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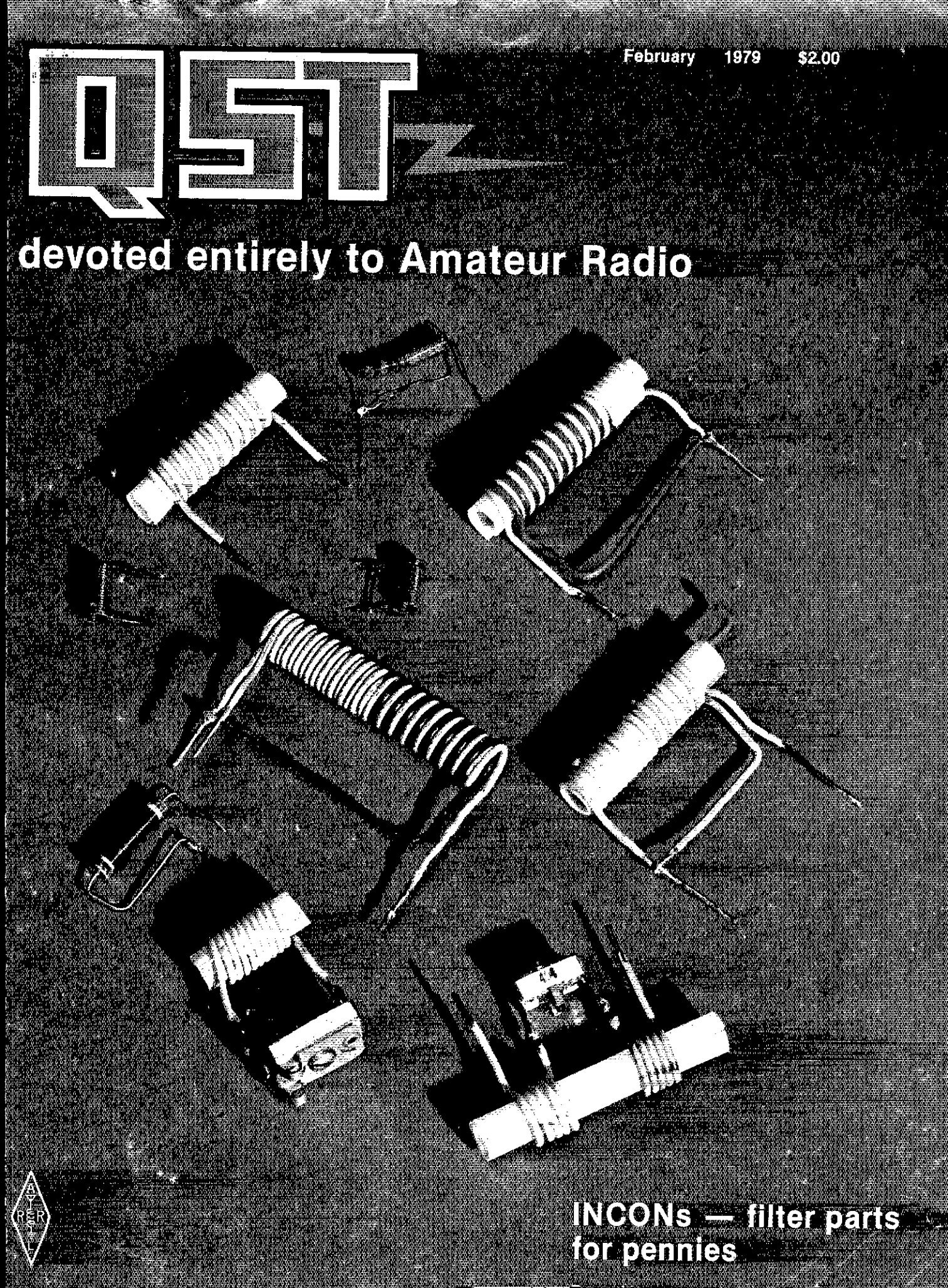
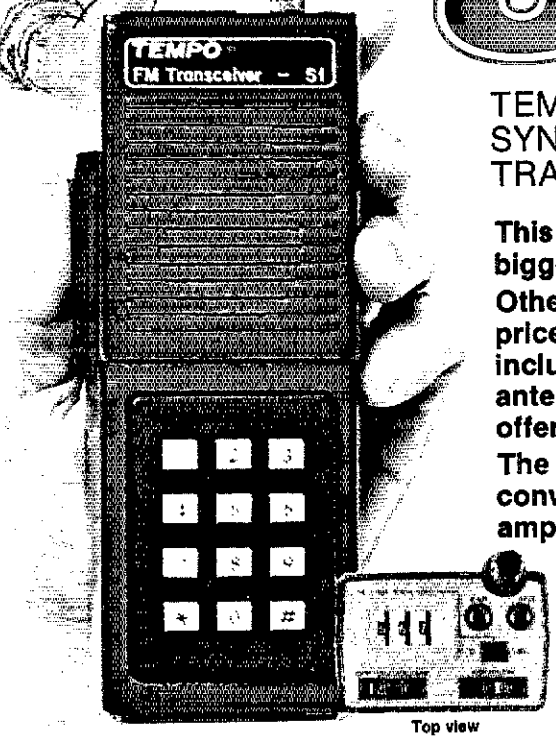


