MT; John E. Schnupp, N3CNL, Ephrata, PA; David J. Schmocker, KJ9I, Oconomowoc, WI; John G. Sullivan, N2DYC, Haddonfield, NJ.

QCWA Robert S. Cresap Memorial Scholarship ($500)—Douglas Swiatlowski, KA2KMT, Camillus, NY.

Radio Club of America Scholarship ($500)—James W. Healy, NJ2L, West Hurley, NY.

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)—Michael Krensavage, KA3CUP, Marietta, GA.

Columbia (MD) Amateur Radio Association Scholarship ($650)—Christine L. Gray, KA3NAK, Elkton, MD.

Baltimore (MD) Amateur Radio Club Scholarship ($500)—Eric J. Smith, KA3KJO, Silver Spring, MD.

Dade Radio Club Tropical Hamboree Scholarships ($500 each)—Christopher A. Atkins, KA2QWC, Fort Pierce, FL; David R. German, N4FAD, Sarasota, FL.

Lewis W. Wilkinson Memorial Scholarship ($500)—Wayne F. Poole, KC4XL, Surfside, FL.

These scholarships were 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. Additional information regarding the Foundation's scholarship program can be obtained from FAR Scholarships, 6903 Rhode Island Ave., College Park, MD 20740.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the the Eastern New York, Eastern Pennsylvania, San Diego, South Dakota, Louisiana, North Carolina, Virginia and Pacific Sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Incumbents are listed on page 8 of this issue.

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

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

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

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

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

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

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

Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before January 2, 1986. Returns will be counted February 18, 1986. SMs elected as a result of the above procedure will take office April 1, 1986.

If only one valid petition is received for a Section, that nominee shall be declared elected without opposition for a two-year term beginning April 1, 1986.

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 the Field Services Manager.

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

Richard K. Palm, K1CE
Field Services Manager

REPEAT NOMINATING SOLICITATION

Since no petitions were received for the San Francisco Section by the petition deadline of June 7, 1985 as a result of notices in April and May *QST*, nominating petitions are herewith resolicited. See the above notice for details on how to nominate.—*Arline Bender, WA1VMC*

SECTION MANAGER ELECTION RESULTS

The following Section Managers will begin a two-year term of office January 1, 1986:

Uncontested

East Bay	Robert B. Vallio, W6RGG
Kansas	Robert Summers, KØBXF
Michigan	James R. Seeley, WB8MTD
Tennessee	John C. Brown, NO4Q
Santa Barbara	Byron W. Looney, K6FI
Western	
Massachusetts	Don Haney, KA1T

—*Arline Bender, WA1VMC*

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 10, 1985. An s.a.s.e will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

DL4BO/125	IK5CXL/111	JA8QR/129	VE7AVC/245	NA2I/105	K4ZCQ/116	W4TZC/102	KB6CLL/126	KD7XR/111
EA4DO/335	JR2QUZ/109	JA0UMV/121	Y25IJ/113	WA2MTR/270	KD4YT/103	WA4YED/201	N6ESV/100	W8FRB/101
EL7W/101	JH6SOR/269	JW0P/106	ZL1PF/166	AA4LL/105	KE4XY/159	WB4J/116		

Radiotelephone

DU1KT/125	EL7W/101	JA1ETO/198	JA4NHG/258	ON7CU/162	PP8WV/120	9M2MM/100	W4OUE/273	KB6CLL/126
EI6EW/104	I3FOM/152	JR2QUZ/109	JH6SOR/250	OZ2RM/112	YB4FW/100	K4ZCQ/116	N5AWE/102	W8EHX/100

CW

JH6SOR/190	PY2RO/202	VE7AVC/242	WP4F/100	KK0M/146				

RTTY

I5FLN/217

160 Meters

OE5KE/102

5BDXCC

ZL1AAS	KK0M	JH6SOR	N6NF	KX1A	N6TP	DL1VJ	K2SD

Endorsements

Mixed

DF6JC/250	OE2EGL/335	K1YZW/339	N3ACU/260	K4TEA/313	N4OM/316	W4ZD/352	W5AL/359	K9RHY/271
DK5AD/312	OH2BH/344	KA1QY/354	W3DJZ/348	K4UEE/324	NN4K/248	WA4BSN/253	W5DL/340	K9XJ/325
DL2QB/231	OH2BZ/343	KN1I/200	W3GG/332	K4XG/334	NN4R/284	WA4LOF/306	W5OB/351	N9ALC/287
DL0WU/297	OH3SR/335	W1AA/355	W3HHG/210	K4XR/303	NT4W/270	WA4VDE/312	WA5IEV/335	N9BUS/251
EA1JO/225	OK1DH/310	W1RED/321	W3LDD/280	K4YYL/342	NZ4Y/284	WB4GNT/307	K6LRN/125	W9IT/313
F6DYY/271	ON4DM/358	K2FB/349	W3LMZ/317	KA4PKB/271	W4BFR/350	WB4ZNH/314	K6TMB/283	W9LNQ/335
JA1RLV/317	PY2PA/343	K2LS/302	W3UJ/310	KC4TJ/250	W4DMV/295	WD4AFY/175	K6ZO/366	W9NYW/276
JH1QOJ/323	PY2PE/343	K2PXX/346	AA4KA/309	KE4HX/286	W4DR/358	WD4FWE/295	W6OB/327	W9RCJ/354
JN1VNW/155	SM4HVB/131	W2BHM/355	AA4H/304	KN4KWD/220	W4DXI/301	WD4RCO/309	W6OKX/316	W9RXJ/321
JA4ZA/343	SM6CVX/334	W2FG/338	AA4V/321	KT4M/248	W4EX/366	WI4K/265	W7FP/317	W9TKD/350
JA5ALE/288	VE3IR/314	W2FXA/354	AE4O/320	KX4R/311	W4FX/351	K5BLV/314	W7MCG/270	WA9OVU/290
JE6EGC/158	VE3XK/320	W2JWK/279	K4BAI/327	N4HOH/205	W4GTS/337	K5DX/357	WA7GVM/291	K0LD/311
JA8AQ/330	VE6VM/318	WA2SSV/143	K4BYK/301	N4IA/319	W4JFL/200	KB5FV/252	W8DMD/363	KK0M/260
LA1K/344	VK2AYK/156	K3LWM/312	K4GFH/283	N4JJ/320	W4OMQ/328	KE5PA/162	W8GZ/365	N0BIZ/181
LA3XI/324	XE1AE/350	K3NA/189	K4JAF/269	N4MM/336	W4UG/344	N5RR/334	W8KKF/309	W0JIN/300
OE1ZL/265	K1WJB/281	K3ZO/276	K4KKJ/270	N4OL/325	W4XJ/340	NF5Y/160	W8QBG/316	W0NB/314

Radiotelephone

DJ2YI/350	JA4ZA/339	PY2PE/343	W2FG/331	K4BYK/297	N4JF/319	W4UYC/219	K5DX/352	K8CFU/348
DK5AD/299	JE6EGC/152	PY4IL/179	W2FXA/334	K4PI/305	N4MM/332	WA4HNL/276	KE5PA/162	N8BLD/207
DL0WU/281	JA7JH/325	PY4LJ/277	WA2MTR/270	K4UEE/287	NN4K/211	WA4LOF/304	NK5Y/271	W8GZ/365
EA1JO/168	LA3XI/323	SM6CVX/328	WB2DND/300	K4URK/299	NT4W/270	WA4PPS/250	W5AL/306	W8KKF/309
EA4DO/335	LU2AH/317	VE3LRU/277	K3LWM/307	K4XG/325	NU4D/269	WA4VDE/309	W5JJA/340	W8QBG/312
EA8LD/314	LU3MCJ/252	XE1AE/350	W3DJZ/347	K4YYL/339	W4BFR/325	WA4YED/200	W5LZW/349	KR9R/251
EI8AR/204	OE2EGL/334	ZP5JCY/268	W3IOA/253	KA4PKB/270	W4DMV/256	WB4GNT/308	WA5IEV/334	N9AF/333
F6CPO/285	OH2BZ/293	KA1FXI/195	AA4H/264	KC4TJ/250	W4DR/354	WD4AFY/175	K6TMB/276	W9LNQ/300
G4ULC/208	OH3SR/334	KA1JLK/150	AA4KA/278	KE4HX/285	W4EX/364	WD4KWI/161	W7FP/317	W9TKD/338
JA1AAT/331	ON4DM/358	W1AA/355	AA4V/314	KN4H/297	W4OWY/291	WI4K/265	W7MCG/226	K0LD/307
JA1BFF/175	PY2PA/343	K2LS/257	AD4E/176	KT4M/248	W4UG/343	WI4R/275	WA7GVM/289	KK0M/247

CW

DK5AD/290	LA3XI/296	KI2P/141	AA4H/161	K4UEE/264	NZ4Y/155	NF5Y/159	W5LW/185	KO9Q/142
EA1JO/172	W1RED/160	W3GG/261	AA4KA/264	K4XG/291	WA4LOF/207	NF5Z/150	K6TMB/174	W9IT/257
JA1BFF/204	K2LS/237	K3LWM/257	AA4V/227	N4MM/305	KC5M/211	W5AL/264	W7MCG/226	W9LNQ/275

160 Meters

W2BHM/127

DXCC NOTES

Pribilof Islands

The ARRL Awards Committee met on September 17 to consider the country status of the Pribilof Islands. The matter had been referred to the Awards Committee by the DX Advisory Committee, which had recommended addition to the list by a 9 to 7 vote. After many hours of studying the voluminous documentation and two hours of in-person deliberation, the Awards Committee unanimously VOTED (7-0) that the Pribilof Islands *not* be added to the DXCC Countries List.

In reviewing Rule 2(a) of the Countries List Criteria, the Awards Committee concluded that the first sentence was operative in making measurements: "Islands situated off shore from their governing area must be geographically separated by a minimum of 225 miles of open water." Since the Aleutian Islands are indeed a part of the "governing area" of Alaska, and since the Pribilofs are less than 225 miles from the Aleutians, the Committee failed to see how they would qualify for separate status. The Committee further determined, through examination of precedent and evolution of the wording of the criteria over some 40 years of the DXCC, that the "mainland" reference in 2(a) only clarifies the situations to which the rule itself applies.

The Awards Committee meeting was chaired by Technical Department Manager Charles Hutchinson, K8CH, upon the request of Committee Chairman John Lindholm, W1XX. Lindholm had authored the staff white paper requested by the DXAC as to the history of DXCC Countries List Criterion 2(a) interpretations. This 26-page document had concluded that the Pribilofs do not qualify under the existing criteria. So as to not prejudice the Pribilofs from being given every consideration, Lindholm also excused himself from voting, in favor of an alternate. DXCC Manager Donald Search, W3AZD, did not vote, as prescribed by Committee rules.

How's DX?

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

Globe-Trotting with QRP CW

The following is based on Alan Kaul's amateur adventures from the Middle East. W6RCL's gear for his QRP Jordan operation, an outgrowth of Project Goodwill, started out life as a back-up rig for his North Hollywood QTH. The producer of the ARRL videotape, Amateur Radio's Newest Frontier, *Alan works for NBC News and is based in Amman, Jordan. His address is: Alan Kaul, NBC News Operations Desk, Room 520, 30 Rockefeller Plaza, New York, NY 10112. But send your JY9RL cards to WA6POZ.*

When ARRL premiered its IARU Project Goodwill transmitter and receiver back in 1978, it seemed like a good idea whose time had come. In case you don't remember, the receiver was direct conversion, and the companion transmitter was crystal VXO, capable of about 6-W output. The design frequency was the CW portion of 20 meters, but the rig was easily modified for use on 80, 40 or 15 meters. The idea behind it was to put it into the hands of amateurs in the so-called Third World who could assemble it and put it on the air with battery power.

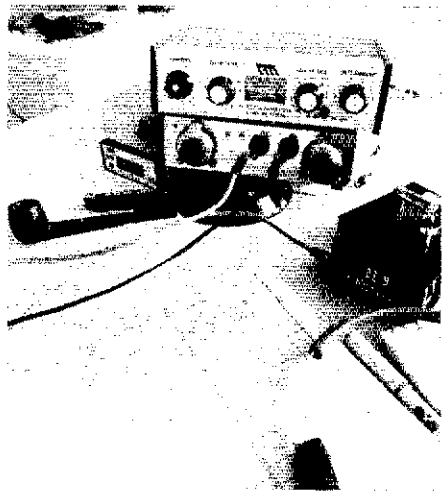
When W6RCL assembled his little station it was to be nothing more than a back-up rig at his home QTH in North Hollywood. He worked about 20 U.S. states, VK and JA, and was basically pretty pleased, although the receiver was a bit wide. A few years later, when Doug DeMaw, W1FB, published his "Bare Bones Superhet" as an 8P6 vacation rig, he upgraded the backup rig and put the superhet receiver in the same box with the 6-W transmitter.[1]

But he experienced disappointment when he went to KH6, making only one contact. It was a good one, though—5W1DC (DF7CC's "DX vacation" to Western Samoa in February 1984). Alan rationalized the problem as being related to his home call, and figured anyone tuning through a CW signal and hearing still another W6 probably wouldn't stay around and catch the /KH6. His second trip as DX was to 6Y5. He had a bit of the same problem there, too. In Jamaica he worked about 40 stations, including five countries (as far away as Germany), using only a monopole off the 7th-floor hotel balcony. It was a bit disappointing, but again he assumed part of the problem was the W6 call, signing portable 6Y5.

Then he came to the Middle East. His first stop was to the Royal Jordanian Amateur Radio Club, in Amman, where after presenting his U.S. license, he was issued a JY call. Weeks later, after receiving permission for a station license, Alan set up a small shack with a QRP rig and tried the same old monopole off the 6th-floor hotel balcony. The first day or two were great. A page in the log, and a dozen or so countries! But, contacts still were few and far between. It took quite a while to fill that first log page. He stumbled around looking for a solution, but didn't think it would be easy in that part of the world.

But, surprisingly, it was. A little antenna design from memory, some simple resources

[1]D. DeMaw, "Build a Bare Bones CW Superhet," *QST*, June 1982, and J. Rusgrove, "A 20-Meter, VXO-Controlled, 6-Watt Transmitter, *QST*, Dec. 1978.



JY9RL and his globe-trotting QRP CW station.

like wire and coax, and presto—QRP with a fairly good ERP! He didn't have roof access, but did have an 8-foot piece of ½-inch aluminum tubing and a couple of 5-foot lengths of PVC. (Tubing and PVC were obtained locally.) He decided to try a two-element wire Yagi, off the same balcony. The tubing holds the center of the driven element 8 feet away from the building, and the two pieces of PVC do the same for the ends. Next to the building is the reflector, which is draped over the tubing and PVC and fastened firmly in place with Scotch tape! Believe it or not, it works quite well.

Unfortunately, the antenna fires northeast. (He didn't have a lot of choice; that's the way the building faces.) But, it doesn't mean he can't work Western Europe, all of which is to the northwest. He has also worked most of Eastern Europe as well, and all but two of the Soviet DXCC "counters" (including most of the ones he never even heard when he lived in California!). When the band is open, JA is a piece of cake. Exotics he has worked include DU and HL, and Alan has heard YB, VU2, 9V1 and ZL.

Remarkably, despite the beam heading, JY9RL has even worked Eastern U.S. stations. His biggest problem there has been propagation. Eastern U.S. comes through about midnight his local time (5 PM EDT), and he is too sleepy at 6 A.M., when the pattern shifts to the West Coast (8 PM PDT). But, one of these days, he'll get to bed early and get up with the sun to chase the 6s and 7s.

His antenna bearing for North America is about 330 degrees, and his antenna points 45 degrees. Alan runs a measured 5-W output on rechargeable NiCds. The AA cells keep him above 4-W output for an hour or so of contacts. After about 90 minutes, the SWR/power meter says it really is time to change. He has an ac supply, but gets a little cleaner audio on the 10 NiCds. (The IARU station was designed to run on flashlight cells.)

As of early September, he has worked more than 450 QSOs, including more than 30 stations in the U.S. His countries total is 49 on 20-meter QRP CW, with a nonrotatable antenna. His countries include all USSR, except Franz Josef. (For the bigger thrill of working sideband into statewide pileups, Alan visits the club station and operates from JY6ZZ.) And, when he gets settled in, plans include bringing the home station from W6, complete with Yagi, and gain antennas for 80-10. But, for pure pleasure, there's nothing quite like QRP from a country with a prefix like JY.

The IARU transmitter does work, in the part of the world for which it was intended. You don't have to take his word for it. Talk to his QSL manager, Gerry Gross, WA6POZ.

A hearty thank you from Alan to W1FB and Jay Rusgrove, W1VD, for designing equipment that works!

HE'S LISTENING UP

[The following is courtesy of W6BDN.—Ed.]

Since the San Francisco Orchestra was playing the CW Symphony (*Beethoven's 5th*), directed by our new conductor, the XYL and I trudged up to the city to attend an open rehearsal. We got there early and staked out seats in the center of the second occupied row. It's somewhat distracting to have the music interrupted and repeated. But, it's rather casual and fun. They have *people* playing the instruments instead of the usual giant penguins. It was interesting observing Maestro Blomstedt for the first time, and trying to see if we could tell the

difference when they replayed a passage.

While the orchestra was regrouping after the intermission, one of the musicians walked to the front of the stage, gazed upwards and waved both arms in a determined fashion. A nattily dressed chap in the row ahead of us (presumably in an attempt to assist) stood up, faced the assemblage, waved his arms also, and shouted "Quiet, Quiet!"

The musician on stage completed his mission (waving to a friend in the balcony), and returned to his place. The audience ignored the shouting exhibitionist in front of us. As for me, I could hardly contain my laughter! Luckily it was an informal occasion. *Now* I know what DX policemen do for kicks when the flux is down!

DJIBOUTI

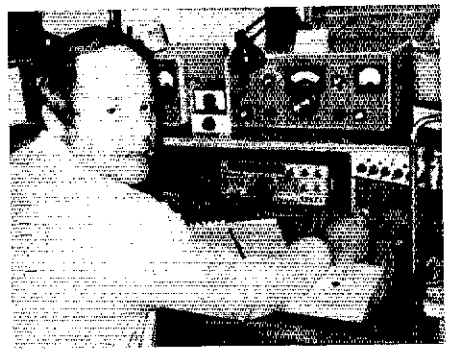
W2II (ex-FØFMV) forwards up-to-date information from his friend Dany, F6CZB, who is now J28EI. Dany is stationed in Djibouti with the French Air Force and is an enthusiastic DXer who especially likes to work stateside DX. J28EI is now ready on nine bands, CW/phone, using an FT-757GX. Twenty-meter likely frequencies are 14,004 14,014 14,025 14,114 14,214. Other checkable spots should include: CW—28,028 24,892 21,021 18,070 10,101 7004 3510; and SSB—28,528 24,900 21,220 21,250 18,160 7043 7076 3798. On 160, Dany likes 1824 1836 1840, CW only. On top band, Dany uses a ground plane 130 ft high. Dany's manager is Roger Luder, FC1JEN, Box 200, 13 300 Salon, France. For 160-meter contact information *only*, contact J28EI direct to Box 2417, Djibouti.

Other Djibouti news: Gerard, J28EB, is now back in France as F6IGS. Local Djibouti Box Numbers include J28DN, Box 1724; J28DQ and J28CI, Box 1076; J28EL, Box 2417; J28EM via F8RV; J28DM via F6GYU; J28DX via F1CFD; J27RDD/J28RAD/J2ØMI via ARAD, Box 1076 (the box to write to for general information).

Troster's Tips for Easy Listening

What kind of calls is the DX station responding to? If you sign your call two or three times and then listen, has the DX station already gone back to someone else? If so, shorten your call to one "sign" because he is going back to the quickest call he can spot. If you continue to sign many times each call, when he is working short calls, you may be displaying semi-lid-like tendencies.

More next month from W6ISQ.



ZP5XDW/N4PW stopped by W1CW for an "auld lang syne" visit late summer. Doug is a top-notch CW operator, seasoned by years of DXing in Africa, Asia, etc. Also see the first Circuit item. *(W1YL photo)*

ZS6USA

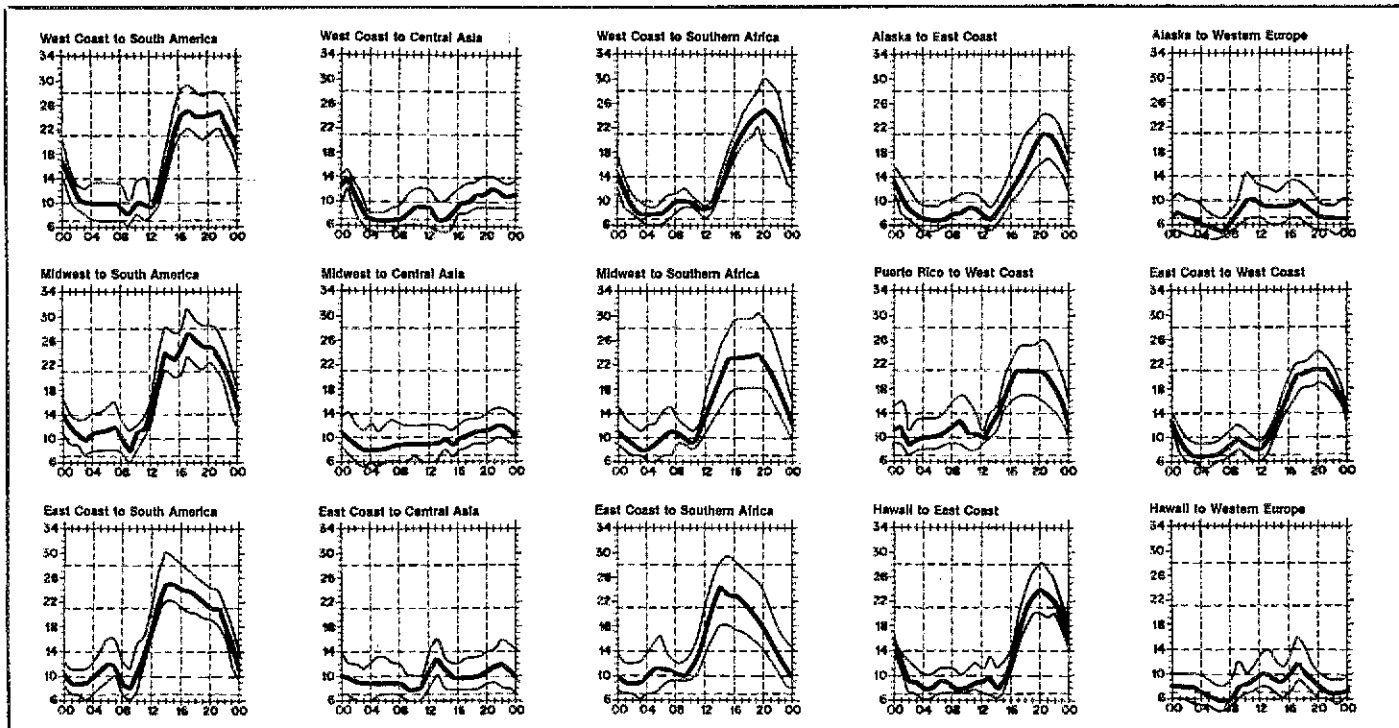
N4NW? Well, Tom is alive and well, and can be heard operating from South Africa as ZS6USA. (The normal call sign structure in the ZS6 area is being issued alphabetically with three-letter suffixes in the "C" block.) ZS6USA, being unique, caused some concern of its legitimacy, until SARL announced its existence. QSL with an s.a.s.e. or s.a.e./IRC to the manager directly via Box 197, Delta, PA 17314 USA. All cards will be replied to, whether direct or via bureau. Tom is QRV on all bands/modes, except SSTV and FAX.

In order to clarify QSLing for his past/current DX operations, Tom notes the following—TU73, TU2NW, 1983/84, EL2AI, 5V7NW, 5T5NW, N4NW/6W8, 1982/83—should be sent to Mike Hayden, AK3F, Box 573, or 296 Oak La., Gettysburg, PA 17325. Operations from ZS6USA, N4NW/ZS, N4NW/3D6, 7P8DE (beginning Aug. 1984) go to Box 197, Delta, PA 17314, or via the ARRL Bureau c/o N4NW for forwarding to the QSL manager. All cards send direct to manager without s.a.e. and postage, or s.a.s.e., will be returned via the bureau. Bureau cards will be returned via the bureau. Tom notes that propagation has been almost nonexistent to the U.S., but expects improvements as the season changes. He finds conditions good to Europe and the Mid East, as well as to the Pacific. He finds it amazing how loud Eastern European stations are this far south, actually louder than they were when he was in TU.

THE CIRCUIT

☐ **ZP5XDW:** Shortly following his September home leave, Doug underwent extensive surgery following an emergency trip to Miami's American Hospital. Words of cheer will be promptly forwarded to him via Doug Wooley, APO American Embassy, Miami, FL 34036.

☐ **Cape Verde/D44BC:** N6TJ's November trip is "go," with Jim hoping to arrive Nov. 15. Operation will be confined to sideband until the CQWW code event, Nov. 23-24. D4 is extremely rare on CW, so he's anticipating some



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

memorable pileups! His usual contest CW spots: 1830-50, 7010 and 7035, 3510 and 3535, 14,035, 21,035, 28,035. Cards go to Jim Neiger, Box 10368, Torrance, CA 90505.

☐ **Pakistan:** W6NLG is QSL for AP2ZA *only*. Sam, AP2ZA, works for Saudi Arabia Airlines, and when home operates 97% sideband (14.200-.220). Sam can often be found at the April International DX Convention in Fresno, mid-April. W6NLG notes that he has all the logs for AP2ZA; your card via an s.a.s.e. W6NLG's QTH is good in all recent directories.

☐ **YA1AH:** After years of frustration and searching, WB9HAD finally received a 1973 confirmation for his contact with YA1AH. Arne is no longer an active ham, but has all his logs from YA1AH. Arne is no longer an active ham, but has all his logs from YA1AH (and, in fact, still has a few of the *original* cards). If you're still after that rare Afghanistan card, write to Arne Hammer, Astralanvagen 4, 26200 Angleholm, Sweden. (tnx for the tip, Jerry!)

☐ **DX Report:** VE3FRA notes that effective the end of August his job-related duties necessitated his ceasing publication. *QRZ DX* editor W5KNE will be fulfilling subscriptions still remaining. Alan's biweekly was consistently informative, easy to use and helpful. We'll miss his professional presence.

☐ **El Salvador:** WAØJYJ reports he now has all the logs and cards for HU1DX and HU1IFI (El Salvador 1984 special-event stations). Check with him at 1509 Avond Dr., Montrose, CO 81402.

☐ **Help!** W2DUN: TL8MM 19/Feb./84 14 MHz, D66FHL 16/Mar./85 14 MHz. K6ARE: EA9NW 20/May/84, TR8JLD 26/May/84, H44IA 18/Aug./84. WA8JOC is looking for help on Franz Josef contacts UW3HY/1 and UK1PGO—mainly how long does it take to get the cards!

☐ **Jordan:** K5KG hoped to operate from Jordan in the All Asian CW DX Contest. If you worked George, QSL via K5TU, 8302 Clover Gardens Dr., Houston, TX 77095.

☐ **XW8BP:** Thanks to information in the March issue, W2TKG's XW8BP card arrived, 15 years and 11 days after his contact with Feng on 21 MHz. The good news to Joe is that Feng is alive and well after all the tragedy in his part of the world. Joe sent a card to JH1ARJ, via JARL, with IRCs on April 19 and felt the three-and-a-half month turnaround time wasn't bad at all.

Special Notes

☐ QSL Corner, June 1985 *QST*, page 55, contains information and addresses for ARRL Incoming Bureaus. QSL Corner, Sept. 1985 *QST*, page 63, contains information on the operation of the ARRL Outgoing QSL Service. For additional information on bureau operations (Incoming and Outgoing), send an s.a.s.e. to ARRL QSL Bureau, 225 Main St., Newington, CT 06111.

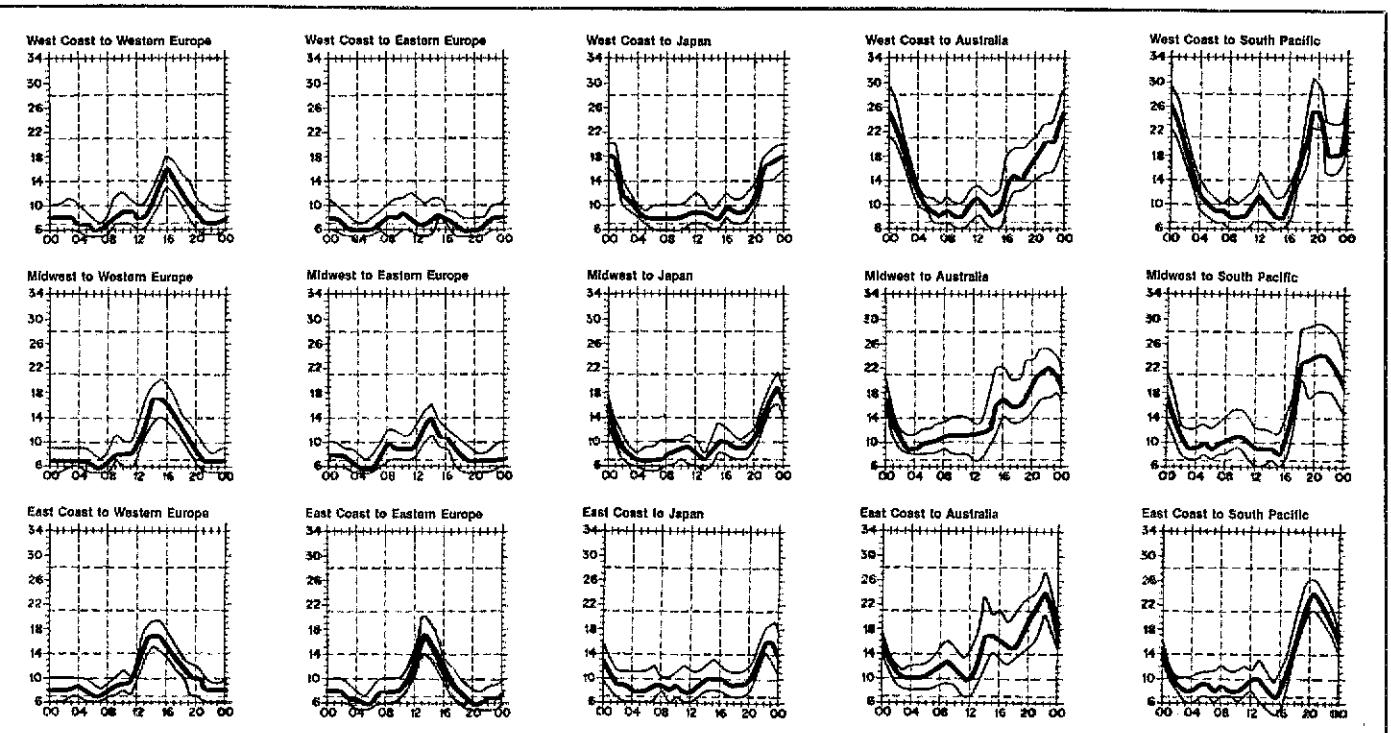
QSL Corner

Administered By Joanna Hushin, KA1IFO

Here is some information for those of you who would like to QSL a QSL manager or 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.

CG9WF (VE1WFO)
C30LBS (11FOU)
EM7BRN (UB4PWQ)
FM5DJ (W5JLU)
HP1XDZ (WA6ZEF)
JW6VDA (LA5NM)
JY8GW (K5TU)
PZ5ES (KX2O)
TZ6FE (DL4BC)
OX3HB (HB9APJ)
V2ACW (WB4OSN)
5H3HM (VE5VJ)
9H1EL (LA2TO)
9Y4AT (N4HPG)

For those of you who have a single-letter prefix and a 4 in your call, these are the ready, willing and able members of the Mecklenburg Amateur Radio Society who have volunteered to serve you. In the foreground: a small sampling of the mail to the Incoming Bureau. (*K4MQG photo*)



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 November 16 to December 15, 1985, assume a sunspot number of 12, which corresponds to a 2800-MHz solar flux of 74.

The World Above 50 MHz

Conducted By Bill Tynan, W3XO
Send reports to P.O. Box 117, Burtonsville, MD 20866,
or call 301-384-6736 to record late-breaking information.

Long-Haul Sporadic E At 50 MHz—Part 2

A discussion of the subject of long-haul E_s at 6 meters (more than two 1200-mile hops), was begun in last month's column. Space limitations dictated that it proceed only as far as an explanation of the difference between E Layer and F Layer propagation, and the reason the F Layer has the much greater DX potential of the two. We'll continue the subject this month, with evidence presented for the contention that, despite the lower layer height, really long-haul E_s is not only possible but may be a quite frequent occurrence.

Many have long thought that the maximum DX attainable via E_s is that associated with two hops, approximately 2500 miles. One well-known and able New England 6-meter operator even wrote to me in the mid '70s expressing the opinion that it would never be possible to work Alaska from his part of the country on E_s because the distance is greater than two hops. About that time, strange reports began coming in telling of super-long DX being accomplished during the summer in the low portion of the solar cycle. The first of these that came to my attention was from WB6NMT San Diego in June 1977. Louis reported an opening to Japan that lasted for about an hour. He described the signals as very weak, but nevertheless was able to work a number of JA stations. It was no fluke. Other 6s were in on it, too, and several similar openings followed over the ensuing weeks. The same year, KH6IAA, KH6GRU (now KH6HI) and other Hawaiian stations worked all over the country, including the East Coast. It is well over 4000 miles from Hawaii to the East Coast. The same year, VE1ASJ heard the FX3VHF 6-meter beacon, then in operation on the coast of France. Andy and several others, including WA1OUB, heard, during the same period, what was believed to be European TV video at about 51.75 MHz. Two years later, also during the month of June, KH6IAA provided his much-sought-after state to scores of East Coast 6-meter operators, including this conductor. These contacts were also most assuredly via E_s. But California, especially the southern part, where WB6NMT is located, is at quite a low latitude, and certainly Hawaii is a low-latitude location. It is well known that this type of E_s is most prevalent at low latitudes. Some still held to the opinion that really-long-haul E_s was not possible, or at least very unlikely, at mid and high latitudes. The European reception in the Northeast and eastern Canada was considered to be one of those unlikely exceptions.

However, on several occasions during the summer E_s seasons from 1980 through 1983, 6-meter openings from the East Coast to Gibraltar were reported, as evidenced by contacts with ZB2BL or reception of the ZB2VHF beacon. Many, at the time, wondered whether, occurring during high-solar-activity years, the propagation might have had some F Layer involvement. This seemed unlikely, however, because of the season of the year and time of day in which the openings took place, namely the summer and usually in the early evening around 0000Z. Then, two years ago, thanks to the wisdom of the British government in allowing a few Gs special permission to operate on 6 meters outside TV hours, word came of a short opening to the U.K. in which several New England and eastern Canadian stations participated. A similar opening occurred again last year, this time lasting over a half hour and involving some 50 stations on this end but unfortunately only one, GJ3YHU, on the other end.

This low-solar-activity year has produced at least three European openings from the East Coast. The July 2 session was reported in the September column, along with one from the Pacific Northwest to Japan. In addition, there was reception, by K7KV Seattle, of the GB3NHQ 50.050-MHz beacon, probably via auroral E. As if these were not evidence enough of extremely long E_s propagation, the July 30 affair should fill the bill. It certainly was the best 6-meter transatlantic E_s opening since the invention of radio! The October column carried details on this one, along with another that occurred five days later, on August 4. In this case, many New England stations, and a few others, completed 6- to 10-meter cross-band QSOs with Spanish station EA4CGN. These contacts took place during a particularly intense E_s opening, which extended up and down the East Coast, reaching as high in frequency as the 88- to 108-MHz FM broadcast band and possibly up to 2 meters.

I think it is safe to conclude that these long-haul openings, many coming as they have at the bottom of the solar cycle, are not connected with the F Layer, at least as far as we presently know how it operates. It is not known whether just plain multihop E_s or some other less-understood phenomenon is involved. With more amateur operation in various parts of the world, we may get a chance to collect enough data to shed some light on the question. One thing now seems clear. Long-distance E_s propagation at 50 MHz is not uncommon. In addition to being a scientifically interesting fact, it points to the need for an amateur allocation at 50 MHz in as many countries as possible. From the propagation standpoint, this is a very intriguing part of the radio spectrum, still full of surprises. Amateurs should be afforded the opportunity to explore its potential to the fullest. Let's hope that British hams are given a general 6-meter allocation without time restrictions very soon, and that other countries that do not permit 6-meter operation will see fit to follow suit.

ON THE BANDS

As the old saying goes, it's a very ill wind that doesn't blow someone some good. This time it was a windy gal named Elena, and the good was in the form of some very notable VHF tropo DX. As the hurricane flirted with the Gulf Coast, trying to decide where to come ashore, a huge, stagnant high-pressure area built up to the north of it. As has happened in many instances in years past, this caused a widespread tropo inversion from the East Coast to the Midwest and as far north as Maine. While this opening did not rival some of those earlier years for geographic extent and activity level, it was a great session, nevertheless. KB3PO Newark, DE was one of those who took advantage of the conditions. Rick passed out 2-meter contacts with his rare state and FM29 grid square to a string of 8s, 9s and Øs, with the best DX being WØFY St. Louis EM45. Altogether, five new grids were added, bringing his totals to 51 grids and 21 states. KB3PO has been on the band since April, so he is doing well, indeed. Equipment is an FT-225-RD driving a 90-W Mirage amplifier and two stacked Cushcraft 215-WBs with the top beam at 36 feet. He is available for skeds by calling 302-737-7966.

K1FO used the superb conditions to good advantage to work a new state on each of three bands. On 1¼, Steve nabbed KC4EG Kentucky for state number 23. A contact with WA9JFM Wisconsin brought his 70-cm total to 37, and a 23-cm QSO with W9ZIH Illinois made it 15 on that band.

When he got word of what was going on, at about 1800Z Sunday, September 1, via a 2-meter QSO with K2SMN Princeton, NJ, K4JSI left his Arlington, VA, QTH and headed for the hills. The hill, in this case, was 4860-foot Spruce Knob in West Virginia. Cal took along his Santec LS-202-A 2-meter FM/SSB hand-held, a Daiwa 25-W amplifier and homebrew seven-element Yagi. The results made the nearly 200-mile round-trip worthwhile. In a little over four hours of operation, beginning at 0040 September 2, 98 stations went into the log. In all, 16 states and 36 grids were worked from NØFQW Missouri EM39, 670 miles to the west, to KA1OJ Maine FN43, 580 miles to the northeast. Cal notes that the use of an ICOM push-to-talk box and headset, which are compatible with the Santec, were very helpful. He also comments that the preamp built into the amplifier made quite a difference in the receive performance of the hand-held.

KD9QU (ex-N9DBB) says that this year was good to him, but that the Labor Day Weekend was his most productive period of the summer. During the three days, Dan hooked up with 18 states. His totals now stand at 33 states and 122 grid squares worked. Those trying to QSL him should use the old call, as the new one is not in the *book* yet.

From the desert of California, K6PVS writes that he has been less active on moonbounce recently, as he is trying to see what can be done from his difficult location using terrestrial modes. Keith says that he has worked 22 states without EME and another 6 with it for a total of 28. He is particularly proud of his contact with KH6HME, mentioned in last month's column, as the path is obstructed by 10,000-foot mountains. The period around the Perseids show some 21 stations in K6PVS's list of contacts, including

50-MHz DX Standings

DXCC countries based on information received as of September 15, 1985. Space limitations dictate that continental U.S. and lower-tier Canadian stations with fewer than 15 countries (except those who claim WAC) not be listed. Cross-band totals listed are those not duplicated by 6-meter two-ways. Credit has not been given for contacts made with stations known not to be authorized 50-MHz operation at the time of the contact; otherwise, countries are those listed in latest ARRL DXCC Country List. Unless stated otherwise, totals are those worked by individual or club stations at a single location or multiple locations within a radius of 150 miles. A † indicates the use of two or more QTHs in the same country but separated by more than 150 miles. Deadline for next update is September 1, 1986.

	1	2	3	4
VE1YX*	78	77	17	16
JA4MBM*	77	76	0	0
KH6IAA	74	72	0	0
K8WKZ*	72	71	15	14
K5FF*	70	69	3	3
VE1BNN	69	68	6	6
WB4OSN*	69	67	8	6
LU3EX*	69	67	0	0
JA1RJU*	68	68	0	0
W3XO*	68	59	12	5
W2IDZ*	67	67	12	11
W5FF*	67	66	2	2
K1TOL*	67	66	0	0
W5VY*	67	63	11	9
W2CAP/1*	66	66	15	15
W4OO*	66	66	4	—
JA1VOK*	66	66	0	0
WD4IYS*	65	65	15	14
WB2MAI	65	65	9	7
N3AHI/4*†	65	64	—	—
WA7JTM*	65	61	1	1
WA5IYX*	65	55	10	8
W8CMS	64	62	12	9
W5HUQ/4*†	63	59	17	9
W3JO	63	31	8	3
ZD8TC*	62	62	10	—
JA2DDN*	62	61	0	0
W4WHK	62	56	14	9
WA4OWC*	62	54	0	0
JA3EGE*	61	60	0	0
WA4UAS*	61	59	0	0
W4CKD*	61	58	20	18
WA8LXJ*	60	55	18	18
JA5HTP*	59	58	0	0
K4KUZ*	59	57	0	0
W6XJ	59	—	3	—
WB7OHF*	58	58	1	0
K5SW*	58	55	10	10
KA1PE*	58	54	0	0
K4CKS*	57	56	18	13
W6BJI*	57	56	2	2
LU9AEA	57	56	0	0
W3IWU*†	56	56	15	15
WA2BPE*	56	56	14	6
WA1OUB	56	54	14	12
W5DZF/4*	56	54	2	2
WB2CZB*	55	55	15	12
K1ZFE*	55	55	5	5
LU3DCA	55	55	0	0
KA1BRD*	55	55	0	0
JE1TGN*	54	54	0	0
WA6BYA*	54	53	0	0
N6AJ*	54	51	1	0
LU7DZ*	54	48	0	0
WA6JRA*	54	18	3	1
K5CM*	54	—	—	—
W7KMA*	53	52	2	1
K8EFS*	53	51	18	15
JA2ODM*	53	48	0	0
W5UWB*	53	42	0	0
WB8BKC*	52	52	16	15
N5DDB*	52	52	1	1
JA0AGA*	52	52	0	0
N0LL*	52	51	8	8
W1JR*	52	48	7	7
K3QMX*	51	51	12	12
W1QXX	51	50	14	12
N5KW*	51	48	—	—
K5ZMS*	50	50	2	0
WB2PMP/4*	50	49	10	9
W6SMS*	50	48	1	—
PY2XB*	50	47	2	1
WB7TOV*	50	47	0	0
N6CT*	50	44	1	1
WA7EPU*	49	49	1	1
WA9AHZ*	48	48	14	14
WB0PKN*	48	47	7	7
WB4RUA	48	46	0	0
W2MPK*	48	44	13	7
JF3KQA	47	47	0	0
W2RTW	47	46	0	0
WA1UQC*	47	45	16	3
WA6PEV*	47	44	3	3
W1EJ*	46	45	14	12
K8UNV*	46	45	2	2
WB8GEX*	46	44	14	12
K0GJX*	46	44	3	2
W2ZKE	46	44	—	—
K2QIE*	46	43	7	2
LU8BF	46	42	0	0
K2QWD*	46	39	13	11
K1ICM*	45	45	15	8
JA9DUR*	45	45	0	0
WA3DMF	45	44	15	15
WB8GEW*	45	44	5	5
W2NVW/3	45	44	2	0
N4TL	45	42	3	3
WB2WSV*	45	42	2	2
XE1GE	45	42	1	1
WA8ONQ*	45	41	7	7
W3BWU	44	43	11	11
WD4FAB	44	43	7	5
K4QXX	44	43	1	1
K1MNS*	44	42	0	0
JA2GHT	44	42	0	0
WA5HNK*	44	38	14	14
AE3T*	43	43	14	14
K2YOF	43	43	13	13
WB8KAY*	43	42	0	0
K6QXY	43	42	0	0
KS2T	43	41	0	0
WB4NMA	43	—	0	0
KA0AYN*	42	41	0	0
KG6DX	42	40	0	0
KG6JDX*	42	38	0	0
KH6FLD	42	35	0	0
CX8BE*	42	29	0	0
N9CEX*	41	41	6	6
N5BBO*	41	41	5	5
K1FWF*	41	40	18	10
WA1AYS	41	40	15	14
WB8YFE*	41	40	5	5
KA1A	41	40	0	0
W5KRH*	41	39	3	3
WB5CHW*	41	37	7	4
JG3AOD*	41	37	0	0
W5HN*	41	35	0	0
K7ICW	41	34	1	1
W3OTC	41	34	0	0
WA0CSL*	41	15	6	4
VP2VGR*	41	—	11	—
K4VPK*	40	39	7	7
N5WM*	40	39	6	5
K6KLY	40	39	0	0
WB6BMB*	40	38	0	0
W1AIM*	40	36	3	0
VP2MO	40	34	0	0
WB6KBZ*	40	29	1	0
ZL1MQ	39	39	0	0
KA1DHO	39	38	12	9
W3WFM	39	38	1	1
K0TLM*	39	36	5	5
K1SF	39	35	8	3
K1FJM/4*	38	38	7	6
JA1NVG	38	38	0	0
WA7UJH*	38	37	0	0
WB5JAR*	38	34	7	6
N7AKB*	38	34	1	1
VE3ASO*	38	31	0	0
WA1CRE	37	36	5	4
KB4CRT	37	35	1	1
JA7QVI	37	35	0	0
W1GXT	37	34	12	4
K3ICH/4	37	32	0	0
WA6HXM	37	29	0	0
K7GGJ	37	28	0	0
K0US*	37	23	1	1
WB0ZKG*	37	20	4	3
WD2AKA	36	34	9	6
WA0SBZ*	36	33	3	2
W6ABN*	36	32	3	3
JH3WXB	36	32	0	0
K3HCE	36	31	6	4
WA9ETW*	35	34	2	2
WA5UFH*	35	33	0	0
K0UDZ*	35	32	3	1
KC2TX/5	35	32	1	1
N6AMG	35	26	0	0
W2VO*	35	26	0	0
K4GOK	34	34	13	12
N7DB	34	34	0	0
K1DAT	34	33	8	5
N4VC	34	33	1	0
W0IJR*	34	33	0	0
W5NZS*	34	33	0	0
WA6CRA/4	34	31	8	8
KA0ETE*	34	31	0	0
WA1ZUB	34	30	11	7
WD2AFH	34	28	4	0
K1SC/7	34	28	2	2
WA5VJB	34	27	1	1
VP2MJ	34	26	1	1
K6JYO*	34	22	0	0
W2LT	34	20	9	0
W2CNS*	33	32	10	4
WA7GCS	33	32	0	0
W2RLV	33	31	3	2
KA4AOK	33	30	11	6
N6RZ	33	24	1	1
AE9M*	33	23	11	1
WB8PAT*	32	32	11	9
K6GSS	32	32	0	0
K2OVS	32	31	13	12
K5VVV*	32	31	3	0
AD1C	32	31	0	0
KS4J*	32	31	0	0
N6VI	32	31	0	0
N7ARC*	32	31	—	—
WB8IGY	32	30	9	7
WS4F	32	30	—	—
K6QAX	32	29	0	0
K1ZKR	32	29	0	0
WB2QLP/4	32	26	5	4
W5NKG	32	25	2	1
K4LFF*	32	22	0	0
K6PHE	31	31	0	0
K8TGC	31	30	4	4
VE4AS*	31	30	2	0
WA2EQK	31	29	6	6
VE3DSS*	31	28	13	7
WB6NMT	31	26	2	1
VE1RC	31	26	0	0
W2BN	31	24	4	1
LU6DLB	31	16	0	0
N4CD	30	27	12	8
K6JZK	30	27	0	0
JG3RGG*	30	22	0	0
K4ROM	29	27	5	5
WA0NOK	29	27	2	1
K8RZB*	29	26	8	3
KA7IXS	29	26	0	0
VE3FDP	29	25	10	8
WB2TMD	29	25	6	4
WA8OGS*	29	25	0	0
8P6KX	29	24	9	2
WB7SLY	29	20	1	1
C5AEH*	29	—	13	—
VK2BA	28	28	0	0
KC0J*	28	27	0	0
N5JM	28	25	3	3
N5DDS*	28	25	2	2
W9TC	28	25	—	—
N7AQM*	28	22	1	1
VE3EVW	28	17	13	7
WA5QCP	27	27	0	0
W7FIV	27	26	2	1
KQ0J*	27	25	0	0
N6AMD	27	25	0	0
KA5CAW	27	23	0	0
K9SM*	27	21	6	4
YV4UY	27	20	0	0
N2ASC	26	26	3	3
VK2DDG	26	25	2	—
VE5LY	26	25	1	1
K9XY*	26	22	0	0
WA9DYT	26	22	0	0
K0SE*	26	21	2	2
NP2AE	26	21	0	0
KA1CDZ	26	13	15	3
WA2YWP	26	13	4	2
K1LPS	25	25	4	4
VK3OT	25	25	0	0
N9ANO*	25	25	0	0
N7EIJ	25	25	0	0
KA0CDN	25	25	0	0
WA5OLT	25	22	5	5
JF3TDC	25	22	0	0
W0RGU*	25	21	3	3
VE5JQ	25	20	2	2
N8AXA*	25	19	5	4
XE1FE*	25	17	1	1
9Y4LL	25	13	0	0
WB4SLM	25	13	0	0
W8NE/4*	24	24	0	0
WA4TJW	24	24	0	0
K0SFH*	24	23	1	1
W7HAH	24	23	0	0
VK4ZJB	24	23	—	—
KD4HP	24	21	4	2
W9NAW	24	20	2	2
JM1LCW	24	17	0	0
KJ3F	23	23	0	0
VK2QF	23	23	0	0
WA9DYV*	23	22	1	1
W7JXU	23	20	0	0
HC8VHF*	23	—	4	—
OA8V	23	—	0	0
VK2VC	22	22	0	0
N4MM	22	22	0	0
W7KNT	22	22	0	0
WB6AAG	22	22	0	0
WB0RJR	22	19	4	2
WB2QLP	22	18	5	4
KA1YQ	22	17	7	1
K7NV	22	16	1	1
KB7N	22	16	0	0
PY2TTV*	22	15	0	0
KA5FLE*	22	14	0	0
KA1GIY	22	12	2	1
JE3YIA	22	12	0	0
HC1MD/HC5	22	—	2	—
WD0FOY	21	21	0	0
KD6PY	21	21	0	0
KA6ING	21	20	0	0
WB4WXE	21	20	—	—
WB6CTQ	21	19	0	0
K6ZMW	21	18	0	0
NI6E	21	16	0	0
K1HTV/3	21	15	17	3
9Y4JW	21	12	1	1
WD8OXK	20	19	2	2
JG3JLC	20	19	0	0
VK3XQ	20	19	0	0
W8QOI	20	18	2	2
K2JF	20	17	5	5
VE1BUF	20	15	4	3
WA8LLY/6	19	19	0	0
ZB2BL	19	18	8	4
VE5XU	19	18	0	0
W9OEH	19	—	0	0
VE6CX	18	18	1	0
W0LSD	18	18	0	0
VK5LP	18	18	0	0
N0AJU	18	16	0	0
WA4TNV/KL7	18	15	0	0
WA6OFO	18	14	1	1
KC4KK	18	14	0	0
K9LCR	17	17	3	3
VK3AMK	17	17	0	0
VK4TL	17	17	0	0
WB9OPD	17	16	1	0
KB7Q	17	16	0	0
VK3NM	17	16	0	0
VK7JG	17	16	0	0
VK4AYX	17	14	0	0
KA4CRT/5	17	14	0	0
HK4EB	17	13	0	0
W0PVL*	16	16	0	0
K0CJ	16	15	5	2
VK4ALM	16	15	0	0
VK4ZSH	16	15	0	0
W0JRP	16	15	0	0
KL7GLL/4	16	14	0	0
W8SMD	16	11	5	5
OA8CW	16	—	0	0
K0WM	15	15	1	1
W7IDZ	15	15	0	0
VK3AUI	15	14	0	0
VK3AQR	15	14	0	0
N5BOG	15	13	0	0
GW3LDH	14	10	11	5
V2ADX	14	4	0	0
EI2W	13**	—	—	—
KL7JAI	13	13	0	0
WA0LHK*	12	12	2	1
GW3MHW	12	12	—	—
VP9WB	12	11	4	1
W1QXX/KP4	12	10	0	0
G4BPY	11**	11	34	30
AL7FH	11	11	0	0
AL7C	11	11	0	0
J6LOV	11	9	2	2
G3COJ	11	7	9	7
JN1DQO	11	5	0	0
GJ3YHU	11	3	4	1
VK6OX	10	10	1	1
KL7WE	10	10	0	0
KL7JJH	10	10	0	0
KL7IKV	10	10	0	0
ZD7BW	10	10	0	0
FK8EB	10	10	0	0
SZ2DH	10	—	0	0
XE2BC	10	—	0	0
VK6RO	9	9	3	3
WB4WXE/KL7	9	8	0	0
G5KW*†	9	4	35	—
K6KLY/8P6	9	3	0	0
G3MCS	8	8	3	3
VP2VDL	8	6	0	0
GI3ZSC	8	—	—	—
G4UPS	7	5	6	2
G3OBD	7	—	5	—
G4JCC	6**	4**	37	35
8P6MH	6	6	4	1
G4GLT	6	—	13	—
G3PWK	6	—	12	—
GW3LDH	6	—	—	—
G4UUT	5	5	12	0
WB4YLR	5	5	0	0
GU2HML	5	—	16	—
G4HUP	5	—	—	—
G4JLH	5	—	—	—
GW4BCD	4	4	0	0
G2AOK	4	—	—	—
G4BAO	4	—	—	—
GM4FZH	3	—	—	—
VK2ZDI	2	0	0	
SM7BAE	1	1	6	3
SM6PU	0	0	23	10
DJ2RE	0	0	14	9
DK6JL	0	0	11	4
SV1DH	0	0	10	—
CT2EE	0	0	5	2
OZ9QV	0	0	5	1
G3VZJ	0	0	4	4
G3PLP	0	0	4	2
I5CTE	0	0	4	0
G4ANT	0	0	3	2
G3TAA	0	0	3	2
F6EMT	0	0	3	2
HA6NP	0	0	3	—
HB9QQ	0	0	2	2
G3RDQ	0	0	2	2
OE1HGW	0	0	2	1
OZ7IS	0	0	2	—
G4IDE	—	—	18	—
GM4WOJ	—	—	9	—

1—6-meter two-way claimed
2—6-meter two-way confirmed
3—Crossband claimed
4—Crossband confirmed
†Some contacts made from locations more than 150 miles apart
*6-meter two-ways claimed with all continents
**Includes 4- to 6-meter crossbands and 4-meter two-ways

K5YY Arkansas, whom he had been scheduling off and on for two years. His goal is VUCC using only terrestrial propagation modes. The current grid-squares total stands at 93, although 12 of these are via EME. Keith comments that he monitors the 2-meter band six to eight hours per day throughout the year and more during the summer, when he is particularly on the lookout for E_s. That mode was a disappointment for him this year, but hope springs eternal in the hearts of VHFers. The setup at K6PVS now consists of a Tempo 2002 into four KLM 17-element LBXs.

The editor for the *SWOT* (Sidewinders On Two) *Newsletter*, K1PLR, wants it known that his new address is 704 Curtiss Dr., Garner, NC 27529. In this conductor's view, Harry is doing an excellent job with the newsletter. It, as well as the fine activity-building organization, deserves the support of all those interested in 2-meter SSB/CW operation.

With sadness, I announce the passing of two VHFers. K3HFV, here in the DC area, was well known across the country to his many friends on 6 meters. Guy will be missed on the band. The other is a West Coaster, Dave Pope, K6JKQ, of Stockton. Dave was active on all of the bands and, in particular, could always be counted on for a 1¼-meter contact. QST

Correspondence

Conducted By Bruce Kampe, WA1POI
Information Services Assistant

ARRL EQUIPMENT INSURANCE

☐ I've been a faithful participant in the ARRL equipment-insurance program since its inception. As a result of a recent lightning stroke, however, I've now had the opportunity to experience first hand your procedures for dealing with a claim. Thanks for your prompt handling of my claim, a fair settlement and a minimum of hassle. This excellent service is certainly a fine fringe benefit of membership in the American Radio Relay League.—*Robert L. White, W1CW/4, Homestead, Florida*

☐ I recently suffered a loss (theft) of my Kenwood TS-130SE and a tuner, taken from my home garage. I sent a claim to Wohlers Insurance (my ARRL policy), and they paid the loss to my satisfaction in a couple of weeks. I highly recommend this to the membership!—*Ralph Turner, W6TN, Bodfish, California*

IT SEEMS LIKE YESTERDAY

☐ One Sunday afternoon not long ago, I was on the sixth floor of the undergraduate stacks in the library at the Oxford campus of the University of Mississippi. I was looking for a future research subject when I happened to find binders of *QST*, going back many years. With my original mission forgotten, I spent three hours looking at old issues of the journal.

This is my way of introducing a reminder that already 10 years will soon have passed since *QST*'s change to the large magazine format, which took place in January 1976.

Amateurs with some free time might find that a look at the old and new is interesting. There were growing pains: The February issue of 1976 had an article on operating abroad *sans* the Table II it referenced. In the same issue, W9BRD's column (Who can forget them!) is missing its ending. However, it wasn't long before the bugs were worked out and the number of pages grew to 200 plus.

I remember looking at articles and advertisements while sitting in my high school classes. I thought *QST* couldn't get any better. W1RU would later write that schoolboys may have trouble hiding the large pages in their school books. The students should consider the change worth it. The journal is bright and colorful now; *QST* has grown into its size. By contrast, I am amazed at how dated the old pages seem. The black, red and white colors are severe and depressing; the equipment is old. But then as now, the prose is professional. *QST* has certainly come a long way. —*Robert Atkinson, K5UJ, University, Mississippi*

[Editor's Note: Old *QST*s can be fun to read. Especially *really* old ones. There's a lot of radio and electronics history back there.]

HERE AND THERE FEEDBACK

☐ Hear! Hear! to KH6IO, Richard C. Rhodes' question: "Is anyone else tired of hearing the constant use of the words 'here' and 'there' in QSOs when they are inappropriate or surplus?" (Correspondence, "Here and There," *QST*, Sept. 1985, p. 65.) Down with redundancy!—*Ray Garner, WA6LUX, San Diego, California*

☐ Hooray for Mr. Rhodes on his "Here and There" letter in the past issue. Let's add to the list of English mistakes "Where are you at?" and "Best 73."

"Where are you at?" is poor grammar. It is "73," which is "best regards," not "best 73," which is "best best regards."

We are being copied by hams in foreign countries on the DX bands. The examples we set of grammar, diction and proper verb usage spread around the world. Next time you open your microphone, think what you're going to say and how you say it. The rest of the world is listening.—*William L. Hilyerd, K4LRX, Henderson, Kentucky*

☐ One more slash that Sir Richard could have made is, "... won't keep you ..." which really means, "don't keep me." This is heard on CW as well as voice. A few other instant "nauseators" in the CW department, while I'm at it, are: BK, a real nothing prosign and time waster if there ever was one; CFM, ditto; and AAA more ditto. But the current stomach turner heard all too often (once is too much) is KK. This stinker was obviously spawned by the original stuttering lid.—*Dean E. Lewis, W7TC, Klamath Falls, Oregon*

HOW MANY KNOBS?

☐ I have noticed recently that ham radio manufacturers are trying to outdo each other with the great number of knobs, buttons and switches on their radios. Some radios have so many that it is difficult to count all the different functions that are available.

I would like to suggest that we adopt a new Q signal that would easily convey this complexity. A good choice might be QKS.

For example, "QKS 93" would mean, "I have ninety-three knobs on my set." "QKS?" would mean, "How many knobs do you have on your set?"

The widespread use of QKS could make an otherwise dull QSO more interesting. "QKS 93/6" would mean you have 93 knobs, but have only figured out how to use 6 of them.—*Jim Roux, W4YA, Clearwater, Florida*

SUCCESSFUL SESSION

☐ I'd like to take this opportunity to express through you my written compliments to the Silicon Valley, California, VE Group for their exemplary conduct of the Amateur Radio examination session held at Monte Sereno, California, on Sunday afternoon, August 18, 1985. It was my privilege and pleasure to attend that session, which was de facto coordinated by Emmett F. Freitas, AE6Z, in a successful attempt to upgrade my Amateur Radio license.

Despite a somewhat disruptive space-assignment mixup on the part of the building manager, the VE group effectively and efficiently conducted the examinations in a manner that reflected creditably upon the amateur fraternity and the ARRL as a VEC, and amply justified FCC confidence in extending Amateur Radio license examination responsibilities to qualified amateurs under the VEC program.

My 50-plus years in radio communications, both in and outside of government, have exposed me to more than a few radio examinations. The session in question probably will be my last and, fortunately for me, rates as my most memorable such experience. My congratulations and appreciation to all concerned!—*Donald Eberlein, W6YHM, Los Gatos, California*

EDUCATING THE PUBLIC

☐ I would like to take this opportunity to provide some food for thought regarding the apparent "dwindling influx of new amateurs" into our wonderous hobby.

Without question, the recent attention given computers by the younger persons of our society have cost us many potential radio amateurs. Recent issues of *QST* lead me to believe that the ARRL has taken the philosophy, "If you can't beat them, join them." I do not believe that outlook is altogether wrong, but I question that the message is reaching the persons to whom it is directed.

I wonder if a different approach might be exercised by making a series of Amateur Radio classes available to the Public Broadcasting Service. Using the television service would certainly make the classes available to the hearing-impaired and shut-ins who normally would not attend other types of structured teaching. Starting off the series with one or more of the *Hams' Wide World*-type movies might assist in initiating the interest of the viewer.

The Saturday mornings in this household are taken up watching oil painting, home handyman and cooking shows which are broadcast on our local PBS-TV channel. Believe it or not, most of the shows are very interesting and entertaining, even to someone like me who can't boil water and couldn't paint decent looking graffiti on a restroom wall.

My personal belief is that the general public is well aware of the Amateur Radio community and the services it is able to provide during times of need. I think the problem is getting the public to realize that they do not have to possess an extraordinary sum of knowledge or skill to join our ranks.

Even though I am a member of ARRL I have not felt the League was responsive to their membership since the fiasco over incentive licensing several years ago. The *only* reason I am turning to you now is that I think you are interested in saving Amateur Radio. You may be assured of my willingness to assist in any manner possible.—*Larry Watson, Bethany, Oklahoma*

Washington Mailbox

Conducted By Katherine Hevener, WB8TDA
Information Services Assistant, ARRL

The Novice Exam Process

Perhaps the most-often-asked question of the training section at Hq. is "How do I give a Novice examination?" The answer is simple, and we bet that most eligible amateurs, even if never told how to give the exam, would do it correctly without instructions—only to worry throughout the next year as to whether they'd done it properly! Here, then, are the answers to the most frequently asked questions about administering this examination.

Q. Are examiners required to publicize examination sessions for Novice candidates?

A. No. According to Section 97.26 (a), they are only required to announce examination sessions for the Technician, General, Advanced and Amateur Extra Class licenses.

Q. May I be reimbursed for out-of-pocket expenses I may incur in giving the Novice exam (as the Volunteer Examiner Coordinators [VECs] and Volunteer Examiners [VEs] may)?

A. No. According to Section 97.36(a), "No reimbursement may be accepted for preparing, processing or administering Novice class examinations."

Q. Must I be an accredited Volunteer Examiner for the purpose of administering the Novice exam?

A. No. You must, however, meet all of the following criteria: (1) hold a General-class license or higher; (2) be at least 18 years of age; (3) not be related to the candidate; (4) never have had your Amateur Radio station license or Amateur Radio station operator's license suspended or revoked; (5) not own a significant interest in, or be an employee of, any company or other entity that is engaged in the manufacture or distribution of equipment used in connection with Amateur Radio transmissions, or in the preparation or distribution of any publication used in preparation for obtaining amateur station operator licenses (97.31 [b]).

Q. How many examiners are required to administer the Novice examination?

A. Only one (97.28 [b]).

Q. What examination elements are required for the Novice class license?

A. Element 1(A), the 5-WPM beginner's code test, and Element 2, the basic written test (97.21 [a]).

Q. Is there a specific order in which the elements for the Novice exam must be administered?

A. Yes. You must administer Element 1(A) (the 5-WPM code test) prior to the written exam (Element 2).

Q. Is it necessary to administer the code test and the written test to an applicant on the same day?

A. There's no rule that says you must do this. However, it's most often done this way.

Q. Who is responsible for constructing the Novice written test?

A. The examiner administering the written Element 2 to a Novice candidate must design the test (97.27 [c]).

Q. Can I make up any kind of written exam I choose?

A. No. You must use a total of 20 questions verbatim from PR Bulletin 1035A (latest date of issuance), entitled "Questions for the Element 2 Amateur Radio Operator License Examination." Copies of this bulletin are available from ARRL Hq. or the FCC. Novice examiners may obtain suggested Novice tests from Hq.

Q. What about the code test?

A. The code test shall be prepared by the examiner. It must prove a candidate's ability to receive texts in the international Morse code at a rate of not less than 5-WPM. Normal spacing or Farnsworth spacing (code sent at 13 to 15 WPM but with added space between characters to bring the overall speed down to 5 WPM) may be used. The applicant is responsible for knowing and may be tested on, the 26 letters of the English alphabet, the numerals 0 through 9, the comma, the period and the question mark, and procedural signals $\overline{AR}$, $\overline{SK}$, $\overline{BT}$ and $\overline{DN}$. (97.27 [a]).

Q. May I use a "cute" Novice QSO as a test?

A. This is generally permissible, but you should not use any language that would be improper to transmit over the air.

Q. Code-exam candidates for higher-class licenses often are asked questions about the text, rather than being required to achieve at least one minute of errorless copy. Is this also permissible for Novice exams?

A. Yes. If the Novice candidate answers questions on the message text to your *satisfaction—or* if the candidate copies solidly for one minute (25 consecutive characters), he/she passes the code test. Note: For the purposes of adjusting telegraphy speed and for grading "solid-copy," code tests, numerals, punctuation marks, and procedural signals each count as 2 letters (97.29 [c]).

Q. Must I give a sending test, too?

A. That's up to you. The FCC has found that the receiving test alone is adequate proof of both sending and receiving ability (Report and Order, Docket 83-27).

Q. Is the candidate allowed to use a slide rule or a calculator during the test?

A. Yes, but it should not be necessary for a Novice test. If the candidate uses a calculator, be sure that it is nonprogrammable or that any programs have been erased from the calculator before the test begins.

Q. What if I catch a candidate cheating?

A. Simply terminate the exam (97.26 [c]).

Q. What should I do if the candidate fails the code test?

A. You must inform the candidate of the percentage of the questions he/she answered correctly and return the Form 610 to the candidate. You must retain the test papers, including answer sheets, as part of the examiner's station records for one year from the date the examination was administered (97.28 [d]).

Q. What's next after the candidate passes the code test?

A. You administer the written test, which covers the nine topics listed in PR Bulletin 1035. This test will consist of 20 questions. If you construct the test (instead of obtaining a test from ARRL), you must use questions exactly as they appear in PR Bulletin 1035A. Note that in the latest edition of PR Bulletin 1035A there are questions that require that the candidate draw simple diagrams, as well as questions which require a written answer (97.27 [c]).

Q. What is the passing score on the written test?

A. At least 15 correct answers, 74 percent (97.29 [b]). Neatness in drawing diagrams found on the exam is not required, as long as the essential parts of the drawing are in their proper place and properly labelled.

Q. Hurray! My candidate passed both the code test and written test! What's next?

A. Complete section II-A on the back of the Form 610 and mail it within 10 days to FCC, P.O. Box 1020, Gettysburg, PA 17325. (The bottom portion of the back of the form is not relevant to Novice examinations). *—John Foss, W7KQW*

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

Strays

MUSICAL CODE

☐ For those amateurs interested in modern music, there is a composition in which an authentic spark-gap transmitter sending Morse code is used as an instrument. The composer is Vladamir Ussachevsky, and the composition is entitled "Wireless Fantasy (1960)." It is on the album "Music for Electronic and Older Instruments," Composer's Recordings no. 227. *(tnx W3EP)*

On Line

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr., Wolcott, CT 06716
CompuServe ID no. 70645,247

RTTY and AMTOR For Hams Who Are Blind

The biggest stumbling block to a ham with a visual impairment getting on RTTY or AMTOR is getting a computer to translate among the ASCII, Baudot and AMTOR codes, and produce synthesized voice at the same time. By accident and experimentation, it was discovered that there was one computer-ham interface that performed the translation. All one had to do was hook up a dumb terminal to the interface and, presto, you had talking RTTY and AMTOR. The device, no longer in production, was AEA's (Advanced Electronics Application) AMT1. It had onboard firmware and a 6802 microprocessor that performed the translation.

Next, we had to interface the AMT1 to the Apple® //e computer. We discovered a terminal program that needed only some parameter changes to do the trick. Using an Apple Superserial card set at 1200 bauds and the terminal program set at 110 bauds in the dumb terminal mode, we could successfully receive and transmit RTTY and AMTOR. To make the operation complete, we had to trick the software to speak to us one word at a time instead of a line at a time (as delimited by each carriage return). We modified the software so that each time it saw a space (ASCII value 32), it converted it to a carriage return (ASCII value 13), and that resulted in speech one word at a time.

We had trouble getting the handshaking between the Superserial card and the AMT1 to work so that the onboard buffer would not overflow and lose data, so we developed an XON/XOFF protocol or stop (control-S) start (control-Q) protocol between the AMT1 and the Superserial card—which solved the problem.

The final hurdle was how to tune an RTTY and AMTOR signal. The AMT1 had a nice LED display, but it was worthless to a blind ham. At that time, Kenwood announced their TS-940 with an optional speech synthesizer. I had a TS-930, but without modification I could not operate AMTOR because the receiver recovery time was too slow. However, the '940 was designed with a recovery time that met AMTOR standards. It also had keyboard entry of frequency and 40 memories that stored mode as well as frequency. Another '940 improvement was that the monitor worked in the FSK mode, so I could key my transmitter for a second, listen to my signal and match it with the desired received signal. Using this method, I usually could swoop down on a frequency faster than a sighted person using the lights. I stored my favorite MSO frequencies in memory, and could be anywhere in a heart beat.

I was fortunate to pick up an AMT1 before all inventories were depleted. Now a less-expensive alternative is in production. It is the Kantronics UTU.

I will be glad to answer inquiries about my setup and talk to people on the air during the weekend as my schedule allows. I also have had the AMT1 manual recorded on tape for anyone who is interested. Joe Giovanelli, W2PVY, (1158 Stewart Ave., Bethpage, NY 11714) runs the Commodore 64™ with speech synthesis and the AEA CP1 interface. You may contact him concerning his setup. I also understand that packet radio is easier than RTTY and AMTOR for a blind computer owner; for information in that area, contact Anna Lee, WB4NCH (9127 Suffield Ct., Tampa, FL 33615).

At long last, the blind ham population can now participate in the modern modes of communications instead of standing outside the candy store with our noses pressed against the window.—*Tandy Way, K4YSN, 8909 Peppermill Ct., Tampa, FL 33614*

HAM RADIO BBS's

☐ Terry Platt, NN4Y, runs a BBS in Mobile, Alabama, that may be accessed at 205-649-2894. This BBS is open to all callers, but specializes in ham radio programs and items of interest.

☐ The Commodore Message Center BBS in Carrollton, Georgia, is run by Randy Hanson, KB4EUX. It features a ham radio special-interest group and is accessible 24 hours a day, 7 days a week by calling 404-834-9097 using any computer (300 bauds, 8-bit word, 1 stop bit, no parity).

☐ John Desmond, KØTG, operates the Digital Newsletter BBS at 612-291-0567 24 hours a day, 7 days a week at 300 and 1200 bauds.

☐ Al Deshotel, WB5VNX, runs the Lamar University BBS at 409-838-3761 (300 bauds, 7-bit word, 1 or 2 stop bits, even parity).

☐ The Orlando (Florida) Communicator BBS is accessible 24 hours a day, 7 days a week by calling 305-859-9443. Run by Butch Weber, WA4GIF, it will soon offer 2400-baud data communications, as well as 300- and 1200-baud.

☐ Two New Jersey BBS's are operational: the W2FJC JSS at 609-693-8637 and the Micro-Fone TBBS at 201-494-3649.

Please note that the existence of a BBS may be very short lived. So, don't blame the On Line desk if some of the above boards are no longer operational by the time you read this. I usually pass the information along as soon as I receive it. *(tnx to Warren Flint, WB4ZOJ, for providing some of the BBS information)*

PX: Tips, Fixes and Programs

PX number 18

Don Singer, WDØGAG, discovered a bug in the Field Day duping and reporting program, PX number 18. When printing scored calls and dupes under the Display Calls function for several bands (files), the program retains any dupes from a previous file for each subsequent file because of the failure to reinitialize the subscript M for the array D$(M) in which dupes are stored. This can be corrected by adding the statement "M=0" to line 2050.

PX number 38

Tom Byers, WB9YTG, wrote about the difficulty he had getting PX number 38, MINIMUF (Atari version), to run on his Atari 800XL, and the solution he discovered in the September 1985 issue of *Antic* magazine, page 25. The solution, a program titled Rev. B to Rev. C Converter, corrects a bug in the 800XL BASIC. It should be used before attempting to run MINIMUF (or other BASIC programs).

TRS-80 software

Programs for the Radio Shack TRS-80® Model I and Color Computers (CoCo) are featured in this month's installment.

Program number 92: learn Morse Code in Spanish, by Jorge Murilio, TI2JMV (CoCo).
Program number 93: QSL card generator, by Jerry Booth, W0ZD (CoCo).
Program number 94: QSL card generator, by Joe Janus, KB3WZ (Model I).
Program number 95: RC active band-pass filter designer, also by KB3WZ (Model I).
Program number 96: net roster recorder, by Dick Bohall, WA2KOJ (Model I).
Program number 97: log duper, by Oli Karpathy, K4ON (Model I).
Program number 98: net manager calculator, by Jerry McCabe, KF4GZ (Model I, will also run on a VIC 20).

To obtain a listing of any PX program, send a business-size s.a.s.e. with 39 cents postage to ARRL, Dept. PX, 225 Main St., Newington, CT 06111. Use a separate s.a.s.e. for each program request and write the PX program number of the desired program at the lower left-hand corner of the s.a.s.e. Please do not send correspondence other than PX requests to Dept. PX. A list of all 98 programs in the PX library is available by sending a business-size s.a.s.e. with 22 cents postage to WA1LOU (address at top of page).

CP/M® PROPAGATION PROGRAM

MINIPROP is a new propagation-prediction program for CP/M-80 computer systems written by Shel Shallon, W6EL. MINIPROP is a long-term prediction program that combines the prediction of signal levels, F-layer maximum usable frequency (using an improvement of the MINIMUF, version 3.5 model) and E-layer cutoff frequency. Contact W6EL at 11058 Queensland St., Los Angeles, CA 90034, to obtain a copy of the program and documentation. (MINIPROP is a user-supported program—that is, if you find it useful, you should consider sending a contribution to its author.)

The New Frontier

Conducted By Bob Atkins, KA1GT
103 Division Ave., Millington, NJ 07946

10-GHz Cumulative Contest

Readers involved in 10-GHz work will be pleased to learn that the ARRL is proposing a 10-GHz cumulative contest for the fall of 1986. The exact contest rules have not yet been finalized, but I can give a few basic details. For those unfamiliar with the concept of a cumulative contest, it involves more than one operating session, with the final score being the sum of the scores obtained in the individual sessions. For this contest, two sessions are being proposed, separated by one weekend. Each session will last from a Friday evening to Saturday evening.

The nature of propagation on 10 GHz requires that the rules of a 10-GHz contest be somewhat different from those in most contests. With the majority of equipment in use today, contacts are possible only over line-of-sight paths; thus, operation from a single, fixed location would not be expected to yield many contacts. Therefore, changes of site will be allowed during the contest (a minimum move of 10 miles required) and repeat contacts with a station will be allowed for points, provided at least one of the stations has changed sites.

Since high-gain antennas with narrow beamwidths are used, and there will not be many stations active, calling CQ will likely result in few contacts. It will be necessary, therefore, for most contacts to be scheduled prior to the contest. To facilitate this, the ARRL will preregister stations wishing to participate. Each entrant may fill out a form with details of equipment, frequencies and modes covered, geographical location, etc., and this information will be made available to all entrants prior to the contest. Interested readers may write to ARRL Hq. to request a registration form. Mark your letter "10 GHz Contest." It will thus be possible to find out who in your area has compatible equipment, and schedules may be arranged by the individuals concerned.

One item that will be of great use in planning 10-GHz paths is a set of topographic maps (i.e., maps showing height of terrain above sea level). Such maps are available from the U.S. Geological Survey at moderate cost. Several map series are available at different scales. The largest scale maps cover an area of 7.5 ′ square (1 in = 2000 ft) and cost $2.25 each. These maps are useful for detailed study of a small area (e.g., a mountaintop), but are of limited use in plotting long paths since they cover such a small area, and an extensive set is expensive (New Jersey, covered by 180 such maps = $405!). For larger areas, a set of maps covering an area of 2 × 1 degrees is published (1 in = 4 mi) at a cost of $3.60 each. The USGS publishes an "Index to Topographic Maps" for each state. These are available free of charge from U.S. Geological Survey, Branch of Distribution, 1200 South Eads St., Arlington, VA 22202, for states east of the Mississippi River, and from U.S. Geological Survey, Branch of Distribution, Box 25286, Federal Center, Denver, CO 80225, for states west of the Mississippi.

Since the contest will not take place until the fall of 1986, there will be plenty of time for interested stations to construct 10-GHz equipment. This need not be an expensive proposition if high performance is not required. As in all transmitting systems, all that is required is an oscillator and antenna, and for receiving the only additional stage required is a mixer and IF system. The oscillator can be a home-constructed Gunn oscillator, a commercially purchased Gunn oscillator or a commercial DRO (Dielectric Resonance Oscillator) for a wideband system, or a crystal-controlled multiplier chain for a narrow-band system. Mixers range from a simple 1N23 diode mounted across a section of waveguide to a Schottkey diode mounted in a specially designed waveguide cavity acting as an image recovery mixer. The IF assembly can range from a broadcast FM receiver for wideband systems, to a 2-meter SSB receiver for narrow-band systems. Antennas range from small horns to large dishes. Depending on what you want and how much work you are prepared to do yourself, the cost of a complete transceiver could range from less than $50 to over $500. The best way to start out is to look through the references given in this column to get a good idea of what is possible. *QST* will also be carrying some practical 10-GHz information over the next few months.

Two sources of 10-GHz components and systems are

Advanced Receiver Research, Box 1242, Burlington, CT 06013, tel. 203-582-9409—Microwave Associates Gunnplexers and associated systems.

Applied Invention, RD 2, Rte. 21, Box 398, Hillsdale, NY 12529, tel. 518-325-3911—Mitsubishi Microwave Modules (Dielectric Resonance Oscillator assemblies for 10 GHz).

10-GHz Bibliography

The following is a short list of 10-GHz-related references that have appeared over the last few years. Individual articles appearing in the RSGB journal *Radio Communication* have not been cited since they mostly also appear in the RSGB *VHF/UHF Manual* or *Microwave Newsletter Technical Collection*.

"Solid-State Microwave RF Generators," J. R. Fisk, *Ham Radio*, April 1977, pp. 10-22.

"10 GHz Transceiver for Amateur Microwave Communications," K. H. Hirschelmann, *Ham Radio*, Aug. 1978, pp. 10-15.

"10 GHz Gunnplexer Transceivers—Construction and Practice," J. R. Fisk, *Ham Radio*, Jan. 1979, pp. 26-42.

"Gunn Oscillator Design for the 10 GHz Band," R. Bitzer, *Ham Radio*, Sept. 1980, pp. 12-22.

"X-Band Calibrator," S. J. Noll, *Ham Radio*, April 1981, pp. 44-50.

"The Care and Feeding of Gunnplexers," D. Peterson, *QST*, April 1983, pp. 14-18.

A number of New Frontier columns have dealt with 10-GHz-related topics. These are

"The World of Gunn Diodes," Feb. 1980, p. 76.

"Narrowband Operation on 10 GHz," Nov. 1980, p. 69.

"Estimating Microwave System Performance," Dec. 1980, p. 74.

"A Practical Dish Feed (for 10 GHz)," Feb. 1981, p. 63.

"10 GHz Frequency Marker," Nov. 1981, p. 83.

"Microwave Horn Antennas," Feb. 1982, p. 74.

"10 GHz Basics," March 1982, p. 79.

"Omnidirectional Beacon Antenna for 10 GHz," March 1983, p. 73.

The following books and collections also contain 10-GHz information:

The Gunnplexer Cookbook, R. Richardson, 1981, The Ham Radio Publishing Group, Greenville, NH 03048.

The VHF/UHF Manual, Chap. 9—Microwaves, G. R. Jessop, 4th ed., Radio Society of Great Britain, 1983.

The Radio Amateurs Handbook—10 GHz Gunnplexer Communications, 1986 ed., ARRL, pp. 32-14 to 32-16.

The Microwave Newsletter Technical Collection (Chap. 5—10-GHz General, Chap. 6—10 GHz Wideband, Chap. 7—10-GHz Narrowband), J. Gannaway and S. Davies, Radio Society of Great Britain.

The German magazine *VHF Communications* has published many 10-GHz articles. The current distributor for the USA is Al Whiting, K3BRS, P.O. Box 432, Lanham, MD 20706. Subscription is $18 per year (4 issues). Selected 10-GHz items from the last few years are

"Getting Started on the 10 GHz Band," D. Evans, 1977/1, pp. 19-29.

"A Transceiver for the 10 GHz Band," J. Reithofer, 1979/4, pp. 208-215.

"SSB on the 10 GHz Band," H. Fleckner and G. Bors: Part 1—Local Oscillators, 1980/3, pp. 130-138; Part 2—Waveguide Modules, 1981/1, pp. 2-12; Part 3—IFs in the 2-m and 70-cm Bands, 1981/1, pp. 13-17.

Strays

***QST* congratulates...**

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

• Robert H. Reid, W4TK, of Jacksonville, Florida

• Ray H. Weihe, W0IH, of Minneapolis, Minnesota

FM/RPT

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr., Wolcott, CT 06716
CompuServe ID no. 70645,247

23-CM AND 70-CM BAND PLANS: WHAT'S YOUR OPINION?

Minutes 67 and 69 of the second 1985 meeting of the ARRL Board of Directors are pertinent to FM/RPT readers.

Minute 67 requests that the VHF-Repeater Advisory Committee (VRAC) reevaluate the portion of the 23-cm band plan pertaining to FM repeater frequency offsets, presently set at 12 MHz, in light of the recent developments in the availability of commercial equipment for this band.

Equipment currently for sale here is based on the Japanese band plan with 20-MHz repeater frequency offsets. The question that the Board is posing to the VRAC is whether the American band plan should be changed to accommodate the equipment available here for that band.

Minute 69 requests that the VRAC study the band plan for 420-450 MHz, with the intent of recommending a standard for the repeater portion. Repeater in/out frequency relationships, either high-in/low-out or low-in/high-out (to provide maximum flexibility for repeater coordinators) should be specified for each 25-kHz channel.

Presently, the 70-cm repeater band is planned according to local option. As a result, there is a hodgepodge of 70-cm band plans across the continent, with neighboring states in the same region having different band plans or, worse, different 70-cm band plans in effect within the same state. Flip through the 442-450 MHz section of the *Repeater Directory* to sample the band-plan chaos. The Board is asking the VRAC to formulate some kind of standards for the 70-cm band plan.

The VRAC solicits your opinion concerning the 70- and 23-cm band plans. To address either or both of these topics, you should send your opinion to your ARRL Division representative on the VRAC (page 60 of September 1985 *QST* lists the VRAC representatives). The VRAC will consider all input on these matters to formulate their final recommendation to the ARRL Board. If you have something to say, now is the time to do it.

MOVED REPEATER SUBJECT TO RECOORDINATION

Repeater owners are reminded that a coordinated repeater would be subject to recoordination under certain circumstances. Coordinated frequencies are based on the actual location, terrain, antenna height, power and antenna gain of the repeater. Any changes—such as a move, raising the antenna or increasing power—may cause your repeater to harmfully interfere with another system on the same frequency. Often, no problems occur, but it is wise to inform your frequency coordinator in writing of any changes, so he or she will have correct information.