INCONs — filter parts for pennies

PORTABLE... MOBILE... BASE STATION

the TEMPO SYNCOM S1

DOES IT ALL AND GIVES YOU 800 CHANNELS



Top view showing controls

*Shown with accessory touch tone pad

TEMPO PRESENTS THE WORLD'S FIRST SYNTHESIZED 800 CHANNEL HAND HELD TRANSCEIVER

This amazing pocket sized radio represents the year's biggest breakthrough in 2-meter communications.

Other units that are larger, heavier and are similarly priced can offer only 6 channels. The SYNCOM'S price includes the battery pack, charger, and a telescoping antenna. But, far more important is the 800 channels offered by the S1.

The optional touch tone pad adds greatly to its convenience and the addition of a Tempo solid state amplifier adds tremendously to its power.

SPECIFICATIONS

Frequency Coverage:	144 to 148 MHz
Channel Spacing:	Receive every 5 kHz, transmit Simplex or +600 kHz
Power Requirements:	9.6 VDC
Current Drain:	17 ma-standby 500 ma-transmit
Batteries:	8 pieces ni-cad battery included
Antenna Impedance:	50 ohms
Dimensions:	40 mm x 62 mm x 165 mm (1.6" x 2.5" x 6.5")
RF Output:	Better than 1.5 watts
Sensitivity:	Better than .5 microvolts

SUPPLIED ACCESSORIES
Telescoping whip antenna, ni-cad bat pack, charger.

OPTIONAL ACCESSORIES
Touch tone pad: $55 • Tone burst generator: $29.95 • CTCSS sub-audible tone control: $29.95 • Rubbe flex antenna: $8 • Leather holster: $16 • Cigarette lighter plug mobile charging unit: $6 • Matching 30 watt output 13.8 VDC power amplifier (S30 $89 • Matching 80 watt output powe amplifier (S80): $149

Price... $349.00 With touch tone pad... $399.00

TEMPO VHF & UHF SOLID STATE POWER AMPLIFIERS

Boost your signal. . . give it the range and clarity of a high powered base station. VHF (135 to 175 MHz)

Drive Power	Output	Model No.	Price
2W	130W	130A02	$209
10W	130W	130A10	$189
30W	130W	130A30	$199
2W	80W	80A02	$169
10W	80W	80A10	$149
30W	80W	80A30	$159
2W	50W	50A02	$129
2W	30W	30A02	$ 89

UHF (400 to 512 MHz) models, lower power and FCC type accepted models also available.

The Tempo line also features a fine line of extremely compact UHF and VHF pocket receivers. They're low priced, dependable, and available with CTCSS and 2-tone decoders
The Tempo FMT-2 & FMT-42 (UHF) provides excellent mobile communications and features a remote control head for hide-away mounting.
The Tempo FMH-2, FMH-5 & FMH-42 (UFH) hand held transceivers provide 6 channel capability, dependability and many worthwhile features at a low price. FCC type accepted models also available.
Please call or write for complete information. Also available from Tempo dealers throughout the U.S. and abroad.

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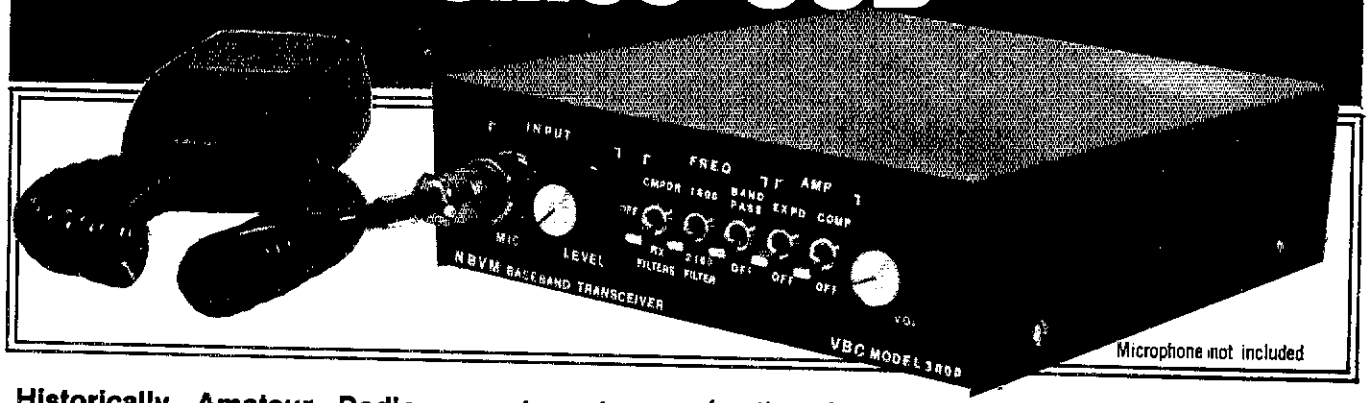
Henry Radio is proud to offer the most important innovation in Amateur Radio since SSB



Microphone not included

Historically, Amateur Radio operators have made important contributions to the art and science of communications. Once again Amateur Radio assumes leadership in advanced communications technology. You have the privilege of being one of the first to include a Narrow Band Voice Modulation (NBVM) system in your station. The VBC Model 3000 is the system that you have been hearing about for a year and have read about recently in QST and the 1979 ARRL Handbook. It is the world's first such system.