A theoretical case: A repeater has been on the air for 12 years in a location blocked by mountains in one direction. The owner decides to upgrade his machine and move it to the top of the mountain. On the other side, another machine on the same frequency has been operating for the past five years. Now there is harmful interference. According to the rules, the owner of the repeater that moved is responsible and must take action to prevent the interference. The moment he moved he was subject to recoordination and, by the move, no longer was the "oldest" repeater.—*The CVRA-SERA Repeater Journal*

FREQUENCY-COORDINATION NOTES

Alaska

A letter from Dianne Marshall, AL7FG, president of the Arctic Amateur Radio Club, states that "Alaska is not considering switching to 20-kHz spacing. We have adopted a 60-kHz spacing plan. With the current lack of crowding on the Alaskan 2-meter band, we hope that the dust has settled and metamorphosed to rock on the spacing issue before we will have to consider switching to the 15- or 20-kHz plans."

Iowa

From the minutes of the May meeting of the Iowa Repeater Council:

"A motion was made, seconded, and passed that 145.01, 145.03, 145.05 and 145.09 MHz be set aside for packet radio. A motion was also made, seconded and passed to change the 220 band plan to accommodate high-speed data links.

"It was suggested that since we have decided to stay with the 15/30-kHz plan, that we also change the packet-radio subband so that the entire 2-meter band plan is consistent. It was decided to study the idea and delay decision until a later date."

Mississippi

The FM/RPT desk has been informed that Mississippi has elected to stay on 30/15 kHz-channel spacing in the top half of 2 meters.

220 BEACONS

☐ In Minnesota, Terry Von Benschoten, WØVB, is putting up a 220 beacon to match his 2-meter system. No frequency known, as yet. That one will be in Rochester.

☐ We just got word of a new one being planned down in Oklahoma City. Hal, WB9MVY/5, tells us that the frequency will be 220.055 MHz, with 10 W to a seven-element beam at 25 feet pointed toward Chicago. Hal says he's looking for an omnidirectional antenna, but didn't say whether he wanted it horizontally or vertically polarized. In addition to the beacon on 220, Hal also has beacons on 144.055, 50.055 and 28.2175 MHz. All transmit in CW in the same format with a 10-second solid carrier between messages.

☐ Finally, Art Reis, K9XI (editor and publisher of *220 Notes*), is also planning a beacon. This one will be located at his work QTH in Mokena, Illinois, will run about 25 W to a vertically polarized gain antenna at 90 feet, and have the frequency of 220.051 MHz. At first, it will only send the ID (K9XI/R), but will eventually send other messages as well in a 30-second-CW, 20-second-carrier and 10-second-silence format. Eventually, a horizontally polarized antenna will be up, hopefully with an automatic antenna switch over each minute.—*220 Notes*

REPEATER LOG

According to reports received in the month of August, repeaters were involved in the following public-service events: 6 weather emergencies, 3 medical emergencies, 18 vehicular emergencies, 2 fire emergencies, 1 search and rescue, 14 public safety events, 21 drills/alerts and 1 power failure.

The following repeaters were involved (followed by the number of events): WA1DGW 20, KA4DII 1, K4GFY 1, K4ICN 1, WA4SWF 3, WA6BJY 6, KH6HHG 2, K8DDG 8, KD8GL 4, WD8IEL 10, WA8ULB 7, K9OK 1, W9QYQ 2.

Strays

I would like to get in touch with...

☐ other senior-citizens Amateur Radio stations interested in forming a net. Squire Senior Center, 22 Media Line Rd., Newton Square, PA 19073.

☐ U.S. hams interested in corresponding. Fernando Casanova Orozco, EA1CYX, P.O. Box 1114, Orense, Spain.

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	Sept. 1985, p. 60
Affiliated-Club Coordinators	May 1985, p. 71
Club Contest Rules	Jan. 1985, p. 72
License Renewal Information	Jan. 1985, p. 45
Major ARRL Operating Events and Conventions — 1985	Jan. 1985, p. 46
MARS Information	July 1985, p. 46
November Sweepstakes Rules	Oct. 1985, p. 88
QSL Bureaus	
Incoming	June 1985, p. 85
Outgoing	Sept. 1985, p. 63
QST Abbreviations List	Jan. 1984, p. 53
902-MHz Interim Band Plan	Oct. 1985, p. 51

Canadian NewsFronts

Conducted By Harry MacLean, VE3GRO
500 Riverside Dr.,
London, ON N6H 2R7
Tel. 519-473-1668

Important Changes in CRRL

Don't worry. They're changes for the better. Starting in January 1986, CRRL will be operating on a new basis. Let's take a closer look.

1) *Finances:* This year, CRRL is still operating within the financial framework of ARRL. CRRL membership dues, collected at the CRRL Headquarters office in London, Ontario, are converted into U.S. funds and forwarded to ARRL Hq. in Newington, Connecticut. CRRL is run—very independently, mind you, under the direction of the CRRL Board—on budgets from ARRL. Starting in January, however, CRRL membership dues will be retained in Canada. CRRL will run on budgets approved only by the CRRL Board. Once a month, of course, CRRL will make a payment to ARRL. This is for certain services still provided by ARRL and for *QST*.

2) *Membership Records:* At the moment, ARRL is still the final repository of all CRRL membership records. However, CRRL has acquired a computer, developed the software that will give CRRL the same record keeping ability as ARRL, and just completed several test runs. The system works beautifully. Starting in January, CRRL will become the final repository of all CRRL membership records. CRRL will even produce the mailing labels for CRRL members' copies of *QST*.

3) *Membership Renewal Notices:* Right now, ARRL issues all CRRL membership renewal notices. This has caused confusion, particularly when an amateur joined CRRL as a result of a CRRL membership-development mailing. He sent his membership dues in Canadian funds to CRRL Hq. office in London, Ontario. After a year, he receives a renewal notice, but from *ARRL* Hq. in Newington, Connecticut—sometimes with membership dues quoted in U.S. funds! No more. Starting in January, all CRRL membership-renewal notices will be issued from CRRL Hq. only.

4) *Membership Certificates:* These are still issued by ARRL Hq. They bear reference to both ARRL and CRRL, but are in English only and are signed by ARRL officers. Starting in January, all CRRL membership certificates will be issued by CRRL. They will be in French and English, and will be signed by CRRL officers.

Now we'll try to answer some questions.

Will CRRL members still be members of ARRL? Yes, but they will be Associate Members. This is the same kind of membership that ARRL makes available to amateurs in the U.K. or in Poland or Australia. It provides for access to ARRL services and for *QST*, but does not provide for voting in ARRL elections.

Does this mean that CRRL members will lose their voice on the ARRL Board? No. CRRL is a democratic organization. CRRL members elect their Regional Directors on even-numbered years, and their President and Vice President on odd-numbered years. There is a provision in the ARRL By-laws that the duly elected CRRL President will sit on the ARRL Board as ARRL Canadian Director.

What about Canadian ARRL Life Members? ARRL has made a commitment to provide Canadian ARRL Life Members with access to ARRL services and *QST* for life. Canadian ARRL Life Members should know that they are now CRRL Life Members as well, entitled to all the privileges of membership in CRRL.

Will the switch from ARRL to CRRL mean a reduction in service? We don't think so. Just look at the record. For the past five years, Canadian League people have taken on many of the services formerly provided through ARRL Hq. They have tailored those services to Canadian needs. The result: a CRRL bulletin service, a free outgoing QSL service, new Canadian training materials, intensified representation to DOC, and more. The changes in January are just part of this ongoing process.

SECTION MANAGER ELECTION NOTICE

To all CRRL members in the Alberta and Maritimes-Newfoundland Sections: You are hereby solicited for nominating petitions pursuant to elections for Section Manager. Names of the incumbents appear on page 8 of this *QST*.

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

Petition forms, FSD-129-D, are available from the CRRL Headquarters office in London, Ontario, but are not required. The following form is acceptable:

(Place and date)

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

We, the undersigned Full Members of the League residing in the ... Section, hereby nominate ... as Section Manager for this Section for the next two-year term of office. (Signatures ... Calls ... Addresses including postal codes ...)

A Section Manager must be a resident of his or her Section, a licensed amateur holding a Canadian Amateur Certificate or higher, and a Full member of the League for a continuous term of at least two years prior to the receipt of a nomination petition at CRRL Headquarters. Petitions must be received at the CRRL Headquarters office before 1600 EST Friday, December 6, 1985.

If only one valid petition is received from a Section, the person nominated will be declared elected. If more than one valid petition is received from a Section, a ballotted election will take place. Ballots will be mailed from the CRRL Headquarters office on or before January 1, 1986. Returns will be counted after February 18, 1986. Section Managers elected as a result of these procedures begin their new terms of office on April 1, 1986.

If no valid petition is received from a Section, that Section will be resolicited in January 1986 *QST*.

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

Harry MacLean, VE3GRO
CRRL Secretary

THE CAN-AM CONTEST—WHAT HAPPENED?

How do you cancel a contest only hours before it's supposed to begin? It's not easy, but that's exactly what was done for the phone portion of this year's CRRL Can-Am Contest, scheduled for the weekend of September 21. Reasons? Several. The contest had the potential of creating serious interference for amateurs attempting to pass traffic in the wake of the Mexican earthquake disaster. It also had the potential of sidetracking good operators whose time was best spent on that traffic. Finally, but this was a minor consideration, the results of the contest would have been meaningless. The top contesters *were* all busy—with the Mexican traffic!

These days, contesters are often criticized for their activities. CRRL officers hope that the decision to cancel the phone portion of the Can-Am Contest—initially suggested by a concerned member of the contest community—shows that contesters are responsible amateurs. Many thanks to CRRL Directors and Section Managers, N6TR and the staff at W1AW for getting the word out so quickly.

NOTES FROM ALL OVER

☐ DOC declined to release its proposal on "Restructuring the Amateur Service" at the RSO-CRRL '85 DOC Forum. Reason: It would set a bad precedent to release a proposal to a special-interest group before it had been released to the general public. The proposal should appear soon in *The Canada Gazette, Part 2.*

IARU News

Conducted By Richard L. Baldwin, W1RU
President, IARU

A Common License

Good progress is being made toward the concept of a common license—that is, a license that would be valid no matter where you lived, no matter where you operated. Such a license has been a goal of IARU Region 1 for many years. On June 25, 1985, the European Conference of Posts and Telecommunications Administrations (CEPT) recommended that the CEPT member-administrations recognize the principle of a "CEPT radio amateur license," under specified conditions. The CEPT Amateur Radio license will take a form similar to a national license issued by the same authority, and will be drafted in the national language and in German, English and French.

There will be two classes of license. Class 1 permits the use of all frequencies allocated to the Amateur Service and authorized in the country where the station is to be operated. Competence in Morse code is a requirement. Class 2 limits use to frequencies above 144 MHz that are authorized for the Amateur Service in the country where the station is to be installed. Portable and mobile operation is permitted. In addition, the holder of a CEPT license may use the station of an amateur in the host country.

The actual list of "regulations" is a bit longer, but those are the essentials. Several countries in the CEPT area are now finalizing the implementation of this concept.

Similar negotiations are underway in the Americas to establish a common license that will be honored throughout North, Central and South America. Once that goal is reached, the next step would presumably be to have the two common license areas join in accepting each other's license, and then we would be a giant step closer to a common worldwide license.

It's coming, and in our lifetime!

THREE NEW BANDS: 10, 18 AND 24 MHz

As of September 24, 1985, the member-societies of the following countries have notified the IARU International Secretariat of the availability of new bands for their use.

• *10.100-10.150 MHz:* Algeria, Andorra, Antigua & Barbuda, Argentina (10.1005-10.103, 10.119-10.1215 and 10.1435-10.1465), Australia (less 10.126-10.134 and 10.1375-10.1455), Austria, Bahamas, Belize, Bermuda, Botswana, Canada, Cayman Islands, Colombia, Costa Rica, Cyprus, Czechoslovakia, Denmark, Djibouti, Comm. of Dominica, El Salvador, Faroe Islands, Fiji, France, German Dem. Rep., Fed. Rep. of Germany, Gibraltar, Greece, Grenada, Honduras, Indonesia, Ireland, Israel, Japan, Rep. of Korea, Luxembourg, Malaysia, Malta, Monaco, Montserrat, Netherlands, Netherlands Antilles, New Zealand (10.100-10.127 and 10.133-10.150), Nicaragua, Nigeria, Norway, Panama, Papua New Guinea, Peru, Portugal, San Marino, Senegal, Solomon Islands, South Africa, Spain (10.1075-10.1135), Sri Lanka, Sweden, Switzerland, Syria, Tonga, Trinidad & Tobago, Turkey, United Kingdom, USA, Vanuatu, Western Samoa and Yugoslavia.

• *18.068-18.168 MHz:* Algeria, Andorra, Antigua & Barbuda, Argentina (18.073-18.0765, 18.0835-18.0895, 18.0965-18.1085, 18.1215-18.149 and 18.1515-18.1675), Australia (less 18.071-18.079, 18.101-18.109, 18.121-18.134, 18.141-18.149 and 18.156-18.164), Austria, Bahamas, Botswana, Canada (pending), Cayman Islands, Colombia, Costa Rica, Cyprus, Denmark, Djibouti, El Salvador, Faroe Is., France, German Dem. Rep., Fed. Rep. of Germany, Grenada, Honduras, India, Ireland, Israel, Malaysia, Monaco (less 18.103-18.116, 18.129, 18.135 and 18.165), Netherlands, Netherland Antilles, New Zealand, Nigeria, Norway, Oman, Panama, Peru, Portugal, San Marino, Senegal, South Africa, Sri Lanka, Sweden, Switzerland, Syria, Tonga, Trinidad & Tobago, Turkey, United Kingdom, Vanuatu and Yugoslavia.

• *24.890-24.990 MHz:* Algeria, Andorra, Antigua & Barbuda, Argentina, Australia (less 24.896-24.904), Austria, Botswana, Canada (pending), Cayman Islands, Colombia, Costa Rica, Cyprus, Denmark, Djibouti, El Salvador, Faroe Islands, France, German Dem. Rep., Fed. Rep. of Germany, Grenada, Honduras, India, Ireland, Israel, Malaysia, Monaco, Netherlands, Netherlands Antilles, Nigeria, Norway, Oman, Panama, Papua New Guinea, Peru, Portugal, San Marino, Senegal, South Africa, Sri Lanka, Sweden, Switzerland, Syria, Tonga, Trinidad & Tobago, Turkey, United Kingdom, USA, Vanuatu and Yugoslavia.

Strays

LOOKING FOR A BARGAIN?

☐ We've got one for you! If you are immediately related to a member of a League member and are living at the same address, you may become a League member, without *QST*, at the special rate of $2 per year. You can enjoy all the other benefits of League membership for this low, low price. We can offer you low-cost insurance, QSL bureau service, awards, and much more. This also applies to blind amateurs. So, if you don't want to miss a bargain, *join today!*

I would like to get in touch with...

☐ anyone wishing to participate in a propagation study of vertical antennas by monitoring the beacon on 28.253 MHz. John Mahagan, WB4JHS, Box 4, Thomasville, GA 31799.

QST congratulates...

☐ David B. Hallock, W0SS, of Marion, Iowa, on being named Engineer of the Year by Rockwell International Corp. for his work in designing HF through UHF military communications receivers.

☐ Jeff T. Wimmer, KA4VXM, of Salem, Virginia, on receiving an appointment to the U.S. Air Force Academy in Colorado Springs, Colorado.

☐ Gary Breed, K9AY, recently appointed *RF Design* Technical Editor.

Hamfest Calendar

Administered By Marjorie C. Tenney, WB1FSN
Convention/Travel Coordinator

[*Attention*: The deadline for receipt of items for this column is the 15th of the second month preceding publication date. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes of any kind and games of chance such as bingo.]

†**Florida (Ft. Lauderdale)—Nov. 30-Dec. 1:** Broward Hamfest, sponsored by the Broward Amateur Radio Club, will be held at Broward Community College, Omni Auditorium. Open Sat. 9 A.M.-5 P.M; Sun 9 A.M.-4 P.M. Setup for exhibitors Fri. P.M. Admission $4 advance, $5 at door or $5 for 2 days. Flea market, technical programs, exams (all levels), new products. All programs on site. RV parking available. Talk-in on 31/91, 449.825-444.825. Reservations: Cy Harris, P.O. Box 130070, Sunrise, FL 33313.

Georgia (Atlanta)—Nov. 23-24: SOUTHNET II Packet Radio Conference hosted by the Georgia Tech Amateur Radio Club and sponsored by the Georgia Radio Amateur Packet Enthusiast Society. The conference is to be held on the campus of Georgia Tech in downtown Atlanta. Technical sessions Sat., 8:30 A.M.-5 P.M., and Sun., 8:30 A.M.-12 P.M. There will be a meeting of the SOUTHNET Coordinating Committee on Sunday. For further information, contact Bill Crews, WB2CPV, 1421 Hampton Ridge Rd., Norcross, GA 30093, tel. 404-923-1978.

Illinois (Grayslake)—Nov. 3: Waukegan Squadron, Civil Air Patrol, will hold its annual Fall Hamfest at the Lake County Fairground, Rtes. 120 & 45. Large, heated indoor selling area, cafeteria, plenty of free parking. Tables, $5; admission, $3. Doors open 7 A.M. For further info and reservations, send s.a.s.e to CAP, 637 Emerald St., Mundelein, IL 60060.

Illinois (Chicago)—Nov. 6: The Chicago Amateur Radio Club will hold its annual ham auction, 7-10 P.M., at Edgebrook Golf Course field house. For further information, please call 312-545-3622.

Illinois (Machesney Park)—Nov. 10: Hamfest sponsored by the Experimental Amateur Radio Society of Rockford, IL., at the Harlem Community Center, 900 Roosevelt Rd., just southeast of the Machesney Park Mall. Tickets $3 advance (with s.a.s.e); $4 at door. Inside tables $5 each. Talk-in on 01/61. Info: EARS, Inc., P.O. Box 4291, Rockford, IL 61110.

†**Indiana (Fort Wayne)—Nov. 10:** The Allen County Amateur Radio Technical Society will present the 13th Annual Fort Wayne, Indiana Hamfest at the Allen County Memorial Coliseum on Coliseum Blvd. (U.S. 30); 380 tables available, all indoors. Dealer set-up begins 5 A.M. Doors open 8 A.M.-4 P.M. General admission $3.50 advance, $4 at door. Children 11 and under free. Tables $8 each (ac power extra). Premium tables (along wall, curtain backdrop and free ac power) $20 each. Plenty of parking on paved lot ($1 charge). Women's activities, forums, banquet on Sat. night. VE exams given Sat., Nov. 9, with advance registration only. For more information or reservations, contact AC-ARTS HAMFEST, P.O. Box 10342, Fort Wayne, IN 46851.

Kentucky (Owensboro)—Nov. 9: Owensboro ARC will hold their ABC Hamfest/Computer Show 9 A.M.-4 P.M. Dealer setup 7:30 at the Chautauqua Center on Leitchfield Rd. All facilities downstairs. Easy access. Talk-in on 81/21. ARRL/Ham forums, women's activities. Tables $3 each. Admission $3. FCC exams will be given (walk-ins allowed). Bring check for $4 payable to ARRL/VEC. Food featuring that good ole KY barbecue. More info: OARC, P.O. Box 231, Owensboro, KY 42301, tel. 502-685-5292.

†**Louisiana (West Monroe)—Nov. 9:** Hamfest sponsored by the Twin City Hams and held at the West Monroe Convention Center, North 7th St. Hours 9 A.M.-4 P.M. No charge for swap tables. Several new dealers. Amateur Radio code and theory exams given. Talk-in on 146.52 and 25/85. Contact Benson Scott, AE5V, 107 Contempo St., West Monroe, LA 71291.

Massachusetts (Billerica)—Nov. 23: The Honeywell 1200 Radio Club, sponsor of the 72/12 repeater, and the Waltham Amateur Radio Association, sponsor of the 04/64 repeater, will hold their annual Amateur Radio and electronics auction at the Honeywell Plant, 300 Concord Rd., exit 27 off Rte. 3. Snack bar and bargain parts store. Doors open 10 A.M. Free admission and parking. Talk-in on both repeaters. For more information, contact Doug Purdy, N1BUB, 3 Visco Rd., Burlington, MA 01803.

Michigan (Oak Park)—Dec. 1: The Oak Park High School Electronics Club presents a Swap 'n' Shop at Oak Park High School. Donation $2.50; after 12 P.M. $1.50. Tables $8/8 ft. Refreshments. Send s.a.s.e. to Herman Gardner, Oak Park High School, 13701 Oak Park Blvd., Oak Park, MI 48237, tel. 313-968-2675.

Minnesota (Faribault)—Dec. 7: The Annual HANDI-HAM Winter Hamfest will be held at the Eagles Club. Registration starts at 9 A.M. Dinner at noon and program. Talk-in on 19/79. For more information, contact Don Franz, WØFIT, 1114 Frank Ave., Albert Lea, MN 56007.

†**New Jersey (Westwood)—Nov. 16:** Stateline Hamfest sponsored by the Stateline Radio Club of New York and New Jersey at St. Andrews School, 120 Washington Ave. Hours 8 A.M., vendors at 6 A.M. Admission $3 gate only; tailgaters $6 per space. Vendors $10 in advance of Oct.31, $13 at door. VEC exams, HT-mobile units, food, free transceiver clinic. Talk-in on 146.835. Info and reservations from Fred, N2ATI, 201-664-5320, or write to SLRC of NY & NJ, P.O. Box 325, Montvale, NJ 07645.

New Jersey (Neptune)—Nov. 3: The 4th Annual Jersey Shore Ham/Computer/Electronic Flea Market will be held 9 A.M.-3 P.M. at the Neptune City Recreational Hall, Neptune City Shopping Center (90 minutes from Philadelphia, 60 minutes from NYC). Admission $3; children under 12 and women free. Refreshments available. Table $6, tailgating $3. Spaces by s.a.s.e. and advance payment to Jersey Shore Ham Fest, P.O. Box 192, West Long Branch, NJ 07764. Talk-in on 645/045 and 146.52. Phone: 201-222-3009.

†**New York (St. James)—Dec. 1:** The 7th Annual "Ham-Central," sponsored by the Radio Central Amateur Radio Club, will be held at the Suffolk Lutheran School, Moriches Rd. and Woodland Ave. Doors open: 7:30 A.M. for dealers; general public 9 A.M.-3 P.M. Plenty of free parking. Big, indoor location. Tasty food and drinks available. Table space $10/8 ft, ham-related items only. Admission $3; children and XYLs free. ARRL and AMSAT seminars. Talk-in on 144.550/145.150 and 146.52. For reservations and additional information: Bob Yarmus, K2RGZ, 3 Haven Ct., Lake Grove, NY 11755, tel. 516-981-2709 after 6 P.M.

†**Ohio (Massillon)—Nov. 24:** The Massillon ARC will sponsor "Auctionfest 85" at the Massillon K of C Hall off Rte. 21. Hours: 8 A.M.-5 P.M.; seller setup 7 A.M. Admission: $2.50 advance, $3.50 at door. Many tables available at $7/8 ft. Refreshments and sit-down dinner. Free parking. Auction starts at 11 A.M. Talk-in on 78/18. For advance registration and information, contact MARC, P.O. Box 73, Massillon, OH 44646. S.a.s.e., please.

Wisconsin (Milwaukee)—Nov. 24: The Milwaukee Repeater Club is proud to sponsor the "6.91 FRIENDLY FEST," from 8 A.M. to 4 P.M. (dealer setup 7 A.M.), at SERB Hall, 51st and Oklahoma. Gather up your swapfest bargains and partake of that famous Milwaukee food, beverages and bowling (12 lanes). Tickets are just $3. Tables $4/4 ft. To save $1 per ticket or table, send s.a.s.e. with payment to the Milwaukee Repeater Club, P.O. Box 2123, Milwaukee, WI 53201, before Nov. 11. Talk-in on 146.91 and 146.52.

[*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.]

Coming Conventions

†**November 1-2—Pacific Division, Las Vegas, Nevada**

ARRL NATIONAL CONVENTIONS

September 5-7, 1986—San Diego, California

July 10-12, 1987—Atlanta, Georgia

August 19-21, 1988—Portland, Oregon

†At press time, Amateur Radio exams are scheduled to be given at this convention. For other exam opportunities see Hamfest Calendar.

†ARRL Hamfest

Strays

***QST* congratulates...**

☐ Mike DiPersio, KC2Q, of Bradley Beach, New Jersey, on receiving the Elmer Award from QCWA Central New Jersey Chapter 138.

☐ Joseph, K2VGV, and Jean, WA2JQC, Schwartz, of Staten Island, New York, on being elected president and secretary/treasurer of the Big Apple Chapter 14 of the National Assn. of Civilian Conservation Corps Alumni.

☐ Irma Curry, WB7FDC, of Arden, Washington, on receiving the National Weather Service Public Service Award.

☐ C. H. "Hank" Ostby, WB6CCJ, on receiving a resolution of commendation from the California State Assembly on his retirement as Coordinator, Emergency Welfare Services and Communications for the California Department of Social Services.

Amateur Satellite Communications

Conducted By
Vern "Rip" Riportella, WA2LQQ
P.O. Box 177, Warwick, NY 10990

Basic Satellite-Tracking Themes

Establishing and maintaining knowledge of the whereabouts of satellites is called tracking.[1] There's a keen interest in tracking OSCAR. And I think I know why.

It's the mystery that shrouds the movements of these artificial planets that makes their movements so fascinating, their reappearance almost mystical. It makes those who accurately predict their appearance rather shaman-like figures in the community.

Most satellite shamans have replaced their icons with IBM®, their crow's feet with Commodore®, their mushrooms with MacIntosh® PCs. The great caldron is first loaded with Kepler stew and feverishly stirred. Soon it yields up a magnificent information porridge richer by far than any gypsy's tea leaves: a forecast of heavenly events to come ... the rise of a great friendly star, OSCAR!

There are two fundamental reasons one needs to keep track of OSCARs. First of all they move—some fast, others not so fast. Since you must use a beam of some sort, you need to know where to point to catch the little bugger as it goes by. Second, most folks would find it rather onerous to sit by a radio and wait several hours for a satellite to show up. That would be an awful waste of time, and could be hazardous to your health besides. The soothing effect of the white noise emanating from the receiver has been known to induce a condition known to medicine as radiosomnia: nodding off at just the wrong moment.[2]

To avoid entirely this potentially debilitating condition, one needs to know when the satellite of interest will appear. Then, one can leisurely go about one's (presumably) less somniferous business to return to the shack at just the right moment to catch the bird on the rise.

Thus, there are two fundamental functions of your OSCAR tracking effort: position determination and scheduling. There are other functions one might envision (and those will be discussed subsequently), but these two functions are clearly most basic.

To track OSCAR requires four things:

1) You need information about the OSCAR you want to track: its precise location and rates of movement at a precisely defined instant.

2) You must know your location.

3) You must know the time of day reasonably accurately.

4) Most important, you need a contrivance to make sense of the first three items.

The contrivance, or tool, can be an OSCARLOCATOR, Satellipse or similar manual tracking device.[3] Or it can be a number engine: a modern-day icon, crow's foot or mushroom. The manual locators are sufficiently accurate for most applications, and can cost under $20. Obviously, the crow's feet are somewhat more dear (ask any crow).

Let's look first at the manual locators. In the usual arrangement, you get an equidistant azimuthal projection map centered on the North Pole. A series of clear-plastic overlays is supplied. The ground-track overlay relates the path of the satellite to the map of the earth. The ground-track overlay pivots around a rivet positioned at the North Pole. In this way, it denotes various paths the satellite can take. Another overlay, called a spiderweb because of its resemblance to same, provides azimuth and elevation pointing information to the satellite from your QTH.[4] Time hacks on the ground-track overlay signify where the satellite will be at selected times after a reference is crossed. The satellite's motion (rates and angles) are factored into your plotter and determine the shape of the curves on the overlays. Different satellites usually have different orbits. That means you need a separate ground-track overlay for each satellite.[5]

To make the manual plotters work you need an accurate reference point, a precise reckoning of where the satellite was at a selected instant. With low earth-orbiting (LEO) satellites, which have very nearly circular orbits, the reference used is the time and longitude of the satellite's northbound equator crossing. More precisely, *the* reference orbit (the one most often used for reference purposes) is the *first* northbound equator crossing of the UTC day.

The reference orbit consists of the time and longitude of the equator crossing. Orbit number is sometimes also included. To track subsequent orbits you increment the longitude of the reference orbit by a fixed amount (given in the bulletins). Similarly, the time increment is given. So, given a reference orbit together with the longitude and time increments (orbital period), you have sufficient information for accurate tracking for several weeks, at least.

With elliptical orbiting satellites such as AMSAT-OSCAR 10 (AO-10), things are a bit more complex. Since both the velocity and altitude of AO-10 change constantly, the shape of the ground-track overlays seems at first a bit bizarre. The earth is rotating at a fixed rate, but the motion of the satellite is variable. The interaction of the two motions yields a ground track that doubles back on itself. Moreover, the shape of the ground-track overlay must be updated periodically to account for changes in the orbit geometry. Finally, when used for AO-10, the manual trackers most often use the time and location (both latitude and longitude) of apogee as a reference rather than the equator crossing time.[6]

Locators used for both circular and elliptical orbits have several things in common: They depend on well-defined graphs of the satellites' movements, and they require a reference time and position input to get started tracking. These reference inputs can be obtained from several sources. W1AW transmits reference orbits as part of its regular bulletin regime. AMSAT nets carry extensive orbital information, including the reference orbits and reference apogees.[7] *Amateur Satellite Report* (ASR) also contains the required information.[8]

So far, we've looked at two of the four items mentioned above that you need. We've looked at the position and motion information you need, and we've mentioned one form of tool (contrivance) to garner some meaning from the information. Now for the easiest two requirements: your location and the precise time.

You can determine your location from an atlas or a good road map. You should be able to determine your location easily to within a tenth of a degree of both longitude and latitude. If you have difficulty, try calling your municipal airport for help. As for time of day, the National Bureau of Standards station WWV can be tuned in on 2.5, 5, 10, 15 and 20 MHz whenever conditions allow. Time hacks are given every minute. You should have an accurate clock, preferably digital, closely synchronized with WWV.

Manual locators have much to recommend them. They're inexpensive and completely adequate for most tracking applications. In fact, they are fun to use, if a bit confusing at first to the newcomer. Designers of AO-10 trackers (K2ZRO, W2GFF and K2UBC) spent years working out the details to produce some excellent, affordable instruments.

Expert DXers know where and when to point their beams, based on years of experience. Tracking satellites is similar in some ways, yet starkly different in others. It *does* take experience to become a proficient satellite tracker and to really understand what is going on. In this way satellite trackers and DXers are similar. On the other hand, DXers have to shrug their shoulders at the vagaries of the F2 mode when overwhelmed by too many variables; simple unpredictability. Thankfully, predicting OSCAR access is much, much more precise. There is enormous satisfaction in dumping a bunch of numbers into a computer, pushing a few buttons and being presented with a piece of paper that says an object traveling at 18,000 miles per hour is going to pop over your horizon in precisely 38 minutes and 22 seconds. And then it *does!* Shamans, man your caldrons!

Next time, we'll conclude the tracking theme with a look at the icons, crow's feet and mushrooms (computer number crunching) tracking methods.[9]

Notes

[1]Tracking in a general sense can mean all those measures one employs to locate the object of interest. In a narrower sense, tracking, as with radar, can involve an exchange of information, either cooperatively or passively, between the tracker and the target. When we speak of "tracking" OSCARs, we generally mean the broader sense of the word. Tracking OSCAR most often reduces to predicting its position in space and time as discussed (in the text) rather than exchanging location information with it.

[2]Symptoms include a red mark on the forehead caused by frequent, percussive contact with the operating position.

[3]See the June 1985 column.

[4]See! There really are mystical allusions here.

[5]For satellites of the same family, however, you can use a single overlay. For example, for RS-5, RS-7 and RS-8 (all the currently operating Russian satellites), a single ground-track overlay is sufficient. Separate overlays are required for UoSAT-OSCAR 9 and UoSAT-OSCAR 11 because of their disparate altitudes.

[6]Apogee is the highest point in a satellite's orbit; the point at which it's farthest from earth.

[7]Net times and frequencies were given in the June 1985 column.

[8]See the June 1985 column.

[9]A free catalog of AMSAT Software Exchange tracking programs is available for an s.a.s.e. to the author at the address above.

YL News and Views

Conducted By Joan Gibson, KG1F
RR 1, Box 1465, Waterbury, VT 05676

For SP2FF: A Tapestry Woven by Many Weavers

If you were to ask SP2FF, "Do dreams come true," Barbara Ulatowska would answer with a Polish-accented "Yes." And she might add that the magic wand for making dreams come true is held by Ethel Smith, K4LMB, as well as many YLs and OMs across the U.S. The dream for Barbara was to visit the U.S., attend the YLRL Convention and meet her many stateside friends. Even though previous plans to accomplish this had not come to fruition, Ethel had no intention of giving up.

In November 1984, Barbara wrote Ethel and again expressed an interest in making the trip for the June 1985 YLRL Convention in Las Vegas. Ethel set out to assist Barbara from this side of the Atlantic by making several visits to the Polish Embassy in Washington. Ethel's diligence paid off and, on June 14, 1985, with a treasured passport in hand, Barbara landed in Washington, DC, where she was met by K4LMB. From that moment she began a whirlwind tour of five major cities, attended the 1985 YLRL Convention in Las Vegas, and was chauffeured, wined, dined and escorted by a multitude of Amateur Radio operators from the Atlantic to the Pacific and back again.

Barbara notified Ethel about a month prior to the convention that everything was "go" for the trip, and Ethel promptly notified YLs around the country. As soon as the word was out that SP2FF was going to visit the U.S., invitations from all over the country poured in from amateurs who wanted to host Barbara in their homes or in some way help to make her visit a memorable one. YL clubs as well as individual amateurs helped to finance Barbara's unique vacation. She was permitted to bring only $400 from Poland; thanks to the hospitality of so many, her "dollar" went a long way!

On June 20, after a few days in Washington with Ethel, the two women arrived in Las Vegas for the YLRL Convention, where approximately 190 YLs had gathered. From there, W6BDE drove her to Los Angeles, where YLs exhibited Southern California hospitality with a trip to Disneyland and a chance for Barbara to observe thousands of tourists waiting in long lines to enjoy the more popular rides and exhibits.

From Los Angeles, Barbara and Esther Given, W6BDE, drove to San Francisco via the scenic Coast Highway. During the two-day trip, they stopped to visit several Amateur Radio operators. Stops were also made at the Santa Barbara Mission (Barbara's name saint) as well as the Carmel mission in Monterey. Upon arriving in San Francisco, Barbara was greeted by KA6SOC, who took her on a tour of the Bay-area sights, which included Fisherman's Wharf, Chinatown and the cable cars. Like so many, Barbara fell in love with

Ethel Smith, K4LMB (left), and Barbara Ulatowska, SP2FF, share a few moments at the YLRL Convention in Las Vegas this past June. *(W6KHM photo)*

San Francisco. W6USE and family entertained her with a typical Western barbecue attended by 20 guests, including 10 hams.

On July 1, Barbara took the "red eye special" to Atlanta, where she was met by K4LMB and was introduced to Southern Hospitality a la WI4K, WO4U, K4JGK and the Amateur Radio community at large of Atlanta. The women proudly showed her the historic antebellum homes in the southern Atlanta suburbs and toured Stone Mountain Park, where Barbara met the artist who carved the granite sculpture on the face of the mountain. The day ended with a chance to swim, one of Barbara's favorite pastimes.

SP2FF was the guest of honor at a large party of Atlanta YLs and OMs given by Carol Shrader, WI4K. Also at the party were a number of QCWA members, who had a chance to meet Ethel. Her stay in Atlanta also included witnessing a great American tradition, the Fourth of July. That morning, Carol asked Barbara if she realized that July 4 was a holiday for Americans. She completely surprised Carol by exclaiming "Oh, yes! July 4th, 1776" and spouting out an amazing stream of American history.

The holiday began with breakfast at a local fast-food establishment. As WI4K said, "How could we let her return to Poland without tasting an Egg McMuffin!" From there it was off to downtown Atlanta to see the parade, receive the gift of a T-shirt, shop at an Atlanta mall and visit the Omni Hotel, site of the Atlanta Hamfestival Convention.

With other 4-land YLs, Barbara attended a MALARC luncheon at the Westin Peachtree Plaza (the world's tallest hotel). The weekend was filled with activities at the Atlanta Hamfestival, where Barbara latched onto an interpreter who, much to her delight, greatly assisted her in communicating with her new friends. If Barbara's English wasn't perfect, then neither, by their own confession, was the Polish of her American acquaintances! Somehow, everyone made themselves understood.

One rather amusing event occurred at Carol's party, during a viewing of a videotape about Amateur Radio produced by a local cable-television company. It was a panel discussion/call-in type of show in which local hams had participated. While Barbara was watching the program, the camera did a close-up of one of the local ham radio "personalities," a rather gregarious type with a Southern accent tinged with some "broadcast culture." All of a sudden, her face lit up and she burst out, "Oh, I can understand *him*! WI4K commented, "Barbara was so pleasant every minute, and that must have taken quite a bit of effort considering that half the time she probably did not know what all of us people with crazy Southern accents were saying."

From Atlanta, it was a return to Washington with Ethel for more sightseeing, and then on to New York City, where W2EEO and OM W2LH took them literally *all* over the city. SP2FF observed the Manhattan skyline from the 110th floor of the World Trade Center, lunched in Greenwich Village, shopped on Fifth Avenue and visited Lincoln Center. She met many new people, including her friend from Gdynia, KB2VO.

Madeline and Arthur went to great lengths in an effort to find someone who could speak Barbara's native tongue. They visited Riverhead's Polishtown, a Polish Fair, a Polish Bakery and a Polish deli. They even visited St. Isidore's Polish Roman Catholic Church, where two Polish-speaking priests resided. No luck; both prelates were enjoying a day off.

On Saturday, July 13, Barbara boarded a flight to her native land, tired but joyous. Her dream of many years had finally come true—she had visited America. As she stepped onto the plane, she was still shaking her head in disbelief and saying "I don't understand it. Why was everyone so nice to me?" It would seem that Barbara received from her one month stay far more than she ever could have imagined. Thanks to K4LMB, who extended her hand of friendship, and the other YLs and OMs who graciously and warmly opened up their homes and hearts to this most charming YL from across the ocean, Barbara Ulatowska no longer dreams about a journey to the United States. Instead, she closes her eyes and vividly remembers. *(tnx K4LMB, WI4K, WO4U, W6BDE, W2EEO, KA6SOC)*

Silent Keys

Administered By Nancy A. O'Neill

It is with deep regret that we record the passing of these amateurs:

W1BF, Earle G. Ham, Cumberland, ME
W1CRE, Edward H. Diggins, Arlington, MA
K1EDW, Keith I. Wilcox, Harrisville, RI
W1EFY, Clinton L. Cummings, Lake Havasu City, AZ
W1HXK, William Stackhouse, Lake Panasoffkee, FL
W1JTA, William E. Gatchell, Sr., Needham, MA
W1KGT, Frank J. Huyber, Redding, CT
KA1KIG, John Joseph Curley, Avon, MA
*KA1KOR, Brian Jensen, Bethel, CT
W1LEA, Raymond L. Lasonde, Port Richey, FL
W1QU, Wasil Litvenko, Woodbridge, CT
*K1TH, Ted Holt, Fort Wayne, IN
K1ZES, Leonard G. Nathan, Boston, MA
W2ADC, John Rogers, Amityville, NY
W2CU, William W. Mumford, Sr., Morris Plains, NJ
W2IHW, Al Newland, Glen Rock, NJ
K2PEM, Nicholas Del Grosso, Bronx, NY
KB2TF, Harold A. Watson, Falconer, NY
W2TV, Robert W. Mink, Fair Haven, NJ
*W2UGL, James D. Mazgy, Lake Hiawatha, NJ
K2WN, William Noah, Delanson, NY
K3BTF, Harry S. Dolde, Connellsville, PA
K3DXW, Norman Unruh, Avalon, NJ
KA3IQV, Frederick V. Zimmerman, Mystic Island, NJ
W3OUG, Francis P. Opalko, Myrtle Beach, SC
K3QHY, George E. Reiger, Sr., Pittsburgh, PA
W4AZS, William H. Moritz, Melbourne, FL
WA4CEN, Theodore F. Waechter, Inverness, FL
WB4CQS, Leonard W. Abrams, Penrose, NC
W4EFS, John D. Barron, Stone Mountain, GA
WA4FAQ, Melvin Mauldin, Sr., Mobile, AL
WA4HCR, John P. Dunnington, Jr., Midlothian, VA
KB4HSY, Frank D. Sarapo, Lauderdale Lakes, FL
W4HTJ, Deryl E. White, Sr., Richmond, VA
K4JKA, A. Robert Cunningham, Clearwater, FL
W4OSG, Eugene N. Berato, Bushnell, FL
K4PRW, Curtis L. Hickey, Knoxville, TN
KA4RUU, Jay D. Stacy, Apollo Beach, FL
WB4TKI, William R. Elliott, Beaufort, NC
WA4UJI, Fred D. Cobb, Burlington, NC
KA4VDK, William A. Chestnut, Sr., Crestview, FL
WA5ENP, Dr. Leon O. Beasley, Lafayette, LA
W5FV, Walter E. Bornemann, Lacombe, LA
KA5LSD, Alice L. Dunn, Rogers, AR
*WB5MHE, A. Irving Fineberg, El Paso, TX
W5NWC, Darrell B. Faubion, Austin, TX
*WA5TPS, Edward J. Meyer, Jr., New Orleans, LA
K5UPB, Robert E. Bryan, Austin, TX
W5ZKJ, Harold R. Bray, Oklahoma City, OK
W6AME, Robert H. Potts, Chula Vista, CA
W6BP, Laurance "Babs" Babize, Granda Hills, CA
W6CAN, J. Wayne Clark, Napa, CA
WA6DJI, Hensley J. Morehen, San Francisco, CA
WA6FIO, Thomas G. Nanson, Los Angeles, CA
W6LEP, Hugh T. White, Ojai, CA
WB6LSC, Glen E. Andrews, Mi Wuk, CA
W6MNS, Philip J. Hellsten, San Ramon, CA
WB6OAY, Patrick Frank McCammon, Montebello, CA
*N7AD, Ken Anderson, Great Falls, MT
W7ARS, Walter Nettles, Tucson, AZ
K7GWG, Alvin C. Ellenwood, Sr., Roseburg, OR
*W7HGU, Curtis B. James, Mesa, AZ
W7LV, Laurence L. Robinson, Friday Harbor, WA
WB7ORD, Veryl Romer, Tucson, AZ
K7OUV, Harold D. Nordeen, Olga, WA
NG7V, Nick Peterson, Bremerton, WA
WB7VXF, Virgil Sly, Salem, OR
W8ADQ, Nolan "Stew" Walker, Canton, OH
W8BD, Norman A. Godwin, Cleveland, OH
WB8CVG, Russell E. Berry, Barboursville, WV
W8EKG, William T. Applegate, Peebles, OH
WA8ENH, Ralph H. Zonker, Toronto, OH
K8HWO, Durward H. Evans, Canton, OH
WB8IMT, Dale Faylo, Toledo, OH
W8KYK, Charles H. Girt, North Canton, OH
W8OND, James Towner, Grand Rapids, MI
W8OP, Paul C. Rohwer, Trenton, OH
WA8PFC, John L. Tidball, Columbus, OH
WB8PRU, O. A. D'Yarmett, Columbus, OH
K8SKT, Garland T. Brown, Huntington, WV
W8SLE, Willis D. Richardson, Painesville, OH
W9AOP, Harry E. Blase, Mapleton, IL
W9AYZ, John J. Swarbrick, Nokomis, IL
KA9CWD, Richard J. Pivonka, Green Bay, WI
W9HBC, Douglas Crocker, Grantsburg, WI
W9JDM, Albert Mahnke, Hammond, IN
KA9NOF, Jay B. Glover, Bloomington, MN
KA9TXV, Ann Williams, Chicago, IL
KØAWM, Jack C. Mankus, Ballwin, MO
KAØCBD, Lyle H. DeRosier, Bemidji, MN
KAØDBY, Kathryn Yeager, Waterloo, IA
WDØGEL, Arthur S. Ritter, Cook, MN
KAØGHP, M. J. Stone, International Falls, MN
WAØKIN, John K. Coppage, Aurora, CO
KØOHM, Maxine M. Lampl, Cascade, CO
WØPKJ, Ernest G. Wilson, Des Moines, IA
WØQMC, Emerson Ross, Grasston, MN
KDØRE, Troy Turner, Jr., Bayfield, CO
KAØSWC, Jack L. Wolfe, International Falls, MN
*WBØVNB, John Chedester, Littleton, CO
VE1ANG, Ronald M. Rickard, Fredericton, NB
VE7ACM, Charlie H. Turner, Victoria, BC
VE7AM, W. T. Mallet-Paret, Vancouver, BC
VE7BEN, James S. Erkskine, Chilliwack, BC
VE7BJ, Marv Wilson, West Vancouver, BC
VE7DKN, Frank Marwood, Vernon, BC
VE7HN, Herbert L. McGlade, Victoria, BC
G4KED, Francis H. Ford, Nicosia, Cyprus
HB9CV, Rudolf Baumgartner, Bern, Switzerland

*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

November 1935

☐ The ingenious Ross Hull has combined the selectivity of a superhet circuit with the gain and noise suppression of the superregen hookup into an advanced receiver for v.h.f. (6-meter) work. Double conversion is the key function in this unit, dubbed the "Super-infragenerator."

☐ Ten meters continues "hot," with various DX accomplishments, peaking in ZS1H's achieving WAC on that band, with J2HU being the final QSO.

☐ The Editor pays tribute to Clair Foster, W6HM, who has joined Silent Keys, particularly for his outstanding transpacific traffic work in the '20s. Though often a critic of the League, Col. Foster served one term as Pacific Division Director, and was the original proponent of the Worked All Continents award.

☐ Voice overmodulation continues to be a problem, and the Federal Communications Commission has instructed its monitoring stations to put their new oscilloscopes to work checking the amateur bands for such violations.

☐ W3AMS is working VK6MO regularly on 7 Mc.—demonstrating the reliability of that band—exchanging information between the Carnegie Institute in Washington and its experimental laboratory in Australia.

☐ *QST* circulation has reached an all-time peak of 42,155 copies, six months average. The 1936 *Handbook* is now out, twice as large as earlier editions. Still $1, the extra cost of the larger book is being covered in part by an expanded advertising section, which the League urges manufacturers to submit in catalog form as a help to builders.

☐ Resonant-line circuits are excellent for v.h.f. work, but at 60 Mc. are bulky. W8DSJ bent his copper tubing into a "U" or "trombone" shape for improved construction.

☐ Glen Browning aims to meet two needs of most hams through a dual-tuner superhet with separate coil-switching units for ham-band and all-wave coverage.

☐ Following up on earlier *QST* pleas for reduced power in local QSOs, George Grammer presents practical methods for achieving QRP without rebuilding the rig—less close antenna coupling, final stage voltage reduction, increasing grid bias, and the like.

☐ W6BOO and W6GWY describe the elaborate setup at show station W6USA, which was actively operating and on public display during the California Pacific Exposition in San Diego this past summer.

☐ The Milwaukee *Journal*'s experimental station on 31.6 Mc., W9XAZ, once a month broadcasts the entire proceedings of one of the regular meetings of the Milwaukee Radio Amateurs Club.

25 Years Ago

November 1960

☐ W4IMP's "IMP" sideband exciter described in last May's *QST* created a lot of reader interest. Now Joe has added an amplifier and power supply, achieving 100-watts p.e.p. in less than half a cubic foot of space.

☐ The ground plane antenna provides good low-angle radiation, but is difficult to match. K2GHM shows us how the gamma approach can simplify the problem.

☐ W2VVC designed a sequencing system of relay changeover control to eliminate arcing in antenna contact points.

☐ Gain from stacked antennas depends largely on the spacing used. K2GAL presents information on putting together multi-antenna arrays, complete with universal design charts and examples of how to use them.

☐ To achieve frequency flexibility on v.h.f., W3KXI adapted the "VXO" principle—swinging an 8-Mc. xtal enough that when multiplied to 144 Mc., as much as 500 kc. can be covered.

☐ W9ESD's article in *QST* a year ago on homemade transformers inspired W2VLA to delve further into core sizes and materials, windings and wire selection.

☐ Dynamic mikes are fine for ham use, except the output is low—a problem K6VGA remedies with his transistor preamp.

☐ W7LHZ dispels the general belief that measuring the important *Q* in r.f. circuitry requires expensive lab equipment; he shows us a simple procedure with only a grid-dip oscillator and antenna impedance bridge.

☐ For the newcomer who would like to tackle v.h.f., W1ICP shows yet another application of the inexpensive (surplus) BC-455 unit as a tunable i.f. for crystal-controlled converters, a combination that produces a very effective receiver.

☐ Deputy Chief Signal Officer Earle Cook lists some of the attractive features of liaison with the Army through the Military Affiliate Radio System activities. Even more benefits are available to the amateur who actually enlists, says W4FZ.

☐ We're using a lot of coax these days, but installing fittings on small (¼-inch) cable can be tricky unless you use the procedure suggested by K8MME.

☐ A radiolocation service operating mainly on the Gulf Coast has received permission to use our 10-kMc. band, with 1 watt maximum power and on condition of no interference to us.—*W1RW*

Affiliated Clubs in Action

Conducted By Leo D. Kluger, WB2TRN
Club Program Manager, ARRL

NOVEMBER SS AFFILIATED CLUB COMPETITION

The 51st annual ARRL November Sweepstakes last year "brought 'em out of the woodwork"! Seventy-three affiliated clubs submitted scores: two in the Unlimited category, 12 in the Medium Category and 59 in the Local Category. Congratulations to the winners in each: Northern California Contest Club, Texas DX Society and the Rubber Circle Contest Club, respectively. And congratulations to all the other clubs who mustered out the troops to polish up operating skills and have some fun to boot.

If you haven't noticed yet, this is the month for the 1985 edition. Will your club be among those who tickle the ether this year? The 73 clubs listed in the *QST* writeup know that not everyone puts in the full 30 hours. Get the gang on the air for however long each can manage—and get them to submit their scores towards your club's aggregate! You'll be surprised how quickly the scores add up. This is one event in which every club that participates comes out a winner.

For the rules of this year's contest, see October *QST*, page 88; for club competition rules and disqualification criteria, see January *QST*, page 80; for the writeup and results of the 1984 contest, see May *QST*, pages 74-75.

CLUBS IN ACTION

Approximately 600 club newsletters come in to ARRL Hq. monthly, and sooner or later we skim through them all. Here are a few items gleaned from these newsletters that are particularly interesting:

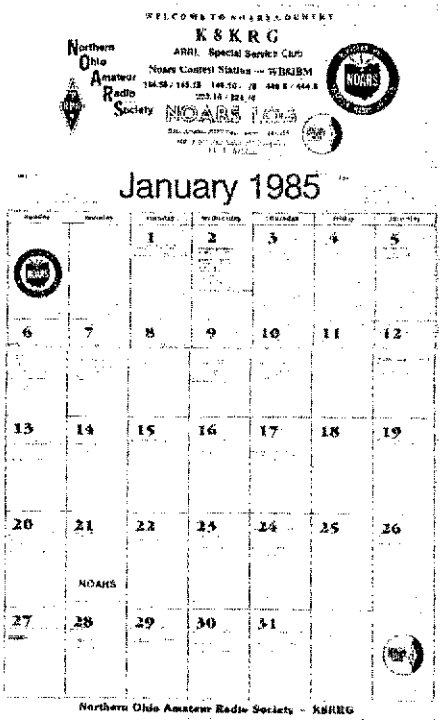
From the *Ground Wave* comes this publicity idea: If you don't save your issues of *QST, 73, CQ, Ham Radio,* etc., the next time you visit your doctor or dentist's office, take the old issue with you and leave it in the magazine rack. A lot of people are introduced to Amateur Radio by browsing through one of these magazines. [Editor's Note: You might want to affix a small sticker to the front of the magazines, giving the name of a person to contact should anyone reading the magazine become interested in learning more about Amateur Radio.]

The Anchorage Amateur Radio Club (AARC) reports this item in their editor's column, "From the Top of the Tower": When Bob McKinnie, AL7AW, visited the China Radio Sport Association last May, he found that BY1PK needed wattmeter slugs for 144 and 450 MHz. The AARC board voted to donate four slugs to the China station, covering 10- and 100-W ranges for each band.

A NOVEL CALENDAR

On page 64 of this issue, you'll find an article by K9TUS extolling the importance of reinforcing your club's presence among its members not only at but also between club meetings. The Northern Ohio Amateur Radio Society (NOARS), a Special Service Club, has found a useful and attractive means of accomplishing this. A yearly calendar is produced and distributed among club members. It's not just any list of dates and their weekly order, but a calendar devoted to Amateur Radio happenings (see photo).

Listed in their appropriate places during the year are the various nets NOARS conducts, the major (and many minor) Amateur Radio contests, the code proficiency qualifying runs, club meetings and locations, Amateur Radio state conventions and other dates important to any active amateur. Throughout the monthly listings are photographs from club events, the club's logo, a history of the club, the repeater and net frequencies, a club officer directory and a reproduction of FCC Form 610 with instructions for filling it out. It's an impressive and useful calendar, one that wouldn't take too much effort to put together for *your* club.



ARRL AFFILIATED CLUB STATIONERY

It's new! And it has a blue ARRL logo on it. Now available, at cost, are sets of stationery for your affiliated club. Write to ARRL Hq. if you want to order some for your club. The price is $3/100 sheets, which includes postage.

CLUB CHALLENGE FOR THE '80s

Less than a month is left to take advantage of the competition and earn a transceiver for your club. For a small amount of time invested in promoting League membership, your club could earn a state-of-the-art transceiver. But there's not too much time left. If you have any questions about the program, call ARRL Hq. and ask for Lori Chadwick.

Renewing SSCs

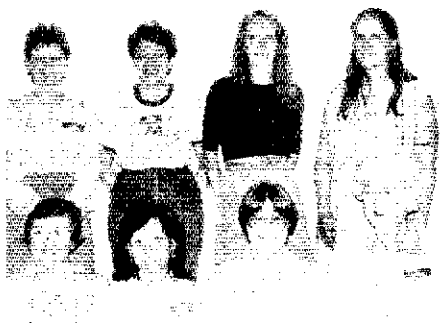
After completing a year of Special Service, SSCs go through a review process with their respective ACCs. With successful programs behind them, they plan their next 12 months of activities. An SSC that recently renewed this status:

Sonoma County Radio Amateurs,
Santa Rosa, CA (75 members)

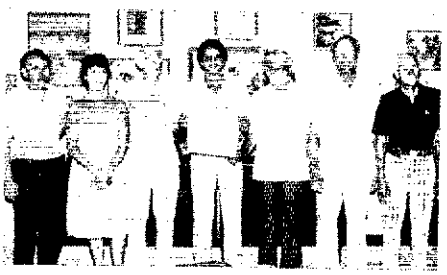
Newest Special Service Clubs

Congratulations to the League's newest Special Service Clubs (SSCs). These are the groups that have that "extra little bit" that sets them above the rest. SSCs are the leaders in their Amateur Radio communities. They're the ones with the active training classes, the ones who work with youth groups in contacting the Space Shuttle, the ones who sponsor local Amateur Radio Explorer groups, and the clubs with members who actively pursue technical projects. Here are the most recently appointed SSCs:

Northern Alameda County ARES,
Albany, CA (40 members)
Dallas ARC, Dallas, TX (349 members)



The YLs of the Nashua Area Radio Club (NARC) have challenged other clubs to come up with more licensed YLs than they have. NARC currently has 22 women who have licenses, ranging from Novice to Extra. From left to right are (front row) KA1LDS, KA1LGX, KA1NDP, KA1KGK; (back row) KA1LDF, KA9GHV, NA1Z and Cynthia, a new Novice who hasn't yet received her call.



West Indies Section Manager Carlos Flores, WP4J, presents the ARRL Charter of Affiliation to Jerry Bourne, WB6RCN, president of the St. Croix Amateur Radio Club. Members of the club's executive committee also accepting the award are (l-r) KV4IH, WP2AED, WB6RCN, WP4J, KV4IJ, KB6IM and KV4JC.

Conducted By Michael R. Riley, KX1B
Public Service Manager, ARRL

We Tip Our Ten-Gallon to the Lone Star State

The following two articles on the response of Texas amateurs during disasters serve as a tribute to their dedication, initiative and resourcefulness in time of need. Thank you, ladies and gentlemen! You can bet your boots we're proud of you!

"Flight 191 Has Crashed!"

At 6:05 P.M. Friday, August 2, Delta Flight 191 ended its journey in a mass of flame while on final approach to Dallas-Fort Worth Airport. The jet carried 149 passengers and a crew of 12, and all except 33 people on board perished. One motorist was killed on Highway 114 when his car was hit by the plane.

At the request of Dallas city/county officials, a disaster unit of Dallas County RACES was activated within a short time after the actual crash. The response and subsequent actions of the amateur community, local emergency coordinators, area casualty transport units and the general public was incredible.

Without a call being issued, citizens of the metroplex lined up for blocks at area blood banks. An official with Wadley Blood Bank announced that a record 590 units of blood were received Friday night, topping the previous record of less than 400 units. Amateur Radio operators stood by to transport the blood while still others worked to provide ice for storage when refrigeration units were overloaded.

Immediately after the crash, ambulances from nearby areas converged on the scene, volunteering their services to the injured. Most were turned away since there were only 33 needing care. Gary Engleman, K5HGL, of the Garland Amateur Radio Club, was one of those not needed to transport casualties. After clearing several checkpoints, Gary was finally admitted to the scene to assist in the Amateur Radio coordination efforts. In addition to handling several pieces of traffic, Gary was able to provide outstanding photographs from the site.

Local emergency officials handled their jobs with a collective calm that comes only through preparation and drill. They voiced their thankfulness for area-wide disaster exercises, most of which had the participation of Dallas County RACES. According to Johnny Davis, K5JD (who opened the emergency net), "We are indeed fortunate in Dallas County to have officials who recognize the value of a trained Amateur Radio resource."

When the net was opened, little was known of the actual needs. The Dallas Amateur Radio Club Emergency Communications van was moved to the crash site by Jim Haynie, WB5JBP. It arrived at the site so quickly that emergency officials immediately stationed the van at the front line of rescue operations. According to Haynie, communications were especially important to officials in those early minutes. In addition to passing information back to the net and other officials not on the scene, Haynie also ran several autopatch phone calls through a local repeater. He even ran a few long-distance patches for federal officials to Washington, DC. Eventually, cellular telephones were provided for communications. "The advent of cellular telephone is excellent and it is a valuable tool in emergency operations, but it can't take the place of an Amateur Radio net where a mass of officials, volunteers and the media can be informed through a single transmission," said Haynie. Haynie also commented on the effectiveness of the RACES net itself: "This is the real test." "Amateur relationships with area officials and organizations are very good during a test exercise, but we must perform well during the real thing for our creditibility to be genuine. I believe we did just that! The tragedy of Flight 191 made many new friends and supporters for Amateur Radio."

A primary target for Amateur Radio resources has turned out to be area hospitals and blood banks. In the early minutes of the emergency net, K5JD dispatched teams of RACES volunteers to area hospitals. When a call was issued for O-negative blood, hospital officials soon learned that the phone lines were useless. Although Medical City Hospital had 14 pints on hand, officials there were unable to notify anyone. Phone lines into Wadley Blood Center and Parkland Hospital were inundated. Thanks to efforts of the Amateur Radio team at Medical City, the message finally got through. Without being summoned, Bud Walton, K5HW, went mobile to Medical City so he would be there and on hand if a blood transfer was needed.

When K5JD had to secure as NCS to handle other telephone traffic, he placed the net under the capable direction of Phil Clements, K5PC, the ARRL North Texas Section Manager. Of immediate importance was for emergency and airline officials to know how many casualties had been transported to hospitals, and which hospitals were involved. An on-the-air roll call of all hospitals and a confirmation from the crash site that there appeared to be no more injured to transfer soon revealed the horrible news—only 33 had been taken to hospitals, leaving 128 people presumed dead at the scene. These totals were checked and rechecked, but stood firm. Not only did Amateur Radio relay the number statistics, but reports on the condition of the patients were soon forthcoming.

Ken Clark, NN5G, a member of the Garland RACES Fast Response Team assigned to the Department of Public Safety, was welcomed enthusiastically when he arrived at his station in the emergency control room of DPS Regional Headquarters. "The officials and officers on duty literally huddled around my 2-meter rig," Clark said. "It provided a much valued source of incoming information for them." Their own officers at the scene were too busy with the more important duties of crowd and traffic control to be bothered with frequent radio reports. This situation left their own coordinators with a critical need for knowledge. It was obvious that the Amateur Radio net helped provide a bridge for the gap.

It may be months before a final critique of this tragedy can determine all we really learned, as Amateur Radio Emergency coor-

While scanning 20 meters for DX, Chuck Andrews, NI5I, is called by XE1VIC. A major earthquake, says XE1VIC, has hit Mexico City. Chuck is asked to stand by for emergency traffic *(WB5TJV photos)*

Rick Nelson, WB5TJV, receiving traffic from Mexico less than 24 hours after the first earthquake.

Flash! Texas Amateurs During The Mexico City Earthquake

Just as your Public Service Branch was completing this column, information on the massive Mexican earthquake began to trickle in.

ARRL Headquarters has been inundated with telephone calls since this disaster occurred. We would like to express our sincere thanks for your assistance and willingness to serve.

dinators have pages of comments to consider. The drain on Amateur Radio resources was minimal, but it could have been a hundred-fold more demanding. We can't prevent disasters, but we can prepare for the worst. So, we train and practice ... and practice and plan.—*Ken McNatt, N5EDI*

COMMUNICATIONS SERVICE OF THE MONTH

Radio amateurs from several Kansas City radio clubs assisted at the second annual Kansas City Spirit Festival on July 4-6 by providing dependable 2-meter communication, liaison with festival officials and other radio-equipped services.

The Spirit Festival was intended to be both an educational and entertaining experience for the public. The festival grounds, divided into five theme areas, contained displays and enactments of Kansas City's past, present and future. Music for every taste and from several eras was presented by 369 musicians in 73 bands. In addition, over 100 other performers entertained. There were carnival rides, games, food and beverages. The celebration closed every night with a fireworks display. Attendance totaled about 750,000 persons over the three days.

The Amateur Radio operation at the Spirit Festival was the largest local public-service operating effort in recent years. The work involved in recruiting amateur participants was enormous. The effort was coordinated through the MO-KAN Council of Amateur Radio Clubs, an organization of radio clubs in the Kansas City area. Members of these clubs were involved: Heart of America Radio Club, Johnson County Radio Amateur Club, PHD Radio Club, Kansas City Amateur Radio Club, Kansas City Association for the Blind Amateur Radio Club, Ararat Shrine Amateur Radio Club, Jayhawk Amateur Radio Society, Shawnee Radio Amateur Communications Team and Johnson County Emergency Communications Service. Thirty-eight hams were involved in the operation. Over the three days, amateurs provided 210 hours of service at the festival site.

The radio amateurs became involved this year because the Spirit Festival organizers had experienced communications problems the previous year. Hand-held radios were borrowed last year from the Kansas City Royals baseball club. After four hours of use, the radio batteries ran down, and the festival officials realized that there was more to know about operating a radio system than they had suspected.

Johnson County Radio Amateur Club President KDØJM volunteered his club's help for the 1985 Spirit Festival at a time when organizers were pondering the communications problems of the previous year. The festival welcomed the amateurs' offer of assistance. After studying the scope of the communications requirement, the Johnson County club decided the undertaking might be too ambitious for a single club. The need for help was communicated to the MO-KAN Council of Clubs, which took responsibility for organizing amateur participation in the Spirit Festival. NØFMO was the individual with the primary responsibility for contacting individual clubs, scheduling operators and doing the other necessary organizational tasks. Operators were scheduled for shifts of four-and-a-half hours. This provided a safety margin, since the average life of hand-held radio batteries in the operation was five hours. Plans called for a demonstration HF station to originate radiograms for festival-goers. Due to an equipment failure, the demonstration station wasn't operated.

The Kansas City, Missouri, Fire Department helped the hams with communications by providing their Emergency Preparedness communications van. This van is equipped with a 2-meter transceiver and other public-service radios. This facility proved valuable as a link between the amateurs and other radio-equipped agencies operating at the Spirit Festival. From the communications van, dubbed Spirit Control, the following services could be monitored and contacted: police, fire department, Red Cross and Salvation Army. The Red Cross provided medical stations for first-aid treatment, and the Salvation Army operated a lost-person-locating service. In addition to the radio equipment aboard the communications van, its PA system was frequently used to locate missing persons.

Spirit Festival officials, quick to realize the value of the amateur 2-meter operation, shortly after opening of the festival requested a ham to staff their headquarters for the duration of the festival. The headquarters, dubbed "Eagle's Nest," was located on an upper floor of the Crown Center Hotel. From Eagle's Nest, a large portion of the festival grounds could be viewed. A bank of scanners in Eagle's Nest allowed monitoring radio transmissions of public safety and festival support services. Festival officials used leased two-way radios for administrative communications with their personnel on the festival grounds.

Communicating on 2 meters with Spirit Control and Eagle's Nest were amateur operators using hand-held radios on the festival grounds. These roving hams were the eyes and ears of the Amateur Radio operation. The KBØPW repeater, located about two blocks from the festival site was used during the operation.

Weather conditions during the Spirit Festival were a significant factor in the Amateur Radio operation. With daily temperatures being in the nineties with high humidity, having only one water fountain on the festival grounds providing liquid refreshment to the festival throng became a serious concern. The hams provided communications, facilitating the delivery of ice and water. On July 4, the National Weather Service declared a tornado watch for the Kansas City area from 4:30 to 10 P.M. The hams informed Spirit Festival officials of the watch and kept them updated with reports on the location and character of the approaching storm. As a safety precaution, electricity was shut off to the stage area, and the musical equipment was protected from the rain. The storm produced 35 mile-per-hour winds, brief rain and pea-sized hail at the festival site. Lightning bypassed the site. The storm caused no significant damage at the festival, and the watch was cancelled at 7 P.M. In fact, a helicopter landing on the grounds after the storm caused more damage than the storm itself. The Spirit Control community van's awning blew off during the helicopter's landing approach.

The amateurs assisted police and security personnel during the festival. In one case, hams directed police to the scene of a stabbing. Exploding fireworks on the festival grounds was prohibited. The amateurs reported numerous cases of fireworks violation to police. When other potentially dangerous conduct was observed by hams, the amateurs either warned the individual involved or summoned police by radio.

The amateurs became involved in a number of medical cases. First aid was obtained for many persons with injuries caused by illegal fireworks. Hams got medical attention for a woman in labor. She was transported to a nearby hospital, where she gave birth. The amateurs also summoned medical aid for five more serious medical emergencies.

After dusk, much of the amateur traffic involved assisting the Salvation Army in locating missing persons. The hams were involved in a total of 40 missing-person cases.

The Spirit Festival was the big news event in the area at the time, and all local television stations had the news crews there. WDAF-TV and KCTV gave some coverage to Amateur Radio participation at the Spirit Festival.

Facts for this article were provided by NØFMO, WØOCK, WBØBBC and KBØPW. —*Mike Bellinger, KØUAA*

IN SERVICE ...

☐ Atlanta, GA—July 3-5. Volunteer communicators from the Alford Memorial Radio Club of Stone Mountain assisted parade marshalls from the Yaraab Shrine Temple of Atlanta during the 1985 National Shrine Convention parades, involving over 30,000 Shriners. Members of the Alford Memorial Club also helped coordinate the annual Salute to America Parade on July 4 in Atlanta. In several instances, amateurs were helpful in assisting parade officials spot needs for crowd control and locating aid for emergencies. (W. R. "Bill" Ronay, KB4JPN)

☐ Monroe, MI—July 13-14. Members of the Monroe County ARES assisted in a 10-km foot race on Saturday and a bicycle tour on Sunday. Three concurrent bicycle tours of 31 miles, 62 miles and 100 miles were part of the course. Progress of both runners and riders were monitored by radio amateurs. (Dale R. Williams, WA8EFK, EC Monroe County)

☐ Cedar Rapids, IA—July 15. An old sewage disposal plant caught fire as it was being dismantled. The fire produced toxic smoke, forcing nearly 10,000 persons to evacuate their homes. Members of the Linn County ARES and Cedar Valley ARC were called to handle communications during the 26-hour emergency. Over 25 amateurs actively participated and about 50 more were on standby, ready to relay messages between evacuation shelters and Red Cross and Civil Defense Headquarters. (R. W. Berridge, WAØSYQ)

YOUR CONDUCTOR'S CABOOSE

A few of you may notice a slight change in the reporting of statistics in this column. Shifting responsibilities within this branch have required us to prioritize our workload.

We have decided to list our Section Traffic Managers by section rather than list each section and local NTS-affiliated net in the nation. Publishing the acronym of a local VHF traffic net in a national journal each and every month seemed a bit out of the ordinary. We believe our SECs and STMs should be listed in a similiar manner.

ARRL SECTION EMERGENCY COORDINATOR REPORTS AUGUST 1985

Thirty-seven SEC reports were received, denoting a total ARES membership of 9167. Sections reporting were: ALB, AZ, CO, EMA, ENY, GA, KS, KY, ME, MDC, MI, MN, MS, NE, NFL, NLI, NNJ, NV, OH, ONT, PAC, SV, SC, SD, SDG, SFL, SJV, SNJ, TN, UT, VA, WA, WI, WMA, WNY, WPA, WV.

Reports were not received by the following Section Emergency Coordinators: AL, AR, AK, BC, CT, DE, EB, EPA, IA, ID, IL, IN, LA,

LAX, MAN, MAR/NFD, MI, MO, NC, ND, NH, NM, NTX, OK, OR, ORG, QUE, RI, SASK, SD, SCV, SF, STX, VT, WI, WY.

SEC monthly reports for November should be received in the Public Service Branch no later than December 12. Late reports will not be published.

Transcontinental Corps August 1985

November TCC reports should be received in the Public Service Branch no later than December 12.

Cycle Two

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
TCC Eastern	108	87.8	548	1089
TCC Central	80	86.0	341	750
TCC Pacific	108	87.1	571	1060
Summary	296	87.0	1460	2899
Cycle Four				
TCC Eastern	145	91.2	806	1585
TCC Central	56	90.3	341	708
TCC Pacific	115	92.7	484	956
Summary	316	91.4	1631	3249

TCC Roster

W1EFM W1ERW WA1FCD W1ISO KN1K N1NH W1NJM W1QYY KA1T KW1U W2AET N2AKZ WA2FJJ W2FR W2GKZ WB2QIX W2RQ K2SB W2XD W2YGW K2ZM W3ATQ N3COY WB3GZU W3PQ K3RZR KQ3T KB3UD WD4ALY WA4CCK WD4FTK N4GHI AA4GL KA4IUM K4JST WB4PNY WB4UHC W4UQ K8OZ W8PMJ W8QHB AF8V N8XX VE3AWE VE3FAS KK1A ND5T W5JOV KU6D K6UYK W6INH WF6O KD7EY KF7R W7TGU WB7WOW K7OVK KB7FE NØIA WAØOYI WAØYNP W4JL WA4JTE N5AMK W5CTZ W5GHP W5KLV KD5KQ WB5OXE KD5RC KA5TTH KS5V KV5X WB5YDD KA9FEZ KW9J W9JUJ NJØB KAØEPY WØKK N5BB WB5CIC W5GHP K5GM K5OAF N5TC K5TL KV5X KW9J WB9UYU KB9X WØHI K5OU N1AWX N1BHH WB1GXZ KN1K KT1Q W1QYY KW1U WA2FJJ W2VY N2XJ N3COY KC3DW WB3GZU KB3UD AA4AT WA4CCK N4EXQ WD4FTK N4GHI AA4GL K4WJR KA8CPS K8OZ W8PMJ W8QHB AF8V WB8YDZ.

Note: Incomplete, illegible or late TCC monthly reports will not be entered in the December Public Service column.

National Traffic System August 1985

November NTS reports should be received in the Public Service Branch no later than December 12.

Net	Sess.	Tfc.	Avg.	Rate	% Rep.	% Rep. to Area
Cycle Two						
Area Nets						
EAN	31	823	26.5	.586	87.7	
CAN						
PAN*						
Region Nets						
1RN	62	546	8.8	.376	98.6	96.7
2RN	54	231	4.3	.260	68.1	90.3
3RN	31	302	9.7	.500	96.0	100.0
4RN	62	557	9.0	.363	80.4	100.0
RN5	62	688	11.9	.401	88.0	100.0
RN6	26	318	12.2	.328	100.0	
RN7	51	419	8.2	.416	86.0	
8RN						100.0
9RN	59	353	6.0	.348	87.0	100.0
TEN	62	782	12.6	.506	85.3	100.0
ECN						48.4
TWN	55	575	10.45	.648	74.0	
TCC†						
TCC Eastern	108	1089				
TCC Central	80	750				
TCC Pacific	108	1060				
Cycle Three						
Area Net						
EAN	31	201	6.48	.385	58.6	
Region Nets						
1RN	26	58	2.23	71.0	67.0	87.0
2RN	30	267	8.9	.515	93.3	74.1
3RN						70.9
4RN						64.5
8RN						22.5
ECN						29.0
Cycle Four						
Area Nets						
EAN	31	1542	49.75	1.419	90.9	
CAN	31	959	31.3	.880	98.9	
PAN						
Region Nets						
1RN						87.1
2RN	62	325	5.2	.482	89.4	80.6
3RN						57.1
4RN	62	583	9.4	.400	100.0	100.0
RN5	62	564	9.1	.432	80.6	100.0
RN6	62	605	9.8	.590	100.0	
RN7	62	485	7.8	.765	84.8	
8RN	60	392	6.5	.355	93.0	93.5
9RN	62	499	8.1	.609	95.6	98.4
TEN	62	420	6.8	.436	78.4	
ECN						96.7
TWN						
TCC						
TCC Eastern	145	1585				
TCC Central	56	708				
TCC Pacific	115	956				

Note: Incomplete, illegible or late NTS monthly reports will not be entered in the Public Service column.

*PAN operates both cycles one and two.
†TCC functions not counted as net sessions.
ARRL Section Traffic Managers reporting: AL, ALB,DE, EMA, EPA, IL, KS, ME, NC, NFL, NH, NLI, NNJ, NTX, OH, OK, QUE, SC, SNJ, STX, TN, VA, WIN, WMA, WNY, WPA, WV.

Note: Changing staff responsibilities no longer allow us to list individual section and local nets. November Section Traffic Manager reports should be received in the Public Service Branch no later than December 12. Incomplete, illegible or late STM reports will not be entered in the Public Service column.

Public Service Honor Roll August 1985

This listing is available to amateurs whose public-service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max. 30; (2) Checking into phone/RTTY nets, 1 point each, max. 30; (3) NCS CW nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned NTS liaison, 3 points each, max. 12; (6) Delivering a formal message to a third party, 1 point each, no max.; (7) Handling an emergency message, 5 points each, no max.; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points, max.; (9) Participating in a public service event, 5 points, no max.

This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from Hq.

November reports submitted for this column should be received at ARRL Hq. no later than Dec. 12. PSHR reports should be listed separately from Section News reports.

205
K4SCL
175
KA2F
157
WB7WOW
143
W7LRB
140
KA3DLY
138
N4GHI
137
WF8O
KAØEPY
131
KT5Y
130
W7VSE
127
KAØARP
123
KC9CJ
122
ND2S
120
W9FZW
119
WA6ZUD
118
KD7ME
115
W9YCV
114
W4PIM
113
N4KFU
VE4AJE
N4EXQ
KB4WT
KW1U
KD8KY
112
WD4KBW
WA4PFK
WA4QXT
WB2OWO
KB1AF
KA1EXJ
W2MTA
111
WX4H
WD8RHU
KB1AF
110
WØOYH
109
KG2D
KA1EXJ
108
KA2SPA
107
WA4JDH
KW1U
WB6DOB
106
AG9G
KB7FE
105
K6UYK
104
W6INH
103
W3FA
102
WA2ERT
N5AMK
W2RRX
WA2FJJ
W6VOM
101
KK3F
WBØTED
AA4AT
K4JST
WB2IDS
100
W3YVQ
99
WB4GHU
K7VW
98
WD4ALY
N4KSO
W4ANK
WA1FCD
KB1PA
KØSI
KØGP
WA1FCD
97
KAØBWM
KB5MU
N2AKZ
K3JL
N7FXJ
96
W4CKS
WD5GKH
W1TN
N9BDL
N8FAZ
WB8JGW
95
KJ3E
N3COY
WØKK
KA8VOZ
94
K4VWK
K7GXZ
93
WB4WYG
KF4U
K4VHC
KØPCK
92
W9DM
N6AWH
NIØR
91
WB4ADL
N8AEH
90
N1CPX
N1DKS
WD8OUO
89
VE3DPO
KY4U
WA4EYU
W5CTZ
WA1TBY
KA5SPT
AE5I
KØGP
88
VE3GT
AA4HT
WD6BZQ
K2YAI
87
VE3BDM
KS5V
N5DFO
NT4S
NØBKE
KB1PA
86
WB6QBZ
WØIKT
KD5FR
85
KA4FZI
KL7IJG
WB2BNA
WA4CCK
K5OAF
KA8KHS
84
VE4RO
WD8KQC
W8QHB
KA8GJV
K8ND
83
AK1W
WD9FRI
N2XJ
K2YQK
82
WA4EIC
N1BGW
NM8I
KF8J
81
WAØTFC
WA2KOJ
N8EFB
80
WD9IID
KT7X
79
KC4VK
WB5EPA
VE2EAK
78
NØCLS
KB3UD
AIØO
WD8PAF
77
WB2UVB
KN1K
AF8V
76
KA4YHS
N6HYM
WA1YNZ
K2YQK
75
KC3Y
VE3WM
WDØBOX
NDØN
WA1TBY
74
WA4RNP
W5KLV
KE5YG
73
VE3KK
KD4KK
NW4O
W3DKX
KA4RSC
W4FMZ
N7BGW
72
WAØQCA
KAØODQ
WB1CBP
K2VX
VE2FMQ
W7LG
71
N1BJW
WØFRC
70
WDØGUF
WA3UNX
VE2EDO
69
KB9LT
WD8KBW
W7LNE
68
KAØBCB
WB5FQU
KA4YEA
N8EZM
N9EJO
K7OVK
67
K6YD
WB5YDD
KA2BHR
K4ZN
KA8CPS
WB8KWC
66
K4MOG
WA7VTD
N1BGW
65
KB4LB
WD4HBP
WD4NYL
W4JZY
VE4IX
KA5PEX
W8EK
64
KA4GUS
N4PL
WB4VMX
N1NH
W4HON
WA8HGH
K8JDI
KA7AID
KA1LIH
63
WP4J
WA4LJI
W4TYU
KA7TCE
KA5QYV
NI8W
62
KA6HJK
AA4GL
N2EVG
KB4BZA
NE7B
KØCY
61
KC3AV
WBØWNJ
N1BUG
WB4FDT
KI1M
60
WA3CKA
WB4UHC
KA9RII
N1DDC
WØOUD
WA8DHB
WD8EIB
WB8WJV
KC8WH
58
KA1LIH/T
N1BYS/T
54
N1BYS/T
KA8TNT/T
51
KA7RFD/T
48
KA1HPO/T
KA1MAM/T
44
KA8SOF/N
41
KA2CQX/T
40
KB4MHH/T
WA2MGV/T

Brass Pounders League August 1985

The BPL is open to all amateurs in the United States, Canada and U. S. possessions who report to their SM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month.

All messages must be handled on amateur frequencies within 48 hours of receipt in the standard ARRL form.

November reports submitted for this column should be received in the Public Service Branch at ARRL Hq. no later than the 12th of December. BPL reports should be listed separately from Section Traffic reports. All BPL reports should be complete and legible. Late, illegible or incomplete reports will not be published.

Call	Orig.	Rcvd.	Sent	Dlvd.	Total
W3CUL	911	901	1269	87	3168
NØBQP	34	1342	57	858	2291
WAØHJZ	0	914	27	623	1567
WDØDVG	552	8	552	0	1112
KA9CPA	35	941	100	13	1089
KW1U	1	578	478	6	1063
W3VR	361	214	382	29	986
K6YUK	56	431	419	16	922
WA4JDH	1	498	446	6	951
KAØCZW	31	429	200	219	879
W9JUJ	0	408	402	1	811
N4GHI	43	371	298	44	756
N4EXQ	24	312	301	49	686
W7VSE	1	350	300	24	675
WX4H	0	360	301	10	672
WØQBK	14	323	82	147	576
W6INH	15	261	257	23	557
K9GDF	169	112	249	2	532
KØRXK	0	228	33	239	500
KØJAN	0	237	31	134	402

BPL for 100 or more originations plus deliveries:

KA2F	368
WB2QMP	320
WØFIR	110
W9FZW	101

Independent Nets 1985 August 1985

November reports submitted for this column should be received in the Public Service Branch at ARRL Hq. no later than Dec. 12.

Net Name	Sess.	Tfc.	Check-Ins
Central Gulf Coast Hurricane Net	31	267	2860
Empire Slow Speed Net	31	54	337
Golden Bear Amateur Radio Net	31	98	1709
IMRA	26	787	1569
New England Novice Net	31	82	191
North American Single Sideband	25	21	179
NYSPTEN	30	78	625
Southwest Traffic Net Report	31	241	1137
20ISSBN	27	446	311

In Training

Conducted By John Foss, W7KQW
Training Manager, ARRL

SOME TIPS ON BUILDING CODE SPEED

Occasionally we receive words of wisdom from our readers about something discussed previously in this column. Our guest columnist this month is Dr. James N. Thurston, W4PPB. (Dr. Thurston has offered to make copies of his tapes for anyone who sends $2 and a blank tape—30 minutes or less—to him at 322 Woodland Way, Clemson, SC 29631. The ARRL in no way warrants this offer.)

There seems to be no easy way to build up speed in the Morse code. A number of good and bad methods have been proposed, but there is really no substitute for practice of the right kind. As one who has taught Amateur Radio classes for over 25 years, I certainly do not claim to have the magic formula, but I do have some suggestions for the learning and teaching of code.

Listening to a tape or a record over and over is not very useful. Of course, we all know that a plain-language message can be memorized very quickly, but what some people fail to realize is that any series of symbols, random or otherwise, can and will be memorized. Those who say their tapes cannot be memorized are downgrading the marvelous capability of the human mind.

Code practice in the form of five-letter groups is also not as helpful as it might be, even if all the groups are different. The mind very quickly learns to expect a break after every fifth character, and that is not what happens in ordinary messages sent by CW, or in licensing tests.

Some people find they can copy random text, in any combination of group lengths, much better than they can copy plain language. This is more common than is generally realized. Apparently, the mind tends to be confused or possibly excited when letters make up words that can be recognized, and this seems to interfere with future copying.

At the radio school where I teach each summer, we send code for four separate half-hour periods each day. It is very hard to send good code at a fixed speed without errors, even with the very best keyboards or electronic keyers. To improve the situation, I have gone to computer-generated code, using the VIC 20® program described in October 1984 *QST*.

I have modified the program to eliminate unnecessary items, such as the temperature-conversion section, the frequency allocation section and a few other parts. In this way, I have available about 1200 bytes for message storage. By using the concatenation feature of the VIC 20, I have stored QSO-type messages and can call them up by hitting the function keys. For example, if function keys 1, 2 and 3 are pushed in order quickly, one message of about enough to fill the screen on the monitor TV will appear. That is enough for about five minutes at 13 WPM. By hitting function keys 4, 5 and 6, you can send a second stored message.

This method has many advantages over using audio on cassette, or using a regular keyboard. The messages can be sent at almost any desired speed. Delays of any amount can be put in after each letter to permit sending the letters fast and the message slow. The tone can be changed, and messages can be mixed by pressing the function keys in a different order. Of course, random code also can be sent, with delays inserted if necessary; and, the regular keyboard sending of messages can be used, also with delays if desired.

I have recorded 20 typical QSOs on each side of an inexpensive cassette, thus getting 40 QSOs on the two sides. When sent in this way, the QSOs are done properly, with no errors, and with proper spacing of letters and words. To relieve the monotony of copying code, some of the messages are made deliberately facetious, while still being basically like the real tests.

By the time my work started at the radio school, I had recorded about 100 QSOs. This was enough to keep the students from hearing the same message over and over again, and it will help me do a better job of teaching. And all of this will be on three inexpensive cassettes.

Results, 1984 CRRL Can-Am Contest

By Yuri Blanarovich, VE3BMV and Jim Roberts, VE3IY

The Can-Am Contest is becoming bigger and better every year! Many contesters are discovering that this is not just another QSO Party, but a popular and interesting North American contest with attractive certificates. After a few years of the sponsorship wandering around, CRRL agreed to cosponsor this event with the Ontario Contest Club.

The 1984 running of the Can-Am was unusual, with a lack of Canadian "big guns." This gave the "little pistols" a shot at the trophies.

Trophy winners in the 1984 single-operator category, combined phone and CW scores, are:

American Champion—David Hachadorian, K6LL/7. The Canadian Champion was Allan Ebert, VE3AXV.

In the multioperator category, combined phone and CW scores, the trophy winners are:

American Champion—Bruce Draper, AA5B and Canadian Champion—Polar ARC, VE8RCS.

SSB Top-Ten

Call	Score	Call	Score
K6LL	528,515	VE3AXV	140,919
AG7M	451,881	XJ5GF	137,865
KB6JK	286,016	XK1QU	86,700
W7FGT	194,571	VE7AV	84,312
KI6O	146,584	XJ6ADA	81,260
K8SCM	146,160	VE4RP	65,538
KB8PK	110,220	XJ3OME	58,520
KS7T	75,225	VE7DLM	53,361
K3GYD	68,799	VE3CPU	47,242
KE4UI	60,600	XJ4AKN	45,540

Multioperator

Call	Score
AA5B	322,056
K5QHD	157,480
KK9G	58,266

CW Top Ten

Call	Score	Call	Score
K6LL	195,776	VE6OU	137,241
N7CIX	84,630	VE3DZV	101,018
W7FGT	83,853	VE3OME	44,160
NA9J	78,652	VE7AV	28,620
AG7M	66,126	VO1AW	27,714
KS7T	64,792	VE0MJN	25,560
W5ASP	59,752	VE3NBE	24,165
W7TC	49,728	VE3KOY	21,801
K8HVT/1	40,827	VE3ST	18,315
KW2J	35,409	VE7DVV	15,180

Multioperator

Call	Score
AA5B	185,040
KB0G	153,408
WD4IIO	21,912

QRP

Call	Score
NU4B	1620
KB1MJ	765
W2JEK	752

K6LL/7 went all out and won on both modes. AA5B, with the help of AI9X, also won on both modes, producing the highest score in the multioperator category. (Can-Am rules classify all club stations and stations using "hired guns" or guest operators in the multioperator category).

To become a single-op champ, you must operate your own station and use your own call sign.

N8BJQ was a sought-after QSO in the 1984 event, as he operated from two rare states: Wyoming and South Dakota. Sincere thanks to you all for participating under adverse propagation conditions.

Phone Soapbox

The mess I heard on phone sure wasn't for me. I'm looking forward to the CW portion (KW2J). Picked up some new provinces for 5B CANADAWARD (WA2UDT). This was the first contest that my children worked with me. It was a great experience for everyone (WB2PXA). Real nice contest! A great warm-up for Sweepstakes (KI4JB). Absolutely no propagation on 15 or 10 meters to anywhere. Needed to be another few hundred miles west. A medical emergency limited my operation to just 15 hours (AA5B). Please, new log forms with more room to write in the entries (W7FGT). In the 1981 Can-Am, I made 1150 QSOs in 10 hours on 10 meters. In 1984, I only made 3 QSOs on 10 in the whole contest! It was lots of fun anyway, with plenty of action (900 QSOs) on 20 SSB (K6LL).

CW Soapbox

My 15-year-old keyer failed after the first dozen QSOs! (K1UCA). Sorry couldn't stay longer. Hope to go for whole bit next year with new gear and a 4-element 4-bander (W1CNU). Many more considerate people than on phone last week. I enjoyed it. The bottom dropped out when the major geomagnetic storm hit at 0500Z (KW2J). My first attempt at contesting. With six kids, I had a lot of off-time (N2FBV). The expected increase of activity on 160 meters was not there (K4FPF). I like your contest rules. This was a chance to check our club station operation after a move to a new location. FB contest! (WD4IIO). I had an anti-contest heckler answer by CQ TEST on 40 meters with a profane comment. I've never yet heard a contester condemn a ragchewer (KS7T). Look out, NA9J; I'm getting better every day! (KB9PC). Activity near the end of the contest was pretty low—perhaps the geomag storm didn't help! (VE3KOY). Very poor conditions and poor participation, especially from VE. Sunday clashed with the London ARC flea market (VE3ST).

Scores

Single-operator scores are listed in the following order: state/province, call sign, category, score, contacts and multipliers. Multioperator scores are listed in the following order: call sign, score, contacts, multipliers and state/province. An asterisk denotes a certificate winner.

Phone

1

Connecticut
K8HVT/1* A- 12,480- 112- 52
WA1NCN A- 2000- 36- 25
K1NCD A 660- 20- 15

Massachusetts
K1UCA* A- 4148- 64- 34

Vermont
WA1TBV* A 1190- 32- 17

2

New Jersey
WA2UDT* A- 12,096- 100- 56
W2FJ* 1.8- 2400- 56- 20

New York
KA2OUO* A- 39,886- 249- 77
WB2DHY* 3.8- 17,917- 212- 41
N2EAI A- 8600- 81- 50
KW2J A- 2871- 41- 29

3

Maryland
N3ADE* A- 15,600- 122- 60
KA3LRQ A- 7920- 191- 33
W3FG* 14- 2002- 40- 22

Pennsylvania
K3GYD* 14- 68,799- 243- 44
WA3YTI* A- 3455- 50- 32
AK3M A 1785- 41- 21

4

Alabama
KB4FAI* 14- 13,026- 154- 39
WD4PZN* 7- 8930- 112- 30

Florida
WK4F* A- 11,832- 94- 56
KE4UI* 14- 60,600- 576- 60
WC4E 14- 17,732- 189- 44
KI4JB 14- 8641- 100- 39
K4FPF A- 2828- 45- 28

South Carolina
WB4AFP* A- 18,224- 132- 68
K4LQ A- 13,440- 102- 60

Tennessee
N4FNB* A- 18,944- 138- 64
KB4FHE* 14- 11,137- 134- 37

Virginia
WN4VAU* 7- 28,464- 287- 48

5

Texas
WA5IYX* A- 12,210- 100- 55
NM5K A- 60- 6- 4

Oklahoma
KJ9R/5* A- 7216- 80- 41

6

California
KB6JK* A-286,016- 823-164
KI6O* A-146,584- 473-146
KV6H A- 38,232- 252- 72
K6XO A- 2730- 39- 32
NS6X/6* 14- 36- 4- 4

7

Arizona
K6LL* A-528,516-1463-173
W7FGT* A-194,571- 779-117
N7CIX A- 34,970- 256- 65
KA7RFC A- 20,878- 131- 73

Montana
KS7T* A- 75,225- 420- 85

Nevada
WB0WNH/7* A- 12,180- 97- 58

Oregon
AG7M* A-451,881-1231-177

Washington
W7TSO* A- 2024- 43- 22

8

Michigan
KB8PK* A-110,220- 485-110

Ohio
N8EKS* A- 7958- 81- 46
KI8O A- 2697- 93- 29
K8CW* 14- 2850- 50- 25

West Virginia
W8VEN* A- 2790- 42- 31

9

Illinois
NA9J* A- 42,780- 215- 83

Indiana
W9JOO* A- 44,986- 256- 83
K8CC/9 A- 18,408- 146- 59
KA9LWL A- 2250- 42- 25
KK9W* 14- 546- 19- 13

Wisconsin
WB9SAU* A- 14,040- 155- 45

0

Kansas
KA0NYG* 7- 1121- 29- 19

Missouri
W0HBH* 14- 3726- 61- 27

Nebraska
K0SCM* A-146,160- 617-112

North Dakota
WA3PWL/0* 14- 4800- 63- 32

South Dakota
K0JV* A- 33,818- 214- 74

Canada

Newfoundland
XK1QU* 14- 86,700- 592- 50

New Brunswick
VE1BEI* A- 7622- 72- 37

Nova Scotia
VE1CBF* 14- 3808- 50- 28
VE1BAK 14- 304- 13- 8

Ontario
VE3AXV* A-140,919- 449-107
XJ3OME A- 58,520- 255- 77
VE3CPU A- 47,242- 211- 79
VE3NBE* 14- 11,460- 132- 30
VE3MCN 14- 7471- 91- 31

Manitoba
VE4RP* A- 65,538- 339- 66
XJ4AKN* 14- 45,540- 357- 44
VE4AR A- 1824- 33- 19
WA3PWL/VE4 14- 1598- 33- 17

Saskatchewan
XJ5GF* A-137,865- 531- 91
XJ5ADA* 14- 81,260- 552- 50

British Columbia
VE7AV* A- 84,312- 402- 72
VE7DLM* A- 53,361- 238- 77
XJ7OR A- 33,859- 236- 49
VE7FOK A- 4980- 59- 30
VE7XYL A- 2880- 41- 24

Yukon
VY1CW* A- 13,566- 93- 51

Multioperator

AA5B (AA5B, AI9X, oprs.)*
322,056-1060-142-NM
K5QHD (KY5N, opr.)*
157,480- 597-124-TX
KK9G (+ KN9C)*
58,266- 329- 83-IN
KH6SP (WB3HVS, opr.)*
56,520- 374- 72-HI
VE8RCS (+ oprs.)*
40,095- 250- 55-NWT
K5LZO (KA5SBS, opr.)*
7491- 109- 33-TX
W8YY (KA8s HFF, SJL, WD8ANR, oprs.)*
4680- 58- 39-OH
VO1QST (+ oprs.)*
2553- 40- 23-NFLD
WB2PXA (+ oprs.)*
795- 24- 15-NY
Check Log: N3CZB

CW

1

Connecticut
K8HVT/1* A- 40,827- 208- 93
W1CNU A- 12,656- 105- 56
K1NCD A- 243- 12- 9

Massachusetts
K1UCA* A- 13,623- 111- 57

2

New York
KW2J* A- 35,409- 192- 87
N2FBV* 7- 1116- 28- 18

New Jersey
W2FJ* 1.8- 930- 30- 15

3

Pennsylvania
K3GYD* 7- 22,616- 243- 44
KA3GXP* A- 8900- 80- 50
N3CZB 7- 9- 3- 1

4

Alabama
WD4PZN* A- 5215- 70- 35
KB4FAI* 14- 3886- 63- 28

Georgia
K4BAI* A- 12,480- 106- 52
W4BEY* 7- 3915- 61- 29

South Carolina
KA4LHV* A- 3429- 60- 27
WB4APP* 7- 1368- 33- 19

Virginia
K4FPF* A- 16,284- 108- 69
WN4VAU* 7- 3906- 58- 31

5

Texas
W5ASP* A- 59,752- 316- 88
NM5K A- 6837- 69- 43
W5NR A- 1036- 27- 14

6

California
AA6EE* A- 29,716- 177- 76
K6XO A- 2028- 36- 26
K6LRN* 3.5- 189- 10- 9

7

Arizona
K6LL* A-195,776- 562-161
N7CIX A- 84,630- 421- 93
W7FGT A- 83,853- 395- 99

Montana
KS7T* A- 64,792- 337- 91
KA7QVN A- 70- 6- 5

Oregon
AG7M* A- 66,126- 287-107
W7TC A- 49,728- 242- 96
KA7EEF* 14- 1425- 46- 25

Wyoming
N8BJQ/7* A 147- 15- 11

8

Ohio
K8MR* A- 4680- 57- 40
K8CW A- 2813- 48- 29
W8IQ* 14- 429- 18- 11

9

Illinois
NA9J* A- 78,652- 352-106
K9BG A- 14,570- 112- 66
KB9PC A- 6407- 71- 43

Indiana
N9ACD* A- 18,618- 147- 58
W9JOO A- 14,934- 122- 57
W9RE A- 7980- 87- 42
KK9G A- 3952- 63- 38

Wisconsin
WA4TWB/9* A- 24,921- 162- 71

0

Colorado
W0IZV* A- 10,856- 103- 48
K0OST A- 1134- 25- 21

Iowa
NC0R* A- 8918- 82- 49

Missouri
W0HBH* A- 14,454- 102- 66

South Dakota
K0JV* A- 12,040- 100- 56
N8BJQ/0 A 147- 10- 7

Canada

Newfoundland
VO1AW* A- 27,714- 158- 62

New Brunswick
VE1BEI* A- 7350- 73- 35

Ontario
VE3DZV* A-101,018- 329-106
VE3OME* A- 44,160- 186- 80
VE3NBE* 14- 24,165- 192- 45
VE3KOY* 7- 21,801- 191- 39
VE3ST A- 18,315- 115- 55
VE3MCN 7- 8086- 76- 37
VE3OMU A- 5145- 52- 35
VE0MJN A- 25,560- 126- 72

Manitoba
VE4AEB* 14- 2071- 35- 19

Saskatchewan
VE5AGM* A- 4470- 51- 30
VE5AAD A 2675- 38- 25

Alberta
VE6OU* A-137,241- 405-117
VE6CB* 3.5- 1620- 33- 18

British Columbia
VE7AV* A- 28,620- 187- 60
VE7DVV A- 15,180- 88- 60
VE7ESN* 14- 2300- 35- 23

Yukon
KA7QZK/VY1* A- 324- 38- 3

QRP

NU4B* A- 1620- 31- 18-TN
KB1MJ* 7- 765- 21- 17-CT
W2JEK* A- 752- 22- 16-NJ

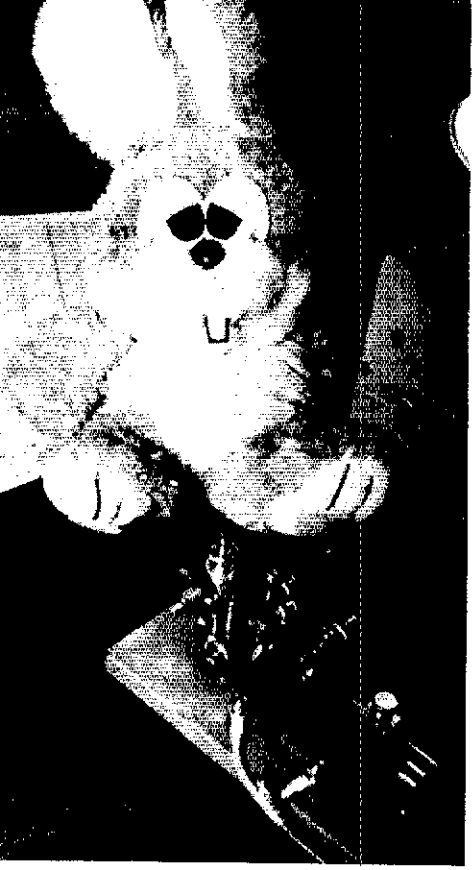
Multioperator

AA5B (+ AI9X)*
185,040- 595-144-NM
KB0G (+ KM0L, KD0IW, N0FNL)*
153,408- 524-136-KS
WD4IIO (+ W4ILE, WD4FNX)*
21,912- 151- 66-FL
VE4QST (VE4MG, opr.)*
3976- 56- 22-MB

Field Day 1985

"This year, it was all fun"—*N4SW*

By Michael B. Kaczynski,* W1OD and Billy Lunt,** KR1R
*Contest Manager, ARRL
**Assistant Contest Manager, ARRL



"Bunny" operated 24 straight hours from K4 Fuzzy Rabbit (K4FR, 1A).

For most people, the fourth full weekend in June is nothing out of the ordinary. For radio amateurs, however, this weekend is a very special tradition: Field Day! As is said year after year, FD is what you want to make of it. Most of all, Field Day is an opportunity for hams and nonhams alike to get together, get into the outdoors, and have a good time.

From a logistical standpoint, Field Day 1985 was even more successful than FD '84, when 1441 entries were received. This year, 1483 summaries were sent in. Category 2A was by far the most popular, with 457 (31% overall) entries. Eighteen percent (264) of the participants used battery power exclusively, while a whopping 76% (1131) relied on generator power. Only 5% of all participants (79 in all) used commercial mains as their primary power source.

Is Field Day a contest? Only in that participants are listed in order of the number of "points" their respective groups "earned" by participating in two-way communications with other amateur stations. Alas, Field Day *is* a contest—for some, to see who can make the most contacts; for others, to see who can have the most fun with our unique hobby. Thanks to Mark Burke, KA1MIS, who helped in the preparation of this report. See you in FD '86, to be held on June 28-29!

SOAPBOX

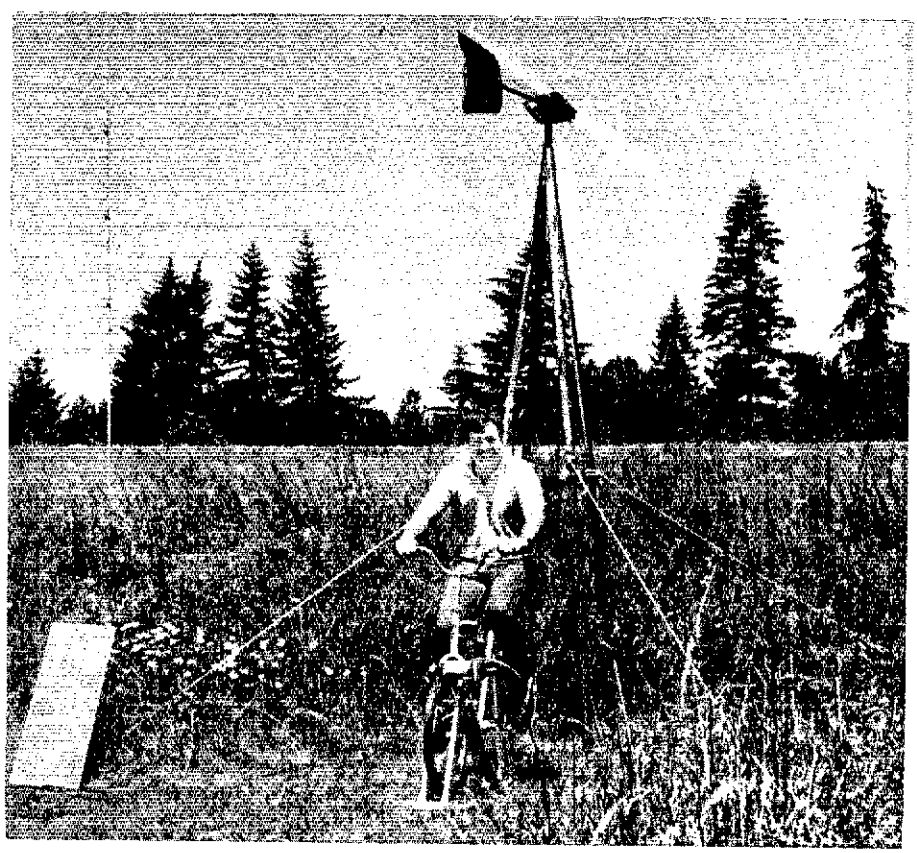
I have not yet digested our Field Day experience, mainly because I am still exhausted. The trip alone took 16 hours of driving on each end, and Bob Joiner, WB7BIV and I slept barely an hour each during the event.—*Jim Stevens, KK7C*

Well, that beautiful combo flagpole/inverted vee mast was taken down early in the race after we were informed by the Park Service that the Big Spy Mountain was famous for its thunderstorms!

We were forced to battle winds gusting to around 40 mi/h for the duration. You should have seen the dupe sheets, logs, potato chip bags—you name it—blowing in, out, around and all over the place! Yeah, this was the first on-our-own Field Day for these two collegians, but boy are we prepared for *anything* and *everything* Mr. Murphy wants to throw at us next year! Look out 2 Bravos of '86—*KD4YY and KA4RQB*

This year's Field Day was held at the Wilderness Park Museum at the eastern base of N. Mt. Franklin, location of the solar-powered repeater featured on the cover of January 1978 *QST*. This proved to be an excellent location, where we had some shelter from the sun and at least a leaky roof. We operated with less than 5-W output, optimistically hoping for good band conditions. The bands were in much better shape than they had been just two months earlier, but were marginal much of the time during FD. Ten meters opened for several hours on Sunday morning, but even with a three-element beam making contacts was difficult. Six opened for about an hour that same morning and several stations were heard—we didn't manage to complete an exchange with any of them.

Even though it is commonly supposed that it never rains in the desert, and it had not for at least three months before Field Day, it did rain off and on for about six hours on Saturday evening. Since the roof of the shelter was designed more for keeping the sun off than for the rain, we had to cover up the radio equipment for at least two hours during the evening. When it was not raining, the static levels were so high much of the time that no signals could be heard. Between the rain and the static, we were not able to work many stations between 6 P.M. and midnight. But it was good emergency training. Overall, Field Day was a suc-



Several "natural" power sources were used by the Chehalem Valley ARC (K7FM, 5A).

Alisa, N1DLW, and Pete, KA1MKN, *reeled* in the contacts for the Waterbury ARC (K1EB, 3A).

Field Day 1985—A Family Affair

When my daughter, Sarah, received her Novice call sign of KAØTZF in January, we discussed many Amateur Radio activities. One activity that particularly interested Sarah was Field Day. I had operated FD seriously twice before—once as a young ham in western Texas in 1956, and again in 1965. The idea of operating Field Day with my daughter, however, had a definite appeal.

Jim Coakley, KXØN, who also has a daughter named Sarah, perked up when I mentioned my plans. He was likewise interested in portable operation and wished to spark some interest in Amateur Radio for his daughter. When she expressed some interest in this outing, we began making plans.

He would furnish the camping equipment and rig; I would supply the antenna and generator. Should we go to the mountains or to the plains? The mountains offered no real advantage, and June nights can be quite chilly at high elevations, so we decided to go to the plains.

Sarah and I took a day and built a dipole with quick-connect jumpers across the insulators, so the antenna could be used on 80 through 10 meters. Jim and his daughter confirmed that the Barbour Ponds campground, east of Longmont, Colorado, would be our field site.

Finally, the day arrived—June 22, 1985. Jim and his daughter Sarah had camped out Friday night to secure our campsite. My Sarah had a swim meet until noon Saturday, so we didn't arrive at the FD site until 1840Z. One hour later, the station was in place, and the antenna was strung so it could readily be lowered to change the jumpers to switch bands. The SWR was high on 15 meters, but it was below 2:1 on the other bands. Our first contact was just minutes later.

Throughout the period, Jim and I operated under my call and my Sarah under hers, sharing a common station. Sarah made more contacts during Field Day than she had in the previous five months as a Novice. Jim's rig performed flawlessly, and the antenna could be changed to another band in less than a minute. The generator hummed along quietly, not disturbing neighboring campers. In fact, our neighbors were fascinated with the operation, and we answered many questions about Amateur Radio.

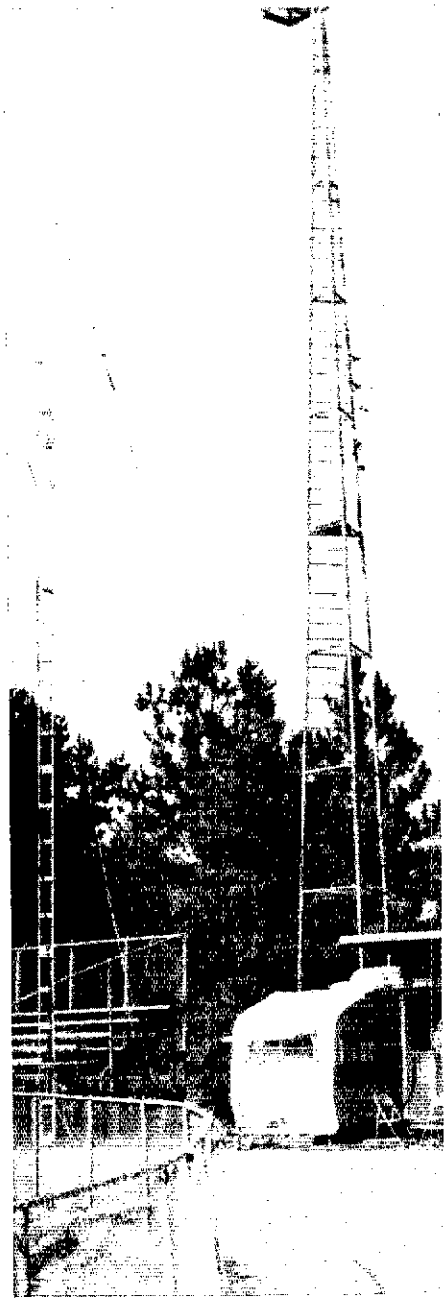
The 400-W generator powered the rig, a keyer and one 60-W light bulb. Oh how we wished that bulb had been yellow! When night fell and the light was turned on, the bugs and mosquitoes descended upon us. How about a 100-point bonus for the biggest mosquito print on a dupe sheet? Another camper rescued us with bug spray and mosquito repellant.

The girls could not tolerate the bugs, so they went to bed at 9:30. Jim and I then spent a very enjoyable night working 40- and 80-meter phone and CW. My Sarah stumbled out of the tent at 5:30 Sunday morning and began working the 40- and 80-meter Novice bands. Her code speed went from a tentative 7 WPM to 13 WPM for the repeated sequences that occur during Field Day. Her confidence soared.

A nostalgic moment occurred for me mid-morning Sunday when I worked W5NW in Odessa, Texas—the very same call under which I had operated my first Field Day almost 30 years ago.

The weekend was culminated for Jim as we were leaving the camping area. His Sarah turned to him and said, "Dad, what will my call be when I get my license?"—*Tom Thompson, WØVJ*

Sarah, KAØTZF, checks antenna resonance with a dip meter in preparation for FD '85.



The Chehaw ARS operated FD '85 at an *at-track*-tive site (K4HAV, 3A-Battery).

Table 1
Entries Per FD Class

1A—219	10A—2	1C—9
2A—457	13A—1	1D—13
3A—280	14A—2	2D—10
4A—127	15A—1	3D—2
5A—69	16A—1	6D—1
6A—33	21A—1	1E—56
7A—15	1B1—61	2E—13
8A—5	1B2—64	3E—2
9A—10	2B2—29	

cess, and we plan to do it next year.—*K5WPH*

The Surrey ARC embarked on their tenth annual Field Day outing motivated by our past nine years of success. The club usually attracts an average of 15 of its 50 members to the top of a small mountain 40 miles east of Vancouver, BC. This year, 19 members operated three stations for the 24-hour period. In addition to our club members, we were honored with the presence of Bob Fabry, N6EK. Bob took time out from his trek across Canada to join us on Field Day. We thoroughly enjoyed his active participation.

The FD site is on top of Mt. McKee, approximately 1400 feet high. Previously, the site was the home of a forestry repeater, but since the site was abandoned the road has deteriorated to the point that it requires some pick and shovel work to make it passable for our FD equipment. After spending a full day working on the road, we found that a local good Samaritan had applied his D6 Cat to the lower portion of the road.

The actual antenna and radio setup had a rather confused start, but quickly regained some semblance of order so that all the gear was in place for a prompt start at 1800Z. The advance testing and checking of all the antennas and towers paid off when the stations were turned on, as everything worked without a hitch. Three stations were set up in three tents using two Kenwood TS-120S radios, run from lead-acid batteries charged by 10-A chargers. The third station was a Yaesu FT-102 feeding a 204BA on a 50-foot mobile tower. A 3000-W generator was used to run the '120s, camp lights and coffee pots. A 1500-W

generator was used with the FT-102.

Contacts were divided up with 58% CW and 42% phone. Twenty meters was the most productive band, which remained open for the entire 24 hours. The other bands in order of useful propagation were 40, 80 and 15, with 10 meters virtually out.

In any successful operation, the workers need to be fed, and our two loyal chefs, VE7CLC and VE7CLE, provided the entire crew with excellent meals. Saturday evening dinner consisted of barbecued chicken, salad, baked potatoes and, of course, imported wine. Sunday morning dawned with the smell of sausages and hotcakes. The chefs kept the coffee pot going for the entire 24 hours and also provided snacks and all sorts of goodies.

The only danger came during the night when one dedicated CW operator had to defend himself against the local mice by setting up a few traps. It seems the tent he was using had a few holes that the mice found most interesting. We enjoyed a dry 24 hours and enough wind to keep the insects away.

Will we be back next year? A post-Field Day meeting was held immediately, and the answer is yes! Many good suggestions were put forth, and we plan to have a better signal than ever for our eleventh year.—*VE7CJG*

Scores

Class A stations are clubs or groups operating portable with more than two operators. Score listings are grouped according to the number of transmitters in simultaneous operation. The listings show club or group name, call(s) used, total number of QSOs, letter indicating highest power output used (A is less than 5 W; B is less than 150 W; C is more than 150 W), number of participants (if known) and total score including bonus points. Scores are listed from highest to lowest in each class.

Class B stations are portables manned by one or two operators. These may have one or two transmitters in simultaneous operation. Class 1B stations manned by one operator are listed first, followed by those with two ops, followed by Class 2B stations. When there are two operators, the other operator's call is listed in parentheses, if it is known. Numbers following the calls indicate QSOs, power and final score.

Class C stations are mobiles. They are listed by call (number of operators) QSOs, power and final score.

Class D stations are home stations using commercial power. Line scores are the same as for Class C.

Class E stations are home stations using emergency power. Line scores are the same as for Class C.

Club/Non-Club Portable

1A Battery

Non-Club Group			
KP4FI	869-A	-6	-9270
MRRC/NOARS/JBMCC			
WB8JBM/8	840-A	-6	-7525
Callway ARI.			
KSØM	695-A-12		-7450
Panama City ARC			
W4RYZ	909-A-15		-7125
Non-Club Group			
N4BP	673-A	-3	-6675
East Alabama ARC			
KE4T	872-A-21		-6025
Central North Carolina DXers			
N4DAZ	655-A	-6	-5575
Texas Chiggers FD Group			
AA5C	488-A	-3	-5280
Morrice, Minnis, Barthelow, & Goldman			
WB8ITM/6	604-A	-6	-5090
Point Loma ARC			
K6ZH	526-A	-8	-5035
CRA Sorel-Tracy			
VE2CBS	432-A-20		-4720
Principia ARC			
W9VM	427-A-12		-4670
Heavy Hitters FD Team			
K1BA	337-A	-3	-3740
Connecticut ATS			
KA1VH	1445-B	-9	-3290
Utah Code Net			
NA7G	286-A	-6	-3290
Three Mousketleers ARC			
VE7ZAF	364-A	-6	-3255
University ARC			
KV7L	411-A-15		-3100
Curly Shuffle FD Group			
WB2AMU	362-A	-3	-3100
Virgin Islands ARC			
KV4IE	326-A-10		-2935
CALM			
NN5O	331-A	-5	-2825
Winesprings Bald QRPers			
N6FFV	268-A	-6	-2780
Saddle Mtn. Corn Whiskey Distillers			
N7FU	227-A	-4	-2770
Thumb ARC			
W8AX/8	369-A	-7	-2665
Litton ARC			
K6HD	438-A-16		-2625
DBARS			
W6HCP	317-A-14		-2520
El Paso QRP Group			
W5XE	239-A	-6	-2505
Oak Park ARC			
W8MB	794-B-18		-2496
Northern New Mexico ARC			
KT5X	687-B-29		-2456
Albemarle ARC			
W6UZ	616-B-14		-2416
Non-Club Group			
K3YNY	301-A	-8	-2360
NRAO			
K6HVH	652-B	-7	-2248
Fort Armstrong Wireless Assn.			
N3DOL	374-A-12		-2170
Ontario FD Assn.			
VE3LPM	566-B	-7	-2156
Tuesday RAC			
NC9O	247-A-12		-2025
NE Alabama QRPers			
KA4LKH	295-A	-6	-1890
Paducah ARA			
WB4ECB	528-B	-4	-1884
Egyptian RC			
W9AIU	226-A	-4	-1835
Neurosa's Gopher Munchers			
AE6C	684-B	-4	-1748
Non-Club Group			
KU6X	795-B	-3	-1690
Mirror Lake Reflectors			
K7RK/7	215-A	-3	-1690
Non-Club Group			
WB8TGY	152-A	-5	-1675
Non-Club Group			
NB7W	486-B	-4	-1372
Worldradio Staff ARC			
N6WR	520-B	-6	-1368
Austin Chapter NFOTB ARC			
N5GXB	348-B	-4	-1352
Peel ARC			
VE3XR	426-B-25		-1356
Jefferson Co. ARC & Port Arthur ARC			
W5SSJ	313-A-45		-1352
Ogden ARC QRP Group			
W8KPI/7	109-A	-6	-1190
South Florida Hamsters			
N4FL	310-B	-6	-1105
Hiawatha ARA			
NJ8H	382-B-15		-1082
NPARC/EOAWA			
W8ZQ	306-B-12		-1022
The Farm Boys			
VE4ADS	333-B	-8	-966
Huron ARC			
W8NOZ	387-B-10		-874
Confederacy of Idiots			
K5TMS	359-B	-3	-818
Indiana University ARC			
K9IU	234-B	-5	-782
West Volusia ARS			
W2DU	171-B-15		-742
Beach Hill Boys			
KA1AVU	106-B	-5	-718
ISRA, Magic Valley Chapter			
W7NJU	278-B	-8	-684
H.A.R.E.M.			
N3DVK	191-B-10		-588
Brenham ARC			
NS5N	175-B-10		-570
AM & FM Group			
KE4HI	211-B	-3	-522

1A

MRRC/SVARFDG			
K3LR	1878-B	-3	-6544
MRRC/SQB			
W8GZ	1958-B	-4	-6260
Raiders of The Lost ARC			
N5HD	1609-B	-6	-5556
Belleville ARF			
K9BGL	1254-B	-3	-5514
MRRC/MMM			
K8CC	1545-B	-4	-5212
MRRC/CSASC			
N8AA	1523-B	-5	-5038
OSU ARC			
W8LT	1316-B	-5	-4886
Rotten Radio ARC			
WK4D	1654-B	-6	-4804
Thibodaux ARC			
W5YL	1262-B-20		-4802
Treaty City ARA			
W8UMD	1852-B	-7	-4742
Radio Free Streamwood			
NA9D	1209-B	-7	-4734
MRRC/TPGGBBFB			
WB3KKX	1502-B	-3	-4408
Southwestern Idaho DX Club			
K7TM	911-B	-3	-4302
MRRC/OH CARP DIV.			
AD8P	1397-B	-6	-4234
IITRI/ECAC FD Group			
W3MR	1268-B	-6	-4032
York Co. ARS			
K4YTZ	1229-B-45		-3930
Dr. Loomis Memorial JML			
N4YE	1141-B	-9	-3712
Idaho Falls Mavericks			
W7RH/7	1088-B	-3	-3662
The Motley Crew ARC			
KK9H	1273-B-15		-3580
ARA of the Tonowandas			
W2SEX	934-B	-6	-3510
MCT Loudenboomers			
W9MV	1027-B	-5	-3488
River Rats Contest Club			
KB9S	814-B	-3	-3322
ARC of Central Wisconsin			
N9BBN	1179-B-10		-3262
Athens Co. ARC			
NC8V	910-B-12		-3232
Carnegie-Mellon University ARC			
W3VC	740-B	-5	-3138
Orange Burg ARC			
AD4U	728-B-30		-3004
Wisconsin Valley RA			
W9SM	862-B-15		-2986
Hecla RC			
KG2I	743-B	-9	-2958
Tamaqua Transmitting Society			
W3TI	713-B	-7	-2952
Annapolis RC			
W3HVQ	948-B	-5	-2896
Collins ARC			
K5CQ	1260-B-19		-2882
Tucson IBM ARC			
K7KZ	775-B	-8	-2852
Canyon Lake ARC			
KS6V	1090-B	-6	-2778
Steubenville-Weirton ARC			
N8RH	1028-B-20		-2754
IBM ARC-San Jose			
N6KL	723-B-11		-2630
Radio Amateur Megacycle Society			
W9DY	551-B-10		-2598
Winona (MN) ARC			
WØNE	766-B-15		-2586
Terrace & Kitimat ARC			
VE7DRW	632-B	-8	-2572
Ogden ARC			
AC7K	1169-B-30		-2538
Non-Club Group			
N7TT	781-B	-3	-2530
The Granite State Hill-Toppers			
AF1T	979-B	-4	-2458
Radio Amateur Club of Knoxville			
W4BBB	684-B-12		-2418
Utah ARC			
W7SP	532-B-30		-2394
Sussex ARA			
K3JL	689-B-14		-2350
Non-Club Group			
K2QC/9	532-B	-3	-2328
Bass Hill Repeater Group			
W1KX	608-B	-6	-2320
Uniontown ARC			
W3PIE	666-B-15		-2316
Associated RA of SNE			
W1AQ	753-B-14		-2310
Tri-Co. and Ottawa Area Clubs			
WØYEK	731-B-18		-2304
Anoka Co. RC			
WØEG	951-B-12		-2300
Williamson Co. ARC			
N5TT	611-B	-7	-2292
San Jose State University ARC			
W6YL	672-B-10		-2248
NOBARC			
K1FFK	757-B	-5	-2178
SRO/CFMC			
W9EJ	722-B-60		-2168
South East ARC			
K8EMY	625-B-14		-2152
Ramsey Co. ARC			
NAØO	735-B	-5	-2070
First State ARC			
K3QBD	642-B-14		-2028
Medina Two Meter Group			
K8TV	1125-C-14		-2002
Red River Valley ARC			
WB5RDD	584-B-14		-1964
Non-Club Group			
NY4N	559-B	-8	-1952
North Augusta-Belvedere RC			
K4FR	487-B-30		-1932
Maui ARC			
KH6RS	564-B-29		-1844
Butte ARC			
W7FO	1369-C-41		-1834
Bedrock Fire Dept. ARC			
KBØVT	566-B	-8	-1804
Non-Club Group			
N6CQ	1058-C-15		-1783
Beacon Radio Amateurs			
W3AA	401-B	-8	-1738
Southern Maryland ARC			
K3RHL	726-B-43		-1710
Woodson Co. Radio Amateurs			
W5SNL	533-B	-5	-1674
Otterbein College ARC			
NJ8L	597-B	-9	-1648
RCMP "N" Division			
VE3CPC/3	714-B-10		-1632
807 FD Group			
WB8UCW	447-B	-5	-1622
Southern Catskill ARS			
W2EFI	608-B	-6	-1590
USAF MARS Bellows AFB			
KH6IJ	861-C	-8	-1577
Relay Repeater Club			
KG6AX	729-B-16		-1558
The Cowan Farm Group			
VE5ABV	622-B	-6	-1544
Lehigh Co. Red Cross			
W3VQ	614-B	-8	-1534
Rainbow Canyons ARC			
NN7T	1034-C	-9	-1534
Turtle Mountain ARC			
VE4LB	557-B-10		-1528
Gallatin HRC			
W7ED	434-B-10		-1520
Better Luck Next Year ARG			
KB7KY	491-B	-6	-1514
Independence ARC			
KØPUX	506-B-22		-1512
West Nebraska ARC			
WØAFG	589-B-15		-1478
Gratiot ARA			
W8AWE	340-B	-4	-1460
Shelby Co. ARC			
KC4AF	464-B-12		-1418
Hastings ARC			
WØWWV	500-B	-8	-1400
ZOT ARS			
WB6RXE	401-B	-2	-1388
West Alabama ARS			
WD4OAT	575-B-25		-1350
Isacomm ARC			
WA4AHP	500-B-15		-1328
Bismarck ARK			
WØZRT/Ø	922-C-25		-1322
LERC ARC			
W6LS	271-B-14		-1308
Gaston Co. ARS			
K4TP	501-B-15		-1304
Imperial Valley ARA			
WE6T	389-B-10		-1302
North Kitsap ARC			
KI7T	475-B	-9	-1300
Northwest ARS			
N5HF	474-B-14		-1300
Cairo ARA			
N9CHM	547-B	-9	-1294
Sam Houston ARK			
N5IF	403-B-10		-1260
Amecom ARC			
K3TM/3	582-C	-8	-1257
Great Rivers ARC			
WØSM	517-B-18		-1234
Manitoba DX Group			
VE4CAT	392-B	-8	-1234
Lake Co. ARC			
NF5T	415-B-11		-1230
Los Alamos ARC			
W5PDO	290-B	-4	-1228
Non-Club Group			
WA4AUX	508-B	-9	-1216
Kennydale Key Klicks			
W7JIE	229-B	-3	-1184
ICARES			
W8LCU	237-B	-7	-1182
Barbour Ponds Bug Pounders			
W8IVJ	416-B	-4	-1178
Wake Tech. College ARC			
WB4TOP	298-B-52		-1168
Cache ARC			
WA7MXZ	205-B	-3	-1150
Hannibal ARC			
WØKEM	274-B	-9	1126
Colorado ARES Dist. 22			
NØAUS	433-B	-3	-1120
Iowa City ARC			
WØJV	275-B-12		-1118
Fauquier ARA			
K4MZ	287-B-10		-1116
Douglas Co. ARA			
K4PI/4	727-C-12		-1096
Hiawatha ARC			
KØNL	330-B-15		-1068
Enterprise ARS			
WD4HOJ	271-B-22		-1050
Friends of Farley			
WB8NSU/8	749-C	-4	-1049
Lookout Mountain ARC			
KØHP	367-B	-8	-952
Tip Toppers			
WA7ZWD	425-B	-6	-950
CCRL			
KA9EZA	342-B	-7	-946
Cheveron ARC			
N6HG	304-B	-4	-946
Tumbleweed ARC			
KY5K	368-B	-7	-936
St. Cloud RC			
WØSV	293-B	-9	-912
Flathead Valley ARC			
K7LYY	393-B-25		886
Mason Co. RC			
K8DXF	373-B-16		-846
Steuben Co. RAC			
KD9GK	317-B	-5	834
Texas A & M MSC ARC			
W6AC	264-B	-3	-808

Mc Kean Co. ARC
W3VV 298-B -5 -796
MTUARC
W8YY 120-B -5 -758
Ellis Co. ARC
WD5DDH 176-B-14 -714
Wild Rivers ARC
W9DLY 438-C -6 -697
Beaver Valley ARC
VE7BWI 153-B-22 -668
Hays ARC
KØUAS 439-B -4 -639
Penny Pines Brass Pounders
KB6OI 240-B -4 -616
Non-Club Group
WD4ELY 252-B -3 -604
Lake Martin ARC
AA4KE 176-B-18 -556
Capilla Peak FD Group
K5FSB 337-C -5 -437
Smoky Valley ARC
WØCEM 111-B-22 -422
Mesabi Wireless Assn
KØMK 155-B -6 -420
Mile's Amateurs
NIØQ 131-B -4 -410
Morgan Family
W7VLG/7 55-B -9 -374
Grady/Caddo ARES
WB5KJD 137-B -3 -366
RAMS
W6HIR 130-B-17 -360
Connecticut Minutemen
KA1FEM 112-B-14 -324
Pearl River HS ARC
WB2ABJ 50-B -5 -300
Radio Amateur Transmitting Society
W4PQP 8-B -4 -116

1A-Commercial

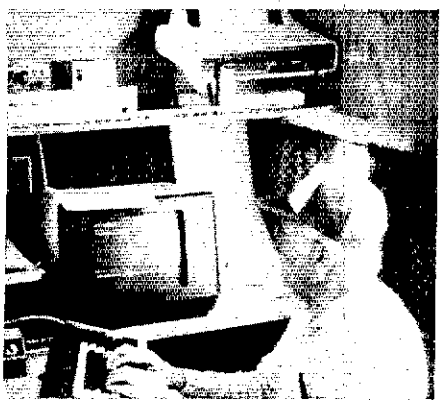
Non-Club Group
WAØGNO 823-B -3 -1650
Federation of Amatuer Radio Transmitters
KA9EES 415-B -4 -1220
Crawford Co. ARC
KA9AMJ 461-B -8 -1022
Valley Amateur Radio Council
K5DG/5 184-B-14 -936
Three Generations
W6SGJ 224-B -3 -820
Lakes Area ARC
KE5FS 284-B -7 -670
Whitewater Hills ARC
KA9GHP 185-B-12 -612
USECA
K8QLM 445-C -590
Charlotte ARC
W4CQ 219-B-20 -560
Metropolitan ARC
NI5D 147-B-28 546
Alton Baynlacs
N1CZC 163-B -5 -402
Non-Club Group
WB7OSC 134-B -3 -368
SIFDMCS
W1GGA 333-C -5 -333
Pretty Wasted ARF
KØPW/Ø 106-B -8 -244
Bluewater ARC
VE3WZL 27-B -3 102

2A Battery

Arapahoe RC
KØNA (+ KAØTHW) 1998-A-21-16,045
Connecticut Wireless Assn.
W1RM 1603-A-12-14,170
Start DX Assn.
NM8K (+ KA8WTZ) 1495-A-17-11,220
No Nukes Solar Powered FD Party
W6JTI (+ KB4IFS) 1077-A -9 -8385
Rubber Circle Contest Club
KC7RN 1093-A-10 -7640
Tri State ARS
W9OG (+ KA9TML) 682-A-40 -7420
Zygo ARC
W1BCH (+ KA1MWX) 920-A -8 -7290
Walton RA
W2LZ 667-A-10 -7270
Berry Mt. ARC
W3TS 776-A -6 -6835
Rogers Co. Wireless Assn.
N5TM (+ WA5NGY) 532-A-23 -5195
Williamsburg Area ARC
K4RC (+ WA4OVW) 1392-B-25 -5130
Columbiana Co. ARC
NN8B 668-A-15 -4835
Cypress Mountain Boys
K6FI 404-A -4 -4520
Morton ARC
W9EEB 1228-B-16 -4444
Elkhart Red Cross ARC
W9XD 1269-B-10 -4350
Brass Fleas
KC9OH 386-A -3 -4260
Tamaqua Area ARA
W3VA 1174-B-14 -4160
South Whidbey Island FD Group
K7WA 446-A -5 -3965
Carroll Co. ARC
K3PZN (+ KA3KDG) 1246-B-18 -3954
WCARC
KD4DX 382-A -8 -3545
Mountain Madness
KØBP 1311-B-11 -3444
Paul Bunyan Wireless Assn.
ADØS/Ø 457-A -8 -3415
West Park Radiops
W8VM 1025-B-14 -3334
Kerr Lake Campers
N4SW 1317-B-13 -3258
Massillion ARC
W8NP 873-B-15 -3218
Mesilla Valley ARC
K7UP 326-A-15 -3190
Pocono ARC
W3PM 821-B-21 -3016
Non-Club Group
WAØRLY (+ KAØKLQ) 258-A -5 -2980
Knox Co. ARC
W9GFD 1026-B-20 -2944
Catalpa ARS
W8AG 946-B-27 -2546
Granite State ARA
K1RD (+ N1DNV) 572-B-15 -2438
Rolla Regional ARS
WØGS (+ KAØUFU) 847-B-16 -2366
Rideau ARC
VE3BPC/3 572-B-15 -2298
Bellflower ARA
WA8SFM 738-B -3 -2276
NEIRAA
WØMG 862-B-37 -2228
Benicia ARC
KE6IA (+ KA6IXG) 250-A-10 2100
Hiawatha Valley ARC
KFØT (+ KAØQFB) 488-B -9 -2088
San Andreas Fault Line Survivors
NZ6N 811-B-10 -1976
Nanaimo ARA
VE7NA 518-B-15 -1942
ARC of Savannah
W4HBB 624-B-32 -1930
Lake of the Ozarks ARC
KDØXR 514-B-15 -1920
Sheridan RAL
W7GUX (+ N7GYA) 452-B-12 -1726
Marshall Co. ARC
KA9T 536-B-50 -1632
Pecos Valley ARC
K5WK (+ N5ECE) 371-B-10 -1522
South Canadian ARS
W5OU 479-B-16 -1474
The Morning Show
VE7LAW 593-B-11 -1420
High Plains ARC
KC7KC 450-B -7 -1376
VE2RM Group
VE2RM 471-B-15 -1330
North Central ARES
NGØY 456-B -7 -1316
IA-IL ARC
WØLAC (+ KAØPGP) 383-B-14 -1298
Sun City ARC
K5WPH 137-A-30 -1160
Clemson University ARC
WD4EOG 77-A -5 -1130
Novatel ARC
VE6NOV 239-B-12 932
King Co. ARES "T"
W7AZU 111-B -7 -822

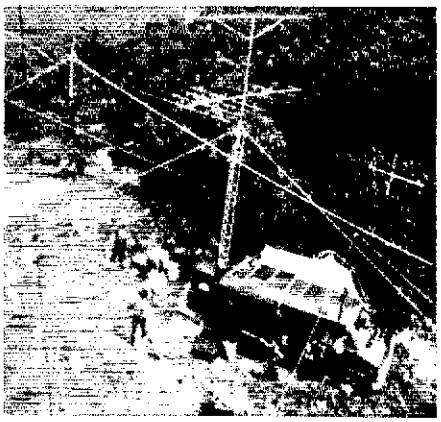
2A

Heart of America RC
WØRR (+ KAØREN) 7827-B-35 -9300
Azalea Coast ARC
K4UWH 2481-B-15 -8092
NAARS
K5LG (+ KA5UMF) 2586-B-32 -7938
Lake Co. RACES
K9SA (+ KA9TAX) 2254-B-35 -7558
Columbia ARA
K3EF 1965-B-25 -7488
Silicon Jct. RC-IBM Burlington
K1VT (+ KA1LEX) 2664-B -7 -7458
Salt City DX Assn.
W2FR/2 2089-B-19 -7370
Motor City RC
WBMRM (+ KA8IKC) 2111-B-50 -6978
Richardson Wireless Klub
K5RWK 2210-B-30 -6878
Batesville ARC
NG5M 2119-B-17 -6654
Reading RC
W3BN (+ KA3HMU) 2112-B-35 -6536
W/K ARC of Greater Milwaukee
N9AW (+ KA9TEP) 2109-B -9 -6488
Radio Amateur Tech. Soc.
W9RW 2420-B-10 -6330
FARS
K6YA (+ KB6ING) 1822-B-17 -6230
Butler Co. VHF Assn
NW4G (+ N8EET) 2116-B-20 -6182
Norwood ARC
K1JMR (+ KA1JRN) 1989-B-19 -6150
Falmouth ARA
K1RK (+ KA1LIH) 1820-B-20 -6132
Somerset DX RA
NB2P 2284-B -9 -6062
Midland ARC
K5CFA (+ N5GVB) 1658-B-55 -5956
Rankin Co. ARC
KV5R (+ KA5WFE) 2521-B-30 -5924
Desert DX Corps
AA7A 1848-B -4 -5890
Oak Ridge Radio Operator Club
K4PJ 1831-B-25 -5874
Owensboro ARC
K4HY (+ KB4MWP) 1601-B-20 -5724
Sussex Co. AC
N2WM 1587-B-20 -5704
Anderson RC
W4FX (+ WD4BUH) 1547-B-18 -5638
Muncie ACS
W9MA 1667-B-15 -5620
St. Louis ARC
KØLIR (+ WDØFPY) 1735-B-20 -5546
Northern Ohio DX Assn.
K8WW 1781-B -5456
Mountaineer ARA
W8SP (+ KA8RHJ) 1619-B-16 -5442
McDonnell Douglas AARC + SCAN
W6VLD (+ N6KOA) 1738-B-16 -5400
Twin City Hams
W5EA (+ KA5UXB) 1508-B-30 -5350
Sutton AS
KØSCM/Ø
(+ KA6DNO) 1978-B-18 -5334
Radio Central ARC
K2KI 1486-B-25 -5330
Sartlesville ARC
W5NS (+ KA5OXA) 1490-B-45 -5310
Kingsport ARC/Bays Mtn. RC
W4TRC 1505-B-20 -5232
Central Georgia ARC
KN4A 1561-B -5220
Rochester DX Assn.
W2TZ 1703-B -7 -5216
Utica ARC
K2IQ 1750-B-12 -5160
Northwest Arkansas ARC
KM5G (+ KA5UGM) 2303-B-50 -5106
Paynesville ARC
KCØT (+ KAØTGW) 1168-B -5 -5072
San Angelo ARC
W5OX (+ KA5VTI) 1431-B-35 -5066
Cape Fear ARS
K4MN (+ N4EWG) 1374-B-40 -5018
Kanawha ARC
W8GK (+ KA8DZD) 1897-B-15 -4948
The Ozarks ARS
KØFA 1618-B-17 -4898
Blue Ridge ARS
WK4O (+ KB4LYE) 1361-B-58 -4886
Cedar Valley ARC
WØGQ (+ KAØULO) 1414-B-50 -4802
CARES
KN9P (+ KA9SGO) 1161-B-13 -4738
Southwest Missouri ARC
WØEBE 1566-B -4732
Kaw Valley ARC
WØCET (+ KAØSEY) 1725-B-23 -4720
Rochester ARC
WØMXW
(+ KAØRTZ) 2742-C-35 -4683
Sabine Valley ARA
N5RM (+ KA5WHY) 1313-B-25 -4628
New Providence ARC
NA2R (+ KA2UGR) 1412-B-20 -4558
Inter Co. ARC
W2NY 1255-B-10 -4508
Ham Assn. of Mesquite
KW5A (+ N5AIB) 1302-B-24 -4484
Big Bend ARC
K5FD 1251-B-14 -4476
West Texas ARC
W5NW (+ KA5OLO) 1576-B-42 -4364
Mobile ARC
W4IAX (+ KA4MUX) 1191-B-35 -4330
Wilderness Ham Radio Operators
KØSG (+ KAØUZP) 1355-B-19 -4304
Lynchburg ARC
K4HEX (+ N4DTK) 1213-B-25 -4284
Union Co. ARS
WK4S (+ KB4NMD) 1247-B-21 -4274
Halifax ARC
VF1FD 1294-B-18 -4266
Robbinsdale ARC
KØLTC 1169-B-20 -4268
Lake Co. ARC
W9LJ 1252-B-35 -4244
Garland ARC
K5QHD 1365-B-60 -4224
Satellite ARC
W6AB (+ KB6EWR) 1310-B-13 -4220
Rip Van Winkle ARS
W2FSL (+ KA2QYG) 969-B-28 -4176
Meriden ARC
W1NRG 1206-B-20 -4128
Colorado Repeater Assn.
WØXR 1252-B-12 -4120
MATPARC
W4QO/4 1018-B-10 -4072
Ole Virginia Hams
N4FS 1595-C-10 -4069
Calhoun Co. ARA
KK4O (+ KB4NVV) 1765-B-25 -4038
Beverly CDC Group
K1WGM (+ KA1LSB) 945-B-10 -4032
Dufferin ARC
VE3NN 1125-B-12 -4026
Holston Mt. Moonshine & SPS
N4TG (+ KB4ORA) 1252-B-15 -4010
Harvard FM Repeater
KA1T 898-B-13 -3988
Farmington ARC
W8RC 1514-B-12 -3978
Valley ARA
W4XD 1365-B-20 -3934
Humboldt ARC
KØGP (+ KA8SBK) 1399-B-30 -3932
West Valley ARA
W6PIY (+ KB6GBX) 1057-B-35 -3892
Lowndes Co. ARC
K5BX 1232-B-15 -3884
Emerson Electric ARC
WØPEV 991-B-10 -3866
Daubenville DXA
KI3N (+ WA3MFT) 1329-B-10 -3796
AT&T CRES ARC
W8ZPF 1341-B-15 -3792
Sheboygan Co. ARC
KV9V (+ KA9SQA) 1313-B-16 -3784
Parkersburg ARK
KD8G 1142-B-25 -3772
North Okaloosa ARG
WS4Y 1040-B-15 -3758
South Lyon Area ARC
N8AR 1214-B-15 -3754
Gower Gulch Gang
N6LL 1221-B -9 -3738
Bankhead ARC
N4AKW (+ N4KIB) 1582-B-11 -3722
Smoke Signal RCG
KD8X 1657-B -5 -3714
Eastern Michigan ARC
K8EPV (+ KA8UKO) 994-B-23 -3674
Centralina ARC
WT4Z (+ KB4OPN) 1188-B-30 -3664
Slam-Dunk DXers
W7IL 1119-B -3 -3664
Portsmouth ARC
W4POX 1105-B-15 -3658
Green Mtn. Wireless Soc.
N1VT 1163-B-30 -3574
Cherryland ARC
W8GI (+ KA8SOF) 1099-B-25 -3526
Brazosport ARC
N5KV (+ KA5COA) 948-B-31 -3526
Baltimore ARC
W3FT (+ KA3NOE) 949-B-25 -3520
The Original North Coast ARC
WBBBTO 1498-B -6 -3476
Edison/Tin Lizzie and Andy's Pig
K8VA 1195-B-44 -3476
Story Co. ARC
WØYL 1045-B-20 -3472
Old Bridge RA
K2SC 980-B-10 -3466
Northeast Missouri ARC
WØCBL (+ KA8KFS) 960-B-20 -3458
Canton ARC
W8AL 1010-B-25 -3438
TRAPS
W8ILC (+ KA8UNM) 918-B -9 -3414
Hoosier Lakes RC
K9RD 1141-B -7 -3400
Johnson Co. RAC
WØERH (+ KAØSTG) 1110-B-10 -3400
Milford ARC
W8SDL 1017-B-16 -3396
Muncie Area ARC
KO9A 940-B-18 -3388
MARC
W5EJK 1378-B-30 -3384
Central Michigan ARC
W8MAA (+ KA8PDW) 1211-B-40 -3324
Morris/Passaic Co. ARES & EM
K2SE (+ KA2NCU) 920-B-18 -3304
Tuscaloosa ARC
W4XI 998-B-25 -3282
LAMARS
W9HOQ 847-B-15 -3280
East Bay AWA
N1RI 1011-B-10 -3272
CRA de Quebec
VE2CQ 679-B-20 -3216
Algoma ARC
VE3SOO 956-B-18 -3204
Kingsmere Park Gatineau ARA
VE3CZ/3 935-B-14 -3190
Twin State RC
W1FN 1003-B-10 -3144
Delaware ARC
W3QLS (+ KA8SSJ) 927-B-25 -3136
Intermedies ARC
W5PWG 822-B-16 -3116
Fort Dodge ARC
WØUL 1293-B-20 -3090
Wichita ARC
WØSOE (+ KAØTOT) 801-B -2 -3078
Livonia ARC
K8UNS 944-B-30 -3074
Port Crane FD Operation
N2HR 907-B-17 -3042
Virginia ARC
WB4YVE
(+ KA4QPO) 1052-B-15 -3024
Lower Power Hams
N6BLN 902-B-14 -3002
PHD ARA
WAØUGU/Ø 845-B-51 -2992
Lockport ARA
W2RUI 797-B-15 -2992
Mid-MO ARC
KØETY 1022-B-10 -2976
MO Valley ARC
WØNH/Ø 1104-B-40 -2970
Goddard ARC
WA3NAN
(+ KA3OBH) 910-B-17 -2924
St. Peters RAC
KBØJ (+ KAØLZN) 891-B-25 -2924
Pioneer ARC
VE3NA 715-B-17 -2920
Johnson City RA
K4SE (+ KB4KFS) 876-B-27 -2908
Portsmouth ARC
WD8LXX 1018-B -7 -2900
Sturdy Memorial Hosp. ARC
K1ZZJ 932-B -4 -2894
Northland ARA
WØGL 1038-B 2880
Rockwell Missile Sys. Emp.
N8LM 712-B-10 -2878
The Alps Gang
KA2AXN 920-B -9 -2876
Laurel ARC
W5NA (+ N5HOA) 831-B-20 -2866
Viking ARS
KØRVN 716-B-13 -2834
Pioneer ARC
AA4HF 1180-B-11 -2828
Hattiesburg ARC
AG5Z (+ KA5WFM) 965-B-28 -2820
Scrubpine Jones and the Bayonnet Band Busters
WØMHK/3 789-B -3 -2808
West Georgia ARS
W4FWD 852-B-14 -2786
Tupelo ARC
K5JG (+ KA5WBE) 845-B-16 -2760
Huber Heights ARC
N8TD 783-B-15 -2758
Oklahoma City Autopatch Assn.
K5NK (+ N5FMU) 858-B-25 -2754
SPARS
NEØX (+ KAØUTE) 887-B-14 -2734
Montgomery ARC
N4AU (+ KB4NYA) 744-B-22 -2712
Middlesex ARC
W1HEB (+ KA1MXT) 1039-B-18 -2704
Sand Hills ARC
WØMI 1024-B-15 -2682
Minneapolis RC
WØCKF (+ KAØTVS) 676-B-30 -2660
Bethel ARC
KY8R (+ KA8RVO) 862-B-19 -2658
Tallawassee ARS
N4WA 721-B-30 -2654
Gadsden ARC
K4JMC (+ N4KYR) 656-B-20 -2638
Oxford Co. ARC
VE3OHI/3 792-B-13 -2624
Parsons Area ARC
WØRT (+ KAØFMX) 743-B-14 -2622
Eastern Shore ARC
WR4R (+ KB4HFX) 834-B-19 -2620
Oakville ARC
VE3HB 919-B-14 -2618
Delta Co. ARS
K8ZAS (+ KA8TUZ) 731-B-15 -2616
Brightleaf ARC
W4AMC (+ KB4CJN) 848-B-20 -2612
Independence FM ARC
WØHV (+ KAØQEK) 1198-B-40 -2596
Saline Co ARC
K5NE 712-B-19 -2554
Saskatoon ARC
VE5AA 827-B-15 -2544
Decatur ARC
WI4ATD 785-B-23 -2540
Huntington Co. AR
W9EI (+ N9BHA) 958-B-14 -2536
Black Hills ARC
WØBLK 765-B -8 -2536
Free State ARC
K3IVO 754-B-12 -2530
Harris AHC
NS4S 792-B-15 -2486
Escondido ARS
N6WB 778-B-30 -2474
The Gumbo Net
W5NTJ 687-B-14 -2464
Gulf Coast ARC
WF4V 719-B-30 -2462
Loveland Repeater Assn.
WØDZ (+ KAØUYX) 727-B-15 -2452
Three Rivers ARC
WØBRN 895-B-14 -2438
Massena RA
WA2USA 658-B -3 -2432
Sakonnet Grape Nuts
WA1ABI 577-B -4 -2392
Regina ARA
VE5NN 537-B-17 -2388
Orange Park ARC
NU4Y 567-B-12 -2364
Nappanee ARC
KQ9B (+ N9EWN) 979-B-33 -2360
Tri City ARC
KQ1O (+ WA1WYN) 640-B-25 -2358
Friday Afternoon RTS
K1XR (+ KA1MTC) 1564-C-25 -2350
LYARS
WA7GVT 665-B-11 -2346
Fulton ARC
WØXV (+ KA2RWK) 787-B-35 -2340
Staten Island ARC
WA2OGV 1056-B-16 -2338
South Brevard ARC and FIT ARS
KU4J 638-B-18 -2338
Glynn ARA
K4TVE (+ KA4OTR) 503-B-12 -2332
Hamilton Co. ARA
KØKWO 964-B-14 -2328
Clark Co. ARC
W9WWI (+ N9DPR) 611-B-60 -2320
Tandem RAC
KE6N (+ KB6DMK) 659-B-12 -2318
Arlington AHC
K5SLD 437-B-16 -2306
Central Kentucky ARC
WA4UXJ 752-B -9 -2302
Victoria ARC
W5DSC 627-B-15 -2298
Beaumont ARC
W5RIN (+ KA5UJB) 643-B-25 -2292



KE6FL takes advantage of the 100 bonus points for making 2-point packet QSOs for the Hughes Aircraft-Hesea ARC (K6ZT, 5A).

Leon, K8EER, chief chef for the Oakland Co. ARS, dishes out Friday night dinner (W8TNO, 4A).



SCORE operated K2XR from this location for a number-five finish in 3A.

Blossomland ARA			
W8MAI	595-B-25	-2290	
Non-Club Group			
K6EID	860-B -3	-2288	
WRECS			
K8NI	790-B -8	-2282	
Naval Research Lab ARC			
W3EW	558-B-10	-2266	
Greater Bridgeport ARC			
KF1N	731-B-26	-2252	
Fresno ARC			
W6TO	302-B-23	-2244	
Merrymeeting ARA			
N1MA	604-B-15	-2224	
Jones Co. ARC			
WØGN	741-B -6	-2222	
Tippecanoe ARA			
W9REG (+ KA9IHB)	816-B-15	-2212	
New Ulm ARC			
ND8A (+ KA8QKT)	585-B-15	-2208	
Northern Kentucky ARC			
K4CO	668-B -9	-2178	
Huntingdon Co. ARC			
W3VI	649-B -8	-2158	
Yolo ARS			
AJ6P (+ KB6DCP)	587-B-12	-2096	
Irvington Roseland AC			
K2GQ	842-B-20	-2088	
East Pasco ARS			
K3IC	596-B -7	-2082	
Des Moines RAA			
WØAK	537-B-26	-2082	
Ausable Valley ARC			
NM8L (+ KA8VQT)	438-B-18	-2080	
Lakeview ARC			
KS7G	830-B-10	-2078	
Kamloops ARC			
VE7UT	631-B-15	-2074	
Tri Co. HRC			
K8BCH	788-B-12	-2060	
Genesee RA			
W2RCX (+ WB3JSU)	899-B-24	-2048	
OSU ARC			
KI7N	609-B -8	-2026	
Washoe Zephyr DX Assn.			
NC7K (+ KA7VLL)	580-B-14	-2024	
Forsyth ARC			
W4NC	538-B-35	-2022	
Bay Area ARS			
KB3MF	772-B -8	-2016	
Central Wisconsin RA			
W9NN	594-B	-2004	
Casper Outlaws			
W7ENE	645-B-12	-2002	
Three Rivers ARC			
KNØA	842-B-24	-1984	
Clackamas ARC			
KX7T	518-B-20	-1980	
Ceder Mountain ARC			
KZ7V (+ KA7UTV)	523-B -7	-1964	
Wantagh ARC			
W2VA	731-B-14	-1962	
Arrowsmith ARC			
VE7EMO	611-B -7	1962	
Shawano Area Amateurs			
WA9BZW	688-B-18	-1956	
Old Post ARS			
W9EOC (+ KA9TOP)	898-B-15	-1948	
Gonzaga Prep HRC			
KC7FJ (+ KA7ULT)	625-B-16	-1930	
Shanendoah Valley ARC			
W4RKC	606-B-23	-1916	
Spartanburg ARC			
K4JLA (+ KA4OTH)	933-B-35	-1911	
Garden City ARC			
W8WI (+ KA8WPP)	752-B-22	-1908	
Hollywood ARC			
KM4Y (+ KB4NRY)	475-B-15	-1902	
Lakes Area ARC			
WB9PZH			
(+ KA9TQQ)	801-B-12	-1896	
Grand Rapids ARA			
W8DC (+ KA8VOL)	737-B-20	-1894	
Saratoga Co. RACES			
KG2H	648-B -6	-1872	
Shuswap ARC			
VE7RW	593-B-15	-1870	
Old Pueblo RC			
W7GV (+ KA7UML)	621-B-25	-1866	
Gwinnett ARS			
NG4I	523-B-12	-1858	
Ogdensburg ARC			
K2JPM (+ KA2CCU)	522-B-25	-1856	
Muskegon Area ARC			
W8ZHO (+ KA7HCR)	511-B-37	-1854	
Bullitt Co. ARS			
W4MDY	722-B-57	-1844	
Capital ARS			
WK4G (+ KB4MYG)	662-B-20	-1832	
Neshoba ARC			
WB5ADC (+ KA5HTF)	473-B-10	-1822	
Fox Hill FD Fools			
ND9C	431-B-10	-1800	
Bethel Educational ARS			
KZ1Z (+ KA1LUT)	554-B-21	-1792	
Grand Island ARS			
WØCUO/8	635-B-10	-1786	
Roanoke Valley ARS			
KA4BQM	442-B -7	-1780	
Suburban RC			
WØDCW	704-B-60	-1776	
Non-Club Group			
KE4EV	552-B -9	-1766	
St. Mary ARTS			
NT5K	459-B-14	-1764	
El Paso ARC			
W5ES	593-B-52	-1762	
Umpqua Valley ARC			
W7LNE	389-B-17	-1760	
Harlan Co. ARC			
AA4EV (+ KB4EGT)	479-B-10	-1754	
Larkfield ARC			
WA2PNU/2	525-B-15	-1716	
Oswegatchie Valley ARC			
WA2NAN	370-B	-1696	
Cass Co. Area Amateurs			
KD9L	497-B-15	-1694	
Chestnut Hill Hams			
AC1J	544-B	-1692	
Petaluma DX & Experimenters Soc			
WB6EGE			
(+ KA6OPN)	394-B-15	-1692	
Twin City RC			
W7LA	1243-C -8	-1684	
Pearl River Co. ARC			
W5UO	645-B-20	-1674	
MARCH			
NE4H (+ KB4IFW)	424-B -5	-1672	
Casper ARC			
W7VNJ	509-B-17	-1644	
Lake Huron ARC			
W8JC	640-B-28	-1628	
Pittsburg Co. ARC			
W5CUQ (+ KA5VQC)	479-B-11	-1622	
Prairie Dog ARC			
N5OX (+ N5HUY)	367-B-22	-1622	
Sharon ARA			
K1JNQ (+ KA1HTO)	519-B-27	-1616	
ZOZ FD Group			
WB6ZQZ	592-B-12	-1602	
Coon Valley ARC			
KVØN	611-B-30	-1590	
Moosehorn ARC			
KL7IEJ	275-B-22	-1578	
Number Four Earth Station			
N4ES	382-B -9	-1576	
Fort Madison ARC			
KØKWU	486-B-12	-1572	
Maryland Navy-Marine Corps MARS			
K3VPZ	393-B -3	-1572	
Athens ARC			
N5GR	344-B-15	-1572	
Non-Club Group			
KS3N (+ KA3LNQ)	576-B -6	-1552	
BARK			
KWØB (+ KAØPDI)	493-B-12	-1550	
West Island ARC			
VE2CWI	488-B	-1542	
Barrie ARC			
VE3GCB	528-B-25	-1540	
Clarksville ATS			
KF4L (+ KA8OGM)	562-B-25	-1538	
Sleepy Hollow Badgers			
W8SJK	365-B -6	-1536	
Carlsbad, New Mexico ARC			
NE5U	454-B-12	-1536	
Lawisville Texins ARC			
KN5N	459-B	-1520	
University of Massachusetts ARA			
N1XZ	395-B -8	-1508	
Cranford ARS			
W82CLW	422-B -8	-1498	
Central Carolina ARS			
WR4E	529-B-14	-1496	
Dublin ARC			
WA4HZX	473-B-22	-1486	
Kings Co. RC			
W2RAK	421-B-25	-1478	
Monsanto ARA			
WB0BBN	474-B-24	-1464	
South Baldwin ARC			
N4BWX	372-B -7	-1458	
ARC of Carrollton			
KB5A	388-B-25	-1454	
Indian River ARC			
W4NLX	287-B-12	-1448	
SIARS			
KB9SB (+ WD8OTW)	398-B-15	-1442	
Sandy River ARC			
KI1B	408-B-16	-1434	
Southwest Dallas Co. ARC			
K5HJ	404-B-50	-1410	
Irving ARC			
WA5CKF	489-B-25	-1404	
Black River Valley ARC			
W2AWB (+ N2FIJ)	376-B-15	-1398	
Forx ARC			
KE0A	490-B -7	-1388	
Friendly ARTS			
W3TV	440-B -4	-1386	
New Bern ARC			
WD4JMS			
(+ KB4NAF)	294-B-19	-1374	
Port Elgin Repeater Team			
VE3PER	473-B-14	-1360	
Queen City Emergency Net			
W8VVL (+ KA8WRH)	411-B	-1356	
Redcomseven			
W4NUS	295-B -5	-1350	
East Kootenay ARC			
VE7IP	894-C-10	-1346	
Northwoods ARC			
AA9Y (+ KA9TCD)	312-B-53	-1342	
Straits Area ARC			
W8GQN	376-B-25	-1319	
Fannin Co. RC			
W5FRC	359-B-10	-1304	
Detroit Metropolitan RC			
W8UMI	358-B -4	-1296	
Montgomery ARC			
N3BE	466-B-15	-1286	
ARPSA			
KZ8B	1079-C-14	-1280	
Fullerton RC			
W6ULI	550-B-15	-1262	
Lake Success RC			
W2YKQ	470-B-12	-1260	
Headwaters ARC			
NØCRO	364-B -6	-1254	
Yellowhead ARC			
VE6YAC	319-B -8	-1254	
GEARS			
W6RHC (+ KA6WBR)	220-B -5	-1244	
Blue Valley ARC			
WAØHOU	412-B-20	-1224	
Jackson RC			
NY4T	353-B-15	-1224	
Mt. Baker ARC			
K7SKW	396-B-25	-1216	
Mid-State ARS			
NF4S	402-B -9	-1204	
York RC			
W9PCS/9	451-B-15	-1202	
Non-Club Group			
N4YX	450-B -3	-1200	
Kent Co. ARC			
W3HZW (+ KA3MIY)	475-B-15	-1182	
Chas. E. Newton Jr. ARC			
K4HYB (+ KB4JMP)	273-B-20	-1182	
Ascension ARC			
WB5KKM	540-B-22	-1180	
Orange ARC			
W5ND	254-B-14	-1176	
Quad Co. ARC			
WA3UFN/3			
(+ KA3MUJ)	332-B-22	-1170	
Jefferson Co. ARC			
WA2TOJ	429-B-18	-1158	
RS of Norwich			
At1D (+ KA1MRV)	292-A-12	-1156	
Columbia-Montour ARC			
KF3Y	387-B -6	-1138	
Sperry Radio			
KM7Y	350-B-15	-1136	
Glastonbury Civil Preparedness			
Amateurs			
K1SSO (+ KA1JKQ)	321-B -9	-1134	
Indianapolis Red Cross RC			
WA8LGQ	416-B-20	-1132	
Key West ARC			
KA4TTS (+ N4IMI)	529-B -6	-1126	
Golden Crescent ARC			
W5DUO	296-B-26	-1124	
Quaboag Valley RA			
KQ1N	416-B-14	-1122	
Jupiter-Tequesta Repeater Group			
K4ZRP (+ KB4CWF)	316-B-18	-1122	
West Essex FD Group			
WA2LWT	343-B -4	-1118	
Kauai ARC			
KH6LG	575-C-28	-1102	
Oshkosh ARC			
N9AOT	387-B -5	-1074	
CHY-WY-RC			
W7NE	364-B-12	-1074	
Lake Co. ARS			
WG6Y	336-B	-1050	
VE2ABO Et Amis			
VE2ABO	204-B -7	-1036	
Mid-Willamet ARC			
NK7A (+ KA7ULL)	216-B-30	-1028	
Great Falls Area ARC			
KC7OA (+ KA7VIU)	321-B-17	-972	
Big Island ARC			
AH6P (+ WH6BDD)	250-B-27	-972	
Chehalis Valley ARS			
WA7UHD			
(+ KA7RNF)	257-B-26	-964	
MARC			
WØUAW (+ NØCMD)	237-B-12	-958	
Eaton Co. ARC			
K8GWW	364-C -6	-945	
Cedar Mountain ARS			
WB7UAO	270-B -8	-942	
CRA Rigaud			
VE2CAN/2	205-B-25	-942	
River Cities ARA			
KK4Y	271-B-15	-934	
Lake ARA			
K4FC	359-B-15	-920	
BEARS			
K7NWS	249-B -7	-908	
Neptune ARC			
N2GT (+ WB2TZJ)	203-B-20	-906	
Chilliwack ARC			
VE7AFA	235-B-16	-904	
Santa Fe AMC			
W5FKP	145-B -8	-904	
Camp Whatheheck			
WA5UZB	146-B -3	896	
Triangle ARC			
W4LEN	237-B-12	-892	
K-BAR-A			
W7VW	330-B -7	-874	
United Airlines Mainliners ARC			
WE6M	265-B -8	-866	
Borderline ARC			
KE7GW	490-B-21	-856	
Alamogordo ARC			
K5LRW (+ KA5WFC)	453-C-15	-858	
HTTY-AMSAT Houston			
NF5K	251-B -9	-844	
Mt. Pleasant ARC			
WØMME	802-B -6	-835	
Charter Oak Wireless Soc			
K8CH/1	217-B -3	-822	
Hub City ARC			
KAØFIF	240-B-15	-812	
Clearwater Valley ARC			
KA7EAH	174-B -6	-810	
Matanuska ARA			
KL7JFU	229-B-12	-788	
Kings ARC			
WF6N (+ KB6FNI)	277-B-35	-782	
Prince George's Wireless Assn.			
K3CEZ (+ KA3NBR)	151-B-12	-780	
El Dorado Co. ARC			
W6AJJ	262-B-14	-772	
ARA of Bremerton			
W7VE	171-B -9	-762	
Wareham ARC			
N1CFV	267-B	-734	
KD7YA Repeater Users Group			
KD7YA	228-B -8	-689	
Chelsea Communications Club			
WA8ORR			
(+ KA8VGN)	200-B -7	-650	
Cape Ann ARA			
W1RK	180-B-25	-642	
Collier Co. ARC			
K4FA	94-B-16	-614	
Uklal ARC			
N6CQH	205-B -8	-612	
Last Mountain RC			
VE5LM	180-B-11	-608	
Hyland Communications Assn.			
KW1J	152-B -9	-606	
Hualapi ARC			
WA7LAZ	185-B -6	-570	
Tennessee Tech ARS			
WA4UCE	149-B -7	-500	
Pioneer ARC			
WØRCH	118-B -6	436	
Purdue ARC			
W9YB (+ KA9SJY)	98-B	-422	

2A Commercial

AR Transmitting Soc.		
W4CN	1930-B-15	-5815
Ottumwa ARC		
NØSM	1398-B -9	-4346
Order of Boiled Owls		
W2AO	2739-C-12	-4167
Sumter ARA		
WA4UMU	1264-B-25	-2952
Rowans ARS		
W4EXU (+ KB4HJR)	676-B-26	-1778
Parking Lot Attendants		
VE3OLP	576-B -4	-1574
Bedminster Far Hills ARC		
NE2P	418-B -6	-1556
Ancaster RC		
VE3DDK	451-B -7	-1508
SPARK		
K3CSG	676-B -6	-1452
West Morris Wireless Soc		
KS2M (+ KA2TDE)	477-B-20	-1318
Rock River RC		
W9TCH	514-B -8	-1280
West Cum ARC		
VE1WRC	235-B-23	-944
Altavista Area ARS		
WA4ISI (+ N4IMD)	212-B-14	-770
Zero-Beaters ARC		
WAØFYA	535-C-11	-735
Henry Co. ARC		
KJ9G	247-B-27	-712
Sundown Emergency Repeater Assn.		
KD5AE	224-B-10	-604
Non-Club Group		
KD7YD	248-B	-496
San Francisco RC		
W6PW	127-B-30	-400
Tishomingo ARC		
KX5I	149-B-14	-318

3A Battery

Chehaw ARS				
K4HAV	3252-A	22-18	100	
Barnesville Area ARC				
W8FYF (+ N8EKR)	1703-A	-48	-12,765	
The A-Team				
W4RRW	905-A	-11	-9590	
Anne Arundel RC				
W3VPR	1274-B	-35	-8095	
FDARTS				
WA6EUZ	673-A	-4	-7197	
North Bay ARA				
K6LI	426-A	-8	-4475	
Oregon Tualatin Valley ARC				
NI7E (+ KA7TAC)	1397-B	-50	-4230	
Naval Postgraduate School ARC				
K6LY	1063-B	-45	-3524	
Madison ARC				
W9EFU	1000-B	12	3218	
Bloomington ARA				
KZ9H	437-A	10	-3125	
Mammoth Cave ARC				
KD4SS	904-B	-16	-2902	
Lincoln Co. ARC				
K7PQ (+ KA7PLI)	921-B	-16	-2584	
Top of Panhandle ARS				
K5IS	208-A	-5	2430	
Algonquin ARC				
KK1B	539-B	-15	-2198	
Raleigh/Mid-South VHFA				
KI4I	402-B	-34	-1858	
Milford (MI) ARC				
W8YDK	491-B	-15	-1766	
Livermore ARK				
AD6X	458-B	-18	-1470	
Kennedy Family				
W8ZCG	244-B	-3	-1244	
Branch Co. ARC				
WD8KAF	282-B	-20	-964	