The VBC Model 3000 provides full audio level compression and expansion... complete intelligibility in only 1300 Hz bandwidth. It permits you to take full advantage of other stations' RF speech clippers and processors... similar to the amplitude compression and expansion used for many years in telephone and satellite communications.

The Model 3000 is for mobile and fixed station use and requires no modifications to your existing equipment. It is completely self contained, including its own audio amplifier. The unit automatically switches into transmit mode when microphone is keyed or voice operation is used. It connects just after the microphone on transmit and just prior to the speaker on receive. In addition to its basic function of operating in a narrow bandwidth, the Model 3000 also increases the performance of your station in the following ways:

- Reduces adjacent channel interference
- Increases signal to noise ratio
- Increases communications range

Some of its outstanding features include:

- High quality narrow band speech
- Self contained transmit/receive adapter
- Built in audio amplifier
- 5 active filters with a total of 52 poles
- Rugged dependable hybrid IC technology
- Low power consumption

Receive only features, such as sharp voice and CW filtering and amplitude expansion, provide improved reception without requiring a unit at the transmitting station.

For the more advanced experimenter the Model 3000 is available in a circuit board configuration for building into your present transceiver.

Henry Radio is ready to offer technical assistance and advice on the use and servicing of the Model 3000 and will help introduce new owners to others operating NBVM units. Get in on the ground floor... order yours now.

Price: VBC Model 3000 $349.00
Circuit board configuration $275.00

For more detailed information please call or write. The Model 3000 will be available from most Tempo dealers throughout the U.S. and abroad.

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IC-701, Your Synthesized Passport

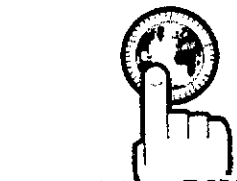
Enter the exciting world of HF DX with ICOM's outstanding, fully synthesized **IC-701**. Globe-spanning QSO's are as easy as hook-up and tune-in. Complete installation requires only a good 50 Ohm antenna and an AC power plug-in. Your **IC-701** comes with everything else you need for beginning DX transmissions, including the matching **IC-701PS** external speaker and power supply, the fine **SM-2** base microphone, and even two built-in VFO's.

Turn on the power, and the world's at your single fingertip. The **IC-701** lets you scan all the Amateur HF bands from 160M to 10M (plus some MARS coverage above and below some of the Ham bands) with one finger. No more fooling around with two or more tuning knobs, and no complicated retuning when you QSY.

When talking on your **IC-701**, you get a 200 watt PEP input signal whose punch is significantly increased by the high quality built-in RF speech processor. This makes your 200 watts sound like so much more that we recommend you leave the speech processor on all the time.

For adding on frequency memory and remote frequency control, the **IC-701**'s synthesizer is completely compatable with ICOM's **RM2** remote computer controller: and with ICOM's optional **EX1** extention, you can operate with the **RM2** and a linear amplifier at the same time.

Nothing else matches the value and ease of the **IC-701**. Plunge into the excitement of HF DX now, and get the whole HF world with ICOM's **IC-701** LSI system.



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THE COVER

Simple, inexpensive and versatile, these inductor/condenser combinations will have a host of uses in Amateur Radio — and in RFI-prone electronic devices. Their story begins on page 11.

Contents

DXpedition...The Ultimate Fantasy

Clipper ships sailing to foreign shores. Sixteen amateurs primed for adventure, coming together as the first group in 20 years to set foot on the remote French Island, Clipperton. Their goal: 30,000 QSO's in just 7 days.

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- Memory channel...with simplex or repeater (±600 kHz transmitter offset) operation.
- Mode switch for operating simplex or for switching the transmit frequency up or down...or for switching the transmitter to the frequency you have stored in the TR-7625's memory (while the receiver remains on the frequency you have selected).
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- Digital frequency display (large, bright, orange LEDs).
- UNLOCK indicator...an LED that indicates transceiver protection when the frequency selector switches are improperly positioned or the PLL is not locked.

TR-7625 WITH RM-76

- Store frequencies in six memories (simplex/repeater).
- Scan all memory channels.
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- Manually scan up or down in 5-kHz steps (or fast tune).
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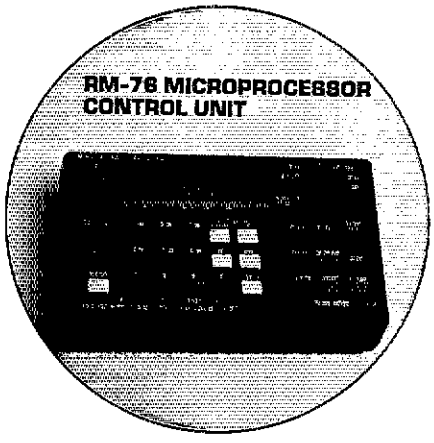

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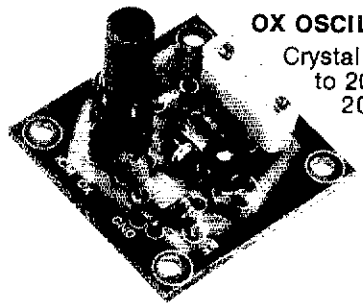

OX OSCILLATOR

Crystal controlled transistor type. 3 to 20 MHz, OX-Lo, Cat. No. 035100. 20 to 60 MHz, OX-Hi, Cat. No. 035101.

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A single tuned circuit intended for signal conversion in the 30 to 170 MHz range. Harmonics of the OX or OF-1 oscillator are used for injection in the 60 to 179 MHz range. 3 to 20 MHz, Lo Kit, Cat. No. 035105. 20 to 170 MHz, Hi Kit, Cat. No. 035106.

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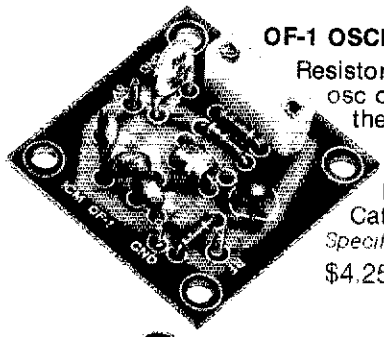

OF-1 OSCILLATOR

Resistor/capacitor circuit provides osc over a range of freq with the desired crystal. 2 to 22 MHz, OF-1 LO, Cat. No. 035108. 18 to 60 MHz, OF-1 H, Cat. No. 035109.

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A single tuned output amplifier designed to follow the OX or OF-1 oscillator. Outputs up to 200 mw, depending on frequency and voltage. Amplifier can be amplitude modulated 3 to 30 MHz, Cat. No. 035104. *Specify when ordering.*

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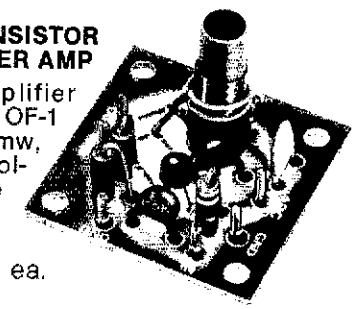

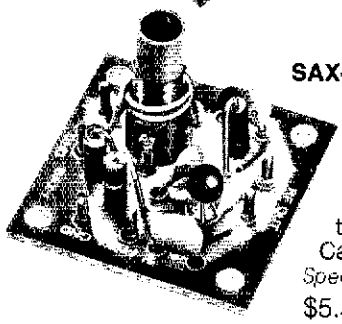

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A small signal amplifier to drive the MXX-1 Mixer. Single tuned input and link output. 3 to 20 MHz, Lo Kit, Cat. No. 03512. 20 to 170 MHz, Hi Kit. Cat. No. 035103.

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General purpose amplifier which may be used as a tuned or untuned unit in RF and audio applications. 20 Hz to 150 MHz with 6 to 30 db gain. Cat. No. 035107.

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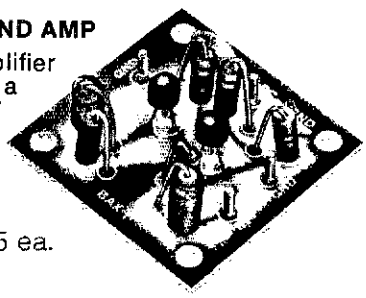

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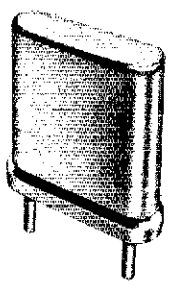

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Missouri — Larry G. Wilson, KØRWL, 5415 E. 97th St., Kansas City 64137 (816-966-8953)
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Eastern Massachusetts — Richard P. Beebe, K1PAD, 82 Wyman Rd., Billerica 01821 (617-667-5609)
Maine — William C. Mann, W1KX, P. O. Box 73, N. Jay 04262 (207-645-3089)
New Hampshire — Robert Mitchell, W1NH, Box 137-A, Chester 03036 (603-895-3456)
Rhode Island — John Titterington, W1EOF, 45 Mountain Ave., Riverside 02915 (401-438-3619)
Vermont — Robert L. Scott, W1RNA, 9 Larce St., Swanton 05488 (802-868-4944)
Western Massachusetts — William T. Lowe, W1TM, Commonwealth Ave., Great Barrington 01230

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Idaho — Lemuel H. Allen, Jr., W7JMH, 1800 S. Atlantic St., Boise 83705 (208-343-9153)
Montana — Robert E. Lee, W7LR, RFD 3, Box 104, Bozeman 59715 (406-586-6417)
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Oklahoma — Leonard R. Hollar, WA5FSN, RFD 1, 710 South Tenth St., Kingfisher 73750 (405-375-4411)
Southern Texas — Arthur R. Ross, W5KR, 132 Sally Ln., Brownsville 78521 (512-831-4458)

THE AMERICAN RADIO RELAY LEAGUE, INC.