3A

Central South Carolina DX Assn.				
AA4V (+ KA4WIW)	3881-B	-18	-11,318	
Dallas ARC				
W5FC (+ KA5TXL)	4221-B	-46	-11,138	
Poughkeepsie ARC				
N2YL (+ KA2SEL)	3168-B	-40	-11,002	
Ashtabula Co. ARC				
W8CY (+ KA8WIL)	3188-B	-20	-10,520	
SCORE				
K2XR	3267-B	-14	-8850	
Split Rock ARA				
K2RF (+ KA2UXQ)	2605-B	-73	-8356	
ABARC				
W1UC	2478-B	-25	8154	
Shreveport ARA				
W5AU (+ N5HUP)	2584-B	-40	-7736	
Enfield RA Group				
N1SR (+ KA1LIV)	2345-B	-28	-7000	
Albuquerque DX Assn.				
N5RR (+ KA5RDX)	2330-B	-16	-6974	
Springhill, LA ARC				
N5II (+ KA5VAD)	2317-B	-21	-6796	
Schaumburg ARC				
K9NO (+ KA9RZV)	2182-B	-21	-6552	
HFEA ARC				
K8QEH	1909-B	-24	-6484	
Lakeland Community College ARC				
WA8SBC (+ KA8UTP)	1771-B	-10	-6474	
Lake Monroe ARS				
NE4I	1713-B	-41	-6444	
Putnam Emergency ARL				
K2AV (+ KA2TNM)	1961-B	-25	-6082	
IBM ARC				
N4TL	1584-B	-32	-6012	
Elgin ARS				
W9IKN (+ KA9SRK)	1774-B	-20	-5974	
Department of State ARC				
W3DOS	1806-B	-13	-5940	
Columbus ARA				
W8TO/8	1891-B	-21	-5878	
Palo Alto ARA				
W6OTX	1955-B	-21	-5814	
Southern Peninsula ARC				
W4MBD (+ N4IIC)	1826-B	-48	-5798	
Paso Robles ARC				
W6LKF	1678-B	-24	-5656	
BARC				
W8DK (+ KA8TOS)	1452-B	-15	-5658	
SCARS				
KB8Z	1912-B	-12	-5528	
Band DIT-DAHs				
K2MP	1739-B	-15	-5452	
Billerica ARS				
NT1C (+ KA1MBU)	1344-B	-20	-5448	
North Shore RA				
W1ND (+ N1CSI)	1614-B	-48	-5292	
Rome RC				
W2OFQ (+ KA2NDP)	1506-B	-20	-5078	
Griz's Gang				
K2SA	1374-B	-20	-4994	
CODEX				
N1CC (+ KA1IAX)	1541-B	-10	-4918	
IARC				
N8II	1413-B	-16	-4838	
Ephrata ARS				
W3AD	1423-B	-28	-4752	
Tri Co. ARA				
KS9O	1298-B	-12	-4712	
Midstate ARC				
KM9S	1622-B	-22	-4642	
Cowichan valley ARC				
VE7CVA	1323-B	-27	-4530	
Surrey ARC				
VE7SAR	1226-B	-19	-4472	
Kishwaukee RC				
WA9CJN (+ KA9TGB)	1163-B	-30	-4424	
San Mateo RC				
W6LMN (+ KA6HWV)	1140-B	-32	-4386	
Valley Forge Mtn. FD Gang				
N3KZ	1463-B	-20	-4346	
Chattanooga ARC				
W4AM	1830-B	-53	-4330	
Greater Fairfield ARA				
WB1CQO (+ KA2OGQ)	1289-B	-27	4320	
Chicago Suburban RA				
K9BY (+ KA9TII)	1460-B	-39	-4304	
Davenport ARC				
W0BXR	1418-B	-45	-4238	
Great Bay RA				
WB1CAG (+ KA1MMC)	1407-B	-27	-4234	
St. Charles ARC				
N0GL	1500-B	-25	-4232	
Trident ARC				
N4EE	1629-B	-35	-4228	
Capeway RC				
K1BU	1358-B	-25	-4214	
Kilocycle Club of Ft Worth				
K5LP	1171-B	-23	-4212	
SLURP				
KC8PR	1334-B	-12	-4118	
Coastside ARC				
WA6TOW	1790-B	-9	-4090	
Club Sherham				
VE2ZW	1064-B	-12	4076	
Non-Club Group				
KN9K	1248-B	-12	-4028	
Highland ARA				
NE8V (+ N8FSQ)	1273-B	-11	-4016	
CVARC				
W2UXC (+ KA2IMM)	1222-B	-17	-3998	
General Dynamics ARC				
W5IU	1428-B	-125	-3952	
Falls ARC				
K9RHH	1190 B	-20	-3924	
Livingston ARC				
KW8G/8 (+ KA8WAX)	1089-B	-20	-3900	
Framingham ARA				
W1FY	858-B	-15	-3874	
Jayhawk ARS				
W0LB (+ N0GAB)	997-B	-16	-3856	
Argonne ARC				
W9GVE (+ KA9PVD)	1037-B	-20	-3802	
Calgary ARA				
VE6NQ	1041-B	-50	-3756	
Rappahannock Valley RC				
K4TS (+ KL7GLK)	1085-B	-15	-3748	
Laurel ARC				
KU3Z	1087-B	-28	-3696	
Northern Ohio ARS				
K8KRG (+ KA8VHK)	1429-B		-3672	
Santa Barbara ARC				
K6TZ (+ KA6EPF)	1004-B	-38	-3626	
Ampex Employee's ARC				
K6OEZ	886-B	-12	-3610	
Red Rose RA				
N3CC (+ WB2OOB)	1040-B	-18	-3608	
Holland ARC				
K8DAA	1120-B	-18	-3600	
Tampa Bay Area FD Group				
K4TN (+ WD4REX)	1013-B	-50	-3594	
Poway ARS				
K6CD	1003 B	-22	-3538	
Conyers ARG				
N4CI	1053-B	-45	-3528	
Ada ARC				
NG5G	1097-B	-20	-3518	
Chip Hills ARC				
KA8T	1075-B	-12	-3497	
Sioux Falls ARC				
W0ZWY	978-B	-18	-3478	
Shiawassee ARA				
W8OQO	1332-B	-10	-3456	
JPL ARC				
W6VIO	925-B	-45	-3454	
MARA				
W8DYY	1178-B	-48	-3394	
Yuba Sutter ARC				
K6AAW	1084-B	-21	-3394	
Watertown ARC				
N9HR	1146-B	-20	-3392	
BARS				
W4DU (+ KB4MPZ)	923-B	-40	-3376	
North Hills ARC				
W3XX (+ N3EJC)	964-B	-35	-3352	
North Ottawa ARC				
KC8P	2015-C	-23	-3291	
HCRA				
W1NY (+ KA1NBS)	827-B	-24	-3270	
Green Co. Chp of 10-10 Int'l Net				
N5FER (+ KA5TMG)	935-B	-10	-3212	
Teays ARC				
KO8D	915-B	-23	-3178	
York Outsiders				
KA3KOL	743-B	-6	-3168	
Dayton ARA				
W8BI (+ KA8TNT)	857-B	-23	-3146	
Marin ARC				
W6SG	733-B	-30	-3136	
Port City ARC				
W1WQM	894-B	-15	-3096	
Long Island DX Assn				
K2ON	917-B	-12	-3080	
Hot Springs ARC				
WA5BRF (+ KA5VIN)	1334-B	-31	-3068	
Fairview Contest Club				
KB3A	1079-B	-5	-3032	
Eastern Oregon ARC				
W7NYW	1302-B	-9	-3024	
Campbell Co. ARC				
W7HNI	1042-B		-3022	
Mahaska ARC				
W0PUR	1098-B	-8	-3016	
Bill Gremillion Memorial ARC				
K4SEX	994-B	-19	-2994	
Lincoln Trail ARC				
W4SEJ (+ KA4TPE)	1059-B	-23	-2980	
Tri-Town RAC				
W9VT	815-B	-25	-2944	
Mt. Vernon ARC				
K8EEN	850-B	?	-2934	
Sonoma Co. RA				
W6LFJ (+ N6IIY)	750-B	-20	-2902	
South Bay ARC				
WA6AHL	783-B	-8	-2874	
Waterbury ARC				
K1EB	979-B	-35	-2840	
Manchester RC				
KE1C	791-B	-8	-2818	
Charlotte ARS				
K4IA	750-B	-18	-2814	
Ottawa Valley Mobile RC				
VE3JW	984-B-28		-2972	
Area Repeater				
KE9I	848-B	-5	-2758	
McHenry Co. Wireless Assn.				
KD9I	1143-B-12		-2738	
Mt. Vernon ARC				
KX4W	946-B-21		-2738	
TARA				
KI3D	1127-B	-7	-2732	
Naperville ESOA				
N9RF	761-B	-8	-2706	
Delaware Co. ARA				
W3UER	711-B-10		-2692	
Cochise ARA				
KO7H	735-B-25		-2666	
Aroostook ARA				
AD1G (+ KA1KME)	908-B-34		-2630	
Adams Co. ARC				
K9UR (+ KA9ORN)	830-B-15		-2612	
Gelac ARC				
WA4QPL	692-B-36		-2586	
Wayne Co. ARC				
K4CYP (+ KB4MQE)	910-B-30		-2576	
Marshall RC				
W0BMJ (+ KA0UIJ)	919-B-20		-2574	
Penn-Mar RC				
W3MUM (+ KA3MMS)	868-B-15		-2574	
Macon ARC				
W4BKM	1021-B-28		-2558	
Scotland ARA				
K8AAR	1000-B-20		-2512	
Brazos Valley ARC				
ND5F (+ KA5WJB)	653-B-32		-2486	
Star-LPA				
NN5S (+ KA5PAY)	412-B-15		-2474	
Echo RA				
K9BTB (+ KA9SUW)	811-B-15		-2460	
Blackstone Valley ARC				
W1DOD	812-B-15		-2448	
MTARA				
kx1F (+ KA1GPU)	670-B-16		-2442	
Delta ARC				
W4BS	848-B-15		-2438	
Findlay RC				
W8FT (+ KA8PMK)	700-B-27		-2438	
Great South Bay ARC				
K2TV (+ N2FIM)	611-B	-3	-2420	
South Central Indiana ARC				
N9BUC (+ KA9MZV)	725-B-21		-2408	
PVARC				
W3GOS	772-B-10		-2388	
South Georgia ARC				
WI4F	1207-C		2382	
Nutley ARS				
W2GLQ	798-B-16		-2364	
Osage Co. RC				
W0NSW	661-B-16		-2352	
CFB Gagetown ARC				
VE1JO	730-B-10		-2348	
20/9 ARC				
W8BOO	690-B-12		-2348	
Tri-City ARC				
W9VQN (+ KA0UND)	532-B-36		-2250	
Kalamazoo Co. RACES				
NK8X	630-B-13		-2226	
Pike Co. ARC				
WB9GZH	520-B-14		-2222	
Mississippi Coast ARC				
W5CH	698-B-24		-2208	
GE Evendale ARS				
K8LUC	562-B	-9	-2166	
AC-ARTS				
W9INX (+ KA9LTV)	866-B-28		-2144	
Willmer Area EAR				
W8SW	745-B-25		-2128	
Bay Area ARC				
KS8K (+ KA8LDF)	662-B-15		-2124	
Non-Club Group				
VE3RAT	670-B		-2102	
PART of Westford				
KA1BM	564-B		2096	
Clark Co. ARA				
W8OG (+ KA8WNJ)	638-B-16		-2092	
Laval Laurentides				
VE2CFA	492-B-10		-2088	
Inter City ARC				
W8WE (+ KA8WCB)	497-B-20		-2082	
West Seattle ARC				
W7AW	447-B-12		-2080	
OMIK Cincinnati Chapter				
KY8E (+ KA8KTE)	566-B-18		-2068	
Parkland RC				
VE5PRC	929-B-15		-2058	
Raliegh ARS				
W4DW	671-B-18		-2038	
Portland ARC				
W7KYC	593-B-23		-2014	
Manatee ARC				
K4GG	655-B-10		-2002	
Tri Co. ARC				
KA0ILO	675-B-10		-1982	
Pasadena RC				
W6KA	687-B-10		-1964	
Mid-Atlantic ARC				
WB3JOE (+ KA3NXM)	581-B		-1924	
Atchinson ARC				
NB0Z	365-B-12		-1912	
Kankakee ARS				
W9AZ (+ KA9SCE)	597-B-18		-1904	
Silvercreek ARA				
WD8PNF	555-B-25		-1898	
Clinton Co. ARC				
W9PC	531-B-11		-1890	
Northern Alberta RC				
VE8NC	497-B-20		-1855	
Boonville ARC				
NC2O (+ KA2SJG)	469-B-10		-1848	
AR Caravan Club				
W5HD	206-B-15		-1846	
RA of Greater Syracuse				
W2AE (+ KA2UDO)	382-B-35		-1826	
North Shores ARC				
K8HAI	538-B-20		-1810	
OCARC				
KB2MK	509-B-10		-1802	
Fossil Creek Wireless Society				
K9MK	582-B-20		-1794	
21 Repeater Group ARC				
W9WM9 (+ KA9SKE)	650-B-15		-1764	
Elkhorn Valley ARC				
WA6BRE/6	577-B-22		-1754	
Evergreen ARS				
W7KQI	466-B-12		-1750	
North Shore RC				
KX9O	545-B-10		-1748	
Placentia Radio Watch				
WB6DCC (+ KA6TOG)	453-B-18		-1738	
HCARA				
K4RX (+ KB4BEX)	478-B-42		-1730	
Monterey Park RC				
K4GIP	650-B-20		-1718	
Niagra RC				
W2QYV	671-B-23		-1688	
TNCRC/RSSARC				
W1SYE	448-B-24		-1668	
Dauphin ARC				
VE4NVF	398-C		-1659	
SHARC				
N4US	315-B-25		-1632	
ARC of El Cajon				
WA6BGS (+ N6FRX)	489-B-40		-1626	
Mobridge Area ARC				
W0YMB	336-B	-8	-1618	
Austin Area ARC				
W0AZR	528-B-10		-1608	
Jamestown ARC				
W8FX	377-B-12		-1588	
White Water Valley ARC				
K9KY (+ KA9TKO)	519-B-13		-1586	
MASER				
K8HF	554-B-25		-1582	
Ebonaire ARS				
WA2OGR	639-B-18		-1580	
Non-Club Group				
N1CF	637-B	-7	-1568	
Preble ARA				
KR8F	462-B-24		-1562	
Richmond ARC				
VE7RAR	461-B-12		-1552	
Kendall ARS				
KE5GL (+ KA5WJY)	386-B	-9	-1548	
Hartford Co. ARA				
W1NEM (+ KA1LHJ)	597-B	-9	-1536	
Tulare Co. ARC				
WA6BAI (+ KB6FEK)	324-B-18		-1524	
East Bay ARC				
W6CUS (+ KB6EJL)	241-B-35		-1518	
Pawnee ARC				
AF0N (+ KA0TWA)	379-B-25		-1494	
Tri Co. ARA				
W2LI	641-B-20		-1486	
High Plains ARC				
W0GGP	439-B	-5	-1478	
Fayette ARA				
WB8ZLT	416-B-15		-1460	
Miami Co. ARC				
K9ZEV	338-B	-8	-1458	
De Vry ARC				
KO9R	509-B-11		-1418	
Flint Hills ARC				
W0HT	505-B	-6	-1412	
MSOE ARC				
W9HHX	555-B	-7	-1410	
Milwaukee ARC				
W9RH	1028-C-37		-1400	
Denver RC				
W0TX	493-C	-9	-1386	
Cumberland ARC				
K3IEC	574-B-12		-1384	
Central Vermont ARC				
W1BD	579-B-25		-1374	
San Gabriel Valley RC				
W6QFK	371-B-32		-1356	
Briarpatch Mt. ARC				
N4VL	938-C		-1315	
BEARS/0				
WD0CCW	291-B-20		-1294	
3M ARC				
WB0BQG/0	697-C-16		-1246	
Cattaraugus Co. ARES				
KA2ODA	309-B	-8	-1237	
Anchorage ARC				
KL7AA	252-B		1198	
Montachusatt ARA				
W1GZ	493-B-12		-1178	
Cascade RC				
W7EK	404-B	-7	-1176	
Owatonna-Steele Co. ARC				
KC8NB	254-B-16		-1178	
Sweetwater ARC				
WB7UWY (+ KA7UMR)	299-B-13		-1164	
LVSRA				
W3EIA	351-B	-7	-1160	
Grant Co. ARC				
W9EBN	343-B-21		-1160	
Sierra ARA				
NM5Y	378-B-10		-1156	
Panoramaland ARC				
W7JTR	324-B	-9	-1148	
Tri-Lakes ARC				
N8GW (+ KA8UTQ)	350-B-20		-1146	
Rockwell Autonetics RC				
WB6YPX	297-B-14		-1116	
South Towns ARS				
WB2ELW (+ KA2WKE)	610-C-24		-1097	
Catalina RC				
W7JQM	284-B		-1090	
Capitol City ARC				
NE7K	331-B-20		-1062	
Highlands Co. ARC				
WG4M	297-B-18		-1052	
Mich-a-Con ARC				
W8HFS	475-C	-8	-1024	
Crazy FD Crew				
KC8YI	394-B-24		-1024	
Prince Edward Island ARA				
VE1PEI	649-C-20		-1023	
Mayes Co. ARC				
KC5FM	248-B	-6	-1014	
Cape May Co. ARC				
AE2Y (+ KA2YDT)	188-B-12		-1010	
South Texas ARS				
NO5Z	257-B-14		-984	
Tioga Co. ARC				
WB3IPW	432-B-22		-964	
Valley of the Moon ARC				
N6KM	254-B	-8	-950	
Robeson Co. ARES				
KS4S	218-B	-8	-924	
Abbotsford Emergency ARC				
VE7ECC	327-B-10		-902	
AR River Valley ARF				
K5PXP	233-B-15		-890	
Lockheed ARC				
WA6GFY	167-B	-9	-836	
Southern Nevada HR Group				
K7SN	223-B-46		-798	
Non-Club Group				
K9IOH	228-B-12		-774	
National Trail ARC				
K9UXZ	289-B	-8	-690	
Rock Point ARC				
VE5TT	147-B	-3	-678	
Cass Co. ARC				
W9VMU	103-C-11		-606	
Houston ARC				
W5DPA	132-B-15		-596	
Drumlins ARC				
WA2AAZ	191-B-17		-584	
Iron Range ARC				
NE8Y	153-B	-9	-576	
Kings Co. RA				
K2GJ	261-C-18		-561	
Newington ARL				
KU7G/1	116-B	-8	-532	
Northern Peninsula Electric Club				
W6PMK	306-C-18		-423	
Wheat Straw RC				
K5GBN/5	55-B	-5	-310	

3A Commercial

RA of Western New York				
W2PE	1116-B-12		-3758	
Green Co. ARA				
NB9B	952-B	-5	-2736	
Rappahannock ARA				
AA4GL (+ KB4KOR)	794-B-16		-2088	
West Side RC				
VE3JJJ/3	567-B	-8	-1854	
Somerset Co. ARC				
KB3VH	456-B	-6	-1470	
Scotland Co. ARS				
WB4ERO	469-B-14		-1296	
Western Arizona RC				
KD7PS	485-B-14		-992	
Northwest AREA				
KG8I	322-B-12		800	
Bishop ARC				
WI6S	202 B		-648	
Keowee-Toxaway ARC				
WA4MIY	223-B-10		-550	
Grene Co. RC				
W5BJR	209-C		-239	

4A Battery

Central Oregon ARC				
K7OMT	788-A	-8	-2365	
Silverado ARS				
W6CO	611-B-10		-2225	

An old trolley car was the operating quarters for the Forx ARC (KEØA, 2A).

The Winchester Gun Club was the site for the Santa Barbara ARC's 1985 Field Day (K6TZ, 3A).

Cenols ARC
K9HGX 204-B -8 -866

4A

Cherryville RA
KJ2NJ (+KA2WFO) 4150-B-32-14,544
Texas DX Society
K5DX 4377-B-32-13,444
Pilgrim AWA
K1BL (+KA1KDH) 4038-B-24-11,488
Northwest ARC
W9LM 3457-B-28-11,160
Kettle Moraine Radio Amateurs
N9KS 3358-B-26-10,846
Hamfesters RC
W9AA (+KA9EXP) 3436-B-36-10,502
Scottsdale ARC
K7TR/7 2962-B-29 -9258
Fort Wayne RC
W9TE (+KA9SEK) 3036-B-27 -9026
United AHC
K6AA 2758-B -8950
Huntsville ARC
K4BFT 2321-B-50 -8168
Eastern Connecticut ARA
K1MUJ (+KA1MPG) 2329-B-20 -8132
Ozaukee RC
W9WQ (+KA9QLP) 2436-B-35 -7848
Old Barney ARC
N2OO (+WB2JPY) 2318-B-40 -7688
Joliet ARS
W9OFR (+KA9KMC) 2264-B-40 -7648
OH-KY-IN ARS
K8SGH (+KA8URP) 2965-B-26 -7612
Alamance ARC
K4EG 2679-B-40 -7454
Delaware-Lehigh ARC
W3OK (+KA3MNY) 2585-B-35 -7416
Pentagon ARC
K4AF (+KB4FAS) 2406-B-20 -7186
Double Cheese No Onion
W8MRE 2030-B-11 -6622
Metuchen ARC
K2YNT (+WA2HHX) 2477-B-40 -6526
Gainesville ARS
N4EC (+KB4MHH) 1731-B-30 -6288
Oakland Co. ARS
W8TNO (+KA8WKI) 2262-B-26 -6276
Reservoir ARA
K8QYL (+KA8PJB) 2142-B-30 -6240
Fox River RL
W9CEQ 2369-B -6132
North Florida ARS
W4IZ (+KB4NTI) 2013-B-66 -6106
BARS
AF9M 1721-B-20 -5992
Two Rivers ARC
KS9R (+KA3JJT) 1992-B-30 -5976
West Allis ARC
W9FK/9 2074-B-14 -5960
Saginaw Valley ARA
K8DAC (+KA8WCG) 1906-B-33 -5914
Suffolk Co. RC
W2DQ 1583-B-14 -5594
Greater Lawrence ARF
W1FW 1373-B-30 -5562
Stateline ARC
K2LSA 1707-B-12 -5526
Palomar ARC
W6NWG 1911-B-44 -5218
Carthage ARS
WØLF 1425-B-35 -5020
Van Wert ARC
W8FY (+KA8NSG) 1712-B-21 -4894
Allegany Highlands ARC
W2SAM (+KA2OVS) 1464-B-17 -4864
Mid-South ARA
W4EM (+KB4LOL) 1267-B-45 -4692
Whitman ARC
WA1NPO (+KA1MAX) 1080-B-23 -4534
York ARC
W3EDU (+KA3NAM) 1345-B-30 -4512
Orange Co. ARC
W6ZE (+KB6FZV) 1290-B-35 -4480
Portage ARC
N8MC (+KA8WBL) 1306-B-25 -4358
Riverside Co. ARA
W6TJ (+KA6ENG) 1396-B-45 -4154
Portland AWA
W1KVI 1224-B -4118
Middle Tenn ARS
W4UOT (+KB4NGR) 1228-B-30 -4092
Hazel Park ARC
W8JXU (+KA8WBQ) 964-B-20 -3930
Bryan ARC
N5TC (+KA5FPT) 1012-B-25 -3904
Anaheim ARA
K6SYU 1174-B-30 -3878
Tri State ARC
AK9M 1253-B-30 -3750
Kokomo ARC
W9XX/9 1186-B-49 -3662
Arizona ARC
W7IO/7 1165-B-25 -3636
North Shore ARC
VE3NSR 1179-B-23 -3628
Overlook Mtn. ARC
N2EK 997-B-12 -3626
Simi Settlers ARC
K6FM (+KB6FWB) 996-B-17 -3538
Parma RC
K8UZW (+WD8MHL) 1121-B-20 -3358
Arlington ARC
W4LMW 815-B-20 -3320
Hamilton ARC
VE3DC 1255-B-25 -3310
Everglades ARC
W4VSI (+KB4ONG) 769-B-35 -3288
Bellevue ARC
WØWYV 1049-B-17 -3276
Lower Columbia ARA
W7DG (+KA7OOV) 837-B-20 -3264
Ocean State ARG
W1XJ (+KA1NDZ) 1137-B-20 -3214
Tahoe ARA
NX6W 963-B-89 -3184
Atlantic Co. ARCs
K2BR 817-B-45 -3182
Hazelton ARC
W3SJI 845-B-30 -3072
Lincoln ARC
KØKKV 1185-B-75 -3034
Austin ARC
W5KA (+KA5UXC) 857-B-20 -2974
Bluff ARC
WØBIU 734-B -9 -2920
Hope Valley ARA
KC1G 880-B-28 -2842
Sarasota ARA
W4IE (+WB3EMQ) 628-B-20 -2774
Bedford Co. ARS
K3NQT 934-B-10 -2760
Iroquois Ford ARS
WB9TAH (+KA9MNY) 812-B-12 -2652
Hogan's Heroes
KA1BED 833-B-12 -2644
Midland ARC
W8KEA 828-B-26 -2630
Delaware ARC
W3SU/3 756-B-15 -2622
Tri-County ARC
NA4T 748-B-24 -2564
SOBARS & ARES
K6QHQ (+KB6GHT) 569-B-21 -2524
Durango ARC
N5SJ 576-B-14 -2500
Flambeau ARC
KQ9J 973-B-12 -2496
McMinnville ARC
KX7M 656-B-15 -2438
Jersey Shore ARS
W2DOR 731-B-19 -2388
Greater Norwalk ARC
KV1A 608-B-27 -2382
Wayne AR Technical Society
KA8D 1049-B-20 -2108
Peninsula ROS
KB3MT 616-B-17 -2300
Seneca RC
W8ID 557-B-15 -2294
GARC
W6RAG (+KB6INO) 708-B-15 -2274
Reginald Fessenden Memorial ARC
VE3RFM 855-B -8 -2248
Spokane Radio Amateurs
W7NBR 643-B-12 -2228
Sandusky Valley ARC
W8NGK (+KA8WBJ) 575-B -8 -2228
Southside-Wecomo ARCs
WØIE 1124-B-12 2218
Susquehanna Valley ARC
K3ARR 982-B-17 -2212
Central Valley RC
N5FA 980-B-10 -2176
Western Piedmont ARC
K4VLY 556-B-10 -2136
Mankato Area RC
WØWCL 708-B-25 -2118
Juneau ARC
KL7GPG 1078-C-20 -2109
Victor Valley ARC
K6QWR 461-B-10 -2072
Southern Sierra ARS
K6RL (+KB6HXW) 370-B-18 -2056
Fredericton ARC
VE1ND 656-B-10 -2016
Rantoul ARA
W9ZK 667-B -7 -1988
Wythe ARC
K4OXN 733-B -8 -1966
Chesco ARA
K3BKG 698-B-11 -1874
Eagle Rock RC
KX7C (+KA7UAH) 401-B-14 -1870
Olympia ARS
KD7N 680-B-30 -1860
Okaw Valley ARC
W9KXQ 1033-B-25 -1844
Tri-County ARC
W9MQB 422-B-10 -1810
Goodrich HS ARC
K9NC 639-B -6 -1784
Muscatine ARC
KEØY 665-B-15 -1720
Champaign Logan ARC
W8EBG 402-B-12 -1622
Springfield Independent RA
KB8WV 587-B-18 -1620
BRATS
KC3DO 438-B-20 -1586
Chicago ARC
W9CAF 522-B-30 -1554
Island Co. ARC
W7PN 303-B -8 -1514
AK SAR BEN ARG
WØEQU 894-C-29 -1481
Key City ARC
AE5I 371-B-50 -1472
North Platte ARC
WØGXH (+KAØTVX) 332-B-18 -1426
Meridian ARC
N4JS 403-B-14 -1372
Heart O'Texas ARC
WD5IAF 533-B-12 -1340
Lancaster and Fairfield Co. ARC
K8QIK 396-B-11 -1224
ARC de Outaouais
VE2CRO 686-C-14 -1186
Northwest Ohio ARC
WB8ULC (+KA8VLZ) 209-B-16 -1182
Germantown ARC
K4WSR 272-B -1038
St. Augustine ARS
W4WSB 222-B-16 -1018
Ardmore ARC
W5JP 222-B-22 -986
Non-Club Group
K3KW (+KA3NWM) 158-B -8 -860
VARA
N1RA 1007-B -6 -2114
Fun Loving AR Troop
WBØTHC 317-B -8 -634
Skyview RS
K3MJW 1889-B-16 -4916

5A Battery

Foothills ARC
W3LWW 1165-A-26 -7320
Western Carolina ARS
W4MOE 743-A-56 -6560
Hendricks Co. Ham Club
N9SF 1764-B-20 -6276
Santa Cruz Co. ARC
K6BJ/6 (+KB6ICN) 564-B-43 -2210

5A

Birmingham ARC
W4CUE (+KB4BED) 4358-B-99-12,776
Garden State ARA
W2GSA 3926-B-20-12,420
VARA
W4FEG (+KB4MIB) 3775 B-35-12,202
Western ARA
N6ME (+KA8WBF) 3024-B-61-10,122
Hughes Aircraft-Hasea ARC
K6ZT/6 (+KA6ODO) 2385-B-29 -8382
Providence RA
W1OP 2914-B-27 -8326
EEB Contest Club
WR4S (+N4KRR) 2774-B-18 -8326
Stu Rockatellow ARS
W8NJH (+KA8USA) 2854-B-56 -8318
Penn Wireless Assn
W3SK (+KA2UDI) 2825-B-30 -8298
Mount Diablo ARC
W6CX (+KB6FKW) 2538-B-15 -8084
Virginia Beach ARC
K4IX (+KB4MHL) 2624-B-50 -8040
Schenectady ARA
K2AE (+KA2WGI) 1899-B-50 -6914
Nittany ARC
W3YA 1988-B-24 -6500
SEMARA
K8BYI (+KA8WGL) 1888-B-25 -6164
L'anse Creuse ARC
W8PBO 2445-B-35 -5922
RCA Astro Electronics ARC
W3KM (+KA2SSS) 1755-B-10 -5730
Wheaton Community RA
W9CCU 1721-B-40 -5298
Grumman ARC
WA2LQO/2 (+N2DYE) 1439-B-65 -5232
Rockford ARA
W9AXD 1655-B-30 -5184
Morris RC
W2OYH 1290-B-26 -4664
Lake Co. ARA
K8BL (+KA8RLH) 1271-B-15 -4396
HRAC
W3UU 1338-B-30 -4394
AVCO ARC
K1BJ 982-B-11 -4310
HTC SCARS/Scott-Carver ARES
NI8X (+KB8HYP) 1439-B-30 -4288
Niagara Peninsula ARC
VE3VM 1258-B-25 -4132
SHBPAM
W3PIQ 1335-B-45 -4094
Twin Cities RC
WØZR 1395-B-21 -4062
Fort Myers Area ARC
W4LK (+KB4JWA) 1006-B-74 -3962
Indiana Co. ARC
W3BMD 907-B-30 -3678
Keesler ARC
K5TYP (+KA5UWN) 1278-B-13 -3632
Panhandle ARC
W5WX/5 (+KA5RSR) 1055-B-24 -3575
SFV-SCV-WV Triclub
W6JW (+KA6ZAP) 888-B-99 -3546
Burlington Co. RC
K2KED (+KA2YNK) 1211-B-32 3418
Rio Hondo ARC
W6GNS (+KA6NOO) 1161-B-50 -3364
Southwest Iowa ARC
WAØYRS 1330-B-15 -3332
Non-Club Group
W7VPA (+KA7MPJ) 917-B-17 -3304
Platt Co. Radio Amateurs
K9IYP 974-B-34 -3190
Elk Grove ARC
NDØW 1151-B-19 -3162
Indian Hills RC
W9ICS 952-B-15 -3122
Warren Co. RACES
NØCB 823-B-20 -2856
Raritan Bay Radio Amateurs
K2GE/2 763-B-23 -2648
Armadillo Gang
KC5UN (+KA5JVD) 726-B-32 -2642
Beaver Valley ARA
W3SGJ 592-B-75 -2596
Adams Co. ARS
N3BIA 750-B-20 -2572
Turlock ARC
W6BXN 492-B-40 -2530
DRONK
N6NR 748-B-20 -2376
Silverton ARC
K7AA 545-B-25 -2346
Pymatuning ARC
AI3N (+KA3LUH) 761-B-11 -2196
Beloit ARC
K9EP 624-B-14 -2124
Metropolitan ARC
K8NOW (+KA8UWF) 743-B -7 -2066
Southeast Missouri ARC
KØCEA 486-B-30 -1998
Mt. Empire ARC
K4AKI 669-B -6 -1996
Quality Not Quantity
W6TB 604-B -9 -1984
Beach Cities Wireless Society
K6MJ 473-B-15 -1714
Quad City ARC
W9YCR 498-B -1696
Edmond ARS
KF5E (+KA5VEK) 507-B-23 -1650
WACOM
AD3T 483-B-18 -1566
Mid Michigan ARC
KW8A 724-B-14 -1548
Geraldton ARC
VE3KRX 402-B -9 -1522
Jefferson Barracks ARC
KØZFK 767-C-15 -1367
Quannapowitt RA
W1EKT 276-B-18 -1354
Chehalem Valley ARC
K7FM (+KA7USZ) 286-B-12 -1352
Butler Co. ARA
W3UDX 434-C -1085
Baldwin Hills ARC
NY6L 263-B -1042

5A Commercial

Telephone ARC of Manhattan
WØDJS 371-B-18 -1214

6A Battery

Alameda Co. Repeater Club
W6HOR (+N6LIM) 745-A-20 -5895

6A

Cary ARC
N4NC (+N4MAR) 4018-B-37-12,222
NBS Brass
K3AA 3747-B-31-11,412
NRC and PVARC
W6CN 3425-B-50 -9736
Mike and Key ARC
K7LED (+KA7SEH) 2639-B-50 -8844
Warminster ARC
K3KT (+KA3JDK) 2879-B-40 -8834
Natchaug ARA

W1TR (+ KA1NCR) 2813-B-20 -8192
West Branch ARA
W3AVK (+ KA3KXT) 2682-B-47 -8176
TRW ARC
W6TRW 2656-B-28 -7922
Hoodview ARC
WB7QIW
(+ KA7TIX) 2405-B-53 -7476
Warren ARA
W8UTD (+ KA8WIY) 2196-B-47 7120
Discrete Components of 855
K3WJV (+ N3CUJ) 1956-B-10 -6910
South Jersey DX Group
NC2V (+ KA2WMU) 2324-B-12 -6696
Tulsa ARC
K5KW 1922-C-99 -6116
Pueblo Ham Club
KH8K 1834-B-36 -4680
Aurora Repeater Assn.
KG0A 1298-B-50 -4612
Middlesex ARS
W1EDH 1479-B-15 -4592
SCATS
WB6LRU
(+ KB6IDR) 1721-B-54 -4560
Monongalia Wireless Assn.
K8WV 1269-B-30 -4106
Kitchener Waterloo ARC
VE3IC 1400-B-15 -4020
Sagamon Valley ARC
W9DUA (+ KA9TNZ) 1042-B-20 -3456
ARA of Long Beach
W6RO 1116-B-35 -3304
Sierra Foothills ARC
K6CBP 1118-B-20 -3114
OWIN
KD5VQ 1021-B -6 -3106
Clinton ARC
W0CS 795-B-75 -2660
BARA
KM8U 531-B-11 -2550
Islander ARA
KB4GY (+ KA4DAX) 853-B -9 -2540
Adrian ARC
W8TQE 784-B-20 -2540
Empire RC
N8AY 798-B-14 -2506
Southern Berkshire ARC
W1BAA (+ KA2PHB) 812-B-12 -2468
Fort Venango MKC
W3ZIC 548-B-26 -2084
Kern Co. ARC
W6LIE/6 554-B-27 -2030
Skywide ARC
VE3DRT 963-B-20 -1573

7A

South Pickering ARC
VE3SPC 3140-B-33 -9754
Stan's Merry Men
W7NU7 3406-B -9046
London ARC
VE3LON 2363-B-50 -7044
RF Hill ARC
W3AI/3 1694-B-20 -6778
Bergen ARA
K2ZO (+ N2FAV) 1946-B-25 -6758
Combined Tioga Co. ARCs
K2OR 2194-B-15 -6692
LIMARC
W2VU/2 2087-B-86 -6256
Stamford ARA
K1GF (+ KA1MJD) 1618-B-50 -5598
Twin Cities ARC
K9CW (+ KA9OZO) 1456-B-16 -4738
North Coast ARC
KV8M 1479-B-46 -4578
San Antonio RC
W5SC (+ KA5RWK) 1560-B-64 -4446
Cuyahoga Falls ARC
W8VPU 1093-B-25 -4118
Antelope Valley ARC
K6OX 806-B-14 -2990
Rock Creek ARA
W3RCN 894-B-21 -2594
Susquehanna Co. ARC
KM3E 494-B-15 -1964

8A

Crystal RC
W2DMC 2864-B-19 -9044
Mahoning Valley ARA
W8QLY 2389-B-33 -6796
Toledo Mobile RA
W8HHF 1588-B-40 -5512
Vienna Wireless Society
K4HTA 1403-B-40 -4542
Mobile Sixers RC
W3AWA 434-B-13 -2038

9A Battery

Conejo Valley ARC
AD6T (+ KB6HKG) 1955-A-25-14,090
Scarborough ARC
VE3WE 1295-A-53-12,210

9A

Murgas ARC
K3YTL (+ KA3LVS) 3343-B-40-10,042
Four Lakes ARC
W9JZ (+ N9FET) 2836-B-45 -8830
RC of Tacoma
W7DK 2083-B-26 -6950
Triple States RAC
K8AN (+ N8FQN) 1943-B-46 -6814
Arrow/UMARC/HVARA FD Team
W8UM (+ KA8UNZ) 1057-B-30 -4534
Eastern Ontario ARC
VE3SAU 926-B-20 -3206
Walla Walla Valley ARC
W7DP 653-B-15 -2594

9A Commercial

South Waterloo ARC
VE3SWA 1177-C -1337

10A

Woodbridge Wireless
W4IY (+ KB4FRD) 5067-B-67-15,474
Clark Co. ARC
W7AIA (+ KA7SZQ) 473-B-26 -2196

13A

West Coast ARC
WG6I 1141-B-45 -4346

14A

South Jersey RA
K2AA (+ KA3NWK) 4944-B-50-15,238
Silver Strings RC
K4GSO (+ N4KIM) 2948-B-37 -9274

15A

Nashua Area RC
N1NH (+ KA1LDS) 4362-B-99-13,502

16A Battery

Nortown ARC
VE3NAR/3 2624-A-50-19,360

21A

Englewood ARA
K2ND/2 (+ KA2GMB) 65-B-15 -514

One or Two Person Portable

1B-1 opr. Battery

VE2FKZ	497-A	-4970
N8XX	311-A	-3615
N2RI	269-A	-3610
WA2MBM/3	407-A	-3430
KN1H	373-A	-3285
W9PNE	225-A	-2450
VE3HIE/3	184-A	-2040
K9EIJ	179-A	-1770
KU7I	182-A	-1680
K5ER	493-B	-1660
WD5BRR	149-A	-1590
W1XH	140-A	-1495
WA2DFI/7	107-A	-1270
NU4B	103-A	-1130
K2NH	98-A	-1080
W6SQN	88-A	-980
KR2V	92-A	-910
W1TF	222-B	-728
AC9B	240-B	-660
KA2KMU	35-A	-650
WA8NSY	53-A	-630
WA2VJL	100-B	-610
KA7CKB	69-A	-600
N6KFB	72-A	-585
WB7VSZ	161-B	-522
N0BQW	75-A	-475
KA5QAP	21-A	-410
KA0KKV	36-A	-390
KE7GR	136-B	-372
KA7GXK	25-A	-350
KA1HDU	58-B	-332
KB7TZ	10-A	-300
W3GPR	90-B	-280
WD9ILG	52 B	204
W6RKX	4-A	-120

1B-1 opr.

W4NW/8	734-B	-3036
K1PAD/1	861-B	-3022
K0MAT	696-B	-2658
NJ7M	215-A	-2250
K2TB	352-B	-1614
N7ETC	274-B	-1296
KD7ZZ	575-B	-1250
WB5MTU	672-B	-1142
WA3KEY	253-B	-1010
N2MR	226-B	-968
N1DBK/1	155-A	-880
WB4RJO	273-B	-746
KC9DL	227-B	-710
WB8ULZ	118-B	-672
N8EVD	65-B	-630
N3DXJ	245-B	-598
KA0TFS	148-B	-592
KA1LMR	123-B	-592
WB7VSZ	161-B	-522
KA7OVN	172-B	-474
KB9PA	122-B	-344
WA6BAN	112-B	-324
KA0UAM	53-B	-212
WB7RPU	56-C	-56

1B-1 opr. Commercial

WO4J	358-B	-1040
KA4RVA	46-A	-212

1B-2 oprs. Battery

WA9IRV (+ KB8NI	698-A	-7180
W6UE (+ WA6OTU)	551-A	4945
W0KEA (+ KA0LRW)	486-A	-4715
KE5FI (+ N5RP)	618-B	-4025
W3NNL (+ W3JKX)	363-A	-3930
W7EL (+ K0EDI	313-A	-3330
W9VV (+ K9OQU)	283-A	-3130
W0UY (+ K0WRY)	380-A	-2755
NK8Y (+ KA8VTF)	256-A	-2660
KK7C (+ WB7BIV)	193-A	-2465
W3SO (+ W4WNY)	202-A	-2185
NA0Z (+ N0ELX)	183-A	-2030
WB8ERJ (+ KA8UGN)	289-A	-1960
WB2REI (+ WA2WPM)	162-A	-1720
VE3JRT (+ VE3JRO)	140-A	-1600
K7SS	218-A	-1485
KA8DOZ		
(+ WB9QDL)	232-A	-1360
W7MAP (+ WA6ANM)	155-A	-1200
K9UHI (+ N9CUM)	338-B	-1050
WA4CEI (+ KB4BVC)	441-B	-982
KA2NYB (+ KA2MZQ)	88-A	-960
AI1V (+ KB4SH)	301-B	-852
KU7K (+ WB7DEX)	203-B	-740
KB4IP (+ K4ENL)	54-A	-595
WB5IUG (+ WB5ISG)	230-B	-560
WB7FFI (+ WA7NTU)	84-A	-545
NB2D (+ WB2DLA)	23-A	-500
VE7DCD (+ VE7DSH)	153-B	-406
W0YBV (+ W0ANZ)	118-B	-395
N3CNJ	10-A	-300
KC8ZQ (+ N8FRU)	143-B	-286
KC4UX (+ KA5B)	51-B	-202

1B-2 opr.

K0WA/8	1541-B	-5340
K8CX (+ K3VK)	1456-B	-4790
W8TK (+ WD8AUB)	1070-B	-4780
KU8E (+ WD8IXE)	1093-B	-4144
N7AZ (+ WB7SRC)	1070-B	4070
WA4FAT (N4CBK)	805-B	-3433
K8FX (+ N5CT)	909-B	-3090
W1WP (+ AD1C)	625-B	-2716
N7AYG (+ KA7HBK)	554-B	-2616
AC8P (+ N8AAU)	597-B	-2578
W6MPH	695-B	-2472
KF8J (+ KF8K)	501-B	-2214
W0YHE (+ WA0DCJ)	886-B	-2140
NJ8Y	738-B	-2134
K3ONW (+ WB3LJK)	495-B	-1946
WA6FSF (+ WB6JJE)	600-B	-1882
VE2QST	267-B	1508
W1HBP (+ WB1FAW)	561-B	-1430
VE3ITJ (+ VE3JTO)	330-B	-1390
K8TK (+ K8MJZ)	1003-C	-1003
KB1PL (+ KA1LBM)	441-B	-982
KU3F (+ N3EBK)	292-B	-914
WA4ZZU (+ WA4RDD)	296-B	-892
KF0D (+ KB0JM)	344-B	-660
N0EKK (+ KA0TEE)	270-B	816
AD9M	301-B	716
KB6UY (+ N6ERT)	194-B	-588
WB4WBL (+ N9FEY)	123-B	-346
W5UEA (+ W3UBQ)	79-B	-159
VE2XL (+ VE2XS)	15-B	-130

1B-2 opr. Commercial

VE3DAP/3	787-B	-3324
W0SG/0	341-C	-341

2B-2 opr. Battery

N3AC (+ WA2SOC)	800-A	-5970
KI4LH (+ AA4BZ)	1084-A	-5820
N7CE	734-A	-5335
KG9Z	375-A	-2736
NA2K (+ NA2J)	772-B	-2669
WB6LRV	703-B	-1952
WI6M (+ WB6NKJ)	420-B	1888
KA1ITX (+ N1CRE)	140-A	-1725
W6RCP (+ KA6TUK)	189-A	-1600
KD8QK (+ N8FVZ)	203-A	-1359
WB8TEI (+ WB8JAY)	293-B	-1186
WG6K/0 (+ N0BHT)	243-B	-1002
WB8HQS	204-A	-708
KA4EPS (+ N4GFB)	190-B	580
KJ7B (+ WA7UHJ)	99-B	-544
N1DEA (+ KA1MDG)	155-B	-512
WA9NJU	20-A	-100

2B-2 opr.

K8GIV (+ K8BQI)	1031-B	-3152
AA4JI (+ KB4JRB)	840-B	-2286
KD4YY (+ KA4RQB)	739-B	-1862
W3OI (+ N3ETI	515-B	-1762
N2APB	332-B	1474
N5EZJ (+ N5GFE)	278-B	-1112
KF6YU (+ KA6RAQ)	417-B	-1034
K7IHW (+ KA7QAH)	150-B	-1000
WA9TXB (+ N0CTU)	418-B	-840
N0ETR (+ WB0TNW)	164-B	-566

2B-2 Commercial

VE3AUI (+ VE3GAM)	204-B	-720
WB2VLM (+ N1AMA)	16-B	-52

Mobile Stations

1C

K4IIEE/MM	674-B -3	-2482
K8IXC	233-A -2	-2330
W6JI	638-B -4	-2252
K4OU/4	224-A -1	-2240
VE3JKC/3	167-A -3	-1670
W3NZ	410-B -1	-1640
K2UFA/5	452 B -1	-1500
N6ESV/MM	189-A -7	-1015
KP4U	252-B -4	-1008
KJ1O	267-B -1	968
VE3MGY	240-B -2	960
N6BMP	159-B -1	718
N6RZ/7	161-B -1	568
KU3J	136-B -2	-532
N6IGI	250-B -1	-500
KC8N	226-B -4	-464
N0EUL	91-A -1	455
NN7A/5	100-B -1	-400
KS8U	73-B -1	-392
NA8R	160-B -1	-320
N8COQ	156-B -1	-314
VE5RO	137-B -2	-274
KH6CF	57-B -1	228
KA5J	105-B -2	-210
N6FMF	64-B -1	-210
K1DII/MM	25-A -5	-139
KC7YE/M	56-B -1	-122
K1EM	53-B -1	-106
WJ4X	23-B -1	-92
K2HVM	51-C -1	53
W6SX	10-B -1	-40
NB8L	7-B -2	-14

2C

K0GFM	339-A -4	-678
VE0MJN	102-B -1	-374

Home Station Commercial Power

1D

AI6V	1087-B -2	-3402
WA5ZUP	1505-B -2	-3010
WB8KKI	776-B -4	-2868
KJ0B	1649-B -3	-2697
KA9HVM	719-B -4	-2208
KC0XK	847-B -1	-2198
N2DLM	512-B -1	-2048
K6TQ	561-B -2	-1782
KR3C	665-B 1	-1624
N5AAH	384-B -2	-1516
KA4NOO	594-B -4	-1188
K5HM	325-B -1	-1122
WA8RXI	242-B -1	962
KB6JK	898-C -1	-903
K6ZN	294 B -1	848
W2DW	261-B -1	-822
KD2HE	246-B -1	-790
N8FTJ	393-B -1	-786
KB9E	248-B -1	-756
KD9U	299-B -6	-752
W9CHD/9	374-B -1	-748
KI4KJ	343-B -1	-686
W8IZV	122-B -1	-636
KB4OP	301-B -2	-602
K9GDF	342-B -1	-542
N5GKM	235-B 1	-536
W8EQ	261-B -3	-522
KA8DXX	235-B -4	-518
N0FFZ	129-B -1	518
WD8HSD	257-B -1	-514
WA5IYX	202-B -1	-404
KT3F	397-C -1	-397
K1TW	119-B -1	-396
K6CSL	222-B -1	-366
VE6BKP	96-B -2	-384
W8IZS	93-B -1	-371
W1QK	202-C -1	-348
N3GZW	172-B -1	-344
N2EOZ	51-B -1	-344
W1SOX	85-A -1	-340
WA7BTZ	102-B -1	-325
KA9PGD	102-B -1	-294
K4CSH	282-C -6	-291
K4ZOX	65-B -1	-258
WB4PBS	143-C -1	-253
N1CGL	121-B -1	-242
K1BZ	81-B -1	-228
W9REC	70-B -1	-225
WB2EAV	56-B -1	-220
W5MW	79-B -1	-218
KA1DSQ	106-B -1	-212
VE4ACF	64-B -1	-212
WA5RMM	74-B -1	-198
WA8GFR	98-B -1	-196
W8VEN	95-B -1	190
KD8LL	97-B -1	-184
WA2EHV/1	58-B -1	-184
W6VB	76-B -1	-152
N5GDP	74-B -1	-148
KA8VZZ	73-B -1	-146
KB4HGV	65-B -1	-130
KA9RRW	29-B -1	-116
W0KAV	52-B -1	104
KA3OAX/N	23-B -1	-92
KA7NOC	21-B -1	84
AA5EE	75-C -1	-78
N6MD	20-B -1	-76
NQ5X	25 A -1	72
WL7AZB	71-C -1	-71
KH6WX	34-B -1	-68
W9UIX	33-B -1	-66
W1YO	25-B -1	-52
WA1PLK	23-B -1	-46
WA6HVX	45-C -1	45
N8CCC	19-B -1	-38
W3GN	17-B -1	-38
N5ZR	15-B -1	-36
WA3LGG	15-B -1	-30
N3CZB	12-B -1	-24
W6PFE	12-B -1	-24
KB4IFE	6-B -1	-24
W7PSS	9-B -1	-18
KS8Q	8-B -1	-16
WD6CQH	5-A -1	10
WA3MGN	7-B 1	7

2D

W3JZH	1064-B -6	-2978
W1NHS	916-B -2	-2828
W9YH	992-B -5	-2228
KJ6H (+ KA6UWU)	746-B -6	-2088
WD6DJY	309-B -2	-780
WD4U	377-B -4	-772
K5CB	269-B -6	-654
KD6SA	270-B -3	-640
NX6M	119 B -1	-142
K3NA	148-C -2	-295

3D

W7JBN	459-B -5	-1316
KA3LRQ	322-B -3	-873

6D

Steel City ARC		
W3KWH	603-C-18	-828

Home Station Emergency Power

1E Battery

N4IV	404-A -2	-3880
KT5D	225-A -1	-2250
K3II	686-B -1	-2142
N7ARE	364-A -2	-2055
WA2JXJ	402-A -1	-2010
K8CV	204-A -1	-1775
N9DHX	305-A -1	-1525
WD9AEU	136-A -1	-1230
W8JOO	387-B -1	-1230
NK4Q	298-B -1	-1148
W7TVF	114-A -2	-1140
W8JMM	117-A -1	-1120
N5BF	107-A -1	-1070
NS6X	70-A -1	-1000
WA4WAX	147-A -1	-870
W5USJ	89-B -1	-748
W8YVK	149-A -1	-745
VE7RG	238-B -1	-704
KZ1L	140-A -1	-700
WD9EGW	64-A -1	-640
N9DBV	311-B -2	-622
WB1DQT	245-B -2	-504
WD8GVY	48-A -1	480
N9ESH	226-B -1	452
W7DFO	71-A -1	-450
K1BTD	97-B -1	-388
WK4C	181-B -1	372
AC7A	37-A -1	-370
VE3OAT	159-B -1	318
K2KGJ	27-A -1	-270
N7DCO	61-B -3	-222
N5GWF	106-B -1	-212
KA9CUT	36-A -1	-180
KC4YN	19-B -1	-38
KL7DG	1-A -1	-5

1F

N5DSK	1165-B -3	-3298
NF7P	1178-B -2	-3384
K9ZO	2419-C -1	-2632
KW5T	1296-B -4	-2592
K9SH	1206-B -2	-2518
W1DA	477-B -2	-1908
W9ZW	558-B-12	-1892
AA4BQ	458-B -1	-1832
W2WOE	449-B -1	-1718
W1KEE	401-B -1	-1604
K6LL/7	1211-C-14	-1398
KA5LAQ	633-B -7	-1366
W6PRI	310-B -1	-1208
WB3HYZ	488-B -2	-976
W2THU	362-B -8	-938
KA1JOD	256-B -1	-526
WA6OSX	127-B -1	-508
KC8VS	124-B -1	-248
K2VX	52-B -1	-208
KA2VXM	98-B -1	-196
WB7UJY	38-B -1	-76

2E Battery

KA7CKU	231-A -3	-1158

2E

AA4S	2505-B -5	-7902
W8AA/9	2724-B -5	-7400
N5FX	906-B-10	-3472
W4NT	1383-B -8	-3028
K5QBM	1043 B-27	-2584
WD4IIO	444-B-14	-1764
N8HC (+ KA8GDX)	513-B -3	-1388
KI0S	444 B-12	-1260
K9YHB	366-B -8	-1042
N9ERF	347-B -2	-848
W7PXL	307-B -7	-726
KC8R	177-B -2	-514

3E

W1FM	1190-B-14	-3872
W2ODV	327-B -9	-676

Checklogs

J73D, AE1X, N1AA, K1JP, W3EXP, W3PHV, K3RYA, N4LS, N5HOX, N7GQU, W7LQU, NE9A, W9XU, VE1CBF, VE3OMU.

Rules, ARRL 10-Meter Contest

The rules for this year's 10-Meter Contest are the same as last year's. Keep in mind that a phone QSO is worth two points, and each CW contact is worth four points. A bonus is provided for each Novice/Technician contact; such contacts are worth eight points each.

Official entry forms are available from ARRL Hq. for an s.a.s.e. If you need log sheets for more than 200 QSOs, please include one extra unit of First Class postage for each five sheets ordered.

Rules

1) **Object:** For amateurs worldwide to exchange QSO information with as many stations as possible on 28 MHz.

2) **Contest Period:** Second full weekend of December (December 14-15, 1985). Forty-eight-hour period; all stations operate no more than 36 hours. Starts 0000 UTC Saturday; ends 2400 UTC Sunday. Listening time counts as operating time.

3) **Categories:**

(A) *Single Operator:* One person performs all operating and logging functions. Use of spotting nets (operator arrangements involving assistance through DX-alerting nets, etc.) is not permitted.

(1) Mixed mode (phone and CW)
(2) Phone only
(3) CW only

(B) *Multioperator:* Single transmitter, mixed mode only. Those obtaining any form of assistance, such as relief operators, loggers or use of spotting nets.

4) **Contest Exchange:** (A) W/VE stations (including KH6/KL7) send signal report and state or province (District of Columbia is a separate multiplier). (B) DX (including KH2/KP4, etc.) transmit signal report and serial number starting with 001. (C) Maritime or aeronautical mobile stations send signal report and ITU Region (1, 2 or 3). Novice and Technician stations sign /N or /T.

5) **Scoring:**

(A) QSO Points: Count two points for each complete two-way phone QSO. Count four points for each complete two-way CW QSO. Count eight points for QSOs with U.S. Novice or Technician stations (28.1 to 28.2 MHz only) — signing /N or /T. Higher class licensees: Remember that your power limit in this segment is 200-W output!).

(B) Multipliers: Fifty U.S. states (plus District of Columbia), Canadian call areas (VE1-8, VY1, VO1-2), DXCC countries (except the U.S. and Canada), ITU regions (maritime and aeronautical mobiles only).

(C) Final Score: Multiply QSO points by the sum of states/VE call areas/DXCC countries/ITU regions. Example: WB5VZL works 2539 stations, including 1633 phone QSOs, 896 non-Novice CW QSOs, 10 Novices, for a total of 6930 QSO points. He worked 49 states, 10 Canadian call areas, 53 DXCC countries and a maritime mobile station in Region 2 for a total multiplier of 113. Final score = 6930 (QSO points) × 113 (multiplier) = 783,090 points.

6) **Miscellaneous:**

(A) Call signs and exchange information must be received by each station for a complete QSO.

(B) No cross-mode contacts; CW QSOs must be made below 28.3 MHz.

(C) Mixed-mode single operator and all multioperator stations may work stations once on CW and once on SSB.

(D) Your call sign must indicate your DXCC country (K6LL in Arizona need not send K6LL/7, but K1JD in Hawaii must send K1JD/KH6).

(E) One operator may not use more than one call sign from any given location during the contest period.

(F) All entrants may transmit only one signal on the air at any given time.

7) **Reporting:**

(A) Official forms are recommended (available for an s.a.s.e. or two IRCs from ARRL Hq.).

(B) Logs must indicate time in UTC, mode, call and exchange for each QSO. Multipliers should be clearly marked in the log the first time worked. Entries with more than 500 QSOs must include cross-check sheets (dupe sheets).

(C) Postmark your entry by January 15, 1986.

8) **Awards:** A certificate will be awarded to the highest-scoring single-operator station (in each category) from each ARRL Section and DXCC country. Top multioperator entries in each ARRL Division and each continent will receive certificates. Additional certificates will be awarded as participation warrants.

9) **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 or her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications: Excess duplicates and call sign/exchange errors. See January 1985 *QST*, page 72, for complete details.

Rules, ARRL 160-Meter Contest

The rules for this year's "Top Band" contest are the same as last year's. As was the case last year, DX stations will send signal reports only.

Official entry forms are available from ARRL Hq. for an s.a.s.e. If you want enough log sheets for more than 300 QSOs, please include two units of First Class postage. Good hunting!

Rules

1) **Object:** For amateurs worldwide to exchange QSO information with W/VE amateurs on 1.8-MHz **CW only.** DX-to-DX QSOs are not permitted for contest credit.

2) **Contest Period:** 2200 UTC December 6 until 1600 UTC December 8. Forty-two-hour period with no time limitation.

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) **Contest Exchange:**

(A) W/VE: Signal report and ARRL Section.

(B) DX: Signal report. Country name is obvious from the prefix. Send ITU Region if maritime or aeronautical mobile.

5) **Scoring:**

(A) QSO Points: Two points for QSOs with amateurs in an ARRL Section. W/VE stations count five points for DX QSOs.

(B) Multipliers: ARRL Sections plus VE8/VY1 (maximum of 74) and DXCC countries (W/VE participants only).

(C) Final Score: Multiply QSO points by multiplier. Example: K1MM works 357 stations, including 13 DX stations, and has a multiplier of 67. His score would be 753 QSO points [344 × 2) + (13 × 5)] multiplied by 67 for 50,451 points.

6) **Adherence to Band Plan:** W/VE stations may transmit only in the segments 1800-1825 and 1830-1850 kHz, in conformance with the ARRL band plan.

7) **Reporting:**

(A) Official forms are recommended (available from ARRL Hq. for an s.a.s.e. or two IRCs).

(B) Logs must indicate time in UTC, call and exchange. Multipliers should be clearly marked in the log the first time worked. Entries with more than 200 QSOs must include cross-check sheets (dupe sheets).

(C) Postmark your entry by January 8, 1986.

8) **Awards:** A certificate will be awarded to the top-scoring single-operator station in each ARRL Section and DXCC country, and to the top-scoring multioperator stations in each ARRL Division and continent.

9) **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 or her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications: Excess duplicates and call sign/exchange errors. See January 1985 *QST*, page 72, for complete details.

Contest Corral

Conducted By Billy Lunt, KR1R
Assistant Contest Manager, ARRL

NOVEMBER

2-3

ARRL November Sweepstakes, CW, Oct. *QST*, page 88.

ARRL International EME Competition, Part 1, Sept. *QST*, page 86.

International Police Association Contest, Oct. *QST*, page 91.

6

West Coast Qualifying Run, 10-35 WPM, at 0500Z Nov. 7 (9 P.M. PST Nov. 6). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3590/7090 kHz. Underline 1 minute of the highest speed you copied, certify that your copy was made without aid and send it to ARRL for grading. Please include your full name, call sign (if any) and complete mailing address. A large s.a.s.e will help expedite your award or endorsement.

9-10

European DX Contest, RTTY, Oct. *QST*, page 91.

Silver Jubilee Contest, Oct. *QST*, page 92.

Delaware QSO Party, sponsored by the Delaware ARC, from 1700Z Nov. 9 until 2300Z Nov. 10. 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. 15 to Charlie Sculley, AE3H, 103 E. Van Buren Ave., New Castle, DE 19720.

12

W1AW Qualifying Run, 10-35 WPM, at 0300Z Nov. 13 (10 P.M. EST Nov. 12). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Nov. 6 listing for more details.

16-17

ARRL November Sweepstakes, phone, Oct. *QST*, page 88.

18

W1AW Qualifying Run, 10-35 WPM, at 2100Z (4 P.M. EST). See Nov. 12 listing for more details.

23-24

ARRL International EME Competition, Part 2, Sept. *QST*, page 86.

CQ World Wide DX Contest, CW, Oct. *QST*, page 91.

29-30

Georgia SSB Anniversary Party, sponsored by the Georgia SSB Assn. from 0000Z Nov. 29 until 0400Z Nov. 30. All bands, SSB only. Work Georgia SSB Assn. members—ask for member ID number. For certificate, work 5 members (GA stations work 15 members). The GA station with most contacts wins a plaque. Send logs before Dec. 31 to Richard Turk, Sr., N4DOM, P.O. Box 373, Rutledge, GA 30663.

DECEMBER

3

West Coast Qualifying Run, 10-35 WPM, at 0500Z Dec. 4 (9 P.M. PST Dec. 3). See Nov. 6 listing for details.

6-8

ARRL 160 Meter Contest, this issue, page 103.

TOPS Activity Contest, sponsored by TOPs International, from 1800Z Dec. 7 until 1800Z Dec. 8. CW only, 80 meters. Single-op stations must take one 7-hour break; multiop stations may operate the entire 24 hours. Classes are single operator, multi-operator and single op-QRP (5 W or less input). Frequencies are 3.500-3.585 MHz. The lowest 12 kHz are reserved for DX contacts. Exchange RST and 3-digit serial number. TOPS members also give their membership number. Count 1 point for QSOs with own country (each call area in W, VE, VK, PY, U and JA counts as a separate country). Count 2 points for QSO with own continent. Count 6 points for each QSO with another continent, and count 2 bonus points for QSOs with TOPS member (TOPS members get 3 bonus points for QSOs with other members). For final score, multiply total points by the number of prefixes worked. Participation certificates for North American entries. Send logs before Jan. 31 to Bertil Arting, SM3VE, Bergesvegen 26, S-823 00 Kilafors, Sweden.

11

W1AW Qualifying Run, 10-35 WPM, at 0300Z Dec. 12 (10 P.M. EST Dec. 11). See Nov. 12 listing for details.

14-15

ARRL 10 Meter Contest, this issue, page 103.

26

W1AW Qualifying Run

Special Events

Conducted By Billy Lunt, KR1R
Assistant Contest Manager, ARRL

Brenham, Texas: The Brenham ARC will operate NS5N, **Nov. 1-3**, from the swapfest and garage sale at the Washington County Fair Grounds. Operation will be on 21.125 and 21.360. QSL via BARC, Box 44, Brenham, TX 77833.

Ochopee, Florida: The Fort Myers Area ARC will operate a special-event station from the smallest U.S. post office on **Nov. 2-3**. Operation will be phone and CW on 80, 40 and 20 meters. Special QSL for s.a.s.e. to Fort Myers ARC, P.O. Box 4814, Fort Myers, FL 33918.

Anoka, Minnesota: The Anoka County ARC and Emergency Services will operate WØEG from 1500Z **Nov. 2** until 0300Z **Nov. 3** to commemorate Anoka as the birthplace of the civic celebration of Halloween and the Halloween capital of the world. Suggested frequencies: CW—3.725 7.125 14.045; phone—3.910 7.240 14.285. Special QSL for s.a.s.e. to WØEG.

Hines, Illinois: The Hamfesters RC will operate K9WFN from 1500Z **Nov. 10** until 0300Z **Nov. 11** in observance of Veterans Week from Hines VA Hospital's "Robert K. Wade Memorial Ham Shack." Frequencies: 7.260, 14.260, 144.210 USB, 146.430 FM. For certificate, send QSL and 9- × 12-in s.a.s.e. to Hamfesters RC, c/o Robert K. Wade Memorial Ham Shack, Hines VA Hospital, Hines, IL 60141.

Newington, Connecticut: The Armored Forces AR Net will operate from 0000Z **Nov. 10** until 2400Z **Nov. 11** to commemorate Veterans Day. Suggested frequencies: SSB—3.870 7.283 21.375; CW—7.065; 2 m. For certificate, contact any net member and send no. 10 s.a.s.e. to Peter Kohanski, WB1DWR, 16 Berkley Cir., Newington, CT 06111.

Dunfermline, Scotland: The Dunfermline ARS will operate GB2ACC **Nov. 11-25** to celebrate the 150th anniversary of the birth of Andrew Carnegie. Operation will be on HF and VHF using CW, SSB and RTTY. Special QSL via R. Mackie, GM4WYR, 15 Lady Nairne Rd., Dunfermline, Fife KY12 9YD, Scotland.

Plymouth, Massachusetts: The Whitman ARC will operate WA1NPO for the 5th year from the Plymouth Plantation on Thanksgiving day, **Nov. 28**. Times and frequencies: phone—1600Z-1800Z 7.290, 1300Z-1700Z and 1900Z-2000Z 14.275, 1300Z-1600Z and 1800Z-2000Z 21.375; CW. For certificates, send 9- × 12-in s.a.s.e. via WARC, P.O. Box 48, Whitman, MA 02382.

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 Nov. 15 to make the January issue. Please include the name of the sponsoring organization, the location, dates, times(Z), frequencies and call sign of the special-event station. Requests for donations will not be published.

QSLing Special-Event Stations: To get your QSL or certificate from any of the special-event 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 self-addressed stamped envelope. If sending for a certificate, use a 9- × 12-in envelope if you want an unfolded certificate, or a no. 10 sized 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-event stations will often print their cards and/or certificates after the operation is over so they will know how many to order.

Strays

***QST* congratulates...**

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

- Ben F. Frish, W9AUO, of Bloomington, Illinois
- Philip Keast, W6DD, of Grass Valley, California
- George F. Norton, W4EEE, of Athens, Georgia
- Stanley C. Perkoski, W1BQS, of Newington, Connecticut
- Joseph H. Hausmann, W8HU, of Dayton, Ohio
- Dewitt L. Jones, W4BAA, of Captiva Island, Florida
- Robert J. Hengel, W8ONM, of Walled Lake, Michigan.

☐ Kenneth M. Gleszer, W1KAY, of Danbury, Connecticut, on receiving the Distinguished Service to Powder Metallurgy award from the Metal Powder Industries Federation.

Section News

Administered by Steven Ewald, WA4CMS

The ARRL Field Organization Forum

CANADA

ALBERTA: SM, E. Roy Ellis, VE6XC—A/SM: VE6AMM. SEC: VE6XC. STM/NM/DEC: VE6ABC. This report could be my last as VE6ABC takes over as SM next month. I wish to thank all who have assisted in the years gone by with their suggestions and ideas as well as their on the job activities. Keep the SET date Oct. 19-20 open as we intend to come up with something of interest. No EC reports this month—trust you will have much to inform VE6ABC of for his first report. 73 and God bless. Traffic: VE6CPE 64, VE6ABC 37, VE6BBI 3. (July) VE6CHK 79, VE6ABC 59.

MANITOBA: SM, Jack Adams, VE4AJE—SEC: VE4FK. NMs: VE4ANR, VE4AFO, VE4AJE, VE4VJ, VE4TE. TC: VE4ALO. ATC: VE4ADP. A big thank you to Kelly, VE4ALO, and Ray, VE4ADP, for taking on the positions as Technical Co-ordinator and Assistant Technical Co-ordinator for the Manitoba Section. Should other League Members like to take on ATC positions please contact Kelly, VE4ALO. Net activity this month: Net Reports WIN - 9 sessions 24 QNI MMN 31 sessions 842 QNI, 37 QTC MTN (CWNET) 17 sessions 133 QNI 19 QTC - CRRL phone net 31 sessions, 1014 QNI, 45 QTC. Noel Funge (VE4CF) a long time member of ARLM and other amateur organizations has left us to take up residents in Australia. Going to miss you Noel. Traffic: VE4AJE 117, VE4NE 114, VE4TE 35, VE4RO 23, VE4AAD 21, VE4AHL 14, VE4GB 10, VE4B 19, VE4CR 6, VE4DT 5, VE4PG 5, VE4MG 2, VE4PA 2, VE4AEE 1, VE4FK 1, total 365.

MARITIME-NEWFOUNDLAND: SM, Don R. Welling, VE1WF—ASM: Aaron Solomon, VE1OC. VE3FXT operated Portable XJ1 Citadel Hill, Halifax, N.S. in Aug. HARC/DARC provided Communication for Naval Cadets, Regatta, Shearwater, N.S. 23-24 August. VE1FQ interviewed on CBC/TV, 1st.Edition, Halifax. VE1CJU now VE1EK. Speedy recovery to VE1KL in hospital. Recent visitors to VE1 incl. VE3FTB, VE3JEA, VE7AMX, WA2QQ, WD4CMI, WD4OCI/MM, KA4FNP/MM; VE6BOZ, KA6OE/MM. CG9ASJ active from Canada Summer Games, Saint John, N.B. Silent Key: VE1CAQ.

ONTARIO: SM, Larry Thivierge, VE3GT—BM: VE3LST. PGL: VE3AR. SEC: VE3GV. STM: VE3BDM. TC: VE3EGO. Congratulations to Gail, VE3GSQ on earning her first BPL—now only two more to go for the bronze medallion, Gail. I enjoyed summer time eyeballs with VE3IFP and VE3BUO as each passed through town. VE3PDE and VE3KIP are the new editors of the Ottawa ARC "Groundwave." VE3AP was one of the lucky ones to work the recent space shuttle. VE3DCX is busy putting Tweed on the traffic map. The following are your NTS nets operating within the Section:

Net	Freq.	Time/Day	Mgr.
OSN*	7045	2100/Dly	VE3FGU
OLN	7.66/.06	2330/Dly	VE3GFN
OPN*	3770	0000/Dly	VE3BDM
OSN*	3667	0000/Dly	VE3CYR
KTN	7.96/.36	0200/Tue/Thur/Sat	VE3AJN
OSN*	3667	0300/Dly	VE3KK

* denotes Section Net, all times shown are in UTC. I encourage you to participate often and generate some traffic—it's a fine public service activity. A special vote of thanks to VE3GFN and VE3GNW for their technical assistance this summer. Traffic: VE3FAS 350, VE3GSQ 236, VE3KK 205, VE3GNW 118, VE3DCX 109, VE3GT 101, VE3CYR 97, VE3DPO 84, VE3AWE 71, VE3BDM 66, VE3BCZ 63, VE3GOL 61, VE3KXB 59, VE3AJN 55, VE3KCZ 53, VE3WV 45, VE3EAM 42, VE3BUO 32, VE3BAJ 24, VE3WM 10, VE3EWD 9. (July) VE3AWE 91, VE3KXB 23.

QUEBEC: Harold Moreau, VE2BP—STM: VE2EDO. BM: VE2ALE. PIO: VE2YW. TC: VE2EC. A/TC: VE2CP. MN: VE2EDO. Code and theroy classes are underway in many clubs and we should have a good crop of new hams next spring. I hope all had a good summer and are looking forward for the new season activities. Malgre la mauvaise temperature, l'epluchette de ble d'Inde de VE2MO, a ete un succes. VE2BP et VE2EKC remercient tous les amateurs aveugles et leurs guides qui ont participes a l'epluchette annuelle. Traffic: VE2EAK 162, VE2EDO 110, VE2BP 50, VE2EC 49, VE2EKC 34.

SASKATCHEWAN: SM, W.C. Munday, VE5WM—SEC: VE5CU. STM: VE5HG. TC: VE5GF. ATC: VE5XZ. BM: VE5WM. OBS: VE5JA. NMs: VE5EX—PWXM; VE5HG—SPN; VE5AEJ—RARA 2 Meter VE5AEM—MJARC 2 Meter; VE5BAF—SATN; VE5HG—SPN. VE5LU became a Silent Key on August 6th. Official opening of the RARA club station, VE5NN, took place on August 3 in the Winnipeg Street North Campus of the Wascana Institute. This was a Saskatchewan Heritage '85 project in conjunction with the Regina Hamfest. A vote of thanks is extended to VE5AEJ and his committee for a successful hamfest held in Regina August 2-3-4. Net reports: MJARC2-28 sessions 248 QNI; PWXN-31 sessions 742, RARA2-29 sessions 674 QNI; SATN-30 sessions 108 QNI 7 QTC; SPN-22 sessions 826 QNI 37 QTC. Traffic: VE5AGM 10, VE5BAF 39, VE5WM 5.

ATLANTIC DIVISION

DELAWARE: SM, Harold K. Low, WA3WIY—STM: W3DKX. SEC: W3PQ. PIO: KC3TI. PSHR: K3JL, W3DKX. About 3000 senior citizens in 57 buses from all over Delaware were in Rehoboth Beach Sept. 6. Communications were handled by SARA. A certificate of appreciation was presented to SARA by Governor Castle. Those active were KA3IXV KA3HAE K3PFW W3FKT WA3RTX W3FEG KC3JM KA3LWJ WB3HKW N3DCK KA3JFY WA3YTB. AWARE elected officers for 85-86 are Pres: N3DYC. VP: WB3DPJ. Rec. Sec: N3DXV. Publicity: K3WAJ. Director: N2RE. DTN QNI 386, QTC 47 in 22 sessions. DEPN QNI 77, QTC 16 in 5 sessions. SEN-QNI 45, QTC 2 in 4 sessions. Traffic: W3PQ 125, W3QQ 64, W3DKX 40, WA3WIY 40, WB3DUG 35, K3JL 33, KA3IXV 10, N3AXH 10, KC3JM 8, KC3FW 6. (June) W3PQ 83. (July) W3PQ 130.

MARYLAND-DC: SM, John A. Barolet, KJ3E—Assistant Technical Coordinator (ATC) is a relatively new ARRL field appointment whose function is to assist radio amateurs in solving their technical problems. The ATC communicates by radio, telephone and mail with local hams and clubs on technical topics. When the subject is beyond his knowledge, the ATC refers the problem to other ATCs whose expertise is in the proper field. Become an ATC: contact your SM for info. Chesapeake Bay Radio Assc. and Southern Maryland ARC renewed as Special Service Clubs (SSC); Goddard ARC, Laurel ARC, Peninsula Radio Operators Society, and Rock Creek ARA become SSCs. ECs KN3U, N3AQG, KA3DUE, WA3YOH, WA3TOY and others from nearby Northern Virginia, with dozens of ARES and RACES members assisting, planned and provided amateur radio communications for a National Disaster Medical System all-day exercise. KA3DUE and 25 members of the Prince George's Wireless Assc., Southern Maryland ARC and District of Columbia ARES manned a communications net for the National Veterans Wheelchair Games at the University of Maryland, College Park, for three days. EC WA3TOY and the Anne Arundel County ARES are developing a good association with the county Red Cross. KA3NAK and KA3KJO won Columbia ARA and Baltimore ARC scholarships administered by Foundation for Amateur radio. PIO KA3DBN asks clubs to submit news to him or local newspapers and radio stations for public relations. I'm sorry to report K3HFV a Silent Key on August 28. KC3D writes that 20 meters is coming alive for DX. W3FA is enjoying his escape from the SM job, but not for long; he is now Net Manager of MOD. KC3PL is leading amateur radio activity at Columbia Union College in Takoma Park. WA3YLO reports that 14 members of the Anne Arundel RC provided communications for the Annapolis Striders 10-mile race. Appointments: W3FA NM; WA3UJE, EC (Kent County); KA3DUE OES; KK3F and N3CDR, ATC, PSHR: W3FA 103, WA2ERT 102, KK3F 101, W3YVO 100, KJ3E 95, KC3Y 75, KC3AV 61. With the nets: Net/Mgr Sessions/Traffic/Average QNI: MEPN/WA2ERT 31/153/25, WRPON/WB3BFK 22/16/12. MSN/KC3Y 31/62/14, WashnCty2Mtr/KC3DW 4/1/21. Traffic: KK3F 221, KJ3E 157, KC3Y 148, W3FA 125, N3DE 113, KC3DW 98, W3YVO 92, K3NNI 55, KC3AV 55, WA2ERT 54, W3DQI 45, N3EFG 40, WB3BFK 28, KA3EWV 27, W3FZV 26, W3LDD 15, K3ORW 8, W3ZNW 6, KC3D 4, WB3FUE 3, KA3IID 2, K3MR 1.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—SEC: K2QIJ. STM: WB2UVB. ACC: K2IXE. TC: VACANT. SGL: KA2KMU. PIO: VACANT. BM: WB2UVB. OOC: WA2HEB. ATCs: N2BQT and K2JF. Special congratulations to the members of the West Jersey Radio Amateurs (WJRA) and the Gloucester County ARC (GCARC) on becoming our section's first two Special Service Clubs (SSC), respectively. Becoming an SSC requires a club to have diversified programs and an active, dedicated membership. At a recent Board of Directors meeting, it was adopted that SSC's could certify and issue the Worked All States (WAS), 5 Band Worked All States (5BWAS) and the VHF/UHF Century Club awards. Although I have no ideas as to whether either club will take on this important activity, you may want to contact them. WJRA's address is: P.O. Box 62, Burlington 08016; GCARC's address is: P.O. Box 370, Pitman 08071. While speaking of clubs, welcome aboard to the South Jersey DX Group of Pitman. SJDXG has been voted as an affiliated club by the League's Board of Directors. The Delaware Valley Radio Association's 450 MHz repeater is now on the air in the Trenton area. The frequency is 442.650 with the ID of W2ZQ/R. 73. Traffic: WB2UVB 235, WA2HEB 28, W2IML 18, KA2CQX 17, WA2MGV 16. (July) K2SB 173, N2CER 30.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—Now 54 Affiliated Clubs in Section! Welcome to Western New York DX Association. CONGRATS to both Salt City DX Association and Squaw Island ARC on becoming Special Service Clubs (now 5 SSC in WNY). They join ranks with Chautauqua AFMA, Liverpool ARC and Rochester ARA in their commitment to the many facets of Amateur Radio. WELL DONE to these communicators at the 1985 Empire State Games in the Buffalo area: AE2T AF2K BARRA Repeater AG2P K2UD BNC CYN RJ ZUW VNM KA2AXI BCE BCF BCH BIW BWG CFI CUN DCN GXS HGB HJX HQF HQJ JJI JWQ KCY KFV KLM KMT LCR MXH MXX QYA KPB RDG TGJ TPI VYW WEY YFY KB2QS XP KC2P JY VS XD YE YW KD2JW KQ KY2F ND2S N2ABA ABX ANE BNE CYJ EH FBK FFP FOR HS VIC NI2G N3AAJ N8GIE VE3NDH OQY W2BCH CUU DRN ICZ OLY PE PVL UCZ WPF YRL ZOC WA2AIV CYQ FLZ GCJ HGQ NFY PUU PYT QDV PCH TRU UGE URK VCC WPI WB2IDS IOF CBC JCB MNN NFZ OWS QZL UBE VLV ZDP ZJY. That's 105 of the 113 plus participating; sorry I missed a few in the list!

Net Name	QNI-QSP-QND	Net Name	QNI-QSP-QND
NYS/M*	300-148-30	NYS/E*	420-208-31
WDN/M*	400-071-31	JCARCN	548-008-30
Mike Farad	209-055-31	LCARES (Sn)	037-000-04
NYPON*	567-377-31	OARCN (Wed)	068-000-04
NYSPTEN	525-078-30	BRVSN	413-015-31
ESS (3590)	337-054-31	CNYTN*	290-043-31
OCTEN/E*	569-067-31	OCTEN/L*	276-037-31
Q Net	307-006-31	STAR*	014-000-05
WDN/E*	638-162-31	WDN/L*	595-130-31
Blue Line	470-064-31	Mohawk VTN	015-001-09
VHF THIN	044-000-04	NYS/L*	372-217-31

*NTS NET. WNY now has 2962 League members. W2WVC appointed ATC by Technical Coordinator K2QR. COMMS: Champlain Valley ARC sponsored shopping mall booth for PR and message service; Boonville ARC at Flat Water Canoe Race; plus bunches by RAGS and RARA. LARC sponsored Packet Radio Seminar at Liverpool. Southern Tier now has EASTNET Link via Wilkes-Barre thanks to the efforts of several including W2OW WB2LRO WA3PWX and W2GJ. Foundation of Amateur Radio Scholarships awarded to KA2IKV KA2KLM KA2KMT. W2FR has received his umpteenth Transcontinental Corps certificate from Director KN1K. ORME: anyone got any UFO reports? OBS Reports: WB2DSR WA2ZPE and K2WK Sunday Skeds 2045 on 146.88, 146.79 and Tuesday Skeds 1930 145.31 repeaters in Rochester area. Public Service Honor Roll: KA2BHR KG2D N2EVG WA2FJJ VE2FMQ WB2IDS WA2KOJ W2MTA WB2OWO ND2S K2YAI. BPL by WB2IDS who honcho'd Empire State Games. Traffic: WB2IDS 431, WA2FJJ 372, WB2OWO 296, WA2HSB 260, VE2FMQ 243, WB2QIX 239, W2MTA 224, ND2S 180, KG2D 159, K2YAI 88, KA2BHR 75, KU2N 70, W2FR 69, AF2K 59, KA2DQA 54, N2EVG 51, W2UYE 48, WA2KOJ 36, KA2DBD 30, KA2QIK 30, KA2UBX 25, WA2RXO 24, W2TZ 24, WA2OEP 10, WA2VKI 8, WB2NAO 3, KC2SJ 3. (July) N2FIZ 15, WA2RXO 8, WB2NAO 3.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB—ASM & STM: WN3VAW. SEC: WA3UFN. OO Coor: KJ3Q. PIO: WB3IZJ. SGL: K3HWL. TC: K3LR. BM: KR3P. We would like to extend our sympathies to W3EXG, XYL of W3EXC, who became a Silent Key last month. I would like to welcome AK3J who accepted the Affiliated Club Coordinator appointment for the WPA Section. All club requests should be sent through him. We can use more ORS, OOs, OBS, ATCs, etc. Please check with the SEC, TC, PIO and the SGL to find out what help they could use to get more coverage in the section. If you need any assistance in any of the above do not hesitate to call on any of the section staff for help in the areas covered. KT3L has volunteered to coordinate the VE exams in the section and would like to have dates that VEC exams will be given by section VECs. This would help to get some order and possibly keep from duplicate exams by two teams in the same time frame. The SKYWARN Director at the Pittsburgh weather station has asked me to assist him in getting a SKYWARN net established in the area covered by them if serious conditions occur. Our SEC is going to tie the WPA counties together for the purpose of passing warnings when conditions warrant a callup. I hope that this can be accomplished without too much difficulty. Please give him all the help you can. Remember that the ARES and RACES are a very important part of our hobby. I know that this is repetitious but having seen what has happened over the years we should be ready for any emergency. Traffic: W3EGK 328, KA3ETC 134, W3OKN 119, WA3UNX 80, N3FM 77, WA3DBW 77, N3EMD 58, K3NPW 52, W3KMZ 49, K3SMB 41, W3RUL 41, KC3JQ 38, W3KUN 28, W3MML 16, KQ3M 16, WA3QNT 16, KA3COX 15, W3SN 10, WB3GUK 9, K3LTV 5, W3TTN 4, N3CZW 4, KA3EGE 3.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ—SEC: W9QBH. STM: KB9X. OOC: W9TT. BM: K9ZDN. SGL: W9KPT. PIO: K9IDQ. ACC: WB9SFT. TC: N9RF. ASM: K9ORP. Congratulations this month to NG9F, formerly KB9QX, and NF9W, formerly KC9YN, on their recent upgrades to Amateur Extra. On August 8th the Hillsboro Hospital staged a mock boat wreck on Hillsboro's Glen Shoals Lake. Montgomery Co. Asst. EC WB9OVF organized the ARES group who initiated the drill by sending a report of the wreck via ham radio. ARES then provided support communications throughout the exercise. TNX to EC WA9RUM for the report. ABOVE AND BEYOND DEPT . . . Central Division Asst Director WB9YJF put in some extra hours this month in settling an RFI complaint between a HAM's mother and a CB op living next door. The CB op was operating his station in accord with the rules. It turned out that the telephone equipment that was being interfered with was at fault. Mike did an excellent job of finding the problem and helping to rectify it to everyone's satisfaction. When there is a need . . . do as Mike did, GET INVOLVED! Morgan Co. EC W9OES reports that he now has 13 ARES members. That's pretty good considering there are only about 30 HAMS in the county. Wish we could match that ratio everywhere. TC N9RF is working on antennas for 40 and 80 which have extremely high angles of radiation and are more or less omnidirectional. He feels that these should be useful on state and local HF nets when the bands are long. PACKET comes to far southern Illinois! KA9MLN has been beating the bushes and there are now three stations on PACKET in the Carbondale and south area with three more 'on the way.' When PACKET gets down here to the toolies, it's here to stay! Traffic: KA9FEZ 418, W9HLX 228, WB8RFB 195, W9JIJ 180, W9NXG 180, KB9X 115, KA9EWN 93, NC9T 90, W9HOT 84, KZ9I 64, KD9K 56, NF9W 47, ND9V 41, W9LDU 21, K9EUI 20, NG9F 17, K9QEW 16, W9HBI 16, W9JR 16, WD9HQW 15, K9EHP 12, W9KPI 12, W9VEY/M 10, WA9SID 10, NF9T 8, WB9TVD 8, K9WMP 7, WA9RUM 6, KA9RBI 5, N9ELU 5.

INDIANA: SM, Bruce Woodward, W9UMH—SEC: WB9ZQE. STM: W9JUJ. SACC: K9TUS. STC: K9PS. SGLC: WA9VQO. SOBC: KC9TA. SPIO: K9DIY. SRC: N9WB. SOOC: KJ9G. Net Managers: ITN KD9DU, QIN KJ9J, ICN KW9D, IRN KB9SU, VHF W9PMT, IWN KA9ERC. August Net Reports:

Net	Freq.	Time Daily UCT	QNI	QTC	QTR	Sess.
ITN	3910	1330/2130/2300	3172	420	2540	92
QNI	3656	1430/0000/0300	636	309	1590	92
ICN	3708	2315	75	24	520	26
IRN	3629	0000	140	70	390	29
IWN	3910	1310	1821	0	422	31
IWN	VHF	Bloomington	1205	0	237	31
IWN	VHF	Kokomo	1205	0	237	31

Hoosier VHF Nets for August QNI 5542, QTC 135. Bulletins 18, QTR 4838 in 196 sessions for 17 nets. 9RN cycle four QNI 434, QTC 499, QTR 899, ses. 62 IN 100% Stns. W9CFJ, N9HZ, KJ9J, W9JUJ, WB9OFG, WA9QCF, W9QCF, W9QLW,, WB9UYU, K9WWJ, D9RN 353 messages in 1014 minutes. IN. 90% Stns. K9CGS, W9JUJ, N9DWU KA9EIV. WA9MEJ. CAND 824 messages in 31 sessions. D9NR 100%. Stns. N9DWU, W9JUJ. Appointments: ATC WB9OFG, WD9JFC, N9CKK. OBS K9BFR, ORS WB9OFG, NM Dekalb County KA9RNY. Silent Key WB9TGK Indiamapolis. The Hancock County ARC will hold a Hamfest December 8, contact K9BRF. I would like your 1986 VE testing schedules please. Members of the Hoosier hills Ham Club provided communications for the Lawerence County Triathlon and The White River Raft Race. Participants were KC9ED,WB9EMH, K9BDI, WB9PFZ, and K9BGF. In order to avoid confusion all MARS stations who refile to section nets should put the message into amateur format. Particularly confusing are full return addresses at the beginning instead of at the end of a message, not refiling under your amateur call sign, and not giving the place of origin of the message. K9PS reports the VE test results from the Bloomington Hamfest. Pass rate 100%. From Novice to Tech: KA7TYA, WD9DJV. WD9FPN, and KA9OLK. Tech to General N9FFP and WB9HZX. General to Advanced N9FDH. Advanced to Extra N9DHX and WB9OFG. Traffic: W9JUJ 811, KJ9J 258, W9UEM 134, W9JZV 132, W9CNE 118, K9WWJ 108,

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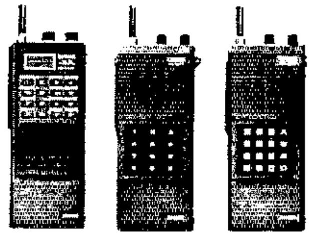

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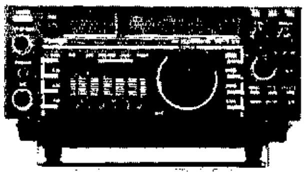

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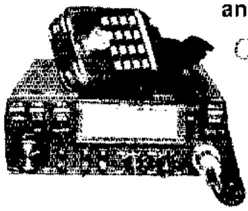

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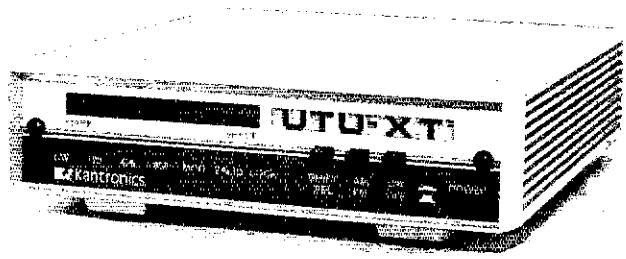

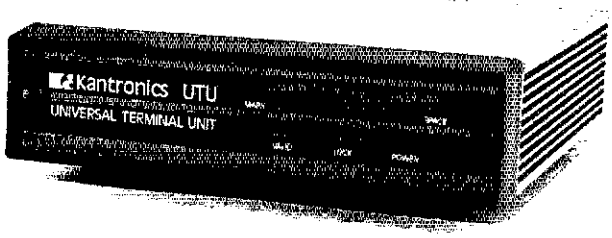

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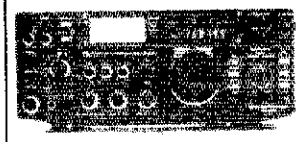

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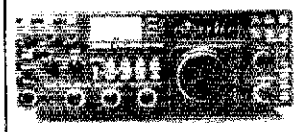

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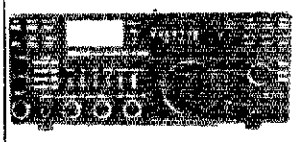

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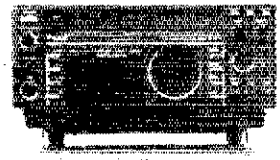

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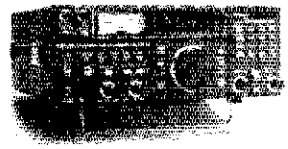

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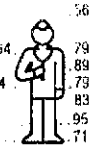

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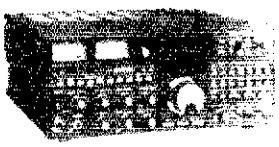

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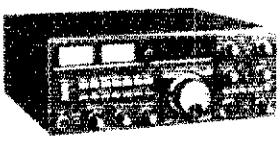

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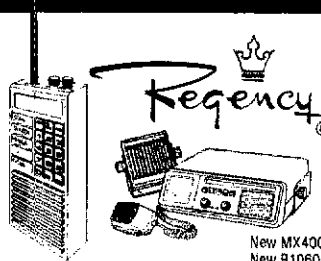

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KA9FFO 73, N9HZH 63, W9UMH 45, WB9OFG 38, KW9D 37, K9DFK 36, WB9AWI 31, K9KTB 27, KD9ER 24, KB9HH 23, WB9PFZ 22, WB9IHR 21, WA9OKK 20, W9QYY 19, N9DTG 19, KK9D 18, KA9EIV 17, WB9OZZ 16, W9BTZ 12, N9DYC 11, KK9N 10, WD9DWD 10, K9OUP 10, K9PS 10, KI9R 10, WD9CIV 8, KA9RNC 8, KW9C 8, N9DHX 7, W9OZJ 6, WD9HII 6, W9ZGC 6, W9XD 5, WD9ART 5, W9GM 5, W9BDP 4, K9SBW 4, KC9TA 4, W9EI 3, N9AST 3, K9JDF 3, W9RTH 2, WB9AJY 2, W9KMY 1, WB9TOW 1, WD9GWM 1.

WISCONSIN: SM, Richard R. Regent, K9GDF—SEC: W9OAK. STM: K9UTQ. ACC: KA9FOZ. BM: WB9JSW. OOC: NC9G. PIO: K9ZZ. SGL: AG9V. TC: K9GDF. Congratulations to newly appointed Assistant Technical Coordinators KV9U of Onalaska and KD9RQ of Madison. They may help answer your technical questions or solve RFI problems. ACC KA9FOZ reports there are 54 ARRL Affiliated Clubs in Wisconsin, which includes 4 Special Service Clubs, with the Wisconsin Experimental Radio Association in Milwaukee as the latest club to become affiliated. Radio bulletin board on 7.085 MHz, 24-hours per day, operated by N9BKJ, Taylor County Area ARC and ARES groups had packet-radio demonstration by N9BIR and have fine newsletter edited by WD9IKF. WB9MFB reports Manitowoc repeater now has link receiver at Green Bay. WNN Manager, KA9OBP, passed Advanced. BPL To KA9CPA and K9GDF. Sorry to report Silent Key KA9SMO. Remember club participation and entry in the November Sweepstakes, mark your logs accordingly. ARRL/VEC exam by CWRA November 2, contact N9JW. Ozaukee RC and Sheboygan County ARC pair to have combined meeting at Saukville on November 11th. The Milwaukee Repeater Club will hold the last Amateur Radio swapfest of the year, the 6 91 Friendly Fest, on November 24th, 8 A.M. to 4 P.M., indoors at Serb hall, Milwaukee, with free parking. See you at the ARRL table.

BWN	3984 6 A.M.	WD9IID	1239-1413-27
BEN	3985 Noon	WB9ESM	872-232-31
WSBN	3985 5:30 P.M.	WA9ZTY	898-210-31
WNN	3723 6 P.M.	KA9OBP	141-54-31
WSSN	3645 6:30 P.M.	N9BDL	181-42-
WIN-E	3662 7 P.M.	WB9IGH	250-170-31
WIN-L	3662 10 P.M.	KC9CJ	177-156-31
XPO	3925 12:31 P.M.	WA9YVC	66-14-22
NWTN	34/94 6:30 P.M.	W9JSF	612-74-31
WCWTN	31/91 6:00 P.M.	N9DHT	514-32-31

Traffic: KA9CPA 1089, K9GDF 532, WD9IID 245, N9BGF 235, KC9CJ 223, W9YCV 221, N9AUG 195, W9CBE 185, KA9OBP 179, WA9WYS 126, WD9FRI 125, W9UCL 103, WB9YPY 100, N9BDL 96, W9JSF 94, KA9BHL 81, WB9ICH 75, W9DND 72, N9DHT 69, AG9G 68, KA9RII 65, N9BCX 64, K9UTQ 59, WA9ZTY 57, K9FHI 51, WB9JSW 42, WB9ESM 41, W9IEM 34, WA9YVC 32, W9ODV 31, N9DCF 28, KA9JJY 28, KA9MSR 28, KG9B 23, KA9BHK 20, W9UW 20, K9BED 10, KV9U 9, KY9P 9, WB8RGE 6, (July) N9EAX 20, WB9NRK 4.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, KCØT—SEC: KAØARP. STM: KDØCI. August was another eventful month in Minnesota. Another nice Sunday for the St. Cloud Hamfest was experienced by all who attended. There was a nice attendance and all had an enjoyable time. Our "Ham of the Month" selection for August is Everett, WØKYG. Congratulations and keep up the good work. Mark on your calendars the annual Handi-Ham Winter Hamfest will be held Saturday December 7, 1985 at the Eagles Club in Faribault, Minnesota starting with registration at 9 AM. Activities include Handi-Ham equipment auction, dinner, and program. Talk-in on 19/79. For more information contact Don Franz, WØFIT, 1114 Frank Avenue, Albert Lea, MN 56007. The Mn. Amateur Weather Net is back on the air and looking for your participation. It comes on following the MN. Section Evening Phone Net. Again a reminder that the Mn. Section MSO is on a frequency of 3620 and operates Tue. and Thurs. evenings from 5 to 7 and Sat. and Sunday 8-12 AM. To access, use CR/LF MNMSO CR/LF. Bulletins and other information can be found on the MSO. Apologies to the following statons who were omitted from the June traffic list in Sept. QST: WDØGUF 18, KØCVD 16, NØJP 14, KAØAJF 12. Again I would like to thank all in the section for your help and participation. Good luck to KDØCI and KAØAJF on their new home and we hope to hear them on the air soon. Congratulations to the following upgrades: to Novice Matthew Smorstok; to Tech KAØUMR, KAØUUK, KAØVDD, KAØVCO, KAØUTU; To General KAØCDC, KAØSBY, KAØUBW; To Adv. WBØVFW, To Extra WDØHFF, WØKHG, KBØVU, and KØUJH. 73 till next time, de KCØT.

Net	Freq.	Time	QNI/QTC/Sess.	Mgr.
MSN/1	3685	6:30P	325/118/31	KAØEPY
MSN/2	3685	10:00P	177/53/31	NCØE
MSSN	3710	6:00P	209/18/27	KAØODQ
MSN/RTTY	3620	7:00P	87/113/12	WAØLUT
MSPN/N	3929	12:00P	529/104/31	WBØWNJ
MSPN/E	3929	5:30P	1110/144/31	WDØBGS
MNAMWXNT	3929	6:15P		KAØIZA
Piconet	3925	9:00A	3141/237/126	WDØBAC

Emergency Freq. in Section: 3929.

Traffic: WBØWNJ 402, WAØTFC 268, KAØEPY 235, KAØARP 138, WØEHI 133, KT9I 93, NØCLS 58, WAØONJ 55, KAØODQ 51, KDØCI 51, W9DM 49, KØCVD 41, NØEWA 32, WDØBGS 30, KØCVD 27, KBØWV 21, KAØAJF 19, NØJP 18, WDØGUF 16, WØHZU 16, KDØKK 15, KØOGI 13, WØZSW 7, NØCRO 6, KAØBFP 3, KØHJC 2.

NORTH DAKOTA: SM, Michael Mankey, WBØTEE—My sincerest congratulations to the Theodore Roosevelt Amateur Radio Club (Dickinson) for their successfully renewing their Special Service Club status. There are three things that distinguish this club: 1.Newest club, 2.Longest name, 3.Only Special Service Club in the state. If you want to find out the benefits of having the SSC affiliation contact WDØDAI, Glenn Johnson, in Dickinson or read QSTJune 1982 on page 62. (Glenn is the Affiliated Club Coordinator). The Superlink is indeed super. If you are in an area that is on it, give it a try. The Technical Coordinator for N.D. is WBØVHW Bill Ockert and the Section Government Liaison is Art Ekblad, KØQQ, form Minot. STM is KAØFSM, Linda Lottes. 73s.

SOUTH DAKOTA: SM, Roland Cory, WØYMB—"Ole" Johnsom, NØABE & Bob Olson, WAØFPR, ASST. SM's. KØSTF & WBØPWA will be operating in the 160 meter contest Jan. 18 &19, 1986 form the Cayman Islands. So you should check out your antennas for 160 meters or install one so you can work Jack & Rudy. Black Hills ARC published their first newsletter, send news to KAØADZ.

SD MORNING WX NET	3.960	DAILY	1300 UTC
SD MJQ NET	3.870	DAILY	1715 UTC
SD NEO NET	3.870	DAILY	0030 UTC
SD CW NET	3.650	DAILY	0000 UTC
SUNDAY MORNING NET	3.960	SUNDAY	1400 UTC
SD NOVICE NET	3.725	TUESDAY	0100 UTC

73, WAØFPR. Traffic: NØABE 62, WBØLTV 107, WBØOMF 56, WBØUEN 46, WAØVRE 92, KØZBJ 65.

DELTA DIVISION

ARKANSAS: SM, Joel M. Harrison, WB5IGF—ASM: K5UR. SEC: N5BPU. TC: W5FD. ACC: NI5D. SGL: W5LCI. Repeater Coordinator: WB5FDP. I am writing this month's news with deep sorrow and regret. One of Arkansas' most loved and respected amateurs, Don Whitney, K5DW, is a Silent Key. Don had recently been serving as the Public Information Officer, but in early years as K5GKN served as the Section Communications Manager for the state. Don's melodious voice could be heard each morning on the Arkansas Phone Net meeting the day with a big grin and thanking the Lord for another glorious and beautiful day which had dawned on the "big muddy Mississippi." No doubt, Don's memory will linger with each of us for years and years. We offer our sympathy to the family and loved ones of our very dear friend and fellow amateur, Don Whitney, K5DW.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—SEC: KA5PFB. ACC: K5DPG. SGL: KD5SL. OOC: KE5QK. TC: N5JM. The recent National Sports Festival VI held in Baton Rouge and the New Roads area benefitted from the helping hands of 70 ham volunteers who donated their time to manage traffic, dispense and advise in the use of commercial equipment and report unexpected requirements that developed during the many sports events that took place. In addition, they provided the communications links to make the opening ceremonies run smoothly. Many thanks to N5ADF, NI5B, K5SVD, KD5SL, WA5TQA, N5CPE, NV5A and the many others that helped or loaned equipment. Election of the ARRL Section Manager for a 2 year term beginning 1 Apr. 86 will be held shortly. All Louisiana ARRL members will receive a ballot. The Section Manager is a volunteer position to promote, supervise and coordinate ARRL activities within Louisiana and includes emergency communications, traffic nets, affiliated clubs, technical coordinators, bulletin stations, state liaison and publicity. Candidates must be a Technician or higher and a member of ARRL continuously for two years. Nominations are solicited in the "Happenings" Column of QST. Traffic: DRN-5 for Aug. 688 msg in 62 sessions by W5GHP. WA5LHL, K5WOD, WA5WBZ, KE5PP, KA5UWW, N5GNM, WB5UCM. KE5PP 100% 31 sessions in CAND.

MISSISSIPPI: SM, Paul Kemp, KW5T—SEC: AL7GQ. STM: KB5W. ACC: KC5VD. VHF Coord: N5DWU. Congratulations to the Hattiesburg Radio on becoming the first Special Services Club in the state. The HARC has several ongoing activities in the area of training and being supportive of the surrounding area. Look for exams to be given there in the near future. Congrats also to the Neshoba Amateur Radio Club on their recent affiliation. New appts: WD5IKD ATC VHF, K5VXV ATC lightning protection, KE5XK EC Pearl River Cty, KE5TL EC Jackson Cty. With regrets report WB5ALB as Silent Key. The MS ARRL Information Net now moved to Monday night. Hurricane Elena paid an unwelcome visit this month to the Gulf Coast. Everyone pitched in and did a fine job providing communications and other assistance. Thanks to all. Thanks to the MCARA for the opportunity to visit their Club. CAND (W5KLV) sess 31 QTC 824. RN5 (W4CJY) sess 62 QTC 564. DRN5 (WB5YDD) sess 62 QTC 688. MTN (K5OAF) sess 31 QNI 115 QTC 34. MSBN (W5HKW) sess 31 QNI 2294 QTC 74. MMN (WB5RMW) sess 30 QNI 526 QTC 6. GCSBN (W5JHS) sess 31 QNI 835 QTC 13. MSN (N4AMK) sess 31 QNI 119 QTC 19. MLEN (KE5WP) sess 4 QNI 113 QTC 0. Traffic: N5AMK 472, K5OAF 260, W5LSG 37, KW5T 13.

TENNESSEE: SM, John C. Brown, NO4O—ASM & ACC: WA4GLS. OOIAA: W9FZW. PIO: WK4V. SEC: WA4GZO. SGL: WA4GZZ. STM: NG4J. TC: W4HHK. Your Section Manager has been getting some reports of various hams taking the time to conduct some much needed orientation of non-hams as an ongoing public education of our great hobby. A case in point is WD4Q with Scouts and their leaders. This area has a great potential for recruiting some very fine quality amateurs. I am sure that there are many others as fine work going on but I have not gotten the word. Let me hear from you when this type of activity is taking place. These type of amateurs would be a great asset to the fraternity and the League. It is also hoped that all the Clubs are getting the word about the reduced membership fees for the lower and senior age amateurs. Also the refund from Hq. when a new member signs up. The refund and fees submitted through clubs will help the club treasure. The repeater split in the adjacent areas has caused problems for several of the Tennessee repeaters I am sure. A letter to the Tennessee frequency coordinator should be sent as WD4KWP will not know unless YOU the trustee or custodian let him know. Contrary to what some people think, radio signals don't know when they cross a STATE line. Hope everybody has their many antennas all repaired and in good shape for the winter and other adverse conditions as we are about in that time of the year again. The section RTTY net has gone the way of many other things as the activity got down to a very few and the net manager advised our section traffic manager that it was time to quit, unless someone otherwise wishes to try. It seems that a real goof was committed as the five major holidays were not all named in the March activity report. One was inadvertently omitted. They are New Year's Day, 4th of July, Labor Day, Thanksgiving Day and Christmas. Sorry about that. The individual station activity reports have been omitted for this and the last report. Let your SM know if you want that back. 73.

GREAT LAKES DIVISION

KENTUCKY: SM, Rose Marie Perciful, KA4SAA—Congratulations to George Wilson III, W4OYI elected Dir. great Laks Div. again for the 1986-87 term. George has done a great job and KY is proud to have our state represented through him again as Director. Congrats to our newly elected Section Manager Dale Bennett WA4JTE, 320 Loy St. Columbia, KY 42728. Dale begins his term Oct. 1. Congrats also to our new Repeater Frequency Coordinator Larry Malone KC4TX 244 Preston Ave. Lexington, KY 40505. This is not an elected or appointed position so Larry was chosed by consensus of repeater trustees. My thanks to all the trustees who replied to the memo about the new coordinator. NEW APPTS: ATC - Guy Partridge K4KZH, Louisville and ATC - Jack Wilson WA4SAC, Owensboro. Kentucklans seem to be getting more involved in Packet Radio. Thanks to WA4UMR, KD4MU, KJ4ER, KB4CF (and probably others) for traveling to clubs and hamfests presenting programs on Packet. Keep up the good work! New ARRL affiliated club - KOSAIR ARC, Louisville. Any club not yet returning their 1985 data for affiliation. Please do so - we are waiting to hear from you. B.G.A.R.S, Lexington has a new Kendecom Mark 4

repeater on 146.16/.76 sounding great.

MICHIGAN: SM, James R. Seeley, WB8MTD—You will note the changed format, in line with the latest recommendations from HQ to free up space for more significant news items. The state net directory and the section leadership roster will be listed periodically, probably quarterly. I will continue to give the reported net QNI and traffic totals monthly, just ahead of the station traffic reports, which will be limited to those totalling 20 or more. Please continue the SARs, even those with smaller traffic numbers. The info still is useful, even if there isn't room to print it all herein. ORSs are reminded that regular reporting is one of the agreements that go with your appointments. Yes, I tried something like this a while back and it backfired badly, an idea whose time hadn't come. The time *is* here now. Look at some of the other columns and see the trend. Probably not news by now, but in case you missed it, I have been declared elected for another term as your SM. I'll be with you for another two years, beginning Jan. 1 next. I trust you will help make the work as easy and pleasant as you have in the past. MI now has an Official Observer Coordinator for the first time in many months. I have appointed Dave Rasche, NJ8S, to the post. Dave, who is bringing a wealth of enthusiasm and organizational ability to the job, will welcome your interest in the OO and Amateur Auxiliary programs. Write to him at P.O. Box 1000, Ann Arbor, MI 48106. We also have a new State RACES Director, Jim Zoss, WD8DHS, of Battle Creek. Jim replaces Maury Hope, W8EMD, who served with distinction in that office for many years. Please note that this is *not* an ARRL appointment (there have been some questions), but rather is under the MI State Police Dept. of Emergency Services. Other changes: WD8PAF, DEC for the U.P.; WB8SIW, General Mgr. for QMN, replacing W8UE; WD8KQC replaces SIW as MN for the Slow Net; N8EXS, NM for VHF activities, replacing W8CUP; and KA8VOZ replaces KA8NCR as NM for MNN. Congrats and best wishes to the new leaders, with thanks to those stepping aside for their good work. SEC WB8BGY comments in his latest *EC Newsline*. "Packet radio is on the way. New stations are coming on the air almost daily. Packet is going to change the way we think about traffic handling and emergency communications ... Do you have a packet station in your county?" Do you? Let WB8BGY or me know. The annual ARPSC Workshop in Lansing was its usual well-attended success. Included was a fine hands-on packet demo, and WD8DHS gave everyone some new insights about RACES. Nets (QNI/TFC): MITN 640/233; QMN 706/222; UPN 1079/109; MACS 507/88; GLETN 932/86; MNN 259/55; WSSBN 865/29; VHF nets 550/18. Traffic: (20 & up): KA8CPS 276, AF8V 258, W8QHB 246, WD8RHU 145, KE8X 134, WD8OUO 127, NJ8S 125, KA8VOZ 125, K8GXV 114, WD8KQC 90, WD8MJB 81, WB8YDZ 73, W8IHX 66, WB8SIW 61, WA8DHB 60, WB8MTD 48, N8EXS 47, K8OCP 40, N8CNY 37, W8YIQ 31, K8UPE 31, W8VIZ 31, KA8SOF 24, WD8EIB 22.

OHIO: SM, Jeffrey A. Maass, K8ND—ASM: N8AUH. SEC: WD8MPV. STM: KF8J. ACC: K8US. BM: W8ZM. TC: KB8MU. STM: KF8J. ACC: K8US. BM: W8ZM. TC: KB8MU. OOC: AD8I. PIO & SGL: N8CVK.

Net	QNI	QTC	Sess.	Time(Local)	Freq.	Mgr.
BN(E)	289	127	31	1845	3.577	W8JMD
BN(L)	239	153	31	2200	3.577	W8BO
BNR	309	121	31	1800	3.605	W8EK
BSSN	402	262	62	0945,1915	3.885	N8AKS
ONN	146	22	29	1830	3.708	WD8KBW
OSN	284	158	31	1810	3.577	N8AEH
OSSBN	2062	795	92	1030, 1615, & 1845	3.9725	WB8MZZ
OSSN	128	59	28	0646	3.577	KA8GJV
O8MN	257	23	29	2100	50.16	WD8CTX

Hamfests: Massillon Auctiontest (Nov. 24). After ten years of service to Ohio as Section Emergency Coordinator, Ralph McDonough, K8AN, has decided to step down to allow himself time to pursue his many other projects. Ralph is a true supporter of Amateur Radio who has never conditioned his support on any thought of fame or personal gain; he has promoted our hobby out of love for Amateur Radio and the Amateur tradition. He is the driving force behind the enormous and active Triple States Radio Amateur Club (TSRAC), an ARRL Special Service Club. He is in charge of their successful Wheeling Hamfest each year. He teaches the Novice classes which have brought an incredible number of new (and many young) amateurs to the bands; the following list shows those who received their Novice licenses in August after completing TSRAC Class XXVI: KA8WXX, KA8WXY, KA8WXZ, KA8WYA, KA8WYB, KA8WYC, KA8WYD, KA8WYE, KA8WYF, KA8WYG (8 years old!), and KA8WYT. (TSRAC Class XVII is in progress at this writing). Ralph was recently named by Great Lakes Division Director W4DYI to serve as an Assistant Director. A list of Ralph's unselfish contributions to our hobby and to Ohio's ARES program would easily overrun my allocation in this column. He won't blow his own horn, you should know about this fine volunteer! The Ohio Section's ARES program can ill afford to lose the expertise and experience that Ralph has gathered in his ten years as SEC, and we are lucky to have Ralph continue within the program as District Emergency Coordinator (DEC) for District 10. Ralph, I doubt that your new-found "free time" will be free for long, but enjoy it while you can: you've earned it! I have appointed Larry Solak, WD8MPV, to serve as Ralph's successor as Section Emergency Coordinator. Larry and his wife Joanne (KJ3O) reside in Mantua near Ravenna, and their oldest son Jamie has just earned his Novice call, KA8WZQ. Larry has served as EC for Portage County, and most recently was appointed DEC for District 9. He has demonstrated a sincere concern for developing Ohio's ARES program, and has offered many suggestions which are in the process of implementation. He is the "father" of the new Ohio Section ARES Net (OSAN, Mondays, 9 PM, on 3.875 MHz). Join me in welcoming Larry to his new and challenging assignment! I'm saddened to note the following Silent Keys: K8TFL, N8BGK, and W8JHA. New appointments: N9EJO ATC; NM8C ATC and PIA; N8DGO EC Huron Cty. The Piqua ARC provided communications for the Piqua Heritage Festival over Labor Day weekend. Seventeen amateurs from Knox, Morrow, and Marion counties did likewise for their third Apple Valley Triathalon on August 18. New licensees in Marion: KA8YAG (Novice) and N8GWE (Tech). Congratulations! See everyone in Sweepstakes! Traffic: W8SO 421, K8JDI 414, W8JMD 406, K8OZ 403, W8PMJ 356, WB8JGW 329, WD8KFN 267, KD8KY 197, K8ND 196, KD8KU 183, W8QZK 153, WD8RAO 142, W8EK 140, WA8HGH 139, KF8J 124, W8SKP 123, N8AEH 112, KA8KHS 112, N8AKS 104, WA8SSI 100, N8FAZ 99, N8XX 99, KA8JTT 92, K8TVG 92, NM8I 89, WD8KBW 87, N8EFB 86, KA8TXJ 75, KV8Q 73, WA8DYS 64, NE8X 63, WB8MEK 62, KD8ZE 62, NC8Q 57, K8EF 55, KA8GJV 55, N9EJO/T 51, KD8WH 48, KA8CGF 47, K8CMR 47, W8WEG 47, WD8RIB 46, K8DXZ 45, N8EEK 44, W8MVE 43, KD8UW 42, K8AN 39, W8CXM 34, K8LOM 34, N8CW 33, KA8HBN 33, WD8QZM 33, W8ZOL 33, KD8XL 32, KA8DJZ 27, N8CJS 26, KW8X 26, WD8JYE 25, W9SWM 25.

N8FPH 24, WD8CTX 23, NI8W 23, NK8B 20, KD8IC 20, K8VOY 20, WA8HED 19, KA8TNT/T 19, KC8YV 19, NK8C 18, N8FWA 18, K8CKY 17, WB8KWD 16, W8ZM 14, WB8HHZ 13, WB8KWC 13, WB8MRL 13, KA8OQF 13, AB8P 13, WA8GMT 12, KD8WI 12, WB8RSM 11, NK8W 11, K8NJQ 10, KA8RIX 9, N8AJU 8, NF8B 8, KC8WH 8, WB8TRK 7, N8GIY 6, KA8MFH 6, N8FNP 5, WD8IKC 5, KA8THO 5, WB8NHV 4, W8OQL 4, WD8EKI 3, WD8JAW 3, KC8JI 3, KA8RBQ 3, W8DYF 2, KA8MFG 2, KC8UZ 2, W8BHL 1, WD8CSP 1, WD8NED 1. (July) W8ZM 2.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—STM: WB2MCO. SEC: AK2E. ACC & SC: N2BFG. BM: WB2EAG. SGL: KB2HQ. TC: KC2ZO. ATC: WA2VGM. ASM: K2ZM.

NET	TIME/DAY	FREQ.	NET MANAGER
ESS	2300Z	3.590	W2WSS
NYS/M	1500Z	3.677	WB2EAG
NYS/E/L	000/0300Z	3.677	WB2MCO
NYPON	2200Z	3.913	WA2KOJ
CDN	2330Z	146.34/94	WB2ZCM
HVN	0030Z S-M-T	144.535/135	
HVN	0030Z W-S	146.37/97	
SDN	0230Z	147.66/06	K2ZVI
SCRN	0100Z	147.735/135	KV2U

NETS: AESN: QNI-15 QTC-1; CDN: QNI-683 QTC-68; WSS:QNI-337 QTC-54; NYPON: QNI-567 QTC-337; NYS/M: QNI-300 QTC-148; NYS/E: QI-420 QTC-208; NYS/L:QNI-372 QTC-217; SDN: QNI-254 QTC-102. CLUB NEWS: AARA had N2YL speak in Sept. and report K2WN Silent Key. CCNR had slide presentation on Field Day. Mt. Beacon reports new officers; Pres-WA2LJM, VP-K2DPL, REC. SEC-KD2AK, Treas-K2UZS, Cor. Sec-W2DOT, Eng. Dir-WA2GZW, Dirs-WA2TIF, WA2ENM, WB2ZVI K2HJX. Rip VWARS had six meter demo. WARA heard W7KQW on moon bounce. WECA had program on hamfest. They are running Novice and Gen/tech courses for fall. Would appreciate comments on ENY newsletter. All clubs please keep N2BFG updated with info on officers etc., classes being held, exams, etc. Thanks to all for expressions of sympathy on the passing of my father. They are greatly appreciated. AUG. PSHR: WB2VUK K2ZVI K2ZM KA2MYJ W2PKY WA2JBO KC2TF WB2MCO AK2E WA2YBM. Traffic: WB2VUK 186, KC2TF 181, W2PKY 174, K2ZM 151, WB2MCO 127, KA2MYJ 111, WA2JBO 94, K2ZVI 65, KA2OPG 44, WA2YBM 42, AK2E 25, N2BFG 9.

NEW YORK CITY-LONG ISLAND: SM, John H. Smale, K2IZ—ASM/ACC: WB2IAP. SEC: KA2RGI. OOC: NB2T. TC/RFI: W2JUP. STM: WA2ARC. PIO: W2IYX. The following are traffic nets in and around the section:

NLI CW*	3630khz	1900/2200	WB2EUF mgr
NCBHF	6.45 rpt	1930 m-f	K2MT mgr
BAVHF	6.67 rpt	2000 m-f	K2YQK mgr
SCVHF	5.37 rpt	2030 m-f	W2GZD mgr
ESS	3590khz	1800	W2WSS mgr
MYS/M	3677khz	1000	WB2EAG mgr
NYS	3677khz	1900/2200	WB2EAG mgr

*Denotes section net, all times are local, please try and help out by checking in whenever possible. If anybody wants me to start listing the on the air mail boxes, please let me know and I will include them in the traffic nets listing. LIMARC is sponsoring amateur radio exams the second Sat. of each month at the N.Y. Inst. of Technology, Rt 25A, Old Westbury, for further info contact Woody Gerstner, WB2IAP,42 Mohawk Ave, East Atlanitc Beach, NY. 11561, if there are any other groups that will be holding the exams on a regular basis please let me know. Officers for Suffolk County ARC are: KA2JMA Pres., KA2LAD V.P., AC2P (again?) Treas., WB2TYN Rec. Sec., W2GZD Corr. Sec. Tu Boro has moved their weekly Wed. Night Net to their club rptr freq. of 224.08 (output), the time is still 2030 local. The Gt. South Bay ARC is setting up a practice CW net in the Novice portion of 10 meters, contact N2FKE, W2DUK or N2FIF for further info. Congratulations to the following members of Larkfield who have upgraded: KC2DH to Extra, N2DAA and WB2RYU to Advanced. Congratulations to the following Grumman members who have upgraded: W2MFN, WB2NVX and finally, WA2HSQ, all to Extra The Kings County RC is still looking into the possibility of setting up a Radio Shack on the Intrepid, if you can help please call Richard Stattield 718-376-7103, or Irv Salon 718-258-6971 Congratulations to WD2AFA on upgrading to Extra and his new call of NK2T. I hope everyone had a chance to read the 8/30/85 issue of Newsday with the article about the FCC monitoring the VHF beat channels. On behalf of the XYL, the 4 harmonics and myself, have a happy Thanksgiving. Traffic: K2YQK 157, W2GKZ 144, N2BGP 16,

NORTHERN NEW JERSEY: SM, Robert R. Anderson, K2BJG—ASM (VE liaison): N2XJ, SEC: KB2ZM. STM: KA2HNQ. OO/AA: N2WM. ACC: K2BJG. PIO: WB2NQV. SGL: W2KB. TC: K2BLA. BM: N2CXX. Appointments effective 9/1/85: From the SEC, New: K2SE DEC (Passaic), WB2HVF EC, and OES's: K2SE, K2OEE, N2EP, N2FOZ, N2XJ. W2KB, W2UH, WA2JVP, and WB2HVF. Endorsed: W2KB DEC (Hudson) EC's KA2OEE, N2EP, and W2UH. From the STM, New: WB2GMP NM (OBTTN). Endorsed: W2PSU NM (RTTY); ORS's AF2L, AG2R, K2SE, K2VX, KC2YG, N2BMB, N2XJ, NJ2Q, W2CC, WA2NPP, and WB2GMP. Help is still needed in all functional areas. If you are interested in a NNJ ARRL field appointment, please contact the applicable leadership official listed above. ASM N2XJ is making good progress in his effort to pool individual VE's and club's to maximize opportunity for amateur licensing exams in the section. Congratulations to the following who upgraded during August. At the August 10th Session of the NNJ VE Board: To Technician: Herb McDonald KA7UYE, KA2NCT, KA2VZN, KA2ZAL and KA2WPP. To General: KA2UOL, N2FRP, and KA2EDB. To Advanced: N2FRO and KA2BZS. To Extra: WB2AAO. At the August 17th session of the Ramapo Mountain ARC: To Novice: Jim Tallman, To Technician: John Howell, KA2YZO, KA2OFF, KA2OOG, and KA2YEC. To General: KA2YBG, KA2VCA, KA2UHS, KA2QCR, KA2QCY, KA2TYG, N2FNU, and KA2TFM. To Advanced: Jerry Jackowitz, K2CSY, KA2NDZ, and W2AJB. To Extra: W2DNO and WA2JSW. Welcome new ARRL affiliated club "Bedminster Far Hills ARC." Congratulations to the "Neptune ARC" and "Ocean Monmouth ARC," now designated as Special Service Clubs. The Stateline ARC Radio-Expo '85 will be held on Nov. 16th. Please note: Input to me for this column must be in at least three months prior to the month of publication in QST. Sorry to have to report Silent Key, Bob McGarvey, WB2EVF. August data:

Net	Freq.	Time	Sess.	QNI	QSP
NJM	3695	1000 Dy	31	202	74
NJPN	3950	1800 Dy 0900 Su	35	293	91
NJSN	3735	1830 Dy	31	176	54
NJN/E	3695	1900 Dy	31	275	162
NJN/L	3695	2200 Dy	30	187	102
NJVN	49/49	2230 Dy	31	273	80
OBTTN	147.12	2000 Dy	31	291	118

TCETN	147.225	1930 Dy	31	70	25	
NJRTTY	147.51	Autostart		220	156	
NJPTN	145.01	WA2SNA-1	PBBS			

UPLINK Amateur Radio News call 201-735-8550. PSHR: KA2F 175, KA2SPH 108, W2RRX 102, N2XJ 83, K2VX 72. Traffic: KA2F 368, WB2QMP 320, KA2SPH 118, N2XJ 108, K2VX 68, W2RRX 41, W2XD 35, N2DXP 11, NJ2Q 10, W2CC 8.

MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, KØCY—SEC: KDØBG. ACC: WBØQAM. PIO: NØEBA. TC: KØDAS. SGL: AKØQ. OOC: KDØRT. BM: KØIIR. Summer is over and it looks like club activities back in the full swing. Hope all clubs are participating in the ARRL Club Challenge. Send your SSC application to the ACC. Now after S.E.T., please send those annual reports to SEC and hdqrtrs, good activity again this year. Old Threshers reunion at Mt. Pleasant brought 161 hams from 17 states to sign guest book and 138 messages. EIDXA is still the ONLY 100% club! Classes starting in DSM.

Net	Freq.	Time	Day	QNI	QTC	Mgr.
75 mtr net	3970	1830-2330	Dy	1999	107	WBØAVW
TLCN (CW)	3560	0030-0400	Dy	330	111	WØYLS
ICN (CW)	3705	0200Z (8 PM)	TThS (utc)	21	2	NCØR
ITEN	3970	2330	SUN	63	9	KDØBG

It is time for us all to support the Iowa Code Net, which is turning out to be a good training net, pass the word! Ft. Madison sponsoring the Annual Radio Rodeo, promises to be a fun time. Waterloo sponsoring "Spook Patrol" and participating in Diabetes Bike Ride. DSM helping with "Love Run," Iowa Regatta. Des Moines Auction in November. Regular exams scheduled at Atlantic. Looks like MIDWEST '86 will be at Sioux City!! Traffic: WØSS 191, WAØAUX 175, WØMME 138, WDØFWB 129, KØGP 114, NØCWW 111, WØYLS 81, KØCY 64, KAØADF 51, W4JL 49, KAØGSA 37, WBØJFF 33, KØTFT 28, WBØAVW 26, KØBRE 24, KCØXL 21, KDØBG 16, WØBW 15, AI9D 9, KCØSC 6, WØFQ 2. (June) W4JL 132.

KANSAS: SM, Robert M. Summers, KØBXF—First—KANSAS has been well represented again at a Midwest Division Convention. One fourth of those attending the ARRL Forums were our most active ARRL members. Kansas nets for the month of August—KSBN 1035 QNI 171 QTC. More station activity from several spots in KS are needed. 3920 is the freq. 6:30 daily is the time and if you need more info, contact WØFRC net manager. KPN QNI 313 QTC 15. Meeting M-W-F at 0645 AM and Saturday and Sunday at 8 AM also on 3920. KWN QNI 881 QTC 694 and KMWN QNI 656 QTC 589. CSTN QNI 1613 QNI 55. QKS QNI 231 QTC 50—still needing those CW minded operators 3610 kHz at 7 and 10 PM daily. WBØZEN will be more than happy to get you off to a good start on the CW net. QKS-SS QNI 50 QTC 9 for those who have not yet got the real CW speed. M-W-F 3735 kHz at 7:30 PM local and WØMYM can fill you in on any info needed. May the wishes of WØQMT and NØGCC come true for their part in liaison to DTEN. Garnett KS new repeater freq. is 148.865. WØKL, SEC reports that only KBØEY, WØFRC, NNØN, WØPBV, WØPCW, WØWVI and WAØYJT were only EC reporting the past month. We have 20 local emergency nets active with 14 having NTS liaison. Looks like a few more out there need to look into traffic nets. Traffic: WØQBK 576, WØFIR 220, WØFRC 316, NBØZ 80, WAØLBB 124, WØOYH 110, WØFDJ 72, KØBXF 47, WBØZEN 35, WØQMT 18, WØMYM 18, WØPB 14, NØAPJ 2, WØKL 1.

MISSOURI: SM, Ben Smith, KØPCK—Newly elected officers of the Audrain Amateur Repeater Club are: Pres. NØCBZ, VP. WBØSEN, Sec-Tres. KAØJQE and Activity manager WBØJES. KAØLBE and WB2QFW made some fast scan tapes form one of the recent shuttle flights. They were used by local TV station which in turn sent the tapes to a National News Network which aired the tapes. A great way to promote ATV. The Heart of America ARC had a Field Day score to 9,300 points. Records show that to be highest 2A scored turned in over the last eight years. Amateurs in the Missouri Section have been very busy this summer assisting their local officals in providing communications for public events. The events ranged from Grand Prix style Go-Cart racing in downtown Mexico to 4th of July celebrations in the cities of Kansas City and St. Louis where many thousands of people attended events lasting several days. In the St. Louis area many amateurs worked helping with VP Fair. The Kansas City amateurs assisted with the Spirit Festival, an event that about 750,000 attended in three days. The Heart of America ARC received a trophy for having the most amateur participation assisting with the event. A major amateur radio activity in the Section every year is the Amateur Radio Booth at the Missouri State Fair. During the nine days of the fair this year over 500 pieces of traffic were originated and sent for fair goers. Many questions were answered by the amateurs in the booth and lots of ARRL hand outs were given to people who hopefully will be amateurs in the future. Operating this booth twelve hours a day for nine days takes a lot time by a lot of people, so on behalf of the CMRA, KT5Y and myself a big thanks to all the clubs and individuals that donated time and money and of course to all the stations that helped handling traffic from WDØDVG.

NET	Sess.	QNI	QTC	Day	Time PM	Freq MHz	Mgr
MOSSB	31	593	218	Dly	6:00	3.963	KT5Y
MON	62	353	202	Dly	7:00/9:45	3.585	KØSI
MEOW	31	560	156	Dly	5:30	3.963	KØDSQ
MTTN	24	94	28	Mon-Sat	6:30	3.370	KAØPGN
HBN	22	326	22	Mon-Fri	12:05	7.260	KØDSQ
NEMOE	14	86	11	TTSat	7:30	144.53/6.13	KAØFTS
PHD	4	119	9	Mon	9:00	146.43	WAØKUH
TGN	5	58	6	Thu	9:00	147.09/.69	KAØILO
MOFON	5	26	4	Wed	8:15,	222.42/4.02	AIØO
CVE	12	16	4	MWF	7:00	3.710	KAØFTS
RRABN	30	484	3	Dly	8:00	146.39/.79	KAØLLN
ZAEN	5	55	3	Tue	8:00,	147.84/.24	K9CGU
MCARES	5	32	2	Thu	8:30	146.52	WBØELJ
JOCCN	4	23	1	Wed	8:00	146.40/7.00	WBØDZX
CMEN	4	53	1	Wed	9:00	146.16/.76	KØPCK
LOZFM	5	119	0	Sun	9:00	146.13/.73	WØRTL
SARN	4	46	0	Thu	9:00	146.43/7.03	WØENW
LARES	4	31	0	Wed	8:00	146.10/.70	WBØRHC
LOZCW	5	13	0	Sat	9:00	3.707	WØRTL

Traffic: WDØDVG 1112, WØBMA 283, KØSI 260, WAØYJX 227, KT5Y 204, KØPCK 153, KCØAS 119, AIØO 119, NIØR 118, NEØA 112, KBØZL 79, NDØN 76, NØBKE 62, KØORB 62, KØDSQ 55, K2ONP 45, WØNUB 34, WBØUD 26, KØUUA 22, WBØCJB 19, K9OCU 17, WBØELJ 15, WØOTF 12, KAØQMV 6, WAØITU 3.

NEBRASKA: SM, Vern Wirka, WBØGQM—STM: Jerry Kohn, WDØEGK. SEC: Jim Sanford, NØAIH. Many fall Novice classes are underway across the section. Novice

class instructors can always use another helping hand and your help with your local sessions would be greatly appreciated. The job does not end when a student receives his or her Novice license but really only begins. We lose too many Novices that just never quite make it on the air and really learn the joys of Amateur Radio. So if you cannot help with an actual Novice class there are plenty of opportunities to assist those newly licensed individuals realize what Amateur Radio really offers. The Nebraska Amateur Packet Society reports there are approximately 70 active packet stations in the Nebraska section. The packet society continues to work toward more extensive coverage of Nebraska with packet radio. Nebraska STM, WDØEGK, says a new traffic net using packet radio is in the very early talking stages but plans are moving forward. WDØEGK also reports Nebraska CW Net participation in the 10th Region Net is about 85% but there are only a few stations going up to ten. NCW Net Manager WBØTED would like to see some more stations going up to ten. If you are interested in trying the 10th Region Net contact WBØTED or WDØEGK in Lincoln. Traffic: WØKK 169, WBØTED 149, KØDKM 128, KØIXY 27, WDØBQG 13, WBØGQM 11, KAØBWM 9, WAØBOK 8, WDØBOX 5, KAØUZY 3, KAØBCB 2.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Robert J. Koczur, K1WGO—STM: K1EIC. SEC: KA1ECL. BM: K3ZJJ. ACC: KG1M. OO/R FI: KA1ML. TC: W1HAD. PIO: KX1B. SGL: K1AH.

Net	Freq.	Local Time	QTC	QNI	NM
CN	3640	1900/2000	152	293	K1EIR
CPN	3965	1800 M-S	75	251	KA1BHT
NYN	13/73	2100	63	260	KA1JAN
WCN	78/18	2030	155	496	WB1GXZ

Bears/CARA assisted EC NA1O at the Danbury Swimathon on Candlewood Lake, an event sponsored by the American Red Cross. The Bears were able to receive slow scan pictures from STS-61F with extensive media coverage following. The next VE exam in Bethel will be held 12/14. The CQ club had a booth at Goshen Fair and signed up many potential new hams for upcoming classes. Congrats to Mary, WB1GXZ for 100% representation to FRN for August. Members of the WARC and 315 Repeaters organization provided communications for the Cheshire Triathalon. Well done to John, KA1ION and the 20 hams helping him out. For all of you out there who are upgrading: Make sure you bring your original current license with you. This is needed for ID purposes. The Brooklyn Fair was covered by a portable station in K1AOK's mini bus. Following that, the same group of hams covered the Woodstock Fair. Nice job. RTTY Corner: one H-F RBBS system is MAILBOX-64 Frequency 3597.6 FSK. Commands—Activate system (cr). WB5JZP (cr) (cr). help (cr) for summary of commands. Another is KC2FI Frank's mailbox. Frequency 3622.0 LSB. Commands—Activate system (cr) // awake'(cr) (cr)// help (cr). In all systems, all commands are preceeded and followed by a carriage return. Affiliated Club Corner: Congrats to Mohawk Mountain VHF Society, Brookfield, Ct. Happy Birthday to FARA which will be celebrating it's 10th anniversary in November. Until next month 73. Traffic: WB1GXZ 285, W1EFW 216, K1EIR 169, KA1JAN 101, KA1KTH 89, KA1GWE 80, KA1KPS 79, N1BOW 61, W1WP 57, WB1CRH 48, KA1BHT 43, W1YOL 37, K1AQE 31, W1BDN 28, WA1NLD 26, K1OQG 4.

EASTERN MASSACHUSETTS: SM, Luck Hurder, KY1T—ASM: N1BBT & K9HI. OO/AA: KA1KF. SEC: KB1PA. STM: KW1U. ACC: K1AZE. TC: KA1IU. PIO: K1HLZ.

NET	MGR	FREQ	TIME(LOC)/DY	QTC	QNI
EMRI	N1AJJ	3658	1900/2200/DY	394	394
EMRIPN	N1BGW	3880	1730/DY	288	259
EM2MN	KA1AMR	63/23	2000/DY	256	411
NEEPN	K1BZD	3945	0830/SN	3	45
HHTN	WB1CMQ	04/64	2230/DY	295	499
EMRISS	KA1EXJ	3715	1600/2030/DY	105	159
CITN	N1BYS	645/045	1930/DY	120	270

On the Day this column is being written, EMASS Amateurs are once again showing their public service worth—this time as communicators for the Red Cross and Civil Defense officials during a simulated evacuation of the area around Pilgrim 2 Nuclear Power Plant. SEC KB1PA says that the goal of evacuating 40,000 people was not only easily realized utilizing Amateur circuits, but that the Hams provided somewhat faster results than parallel telephone circuits that probably wouldn't be functioning in a real disaster situation anyway! About 20 Amateurs were reported working with the Red Cross; with another 15 or so with CD officials. KW1U, N1AWX, KB1PA and others made use of a fine opportunity to show off packet radio's high speed, error-free benefits to authorities. STM KW1U even brought along computerized AMTOR gear! KB1AF topped the list of Public Service Honor Rollers this month with KA1EXJ KW1U WA1FCD KB1PA WA1TBY N1BGW KA1LIH N1BYS and KA1MAM also qualifying. K1HLZ/PIO is working on obtaining a Boston area Amateur Radio public information telephone number that would carry up-to-date news of our service to Amateurs as will as the general public. Do you have contacts in the media? Tell K1HLZ pronto so that he can sign you up as Public Information Assistant! ARRL vice director K1PAD is soliciting volunteers to act as Elmers for the many new Novices that are being brought into the Amateur Radio Service lately. Contact him if you can assist. Have you expressed your opinions to your Section Manager lately? Your lone voice counts! Traffic: KW1U 1063, KA1EXJ 352, N1BGW 330, WA1TBY 308, W1PEX 299, KY1T 254, WA1FCD 249, K1GRP 176, KA1AE 171, KB1AF 165, N1BHH 150, N1AJJ 125, KA1AMR 124, N1DDC 106, N1CVE 103, K1ABO 102, WA1SNH 97, KY1B 75, KY1B 75, WB1CMQ 70, KA1KCU 51, N1BYS 50, KA1ON 48, KB1PA 54, KA1LIH 39, W1ZHC 38, W1CE 34, KA1MAM 34, KA1EID 33, W1DMH 28, WA1FNM 19, K1LCQ 18, K1BZD 16, KA1DJV 8, KT1K 2.

MAINE: SM, Cliff Laverty, W1RWG—SEC: KL7IJG/1. STM: AK1W. ACC: KY1C. BM: W1JTH. OOC: W1KX. PIO: KY1E. SGL: K1NIT. TC: K1PV. ATCs: KR2K/1, KA1MGR, N1CNM, AC1G. Congratulations to Ron, N1CMZ, and his committee from the Augusta Emergency Radio Unit for a successful Windsor Hamfest. Among the record attendance of 547 were Tom, K1KI, NE Director; Dick, W1RU, President IARU; and SM W1RWG. Congrats to Bob, K1MZB, recently appointed Net Mgr of the Pine Tree Net. Thanks to Chris, AC1G, who has done a great job with the PTN for past 3 years. Congrats to Tony England, WØORE, who has been elected an honorary life member of the Mid-Coast ARRC including the club "T" shirt. Under the Volunteer Examiner program Maine is holding at least one test session each month. PSHR: KL7IJG 85, AK1W 83, WA1YNZ 76, WB1CBP 72, N1BJW 71, N1BUG 61. Traffic: KA1JOJ 110, W1ISO 101, AK1W 92, KA1JPR 83, WB1CBP 66, N1BLZ 62, W1KX 48, W1BMX 44, N1BJW 41, WA1YNZ 35, KL7IJG 30, W1RWG 30, K1MZB 20, WA1CSG 19,

W1GCB 17, W1JTH 16, KA1FTL 11, WB1GLH 7, W1OTQ 5, KA1ENL 4. (July) N1BLZ 46, WB1GLH 22.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—PIO: WA2MBQ. SGL: N1AIX. This month, I'm highlighting the Great Bay Amateur Radio Assoc of Dover NH. GBARA has been affiliated for over 50 Yrs and has 60 very active members. The club serves the seacost area in NH and meetings are on the 2nd Sunday of each month. Bob Ross, W1HJT, club president, reports that the club picnic in Aug had 35 attendees and an antenna repair party at the club station got their emergency station back on the air. Club members Dick, K1IEE, and Jason, KW1W, operated K2BSA at the National B.S. Jamboree in Virginia in Aug. Current activities include a Novice slass starting 24 Sept, SET in Oct, and a VE on Nov 2. The club has spearheaded the current effort to get Ham license plates in NH and was recently cited by Gov Sununu for Civil Defense activities. New PIO for NH is Phil McGan, WA2MBQ, and Bob, W1NH, will serve as SEC. The Nashua and Kearsarge clubs were successful in contacting W0ORE on board the Shuttle Challenger. Bernice, KA9GHV, received the Marchof Dimes award for raising the most money in the Nashua WalkaThon. NH Net reports-GSPN, 5:30PM Dly, 3547; GSFMN, 8:30PM Dly, 146.94/146.655. Traffic:MSOVTP-12, N1CPX 332, N1NH 264, W1FYR 201, N1AKS 141, W1TN 124, KA1LBW 82, W1ALE 80, W1GUX 75, KI1M 75, K1TQY 54, N1ALM 49, KK1E 48, WB1GXM 44, K6UXO 41, K1PQV 30, KA1GOZ 26, KA1HPO 20, W1LQQ 13, WB1BRE 10, WA1YZN 3.

RHODE ISLAND: SM, John Vota, WB1FDY—Recently visited the Associated Radio Club of Southern New England, and met a great bunch of guys. Tnx for the warm welcome. We now have the Brown Radio Club at Brown University active and well again; welcome back all at Brown. I did not receive any club news this month, come on gang if you want a SM column get it to me. Nov. 17 will be a VE test session sponsored by the Ocean State A.R.G Good luck to all on their exam, and be sure to bring along your original FCC license to the Exam session. See you all next month. Tnx.

VERMONT: SM, Ralph T. Stetson, KD1R—Last month I asked who the youngest HAM in VT is—well I'm still waiting to find out. This person ideally should be active but if school needs prevent any but occasional activity that's not a problem, the reason for this is curiosity on my part. I also would like to recognize this young person at their club meeting with a certificate. A Special Congratulations to Joan, KG1F, the NEW Conductor of the YL column here in *QST*, Good Luck, Joan. New Calls to watch for are: N1DGY now KB1UE; KA1NEO now KB1UG; KA1LYI now KB1UF; KA1KQP now N1DEP; KA1FJW now N1DRA; new call KA1NIB. I understand that Beth got her call 17 days after papers were filed and is active on the air. WA1ZMS working on a 440 to 220 MHz linking system for Rutland area while also keeping his studies up to snuff at UVM. Also at UVM N1BYG of Tunbridge as an entering Freshman. All Hams attending UVM are asked to contact Frank W1CTM or Roger WA1OZE to arrange for on air time at BARC Club Station in Red Cross Chapter house next to UVM. The Burlington club has done a great job of assembling as complete a station as only most of us can only dream of having. The Mount Ascutney Packet Radio Association Celebrated their first year of operation with an antenna raising party. WA1TLN-1 now talks to us with an AEA Isopple Sr. Thanks for providing all of us in VT, NH, NY, Canada with such a reliable outlet to southeastern New England. In the New toys Department, KD1R on Packet finally, if you can connect to W1HJF-1 or WA1TLN-1 then use KD2AJ as best path to connect to me. BCNU on Packet. I understand through the grapevine that WB2JSJ is getting married in Sept. Good Luck, Mitch, may you have many years of happiness together. NETS VTN 31/153/68; VSSB 29/387/74; VTRFD 4/47/18; CAR 27/745/44; VTPN 4/76/5; GMN 27/397/36; CVFM 4/74/5. Traffic: KT1Q 464, AE1T 89, W3QQ/1 64, N1COB 51, W1KRV 50, W1OAK 19, KB1UE 11.

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T—PIO/ACC: K1BE. SEC/SGL: WB1HIH. OO/RFI: N1CM. TC: KA1JJM. STM: W1UD. Traffic nets have been seeing N1DMU quite regularly and he is now a new ORS appointee. Provin Mtn. Club has instituted a life membership plan this fall. HCRA carrying Teleconference Net on KA1KPH repeater and space shuttle audio on W1NY. Next VE session by HCRA is December 14. Contact K1BXE for info. NOBARC had been very active supporting races and parades this past summer. And KY1H suggests we all use signs or banners for publicity when we help with public events. ARRL Board Meeting coming up in January. Do you have suggestions for changes or new programs that you want the Board to consider? Let K1KI know about them now. YOUR inputs are effective. KA1KPH wrote a very thorough letter about the Novice Enhancement which resulted in the Board modifying their recommendations to FCC. PSHR: WB1HIH, N1DMU. Traffic: W1SJV 197, N1DMU 172, W1UD 137, KA1EKQ 105, WB1HIH 55, KA1T 47, W1JP 41, W1ZPB 31, WB1FSV 12, WA1OPN 12.

NORTHWESTERN DIVISION

ALASKA: SM, David W. Stevens, KL7EB—SEC: KL7QS. STM: KL7T. OO/RFI: AL7FL. PIO: NL7CP. Motley Group Net Manager, Gene KL7GID, often records the net. If you need a HF radio check, checkin and have Gene record your signal. Section Emergency Coordinator, KL7QS, had moved out of the state. Thank you, Martha, for the nice job. Remember the Yukon Quest and Iditarod Dog Races in March and set aside vacation time to help. Don Bush, KL7JFT, said that the October SET went well. HAPPY THANKSGIVING TO ALL. Traffic: KL7VL 20.

IDAHO: SM, Lem Allen, W7JMH—SEC: KD7HZ. STM: W7GHT. OO: KU7Y. RFI: K7QQP. PIO: WB7PFQ. ASM: KA7T. TC: W7ZRC. CLUB NEWS: Boise Club had a potluck at W7SC diggins, with a tail-gate swaperoo, enjoyed by about 30. The Voice of Idaho Club held VE Exams August 10. 17 participated, 10 upgraded. Twin Falls Club provided communications for the NW International Air Show. ARRL MATTERS: KB7MZ is new OO, moving—on air again soon. PEOPLE AND THINGS: W7JMH & N7DYU took their trailer to Missoula, MT, to measure a BC Ant. and visited K7AF, W7PSX, WA7HDL, WA7PFL, W7FFD, W7GHT enroute. Need a hard-to-get tube? Contact WB7CYO—he has a tube bank for hams—$1 each for mailing, etc. W7IRY has recovered enough to get on the nets again—welcome back, Francis.

NET REPORTS:

Net	Freq-Time	Sess.	QNI	QTC
FARM	3937 Lsb 8 P Da	31	2150	74
ID CIV DEF	3990 Lsb 810 A M-F	22	822	25
IMN	3635 CW 9 P M-F	22	230	88
NW TFC	146.36/98 FM Da	31	823	24

GENERAL: Traffic Handlers—try harder to get the tfc out within 24 hours! It is really embarrassing to deliver a RADIOGRAM a month after origination. Traffic: W7GHT 171, N7BHL 78, KA7KAI 65, W7JMH 37.

MONTANA: SM, Les Belyea, N7AIK—Talk about planning ahead, the Capital City ARC (Helena) has a committee to set up a Special Event Station in conjunction with Montana's 1889-1989 celebration, If anyone from this group should ask for your help, please respond. If you do not belong to one of the stated radio club's and there are several, take the opportunity to join and meet up with some of your friends and acquaintances, it's fun. For the first time in Montana, N7AFS and K0PP put up a high altitude packet radio repeater on a freq of 145.01. KC7AA recently went out on a limb and said he would make a considerable contribution to anyone putting up a repeater in the Sentinel Butte-to- Fryburg area. For those aspiring CW operators out there who would like some CW practice, there is a slow speed traffic net that meets each Tuesday and Thursday on 3715 kHz at 9:30 p.m.

NET	Sess.	QNI	QTC	MGR
MTN	31	1479	95	KF7R
IMNS	9	18	2	KA7QVN
IMN	22	240	88	WA7GQO
MSN	4	76	0	K0PP

Traffic: KF7R 108, N7AIK 36, KA7KLH 29, WA7TUW 26, W7DB 6.

OREGON: SM, William R. Shrader, W7QMU—STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. STC: N7ENI. ACC: KB7CC. OO: N7SC. RFI: AK7T. Upgrades: KA7VTA, KA7VYA, KA7VXC, KA7VJP (Novice); N7HIR, N7HIS, KA7VFI, KB6EAN, KA7SUL, KA7RGS, KA7VLZ, KA7UZY, KA7VAA, KA7TDU, KA7RNM, KA7VVM, KA7TMS (Tech); WB7PYQ, N7GSC, KA7TAC, KA7RJR, KA7UZX, KA7TAC (General): W7YCK, WA7ROS, N7GLD, N7EDK, N7HHD (Adv); N7ENU, W7KJJ, N7DJE, WB7OXF (Extra). VE's have been busy! Hearty CONGRATULATIONS to all. OTVARC has received an award from the ARRL for outstanding efforts in getting new members. Farmers Mountain Repeater Association is new ARRL affiliated club. Portland ARC has undertaken a big job. They are working with the U.S. Coast Guard Cutter Glacier to train interested personnel for amateur licenses which will be used in the Glaciers' next deployment to the Antarctic. The FCC Auxiliary program is growing. We need members/observers badly in several areas, the coast (both north and south), central Willamette Valley, and the northeast. If you are interested contact your SM or OO Coordinator. The FCC has a list of 48 Oregon hams with incorrect addresses on their license, CHECK yours. Traffic: W7VSE 675, K7OVK 295, N7FLC 234, W7ZB 160, KI7X 143, N7FXJ 102, W7LRB 84, WA7VTD 51, KA7AID 46, N7BGW 45, W7LNE 19, W7FBP 18, W7DAN 7. (July) N7BGW 66, WA7VTD 51.

WASHINGTON: SM, Joe Winter, WA7RWK—STM: K7GXZ. SEC: W6IIH. 8M: N7IL. TC: K7UU. PIO/SGL: W7CKZ. OO/COORD: KC7FA. ACC: KD7G.

Net	Freq.	Time(Z)	QNI	QCT	Mgr.
EWTN	146.84/	0030/0430	86	36	WA7CBN
NTN	3970	1900	1189	76	W7UU
NWSSB	3945	0130	815	33	W7VDR
PSTS	145.33	0030/0430	173	118	W7IEU
WARTS	3970	0100	3036	268	W7IGC
WSN	3590	0145/0445	517	181	W7GB
WARNS	3940	0200	AR NEWS NET		W7CKZ

This column is being written by Gene Sprague, KD7G (who will be your new Section Manager on Oct. 1st) and me in this transition period. Gene and I are doing everything possible to make the change in an efficient manner which will benefit you the member. It would be most helpful if information for this column is sent to KD7G (see *QST* pg. 8 for address). Congrats to the Olympia ARS on becoming a Special Service Club and to the Tri-Cities ARC on receiving the ARRL Booster Certificate. These are two of the many clubs that are actively promoting amateur radio. Clubs are a focal point for many funfilled activities and a rallying point for our causes. The Mic & Key and the B.E.A.R.S. are sponsoring a twelve week General Class Theory class. N7BTI conducted a one hour demonstration of packet radio at a meeting of the M & K ARC. The OARS reports that the Capitol City Marathon went well and their exhibit at the Thurston County Fair was successful in promoting Amateur Radio. They felt they touched a lot of people by their presence. New officers for the Mt. Baker ARC are KD7YV, Pres., W7ILR, VP, WB7PMU, Sec., N7FYU, Treas. Clallam Co. ARC was involved in the Great Olympic Mountain Run, Sequim Senior Run & Port Angeles Derby Days. Clallam Co. EC WB7RHY thanks those hams who helped in the recent search on Hurricane Ridge. Lower Columbia ARA and the Tri-Cities RC had a friendly field day contest, the 2nd place club was to host the picnic for both clubs. LCARA acquired the most points and will join the Tri-Cities Club at the Maryhill Park in the Columbia Gorge. Chehalis Valley ARS had a display at the Mall the weekend of Sept. 7th. The Issaquah ARC will be providing communications for the Salmon Days parade on Saturday October 5th. The Radio Club of Tacoma: Hamfair '85 was a huge success. Attendance hit an alltime record and each committee head reported increases over last year. Hamfair '86 is scheduled for Aug. 16th-17th at P.L.U. Tacoma. Traffic: WB7WOW 351, K7GXZ 273, KD7ME 262, W7LG 240, W7GB 200, KR7F 105, NE7B 86, N7DDP 61, W7IEU 43, KD7G 29, WA7BDD 27, KD7TJ 27, K7AJT 18, KD7MW 16, K7OXL 14, N7GDW 12, KA7TCE 11.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASM: W6ZF, N6DHN. SEC: W6LKE. STM: NI6A. EBARC welcomes new members WA6DOB and WT6V. Their member, KB6IRR, has upgraded to Tech. NBARA new Directors: WB6YYY, W6LRT and WB6RGY. The club is looking into the legality of Bingo sessions at their meeting. BARC's ARES is evaluating response to a questionnairs sent to all members. N6ERR, KA6BPR and K6OEV are Assistant ECs. The relocation of WB6ABE/R has been delayed due to the removal of power from the new site! MDARC is again running classes for Novice through Extra. The training staff is KT6Y, WD6G, KT6X, K6RK and K0ED. Their most recent exams had a 90% passing rate. I had the pleasure of resenting a slide show on the recent FO0XX DX-pedition to LARK. Their hospitality was much appreciated. HARC had 14 members providing communication for the Bathtub Regatta. N6ICL has accepted position of Secretary for the rest of the year. Traffic: WB6DOB 107, WB6VOM 172.

NEVADA: SM, Joe Lambert, W8IXD—SEC: K7HRW PIO: WA7JUO. TC: K7ICW. OCTOBERVENTION, the ARRL PACIFIC DIVISION CONVENTION will be held in Las Vegas Nov. 1-2 with Astronauts Drs. Tony England, W0ORE and John Bartoe, W4NYZ as the Guests of Honor. Roy Neal, K6DUE, NBC Science Editor will MC. During the Convention, a forum conducted by TAPR on packet radio will be timely and informative. K7ICW, Nevada TC and WA7JUO, Nevada's PIO will be conducting Forums also. The L.V. Repeater Association had a nice picnic at Mt. Charleston for their August meeting. At this meeting their August meeting. At this meeting the Packet Radio Digipeater was discussed, and by the time this goes to

press, it should be up and running. Approximately 15 members of the Tahoe Amateur Radio Association were involved in emergency radio communication for the Triathlon on 9/7. TARA member N7EQU recently upgraded to Advanced. There are some openings for ARRL Field appointments. Anyone interested, let me know and I will send you an application. Don't forget—both clubs and individuals—I rely on you for info for this column, so send me your ham radio news.

PACIFIC: SM, James Wakefield, AH6CO—KH6CXJ and KH6EVY join our islands *Silent Keys. Harry* and *Glenn* will be missed as they were both very active in BIARC and HARC. Aloha! KH6IJ has a new TS-940. W6ORS has taken on a bride! Congrats! KH6UZ, KH6AFS, W6ORS (?-see above!) and WH6AXL are handling the NCS duties on the Hawaii Afternoon Net - 7290 - daily 0200 UTC. Join 'em! AH6AM, WH6C, KH6H, KH6HA, KH6MX and KH6UU participated in Public Service during Run to the Sun on August 4. Get the Emergency equipment and nets functioning for it is *that* time of the year. NH6N has new YAESU dual freq transceiver for OSCAR work. Picked up in Japan so don't have the model. KH6HIJ needs members for traffic nets. Jack is STM and will set up a slow speed net if anyone interested? Contact him. Traffic: KH6S 54, KH6HIJ 40, KH6H 14, KH6BZF 6.

SACRAMENTO VALLEY: SM, Glenn Koropp, W6YFW—ASM: Hugh Nickles, WB6YKI. SEC: Lyle Taylor, WA6ZUE. This is my last column as your SM during the interim period before elections. I welcome the newly elected SM, Robert Watson, whom you elected to take office on October 1st. Congratulations Bob, you have my full support. To all of you who have assisted me during this short period, many thanks, it has been greatly appreciated. Dave Carlson, KE6NS, has been appointed EC, Amador County, and Milton Smith, WB6EHF, EC for Sacramento County. VEC Hotline for this section is 916-483-0551. Amador County VE exams are—Nov. 9, 1985, March 15, July 19 and Nov. 8, 1986. YARS, Davis, CA. gave exams Sept. 21st. Trinity County Exams, Sept. 28th, GEARS, Chico, CA, Sept. 14th, Cecil, WB6ROS and Lyle, WA6RPB, did an excellent job as instructors for the River City ARC's classes this past summer. When the VE exams were held on Aug. 28, the passing rate was 82%. The River City Club sponsors Novice through Advanced classes all through the year. Nevada County ARCs had a display of amateur radio antiques furnished by Phil W6DD, oldest ham in Nevada County. Along with the display was an operating radio station operated by several of the local amateurs. YARS members are participating in the Sutter Shuffle Run and the Fall Century bicycle tour. The Carmichael Elks Lodge #2103 is organizing a radio club, and will be installing a 220 repeater with auxiliary power so as to be useful in emergency operations. Amador Radio Club has been very active in the past month. They gave a club sponsored breakfast, members have gone to adjoining county to help with communications during fires, their new communications van has now been newly painted and outfitted with radio equipment. This past Sunday one of their members motored to Lodi, CA to help a blind ham get his station going. Lyle Taylor, SEC, has been most cooperative in getting news to me. I plan to go to Redding Sept. 8, to the Hamswap and QCWA meeting and meet with Lyle. Traffic: WD6BZQ 234, W6RFF 24. (July) WB6SRQ 16, WA6ZUD 8.

SAN FRANCISCO: SM, Bob Smith, NA6T—I hope to see you all in Las Vegas for the PACDIV Convention. I will be on the program with "BELIZE-83", MARC is back in the Public Service again-no less than six public service events in October—if you live in Marin get out and help. MARC was chosen as the PUBLIC SERVICE CLUB OF THE YEAR for all volunteer agencies in Marin County for 1985 SCRA has THREE novice and two upgrade classes in full operation. Their ain't no reason for not upgrading in Sonoma county unless you are already an EXTRA! I hope SFRC finds another editor for their newsletter, DEE and ED NOVAK, N6DAM, KA6YTF, have done an exceptional job, tnx. SFRC has a novice and upgrade class—Contact SFRC for info. Don't forget the OLD TIMERS NITE at SFRC meeting Nov. 8, 1985 at VA Hospital. Contact W6VV for info at 415-986-1880. Who will be the oldest OM This year? Don't forget the VE Hotline number for contact people and test locations, 408-984-8353. Traffic: K6TP 83, K6TWJ 94, KK1A 121, N6FWG/T 60, W6IPL 216, NA6T.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD—SEC: WA6YAB. STM: N6AWH. TC: WA6EXV. ACC: N6ECH. Asst. SMs: W6TRP and K6YK. The Club Challenge for the 80's ends Dec. 31. So far only 1 club in the SJV has recruited new ARRL members during the drive, then only 2 members. Let's work to finish this membership drive with a flourish in the SJV. Help your club, get new ARRL members. Congrats to the Central Valley VHF-FM Club of Stockton on Affiliation with ARRL. New officers of the Central Cal. SSB ASSN. are Pres. WB6OHK and S/T W6WZM. W6IHD and W6RJE are Silent Keys. N6KNA is the new EC for Mariposa County. Appointments renewed: ECs WA6SHO, WC6U, and W6BWM. N6BMM won a TS830SP and W6MND won an IC2AT at Hamcon. K7LRJ, K7SQG, and WA6OEC have FT757s. KB6HGW has an IC745. KA6UAP is KG6WG. KB6DGF is KG6WE. KB6FLO is Tech. N6DTB is General. Happy Thanksgiving to all. Traffic: N6AWH 242, WB6QDN 189, W6DPD 24, K6PMG 14, KB6HGW 10, WA6YAB 4.

SANTA CLARA VALLEY: SM, Rod Stafford, KB6ZV—BM: W6BCY. PIO: N6BIS. TC: K6HLE. SEC: K6ITL. ACC: W6MKM. ASM: NS6N. STM: W6PHT. WB6GFJ, the local AMSAT Coordinator hosted an "OSCAR Users Meeting" recently in San Mateo. There was a little bit for everyone, whether a beginner or old-timer on the satellites. For those interested in a net that is related to satellite communications, be sure to listen in on 147.330 on Wednesday evenings at 8:00 P.M. It seems to be the time of the year for club picnics. The Northern California DX Club held its annual fall picnic as did the Coastside ARC. Doc, K6UAL, has become a Silent Key. He was very active on RTTY and was a regular user of the WB6OQS/R (146.76). He always had something interesting to talk about and was eager to help anyone with any technical problems that they might be having. He was a good ham and I for one will miss his presence and sense of humor. WA6O and WB6WKM are teaching the Novice class at SCCARA. NJ6L is teaching a Novice class at his home in Gilroy. The Gabilan ARC has had a lot of growth in the last couple of years due to the dedicated efforts by the members to run Novice classes and then follow through and make sure that the Novices stay interested in amateur radio. The "Elmers" are alive and well in that area of the Section. A recent fire about 20 miles west of the town of Gustine in early September provided an opportunity to amateurs from the Silicon Valley Emergency Communications System (SVECS) to explain their Initial Response Team

to some of the amateurs from Merced and Stanislaus Counties. WA5PWW, WA5ZBX and KA6YRK were among the first amateurs on the scene of the fire! They brought antennas, masts, radios and packet radio setups in response to a request by CDF in Morgan Hill. Although much of the tactical traffic was handled by Merced and Stanislaus hams, they were interested in the SVECS ability to respond quickly and effectively to an emergency so far away from their own area. The fires of '85 have brought the amateurs in the section to a high level of preparedness so that whenever our services are needed we are able to respond effectively. Be sure to listen in on the Secton Net on Tuesday nights at 9:00 pm on WB6OQS/R (146.76) for news and announcements about what is happening in amateur radio in this section and elsewhere. Traffic: W6PHT 138, W6YBV 133, KA6CVM 106, W6KZJ 100, W6PRI 9.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN—Sincere pleasure seeing everyone at the Shelby Hamfest. KA4EYF was presented PSHR Certificate at the Traffic meeting. Congrats to 51 upgrades at Shelby. New appointments: EC: Rutherford Co. N4IVT, WD4RMQ. Guilford Co. ORS: N4LUO, WD4RMQ. ATC: WD4RMQ. OES: WF4M. NM of CSN is N4LST. Silent Keys: W4AJU, WD4HFI, WA4SXC. WB4WII has also received his PSHR Certificate. K4SNF now fully operational on OSCAR mode J. Anyone on Mode L yet? WC4T reports that trip to FCC Gettysburg very disappointing. VEC's were unable to discuss problems and work out. Says everything cut and dried. VEC's in Section don't want responsibility of creating and printing question pools. Want FCC to continue this. VOLMON is 1 year old. What's that? It's the ARRL/FCC volunteer monitor program. K1PLR is looking for qualified people in section to participate. Contact him or SM. CVRA reports that several repeaters have been coordinated on new 900 MHz. band. ARRL/NCS Night Tango Exercise held in Charlotte. Many stations participated and first reports are that Amateur Radio was far ahead of other services in passng traffic. Many thanks to all who made this possible. Our interest and participation in traffic handling in Section is at an all-time high. Hats off to WD4SKH for excellent CCARS newsletter. Concord hamfest Nov. 3. Walk-in exams. Contact WC4T. Greensboro Hamfest Nov. 23/24. This is new date for hamfest. Walk-in Exams. Contact AE4N. N4JRE was NCS for handling simulated emergency traffic and was very pleased with results. Congrats to WB4HRR, K4LZU on new Jr-ops. W4UIJ has undertaken new sport with his ham radio friends—GOLF. ARRL State Convention will be in Raleigh in 86. Watch and listen for more information. EC, WV4Z is now using OES to stations who qualify in ARES program. AB4W reports over 800 amateurs have ordered HAMWATCH plates. K1PLR, SECTION OFFICIAL OBSERVER COORDINATOR advises he is available to speak to clubs about OO Work. Your club is short of programs? Invite him to speak. WA3OBR needs more PUBLIC INFORMATION ASSISTANTS. If your club doesn't have one contact him. Let us thank our maker for allowing us to enjoy such a wonderful hobby—Amateur Radio. HAPPY THANKSGIVING. Traffic: K4NLK 419, NJ4L 214, K4JHF 172, WB4HRR 143, KA3EYF 133, WD4RMQ 77, WB4N 76, KA4YMY 74, KB4IVV 69, KB4FWU 68, WA4MNR 60, WD5EQK 40, WB4WII 39, NT4K 37, NE4J 36, WD4HTE 35, N4BYV 34, K4IWW 33, N4LUO 33, N4JEO 32, KI4YV 28, K4SWN 26, WB4CYN 25, K4GI 24, NV4F 22, K4YJB 21, KI4ME 19, N4UE 15, N4CJJ 14, K4QXA 14, K4SNF 12, KU4W 12, N4JRE 11, WD4MRD 8, N4KYD 7, W4EHF 6, WD8BOO 5, K1PLR 5, WR4E 4, W2JDB 3.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ—HAM WATCH has the stamp of approval from SC Highway Patrol (SCHP) and the Governors Office of Public Safety and Crime Prevention. I ask that all of you—PLEASE BE PATIENT. We are working with state agencies and it will take time to get the program developed and that brochures printed In addition, NC HAM WATCH was the first program in the US and we are the second. Therefore, I am requesting input as to what you would like HAM WATCH to mean to SC and to your area of the state. Initially, the program will interface with the SCHP in reporting auto accidents, fires, stranded motorists, downed power lines and trees and suspected drunk driving. When the SCHP dispatchers return to the Criminal Justice Academy for training late this year, amateurs will present a seminar on amateur radio, phone patch operation and HAM WATCH. State Officials *praise* and *respect* Amateur Radio in SC and if it were not for those facts, HAM WATCH would not be a program in our state. **CONGRATS TO ALL.** Traffic: K4ZN 212, W4FMZ 105, W4ANK 89, KB4BZA 64, WØIKT 59, WJ4P 34, WB4UDK 29, KA4YEA 18, KA4LRM 17, K4ZB 15, WD4FJP 2.

VIRGINIA: SM, Claude Feigley, W3ATQ—STM: KB4WT. SEC: WB4UHC. OOC: W4HU. BM: AB4U. SGL: W4THV. TC: WB4MAE.

VTN	1 PM	3907	AA4AT
VSBN	6 PM	3947	K4VWK
VSN	6:30 PM	3680	NN4I
VN (EARLY)	7 PM	3680	K4AXF
VN (LATE)	10 PM	3680	N4GHI
VLN	10:15	3947	N4KSO

The listing of section HF NTS nets is given so that you can note the recent changes in net MGRS. K4AXF replaces KR4V as a VN mgr. as Jean asked to be replaced due to heavy work schedules. Tnx to KR4V for an excellent job. NN4I is mgr. of VSN replacing Glynn, KB4WT, who is busy with STM duties. I regret to announce WD4APO and N4UY as Silent Keys. The Rockbridge Amateur Radio Club was active at their community festival handling 98 messages thru rutt conditions. Participants were: WD4RIE, KI4ZR, K4AOV, WA4FFE, KF4JT, KB4MDG and WA4LJI. Affilated Club annual reports were received form the Hampton Roads Amateur Radio Club and the Richmond Amater Telecommunications Society. To date only 25% of the affiliated clubs have submitted reports. If you need forms contact the SM. The "ATC" (Assistant Technical Coordinator) program is starting to roll. Every club that has a Technical or RFI committee should have one of its members as an "ATC'appointee. See the TC or SM for appointment details. Starting with this month I will be listing the calls of the ORS, OES, OBS, DEC, EC, OO and ATC appointees on record at League hdqs. If your call is missing it is probably due to lack of reporting or ARRL membership has expired. If you are interested in an appointment contact the SM. OOs are: WB4CGI, AA4EL, KE4EQ, W4HU, W8IRT, WB4J, K4JDJ, WA4PGM, KB4WT. ATC appointees are; N4UA, KC4YN, WB3ANC. OES stns are; K4BAV, WA4CCK, W4CFV, N4EHJ, N4EXQ, KA4ERP, K4JST, W4KXE, N4LE, WA4LJI, WB4MAE, WB4ODZ, WD4OLV, WB2OMZ, WB4PNY, WB4SHK, WA4TVS, WB4UHC, WA1VRL, KI4W, KB4WT, KM4X, WB4ZNB. DEC appointees: WB4AXY, K4BAV, WD4DUU, KA4ERP, N4EXQ, WB4FNW, AA4GL, NM4R, WD4RIE, WA4RTS,

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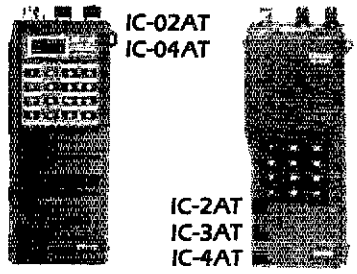

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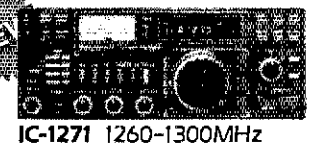

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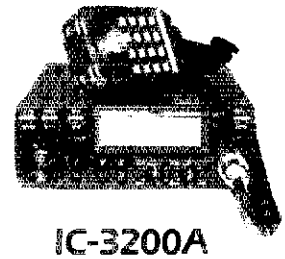

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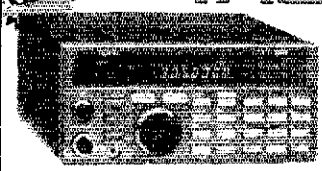

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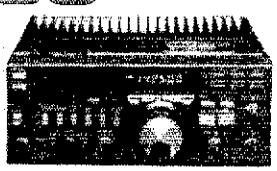

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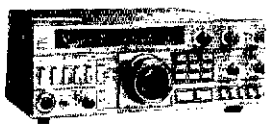

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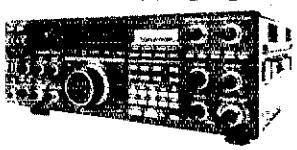

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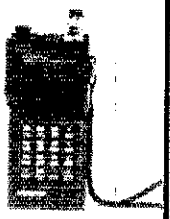

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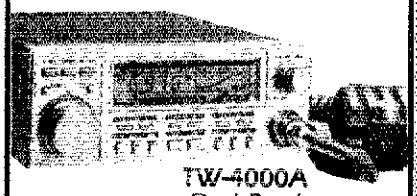

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WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM:KD8G. ACC: WA8CTO, TC: K8CG, SGL: K8BS. Repeater Coord: WD4KHL. KU8R is looking for Hams in Chas. area interestd in ATV. Check with Jim for activity. Mark, KD8RD, is looking for new members for WV RTTY net, 3639.1 at 6:30 daily. W8YP needs a few good NCS for WVFN. If interested contact Tom at 6:00 on 3865.

Net	Time	QNI	QTC	Sess.	NM	Freq
WVFN	6:00	700	106	31	W8YP	3865
WVN	7:00	252	60	31	W8LYV	3567
WVRN	6:30	214	48	31	KD8RD	3640
WVMD	11:45	738	38	31	W8FZP	7235
WVNN	5:30	80	17	26	WD8LDY	3730

Traffic: W8YP 207, KZ8Q 131, WA3NUI 108, K8QEW 101, N8GJO 100, W8FZP 76, KD8RD 76, K8TPF 71, N8FXH 48, K8KT 40, NC8G 28, K8UQY 28, KD8G 16, W8CAL 15, KA8OGF 15, WD8EBH 14, WB8ZMX 8.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ0J—SEC: WB0FQB, STM: WD0AIT. WASM: W0RSG. ACC: WB0DUV. OO Coord: NM0X. PIO: N0FOE. SGL: WD0GQL. TC: NC0F. BM: KD0RX. I start this months news on a sad note. BM: Tom Leonard, W0MDT has become a Silent Key. A very active amateur for 45 years, he always contributed as an elmer to many...traffic...public service...OBS & BM for 8 years. Colorado & the Section Team will miss him. KD0RX will assume the position of BM. He will be trying to recruit more OBS throughout the state, let him know if you can help out. Nov 9-10, Amsat Space Symposium at Western Hotel in Vail. Nov 16th, CCARC meeting UAW hall, Englewood. All repeater owners & trustees are urged to attend. VE Tests: Nov 21 ARA Ham School, (KQ0J). Nov 23 PPRAA Coto Springs (N0LA). Nov 30th Mile Hi, Lakewood, (W0IJR). Name Droppers: KA0CZW for coordination of EAA Fly-In. NK0P, WA0VSL, KX0O, W0MXY for new US Land Record set on 24 GHz. WA7WDJ 85/86 Principal of ARA Ham Radio School, Novice to Extra Classes every Thursday 7 p.m., Aurora. NC0F & KD0RW for their many hours spent on the W. Slope linking system. 73, KQ0J. NETS: Col; QNI 771, QTC 31-70 int, 25 sess, 2790 min. CWN-HNN-NCTN-SCTN (no totals) Traffic: N0BQP 2291, WA0HJZ 1567, KA0CZW 879, K0RXK 500, K0JAN 402, W0ACH 168.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: W5HD. DEC: KB5XD. STM: ND5T. NMs: WA5UNO K6LL W5VFQ. TC: W8GY. ACC: W5HD. Southwest Net (SWN) meets daily on 3583/7083 at 0230 UTC and handled 108 msgs with 133 stations in. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 61 msgs with 1128 stations in. New Mexico Breakfast Club meets daily on 3939 at 1330 UTC and handled 102 msgs with 908 stations in. Yucca 2-mtr Net 78/18 & 93/33 handled 15 msgs with 352 checkins. Caravan Club 2-mtr Net 66/06 handled 17 msgs with 139 checkins. SCAT 2-mtr Net 66/06 handled 16 msgs with 530 checkins. Congrats to W5WRS as the RM DIV HAM OF THE YEAR and his xyl W5TLI and to N5IA & W5HD as the NM Section hams of the year. They all deserve a BIG vote of thanks. So sorry to report the passing of W5QGX, WD9DTZ & W5WOL. They will certainly be missed. Traffic: W5ENI 101, W5DAD 80, W6SX 3.

UTAH: SM: Jim Brown, NA7G—SEC: Rich Fisher, WA7JJL. STM: John Sampson, W7OCX. Rich and I had the chance to visit Tooele County and speak to the Tooele County Club at the County Courthouse regarding emergency communications. WA7JJL answered questions about SET at the meeting. Packet Radio is growing daily in Utah: my TNC 2 is now working. Sure wish SET weekend would not be scheduled during the general deer season in Utah. TNX for our SET participation. 73 de NA7G. Traffic: K7HLR 306, WA7KHE 125, WA7JJL 105, WA7MEL 104, WA7WIB 96, KD7NU 37, W7OCX 8.

WYOMING: SM, Dick Wunder, WA7WFC—ASM: KA7AWS, SEC: W7TVK. August 4 is a day to be remembered by Cheyenne as a record 6.25 inches of rain fell in a 4-hr period. Area hams were called into service to provide communications. The local 911 emergency service was flooded out and telephone service was out. Commendations from the Mayor's Office, County Civil Defense, and National Weather Service were presented to the Cheyenne hams. Thanks to all for the fine job. More areas being covered by VE teams, but a few areas still need teams. Lets go guys. Recent upgrades include WA7ZZY to Extra. Congrats. Wyo Cowboy Net held 22 sessions with 720 QNI &13 QTC. Rock Springs Club held first exam & 83% passed. Traffic: NN7H 238, W7HLA 43, KC7QE 14.

SOUTHEASTERN DIVISION

ALABAMA: SM: Joseph Smith, Jr., WA4RNP—STM: N4JAW. SGL: KA4WVU. BM: KF4VV. OO/A AUX: AA4BL. I have appointed a new Official Observer Coordinator for the section in the person of Wayne Gentry, AA4BL of Montgomery and the address to send your reports to is: 108 Graylynn Dr. Prattville, AL 36067. The Montgomery Hamfest will be the 9th of this month I hope to see all of you there. I trust that your local group had a good Simulated Emergency Test last month and that everyone learned something new that will help if and when the real thing should come to pass. I have only one Silent Key to mention: W4VDL, Eileen Pendleton of Mobile. The "Night Tango" exercise was a success again this year. The "amateur" traffic system is tested as a backup for the normal system of telephone and telegraph message handling used every day; thanks to N4JTX, NW4X, AA4BL, and N4AU for helping with the test. Traffic for August: CAND reports 824 messages in 31 sessions with Ala represented 100% by W4CKS and NW4X DRN5 reports 688 mess passed in 62 sessions with Ala represented by WB4IXA, WA4JDH, W4CKS, W4WJF, NW4X, and KC4GS, BPL: WA4JDH. PSHR: WA4JDH, W4ZJY, W4CKS, WD4NYL, and WA4RNP. Totals: WA4JDH 951, W4ZJY 207, K4AOZ 109, W4CKS 93, WB4IXA 41, WD4NYL 39, KB4GAP 38, WA4RNP 37, W4DGH 20, WB4TVY 14, and W4WJF 10.