"It Seems to Us..."

Good News — And Disappointments — In FCC WARC Proposals

On page 55 begins a summary of the FCC WARC-79 proposals as they would affect radio amateurs. Thus is completed a four-year process of public inquiry into the nation's long-term telecommunications needs. The amateur community played an important role in this process.

The staff of the Commission and the National Telecommunications and Information Administration faced a difficult task in attempting to meet the stated requirements of dozens of competing radio services. They deserve our thanks for the conscientious job they have done. We cannot say we agree with all of the FCC/NTIA conclusions; on the other hand, we can and *should* say that our arguments generally were given proper consideration, and that our needs were weighed against those of others.

As the proposals now stand, sharing with International Broadcasting at 7 MHz would be eliminated and a full 300-kHz band retained; new exclusive, worldwide amateur allocations totalling 350 kHz would be provided between 10 and 26 MHz; new satellite bands in the microwave region would be available; and sharing would be eliminated from most of the 3.5-MHz band, at least in Region 2. This is very good news. To be sure, we asked for more; we felt entitled to more. The proposed bands will hardly absorb the increasing amateur population in the coming decades. We suggested ways to make more amateur allocations available without affecting other vital services, and have reason to be disappointed that these suggestions were not adopted.

Aside from that, there are three major disappointments in the FCC WARC proposals. The technical arguments against an expansion of the A-M Broadcasting Band at the expense of the amateur 160-meter band are so formidable that the proposal logically should not have survived. The U.S. already has about as many a-m stations as all of Europe, Asia and Africa combined. A proposal to add still more runs counter to the prevailing attitude overseas, which is that the developed countries should use vhf fm for broadcasting expansion and leave the a-m band to those countries for whom vhf fm is not practical.

A last-minute change which has caused much concern among amateurs is the proposed change in sharing partners at 220-225 MHz. The Amateur Service has shared bands with government Radiolocation for decades, permitting amateurs access to wider bands than could have been made available on an exclusive basis. Now, however, an attempt to find spectrum for a mobile telephone service for maritime use has led to a proposal for a worldwide maritime allocation at 216-225 MHz. The Amateur Service would be secondary to maritime at 220-225 MHz, which is the same status we now have domestically while sharing the allocation with Radiolocation. The maritime community itself favored a much higher frequency, partly, no doubt, in the belief that such a proposal would stand a better chance of success in Geneva. As it is, the 216-225 MHz proposal raises more questions than it answers. It surfaced during October, while much of the U.S. WARC team was away in Geneva, and it obviously was not given the careful, professional scrutiny to which most of the WARC proposals were subjected. How can European administrations, who use the band heavily for TV broadcasting, be expected to support it? Why are separate systems needed for maritime and land mobile, i.e., for the yacht tied up at the marina and the "land cruiser" parked 100 feet away? Was *future* amateur occupancy of the band considered, or just present occupancy?

The last major disappointment is that the Commission appears to have ignored the comments it solicited on its original proposal to make no changes to Article 41. It has proposed removing the "requirement" of Morse code proficiency, replacing it with a "recommendation." That may seem harmless enough to some. Unfortunately, administrations often lose control of such proposals after they are made at international conferences; subsequent discussion may so change the proposal that the original intent is subverted. For that reason, amateur societies throughout the world have urged their administrations to propose no changes in Article 41. Canada earlier made a similar proposal which was withdrawn; now the U.S. has fallen into the same trap.

There are expected to be few changes made before the proposals contained in the FCC document are adopted by the Department of State and forwarded to Geneva. Of course, what emerges from Geneva at year end may be quite different; this depends upon the proposals made by other administrations, and upon the skill of the U.S. negotiators. Only time will tell. — *David Sumner, K1ZZ*

League Lines...

Amateur Radio's old arch-enemy, RFI, is the subject of an FCC Inquiry, General Docket 78-369. What action will the Commission take in solving RFI susceptibility problems of consumer devices? The answer depends largely on whether hams send their comments to the Commission. See this month's "Happenings" and March QST for more information.

Hams near FCC Monitoring Stations may have their operations affected by a proposed amendment to the Amateur Rules. See "Happenings" in this issue for more details.

One of the reasons Amateur Radio antenna installations are opposed by neighbors is the claimed adverse impact upon adjacent property values. However, no instances of this having occurred have come to the League's attention. Realtors who are hams are urged to assist by letting Hq. have their views on this subject.

New Advanced Class exams are being used by all FCC Field Offices, according to Commission sources. New Extra Class exams are supposed to be in use by the time you read this. Implementation of the new General/Technician Class exams has hit a snag. FCC will not predict when these tests will be in use. New versions of Novice Class exams have replaced exams previously used.

Another IEEE Technical Session organized by W1FB has been accepted for ELECTRO/79 in New York City. The convention is to be held at the Americana Hotel and N.Y. Coliseum April 24-26. Four noted radio amateurs will speak at this session.

DX Competition: Don't forget that beginning this year the contest has been cut to one weekend per mode. Phone is March 3-4, and CW is March 17-18.

November Frequency Measuring Test results will appear under the "Operating News" column in March QST.

New radio Public Service Announcements for Amateur Radio by noted actor Lorne Greene are available from the ARRL Public Information Office. If you can arrange air time for these 20- and 30-second spots, please write to Bobbie Chamalian, WB1ADL, at Hq.

Expanded services for radio amateurs and prospective radio amateurs who are handicapped is the subject of an ARRL survey mailed to all League-affiliated clubs. Please give Hq. the benefit of your club's guidance by seeing that this survey is returned.

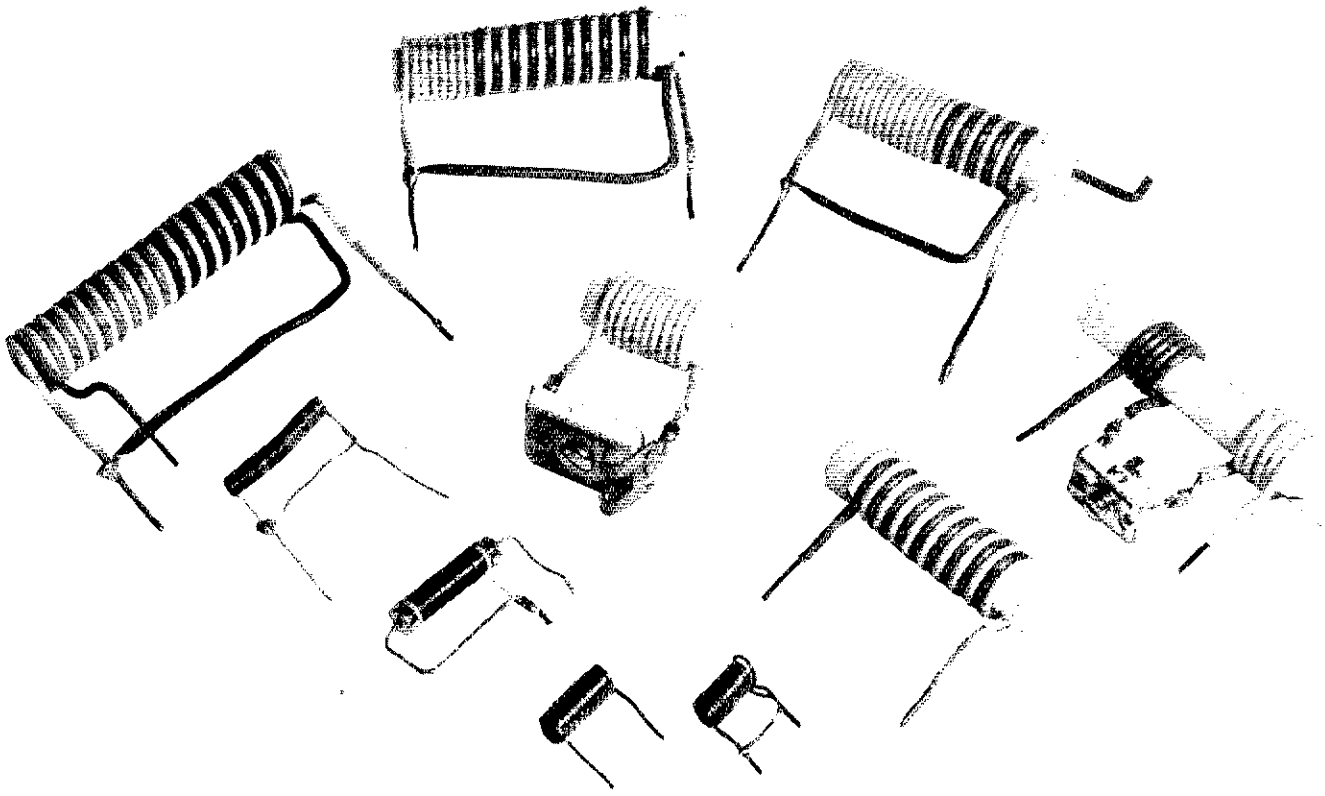
There will be a brief delay in mailing etching patterns for the narrow-band voice modulation system (December 1978 QST, p. 21, note 12). The inventors have modified the board slightly for improved circuit operation and want QST readers to have the benefit of these latest changes. The templates should be available from Hq. after Feb. 1. Completed units, designated VBC-3000, will be available from Henry Radio about Feb. 1. Subsequently, ready-made circuit boards and the special ICs will be made available, as well as boards with parts installed. A word to the wise -- these ICs are delicate hybrid CMOS devices, selling for $30 to $45 each. The assembly of a nbvm processor from scratch is not recommended as a project for inexperienced builders.