GEORGIA: SM, Eddy Kosobucki, K4JNL—ASM & BM:

K4VHC. SEC: NC4E. STM: W4PIM. ACC: WA4ABY. OO Coord: NA4I. PIO: WA4PNY. SGL: W4BTZ. TC: K4UDR. Won't u check into one of the section nets? GSN on 3593 at 1900 & 2200 daily, GCN on 3995 at 0700 Dy, 0800 Sun, GN on 3987.5 at 1300 Dy, GSBN on 3975 at 1930 Dy. At this writing the GTN is not functioning. Don't forget the Ham Radio & Computer Expo '85 in the Gwinett County Fairgrounds in Lawrenceville on Nov. 2 & 3. This is taking place of the Stone Mt Hamvention. Ga Tech ARC will host the 2nd annual Packet Radio Conference on Nov. 23 & 24. It will be held on the campus of Ga Technical Univ in Atlanta. For more info write Bill Crews, WB2CPV at 1421 Hampton Ridge Rd., Norcross, GA 30093. According to many sources Packet Radio in the section is the item of topic in all areas of the state. Congrats to the Coastal Plains ARC on becoming an ARRL affiliated club. New Atlanta ARC officers are: Pres: KF4MK, VP: K4FME, SEC: N4MAQ, Treas & Hamfest Chrm: N4IBW, Act: WA4MPW, Editor: NM4T, Rpt Mgr: W4AQE, Trng: KC4EI. Volunteer Exams are consistently being given throughout the section. Check into one of the nets & I'm sure u can get the info u need as to dates, times, etc. All ARES members are requested to participate in the ARES Net which is being held at 9 P.M. on Sun nites. All clubs should have an ATC (Assistant Technical Coordinator). If u have a qualified ham in ur club please have him contact me for the necessary form. HE OR SHE MUST BE AN ARRL MEMBER. I haven't got the full details of the proposed 25th Anniversary celebration of the Ga SSB Association to be held on Dec 1 but check the nets for further info. Agn if ur club or group are planning an ARRL sanctioned Hamfest in 1986 please write me or the Director for forms. Traffic: W4WXA 274, W4PIM 242, W9NXC 79, K4MOG 77, K4VHC 75, W4BKK 66, WB4WOL 35, N4DOM 32, KF4FG 31, W4FIZ 30, W4HON 26, K4EV 22, N4UZ 22, K4BAI 19, KJ4EV 16, WB4SPB 12, N1BKC 3.

NORTHERN FLORIDA: SM, Phil O'Dwyer, WF4X—ASM/ACC: N4ADI. STM: WB4GHU. TC: N4KF. SGL: KC4U. SEC: WA4PUP. OO: K4JJE. PIO: WA4PUO. BM: KB4LB. Phil asked me (N4ADI) to help with the reins while he is recuperating and I am pleased to do so. To make this column of more interest, please send items that should be known throughout the Section. The OARC has Gene, KA4RCM, as it's new President. We wish him and the new Board much success. As this is written Elena has gone that-a-way and many of us are writing the reports that ARRL and our SEC and STM need. So many responded to the emergency both on HF and VHF Nets it will take time to have them all recognized. If you have pics of radio operators in action in the field I'm sure ARRL would like to have them along with your story. Our PIO, Petey would like a copy also. Notice that I didn't say "AMATEUR" above, all those I heard were and are "PRO's". Thanks to all who helped. If you would like to write me, please do, P.O. Box 1598, Maitland, FL 32751. Traffic: WX4H 672, WB4ADL 474, KB9LT 327, N4PL 323, WB4GHU 251, WA4QXT 234, WA4EYU 188, KD4KK 152, WD4IIO 131, AA4NT 129, KB4LB 124, KB4MHH 113, KC4VK 101, KF4U 92, W4KIX 88, N4GMU 86, N4JAQ 80, KF4TM 70, W4GUJ 61, WD4IUI 60, W4MGO 55, KB4FIY 46, KI4CQ 42, WA4SXW 41, W4LDY 35, WD4MLQ 32, NS4C 31, N4ADI 31, WD4HBP 30, WD4EQB 24, WB4AWG 17, NQ4P 16, N4JHI 16, WD4HUZ 14, KF4GY 14, N4ENL 11, NA4F 8, N4EDH 7, N2AOX 7.

SOUTHERN FLORIDA: SM, Richard D. Hill; WA4PFK—SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WD4KBW. PIO: W4WYR. SGL: KC4N. OO: W4SS. WD4KBW reports a total of 213 bulletins received and transmitted this month. OBS stations reporting were: AA4BN 25, W4DL 29, W4ESH 9, WT4F 8, KA4GUS 15, K4IEK 32, WD4KBW 68, WA4EIC 13 and AA4MI 14. It was very upsetting to learn that WF4X, SM Northern Florida had a heart attack about a week following the Jacksonville Hamfest. I received a note from him saying he was doing a lot of resting before open-heart surgery in the next 3-5 weeks. He has appointed N4ADI as acting SM for Northern Florida. As this is being written Hurricane Elena has moved into Mississippi after sitting just off Cedar Key the past two days. The reports are not in, but it appears that in the affected areas the emergency operations went very well. The Emergency Operations Schedule for the Florida Sections Nets was in operation from Saturday morning until late Sunday night. Many thanks to all of you who gave so much time and assistance. The first three Assistant Technical Coordinators for Southern Florida have been appointed by KI4T—they are W4ESH, Collier County; WD4KBW, Hardee County; KB4CIA, Charlotte County. K4SCL reports that he is now active on packet on 144, 220 and 432 MHz—he is usually monitoring 144.010. K4SCL also tried it on OSCAR 10 with no contact. Congrats to AA4HT, New Port Richey who is the new manager of the Florida Medium Speed Net—and many thanks to AA4BN for a fine job this past year. AA4EE, EC for Broward County held a simulated emergency test the latter part of August—it was held over a period of two days and went very well. Congratulations to the South Brevard ARC—they have been officially designated a Special Service Club. They have also been named an ARRL Booster for recruiting five new ARRL members. The Vero Beach ARC has also been named an ARRL Booster. WB4WDK, EC Highlands County sent me a file of Public Service Activity Reports—There have been several activities in which communications were furnished for March of Dimes Walk-America, Sailboat Races, Precision Aerobatic Contest, State-wide Rowing Races, Field Day and a medical emergency. WB4WDK has fishing when a nearby boater suffered a heart attack. WB4WDK used the KF4EV repeater autopatch to call the Sheriff's Department to dispatch an ambulance. Also assisting were W4IEV in Sebring and KF4QI who happened to live near the boat landing. The victim was transported to the Lake Placid Medical Center where he was treated and eventually released. WB4WDK and his family then resumed their fishing and had a great time as the fish were really biting! K4SCL sent a radiogram stating that they had a weather watch preceding three days and nights of evacuation shelter communication—and he was tired and sleepy! KB4FBX announced on the FAST late net that WD4HHH did a superb job on the two meter emergency net in Tampa during the hurricane. WA4ATF reported he participated in the Pinellas County hurricane efforts. Had a nice letter from KE4O, a member of QFN—he said that he hasn't been active recently as he is very active in computer programming right now. He also said he isn't sure just when he will be back on QFN but, like MacArthur, "I shall return." The Palmetto ARC indicated in their club bulletin that they are installing a Mark 4 machine at their repeater site. It is supposed to be the last word in modern repeater technology. W4LLA reported 59 phone patches during August. Also, many thanks to W4LLA for doing the Traffic Hounds column while K4ZK was on vacation. The September issue of the *ARRL Section Leader* shows the

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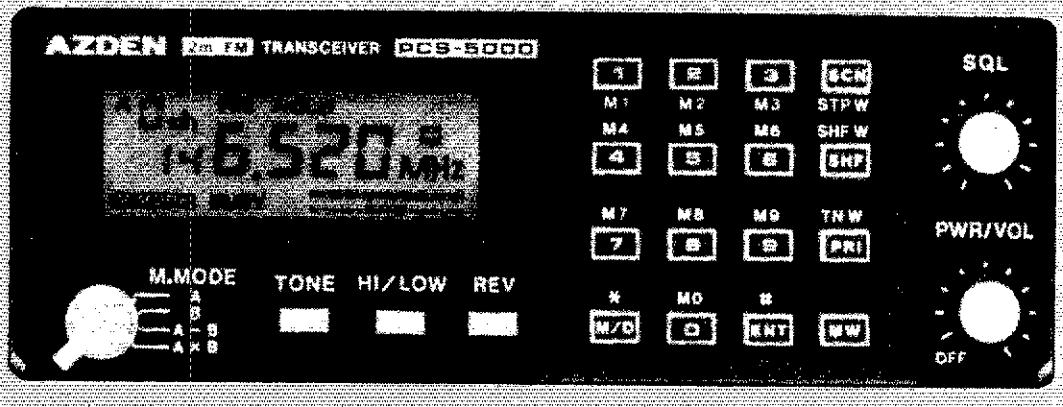

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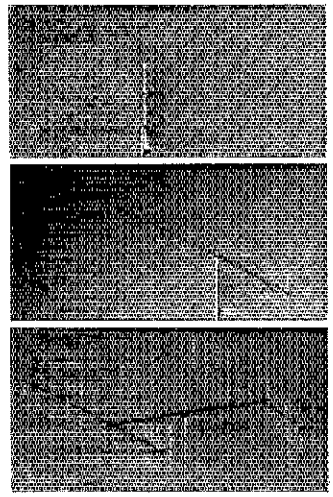

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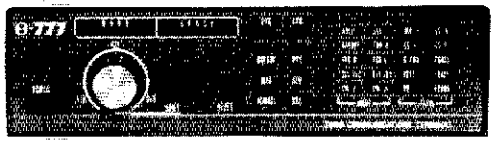

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state of Florida ranked NUMBER ONE in the 1984 Simulated Emergency Test. In the rankings by section, Southern Florida was third. It is great to see both Florida sections working together to put Florida on top! 73 de WA4PFK. Traffic: W3CUL 3168, W3VR 986, WA4PFK 412, KF4JA 345, K4SCL 300, KA4FZI 280, K4EUK 275, W4NFK 233, KY8Y 209, KA4NXF 127, WD4KBW 125, W4DL 122, KY4U 99, N4KFU 94, K4IA 88, KF4RL 84, WA4HXU 83, KA4GUS 78, N4HAS 78, N4EOW 76, W3TLV 75, WB4WYG 74, WA4EIC 71, WA4RUE 69, AA4BN 62, KA4YHS 61, N4ET 61, KI4ZW 55, NW4R 54, KB4KB 52, W4LLA 48, N4MML 45, KB4KAW 43, K4IHH 41, WB4GCK 37, KB4EWO 29, K4ZK 28, W4ESH 25, WD9AEP 21, W3IJR 14, W4PKP 14, KD4GR 12, K4OVC 11, WT4F 11, KA4SIH 11, W4MPV 10, W4MFD 10, WA9VND 10, KA9AKY 9, AA4IF 8, WK4F 7, K4IRT 7, KA4KDD 6, K4FQU 5, N4ILN 5, WV4F 5, KA4GDU 5, WA4GIE 5, WD4MCC 5, W2INZ 3, WB4SNT 3, N4KB 3, W8ARW 2, WA4AAA 1, WR4J 1. (June) W4NFK 98. (July) W4NFK 94.

WEST INDIES: SM, Carlos Flores Roman, WP4J—West Indies Net Slow (WINS) daily 7 P.M. (2300 UTC) on 3.710 kHz. West Indies Net Central (WINC) daily 6:30 P.M. to 6:45 P.M. (2300 to 2345 UTC) on 146.94-600 MHz. The SM called for a section meeting for West Indies for the first time at the QTH of WP4CSG, Alberto Valdelluli, SGL for the section. Mr. Jerry Bourne, WB6RCN, President for the St. Croix ARC and Mr. Robert (Bob) Denniston, President of the St. Thomas ARC attended with KP4DDP, Don Caldwell, rep. of the Puerto Rico ARC. All together there were 10 people (all ARRL members). The meeting was highly successful. The civil war was over and we finally joined the union. SM WP4J recently appointed NP4NF as the Section Emergency Coordinator. With cooperation of the Civil Defense and Amateurs, ARES and RACES is taking growth again. President for the PRARC, KP4AOC, Roberto Morales, and club board of directors are arranging its annual hamfest convention on Sept. 27, 28, 29. National communications systems have sent certificates to the 7 operators in Puerto Rico for the Night TANGO operation during the month of June. Hasta Luego. Traffic: KP4DJ 17.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—ASM: Ray, K7OMR. ACCs: Bob, N7ECE; Bernie, WØYOY. TC: Bill, K7KI. OOC: John, NJ7E. SGL: Jim, W7YXE. BM: Eric, N7EH. STM: Bob, W7EP. NMs: Dave, K6LL; Ben, KA7HEV; Gary, WB7CAG. Above are latest and current AZ Section level appointees. We have a good group. Still need SEC volunteer. Any takers out there? The SW Div. convention aboard the RMS Queen Mary berthed at Long Beach was a huge success. Kudos to all sponsoring So. Cal. Clubs for hosting a grand event. Many AZ hams in attendance including Barry Goldwater, K7UGA, who gave FB banquet speech. Your SM enjoyed meeting with League Exec. V.P. Dave Sumner, K1ZZ, and Legal Counsel Chris Imlay, N3AKD, for exchange of ideas. Hot item on ARRL forum and subsequent cabinet meeting was proposed expansion of Novice privileges. Be thinking about this so that if and when FCC comes out with an NPR you can voice your feelings to the Div. Director. K7PYK is now running 147.70/10 packet radio repeater on Mt. Bigelow linking Phoenix with Tucson, and includes a BBS/Mailbox service and Gateway to HF bands. Additional info contact W1FJI at 602-994-3504. KB7FE reports that he is now NCS of newly formed Australian-American Tfc. Net (AATN) meeting daily on 14280 at 0500 UTC. N7CEE and W7YS, Coconino County and W7KAX, Mohave sent DEC/EC reports. Need more. Welcome to new YL Novice KA7VZP in Flagstaff. N7EH is pumping out bulletins on Thurs. at 1930 local on TRA rptr. 146.28/88 on Mt. Lemmon. Newly affiliated club is No. Arizona DX Assoc. in Flagstaff, KR7Y, Pres. Congratulations. Your SM solicits your ideas about how to make this column more interesting and useful. 73, and let me hear from you. That's what I'm here for. ATEN: QNI 940, QTC 166. Cactus Net: QNI 595, QTC 89. SWN: QNI 133, QTC 108. AATN: QNI 23, QTC 67. KB7FE made PSHR. Traffic: KB7FE 205, K6LL 189, W7OIF 69, WB7CAG 22, NN7A 13, W7YS 1.

LOS ANGELES: SM, John Walsh, N6UK—Contributed by STM W6INH. This has been a big month for the Los Angeles Section with the convention on the Queen Mary at Long Beach, next to the Spruce Goose. A large turnout. Rooms on the QM were $85.00 per night and I believe they filled her up. Definitely not a working guy's party! Bands have been poor this Summer and traffic seems to be up with all the fairs around the area. Remember time change for SCN/1 effective November 1, UTC. SCN will begin at 6:30 P.M. local time instead of 7:00 P.M. Sorry to report that we have lost one of the old timers from whom most of us in the area learned copying code some 50 years ago. It was W6BP, ole Babs. Very sorry to hear that; he meant a lot to a lot of old timers. Traffic: K6UYK 922, W6INH 557, N6LHE 55, W6NKE 14, AD7O 12, W6ORF 8, K6CL 8, WD6F 8.

ORANGE: SM, Joe H. Brown, W6UBQ—ASM: Karl, N6BVU. SEC: Jim, AE6N. STN: Ernie WA6QCA. OOC: Alex, W6RE. SGL: N6HIQ, Loren. TC: John, KD7XG. PIO: Joe WB6DXT. Will Anderson, AA6DD, resigned the TC position due to job committments. He will stay on as ATC for SIX METER activity. Will was on hand to get the ATC program stated and did a heck of a job. Our new TC John Alan Lind comes well qualified to fill the position. B.S. Physics, Ariz ST. U eight years in installation, operation and maint. of HF, VHF, SSB, FM and FSK communication systems. First license 1968, has been an Amateur Radio instructor and given technical presentations covering propagation predicton methods and OSCAR operation. For information and/or action on a Tech problem contact John 714 7378949. He is also educating the City of Corona council members and planning staff on the fine points for writing Antenna Ordinances to benifit the community and Amateur Radio. Fullerton Radio Club T-Hunt report. Five of the eight teams took their lives in their hands and drove looking for nasty quasi-legal T location. Winners K6OV/WA6OPS/WB6RIE. The southern California Six meter Club sez there is a two meter liaison frequency. If you ever want to know if six meters is open and you are mobile with only two meters, stay tuned to 145.080. The Riverside County Amateur Radio Association has formed and Elmer Committee to get Novices on the air. The Elmer Committee consists of volunteer club members. There are no license class restrictions; any licensed ham qualifies Novice to Extra. Heading this project, W6TKV and KG7XG. The Coachella Valley Amateur Radio Club gave Hazel Kirk NR6P CVARC president a plaque for all the countless hours she has dedicated to amateur radio. If ever a person truly typified how an amateur should be dedicated to public service, then no better model could be found other than Hazel. The Southern California Amateur Radio Computer Club and The West Coast Amateur Radio Club have

qualified for the Club Challenge for the 80's Cerificate for promoting new ARRL members. Amateur Radio must continue to grow and the League must be strong. The Orange County ARES Staff, DEC, Ralph WB6JBI, April WA6OPS, Gorden WD6DUC and Orange Section SEC, Jim AE6N met on Sept. 11, 1985 formed a committe to write, study and implement a Radio Amateur Civil Emergency Service Plan for the County. The purpose is to better use the amateur radio resources such a personnel and freq coordination. The Plan will effectively coordinate the activities of the many emergency service groups with the Orange County Public Service and Emergency Service officials. This would expedite the mutual aid programs between communities during emergencies. The STM reports Dan Farrell, WF6O has qualified for the Brass Pounders league with a total of 592 msgs handled. Congratulations Dan. PSHR WF6O, WB6QBZ, WA6QCA, KA8HJK.

NET	FREQ	TIME	Sess.	QNI	NM	TFC
SGN/1	3598	1900	29	341	WF6O	300
SGN/2	3589	2015	29	238	WF6O	75
SGN/V	146.645	2100	31	520	WA6QCA	374
RTTY	145.12	0900	62	400	KA6HJK	127

Traffic: WF6O 592, WA6QCA 216, AD0A 170, KA6HJK 162, N6GOT 102, WB6QBZ 98, K6ZCE 59, W6CPB 47, W6RE 36, K6DD 24, N6LNI 21, K6JT 21, W6TKV 18, W6NTN 17, KA6HMS 12.

SAN DIEGO: SM, Arthur R. Smith, W6INI—ARRL 1986 Nat Conv will be best ever. San Diego Sept. 5-7, 1986. A special feature is planned for prospective amateurs of junior and senior high school age. The DRONK Radio Network provided comm for America's Finest City Half Marathon with N0AOT, N6ELY, N6FUY, N6NR, W6OGC, KE6VK, K8WEN, KF6Z participating. Extreme heat caused many first aid runs. Upgraded: WB6ODR to Extra: WA6PLX, KG6VX to Adv. SoCal amateurs are invited to take part in 160m ARES net on 1945 kHz at 1100 Sundays. New ARES members: WA6BEJ, KB6HUP, N6LWG, N6MAE, W6MFT, KA0RGQ, KF6WL. The Palomar ARC's North County Traffic Net meets daily at 2000 on 146.73(−). Here's a good opportunity to learn to handle written messages. A must for all who expect to be involved in disaster communications. If you are not an active member of your local Amateur Radio club, you are missing an interesting part of Amateur Radio. In north SD County, the Escondido ARS meets 4th Mon at Glendale Federal, Valley Pkwy and Rose, at 1930. Contact Pres. WD6CZR, 743-7437. NCTN held 30 sessions, handled 104 msgs. ARES-CW met 4 times with 16 checkins. Traffic: KU6D 214, KB5MU 158, N6GW 17, WA6IIK 17.

SANTA BARBARA: SM, Byron Looney, K6FI—After July, August was a pussy cat. Some of our fires continue to burn and USFS has crews on hand for the occasional breakout. Now we can worry about floods and landslides from winter rains. San Luis Obispo area amateurs checked over 100 sirens in less than two hours for Diablo Nuclear Plant. Antenna restrictions continue to plague many areas. Latest victims are in Santa Barbara and Ventura counties. Somehow, our good deeds are never related to antennas. Convention at Long Beach was excellent. Santa Barbara Hamfest enjoyed by all. Your SM still has white knuckles from riding along on T-hunt the night before. If your club hasn't tried the T-hunt as a means of training for search and rescue, think about it. How about a good port-a-peater for your next club project? Traffic: N6HYM 48, K6YD 25.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC—Asst. SM/ACC: NI5V. STM: AE5I. TC: W5LNL. BM: W5QXK. RFI: WB5JBP. SGL: W5UXP. I am very pleased to announce the appointment of Don Divinia, W5LNL, as our new Technical Coordinator for our Section. Don is employed by E-Systems in Greenville as an Electrical Engeneer, has been an extra class licensee since the extra was created; as well as holder of the 1st class commercial ticket. Don came to Texas in 1962 after graduating form M.I.T. and was employed by Collins Radio Co. His wife and son also share the hobby. We are most fortunate to have Don donate his time and expertise in helping our Section membership in any technical problems that may arise. I am sure he will be good source of a club program also. His address is: Don Divinia; Rt. 6 Box 269: Greenville, Tx. 75401. Congats to the Dallas ARC for becoming our newest Special Service Club! The officers and members have worked long and hard in public service activities here in the D/FW Metroplex, and are deserving of the honor and recognition. We need a new Public Information Officer for our Section, If you are interested, write me for details; my address is on page 8 of this issue of QST.PSHR for August: KE5YG N5EZM KA5SPT KD5FR KA5QYV and AE5I. Traffic: KD5RC 290, KA5SPT 144, AE5I 126, WB5VIH 76, WB4HML 69, W9OYL 68, KD5FR 66, KE5YG 61, N5BT 52, KA5AZK 51, KA5RYF 29, KA5QYV 20, KB5UQ 3, N5EZM 2, K2SCU 2, K5PC 2.

OKLAHOMA: SM, Dave Cox, NB5N—ASM: K5WG. SEC: W5ZTN. STM: KV5X. ACC: NJ5Y. BM: W6AS. PIO: WD6IFB. OOC: K5WG. SGL: W5NZS. TC: W5QMJ. The National Traffic System (NTS) is alive and well in the OK Section, but we're always looking for additional participants to broaden our coverage. Our biggest area of need lies in the area of CW ops for the OLZ and OCWN nets. Following is a listing of net stats for August:

NET	FREQ	TIME/DAYS	QTC	QNI	Sess.	NM
OCWN(1)	3740	0200z/TThSSn		(2)		N5HIH
OLZ(1)	3682.5	0100z/Dy	25	152	30	NG5O
ONON	07/67	0430z/Dy	134	495	30	W5AS
OPEN	3900	1400z/Sn		(2)		W5ZTN
OTWN	3900	2345z/M-S	349	389	27	WA5OUV
OCWA	n/a	n/a	18	134	4	W5AS
STN	3850	2330z/M-S	112	455	27	WD5IFB
TRO	28/88	0100z/Tu	2	40	4	K5ENA

(1) CW nets (2) no report for August Kudos to: KA5TTH, WB5SRX, KV5X, KE5JE, KD5NX, NG5O, KX5E, NG5P, W5RB, K5RZF, K5OIP, K5CXP, W5UYH, and WA5ZAA for liaison work with regional nets (RN5, DRN6, CAND). Traffic: WB5SRX 228, W5AS 200, KV5X 149, WD5IFB 145, K5CXP 119, NX5I 98, W5REC 93, KB5EK 82, N4GTP 78, KC5OU 66, NB5N 65, KA5FUU 57, W5VXU 52, W5RB 47, K5GBN 38, NR5L 33, WA5OGC 30, W5VOR 28, W5VLW 28, WA5OUV 27, K5CAY 25, WB5OHK 23, WA5ZOO 18, W5UYH 14, KA5TTH 12, ND5S 5, N5GVK 5, W5JJ 4.

SOUTHERN TEXAS: SM, Arthur R. Ross, W5KR—STM: K5QEW. SEC: KA5KRI. ASM: N5TC. TC: N5AMH. KA5PEX (soon to be ex-KA5PEX for Extra) reports excellent Amateur Radio publicity in Seguin from radio and newspaper; local net certificates issued to WA5WZX, WD5DLN, WD5DOM, KE5QW, W5FFG, WD5BEP, W5MTO, W5UPS; suggests an article in QST on "How to Get Publicity." WA5UZB, K5CVD, N5IDD, WD4PPG, NI5I ran a special events station in Hempstead; 'twas a special fair to raise money for a heart transplant patient. Brenham ARC busy developing plans and collecting people for emergency communication following seminar at that club held by WA5UZB, WB5TJV, K5CVD, WD4PPG. OO Coordinator WA2VJL gave Amateur Radio talk to San Benito Lions Club. OBS W5KLV reports 11 bulletins, 38 satellite bulletins, 5 Propagation forecasts, 5 DX bulletins given 149 readings on 8 nets. DRN5 Mgr WB5YDD reports 688 messages in 62 sessions; STX represented 100% by W5KLV, WB5EPA, WB5FQU, W5CTZ, KD5CB, W5URN, NX5V, KD5KQ, N5GKM, N5DFO, N5AMH, W5ZJY, WB5YDD. CAND Mgr W5KLV reports 816 messages in 31 sessions; DRN5 represented 100%; STX stations WB5YDD, W5KLV, N5AMH, KX5V, N5DFO, W5CTZ, KD5KQ, WB5FQU, WB5EPA, aided in the effort. Newly appointed Technical Coordinator N5AMH reports much activity from ATC applications. Several clubs reported activity during the emergencies of Hurricanes Danny and Elena; STX stations NI5I and N5AMH were heard doing great work as NCS on the Gulf Coast Hurricane Net. Two items I noticed in an overall excellent effort by Amateurs were lack of traffic handling experience by some eager ops and lack of "source of information" on quite a few reports. de W5KR. Traffic: W5KLV 420, W5CTZ 367, N5DFO 242, WB5YDD 237, KS5V 217, WB5FQU 105, WB5EPA 94, WD5GKH 65, K5HZR 65, ND5C 62, WA2VJL 46, N5GKM 32, W5BGE 24, AC5Z 24, KA5PEX 21, W5KR 11, WA5UZB 4.

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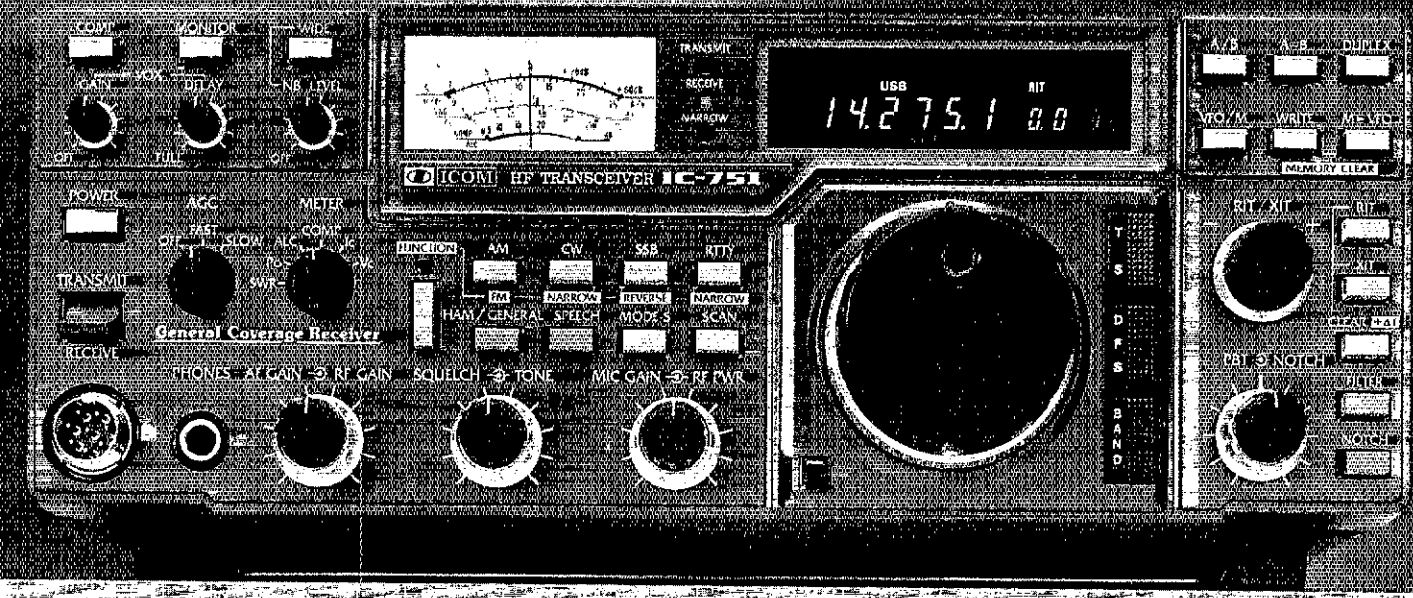

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FILTER SPECIFICATIONS

Filter	Model	Center Freq. (KHz)	6dB [KHz] Width
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AM Ceramic	CFW-455	455	6.0
SSB (PBT) XTAL	FL-30	9011.5	2.3
FM Filter	XM15A	9011.5	15
SSB Narrow (Hygrade Crystal)	FL-44A	455	2.1
OPTIONAL FILTERS			
CW Narrow	FL-52A	455	0.500
CW Narrow	FL-53A	455	0.250
SSB Wide	FL-70	9011.5	2.6
CW Narrow	FL-32	9010.6	0.500
CW Narrow	FL-63	9010.6	0.250
AM	FL-33	9010.0	12.0

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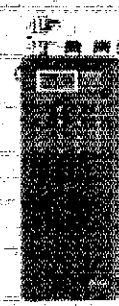
- ★ Grand prize for in-store drawing:



IC-02AT 2-Meter Digital Readout Handheld

- ★ No purchase necessary to register for in-store drawings.
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- ★ ICOM Personnel to demonstrate new equipment.
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THE NEW ALINCO TOWERS ARE IDEAL FOR MOUNTING
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- VHF UHF Antennas
- Oscar Antenna Systems

- Four models from 3½' for roof mounted verticals to 6½' for beam antennas
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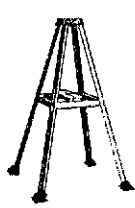
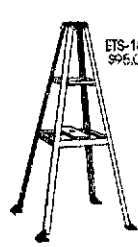
- All towers have four legs for easy mounting. Along with ALINCO's unique dual wall construction for unparalleled strength
- Easy installation
- Rotor mounts inside the ALINCO Tower with provisions for top mounted thrust bearing
- Light-weight aluminum construction for easy installation and durability

ETS-120
$67.00



ETS-150
$79.00



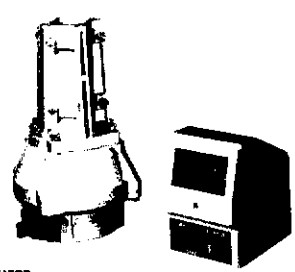
ETS-180
$96.00

ETS-210
$107.00

MODEL	ETS-120	ETS-150	ETS-180	ETS-210
Base for Bearing (top)	6"	6"	6"	6"
Max. Spacing Width (Legs)	1'10"	2'5"	2'7"	3'10"
Actual Height	3'10"	4'7"	5'7"	6'6"
Angle	60°	73°	80°	80°
Legs	Rubber Feed Step	Adjustable Step	Adjustable Step	Adjustable Step
Weight	12 lb	16 lb.	22 lb	28 lb

CONSTRUCTION OF LEGS

ALINCO MODEL AAZ-7 ROTATOR

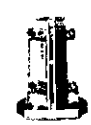


ROTATOR
MODEL AAZ-7 $121.00

FEATURES
- Wind load 8.5 sq. ft. with thrust bearing.
- Accepts mast from 1¼" to 2" in Diameter.
- A stabilized power source built-in the circuits and an industrial sized direction finder with two scales (S—W—N—E—S and 0° to 360°) makes for accurate and easy antenna directioning.
- Tempered mold and die cast gears reduce noise and increase durability.
- Complete water-proofing prevents winter freeze-up.
- The melamin-coated die cast aluminum housing, reinforced at all stress points, prevent rusting and lengthen the lifetime.
- Transformer reduces input voltage to a safe 24 V.A.C. so that an economical 6-core cable can be used.
- Terminal board cable connections can be done easily with a screw driver.

THRUST BEARING
MODEL AAZ-7A

$ 36.00



MAST CLAMP
MODEL AAZ-7B

$ 22.00

OM 2-Meter Mobile

IC-27H

Compact Size No Compromise

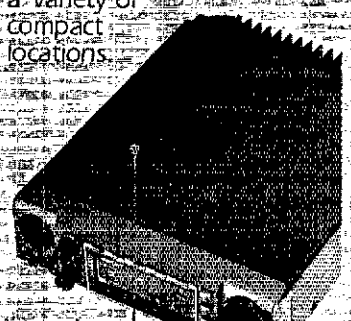
ow ICOM offers the best ices in compact 2-meter mobiles...the IC-27H watt compact and the 7A 25-watt ultra com- t mobile.

ze. The ICOM IC-27A IC-27H measure only W x 1½"H x 7"D (IC-27H is eep).

asy to Operate. Even ugh the IC-27A and IC-27H the smallest mobiles they e large operating knobs ch are easy to use in the ile environment.

2 PL Frequencies. The pacts come ready to go with 32 PL frequencies.

Internal Speaker. The compacts feature an internal speaker which allows the mobiles to be mounted in a variety of compact locations.


Internal Speaker

9 Memories. The compact mobiles have 9 memories which will store the receive frequency, transmit offset, offset direction and PL tone. All memories are backed up with a lithium battery.

Speech Synthesizer. To verbally announce the receive frequency, an optional UT-16 voice synthesizer is available.

Scanning. The ICOM compacts have four scanning systems...memory scan, band scan, program scan and priority scan. Priority may be a memory or a VFO channel...and the scanning speed is adjustable.

More Features. Other standard features include a mobile mount, IC-HM23 DTMF mic with up/down scan and memory scan and internally adjustable transmit power. An optional IC-PS45 slim-line external power supply and IC-SP10 external speaker are also available.

See the IC-27A/H compact mobile transceivers at your local ICOM dealer. For superb performance and reliability your only choice is an ICOM.

Also Available are the IC-37A 220MHz and IC-47A 440MHz 25 Watt compact mobiles.

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First in Communications

ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234

IC-02AT

ICOM 2-Meter Handhelds

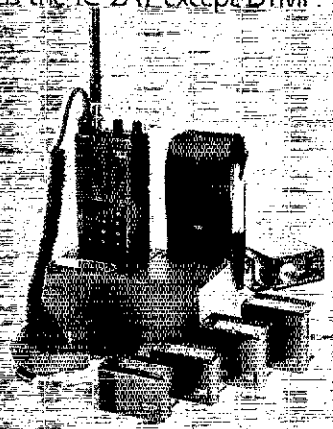
If you want a 2-meter handheld with exceptional features, quality built to last and a wide variety of interchangeable accessories, take a look at the ICOM IC-02AT and IC-2AT handhelds.

Frequency Coverage. The IC-02AT covers 140.000 through 151.550MHz and the IC-2AT, 141.500 through 149.994MHz, both include frequencies for MARS operation.

IC-02AT Features. ICOM's top-of-the-line IC-02AT handheld has the following outstanding features:

- DTMF direct keyboard entry
- LCD readout
- 3 watts standard, 5 watts optional (with IC-BP7 battery pack)
- 10 memories which store duplex offset and PL tone (odd offset can be stored in last 4 memories)
- Frequency dial lock
- Three scanning systems: priority, memory and programmable band scan (selectable increments of 5, 10, 15, 20 or 25KHz)

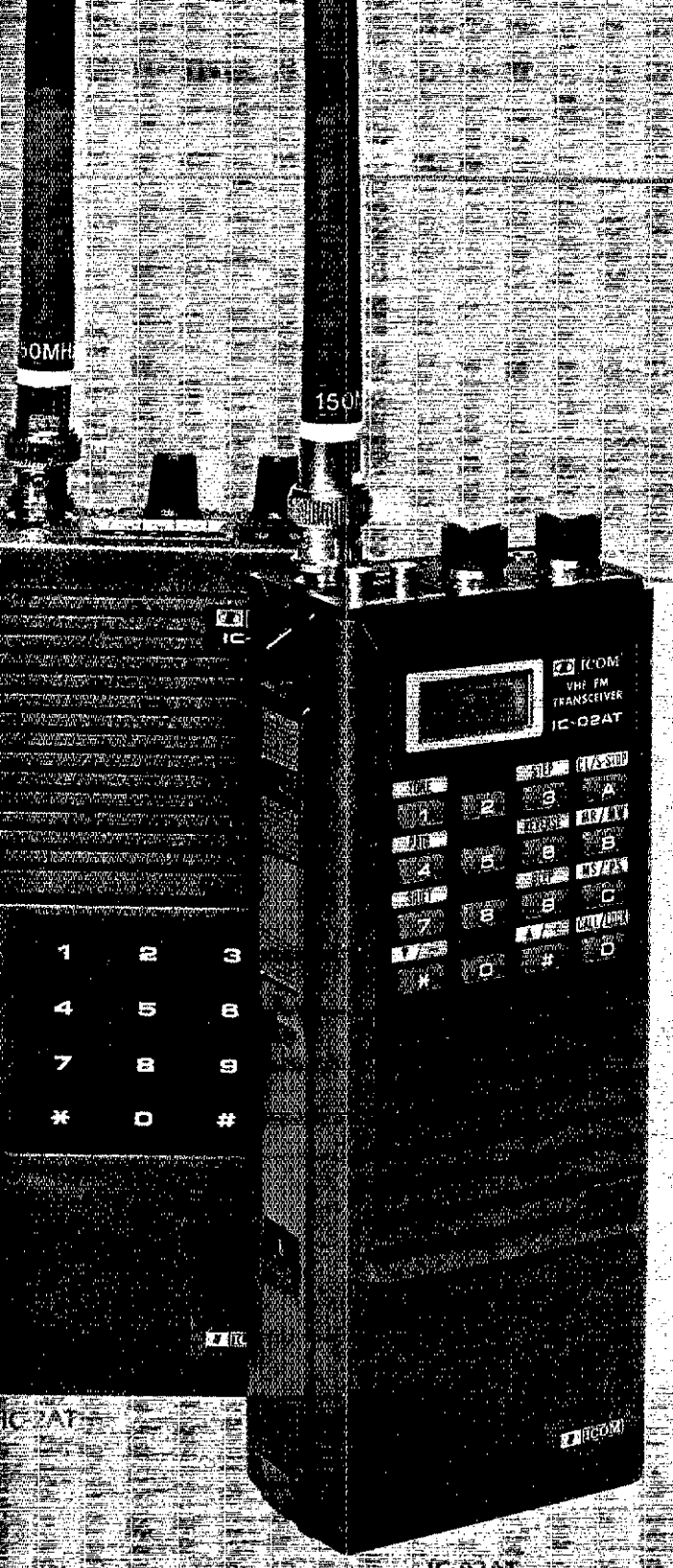
IC-2AT Features. The IC-2AT is ICOM's most popular handheld on the market. The IC-2AT features a DTMF pad, 1.5 watts output and thumbwheel frequency selection. The IC-2A is also available and has the same features as the IC-2AT except DTMF.



Accessories. A variety of slide-on battery packs are available for the IC-02AT and IC-2AT, including the new long-life 800mAH IC-BP8 which can be used with both handhelds.

Other accessories include the HS-10 boom headset, HS-10SB PTT switchbox, HS-10SA VOX unit (for IC-02AT) and an assortment of battery pack chargers.

The IC-02AT and IC-2AT come standard with an IC-BP3 NiCd battery pack, flexible antenna, AC wall charger, belt clip, wrist strap and ear plug. See the IC-02AT and IC-2AT 2-meter handhelds at your local ICOM dealer.



IC-02AT

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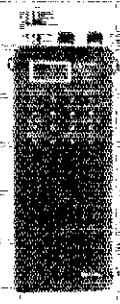
- ★ In-store drawings each hour. Come and register to win!!
- ★ Grand prize for in-store drawing:
  IC-02AT 2-Meter Digital Readout Handheld



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- ***See a change in your Challenger***
- ***Put some fun in your Flescher***
- ***Get your CP-1 in the chips***
- ***Really motivate your MFJ***
- ***Heat-up your HAL and hop-up your Heath with the. . . .***

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For both the COMMODORE 64 and VIC 20
(Soon for the new C-128)

Works with all these fine terminal units to bring you the ultimate in RTTY/CW/AMTOR performance. New AMTOR+ program with variable PTT delay for slower rigs and high rate bit sync to compensate for computer clock crystal variations. It's the best $39.95 you'll ever spend to improve your station. Don't have a disk drive, then use the ROM cartridge at $59.95. On performance and features vs. cost, nothing even comes close! No complicated menus to bog you down. No limited performance programs here. The AIRDISK will enhance **any** demodulator. Disk works with both computers. Specify which for cartridge.

HERE ARE A FEW OF ITS MANY FEATURES:

• on screen tuning indicators • full or split-screen • auto-load memories* • output to commodore printers • full speed operation, morse to 99 wpm. Baudot to 132 wpm, ASCII to 300 Baud • 4 mode AMTOR • WRU • independent RX/TX normal/invert • pitch reference CW tuning • real-time disk communication* • break buffer • random code generator • RX/TX of basic programs* • 24 hr. clock • unshift or space • foxtest and more.

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*Disk only

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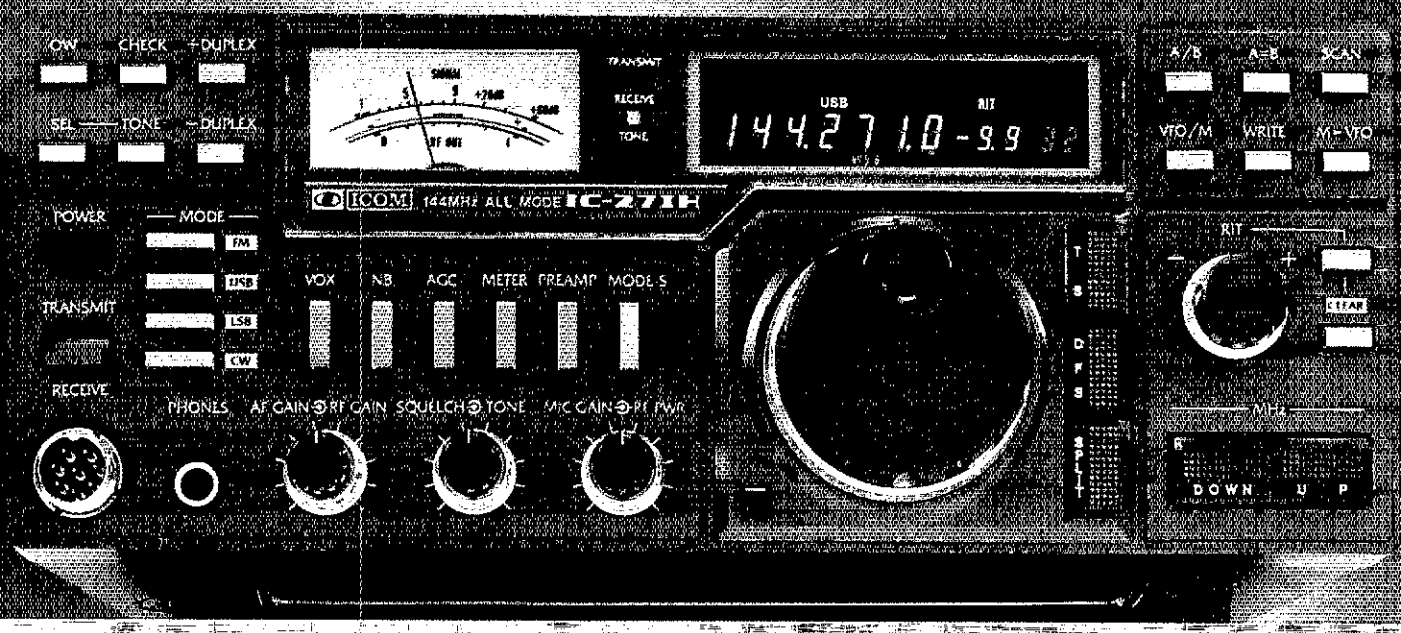
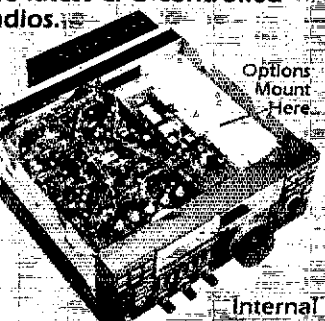
COM VHF Transceiver

IC-271H

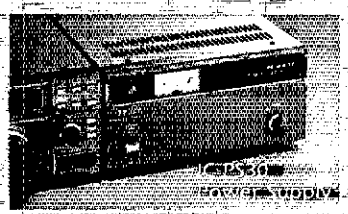


The Versatile 100 Watt 2 Meter Base System

For the ultimate in 2-meter communications, ICOM presents the IC-271H transceiver with a high dynamic range receiver and a 100 watt transmitter...And all the advanced functions of the latest CPU controlled radios.



Internal Construction

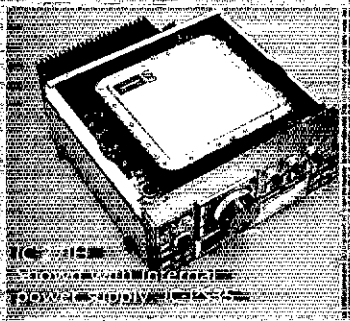


Exceptional Standard Features:

- 143.800 – 148.199MHz, expandable for MARS operation
- 32 full-function Memories with lithium battery backup
- 100 Watts, fully adjustable on all modes
- Variable Tuning Steps, FM 5KHz and 1KHz; SSB 10Hz, 50Hz and 1KHz
- 32 built-in Subaudible Tones
- High Visibility Display
- S-Meter and Center Meter
- Scanning Systems Memories, Modes and Programmable Band
- IC-HM12 Microphone with Up/Down Scan
- 11¼"W x 4⅜"H x 12⅝"D

Optional Features. AG-25 switchable preamp, UT-15S CTCSS encoder/decoder (encoder is standard), IC-EX310 voice synthesizer, IC-SM8 two-cable desk mic and IC-SM6 desk mic. PLUS a variety of power supplies... IC-PS30 system power supply, IC-PS15 external or IC-PS35 internal power supplies.

The IC-271A. The 25 watt IC-271A has the same outstanding features as the IC-271H, including an internal power supply, IC-PS25.



See the IC-271A(H) and other fine ICOM equipment at your local ICOM dealer today.

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ICOM 440MHz

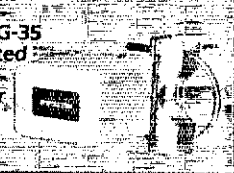
For a Total UHF System, Choose ICOM

ICOM offers a variety of UHF gear to meet your operating requirements... the IC-471H base station transceiver, IC-47A compact mobile, IC-04AT or IC-4AT handheld transceivers, and the RP-3010 crystal controlled repeater.

The IC-471H all mode 430-450MHz base station transceiver provides 10 to 75 watts of adjustable power. With 32 full-function memories, 32 PL tones, memory scan, mode scan and programmable band scan, the IC-471H provides maximum UHF base station performance. The IC-471A 25 watt version is also available.

The IC-47A 25 watt 440-449.995MHz ultra-compact FM mobile provides superb performance in the mobile environment. Measuring only 5½" wide by 1⅝" high by 9" deep, the IC-47A also features nine full-function memories, 32 built-in PL tones and a complete scanning system. Each unit comes standard with an HM-23 mic with up/down scan and a mobile mounting bracket.

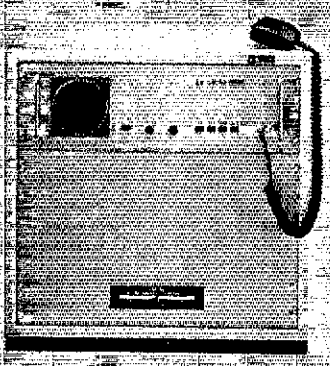
Optional AG-35 Mast Mounted GaAsFET Preamplifier for IC-471H



The IC-04AT top-of-the-line UHF handheld features DTMF direct keyboard entry, LCD readout, 32 PL tones, 3 watts standard (5 watts optional) and 10 memories which store duplex offset and PL tone.

The IC-4AT handheld features 440-449.995MHz coverage, a DTMF pad, 1.5 watts output and thumbwheel frequency selection.

The IC-04AT and IC-4AT come standard with an IC-BP3 NiCd battery pack, flexible antenna, AC wall charger, belt clip, wrist strap and ear plug. PLUS a wide variety of slide-on battery packs and accessories are available.



The RP-3010 crystal controlled UHF repeater covers from 430-450MHz and includes CTCSS, 3 digit DTMF decoder and CW ID'er.

See ICOM's full line of UHF gear at your local ICOM dealer.

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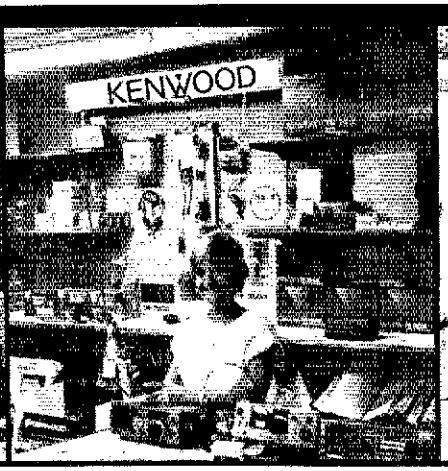
All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 471H1184

Rob, WA3QLS



Katherine, KA3IYO

Paul, WA3QPX

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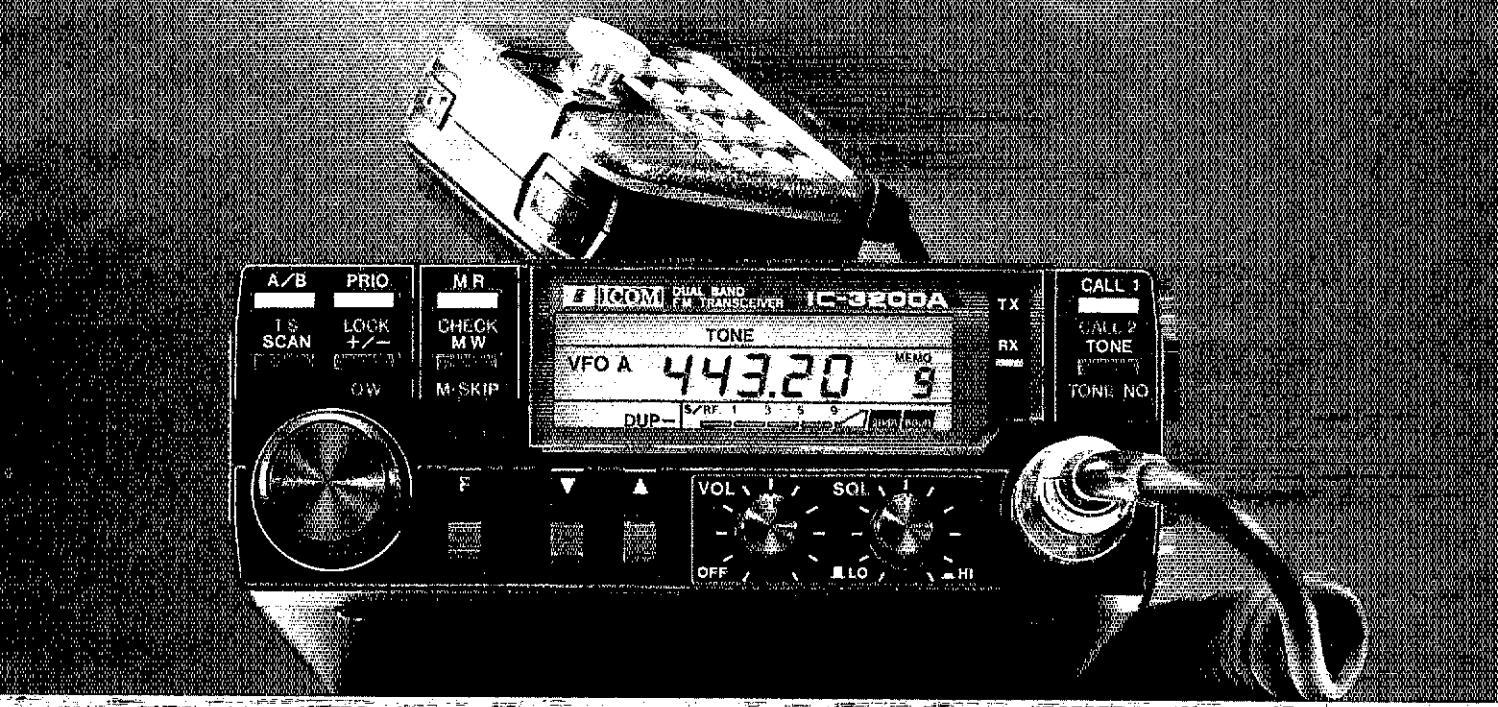
COM Dual Bander

IC-3200A



The Most Compact Dual Bander at the Smallest Price

Finally there's a compact ll featured 25 watt FM ual bander that's simple in esign and operation, plus ry affordable...the -3200A.

Dual Bands. The IC-3200A vers both the 2-meter 0.000–150.000MHz) and cm (440.000–450.000MHz) nds. The IC-3200A also fea- res fully programmable off- ts in 5KHz steps for MARS d CAP repeater operation.

25 Watts. The IC-3200A livers 25 watts of output on th bands. Or the low power n be adjusted to one to ten atts.

Compact. The IC-3200A is only 5½"W x 2"H x 8½"D.

Simple to Operate. With only 14 front panel controls, the IC-3200A is by far the easiest dual bander to use.

Memory Lockout. For scanning only certain memory channels, ICOM utilizes a memory skip (M SKIP) function.

10 Tunable Memories. To store your favorite frequencies, 10 memories are provided. Each memory will store the receive frequency, transmit offset, offset direction and PL tone. Each memory can be tuned up or down when selected, yet automatically returns to the original frequency when reselected. All memories are backed up with a lithium battery.

Scanning. The IC-3200A has four scanning systems... memory scan, band scan, program scan and priority scan.

Other Outstanding Standard Features:

- New LCD display, easy to read in bright sunlight
- Tone encoder (all PL/subaudible tones built-in)
- IC-HM14 mic with up/down scan and DTMF
- One antenna connector (Duplexer already installed)
- Variable tuning increments 5 and 15KHz (2-meters) 5 and 25KHz (70cm)
- Frequency dial lock
- Dual VFO's
- Mounting bracket

Optional Accessories. An optional IC-PS30 system power supply, voice synthesizer and IC-SP10 speaker are available.

See the IC-3200A at your local ICOM dealer for the best buy on a full featured dual bander.

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First in Communications

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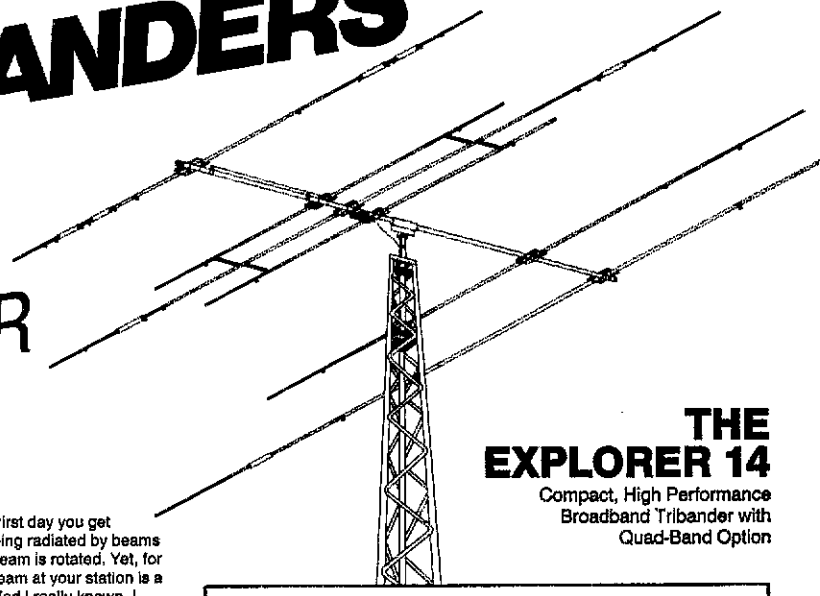
hy-gain®

BROADBANDERS

MAXIMIZE THE POTENTIAL OF YOUR HAM GEAR



There is nothing like a beam!

You hear about the importance of the antenna system from the first day you get involved in amateur radio. You hear the big signals on the air being radiated by beams and you hear those same signals virtually disappear when the beam is rotated. Yet, for whatever the reason, getting on the air for the first time with a beam at your station is a down-right exhilarating experience. The universal reaction is "Had I really known, I would have installed a beam years ago".

The gain of a beam multiplies the effective radiated power of your transmitter just like an amplifier. More importantly, it amplifies the signal from the station being beamed. Off the sides and back of the antenna, the effective radiated power of those kilowatts on/near your frequency are reduced to manageable QRP levels.

A well-designed beam is by far the best performance buy you can make and it doesn't use any electricity. Further, if you buy a good one, it will last longer than some of the electronics gear in your shack. In terms of cost per hour of enjoyment, a beam antenna is among the least expensive major station components.

As sunspot cycle 21 winds down over the next few years the priority for a good beam shifts from "great to have" to "essential!" To maximize your station capability on the high bands choose one of these super broadband arrays.

THE EXPLORER 14

The same compact size as the well-known TH3Mk3 it replaces. The driven element uses an open sleeve dipole which is a concept that we call PARA-SLEEVE (Patent Pending). The para-sleeve design achieves the broadband performance objective. The forward gain and front to back ratio is very impressive, especially when compared with other antenna designs in the same size class. 43 lbs. (19.5 kg) of superb performance on a 14 ft. (4.3 m) boom. Turning radius 17 ft. (5.3 m) and 7.5 sq. ft. (.69 m²) of surface area. The EX 14 is the ideal choice where space is limited. Great for roof mount or on smaller towers. Optional QK7-10 kit adds your choice of either 30 or 40 meters to the driven element.

FIVE ELEMENT THUNDERBIRD TH5Mk2

Broadbanding is achieved with our unique dual driven element system. Five elements on the 19 foot boom (5.8 m), with four active elements on each of the three bands. 72 lbs. (32 kg) of rugged antenna with 7.4 sq. ft. (.68 m²) of surface area. Turning radius is a manageable 18.4 ft. (5.6 m).

SEVEN ELEMENT THUNDERBIRD TH7DX

This is a broadband successor to the legendary TH6DXX. Five active elements on 10 meters and four elements on both 15-20 meters. The TH7DX represents the ultimate in high-performance arrays whether you're comparing other large tribander's or stacked monobander's. 76 lbs. (35 kg) with a surface area of 9.4 sq. ft. (.87 m), a 24 ft. (7.3 m) boom and a turning radius of 20 ft. (6.1 m). If you own a TH6DXX, a conversion kit is available which includes the second driven element, the completely new matching system, a full set of stainless steel hardware, and of course, step by step instructions. After conversion, your TH6DXX is a TH7DX, exactly.

FEATURES COMMON TO EX 14, TH5Mk2, and TH7DX:

- Separate Hy-Q traps for each frequency. Factory assembled and individually resonated to insure uniform performance.
- Handles maximum legal power with a respectable margin of safety.
- Unique broadband beta match assures efficient energy transfer and places the entire antenna structure at dc ground.
- BN 86 balun supplied as standard.
- Top quality stainless steel hardware supplied at no added cost.
- Super strong, taper swaged 6063-T832 thick-wall aluminum tubing used throughout.
- Unique Hy-Gain die cast aluminum boom to mast bracket. Accepts mast diameters up to 2½" (63 mm).
- Twist and slip proof die formed heavy gauge aluminum element to boom brackets.
- All tubing deburred and cleaned for ease of assembly.
- Only one set of dimensions for complete coverage of all three bands below 2:1 SWR.
- Designed to survive winds of 100 mph (160 km/hr).

THE EXPLORER 14

Compact, High Performance Broadband Tribander with Quad-Band Option

The value of a Directional Antenna was one of my early "discoveries". Over the years, I have built or bought numerous Quads and Yagis. I have never been so impressed as I am with my TH7DX. I enjoy QRP but now have a problem convincing folks that I am only running 5 watts! The TH7DX is a superb antenna, both from a performance and a structural point of view.

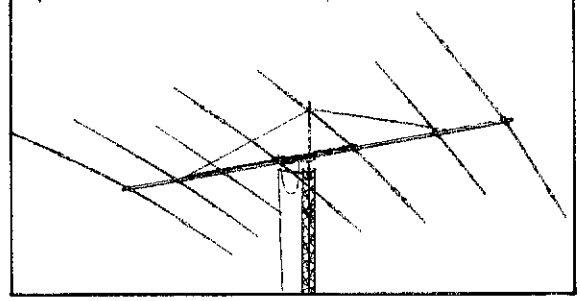
Congratulations!

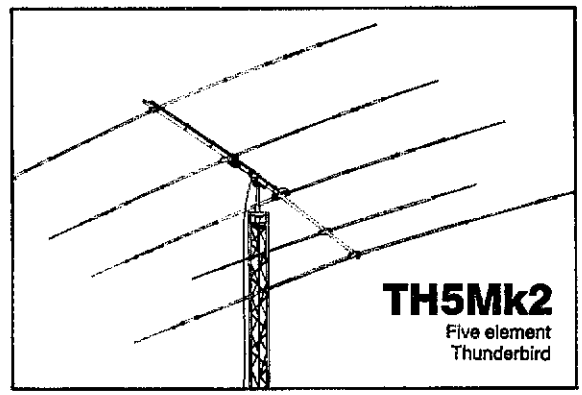
Jack Falker
W8KR

(W8KR has worked all countries but two!)

TH7DX

Seven element Thunderbird





TH5Mk2

Five element Thunderbird

TELEX hy-gain

TELEX COMMUNICATIONS, INC.

9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A.

KENWOOD

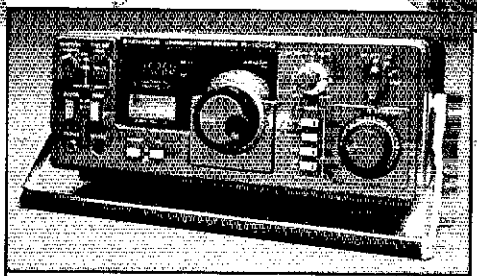
...pacesetter in Amateur radio

Scan the World

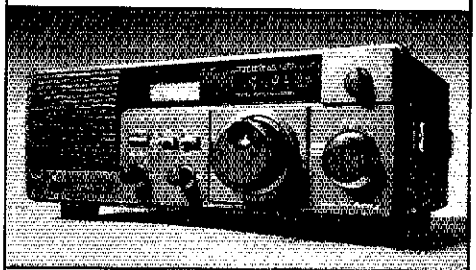
R-2000

All-mode receiver.

- Covers 150 kHz - 30 MHz in 30 bands.
- All mode: USB, LSB, CW, AM, FM.
- Digital VFO's, 50-Hz, 500-Hz or 5-kHz steps. F. LOCK switch.
- Ten memories store frequency, band, and mode data. Each memory may be tuned as a VFO.
- Lithium batt. memory back-up.
- Memory scan.
- Programmable band scan.
- Fluorescent tube digital display of frequency (100 Hz resolution) or time.
- Dual 24-hour quartz clocks, with timer.
- Three built-in IF filters with NARROW/WIDE selector switch. (CW filter optional.)
- Squelch circuit, all mode, built-in.
- Noise blanker built-in.
- Large front mounted speaker.
- RF step attenuator. (0-10-20-30 dB.)
- AGC switch. (Slow-Fast.)
- "S" meter, with SINPO scale.
- High and low impedance antenna terminals.
- 100/120/220/240 VAC operation.
- RECORD output jack.
- Timer REMOTE output (not for AC power).
- Muting terminals.



R-1000 High performance receiver • 200 kHz-30 MHz in 30 bands • AM, CW, SSB • 3 IF filters • noise blanker • RF attenuator • S-meter • 120-240 VAC • muting terminals • built-in speaker • digital display/clock/timer



R-600 General coverage receiver • 150 kHz-30 MHz in 30 bands • AM, CW, SSB • IF filters • noise blanker • RF attenuator • S-meter with SINPO scale • front mounted speaker • 3 antenna inputs • 100-240 VAC operation • record jack • muting terminals • digital display

Optional accessories:

- VC-10 VHF converter for R-2000 covers 118-174 MHz
- YG-455C 500 Hz CW filter for R-2000
- HS-4 Headphones
- HS-5 Deluxe headphones
- HS-6 Lightweight headphones
- HS-7 Micro headphones
- DCK-1 DC cable kit for 13.8 VDC operation
- AL-2 Lightning and static arrester
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Additional information on Kenwood all-band receivers is available from authorized dealers.

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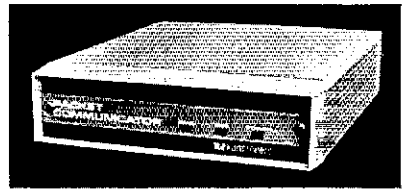

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Those devoted Yaesu fans out there — the FT101E certainly had a lot of supporters — should be pleased to know that Yaesu is just about to come roaring back into the marketplace. This means new products, stronger advertising and maybe—just maybe—a price promotion or two. Yaesu started to get serious about computer control of rigs with their ultra-boxes— [redacted] —so you might expect to see some more tricks with computer control. Now—when will these guys get wise enough to have the code written for the big 4 machines in amateur radio—Radio Shack, Commodore, Apple, and IBM. Contact Madison for the latest in Yaesu all the time. Another idea — how about a dual banded hand-held. Two meters and 430 for openers. Certainly the technology is available . . . and the market is ready. First one to market with this product will move a lot of radios.

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List price $699.95/**CE price $379.00/SPECIAL**
10-Band, 20 Channel • Crystalless • AC/DC
Frequency range: 25-550 MHz. continuous coverage and 800 MHz. to 1.3 GHz. continuous coverage
The *Regency* MX7000 scanner lets you monitor military, F.B.I., Space Satellites, Police and Fire Departments, Drug Enforcement Agencies, Defense Department, Aeronautical AM band, Aero Navigation Band, Fish & Game, Immigration, Paramedics, Amateur Radio, Justice Department, State Department, plus thousands of other radio frequencies most scanners can't pick up. The *Regency* MX7000 is the perfect scanner for intelligence agencies that need to monitor the new 800 MHz. cellular telephone band. The MX7000, now at a special price from CE.

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Multi-Band, 20 Channel • No-crystal scanner Search • Lockout • Priority • AC/DC Selectable AM-FM modes • LCD display
Bands: 30-50, 118-136, 144-174, 440-512, 800-950 MHz.
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NEW! Bearcat® 50XL-BB

List price $199.95/**CE price $129.00/SPECIAL**
10-Band, 10 Channel • Handheld scanner
Bands: 29.7-54, 136-174, 406-512 MHz.
The Uniden Bearcat 50XL is an economical, hand-held scanner with 10 channels covering ten frequency bands. It features a keyboard lock switch to prevent accidental entry and more. Also order part # **B5** which is 5 AA ni-cad batteries for $13.00, a plug in wall charger, part # **AD100** for $14.95 and also order optional cigarette lighter cable part # **PS001** for $14.95.

NEW! JIL SX-400-BB

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Multi-Band, 20 Channel • No-crystal Scanner Search • Lockout • Priority • AC/DC
Frequency range 26-520 MHz. continuous coverage. With optionally equipped RF converters 150KHz-3.7 GHz.
The *JIL* SX-400 synthesized scanner is designed for commercial and professional monitor users that demand features not found in ordinary scanners. The SX-400 will cover from 150 KHz to 3.7 GHz. with RF converters. Order the following RF converters for your SX-400 scanner. **RF-1030-BB** at $234.00 each for frequency range 150 KHz - 30 MHz. USB, LSB, CW and AM. (CW filter required for CW signal reception); **RF-5080-BB** at $194.00 each for 500-800 MHz; **RF-8014-BB** at $194.00 each for 800 MHz.-1.4 GHz. Be sure to also order **ACB-300-BB** at $99.00 each which is an antenna control box for connection of the RF converters. The **RC-4000-BB** data interface at $259.00 each gives you control of the SX-400 scanner and RF converters through a computer. Add $3.00 shipping for each RF converter, data interface or antenna control box. If you need further information on the JIL scanners, contact JIL directly at 213-926-6727 or write JIL at 17120 Edwards Road, Cerritos, California 90701 U.S.A.

SPECIAL! JIL SX-200-BB

List price $499.95/**CE price $154.00/SPECIAL**
Multi-Band - 16 Channel • No-Crystal Scanner
Frequency range 26-88, 108-180, 380-514 MHz.
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Regency® HX1000-BB

List price $329.95/**CE price $189.00/SPECIAL**
6-Band, 30 Channel • No Crystal scanner Search • Lockout • Priority • Scan delay Sidelit liquid crystal display • Digital Clock
Frequency range: 30-50, 144-174, 440-512 MHz.
The new handheld *Regency* HX1000 scanner is fully keyboard programmable for the ultimate in versatility. You can scan up to 30 channels at the same time. The LCD display is even sidelit for night use. Order **MA-256-BB** rapid charge drop-in battery charger for $68.95 plus $3.00 shipping/handling. Includes wall charger, carrying case, belt clip, flexible antenna and nicad battery. Order now.

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List price $349.95/**CE price $209.00/SPECIAL**
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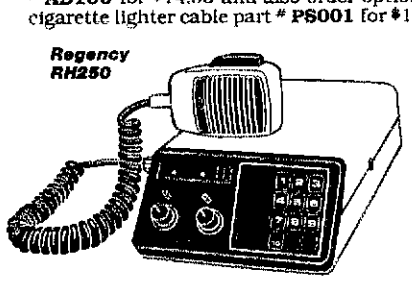

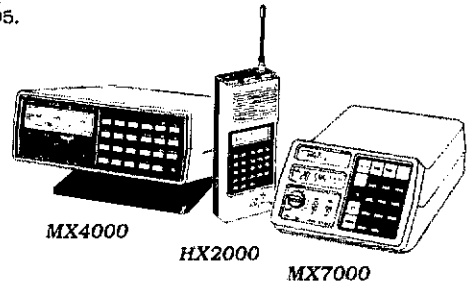

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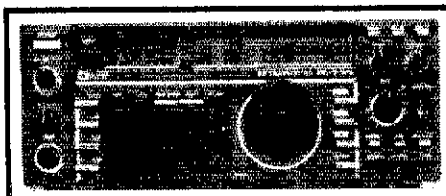

HF Equipment	Regular	SALE
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AT-150 Automatic antenna tuner	349.00	314.95
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EX-243 Electronic keyer unit	50.00	
IC-745 9-band xcvr w/1-30 MHz rcvr	999.00	779.95
PS-35 Internal power supply	160.00	144.95
EX-241 Marker unit	20.00	
EX-242 FM unit	39.00	
EX-243 Electronic keyer unit	50.00	
FL-45 500 Hz CW filter (1st IF)	59.50	
FL-54 270 Hz CW filter (1st IF)	47.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
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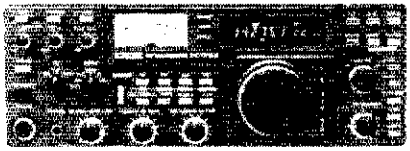
SM-6 Desk microphone	39.00	
HM-12 Extra hand microphone	39.50	
MB-12 Mobile mount	19.50	



IC-751 9-band xcvr/1-30 MHz rcvr	1399.00	1199
PS-35 Internal power supply	160.00	144.95
FL-32 500 Hz CW filter (1st IF)	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
FL-33 AM filter	31.50	
FL-70 2.8 kHz wide SSB filter	46.50	
HM-12 Extra hand microphone	39.50	
SM-6 Desk microphone	39.00	
RC-10 External frequency controller	35.00	
MB-18 Mobile mount	19.50	

IC-720A 9-band xcvr • (CLOSEOUT) •	1349.00	749.95
PS-15 20A external power supply	149.00	134.95
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 kHz AM filter	49.50	
BC-10A Memory back-up	8.50	
SM-5 8-pin electret desk mic	39.00	
MB-5 Mobile mount	19.50	

Other Accessories	Regular	SALE
PS-15 20A external power supply	149.00	134.95
CF-1 Cooling fan for PS-15	45.00	
EX-144 Adaptor for CF-1/PS-15	6.50	
PS-30 Systems p/s w/cord, 6-pin plug	259.95	234.95
OPC Opt. cord, specify 2, 4 or 6-pin	5.50	
SP-3 External base station speaker	49.50	
SP-5 Remote speaker for mobiles	25.00	
CR-64 High stab. ref. xtal (745/751)	56.00	
PP-1 Speaker/patch (specify radio)	139.00	129.95
SM-8 Desk mic - two cables, Scan	69.95	
AT-100 100W 8-band auto. antenna tuner	349.00	314.95
AT-500 500W 9-band auto. antenna tuner	449.00	399.95
AH-1 5-band mobile antenna w/tuner	289.00	259.95
GC-4 World clock • (CLOSEOUT) •	99.95	79.95

ICOM

HF linear amplifier	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1795.00	1299

6-meter VHF Portable	Regular	SALE
IC-505 3/10W 6m SSB/CW portable	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	

VHF/UHF base multi-modes	Regular	SALE
IC-551D 80W 6-meter SSB/CW	699.00	599.95
EX-106 FM option	125.00	112.95
BC-10A Memory back-up	8.50	
SM-2 Electret desk microphone	39.00	
IC-271A 25W 2m FM/SSB/CW	699.00	569.95
AG-20 Internal preamplifier*	56.95	
IC-271H 100W 2m FM/SSB/CW	899.00	759.95
AG-25 Mast mounted preamplifier*	84.95	
IC-471A 25W 430-450 SSB/CW/FM xcvr	799.00	699.95
AG-1 Mast mounted preamplifier*	89.00	
IC-471H 75W 430-450 SSB/CW/FM	1099.00	969.95
AG-35 Mast mounted preamplifier*	84.95	

For a Limited time!

With the purchase of an IC-271A/H or IC-471A/H get the matching PREAMP* for only • $1.00 Extra.

Accessories common to 271A/H and 471A/H	Regular	SALE
PS-25 Internal power supply for (A)	99.00	89.95
PS-35 Internal power supply for (H)	160.00	144.95
PS-15 External power supply	149.00	134.95
SM-6 Desk microphone	39.00	
EX-310 Voice synthesizer	39.95	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	12.50	
UT-15S UT-15S w/TS-32 installed	79.95	

VHF/UHF mobile multi-modes	Regular	SALE
IC-290H 25W 2m SSB/FM, TTP mic	549.00	479.95
IC-490A 10W 430-440 SSB/FM/CW	649.00	579.95

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	369.00	299.95
IC-27H Compact 45W 2m FM w/TTP mic	409.00	359.95
IC-37A Compact 25W 220 FM, TTP mic	449.00	299.95
IC-47A Compact 25W 440 FM, TTP mic	469.00	399.95
PS-45 Compact 8A power supply	112.95	99.95
UT-16/EX-388 Voice synthesizer	29.95	
SP-10 Slim-line external speaker	29.95	
IC-3200A 25W 2m/440 FM w/TTP	549.00	489.95
UT-23 Voice synthesizer	29.95	
AH-32 2m/440 Dual Band antenna	32.95	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	20.18	
Larsen PO-MM Magnetic mount	19.63	
IC-1271A 10W 1.2 GHz SSB/CW Base	999.00	889.95
ATV-1200 ATV interface unit	TBA	
PS-25 Internal power supply	99.00	89.95
EX-310 Voice synthesizer	39.95	
UT-15S CTCSS encoder/decoder	79.95	
IC-120 1W 1.2 GHz FM Mobile	499.00	449.95
ML-12 1.2 GHz 10W amplifier	339.00	299.95

Repeaters	Regular	SALE
RP-3010 440 MHz, 10W FM, xtal cont.	999.00	899.95
RP-1210 1.2 GHz, 10W FM, 99 ch. synth	1199.00	1089
Duplexer 1210 1.2 GHz duplexer	1199.00	1089
Cabinet	249.00	

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Hand-held Transceivers		
Deluxe models	Regular	SALE
IC-02AT for 2m	349.00	289.95
IC-04AT for 440 MHz	379.00	289.95
Standard models	Regular	SALE
IC-2A for 2m	239.50	189.95
IC-2AT with TTP	269.50	199.95
IC-3AT 220 MHz, TTP	299.95	239.95
IC-4AT 440 MHz, TTP	299.95	239.95

Accessories for Deluxe models	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	67.50
BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50
BC-35 Drop in desk charger for all batteries	69.00
BC-60 6-position gang charger, all batts SALE	359.95
BC-16U Wall charger for BP7/8P8	10.00
LC-11 Vinyl case	17.95
LC-14 Vinyl case for DIx using BP-7/8	17.95
LC-02AT Leather case for DIx models w/BP-7/8	39.95

Accessories for both models	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	39.50
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	29.50
BP-4 Alkaline battery case	12.50
BP-5 425mah/10.8V Nicad Pak - use BC35	49.50
CA-2 Telescoping 2m antenna	10.00
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	10.00
CP-1 Cig. lighter plug/cord for BP3 or DIx	9.50
DC-1 DC operation pak for standard models	17.50
LC-2AT Leather case for standard models	34.95
RB-1 Vinyl waterproof radio bag	30.00
HH-SS Handheld shoulder strap	14.95
HM-9 Speaker microphone	34.50
HS10 Boom microphone/headset	19.50
HS-10SA Vox unit for HS-10 & Deluxe only	19.50
HS-10SB PTT unit for HS-10	19.50
ML-1 2m 2.3w in/10w out amplifier SALE	79.95
SS-32M Commspec 32-tone encoder	29.95

Receivers	Regular	SALE
R-7000 25-2000 MHz, 117V AC	899.00	789.95
RC-12 Infrared remote controller	TBA	
R-71A 100 kHz-30 MHz, 117V AC	$799.00	659.95
RC-11 Infrared remote controller	59.95	49.95
FL-32 500 Hz CW filter	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
EX-257 FM unit	38.00	
EX-310 Voice synthesizer	39.95	
CR-64 High stability oscillator xtal	56.00	
SP-3 External speaker	49.50	
CK-70 (EX-299) 12V DC option	9.95	
MB-12 Mobile mount	19.50	

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KENWOOD

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Handy Handful...

TR-2600A/3600A

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

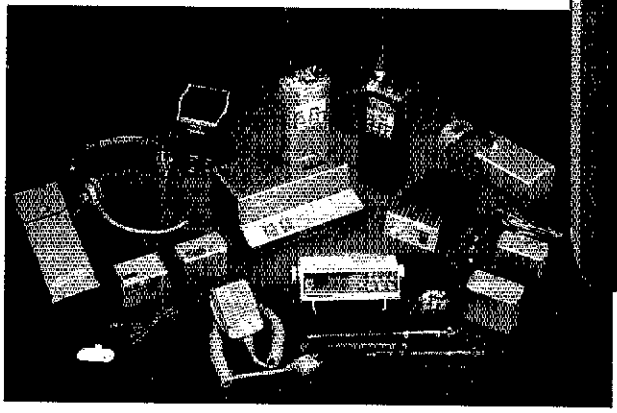
- **Simple to operate**
  Functional design is "user friendly." Built-in 16-key autopatch encoder, TX STOP switch, REVerse switch, KEYboard LOCK switch, high efficiency speaker.
- **Large LCD**
  Easy to read in direct sunlight or in the dark with convenient dial light that also illuminates the top panel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

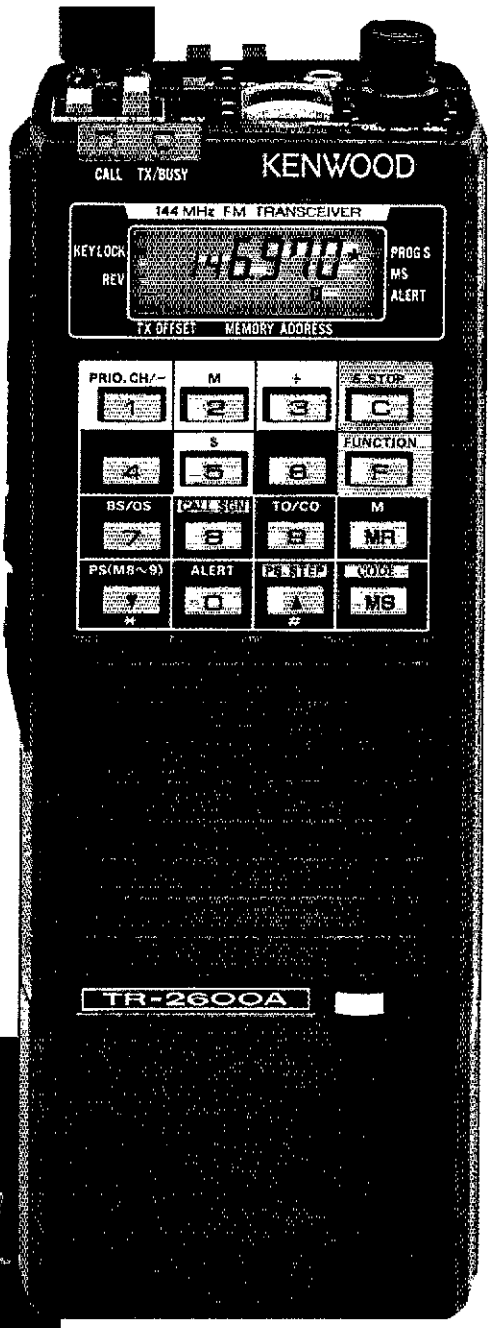
The Kenwood TR-2600A and the TR-3600A pack "big rig" features into the palm of your hand. It's really a "handy handful"!

Optional accessories:

- TU-35B built in programmable sub-tone encoder
- TB-2530 2-m 25 W RF power amp.
- ST-2 base stand/charger
- MS-1 mobile stand/charger
- PB-26 Ni-Cd battery
- DC-26 DC-DC converter
- HMC-1 headset with VOX
- SMC-30 speaker microphone
- LH-3 deluxe leather case
- SC-9 soft case with belt hook
- BT-3 AA manganese/alkaline battery case
- EB-3 external C manganese/alkaline battery case
- RA-3 2-m telescoping antenna
- RA-5 2-m/70-cm telescoping antenna
- AX-2 shoulder strap w/ant. base
- CD-10 call sign display
- BH-2A belt hook

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





KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

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

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AMERITRON
AIR-15 Tuner $199 m
AMP SUPPLY
LA-1000A Linear $289 f
LA-100NT No-tune linear 369 v
ASTRON
RS-35A 25A ps $ 99 m
COLLINS
75S-3 Ham Rcvr $269 mfc
75S-3B conv to C (round) 349 w
32S-1 Transmitter 179 m
32S-3 Transmitter 329 mc
32S-3A Xmtr (round) 469 w
KWM-2 Xcvr 439 mc
516F-2* AC supply 149 mwfc
*Not sold separately
KWM-380 sn 552/blower/ 1895 v
mars/warc/18/update 4/84
DAIWA
CNW-419 Ant tuner $129 m
CNW-518 Ant tuner 189 mw
CNA-1001 Auto ant tuner 199 mc
DENTRON
Clipperton L Linear $459 f
DRAKE
R-4A Ham Rcvr $149 f
R-4B Ham Rcvr 179 mwfc
R-4C Ham Rcvr 249 mwv
MS-4* Speaker 19 mwv
*Not sold separately
4NB Blanker 49 v
FL-500 500 Hz filter 35 v
SC-2 2m rcv conv 59 m
SC-6 6m rcv conv 59 mw
CPS-1 Conv ps 19 m
SCC-1 VHF calib 19 w
CC-1 Conv console 29 m
R-7 SW Receiver 699 c
R-7/NB/4 KHz filter 769 m
T-4 Recrter 129 m
T-4X Transmitter 149 mwf
T-4XB Transmitter 169 mwv
T-4XC Transmitter 219 mwv
TR-4 Xcvr 229 wc
TR-4C Xcvr 269 fc
TR-4CW/RIT Xcvr 369 w
RV-4 Remote VFO 69 w
AC-3* AC supply 59 mwf
AC-4* AC supply 79 mwfcv
*Not sold separately
TR-5 Xcvr 369 mc
TR-5/500 Hz filter 399 m
TR-7 Xcvr 499 wfc
TR-7/300/500/NB/AUX 629 e
TR-7 service manual 25 e
PS-7* Power supply 169 mwtce
*Not sold separately
PS-75 Power supply 89 m
MS-7 Speaker 29 e
L-4B Linear 695 v
MN-4 200w ant matcher 69 w
9000E Terminal 399 m
ETO
Alpha 76A Linear 1249 w
Alpha 374A Linear 1499 w
ELECTRA BEARCAT
BC-100 Pocket scanner $149 m
HAL
RKB-1 RTTY keyboard $ 49 m
DS-3000KSR Term vers 2 369 m
DS-3000KSR Term vers 3 469 e
ARQ-1000 Error terminal 599 m
IRL
FSK-1000 Demod/kyr $169 m
ICOM
IC-701 Xcvr w/ps $399 m
IC-701 Xcvr only 299 f
IC-720 Xcvr 499 m
IC-720A Xcvr 599 m
IC-720A/CW/AM filts 649 m
IC-730/FL-30/SSB pbt 499 m
IC-740/internal ps 649 v
IC-740/ssb/cw filts 659 f
IC-745/cw filt/FM 649 m
IC-751/CW filter Xcvr 969 m
IC-751/int ps/2 CW filts 1099 m
PS-15 Power supply 99 w
PS-20 Power supply 159 m
PS-35 Internal ps 99 w
RC-10 Ext controller 19 m
AT-100 Tuner 229 c
R-71A SW Rcvr 529 me
R-71A/remote/DC 549 w
RC-11 Remote for R-71A 19 m
IC-505 6m portable 319 f
IC-560 6m Xcvr 349 m
IC-22S 2m FM Xcvr 99 c
IC-25A 2m FM grn LED 219 c
IC-202S 2m SSB port 169 m
IC-251A 2m Xcvr 369 m
IC-255A 2m FM Xcvr 169 m
IC-260A 2m Xcvr 269 m
IC-271A 2m Xcvr 469 mw
IC-271H 2m Xcvr 599 m
IC-451A 430-440 Xcvr 469 f
AG-1 440 preamp 59 m
SM-6 Desk mic 25 m
IC-2AT 2m FM HT 159 m
ML-1 2m 10w amp DEMO 59 v
KDK
FM-6033 6m FM Xcvr $199 v
KLM
PA10-70B 2m 10/70w $ 59 m
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R-599 Ham Rcvr $129 cv
T-599D Transmitter 229 m
TS-130S Xcvr 399 f
TS-130SE w/fan Xcvr 429 c
VFO-120 Remote VFO 99 c
TS-180S/DFC Xcvr 399 f
PS-30 Power supply 99 mf
AT-230 Ant tuner 129 w
AT-250 Auto tuner 239 f
TS-520 Xcvr 369 cve
TS-520S Xcvr 389 mfc
TS-520S/CW filter 419 m
TS-520SE Xcvr 429 mwc
VFO-520 Remote VFO 89 tc
SP-520 Speaker 19 e
DS-1A DC conv 49 w
TS-530S Xcvr 469 m
TS-530S/cw/ssb filts 529 m
TS-530SP/cw/ssb filts 589 f
TS-820/DG-1 Dig Xcvr 449 mf
TS-820S Dig Xcvr 469 mc
SP-820 Speaker 49 m
AT-200 Ant tuner 115 f
TS-830S Xcvr 589 mc
TS-830S/500Hz cw filt 619 m
DFC-230 (new close-out) 169.95 mwfv
SP-230 Speaker 49 mv
VFO-230 Dig remote VFO 199 m
VFO-240 Remote VFO 119 mv
AT-230 Ant tuner 129 m
TS-930S Xcvr 898 f
TS-930S/tuner Xcvr 998 mfce
TS-930S/AT/am/2 cw filts 1098 m
SP-930 Speaker 55 c
SM-220/BS-8 Scope 289 m
R-1000 SW receiver 269 w
TS-600 6m Xcvr 369 m
TS-700A 2m Xcvr 289 m
TS-700S 2m Xcvr 369 f
TM-201A 2m FM Xcvr 229 v
TR-7400A 2m FM Xcvr 169 m
TR-7600 2m FM Xcvr 129 c
TR-7625 2m FM Xcvr 179 m
TR-7730/TTP 2m FM 219 m
TR-8400 440 FM Xcvr 229 mc
TR-8400/TTP mic 249 m
RM-76 Microproc 49 m
KPS-7 7A ps 59 m
MC-30S Hand mic 19 v
MC-50 Desk mic 29 m
MC-80 Desk mic 39 m
SW-2000 SWR/PEP watt 79 e
MACROTRONICS
GA-650 Interface/Apple $ 49 m
MICROLOG
ACT-1 Terminal $229 v
PALOMAR
P-310X Preamp $ 89 m
PANASONIC
RF-6300 SW receiver $299 w
RF-B600 SW receiver 369 m
SBE
SB-450 440 FM Xcvr $ 79 m
SANTEC
ST-144up 2m FM HT $199 m
SONY
ICF-2002 SW receiver $169 wf
SWAN/CUBIC
PSU-6A Power supply $119 f
TV-2C 2m Xvtr (6m IF) 149 m
WM-2000 Wattmeter 49 f
TEMPO
2020 Xcvr $289 m
8120 Speaker 19 m
Tempo One Xcvr 189 mwc
AC One* AC ps 69 mwc
*Not sold separately
TEN-TEC
515 Argonaut Xcvr $289 m
210 1A power supply 19 m
208A Notch/cw filter 19 m
251 9A power supply 49 m
525/cal/audio filt Argosy 389 w
525D/nb/2 cw Argosy II 469 w
525D/nb/2xcw/ssb filts 489 m
225 9A power supply 89 mw
222 Mobile mt 15 m
570 Century/21 Xcvr 189 mwf
574 Century/21 digital 249 m
276 Calibrator 19 mc
Triton II Xcvr 229 mf
544 Dig Xcvr 349 e
546 Omni-D Xcvr 369 m
546C/500/1.8 filts 599 v
252M/O Power supply 79 m
262G Power supply 89 mce
560/2 cw filts Corsair 769 m
255 Power supply 119 m
260 Power supply 129 m
227 Ant tuner 59 m
444 Hercules Linear 1069 m
KR-5 Keyer 19 m
670 Keyer 19 mw
214 Desk mic 29 mw
215P Desk mic 25 v
700A Hand mic 19 mw
YAESU
FL-101 Transmitter $229 mwc
FT-101 Xcvr 379 fc
FT-101B Xcvr 389 f
FT-101E Xcvr 449 mwc
FT-101EE Xcvr 399 fc
FT-101EE/CW filter 429 m
FT-101EX Xcvr 389 mf
FT-101F Xcvr 449 mfc
FT-101ZD Dig Xcvr 469 fc
FT-101ZD Mk II Xcvr 549 mv
FT-101ZD Mk III Xcvr 549 w
FT-101ZD Mk III/cw/fm 599 m
FV-101 Remote VFO 89 f
FV-101B Remote VFO 99 m
FV-101Z Remote VFO 89 m
SP-101 Speaker 19 fv
SP-101PB Spkr/patch 49 f
FT-301 Xcvr 229 f
FP-301 Power supply 99 f
ERB Relay box 19 f
FT-77 Xcvr 389 c
FP-700 Power supply 99 m
FV-700DM Remote VFO 89 c
FV-707DM Remote VFO 59 f
FT-901DM Xcvr 549 m
FT-902DM Xcvr 749 m
SP-901P Spkr/patch 49 mc
FV-901DM Remote VFO 169 m
FT-102 Xcvr 589 m
SP-102 Speaker 49 c
FT-107M/DMS/int ps 569 w
SP-107P Spkr/patch 49 w
FT-980 Xcvr 998 fc
FT-980/cw/am filts 1049 m
FL-2100 Linear 349 f
FTV-250 2m Xvtr 129 c
FRG-7000 SW Rcvr 289 m
FRG-7700 SW Rcvr 289 m
FRG-7700/memory unit 369 w
FT-620B 6m Xcvr 289 m
CPU-2500RK 2m FM Xcvr 189 m
FT-225RD 2m Xcvr 449 m
FT-720RU 440 FM Xcvr 199 w
FP-80 4.5A ps 49 w
YM-50 TTP mic 39 m
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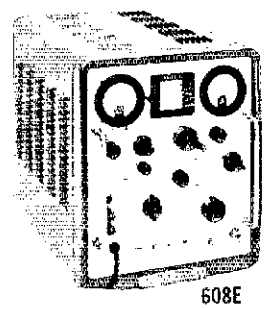
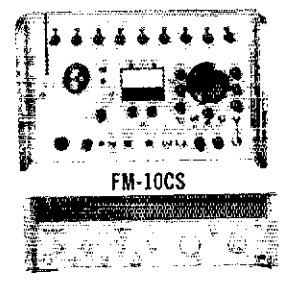
YM-400 Receiver $149 m
YM-1000 Receiver 249 m

9-24-85

(1) This list was prepared from an inventory taken on the date shown. The letters after the prices indicate in which store the equipment was located at that time. The quantities vary. In some cases there are several of an item; others, only one. Due to the lead and distribution time of this publication, some of the items may have already been sold by the time you see this ad. However, due to the number of trades we are involved in each day, some items are in stock that are not listed. (2) We reserve the right to sell certain power supplies and accessories only with matching transmitters or transceivers, depending on our stock situation. (3) Sometimes used gear is serviced after we receive your order. Please allow for a few days delay in shipping your order. (4) No trades on used gear. (5) Used gear policies do not apply to New Equipment specials, Closeouts, etc.

USED AES SHOP TEST EQUIPMENT


608E



8640B

HEWLETT-PACKARD
608E 10-480MHz sig gen 1495
8640B .5-1024Mhz sig gen w/options 002/003 5495

SINGER-GERTSCH
FM-10CS w/RFM-10A, FIM-3 & ODM-1 4495
OAM-1 AM module for FM-10C 195

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f = Orlando, FL 32803; 621 Commonwealth Ave	(305) 894-3238	1-800-327-1917	1-800-432-9424
c = Clearwater, FL 33515; 1898 Drew Street	(813) 461-4267		
v = Las Vegas, NV 89106; 1072 N. Rancho Drive	(702) 647-3114	1-800-634-6227	
e = Chicago, IL Erickson Communications (Associate)	(312) 631-5181		

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They'll even boast of a signal quality and DX potential that would make any 20-meter operator envious. Regardless of where we are in the sunspot cycle.

In fact, the FT-726R is the world's most popular link to OSCAR 10.

And for good reason. This 2-meter, 10-watt rig gives you full cross-band duplex capability. Simply plug in two optional modules, one for 435-MHz operation, another for cross-band duplex.

You can set up your earth station just about anywhere. All you need is the 726 and two Yagi antennas: 435-MHz for transmit and 2-meters for receive.

Even as a conventional base station, the FT-726R is a real standout.

You can choose from three operating modes: SSB, FM or CW. Expand to three-band operation with your choice of optional modules for 10 meters, 6 meters, 430-440 MHz and 440-450 MHz.

Then store your preferred frequencies and modes into the eleven memories for instant recall. With pushbutton transfer capability to either of two VFO registers. And versatile scanning functions you'd expect from a Yaesu radio.

Plus you get a lot more extras, including a built-in speech processor, all-mode squelch and a noise blanker.

So no matter where your shack is, let Yaesu's FT-726R introduce you to OSCAR 10. The world is waiting.

YAESU

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6851 Walthall Way, Paramount, CA 90723
(213) 633-4007

Yaesu Cincinnati Service Center
9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100

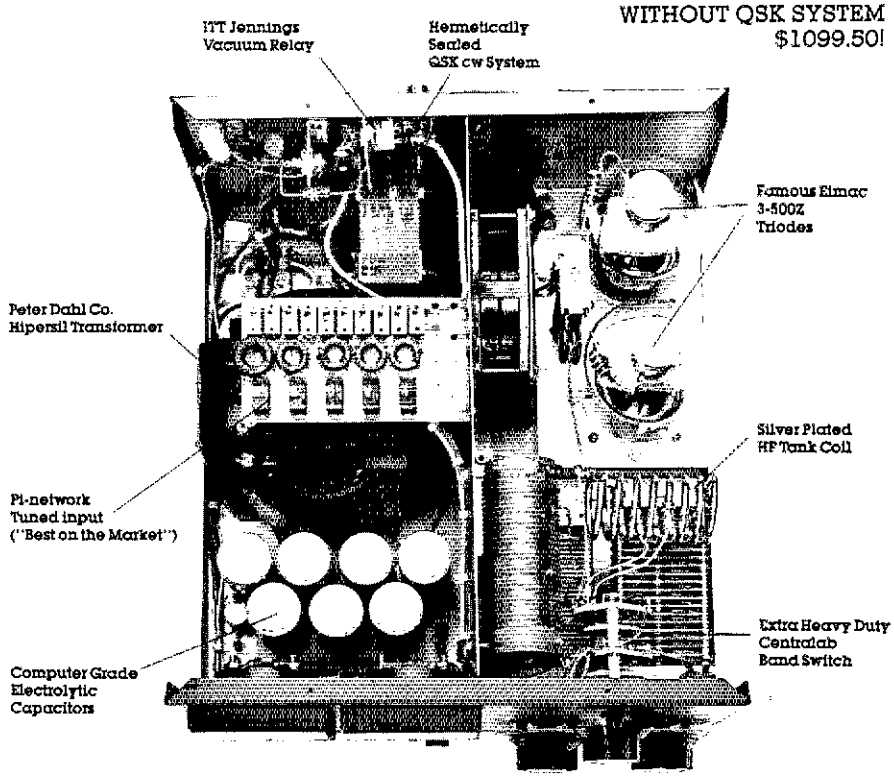
CIRCLE 136 ON READER SERVICE CARD

Prices and specifications subject to change without notice.

Introducing The New LK-500Z "B"

Legal Limit Amplifier

NEW LK 500ZB
WITHOUT QSK SYSTEM
$1099.50!



Thinking of buying a linear amplifier? You owe it to yourself to check out the new LK-500ZB.

The LK-500Z series of amplifiers were created to offer the best value you can buy in HF linears covering 160-15 meters. Last year, it was demonstratively the best value. It was the lowest priced, full feature pair of 3-500Z's on the market. It had the longest warranty and the only amplifier with a money-back guarantee. It's not surprising that the LK-500ZA, both the standard and "hipersil" version, became one of the most popular amplifiers on the ham bands.

Now, for 1985, Amp Supply engineers have taken this durable, dependable "rock crusher," fantastically improved it, and called it the LK-500Z "B" version.

Improvements include an ITT Jennings vacuum antenna changeover relay with a companion sealed relay QSK system which eliminates any signal attenuation between CW characters. The silver-plated HF tank coil and the extra heavy duty silver-plated Centralab bandswitch are the finest available.

The LK-500Z "B" version has all the outstanding standard features of the LK-500ZA; such as the Peter Dahl Hipersil power transformer, and a full-wave bridge rectifier system (we will not produce amplifiers using weak voltage doublers). Computer grade electrolytic capacitors are standard and the low-pass pi-network tuned input is the absolute best on the market. Oh yes, we only use Eimac 3-500Z triode tubes in the LK-500Z amplifiers.

Amp Supply Co. has been a pioneer in manufacturing quality amateur radio products, providing service to back them up and selling at low prices. The people of Amp Supply Co. have been designing and manufacturing amplifiers since 1974, and we challenge any competition to match our total amateur HF amplifier production — 17,678 amplifiers in eleven years. You don't manufacture and supply that many amplifiers unless you have first-rate products and service. Join the thousands of satisfied radio amateurs who have come to the people at Amp Supply Co. for their amplifier needs. We believe good service starts with answering your questions and needs before and after you buy.

All Amp Supply amplifiers carry a two year warranty. Ask our competitors what theirs is!

Our price is the whole price. LK500Z "B" version: $1295.00 includes UPS surface charges and insurance in the continental USA. In a hurry? Two day UPS air service is just $20.00.

The LK-500Z "B" version is clearly a progressive, new amplifier, a leader in its field; but what else would you expect from a company called Amp Supply?

Thank you for purchasing an Amp Supply Co. product.

Denny K8KXX

NO RISK GUARANTEE

If you are not completely satisfied with the performance of your new LK-500ZB you may return it within ten days for a refund less shipping and repackaging. If you can get any of our competitors to give you the same guarantee, buy both and return the one you don't like. We know which one you'll keep.

LK-500ZB	$1295.00
LK-500NT-B No-Tune-Up	$1595.00
NEW! LK-500-ZB Without QSK System	$1099.50

Order Today.

For fastest delivery, send cashiers check, money order, or order by credit card. Personal checks, allow 14 days to clear. North Carolina residents, add 4½% sales tax. Hours: Monday-Friday 9:00 a.m.-5:00 p.m. E.S.T.

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Amp Supply Co.

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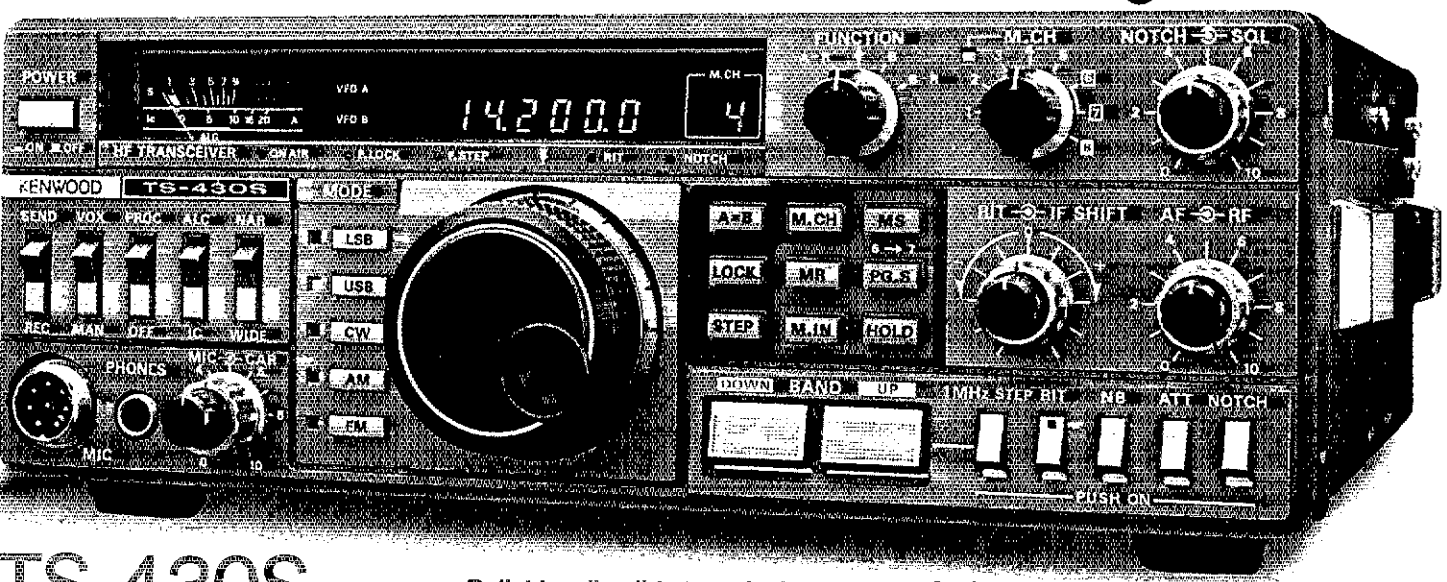
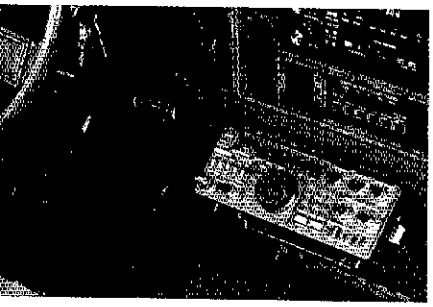
"Digital DX-terity!"



TS-430S

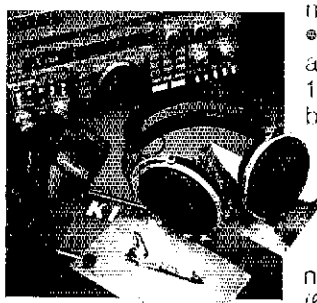
Digital DX-terity—that outstanding attribute built into every Kenwood TS-430S lets you QSY from band to band, frequency to frequency and mode to mode with the speed and ease that will help you earn that dominant DX position from the shack or from the mobile!



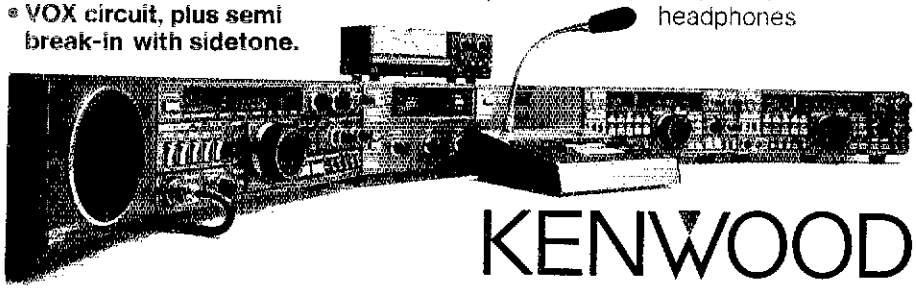
Covers all Amateur bands
60 through 10 meters, as well as the new 30, 17, and 12 meter WARC bands. High dynamic range, general coverage receiver tunes from 150 kHz to 30 MHz. Easily modified for HF MARS operation.

Superb interference reduction
Eliminate QRM with the IF shift and tuneable notch filter. A noise blanker supresses ignition noise. Squelch, RF attenuator, and RIT are also provided. Optional IF filters may be added for optimum interference reduction.

- **Reliable, all solid state design.** Solid state design permits input power of 250 watts PEP on SSB, 200 watts DC on CW, 120 watts on FM (optional), or 60 watts on AM. Final amplifier protection circuits and a cooling fan are built-in.
- **Memory channels.** Eight memory channels store frequency, mode and band data. Channel 8 may be programmed for split-frequency operation. A front panel switch allows each memory channel to operate as an independent VFO or as a fixed frequency. A lithium battery backs up stored information.
- **Programmable, multi-function scan.**
- **Speech processor built-in.**
- **Dual digital VFOs.**
- **VOX circuit, plus semi break-in with sidetone.**



Optional accessories:
• PS-430 compact AC power supply • SP-430 external speaker • MB-430 mobile mounting bracket • AT-130 compact antenna tuner covers 80-10 meters, incl. WARC bands • AT-250 automatic antenna tuner covers 160-10 meters, incl. WARC bands • TL-922A 2 kW PEP linear amplifier • FM-430 FM unit • YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters • YK-88SN (1.8 kHz) narrow SSB filter • YK-88A (6 kHz) AM filter • MC-42S UP/DOWN hand mic. • MC-60A/80/85 deluxe desk mics. • SW-2000/200A SWR/power meters • SW-100A SWR/power/volt meter • PC-1A phone patch • HS-4, HS-5, HS-6, HS-7 headphones



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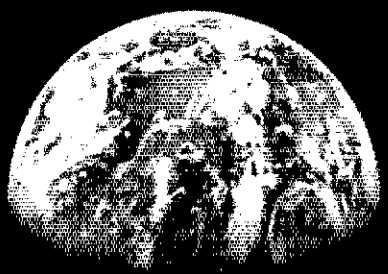
SPECTACULAR SIMPLICITY



KDK FM-240

2M - 25 WATT FM TRANSCEIVER

- Superior features, simpler to use for 2 meters, MARS, CAP
- Compact size for better fit in today's automobile
- 16 fully programmable memory channels, plus priority call channel, plus 2 VFOs for today's user
- Subaudible encode and decode standard for today's 2 meter bands
- Subaudible frequency programmed by freq, no chart needed
- Speech synthesis option for voice VFO
- Superior man machine interface—one knob and one button, program all of the features easily—alphanumeric LCD prompts
- 16 button speaker/mic with UP/DN lock-out switch

This radio does every single thing we asked the design staff to make it do, and it does it in an easy to use, simple manner. It is truly spectacular to operate such a radio in the 2 meter band. For example, the FM-240 has two VFO modes—one called VFO, the other QSY. So if you are on your favorite channel and want to QSY, simply push QSY and tune the main knob to the new frequency. To return, simply push QSY again. The entire radio follows this simple but spectacularly effective engineering formula. ONE BUTTON + ONE KNOB, SIMPLY SPECTACULAR SIMPLICITY.

ENCOMM 1506 Capitol Avenue, Plano, Texas 75074
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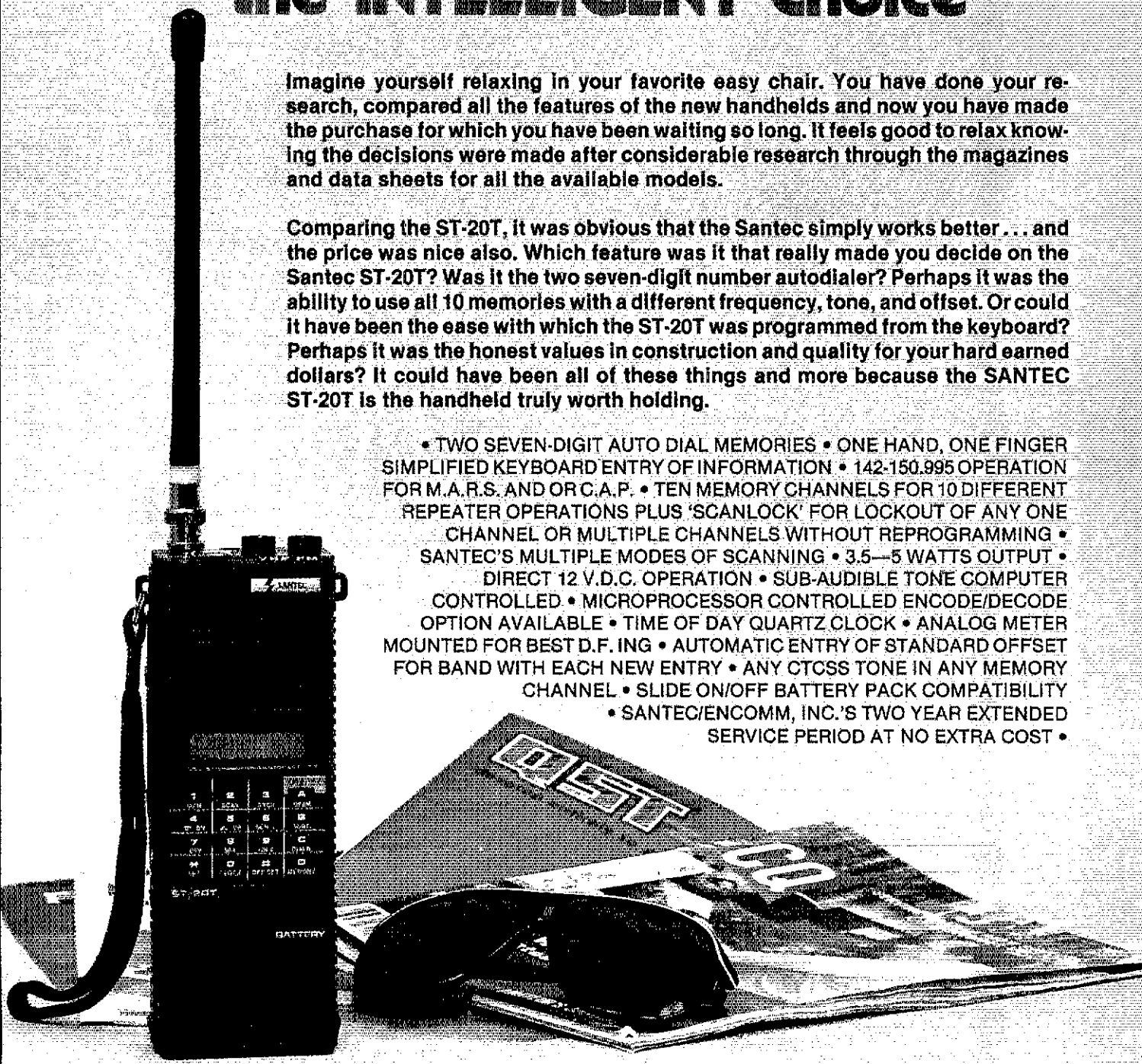
SANTEC® ST-20T

a SMART Radio... the INTELLIGENT Choice



Imagine yourself relaxing in your favorite easy chair. You have done your research, compared all the features of the new handhelds and now you have made the purchase for which you have been waiting so long. It feels good to relax knowing the decisions were made after considerable research through the magazines and data sheets for all the available models.

Comparing the ST-20T, it was obvious that the Santec simply works better . . . and the price was nice also. Which feature was it that really made you decide on the Santec ST-20T? Was it the two seven-digit number autodialer? Perhaps it was the ability to use all 10 memories with a different frequency, tone, and offset. Or could it have been the ease with which the ST-20T was programmed from the keyboard? Perhaps it was the honest values in construction and quality for your hard earned dollars? It could have been all of these things and more because the SANTEC ST-20T is the handheld truly worth holding.

• TWO SEVEN-DIGIT AUTO DIAL MEMORIES • ONE HAND, ONE FINGER SIMPLIFIED KEYBOARD ENTRY OF INFORMATION • 142-150.995 OPERATION FOR M.A.R.S. AND OR C.A.P. • TEN MEMORY CHANNELS FOR 10 DIFFERENT REPEATER OPERATIONS PLUS 'SCANLOCK' FOR LOCKOUT OF ANY ONE CHANNEL OR MULTIPLE CHANNELS WITHOUT REPROGRAMMING • SANTEC'S MULTIPLE MODES OF SCANNING • 3.5—5 WATTS OUTPUT • DIRECT 12 V.D.C. OPERATION • SUB-AUDIBLE TONE COMPUTER CONTROLLED • MICROPROCESSOR CONTROLLED ENCODE/DECODE OPTION AVAILABLE • TIME OF DAY QUARTZ CLOCK • ANALOG METER MOUNTED FOR BEST D.F. ING • AUTOMATIC ENTRY OF STANDARD OFFSET FOR BAND WITH EACH NEW ENTRY • ANY CTCSS TONE IN ANY MEMORY CHANNEL • SLIDE ON/OFF BATTERY PACK COMPATIBILITY • SANTEC/ENCOMM, INC.'S TWO YEAR EXTENDED SERVICE PERIOD AT NO EXTRA COST •

ENCOMM

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KENWOOD

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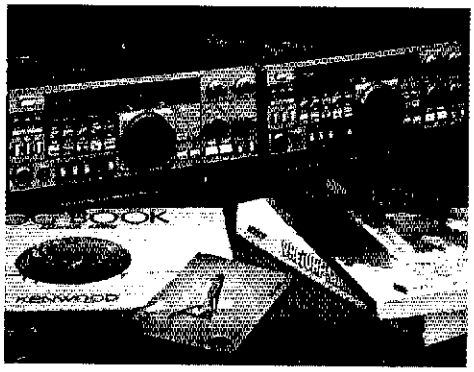
Matching Pair

TS-711A/TS-811A VHF/UHF all-mode base stations.

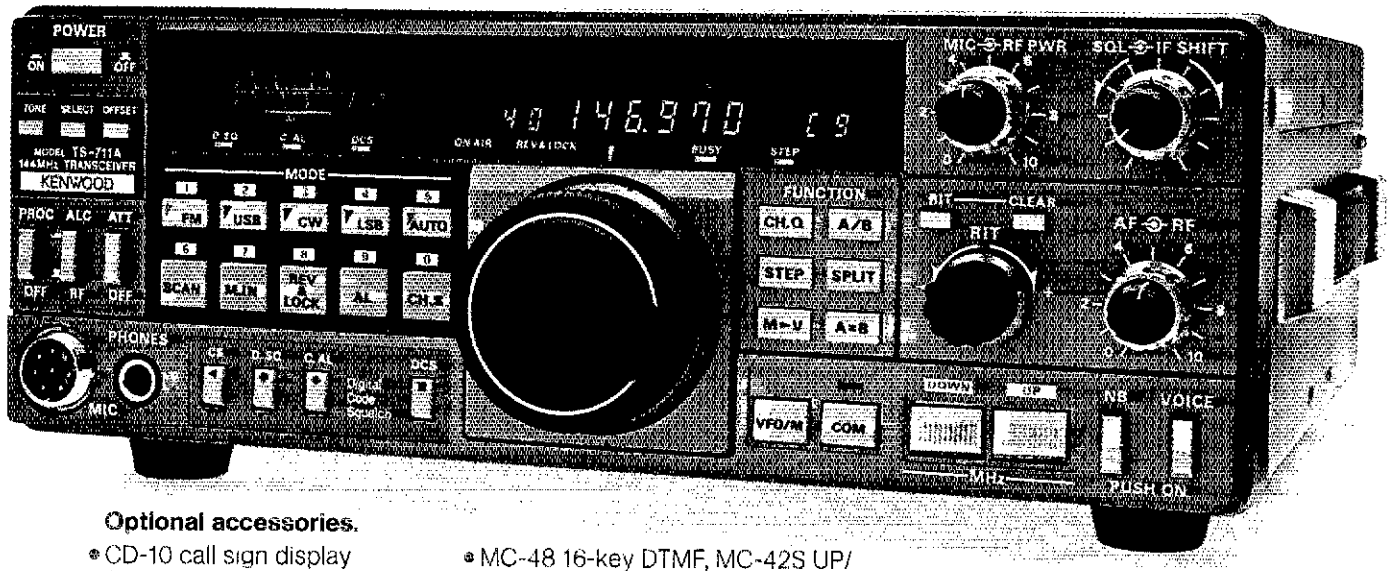
The TS-711A 2 meter and the TS-811A 70 centimeter all mode transceivers are the perfect rigs for your VHF and UHF operations. Both rigs feature Kenwood's new Digital Code Squelch (DCS) signaling system. Together, they form the perfect "matching pair" for satellite operation.

- **Highly stable dual digital VFOs.** The 10 Hz step, dual digital VFOs offer excellent stability through the use of a TCXO (Temperature Compensated Crystal Oscillator).
- **Large fluorescent multi-function display.** Shows frequency, RIT shift, VFO A/B, SPLIT, ALERT, repeater offset, digital code, and memory channel.
- **40 multi-function memories.** Stores frequency, mode, repeater offset, and CTCSS tone. Memories are backed up with a built-in lithium battery.



- **Versatile scanning functions.** Programmable band and memory scan (with channel lock-out). An "alert" function lets you listen for activity on your priority channel while listening on another frequency. **A Kenwood exclusive!**
- **RF power output control.** Continuously adjustable from 2 to 25 watts.
- **Automatic mode selection.** You may select the mode manually using the front panel mode keys. Manual mode selection is verified in International Morse Code.
- **All-mode squelch.**
- **High performance noise blanker.**
- **Speech processor.** For maximum efficiency on SSB and FM.
- **IF shift.**
- **"Quick-Step" tuning.** Vary the tuning characteristics from "conventional VFO feel" to a stepping action.
- **Built-in AC power supply.** Operation on 12 volts DC is also possible.
- **Semi break-in CW, with side tone.**
- **Optional voice synthesizer.**

More TS-711A/TS-811A information is available from authorized Kenwood dealers.



Optional accessories.

- CD-10 call sign display
- SP-430 external speaker
- VS-1 voice synthesizer
- TU-5 CTCSS tone unit
- MB-430 mobile mount
- PG-2J DC power cable
- MC-60A, MC-80, MC-85 deluxe desk top microphones
- MC-48 16-key DTMF, MC-42S UP/DOWN mobile hand microphones
- SW-200A/B SWR/power meters:
  SW-200A 1.8-150 MHz
  SW-200B 140-450 MHz
- SWT-1 2-m antenna tuner
- SWT-2 70-cm antenna tuner

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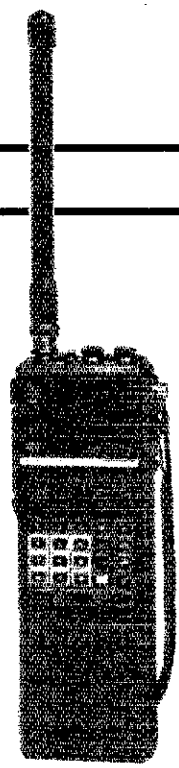
Your Best Bet–YAESU Quality at an EGE Discount

VHF/UHF



FT 203
2m HT with TTP

FT 103
220 MHz HT / TTP

FT 703
440 MHz HT / TTP

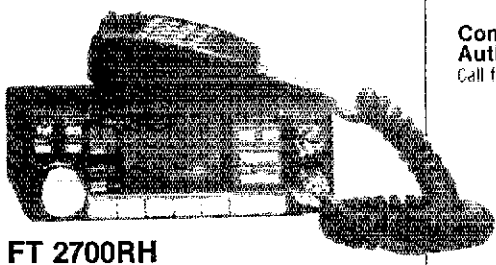
FT 209RH
2m Handheld

FT 709R
440 MHz Handheld

Accessories:
YH-2 Headset
MH-12A2B Speaker/Microphone
FTS-6 Programmable Tone Squelch
PA-3 DC/DC Car Adapter/Trickle Charger
MMB-21 Mobile Hanger Bracket
NC-15 Quick Charger/DC Adapter
FBA-5 Battery Case for 6xAA
FNB-3 10.8V, 425 mAh Ni-Cd pack
FNB-4 12V, 500 mAh Ni-Cd pack

FT 726R
Especially good for Oscar

Accessories:
6m-726 6-meter module
430-726 430-440 unit for Oscar
440-726 440-450 FM unit
HF-726 10-12-15 meter unit
SU-726 Satellite Duplex module
XF 455 MC 600 Hz CW Filter

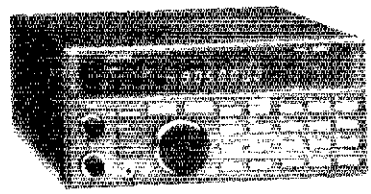


FT 2700RH
Duo-band 2m/440 Mobile Radio

FT 270RH
Compact 45 Watt 2m FM Mobile

Accessories:
FTS-8 Programmable Tone Squelch Unit
FVS-1 Voice Synthesizer Unit

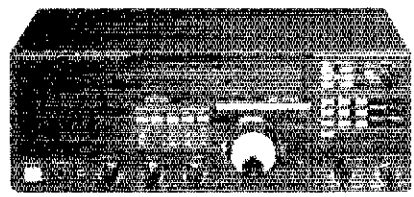
SHORTWAVE LISTENING



FRG 9600
Scanning Receiver for 60-905 MHz
FM/AM/SSB, 100 memories

Accessories:
PA-4B/PA-4C AC-DC Wall Adapter
SP-55 External Speaker
NTSC Video Unit

Coming soon: Software to extend the range of the 9600. Call for details.



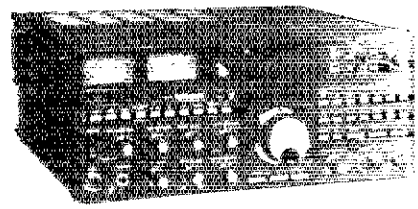
FRG 8800
General Coverage Receiver
All-band, all-mode
AM/SSB/CW/FM, 150kHz-30MHz

Accessories:
FRV-8800 Converter for 118-174 MHz
FRA-7700 Active Ant for 150kHz-30MHz
FRT-7700 Antenna Tuner
DC-8800 12-volt kit
SP-102 Speaker with filters

Commercial Land Mobile Authorized Dealer
Call for more information

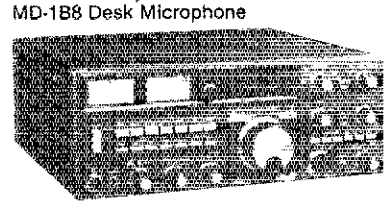
Call to check our new low prices on the FRG 8800, FT 270RH, FT 2700RH, FT 203RK, and FT 103RK.

HF TRANSCEIVERS



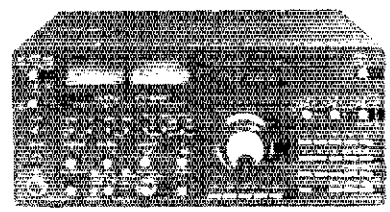
FT 757GX
Mobile Transceiver, SSB/CW/AM/FM
General Coverage Receiver
Receives 500kHz-30MHz

Accessories:
FP-757GX Flatpack Power Supply
FP-757HD Heavy Duty Power Supply
FC-757AT Automatic Antenna Tuner
FAS-1-4R Remote Antenna Selector
SP-102 Speaker
SP-102P Speaker
MMB-20 Mobile Mounting Bracket
FRB-757 Relay Box
MD-1B8 Desk Microphone



FT 980 CAT
Computer Controlled Transceiver

Accessories:
GEN-980 General Coverage Kit
XF 8.9 HC 600 HzCW Filter
XF 455.8 MCN 300 Hz CW Filter
SP-980 Speaker
SP-98P Speaker Patch
MD-1B8 Desk Microphone



FT ONE
General Coverage Transceiver
The all-mode Super Radio

FT 77
Compact Transceiver

Accessories:
FP-700 Power Supply
FC-700 Antenna Tuner
FM-77 FM Unit
MK-77 Marker Unit
FV-700DM External VFO
XF 8.9 KC 600 Hz CW Filter

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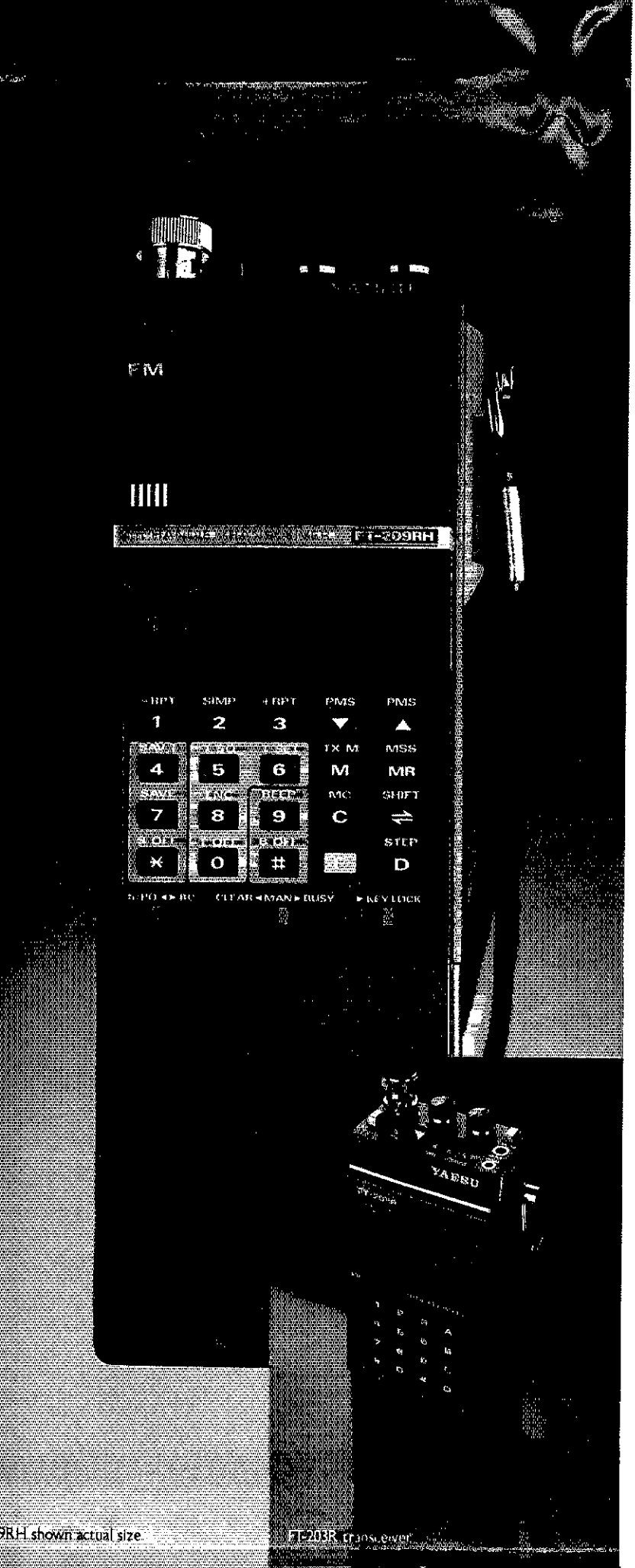

9RH shown actual size

FT-203R shown actual size

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.

YAESU

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6851 Walthall Way, Paramount, CA 90723
(213) 633-4007.

Yaesu Cincinnati Service Center
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(513) 874-3100.

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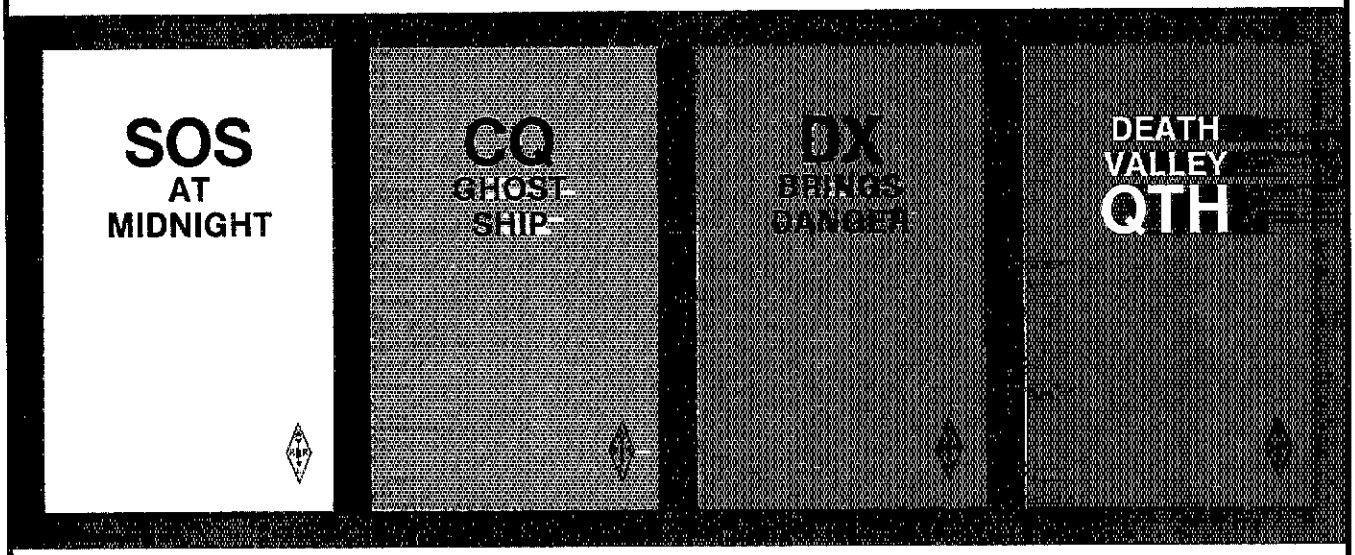
K6ATX IS BACK!



GREAT HAM RADIO ADVENTURES!

Tommy Rockford, K6ATX is back on the trail of high adventure! ARRL is proud to bring back updated editions of Walker Tompkins' exciting classics plus the *brand-new* thriller, **Death Valley QTH.** Newcomer and oldtimer alike will find that you just can't put these books down; and what a way to spark an interest in Amateur Radio among unlicensed individuals as well!

In **Death Valley QTH,** what starts out to be a typical field day operation becomes a matter of life and death for K6ATX and the members of the Santa Bonita Amateur Radio Club. **SOS at Midnight** finds Tommy up against the Purple Shirt Gang. Spark Gap Gallagher seems like a harmless character, but what did he have to hide in **CQ Ghost Ship?** Underwater adventure and ham radio join together to form the exciting conslusion to **DX Brings Danger.**

These new ARRL publications represent the efforts of accomplished TV screenwriter, newspaper columnist, historian, and biographer Walker Tompkins who is K6ATX in real life.

Each title is $5.00. Please add $1.00 for shipping and handling on orders under $10.00. Expected shipping dates: *SOS at Midnight* and *CQ Ghost Ship*, December 1. *DX Brings Danger* and *Death Valley QTH*, December 15. Available from: ARRL, 225 Main Street, Newington, CT 06111.

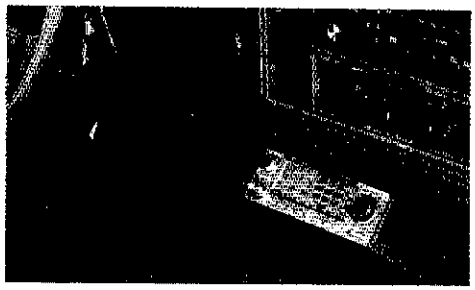
KENWOOD

...pacesetter in Amateur radio

Up Front and Center!

TR-7950/7930

The exceptional front-end selectivity and sensitivity, coupled with Kenwood's excellent audio section, gives you lots to hear! Compact design makes this transceiver at home in the shack or on the go!



- **Large, easy-to-read backlighted LCD readout.** Indicates receive/transmit frequency, frequency offset, sub-tone selection, memory status. An LED readout indicates S & RF units, REVERSE, CENTER TUNING, PRIORITY, and ON AIR.
- **Programmable scanning, with center-stop tuning.** Microprocessor technology allows you to scan the entire 2 meter band, or just a small portion of it. Scanning stops on the center frequency during band scan—**a Kenwood exclusive!**
- **21 Multi-function memory channels.** The TR-7950/7930 "remembers" frequency offset, and optional subtone channels. Memories 1-15 are for simplex and "normal" repeater operation. Memory pairs 16/17 and 18/19 are for "odd-ball" splits. Memories "A" and "B" store upper and lower band scan limits. The radio "beeps" when memory channel 1 is selected.
- **Extended frequency coverage.** Covers 142.000-148.995 MHz in 5-kHz steps. Repeater offsets are automatically selected in accordance with the ARRL 2 meter band plan. The front panel "OS" key may be used to allow manual changes in offset.
- **Multi-function keyboard.** The 16-key DTMF pad can also be used for direct frequency entry, subtone selection, memory address and scan programming. The keyboard is illuminated for night time use.

TR-7950 optional accessories:

- TU-79 three frequency tone unit
- PS-430 power supply
- KPS-12 fixed-station power supply for the TR-7950
- KPS-7A fixed-station power supply for the TR-7930
- SP-40 mobile speaker
- SP-50 mobile speaker
- MC-55 mobile microphone
- MC-46 16-key autopatch UP/DOWN microphone
- SWT-1 2 m, 100 W antenna tuner
- SW-100A/B power meters
- PG-3A noise filter

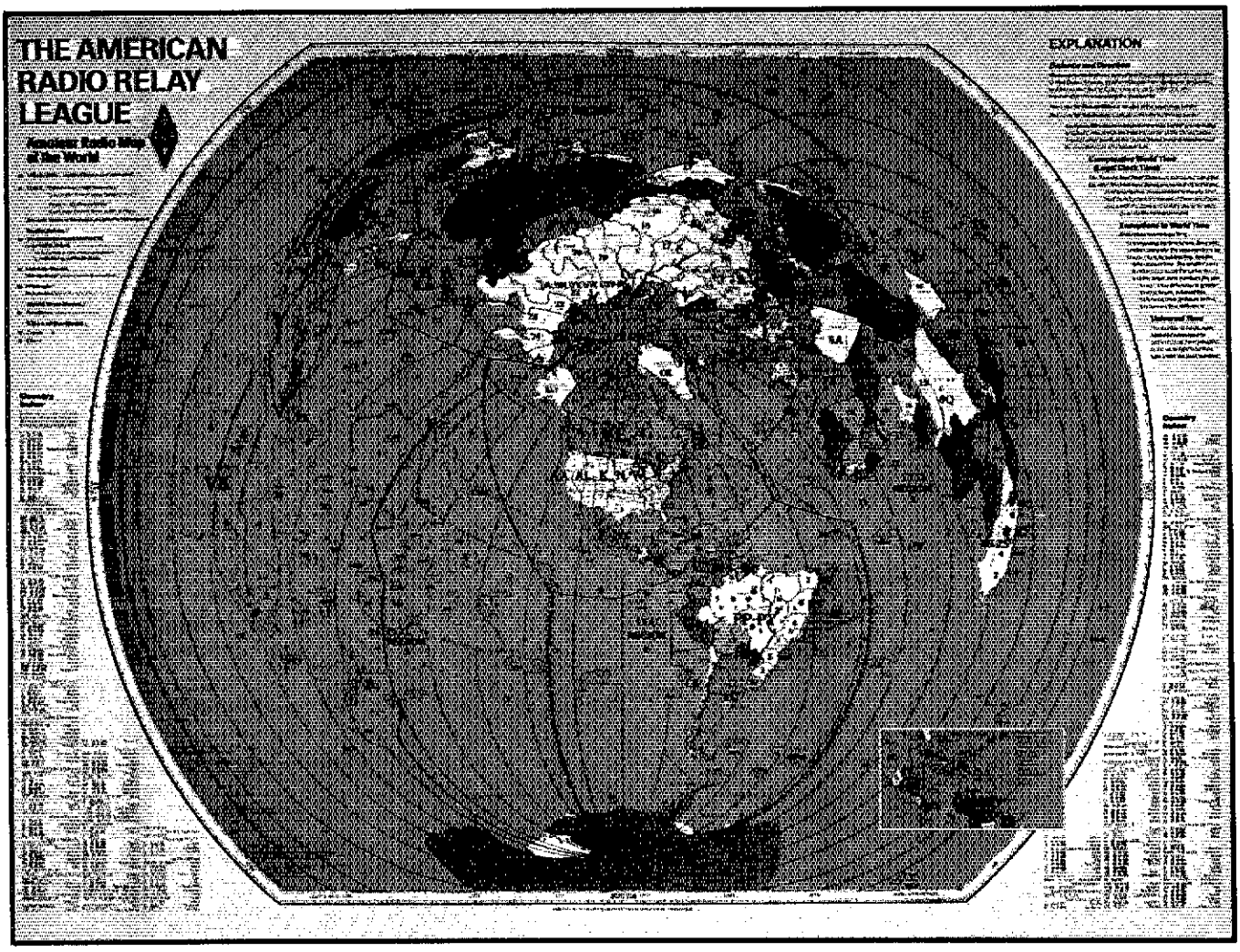
More TR-7950/7930 information is available from authorized Kenwood dealers.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

Model TR-7950 (45 watts) shown. TR-7930 is identical, but with 25 watts output.

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation.



NEW EDITION!

136 CHANGES • A BIG 30"x40" DETAILED CARIBBEAN INSERT

The ARRL Amateur Radio Map of the World has just been updated from the 1980 version by the League and Rand McNally. The colors are brighter and bolder, and we have added an enlarged and detailed insert of the Caribbean. The country index lists countries alphabetically by prefix and shows ITU and CQ Zones as well as continent. On the map itself you will find ITU Regions, time zones and great circle bearings centered on the United States as well as prefixes and call districts. This new edition will brighten any ham shack wall! Price is $8.00 plus $1.00 shipping on orders of under $10.00.

The American Radio Relay League, Inc.
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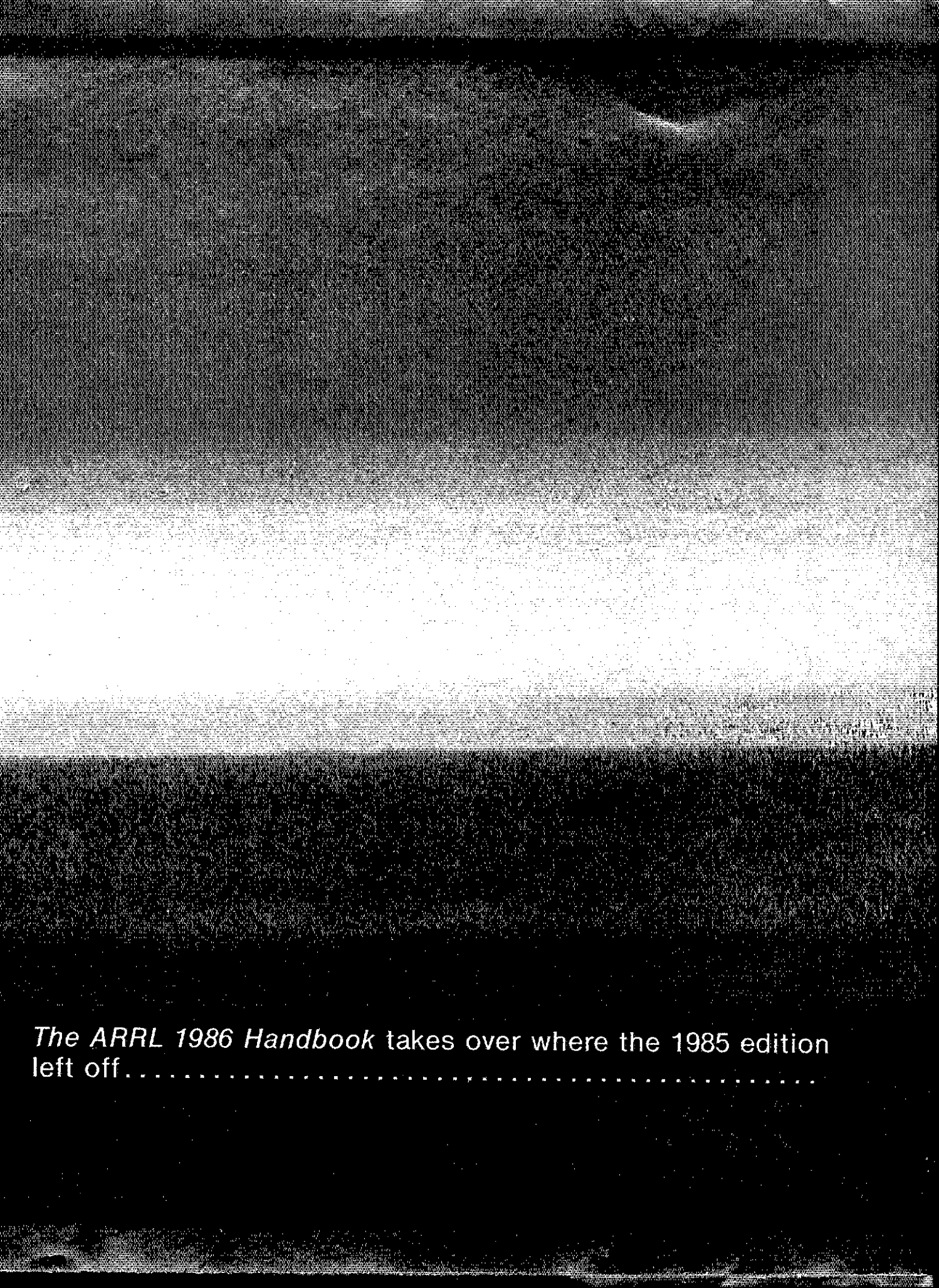

The ARRL 1986 Handbook takes over where the 1985 edition left off.....

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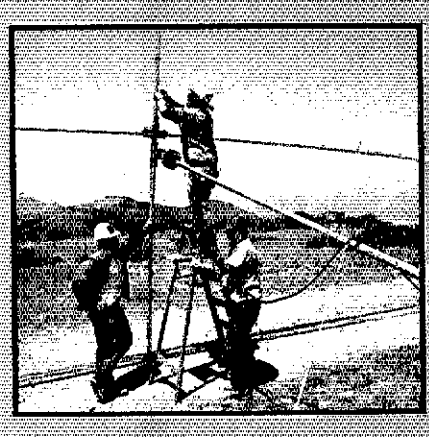
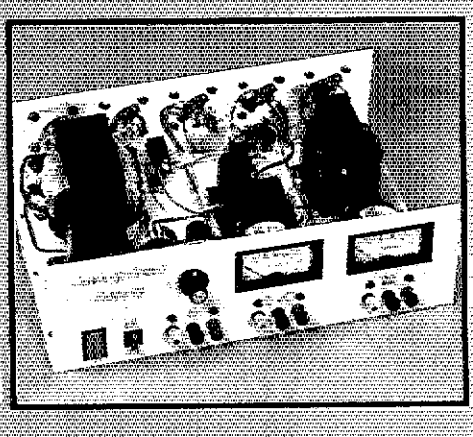
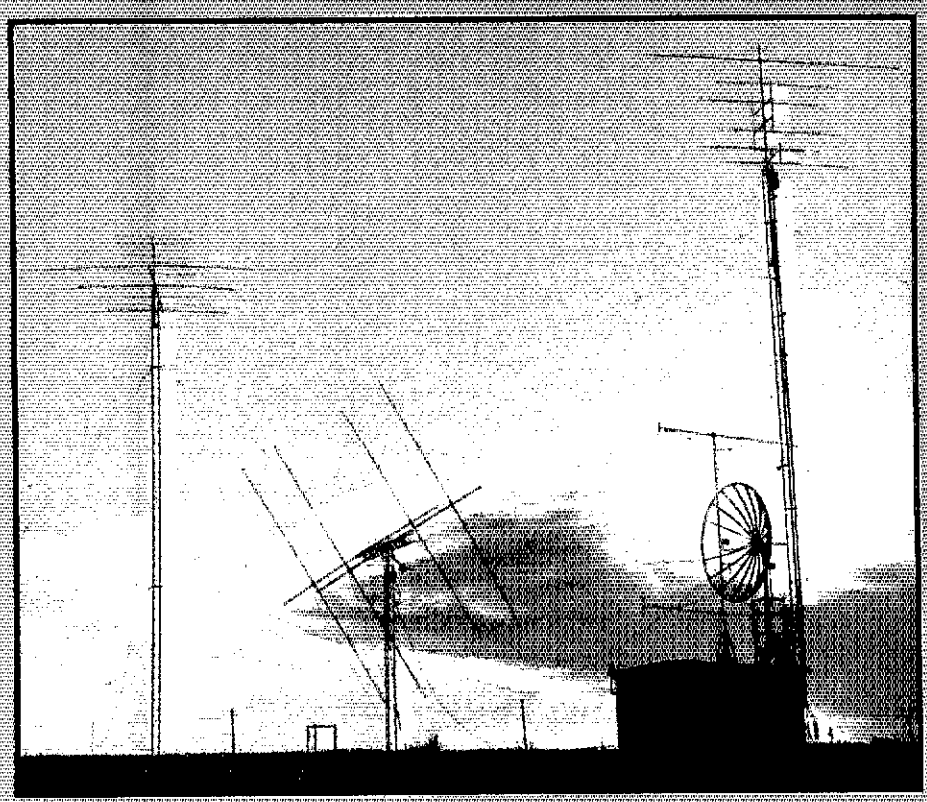
THE AMERICAN RADIO
RELAY LEAGUE

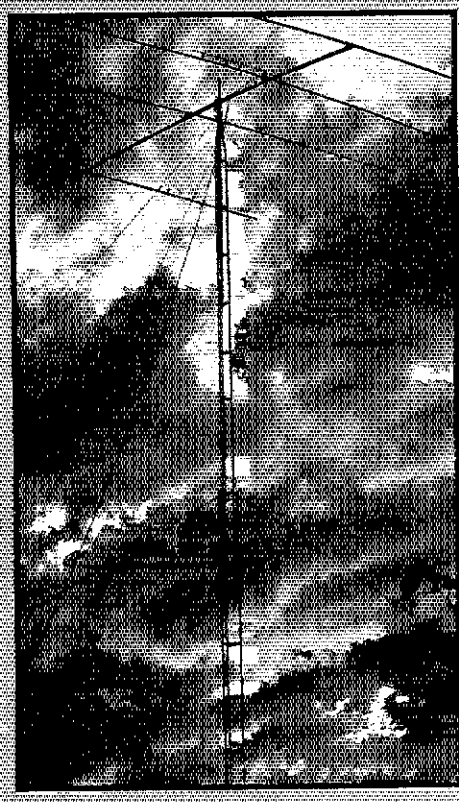


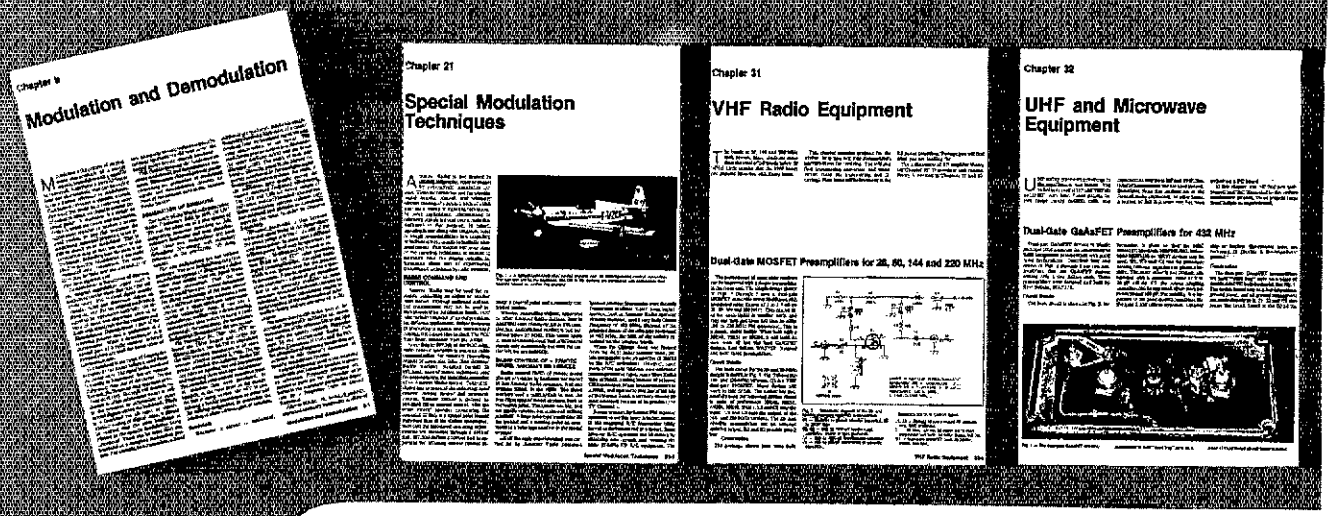


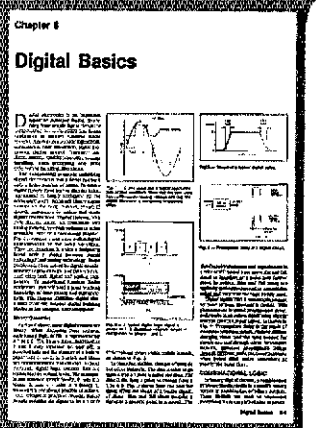
THE ARRL 1986 HANDBOOK

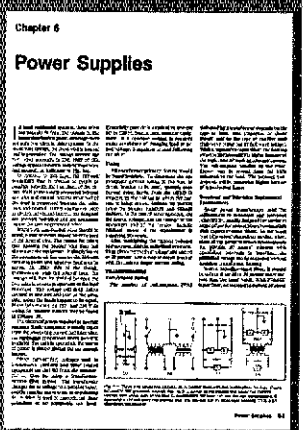
FOR THE RADIO AMATEUR

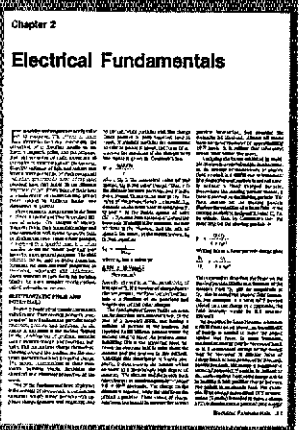












THE PLOT THICKENS!

The ARRL 1986 Handbook for the Radio Amateur takes over where the 1985 Edition left off. Each of the 40 chapters has had some revision, and there are more than 500 new or revised figures. The new edition will contain 1184 pages — way up from last year's count of 1024. Many key chapters with "hot" topics among today's radio amateurs have been completely revised and rewritten. In fact the new material represents 532 text pages.

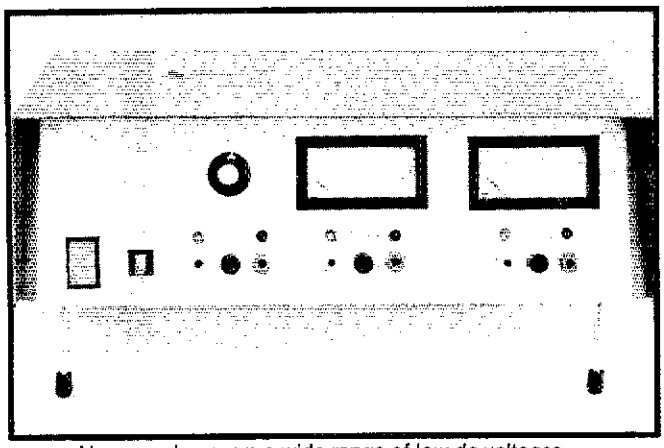
An understanding of digital electronics is a must these days since such circuitry has so many practical applications in station control, frequency synthesis, telemetry, word processing and other information-handling systems. The Digital Basics chapter will help you to understand what is going on in everything from simple keyers to sophisticated microcomputers. Packet-radio enthusiasts will find the most up-to-date information available in the Digital Communications chapter. There are new sections on data interfacing and modems, 50 new and revised figures, plus an expanded bibliography and glossary.

The Special Modulation Techniques chapter has the latest on spread-spectrum. On the fun side, we've added a new section on remote control of model aircraft and vehicles.

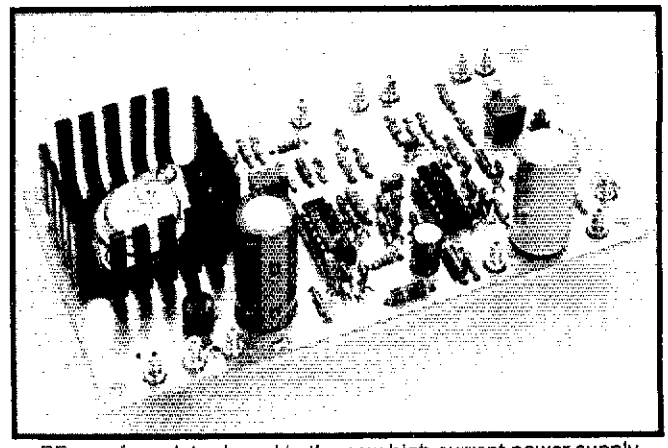
On the practical side, you will find many of the 27 new projects described on the next page. There are new power amplifiers for 1.8, 50, 144 and 1296 MHz, plus preamplifiers and transverters for the VHF/UHF enthusiast. The new digital PEP Wattmeter - SWR Calculator will be one of the most popular projects.

We've only scratched the surface in describing what is in the standard manual of RF communication. Over 5.7 million copies of *The Handbook* have been published in 63 editions since 1926. The new edition will be available in early November. It is must reading for today's radio amateur!

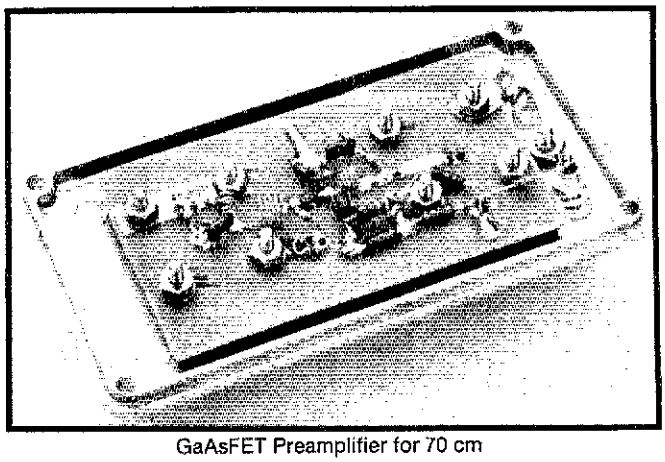
The *1986 Handbook* will be available in November. Paperbound prices are $18.00 in the U.S., $19.00 in Canada and elsewhere. Cloth prices are $27.00 in the U.S. and $29.00 elsewhere. Prices in U.S. funds. Foreign remittance should be in the form of an international money order or a check drawn on a bank account in the U.S.



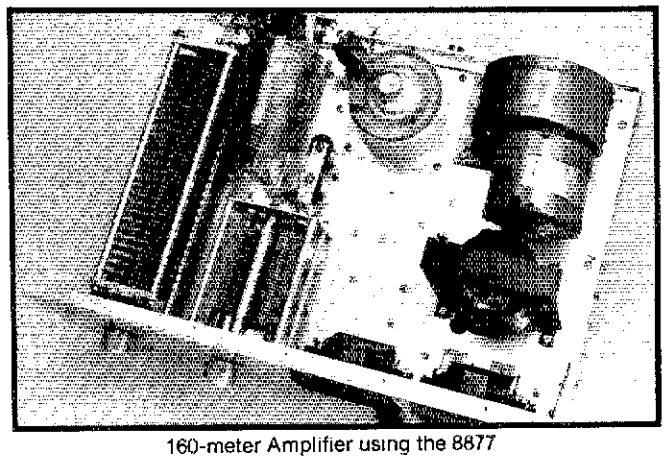
New supply covers a wide range of low dc voltages



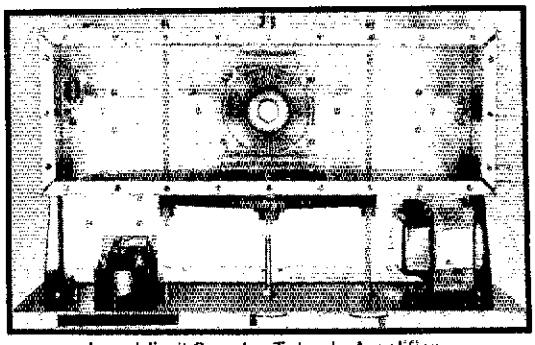
RF-proof regulator board in the new high current power supply



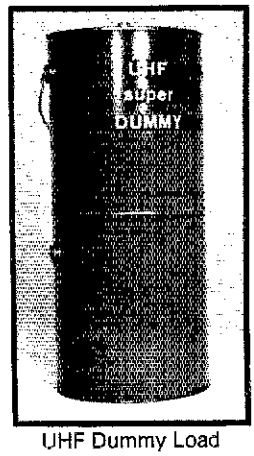
GaAsFET Preamplifier for 70 cm



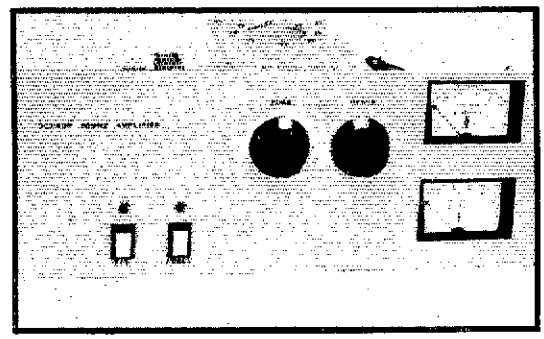
160-meter Amplifier using the 8877



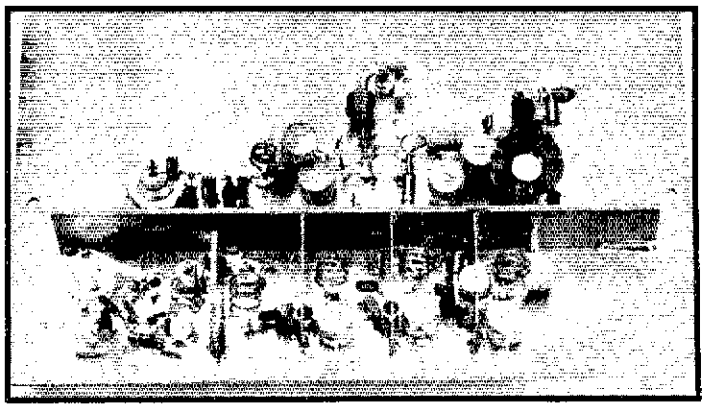
Legal-limit 2-meter Tetrode Amplifier



UHF Dummy Load

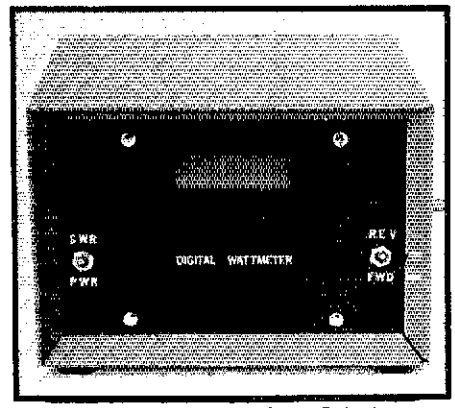


6-meter Amplifier using the 3CX800A7

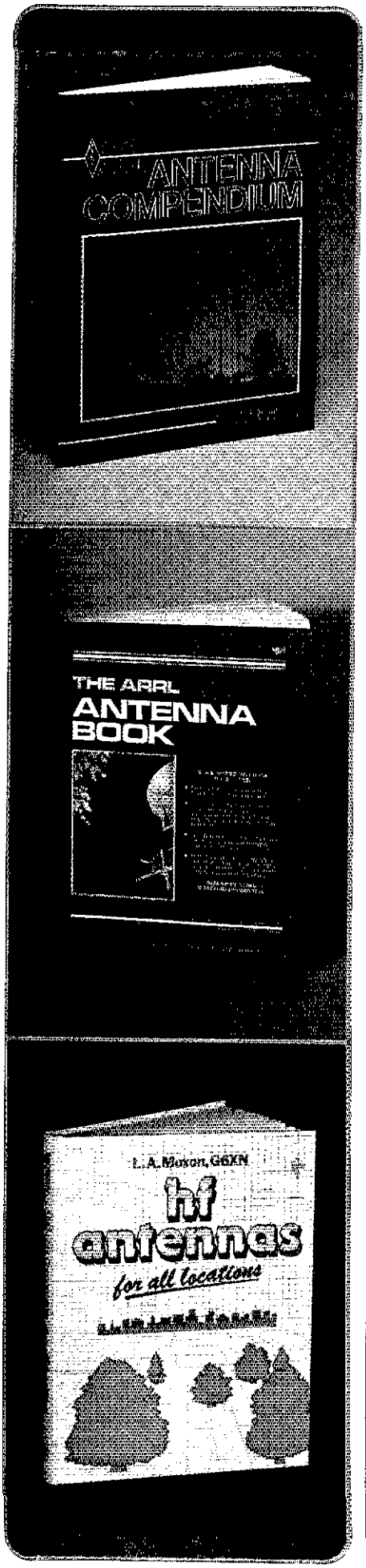


Transmit converter board: 220 MHz Transverter

New for '86



Digital PEP Wattmeter-SWR Calculator



NEW! THE ARRL ANTENNA COMPENDIUM

Because of space limitations in ***QST,*** we don't have room to run all of the good antenna articles that are submitted. The solution to this problem? ***THE ARRL ANTENNA COMPENDIUM!*** You'll find 178 pages packed with new material on quads, loops, log periodic arrays, other beam antennas, multiband antennas, verticals, reduced size antennas, plus such interesting topics as: Mr. Smith's "Other" Chart and Broadband Rigs; Available Power, SWR and Loading; Baluns: What They Do and How They Do It; The Horizontal Dipole Over Lossy Ground; and Antenna Polarization. Copyright 1985. Paperbound: **$10.00** in the U.S., **$11.00** elsewhere.

OTHER ANTENNA BOOKS

THE ARRL ANTENNA BOOK The best and most highly regarded antenna information available. The 14th Edition contains 328 pages of propagation, transmission line and antenna fundamentals. You can update your present antenna system with practical construction details of antennas for all amateur bands - 160 meters through microwaves. There are also antennas described for mobile and restricted space use. Tells how to use the Smith chart for making antenna calculations and covers test equipment for antenna and transmission line measurements. Over 600,000 copies of previous editions sold. Copyright 1982. Paperbound: **$8.00** in the US., **$8.50** elsewhere. Clothbound: **$12.50** in the U.S., **$13.50** elsewhere.

HF ANTENNAS FOR ALL LOCATIONS by L.A. Moxon, G6XN. An RSGB publication. Contains 264 pages of practical antenna information. This book is concerned primarily with small wire arrays, although construction information is also given on a small number of aluminum antennas. Chapters include: Taking a New Look at hf Antennas; Waves and Fields; Gains and Losses; Feeding the Antenna; Close-spaced beams; Arrays, Long Wires, and Ground Reflections; Multiband Antennas, Bandwidth; Antenna Design for Reception; the Antenna and its Environment; Single-element Antennas; Horizontal Beams; Vertical Beams; Large Arrays; Invisible Antennas; Mobile and Portable Antennas; What Kind of Antenna: Making the Antenna Work; Antenna Construction and Erection. Copyright 1982, 1st Edition, Hardbound **$12.00.**

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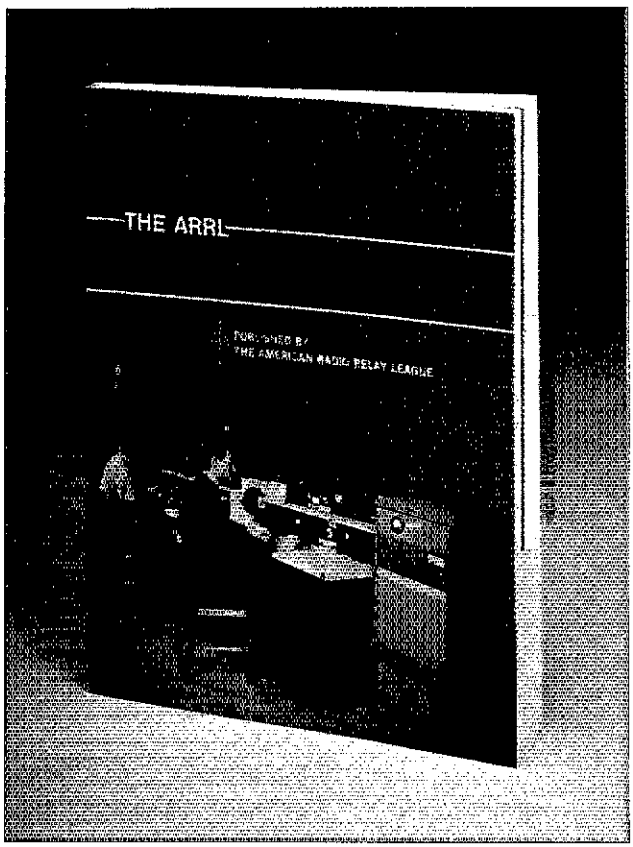
RAVE REVIEWS!



The revised 2nd Edition of *The ARRL Operating Manual* has been critically acclaimed by radio amateurs around the world as **the source** of contemporary operating information. Operating trends and techniques have changed dramatically since the first edition was published five years ago. Besides the basics, there are chapters on interfacing equipment with home computers, VHF/UHF, OSCAR, contesting, DX, traffic/emergency matters and even shortwave listening. This publication is a must for today's amateur! 196 pages. Copyright 1985, $5.00 in the US, $5.50 elsewhere. Add $1.00 for shipping and handling on orders less than $10.00.

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NEW!
THE POPULAR QST SERIES
FIRST STEPS IN RADIO
By DOUG DEMAW, W1FB HAS BEEN COMPILED INTO A SINGLE PUBLICATION!

Originally appearing in 1984 and 1985 issues of *QST*, the wide-ranging First Steps in Radio series helped newcomers to learn the electronic theory needed for licensing exams and to gain some insight into how their radio equipment works. The entire *QST* series is reproduced. You will find basic explanations of circuit components, see these components assembled into practical circuits, and see how the circuits make up your radio gear. Additional segments cover antennas, propagation and radio-frequency interference at a beginner's level. The purpose of this book is to open the doors to those who wish to learn more about the technical side of Amateur Radio.

Copyright 1985, $5.00 in the US, $5.50 elsewhere. Add $1.00 for postage and handling on orders under $10.00.