Do you need official copies of Part 97? You can order them from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Reference Stock #004-000-00338-1. Price is $1.30. Part 99 (Disaster Communications Service) is Stock #004-000-00326-8 and costs 75 cents. Note: These documents are no longer on a subscription basis -- no updates are included!

Introducing the INCONs

Meet a new family of electronic components. Each component is both inductor and capacitor. Using them can reduce by 50 percent the number of parts needed for RFI filters.

By A. C. Doty, Jr.,* K8CFU and Dr. Alan B. Macnee,** ex-W1JIR



Meet the INCON family. The larger units are experimental INCONs constructed mainly for demonstration purposes. The smaller versions are more typical of those that would be used in many RFI applications. INCONs replace the familiar series- and parallel-tuned circuits such as the two in the photo having trimmer capacitors.

On a snowy afternoon in March 1977, three men met in a Michigan research laboratory to talk about possible ways of reducing the complexity and cost of radio-interference filters. By the end of that afternoon, they had conceived the first of a new family of electronic components which permits design of RFI filters with 50 percent fewer parts than previously needed. Because the new devices are essentially both *in*ductors and *con*densers (capacitors), they have been given the name INCON.

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**Department of Electrical Engineering, University of Michigan, Ann Arbor, MI 48109

In conference that blustery afternoon were Professor Michael Scherba of the Department of Electrical Engineering of Wayne State University, Mr. Norman Berry, Sr., president of Pyrohm, Inc., and A. C. Doty, Jr., K8CFU, a consultant on radio interference. What developed from the principles outlined that afternoon was a set of product designs that hold much promise in the field of communications. They should be particularly applicable to many Amateur Radio RFI problems.

The first design, that of the INCON I, is a series-resonant circuit consisting of a dual wire-wound coil in place of the more traditional combination of a coil and separate capacitor for producing resonance. The capacitive effect between the windings serves as a replacement for an external capacitor. By referring to Fig. 1 and the photographs, one may easily understand the construction and basic principles of the INCONs. But, before we go into the details, let us say a little more about the background of this new family of devices.

In June 1978, the INCON II came into existence as a novel parallel resonant circuit which, like the earlier INCON I, is entirely wire wound and does not require a separate capacitor. Today the INCON family has three members, each of which

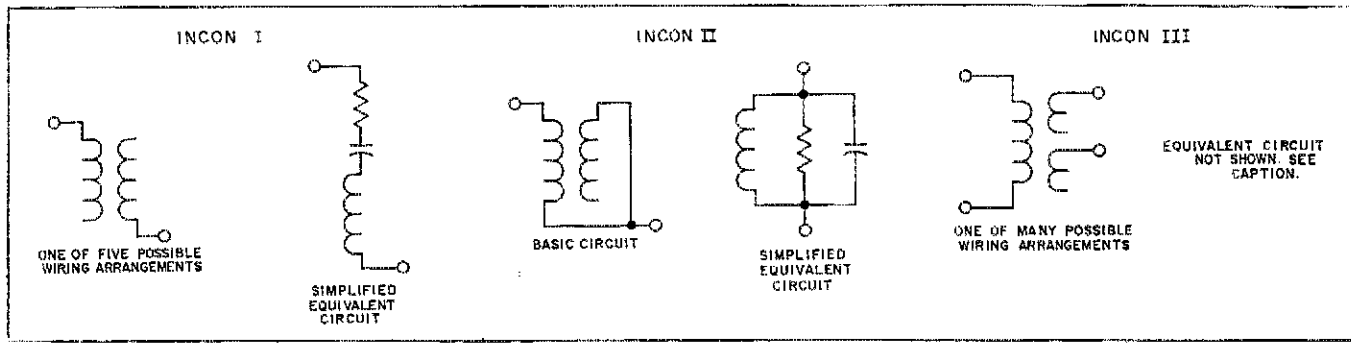


Fig. 1 — Typical arrangements are shown for three members of the INCON family of inductor/capacitor units. INCONs permit the design of RFI filters having 50-percent fewer parts than used customarily. A simplified equivalent circuit is shown for INCON I and II. Because the equivalent circuit for INCON III depends on the basic wiring arrangement to be selected, it is not shown.

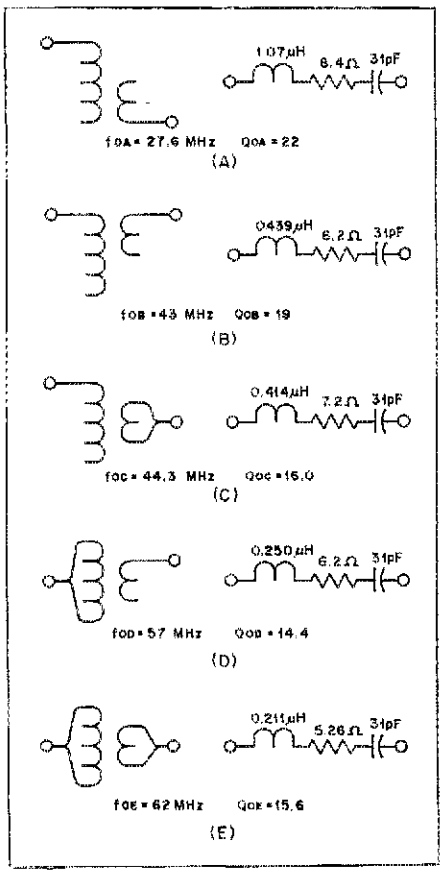


Fig. 2 — Measured electrical characteristics are noted here for five configurations of the INCON I. These characteristics display variations according to the method of connecting the two windings.

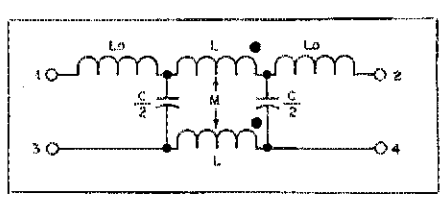


Fig. 3 — An INCON circuit model applicable to either INCON I or INCON II, depending on connections used, is illustrated. M represents the mutual inductance between overlapping windings. L is the inductance of each overlapping winding. L_o is the inductance of the nonoverlapping windings.

uses the inductance of a primary coil plus the capacitance between the primary and a second (or third) coil to produce a resonant circuit.

The second author undertook the initial studies of INCON I and INCON II. Although both of these devices have almost unlimited application possibilities in electronic circuitry, there was a feeling at the outset that a very important use might be in the development of simple but effective RFI filters. Testimony of the ARRL, the FCC and others on Senator Barry Goldwater's bill (S. 864) and on companion House bills has already highlighted the urgent need for inexpensive filters small enough to be integrated into TV and other receivers. Thus the original investigations were devoted to smaller INCONs that would meet these criteria. Fig. 1 illustrates the three INCON circuit designs.

INCON I

INCON I is composed of two adjacent but physically separate windings. See Fig. 1. The inductance of the windings plus the capacitance between the windings are used to develop a series resonant circuit that does not require a separate capacitor. The electrical characteristics of INCON I vary considerably, depending on the method used to connect the two windings. By placing 30 turns on the primary and 10 turns on the secondary, the characteristics provided in Fig. 2 were found through laboratory tests.

Much as one might expect, the turns ratio between the two windings also affects the performance of the units. When connected in parallel-parallel (see E in Fig. 2), the characteristics shown in Table 1 were determined. These are based on average measured data.

Generally the capacitance does not vary with the method of connecting the windings on the INCON. That capacitance depends primarily on the number of overlapping turns. Thickness of the insulation is another factor affecting the value of capacitance. For units wound with no. 30 enameled wire, the values are predicted quite well by the equation

$$C = 100 \times \frac{n}{22} = 4.55 \times n$$

where n is the number of turns on the smaller winding of the INCON and the winding is wound entirely on the top of the larger winding. The parallel-parallel INCON I arrangement produces the smallest series inductance and hence the highest series resonant frequencies along with the highest Q. To determine the Q this formula may be applied

$$Q = \frac{(2\pi f_o)\, L_s}{R_s}$$

Table 1

Average Measured Data on INCON I Units.

		Parallel-Parallel		
N_1-N_2 *No. of Turns*	C *pF*	$f_{on\text{-}p}$ *MHz*	L_s *nH*	R_s *ohms*
No. 30 Wire Units				
10-10	35.8	152	30.7	1.66
20-20	95	97.5	28.1	1.6
30-30	134.5	77.7	31.3	1.85
10-20	42.6	91.8	70.6	2.84
10-30	31.2	62	211	5.26
20-30	84.7	63.1	75.1	3.85
No. 34 Wire Units				
30-50	112.2	31.8	224	2.93
40-60	146.1	27.9	223	3.28

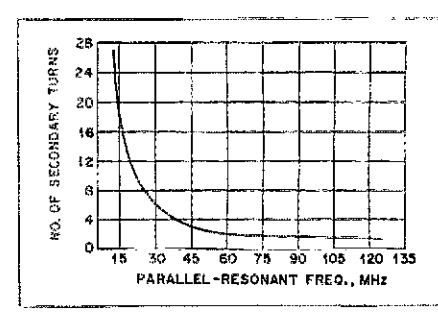


Fig. 4 — Wide variations of resonant frequency are possible with INCON II through a choice of the turns ratio, as illustrated by this graph. The number of secondary turns for the parallel-resonant circuit configuration is plotted against frequency. A 30-turn primary was used in this case.

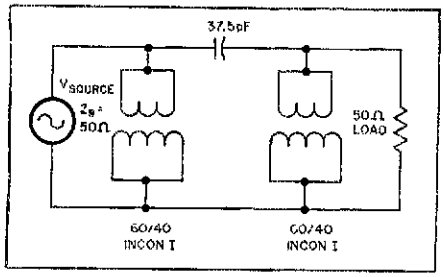