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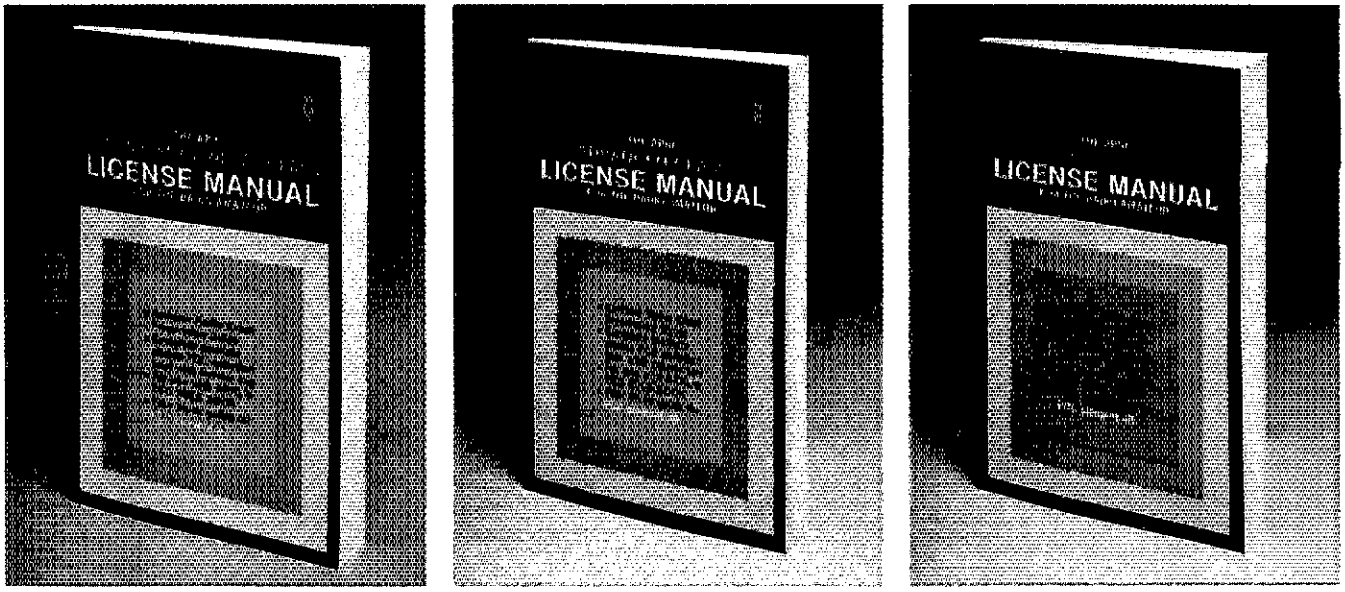
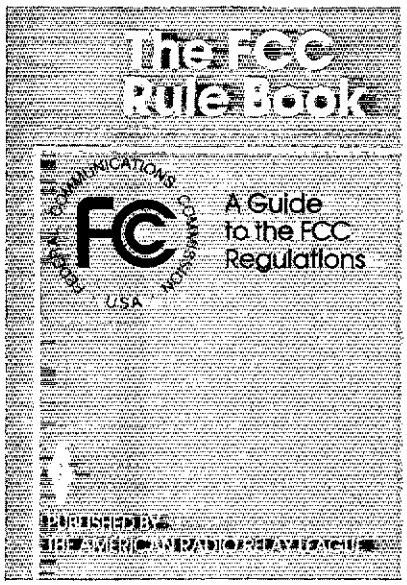


PASSING POWER!

- **NEW EXTRA CLASS LICENSE MANUAL**
- **NEW EDITION OF THE FCC RULE BOOK!**

The ARRL publications pictured on this page are just what you need in order to pass the various amateur exams. Beginning with **Tune in the World with Ham Radio** for the Novice and progressing through the new and critically acclaimed **ARRL License Manual Series** for the Technician through Extra Class; you will find passing each exam element a snap! There are accurate text explanations of the material covered along with the FCC question pools and answer keys. The **new** *4th Edition* of **The FCC Rule Book** is invaluable as a study guide for the regulatory material found on the exams and as a handy reference. *Every* amateur needs an up-to-date copy of **The FCC Rule Book!**



Tune in the World with Ham Radio $8.50.
The ARRL License Manual Series:

Technician/General	$5.00
Advanced	$5.00
Extra	$5.00
FCC Rule Book	$3.00

$1.00 Shipping and Handling on orders under $10.00.

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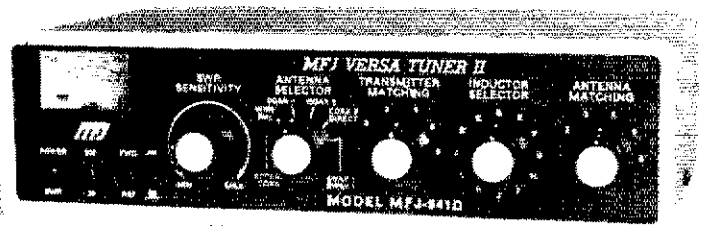
MFJ ACCESSORIES

300 WATT ANTENNA TUNER HAS SWR/WATTMETER, ANTENNA SWITCH, BALUN. MATCHES VIRTUALLY EVERYTHING FROM 1.8 TO 30 MHz.



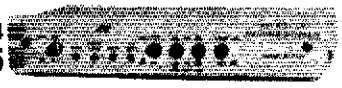
$99.95 MFJ-941D

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**



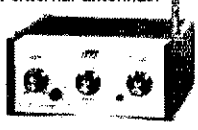
Free MFJ RTTY/ASCII/CW software on tape and cable for VIC-20 or C-64. Send and receive computerized RTTY/ASCII/CW with nearly any personal computer (VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64, etc.). Use Kantronics or most other RTTY/CW software. Copies both mark and space, any shift (including 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.

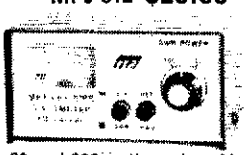
MFJ/BENCHER KEYER COMBO

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.

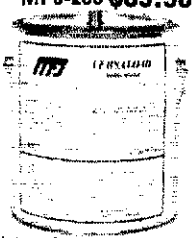
VHF SWR/WATTMETER

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

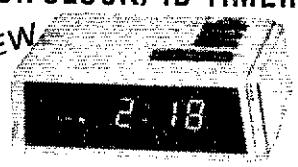
MFJ-250 **$39.95**



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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- Add **$4.00** each shipping/handling • **Call or write for free catalog, over 100 products.**

MFJ ENTERPRISES, INC.
Box 494, Mississippi State, MS 39762

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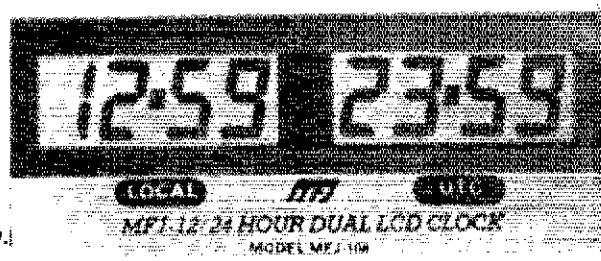
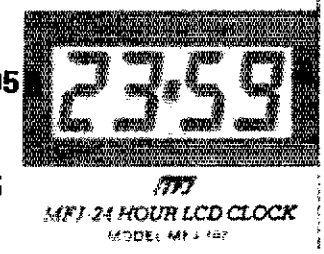
BEST OF MFJ

MFJ 24 HOUR LCD CLOCKS



MFJ-108 **$19.95**

MFJ-107 **$9.95**



These MFJ 24 hour clocks make your DXing, contesting, logging and SKEDing easier, more precise.

Read both UTC and local time at a glance with the MFJ-108, $19.95, dual clock that displays 24 and 12 hour time simultaneously. Or choose the **MFJ-107, $9.95** single clock for 24 hour UTC time.

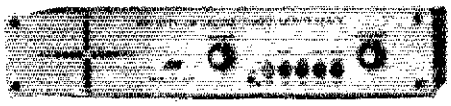
Both are mounted in a brushed aluminum frame, feature **huge easy-to-see 5/8 inch LCD numerals** and a sloped face that makes reading across-the-shack easy and pleasant.

You can read hour, minute, second, month and day and operate them in an alternating time-date display mode. You can also **synchronize them to WWV** for split-second timing. Both are **quartz controlled** for excellent accuracy.

They are **battery operated** so you don't have to reset them after a power failure, and battery operation makes them suitable for mobile and portable use. Long life battery included.

MFJ-108 is 4½x1x2 in. MFJ-107 is 2¼x1x2 in.

RTTY/ASCII/AMTOR/CW COMPUTER INTERFACE MFJ-1229 $179.95



Everything you need is included for sending and receiving RTTY/ASCII/CW on a Commodore 64 or VIC-20 and your ham rig. You get MFJ's most advanced computer interface, software on tape and all cables. Just plug in and operate.

The MFJ-1229 is a general purpose computer interface that will never be obsolete. An internal DIP switch, TTL and RS-232 ports lets you adapt the MFJ-1229 to nearly any home computer and even operate AMTOR with appropriate software.

A crosshair "scope" LED tuning array makes accurate tuning fast, easy and precise.

You can transmit both narrow (170 Hz) and wide (850 Hz) shift while the variable shift tuning lets you copy any shift (100-1000 Hz) and any speed (5-100 wpm, 0-300 baud ASCII).

Automatic threshold correction and sharp multi-pole active filters give good copy under severe QRM, weak signal and selective fading.

There's an FM (limiting) mode for easy trouble-free tuning that's best for general use and an AM (non-limiting) mode that gives superior performance under weak signals and heavy QRM.

A handy Normal/Reverse switch eliminates re-tuning while checking for inverted RTTY.

An extra sharp 800 Hz CW filter really separates the signals for excellent copy.

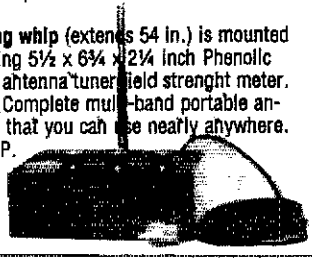
12½ x 12½ x 6 inches. Uses floating 18 VDC or 110 VAC with MFJ-1312, $9.95.

MFJ PORTABLE ANTENNA

MFJ's Portable Antenna lets you operate 40, 30, 20, 18, 15, 12, 10 meters from apartments, motels, camp sites, vacation spots, any electrically clear location where space for full size antenna is a problem.

A telescoping whip (extends 54 in.) is mounted on self-standing 5½ x 6¾ x 2¼ inch Phenolic case. Built-in antenna tuner, field strenght meter. 50 feet coax. Complete multi-band portable antenna system that you can use nearly anywhere. 300 watts PEP.

MFJ-1621 **$79.95**



MFJ ANTENNA BRIDGE MFJ-204B $79.95

Now you can quickly optimize your antenna for peak performance with this portable, totally self-contained antenna bridge that you can take to your antenna site—no other equipment is needed.

You can determine if your antenna is too long or too short, measure its resonant frequency and antenna resistance to 500 ohms. It's the easiest and most convenient way to determine antenna performance available today to anyone. There's nothing else like it and only MFJ has it. Built-in resistance bridge, null meter and tunable oscillator-driver (1.8-30 MHz). Uses 9 V battery. 4 x 2 x 2 inches.

REMOTE ACTIVE ANTENNA

The authoritative "World Radio TV Handbook" rates the MFJ-1024 as "a first-rate easy-to-operate active antenna ... Quiet, with excellent dynamic range and good gain ... Very low noise factor ... Broad frequency coverage ... the MFJ-1024 is an excellent choice in an active antenna"

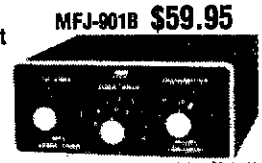
54 inch remote active antenna mounts outdoor away from electrical noise for maximum signal and minimum noise pickup. Often outperforms long-wire hundreds of feet long. Mount anywhere-atop houses, buildings, balconies, apartments, ships.

Use with any radio to receive strong clear signals from all over the world. 50 KHz to 30 MHz. High dynamic range eliminates intermodulation. Inside control unit has 20 dB attenuator, gain control. Switch 2 receivers and auxiliary or active antenna. "On" LED. 6 x 2 x 5 in. 50 ft. coax. 12 VDC or 110 VAC with MFJ-1312, $9.95.

MFJ-1024 **$129.95**

200 WATT VERSA TUNER

MFJ-901B **$59.95**



MFJ's smallest 200 watt Versa Tuner matches coax, random wires and balanced lines from 1.8 thru 30 MHz. Works with all solid state and tube rigs. Very popular for use between transceiver and final amplifier. Efficient air-wound inductor gives more watts out. 4:1 balun, 5x2x6 in.

ROLLER INDUCTOR TUNER

MFJ-989 **$329.95**

Meet the "Versa Tuner V", the compact roller inductor tuner that lets you run up to 3 KW PEP and match everthing from 1.8 to 30 MHz.

Designed to match the new smaller rigs, the MFJ-989 is the best roller inductor tuner produced by MFJ. Our roller inductor tuner features a 3-digit turn counter plus a spinner knob for precise inductance control for maximum SWR reduction. Just take a look at all these other great features! **Built-in 300 watt, 50 ohm dummy load, built-in 4:1 balun and a built-in lighted meter** that reads SWR and forward and reflected power in 2 ranges (200 and 2000 watts). Accuracy ±10% full scale. Meter light requires 12 VDC. 6 position antenna switch. 10¾ x 4½ x 15 inches.

MFJ "DRY" DUMMY LOADS

MFJ-262 **$64.95**

MFJ-260 **$26.95**

MFJ's "Dry" dummy loads are air cooled—no messy oil. Just right for tests and fast tune up. Non-inductive 50 ohm resistor in aluminum housing with SO-239. Full load to 30 seconds, de-rating curve to 5 minutes. **MFJ-260 (300 watt)**, SWR 1.1:1 to 30 MHz, 1.5:1, 30-160 MHz, 2½x2½x7 in. **MFJ-262 (1 KW)**, SWR 1.5:1 to 30 MHz, 3x3x13 inches.

MFJ ELECTRONIC KEYER

MFJ-407 **$69.95**

MFJ-407 Deluxe Electronic Keyer sends iambic, automatic, semi-auto or manual. Use squeeze, single lever or straight key. Plus/minus keying. 8 to 50 WPM. Speed, weight, tone, volume controls. On/Off, Tune, Semi-auto switches. Speaker. RF proof. 7 x 2 x 6 inches. Uses 9 V battery, 6-9 VDC or 110 VAC with AC adapter, MFJ-1305, $9.95.

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NEW FROM MFJ

MFJ'S BEST 300 WATT TUNER NOW GIVES YOU A CROSS-NEEDLE METER THAT READS SWR, FORWARD AND REFLECTED POWER — ALL AT A GLANCE.

MFJ-949C
$149.95

MFJ's best 300 watt tuner is now even better! The MFJ-949C all-in-one Deluxe Versa Tuner II gives you a tuner, cross-needle SWR/Wattmeter, dummy load, antenna switch and balun in a new compact cabinet. You get quality conveniences and a clutter-free shack at a super price.

A new cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance. SWR is automatically computed with no controls to set. Has 30 and 300 watt scale on easy-to-read 2 color lighted meter (needs 12 V).

A handsome new black brushed aluminum cabinet matches all the new rigs. Its compact size (10 x 3 x 7 inches) takes only a little room.

You can run full transceiver power output—up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Use it to tune out SWR on dipoles, vees, long wires, verticals, whips, beams and quads.

A 300 watt 50 ohm dummy load gives you quick tune ups and a versatile six position antenna switch lets you select 2 coax lines (direct or thru tuner), random wire or balanced line and dummy load.

A large efficient airwound inductor—3 inches in diameter—gives you plenty of matching range and less losses for more watts out. 1000 volt tuning capacitors and heavy duty switches gives you safe arc-free operation. A 4:1 balun is built-in to match balanced lines.

Order your convenience package now and enjoy.

SUPER KEYBOARD

MFJ-496
$169.95

Price slashed 50% to $169.95! Get a full feature Super Keyboard that sends CW/RTTY/ASCII for the price of a good memory keyer.

You get the convenience of a dedicated keyboard—no program to load—no interface to connect—just turn it on and it's ready to use.

This 5 mode Super Keyboard lets you send CW, Baudot, ASCII, use it as a memory keyer and for Morse Code practice. You get text buffer, programmable and automatic message memories, error deletion, buffer preload, buffer hold.

A 256 character keyboard buffer gives you perfect CW even if you "hunt and peck". A meter reads CW speed and buffer remaining. 4 message memories lets you store up to 256 characters. 4 preprogrammed messages lets you send CQ CQ DE, CQ TEST DE, DE, QRZ. Has speed weight, tone and volume pots that remembers their settings even after power is turned off. Send 60 WPM Baudot and 100 baud ASCII.

You can use it as a deluxe full feature memory keyer that has automatic and programmable memories, iambic operation, dot-dash memories. Has random and pseudo random code generator.

Automatic serial numbering, message repeating, tune switch, shielded for RFI. 12 VDC or 110 VAC with MFJ-1312, $9.95. 12 x 7 x 3½ inches.

CROSS-NEEDLE SWR/WATT METER

MFJ-815 $59.95

MFJ's cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance! SWR is automatically computed—no controls to adjust. Easy-to-use push buttons select three power ranges that give you QRP to full legal limit power readings. Reads 20/200/2000 W forward, 5/50/500 W reflected and 1:1 to 1:5 SWR on easy-to-read two color scale. Lighted meter. Needs 12 V. ±10% full scale accuracy. 6½ x 3¼ x 4½ inches.

2 KW COAX SWITCHES

MFJ-1702 $19.95

$29.95 MFJ-1701

Instantly select any antenna or rig by turning a knob. Organizes coax cables and eliminates plugging and unplugging. Unused terminals are grounded to protect your equipment for stray RF, static and lightning. 2 KW PEP, 1 KW CW. For 50 to 75 ohm. Negligible loss, SWR, and crosstalk gives high performance. SO-239s. Convenient desk or wall mounting.

MFJ-1702, $19.95. 2 positions. Cast aluminum cavity construction gives excellent performance up to 500 MHz with better than 60 dB isolation at 450 MHz. Heavy duty, low loss switch has less than 20 milliohm contact resistance, less than 0.2 dB loss and SWR below 1:1.2. 2 x 2½ x 1 inches.

MFJ-1701, $29.95. 6 positions. White markable surface for recording ant. positions. 8½ x 1½ x 3 in.

ANTENNA CURRENT PROBE MFJ-206 $79.95

This new breakthru MFJ Antenna Current Probe lets you monitor RF antenna currents—no connections needed! Determine current distribution, RF radiation pattern and polarization of antennas, transmission lines, ground leads, building wiring, guy wires and enclosures.

- **Indicate transmission line radiation** due to high SWR, poor shielding or antenna unbalance.
- **Detect re-radiation** from rain gutters and guy wires that can distort antenna field patterns.
- **Detect RF radiation** from ground leads, power cords or building wiring that can cause RFI.
- **Determine if ground** system is effective.
- **Pinpoint RF leakage** in shielded enclosures.
- **Locate the best place** for your mobile antenna.
- **Use** as tuned field strenght meter.

Monitors RF current by sensing magnetic field. Uses an electrostatically shielded ferrite core, FET RF amplifier, op-amp meter circuit for excellent sensitivity, selectivity. 1.8-30 MHz. Has sensitivity, bandswitch, tune controls, telescoping antenna for field strenght meter. 4 x 2 x 2 inches.

DIGITAL SWR/WATTMETER

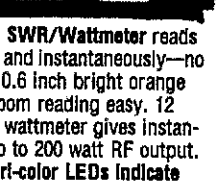
MFJ-818
$89.95

Fully automatic Digital SWR/Wattmeter reads SWR 1:1 to 1:9.9 directly and instantaneously—no SWR knob to set. Huge 0.6 inch bright orange digits make across-the-room reading easy. 12 segment LED bar graph wattmeter gives instantaneous PEP readings up to 200 watt RF output.

Good, bad, mismatch tri-color LEDs indicate SWR conditions. Small size (5½ x 4¼ x 1 in.) and easy-to-read digital display makes it ideal for mobile use. For 50 ohm systems. 1.8-30 MHz. 12 VDC or 110 VAC with MFJ-1312, $9.95.

MOBILE ANTENNA MATCHER

MFJ-910 $19.95



Lower your SWR and get more power into your mobile whip for solid signals and more QSOs.

Your solid state rig puts out more power and generates less heat. For 10-80 meter whips. Easy plug-in installation. Complete instructions on how best to lower SWR. Fits anywhere, 2½ x 2½ inches.

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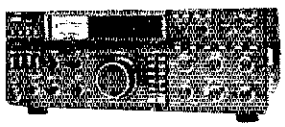

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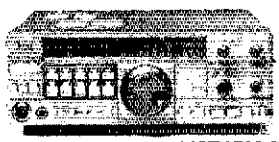

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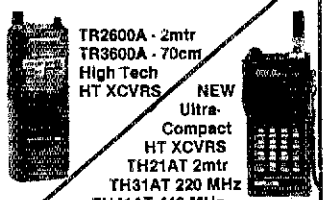

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C22	220	No	2W	20W	$ 79
C106	220	Yes	10W	60W	$179
C1012	220	Yes	10W	120W	$259
D24	440	No	2W	40W	$179
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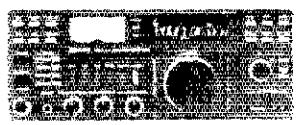

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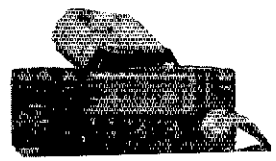

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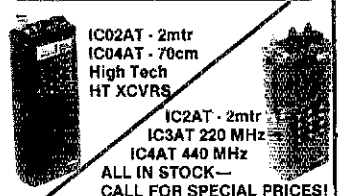

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RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229

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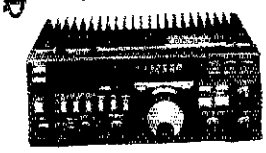

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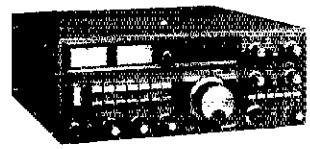

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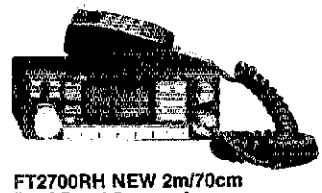

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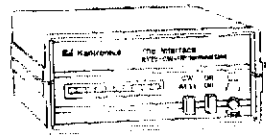

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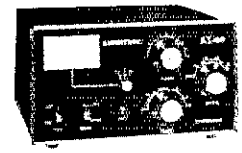

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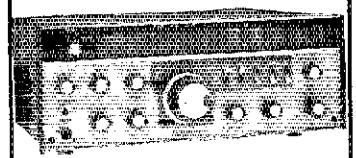

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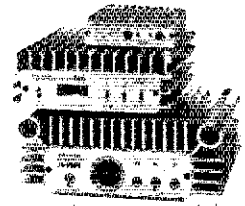

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Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 85 cents per word. This includes firms or individuals offering products or services for sale. A special rate of 25 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.

(4) Closing date for Ham-Ads is the 20th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 21 through September 20 will appear in November *QST*. If the 20th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in *QST* advertising.

(6) New firms or individuals offering products or services for sale must submit a production sample (which will be returned) for our examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must furnish a statement in writing that you will stand by and support all claims and specifications mentioned in their advertising before their ad can appear.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or characters of their products and services. Individual advertisers are not subject to scrutiny.

Clubs/Hamfests

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed the entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA, Inc., 1409 Cooper Drive, Irving, TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers — W7GAQ/6 Box 530, Santa Rosa CA 95402.

IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed. F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

JOIN the Old Timers Club, an international non-profit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C. 1417 Stoneybrook, Mamaroneck, NY 10543.

HAVE A-M capability? Join S.P.A.M. (Society for Promotion A-M) Membership is free. Write: F.A. Dunlap (S.P.A.M.), 14113 Stoneshire, Houston, TX 77060 (S.A.S.E. please).

FIND OUT what else you can hear on your general coverage transceiver or receiver. Complete information on major North American radio listening clubs. Send 25¢ and S.A.S.E. Association of North American Radio Clubs, 1500 Bunbury Drive, Whittier, CA 90601.

MORSE TELEGRAPH CLUB, established 1942, seeks landline and radio operators interested in telegraphy and Morse history. 46 chapters USA & Canada. For information and sample paper contact W. K. Dunbar, AD9E, 1101 Maplewood Dr., Normal, IL 61761 309-454-2029.

THE FLORIDA Amateur Digital Communications Association (FADCA) publishes a monthly newsletter, the FADCA Beacon, about Packet Radio. Write for a sample copy, FADCA, 812 Childers Loop, Brandon, FL 33511.

FREE QRP Info Kit. Send S.A.S.E. with two first-class stamps (U.S.) or three IRCs (DX) to: QRP ARCI, P.O. Box 354, Carlisle, PA 17013.

THE GOOD SAM HAMS CLUB invite RV operators to check in the Good Sam Ham Net 14.240 or Sundays 1900Z also 3.880 or Tuesdays at 2359Z Net control, N5BDN, Clarksville, TN.

MARYLAND/DC - COMPUTER & Electronics Fleamarket, 300 vendor tables, Indoors, Saturday, Nov. 9th. - Sheraton Hotel, New Carrollton, MD I-95 Exit #20B. 10 A.M.-4 P.M. Buyers $5, sellers from $25. Information 201-297-2526. W2TGH.

NEW JERSEY-SOUTH - Computer & Electronics Fleamarket, 250 vendor tables, Indoors, Saturday, Nov. 23rd. Halloran Plaza Hotel, Pennsauken, Route 130 South. 10 A.M.-4 P.M. Buyers $5, Sellers from $25. Information 201-297-2526. W2TGH.

"12-12" WORLDWIDE is promoting activity and good operating practices on the new 12-Meter Band. During Charter Membership months you may get your Number, Certificate, and quarterly newsletter, by joining. $4 per year. "12-12" Worldwide, Box 222, Cherokee, OK 73728.

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285 500 Hz 6-pole CW filter	65.00	
288 1.8 KHz 8-pole SSB filter	65.00	
214 Electret desk microphone	49.50	
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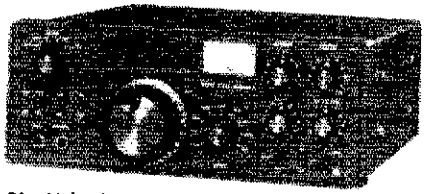
700C Electret hand mic w/connector	32.95	
1140 18/24.3A DC circuit breaker	15.00	



Big Value!	Regular	SALE
525D Argosy II 10/100w digital xcvr	659.00	589.95
225 9A power supply	129.00	119.95
217 500 Hz 8-pole CW filter	65.00	
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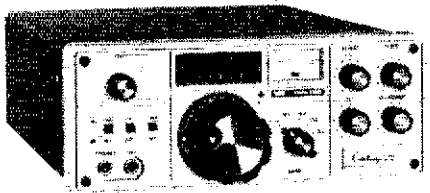
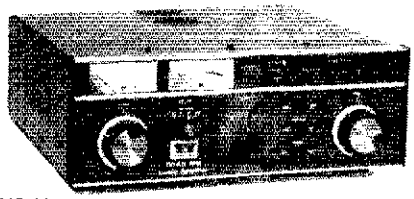
219 250 Hz 6-pole CW filter	65.00	
220 2.4 KHz 8-pole SSB filter	65.00	
222 Mobile mount	27.50	
223A Noise blanker	37.50	
224 Audio CW filter	37.50	
700A Electret hand microphone	32.95	
1125 DC circuit breaker w/cable	19.75	
1126 Linear amplifier switching kit	16.50	

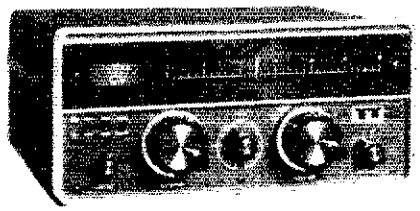


CW only	Regular	SALE
579 Century/22 50w 6-band CW Xcvr	$389.00	359.95
979 5A power supply	98.00	
979/E 230v 5A power supply	110.00	
226 Crystal calibrator	31.95	
279 Mobile line filter/circuit breaker	TBA	
679 Internal keyer kit	29.50	
1179 DC circuit breaker	15.00	

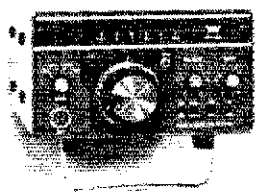
Misc. accessories	Regular	SALE
214 Electret desk mic w/4-pin plug	49.50	
700A Electret hand mic, 3-cond ¼" plug	32.95	
700C Electret hand mic, 4-pin plug	32.95	
209 Dry Dummy load	29.00	



HF Linear	Regular	SALE
425 Titan 1.5kw PEP output amplifier	2685.00	2299



Antenna tuners	Regular	SALE
229A 1.8-30 MHz 2kw PEP tuner/SWR	299.00	269.95
4229 1.8-30 MHz 2kw tuner/SWR kit	219.00	199.95
227 1.8-30 MHz 200w antenna tuner	89.00	



Satellite	Regular	SALE
2510 SSB/CW, Mode B satellite converter	549.00	489.95

VHF Handheld	Regular	SALE
2591 .3/2.5w 2m HT/batt/wall cgr/TTP	319.00	279.95
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2202 Protective case	9.75	
2425 30w amplifier	87.00	
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Phone (305) 894-3238
Fla. WATS 1-800-432-9424
Outside Florida 1-800-327-1917

CLEARWATER, Fla. 33575
1898 Drew Street
Phone (813) 461-4267
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No Nationwide WATS

LAS VEGAS, Nev. 89106
1072 N. Rancho Drive
Phone (702) 647-3114
No In-State WATS
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QSLs & rubber stamps. Top quality. QSL samples and stamp information 50c. Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

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MANUALS for most Ham gear made 1937/1972, plus Kenwood. Our 1985 catalog is $1 USA and required for ordering. Over 2,000 models listed. HI-MANUALS, P.O. Box E802, Council Bluffs, IA 51502-0802.

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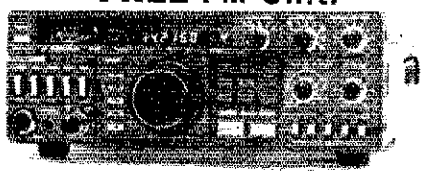

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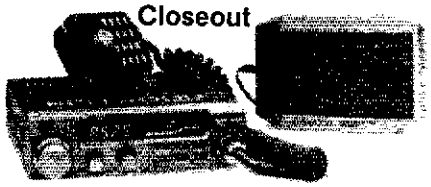

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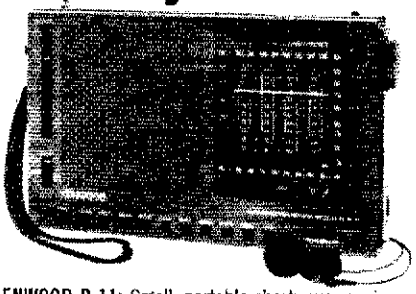

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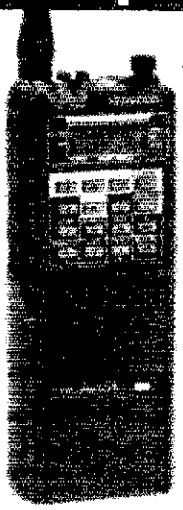

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or

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MICROPHONES and related memorabilia used in radio/TV broadcasting prior to 1960 wanted. Cash paid; trade items available. Write: James Steele, 80 Central Park West, New York, NY 10023-5206.

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WANTED: EARLY telegraph instruments for my collection. Landline keys, spark keys, miniature keys, call boxes, sounders, meters, etc. Any instruments made in California. Pre-1910 books, catalogs, and franks. Larry Nutting, WD6DTC, 5957 Yerba Buena, Santa Rosa, CA 95405.

RECAPTURE EARLY DAYS of Ham radio, professional radio and broadcasting! Our book Vintage Radio (263 pages) takes you from the earliest days up through spark to early 'phone days. A Flick Of The Switch (312 pages) covers Ham, commercial, wartime and broadcast radio from 1930 to 1950. Rekindle that excitement of early ham days! Discover the pleasures of collecting old radio gear! Just send $10.95 for each book to N6VY, Box 2045, Palos Verdes Pnsla., CA 90274.

WANTED SPEAKER Horn K4NBN "No Bad News".

WANTED: MCINTOSH and Marantz tube-type audio equipment, parts, accessories and literature, for personal collection. 100% reply. Marcus Frisch, WA9IXP, Box 385, Elm Grove, WI 53122-0385, 414-475-5356.

FOR SALE: Hallicrafters SX-100 Communication Receiver. Collectors item. Good condition. $99 F.O.B. W4NEX, G.E. Nemetz, 8202 Beechwood Drive, Lynchburg, VA 24502, 804-239-7789.

MINT CONDITION Hallicrafters HT32B SSB/CW Transmitter, with junk HT32A for parts. Both $175. National NC300 160-10 Receiver, speaker $75. Everything with Cables, Relay and Manuals $225. WA9TXB, 319-351-2046.

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WANTED: QST VOLUME 1. W6ISQ, 82 Belbrook Way, Atherton, CA 94025.

SCHEMATICS: Radio receivers 1920's/60's. Send Brandname, Model No., SASE. Scaramella, Box 1, Woonsocket, R.I. 02895-0001.

HAMMARLUND RECEIVER SERVICE by former factory Service Manager. Parts and manuals available, send $2 plus SASE for lists. Wayne Cordell, K4HCG, Blue Ridge Communications, 770 New Stock Rd., Weaverville, NC 28787, 704-645-7070.

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WANTED: Webster Wire Recorder, K4NBN, "No Bad News".

RECEIVERS WANTED: National NC-303, NC-400, HRO-500. Contact: G. Hawrysko, K2AWA, P.O. Box 568, Boro Hall, Jamaica, NY 11424.

NATIONAL SW-3 with Pwr Pac wanted. Myers, 1425 E. Jackson Blvd., Elkhart, IN 46516.

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COLLINS 32V, 32V3 excl $195. 32V1 good $165. K6DUY, 415-820-6966.

HQ-215 HAMMARLUND Receiver. Waters Hybrid Telephone Coupler. Robot 400 SSTV-10 inch monitor-camera with lens. James Millen GDO Type 90651. Call 201-231-1760 and ask for George, W2IJE.

HARVEY WELLS Receiver Bandmaster R9A $40. Hallicrafter S22R Receiver $75. Gonset 6-meter 12-volt with AC $50. Heath AT1 $35. Want Atwater-Kent Breadboard, DeForest-Receiver and tubes. K4UJZ, Russ Olmsted, Rte. 11, #349, Murfreesboro, TN 37130. 615-893-5344.

VIKING RANGER wanted W2QFR, 25 Cameron Pl., New Rochelle, NY 10804, 914-633-7840.

WANTED: QSL cards from the 1920s, early Amateur Radio Receivers, Transmitters, Parts, Literature, W3HWT, 329 Evergreen, North Wales, PA 19454.

General

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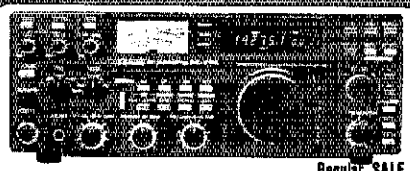

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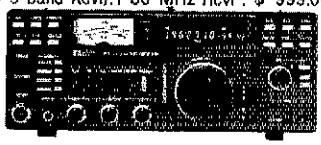

IC-271H 100w 2m FM/SSB/CW Xcvr .. $899 Call
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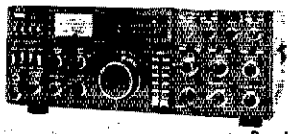
IC-R71A GENERAL COVER RCVR



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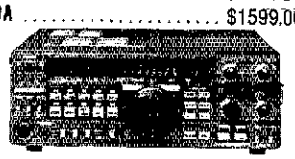

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TH-21A Call
TH-21AT Call
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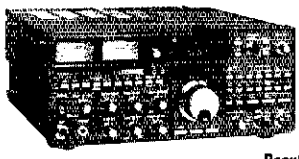

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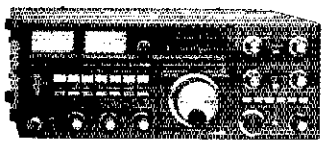

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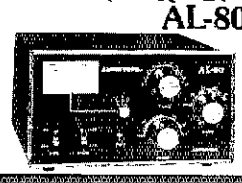

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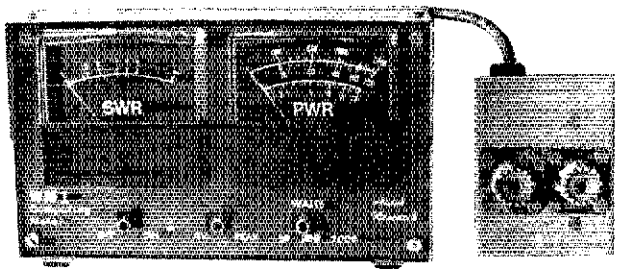

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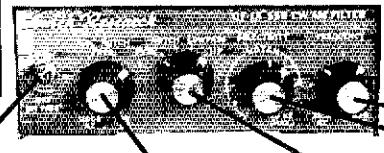

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FOR SALE: KENWOOD TR-7800 (two meters) $200/offer; Regency & Hallicrafters 150-174 MHz receivers, $15 each; Realistic SSB/AM CB $75. WB9YBM, Klaus.

WANTED: RV-75 W5EQD, 5801 Highland Pass, Austin, TX 78731, 512-453-7920.

QTH FOR SALE: Contest-winning hilltop (el. 1100′ asl) QTH in beautiful, rustic Morris County, NJ. Lovely 14 year old 4 BR, 2½ bath home features formal LR & DR, cathedral ceilings, custom double-glazed windows, raised deck off DR, efficient HWBB heat, city water and gas, lots more. 12′ × 16′ hamshack on ground floor has W-W carpeting, 125 A, 230 V service, custom wraparound operating console set up for multiop contesting or pleasurable operating. Can include two small towers, already installed. No anti-tower ordinances! $149,900, no brokerage fees. WB2WIK, 201-376-2004 M-F days.

WANTED, LATE model Motorola repeaters, portables and mobile. On VHF-hi, UHF, or 800 MHz. NØCAM, 303-632-8413.

PRE-WINTER SALE! All gear good working condition, no junk! Heath SB614 Monitor Scope/w man, $100. Dentron MT2000A kW Antenna Tuner/w man, $100. Hallicrafters SX117 (classic) Ham Band Receiver-mint/w man, $125. ICOM SP3 External Speaker $32. All prices firm. I pay shipping lower 48. Money order/check to: Richard Tashner, N2EO, 163-34 21 Road, Whitestone, NY 11357. Tel. 718-352-1397.

SELL TS520S, excellent $435. Dentron Ampl. GLA 1000 (A1) $225. 305-498-4120.

TEKTRONIX SCOPES: 533-Dual Trace 15 MHz $100. 547-Four Trace 50 MHz $150. With manuals and Scopemobiles. WAØVBM, 515-752-8517.

SWAN 350B, $350. Info W6XM, 619-459-5527.

SHORT DIPOLES for 160/75, 160/40, 160/30 . . . coax-fed, no tuning. $59.50 postpaid. Tom Evans, W1JC, 113 Stratton Brook, Simsbury, CT 06070.

SPY RADIOS And "Bugging" Equipment Wanted! Buying radios beginning with letters "SS" or "SRR" (Example, SSR-5, SRR-5, etc.), military radios in civilian suitcases, "bugging devices! MUSEUM, Box 18521, Wichita, KS 67218, call 316-684-6254.

CLIMBING BELTS & Accessories. Illustrated brochure. W9JVF, 1147 N. Emerson, Indianapolis, IND 46219.

DXPEDITION to MONTSERRAT only $250/week. Details: VP2ML, Box 4881, Santa Rosa, CA 95402.

120' GUYED STEEL TOWER. Extremely strong, $700. WA8MLV, 216-834-1737.

AMATEUR RADIO EQUIPMENT. Selling off my three generations of Amateur Radio equipment due to a work relocation. All equipment is either brand new, like new, or restored to new or better. Yaesu FT980 Transceiver in sealed box $1000. FT902DM $625. Kenwood TS930S sealed carton $950. Brand new National HRO500, LF-10 Preselector brand new $1000. Dentron Clipperton QRO Linear new model 4X572B tubes $549. GLA 1000C $338. MLT 2500 Roller Inductor Tuner $299. Collins KWM380 new $2000. Drake C-line factory sealed cartons, complete, never used $900. Note: I hve most of the matching accessories like Speakers, Microphones, etc. All have manuals. I will take offers. I will also answer all inquiries as well as export. Send for list. Mark Paulson, P.O. Box 0280, Baldwin, NY U.S.A. 11510.

DRAKE PURCHASED 1973, TR4 with N.B., Mike, RV4 Remote VFO Speaker and Power Supply. Console with Phone Patch Wattmeter, Antenna Relay Box never used. Factory overhaul. Mint condition $500. National NCX3 Transceiver $175. Raul Bottenhorn, 203-575-0426 evening.

SURPLUS USED Equipment For Sale. As is, first come, first serve. $24.95 each. Three or more of any combination $20 each. Add $5 to each order for shipping and handling. Send check or money order to CECO, P.O. Box 742209, Houston, TX 77274, 713-666-8822.

NEW CODE SYSTEM! CURLYCODE, by W4BUP, lets beginners know code without "study," helps YOU boost your speed! System shows how sound patterns make unforgettable shapes in your minds eye. Eight CURLYCODE shapes show most letters. Average of two different endings for each shape show all 61 characters. Booklet $6.50. Complete set: Booklet, Wall Chart, Pocket Card, Special Chart, all for $11.50. Discount 20% for 10 or more complete sets. Minds eye Publications, Dept. Q1, Box 1310, McLean, VA 22101.

HEATH HW22 and HW32 for sale. Includes manuals, speaker, microphone, mobile power supply and HP-23 AC supply. All for $200. W1JEC, Route 3, Hendersonville, NC 28739. Tel. 704-697-9829.

4CX250B $61; 6L6GC $4.95; 811A $11.50; 807 $6.65; 3-500Z $94.50. Thousands of tubes and semiconductors in stock. Thor Electronics, P.O. Box 707, Linden, NJ 07036. 201-486-3365.

HAPPY THANKSGIVING from all the little Pilgrims at Junior High School 22 on Manhattan's Lower East Side. Send us your QSL today and we may send you our QSL Of The Week Award just in time for showing off around the Holiday table. Mail today to WB2JKJ.

UNIQUE OPPORTUNITY. For Sale: Major Amateur Radio importer and distributor, located in S.E. U.S. Send all inquiries in care of QST Advertising Department, 225 Main Street, Newington, CT 06111.

COLLINS WANTED: 55G-1 Preselector with manual, good condition. Need KWM-380 accessories - mics MM-280/281, SM-280/281, AC-2821 DC Cable, AC-3803 Control Interface, AC-3802 Speech Processor. Need filters - F455B60 and F455B05. Need 270G-2 Speaker (75A-2/3 era). Need Spinner Knob for 75A-4 (already have 4:1 reduction gear). Need Tuning Knob for S-Line (NO finger indent). Want to locate 75S-2 and 32S-2 with Power Supply in good condition and manuals. All replies answered. AC1Y 35 Brookmoor Road, Avon, CT 06001, 203-673-3662 eves.

2M linear TRANSVERTER with 6M I.F., 10 watts out, works well with IC-551, made by National/Panasonic $85. Kenwood MS-1 Mobile Stand for TR-2600 or 2500 $25. Heathkit FET FOM $25. W7TZO, 503-267-6064.

WANTED: TEN-TEC 405 amp KB0QS. RR9, Box 280, International Falls, MN 56649, 218-283-4649.

FOR SALE: YAESU FT-707, FC-707, FP-707 and YM-36 microphone, Kenwood VFO-820 Sure model 330 Broadcast Microphone, Western Electric 72A Frequency Meter. Old radio books. Bill, N0ZX, 11608 Davenport Plz #23. Omaha, NE 68154.

WANTED: DUAL 150-pF Variable Capacitor (Bud CE-2046 or Surplus), Seven 2N406 Transistors and One 2N408 Transistor, Heath HRA-10 Crystal Calibrator. N2BDU, 38 Chapin St., Canandaigua, NY 14424.

UTC S-47 3000VCT 300mA and S-34 Swinging Choke like new $50. Many nice Inductors, Ceramic Switches and Sockets, Receiving Tubes, 866's, 811A's, 6146's Hardware, etc. Going to junk unless picked up in November. Call evenings to K3COO, Wilmington, DE 302-994-1035.

HAM CLEANOUT SALE - Disposing of most ham gear - Heath SB301/401/610, RTTY Model 28ASR, Reperf, etc., TU, Regen Repeater. Test gear, power supplies. SASE for full list and low prices or make offers. W2OKO, R. Mendelson, 27 Somerset Place, Murrayhill, NJ 07974, 201-464-5244.

REDUCE QRM: M&M Audio Filter model MSB-1, used very little. $50. K3CSV, 813-488-4644. Will ship.

QUITTING: USED less than 5 hrs! One-owner ICOM IC-451-A 430-440 MHz all mode xcvr with Shure EM-28A desk mic low serial no. $385 firm. ARR SP144VDG GaAsFET Preamp $80 firm. Or both for $450. I'll ship U.P.S. Paul, KB2VD, 201-796-5805 after 7:00 P.M. E.S.T.

SHURE 444D Mike and new Hiel HC4 element. $35. Art, K1VKO, 203-853-0587.

WANTED: Plate Transformer for Collins 30S1 Linear Amplifier. Carlos, LU2DZ/4. 516 Mokena Dr., Miami Springs, FL 33166.

RTTY: HAL top-of-line DS-3100 ASR with DSK-3100 Disc unit and ST-6000 Demodulator Okidata 82A printer $1600. KD7HN, 503-476-5703.

TS-830S, VFO-240, two 500 Hz CW filters. $749. Includes shipping. K1BW, 203-848-3796.

WANTED: OPERATIONS Manual Schematic Sierra 305A-L Frequency Selective Level Meter. Weber, 2605 West 82nd Place, Chicago, IL 60652.

COLLINS: 312B-4, w/mike; CP-1; DL-1. $75 each. $200 for all. U-ship. Gary, KD2ES, 518-563-3861.

DRAKE EQUIPMENT: TR4CW w/AC4 $375. FS4 Synthesizer $175. 2C Receiver 120 C4 Console Complete $275. L4B Linear Amp $720. UMK3 Remote Bracket for UV3 never used. $20. PS7 Power Supply $165. HS7 Headphones $15. John Kakstys, W2FNT, 18 Hillcrest Terr., Linden, NJ 07036, 201-486-6917.

DRAKE R4A receiver, T4X xmitter, MS4 power supply, Shure 444 mike, excellent condition. $325. Stan, K2SJO, 914-939-6681 evenings.

KENWOOD TS120S, SP120, MB100 $350. TS830S, SP230, AT230, MC50 $780. OA1A Carlos, Box 5466 C'sted St. Croix, USVI, 00820, 809-778-5169.

SALE: HEATH HW-101, P.S., CW Filter, HS-1661 Speaker, mint, $230; HW-100, P.S., CW Filter, Fan, Modified, $200; Tailtwister Rotator, like new, $230; TS-430, PS-430, $700; you pay half ship. N2FNO, 718-507-2819.

ELECTRON TUBES - Radio & TV types 75% off List Price - Huge Inventory! Also Industrial types. Send for Free Catalog today or call Toll Free 800-221-5802, Box QC, Transleteronics, Inc., 1365 39th St., Brooklyn, NY 11218. See Our Display Ad This Issue!

FREE 3 MONTH Subscription. Send Callsign to Westlink Report-Q11, 28221, Stanley Court, Canyon Country, CA 91351. New only!

WANTED ORIGINAL intact Shop Service Manual for Motorola U43HHT3100A part number 68-862350. Dave, KC4QG, PSC Box 12 APO SF 96298.

FOR SALE: Kenwod TS-530SP, 2 Filters. Never used as transmitter. Also Heath Tuner SA-2060A, never used. $625 for both Ed Shoup, Orlando, FL 305-851-2174.

COMPUTERIZED BEAM HEADING and Distance Printout from your exact location to all call sign prefixes worldwide, plus over 200 U.S. and Canadian cities. Send $11.95 (U.S.) to: G. Miller, K7GFL, 3715 Brittlewood, Las Vegas, NV 89120. Ph 702-456-9048.

MFJ-1224, Power Supply, MFJV-20, Cables and Tape Machine. Dentron 80-10 Long Wire Ant. Tuner. All for $75 in mint condx. K2GYX, 201-992-0795.

WANTED: DENTRON DTR-3KA Antenna Tuner. Contact KY0R, 21 Loyola, Pueblo, CO 81005 or call 1-303-564-6003 after 0300 UTC.

SELL: KENWOOD TS930S, TS820, R820, VFO-230 all with 500 Hz CW filters, all in good to mint condition. Call or write with quote. Need to sell all equipment as soon as possible. K3UA, 122 Lang Dr., Coraopolis, PA 15108 412-262-7076 Weekdays.

ESTATE SALE - Swan 350 Transceiver with Mike, Dummy Load and Spare Tubes. $250. Kenwood TS-520S with DG-5 Readout and Mike $425. W5RJV, 409-295-7379 Huntsville TX.

WE WOULD LIKE and need any kind of Ham Equipment for our Senior Citizen Stations. Please send to Rocky, K3PAQ, Squire Senior Center, 22 Media Line Road, Newtown Square, PA 19073.

FOR SALE: 4 new Eimac 4CX350A Tubes, $125. Heatn SB614 Monitor Scope, $75. Above include UPS 48. K7GWK, Steve Humphrey, 807 Delaware, North Bend, OR 97459.

FOR SALE: 6M Swan 250 SSB/AM/CW 250W PEP Transceiver, Mike, Manual, less 117XC/PS. Excellent condition, $250. W4BUZ, 1703 Verdun Dr., Greensboro, NC 27410, 919-292-1538.

SELL DENTRON Clipperton-L Amplifier, $375; Atlas 215X, 160-15, 110V P.S., Mike, $275; Mil-Spec 1030, mint with 200W, CW Filters, Mike, $4,995; Viking Courier Amp, $115; HQ-129X, $50; 100-Foot Portable Mast, Trailer, Gas-Powered Compressor, 2.5 kW H.D. Generator, Guys, $2,500; C.E. 600L, needs 40M, P.S. repairs, $70; Valiant II, Johnson SSB Adaptor, $250; 3-1000Z 80-10 H.B., 2 kW Amp, Neat, P.S., Spare Final, $600; KLM Rotatable 80M Dipole, $350; Want to Buy: Telrex Rotor Cable, 2-inch mast, 646, 845, 1044 Beams, RG-17, Rohn 55 Tower, Gin Pole, Accessories, KLM 10-30 Log Periodic. F.O.B. K8CCV, 216-427-2303, 6-9 P.M., EST, weeknights.

INTEL SOFTWARE Development Systems (2) $1000 each; Intel ICE49 Emulator $500; Intel ICE51 Emulator $500; Intel UPP8751, UPP8749 for Single and Triple Power Supply PROMS $500; Anadex CF-735 Universal Timer Counter $100; Monsanto 106A Reversible Counter $100. Contact Greg Smith, Ohaus Scale, 201-377-9000.

FOR SALE - two used Eimac 4-1000A's, $75 each. W4OKM, 40 Arrowhead Drive, Lynchburg, VA 24502. 804-239-7072.

SELL OUT: Kenwood TS180S $395, PS30 $95, Hallicrafters SR2000 $495, SR500 $250, HT37 $125, S20R $65, SR160 *$165, HT18 $65, HA5 VFO $48,* HW100 $85, HW32 $35, HW12 $35, HP23 $45, HP13 $37, SB303 $135, HW17 $85, SB10 $95, Duo-Bander $125, Swan 250-6-meters $150, 117XC $95, CE20A $65, Elco 720 $50, T60 $38, Johnson SB200 $150, Viking 122 VFO $55, TR5 mint $195, AC4 $85, DC3 $50, MS4 $35. Instructorgraph, Tapes $35. 1936 Handbook $35. HA14 Mobile Linear, AC only $295. N4LX-F.E. Coble, 251 Collier Ave., Nashville, TN 37211. Phone 615-833-2724.

COLLINS S-Line, Round Emblem, Receiver, Transmitter, Console, Power Supply, Microphone, Audio Filters, all original Manuals, Digital Frequency Display, excellent condition. P.O. Box 2025, Davenport, IA 52809. 319-391-6226, Ken Beck, 8-5 P.M. CST.

WANTED: ALL General Radio 874 Series devices. Send price and description. N7BBC.

IN MEMORY OF MABLE IRMA OLDS WATSON, KA4ZRB/AAV4TK, ex-K4YXN. Born November 20, 1911, Tyler, Texas. Became Silent Key, August 16, 1985, 6:22 P.M., Fort Walton Beach, FL. 73 years young. Wife of 54 years to Robert H. Watson, Sr., W4DTV. Mother of son and two daughters, one grandson and two granddaughters. Independent Baptist. Accomplished oil painter with awards, cook, organist, pianist, seamstress, rockhound (semi-precious stones), photographer, gardener. Loved camping, fishing, people. Moved 37 times to 22 cities with husband during 27 years USCG service. Member of OARC, Army MARS, Former Member Eastern Star, and a very WONDERFUL WOMAN.

FOR SALE, TEN-TEC 540 (80-10) Transvr, Noise Filter & CW Filter, 262M P/S, $350. Tempo S1 H/T w/TTP and Charger $125. WD6EQR. 213-370-3410.

WANTED: NEWTRONICS Cliff-Dweller Model CD 40-75 antenna. KA6LDN, 714-837-2757.

WANTED: R-1490/GRR-17 Receiver, parts and manual. Gene Mottern, 313 Royal Drive, Kingsport, TN 37663.

SELL: SWAN 260 Mobile or base station SS Transceiver $175. SASE details W6QEO.

FOR SALE: Corsair, CW Filter, Power Supply/Speaker. MFJ-422 keyer. $925 plus shipping. Cashier's Check. Lawrence Wiggs, KA9ORX, Route 2, Winslow, IN 47598. Phone 812-789-2991.

KDK 2033 like new, $175. Century-21 digital w/Keyer & Callibrator, excellent, $250. Heath HW-8 w/PS good cond. $95. K4JXC, 121 Maple, Oak Ridge, TN 37830, 615-483-1427.

DRAKE TR/DR7, PS, 1.8 2.2 .5 filters, AUX7, NB, Speaker, RV75, loaded guaranteed $1150. HP608C $150. George, W2YJ, 716-684-3562.

JAPAN RADIO COMPANY NSD-515 Transmitter/Power Supply/Hand Mike. New $1150. + shipping. List $1684. Built to marine specs. Bob Lee, K2TWK, 201-573-9743.

R.F. POWER LABS C500X (2-22 MHz, 1 kW) solid state, AC PS, $750. 75S3B, 32S3, 516F2, 312B4, $750. 30S1, $1500. Collins 35C-2 L.P.F. $75. 75S-3A, Skyteks, $300. 32S1, $200. James Craig, 32 Birchwood, Rye, NH 03870, 603-964-6658.

DENTRON MLX Mini Transceiver, 40 meter. Good condition physically, needs some refinement work. $69. N3LC, 703-788-9797.

WANTED: SWAN 14-C DC Converter for 117XC Power Supply. John E. Smith, W2JVX, Route 3, Box 801, 704 Crescent Circle, Pompano Beach, FL 33067.

DRAKE TR-7, PS7 Power, RV75 VFO, Aux & All extras factory installed. $1100. K6DUE, 818-346-0137.

WANTED: HEATHKIT HW-8 with Power Supply and books. Scott Forman, Route 5, Trenton, MO 64683. 1-816-789-3505.

SELL: RK4D32 @ $35 each, 100TH @ $25 ea. Tubes 813 @ $15 each. 807 @ $3, M. Levy, 101 E. Driftwood, Apt. 26, Fredericksburg, TX 78624.

YAESU FT-101ZD Mark 3 with fan. Very few hours, no mods, looks new. $475. Rick, KE6DO, 619-756-5749.

FOR SALE: TS520 with DK-520 type Digital Readout. Retubed and realigned. For top condition, $450. W6MZC, 26 Princeton Circle, Longmont, CO 80501, 303-776-1249.

KENWOOD TS-530S xcvr. C.W. and SSB Filters. Hardly used. $500. ICOM IC25A 2-Meter Xcvr. $200. Call 815-351-4738 after 6:00 P.M. WB1GEW.

SSTV, ROBOT Color Transceiver Model 450C. Fully automatic. Computer interface and more, looks new. $495. Also Model 400C, factory installed $375. Rick, KE6DO, 619-756-5749.

COLLINS 51 S-1 General Coverage Receiver, 1.5 to 30 MHz. Rack mount. Good condition. $500. Commercial Power Supply, 115-230 VAC input, 2500-3000 Volts D.C. output, Lamp. $300. 2- 3-1000Z tubes. $60 each. Collins KWM-2 Round emblem with Waters "Q" Multiplier, xtal pack & power supply (AC). Transmit & receive 3-30 MHz. $500. Local pickup only. W5ZJG, R. C. Hall, Sealy, TX. Phone: Area code 409-885-7009.

NICADS! Brand-new Yaesu FNB-2 battery packs. 10.8V 450 mA, fits FT208R/708R, Wilson Mark II/III HT's. $20. Jim Sieminski, KE6XE, 1978 Morning Glory St., Simi Valley, CA 93065, 805-527-5579.

DRAKE UV-3 3 band Mobile Transceiver, 2 metres, 220, 440 with remote control for trunk storage. $1000 value. Asking $499. Tempo FM S5 - 2 metre handy talky $150. S. Helperin, 5046 Veloz Ave., Tarzana, CA 91356. 818-345-6760.

NRI MASTER Course in TV/Video Servicing, and NRI Computer, Microprocessor Courses, etc. Wanted. Reasonable. Joseph Wegner, Jr., P.O. Box 262, Glendale, CA 91209.

WANTED FOR Repair Parts: R-392 Receiver. Condition, tube content, and price info to Bob Ragain, WB4ETT, 6001 South Grant, Littleton, CO 80121, 303-794-6978.

FREE AD - HAMSWAP Newsletter. Send ad with phone #. Buy/Sell/Trade. Subscriber equipment discounts. 12 issues $9. HamSwap, P.O. Box 2222, Vacaville, CA 95696.

YAESU FT-980, SP-980 Speaker, all IF Filters, Keyer Module, Keying Relay, MD-1 Mike, Manuals, Boxes. All mint. $1050. W7BER, 602-820-9111.

OMNI 546C Transceiver, Pwr Supply 255, Keyer KR-20, Mic. 444D. All fine condition, $770. Prefer you pick up. John Bittens, W8WTK, 8463 Buckingham Dr., Parma, OH 44129, 216-884-1006.

ICOM IC02AT, BP-3, HM-9, CP-1, Mint $275. N7EM 818-784-8862.

ROHN TOWERS - Wholesale direct to users. 23% to 34% discount from dealer price. All products available. Write or call for price list. Also we are wholesale distributor for Heliax antenna cable. Hill Radio, 2503 G E Road, P.O. Box 1405, Bloomington, IL 61701-1405, 309-663-2141.

PLATE TRANSFORMER, Commercial Transmitter Grade, 230V single phase primary, output - 6.2 kV @ 3.5A, (not pole-pig junk), Trade/sell $195. A. Emerald, 8956 Swallow, Ftn. Vly, CA 92708, 714-962-5940.

ROSS $$$$ USED November Specials: (over 200 used items in stock) Kenwood TS-130S $419, TS-530S $459.90, TS-180S $359 to $499.90, TS-930 SWAT $1099, TS-820S/DG1 $459.90, TS-940S $1299.90, Yaesu FT-757GX $629.90, FT-301D $369.90, FT-620B $279, ICOM IC-490A $399.90, IC-730 $469.90, IC-701 $389.90. If this month's special is not what you are looking for send SASE, Call Letters, name & phone # for used list. Also 7,500 NEW ham-related items in stock. Mention ad. Prices cash, FOB Preston. We close at 2:00 on Saturdays & Mondays. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830.

CX-7A with B mods, RIT, CW Filter, spare parts, perfect condition, all documentation $750. 2 meter amp and relay Ramseykit new $25. Recordit Wire Recorder $20. W9RE, 317-862-5137.

SELL KENWOOD TS-930S, AT-930, 500 Hz CW, 6 kHz AM filters. WARC factory update. $1300. W2IVA, 782 Preston Road, East Meadow, NY 11554, 516-481-2638.

ROSS $$$$ NEW Specials (November only): If you don't see what you want, send Call Letters, name & phone # for personal price quote. Over 6500 ham-related items in stock. Shure 444D $44.90, ICOM IC-735 $729.90, IC-02AT $282.90, IC-745 $768.90, IC-490A $509.90, IC-751 $1129.90, Kenwood TS-940S/WAT $1699.90, TH-21AT $194.90, TR-7930 $303.90, TR-7950 $356.90, TS-430S $589.90, TM-211A $309.90, TR-8400 $349.90, TW-4000A $494.90, TS-660 $759.90, Yaesu FT-720RVH $259.90, FT-757GX $698.50, FRG-7700 $369.90, FRG-8800 $589.90, FT-980 $1429.90, FT-230RT $279.90. All major lines stocked, L.T.O. Mention ad. Prices cash, FOB Preston. We close at 2:00 on Saturdays & Mondays. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830.

CRYSTALS - BUILD SOMETHING! QRP, quick and easy with inexpensive FT-243 crystals. All bands FT-243's 160M to 2M made to order. FT-243 General, Novice - 4001 to 8700 kilocycles $2.50, minimum five $1.95 each. 30M fundamentals 10100 - 10150 .01% $2.95, five $2.70. 3500 - 4000 $2.95, five $2.50. 160M $3.95, five $2.95. Overtones including 12M, 1000 - 25,000 $3.95. Sockets 60c. Postage-Airmail 30c per crystal. Crystals Since 1933. Stamp or long SASE for 1700 - 60,000 kilocycles, listings-circuits. Special - unused 203-As $9.95 + $2.50 postage. C-W Crystals, Marshfield, MO 65706.

YOUR CALL LETTERS in solid 14 Karat Gold to display proudly on your lapel. See Sept. '85 QST, Page 131. Tuttrup, KD0QS, 309 18th Ave NE, Waseca, MN 56093.

SELL COLLINS HF-330 serial # 1, with Keypad $4000 OBO. McKay Dymek Rcvr DR-44 with Cabinet, DP-40 Preselector & DA-100 Active Antenna. Also DA-9 VLF preamp/Antenna included. $300 OBO. Warranty available. All above mint condx. Must sell. George, W6NRE, 818-901-7440.

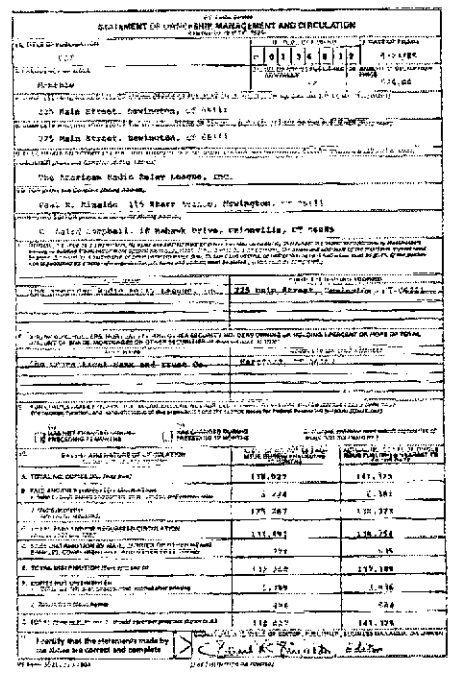
MICROLOG ATR-6800 RTTY w/Applications Expansion Module, Monitor. Mint, used little. B/O. WB2CHW, Larry, 516-621-8362.

FOR SALE: Drake C line, T4XC, R4C, AC4, MS4 WARC bands, Satori Mods, N.B. and 3 filters, S.N. above 29K absolutely perfect condx $550. Drake MN2000 Antenna Tuner $150. Drake TC2, SC2, P.S. & calibrator. Phone 617-438-1765. Write WA1TQQ, Guy Quartarone, 14 Cedar Way, Stoneham, MA 02180.

IBM-PC RTTY/CW. CompRtty II is the complete RTTY/CW program for the IBM-PC and compatibles. Virtually any speed ASCII, BAUDOT, CW. Text entry via built-in screen editor! 10,000 character transmit/receive buffers! Adjustable split screen display. Instant mode/speed change. Hardcopy, diskcopy, break-in buffer, select calling, text file transfer, customizable full screen logging, 24 programmable 1000 character messages. Now with WRU (simple mailbox). Ideal for MARS and traffic handling. Requires 128K PC, XT, AT, PCjr, PC-DOS, serial port, RS-232C TU. $65. Send call letters (including MARS) with order. David A. Rice, KC2HO, 7373 Jessica Drive, North Syracuse, NY 13212.

TEST EQUIPMENT Service Manuals for sale. Tektronix 465B, 475A, many others, new and old. Also HP, GR, etc. Hundreds available. Selling originals and copies. Also some catalogs. Also selling computer library, 150 quality, engineering grade books, at low prices. S.A.S.E. for list. Joseph Cohen, WA1HDD, 200 Woodside, Winthrop, MA 02152.

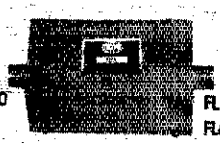
DIGITAL AUTOMATIC DISPLAYS for FT-101's, TS-520's, Collins, Drake, Swan, Heath and all others. Six ½" digits. 5" wide by 1¼" metal cabinet. Send $1 for information. Please be specific. Grand Systems, POB 3377, Blaine, WA 98230. Canadians VE7LB.



T.V.I. problems?

low pass T.V.I. filters from Barker & Williamson

FL10/1500
FL6/1500



FL10/100
FL6/100

Model	Power (Watts)	Cut Off Frequency	Frequency of Maximum Attenuation	Minimum Attenuation	Frequency Range	Price
FL10/1500	1000	34 MHz	52 MHz	70 db	1.8-30 MHz	$29.50*
FL10/100	100	44 MHz	57 MHz	60 db	1.8-30 MHz	$22.50*
FL6/1500	1000	55 MHz	63 MHz	70 db	6 meter	$36.00*
FL6/100	100	55 MHz	63 MHz	50 db	6 meter	$25.00*

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All above to match 50 ohm transmitters and antennas.

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TC2	$12.50
TC3	$13.50
Spinner Handle Add	$1.50

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Model TC2: Skirt 2-1/8"; Knob 1-5/8"

Model TC3: Skirt 3"; Knob 2-3/8"

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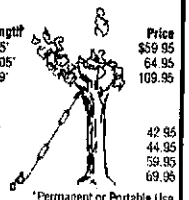
MULTI BAND TRAP ANTENNAS

TRAP DIPOLES:

Model	Bands	Traps	Length	Price
D-42	10/15/20/40	2	55'	$59.95
D-52	10/15/20/40/80	2	105'	64.95
D-56	10/15/20/40/80	6	99'	109.95

TRAP VERTICALS - "SLOPERS":*

VS-31	10/15/20	1	12'	42.95
VS-41	10/15/20/40	1	27'	44.95
VS-52	10/15/20/40/80	2	52'	59.95
VS-53	10/15/20/40/80	3	49'	69.95



*Permanent or Portable Use

*Can be used without radials
*Feed line can be buried if desired

ALL ANTENNAS are Ready to use - Factory assembled - Commercial Quality - Handle full power - Comes complete with: Deluxe Traps, Deluxe center connector, 14 ga Stranded CopperWeld ant. wire and End Insulators. Automatic Band Switching - Tuner usually never required - For all transmitters, Receivers & Transceivers - For all class amateurs -One feedline works all bands - Instructions included - 10 day trial!

COAX CABLE: (Includes PL-259 connector on each end)

Type	Length	With antenna purchase	Separately
RG-58	50'	$8.00	$11.95
RG-58	90'	12.00	16.95

DELUXE CENTER CONNECTOR

- ★ NO RUST Brass Terminals
- ★ NO jumper wires used
- ★ NO Soldering
- ★ Built in Lightning Arrestor
- ★ With SO-239 Receptacle
- ★ Handles Full Power
- ★ Completely sealed, weatherproof
- ★ Easy element adjustments
- ★ Commercial quality

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DELUXE ANTENNA TRAPS: Completely sealed & weatherproof - Solid brass terminals - Handles Full power -NO jumpers - NO Soldering Instructions included. For 4 band Dipole Ant. 40/20/15/10 $36.00/pr. For 5 band Dipole Ant. 80/40/20/15/10 $38.00/pr.

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RT-1057/ARN-103	AN/ARC-114,115,116
RT-823/ARC-131	AN/ARN-89
RT-868A/APX-76	AN/TPX-46
RT-988/APX-76	AN/APQ-120
RT-547/ASQ-19	MK-994/AR
RT-857/ARC-134	MK-1004/ARC
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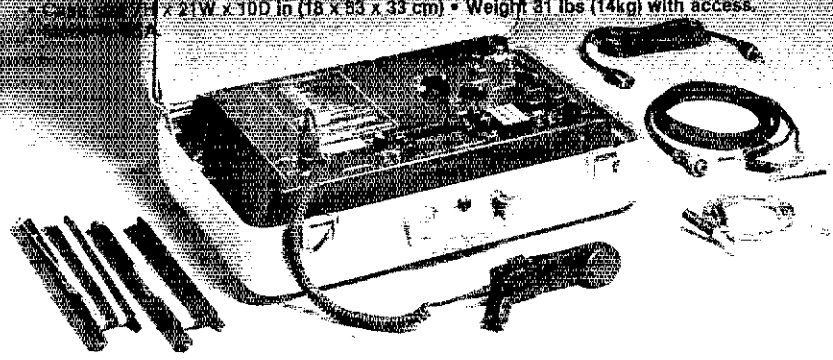

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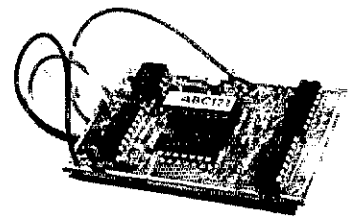

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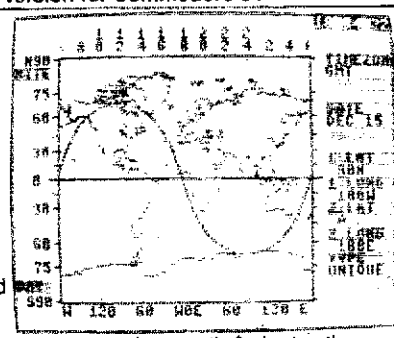

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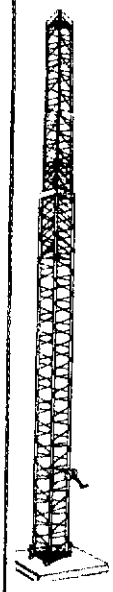

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Model	Height	Load	Sale Price
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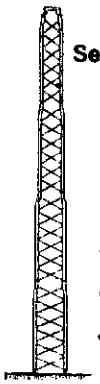

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Model	Height	Ant Load*	Weight	Delivered Price*
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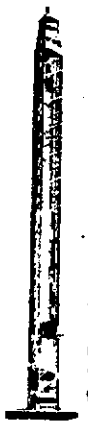
HBX48	48 ft	10 sq ft	303	$429
HBX56	56 ft	10 sq ft	385	$499
HDBX40	40 ft	18 sq ft	281	$399
HDBX48	48 ft	18 sq ft	363	$489

*Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.



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- Totally self-supporting—no guys needed

Model	Height Up	Down	Wind Load	List	Sale
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WT51	51.0 ft	20.5 ft	9.0 sq ft	$1154	$899
LM354	54.0 ft	21.0 ft	16 sq ft	$2010	$1599
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DX86 (Motorized)	86.0 ft	23.0 ft	25 sq ft	$7200	Call

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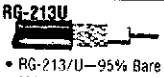
RG-213U



$.29/ft $279/1000 ft
Up to 600 ft via UPS

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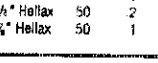
- Non-contaminating Vinyl Jacket Foam Dielectric

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE/HELIAX™



Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket $.79/ft
½" LDF4-50A w/ ½" Heliax™ $1.79/ft
⅞" LDF5-50A w/ ⅞" Heliax™ $3.99/ft
select connectors below.

HARDLINE & HELIAX™ CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
½" Heliax™	$25	$25	$25	$25
⅞" Heliax™	$49	$49	$49	$49

AMPHENOL CONNECTORS

Silver PL259 $1.25
UG21B N Male $2.95 UG23B N Female $2.95

Antenna Wire & Accessories

Copperweld Antenna Wire (steel core, copper coated)
Solid 12 ga $.12/ft 14 ga $.10/ft
Stranded 14 ga. $.10/ft 16 ga. $.09/ft
¼ mile 18 ga copper-clad steel wire $30
6 inch heavy-duty end insulator $2.00/ea
Dog-bone insulator $.79 Coax seal $2.50

Van Gorden

1:1 Balun $11 Center Insulator $6
Dipole Kits D80 $31/D40 $28
Short Dipole Kits SD80 $35/SD40 $33
All-band Dipole w/ ladder line $29
Eavesdropper SWL Antenna $64

ALPHA DELTA

DX-A 160-80-40 Sloper .$49

CUSHCRAFT

A3 3-el Tribander Beam	$209
A743 30/40mtr Kit for the A3	$75
A4 4-el Tribander Beam	$269
A744 30/40mtr Kit for the A4	$75
R3 20, 15, 10mtr Vertical	$259
AV5 80-10mtr Vertical	$99
D40 40mtr Dipole	$149
40-2CD 2-el 40mtr Beam	$279
A50-5 5-el 6mtr Beam	$79
215 WB NEW 15-el 2mtr Beam	$75
3219 19-el 2mtr Beam	$89
220B 17-el 220MHz Beam	$89
424B 24-el 432MHz Beam	$75
ARX2B 2mtr Vertical	$39

hy-gain

Limited Quantities purchased at old prices. Call for current prices.

Discoverer 2-el 40-mtr Beam	
Discoverer 3-el Conversion Kit	
EXPLORER-14 SUPER SPECIAL	
QK710 30/40 mtr. Add-On-Kit	
V2S 2-mtr Base Vertical	
V4S 440MHz Base Vertical	
TH5MK2S Broad Band 5-el Triband Beam	
TH7DXS 7-el Triband Beam	
TH3JRS 3-el Triband Beam	
205BAS 5 el 20-mtr Beam	
155BAS 5-el 15-mtr Beam	
105BAS 5-el 10-mtr Beam	
204BAS 4-el 20-mtr Beam	
64BS 4-el 6-mtr Beam	
18 AVT/WB 80-10mtr Vertical	
18HTS 80-10 mtr Hy-Tower Vertical	
23BS 3-el 2mtr Beam	
25BS 5-el 2mtr Beam	
28BS 8-el 2mtr Beam	
214BS 14-el 2-mtr Beam	
2BDQ 80/40 mtr Trap Dipole	
5BDQ 80-10 mtr Trap Dipole	
BN86 80-10 mtr KW Balun W/Coax Seal	

HUSTLER

6BTV 80-10 mtr Vert $129 5BTV 80-10 mtr Vert $109
4BTV 40-10 mtr Vert $89 G7-144 2-mtr Base $119
G6-144B 2-mtr Base $89

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
2KW Super	$20	$22	$25	$29	$39

Bumper Mounts - Springs - Folding Masts in Stock!

BUTTERNUT ELECTRONICS CO

NEW HF4B "Butterfly" Compact Beam $169. delivered (cont. USA)

HF6V $129 Delivered (Cont. USA)
- Full Legal Power 80/10 Meters
- Optional Stub Tuned Radial Kit Model STR II $29
- Optional Roof Mounting Kit Model RMK II $49 (includes STR II)
- Optional 160 Meter Resonator Kit Model TBR 160 $49

HF2V 80/40 Meter Vertical Antenna $129 Delivered (Continental USA)
- Optional 160 Meter Resonator Kit Model TBR 160 $49

Free Shipping On Butternut Accessories Also When Purchased With Antenna

KLM

KT34A 4-el Broad Band Triband Beam	$339
KT34XA 6-el Broad Band Triband Beam	$489
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	$99
432-30LBX NEW 30-el 432 MHz Antenna	$119
435-18C 435 MHz Satellite Antenna W/CS-2	$119
435-40CX 435 MHz Satellite Antenna w/CS-2	$159

MOSLEY

TA-33 3-el Tribander	$239
TA-33JR 3-el Tribander	$189
PRO 37 7-el Tribander Beam	$469
S 403 3-el 40-mtr Beam	$699

MINI-PRODUCTS HQ-1 $159

ROTORS

Alliance HD73 (10.7 sq ft rating)	$119
Alliance U110 (3 sq ft rating)	$49
Telex CD 45II (8.5 sq ft rating)	$Call
Telex HAM 4 (15 sq ft rating)	$Call
Telex Tailtwister (20 sq ft rating)	$Call
Telex HDR300 Heavy Duty (25 sq ft rating)	$Call
KLM EL-3000 Moon Tracker Elevation Rotator	$359
Kenpro KR400 Azimuth Rotator	$129
Kenpro KR500 Heavy Duty Elevator Rotator	$159
Kenpro KR600 Azimuth Rotator	$199
Kenpro KR2000 Heavy Duty Azimuth Rotator	$379
Kenpro KR5400 AZ/EL Rotor Package	$259
Kenpro KR5600 Heavy Duty AZ/EL Rotor Pkg	$329

ROTOR CABLE

Standard 8 cond cable $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

ROHN GUYED TOWERS

10 ft Stack Sections

20G $39.50 45G $112.50
25G $49.50 55G $134.50

All 20G, 25G, 45G and 55G Accessories In Stock at Discount Prices - CALL!

Foldover Towers	Model	Height	Ant Load*	Price
	FK2548	48 ft	15.4 sq ft	$899
	FK2558	58 ft	13.3 sq ft	$949
	FK2568	68 ft	11.7 sq ft	$999
	FK4544	44 ft	34.8 sq ft	$1199
	FK4554	54 ft	29.1 sq ft	$1299
	FK4564	64 ft	28.4 sq ft	$1399

25G Foldover Double Guy Kit $219
45G Foldover Double Guy Kit $249
*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

All Foldover Towers Shipped Freight Prepaid Continental USA! Foldover Prices 10% Higher West of Rockies

TOWER/GUY HARDWARE

3/16 EHS Guywire (3990 lb rating)	$.15/ft
1/4 EHS Guywire (6650 lb rating)	$.18/ft
5/16 EHS Guywire (11,200 lb rating)	$.29/ft
5/32 7 × 7 Aircraft Cable (2700 lb rating)	$.15/ft
3/16 CCM Cable Clamp (3/16" or 5/32")	$.45
1/4 CCM Cable Clamp (1/4" Cable)	$.55
1/4 TH Thimble (fits all sizes)	$.45
3/8EE (3/8" Eye & Eye Turnbuckle)	$6.95
3/8 EJ (3/8" Eye & Jaw Turnbuckle)	$7.95
1/2 × 9EE (1/2" × 9" Eye to Eye Turnbuckle)	$9.95
1/2 × 9EJ (1/2" × 9" Eye & Jaw Turnbuckle)	$10.95
1/2 × 12EE (1/2" × 12" Eye & Eye Turnbuckle)	$12.95
1/2 × 12EJ (1/2" × 12" Eye & Jaw Turnbuckle)	$13.95
5/8 × 12EJ (5/8" × 12" Eye & Jaw Turnbuckle)	$16.95
3/16" Preformed Guy Grip	$2.49
1/4" Preformed Guy Grip	$2.99
6" Diam - 4 ft Long Earth Screw Anchor	$14.95
500 D Guy Insulator (5/32" or 3/16" Cable)	$1.69
502 Guy Insulator (1/4" Cable)	$2.99
5/8" Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.29/ft
HPTG4000 Guy Cable (4000 lb rating)	$.49/ft
HPTG6700 Guy Cable (6700 lb rating)	$.69/ft
9901LD Cable End (for 2100/4000 cable)	$7.95
9902LD Cable End (for 6700 cable)	$8.95
Socketfast Potting Compound (does 6-8 ends)	$14.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 in Wall	$29	$49	$59	$79
.18 in Wall	$39	$69	$99	$129
.25 in Wall	$69	$129	$189	$249

VISA MasterCard

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Sat: 9am - 1 pm

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(Antenna/tower product prices do not include shipping unless noted otherwise)

MISSOURI RADIO CENTER

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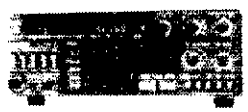

TS-430S Most Advanced, Compact HF Transceiver

• 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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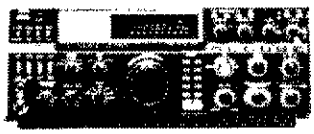

TS-930S Top of the Line HF Transceiver

• General Coverage Receiver • Superior Dynamic Range • All Solid State—26 VDC Final • QSK CW • Optional Automatic Antenna Tuner • Dual VFO w/9 Memories • Dual Mode Noise Blanker

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TR-7950/7930

• Large LCD Readout • 21 Multi-Function Memory • Lithium Back-up • Automatic Offset • Built-in Encoder • Memory or Band Scan

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TR-2600

2.5W/300 mW (Switchable) 2 Meter Handheld Transceiver

• LCD Readout • Ten Memories w/Lithium Back-up • Band and Memory Scan

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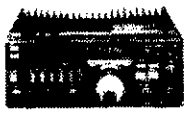

FT-757 GX

Compact General-Coverage Receiver

• General-Coverage Receiver • USB/LSB/CW/AM/FM • Dual VFOs • Memory/Band Scan • Speech Processor • CW Filter and CW Keyer included

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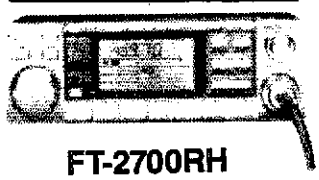

FT-2700RH

Dual Bander

• VA/HF FM • 144/430 MHZ • 25 WATTS

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FT-209RH

• 5 Watts • 10 Memories • LCD • Compact

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FT980

CAT SYSTEM—ComputerAided Transceiver

• Wide Dynamic Range • General Coverage • Low Noise Front End • 10 Hz Digital Readout • All Mode Transceive—CW/SSB/AM/FM/FSK!

ICOM

IC-745 HF Base

All ham band HF transceiver. 16 memories. 100KHz to 30 MHz general coverage receiver and adjustable noise blanker and AGC

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IC-27A Compact Mobile

A breakthrough in 2-meter mobile communications! Most compact on the market (5⅛" x1⅝" Hx7" D), contains internal speaker for easy mounting. 25 watts. 32 PL frequencies. 9 memories, scanning and touchtone mic.

ICOM

IC-02AT

The IC-02AT 2-meter LCD readout handheld features 10 memories, 32 PL tones, scanning, keyboard frequency entry, dial lock, 3W std. 5W opt. DTMF

ICOM

IC-R71A General Coverage Receiver

The IC-R71A 100KHz - 30 MHz superior-grade general coverage receiver features keyboard frequency entry, 32 memories, SSB/AM/RTTY/CW, selectable AGC and noise blanker, and wireless remote controller (optional)

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Celebrate your buying decision with the money you've saved.

When it comes to getting maximum HF performance for your dollar, the choice is clear. Yaesu's FT-757GX.

Nowhere else will you find so many HF features packed into one compact, mobile-ready package. At a price that's got the competition baffled.

For starters, each 757 includes an electronic keyer. 600-Hz CW filter. AM and FM modes. AF speech processor. And a 25-kHz marker generator. All at no extra charge.

And working the DX has never been easier with dual VFOs, single-button VFO/memory swap for split-frequency operation, eight memories, and push-button quick memory and band scan.

The 757 also lets you listen from 500 kHz to 30 MHz with its high-performance general coverage receiver. The transmitter covers 160 through 10 meters, including the new WARC bands, with 100 watts output on sideband, FM and CW.

CW buffs will enjoy the delights of full QSK operation. Plus the massive heatsink and duct-flow cooling system allow continuous RTTY operation for up to 30 minutes. Use the FP-757HD heavy-duty power supply option for continuous-duty applications.

And of course, there's the 757's highly attractive price. It's the perfect way to get all the HF performance you desire, with money left over to apply toward other ham gear. Perhaps a power supply for base station use. An antenna or antenna tuner. Or whatever else makes your operation complete.

So ask your dealer today about Yaesu's FT-757GX. The most celebrated HF price/performer on the air.

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CA 90723 (213) 633-4007

Yaesu Cincinnati Service Center
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Prices and specifications subject to change without notice. Contact your Yaesu dealer regarding MARS operation.

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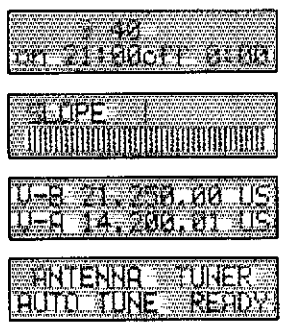
"DX-cellence!"

TS-940S

The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display graphically illustrates VBT, SSB slope, and other features.

- **100% duty cycle transmitter.** Super efficient cooling system using special air ducting works with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.
- **Programmable scanning.**
- **Semi or full break-in (QSK) CW.**
- **Low distortion transmitter.** Kenwood's unique transmitter design delivers top "quality Kenwood" sound.
- **Keyboard entry frequency selection.** Operating frequencies may be directly entered into the TS-940S without using the VFO knob.
- **Graphic display of operating features.** Exclusive multi-function LCD sub-display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT-940 antenna tuner status.
- **QRM-fighting features.** Remove "rotten QRM" with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.
- **Built-in FM, plus SSB, CW, AM, FSK.**



Optional accessories:

• AT-940 full range (160-10 m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-42S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL- 922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters.

- **High stability, dual digital VFOs.** An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel."
- **40 memory channels.** Mode and frequency may be stored in 4 groups of 10 channels each.
- **General coverage receiver.** Tunes from 150 kHz to 30 MHz.
- **1 yr. limited warranty.** Another Kenwood First.

More TS-940S information is available from authorized Kenwood dealers.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation.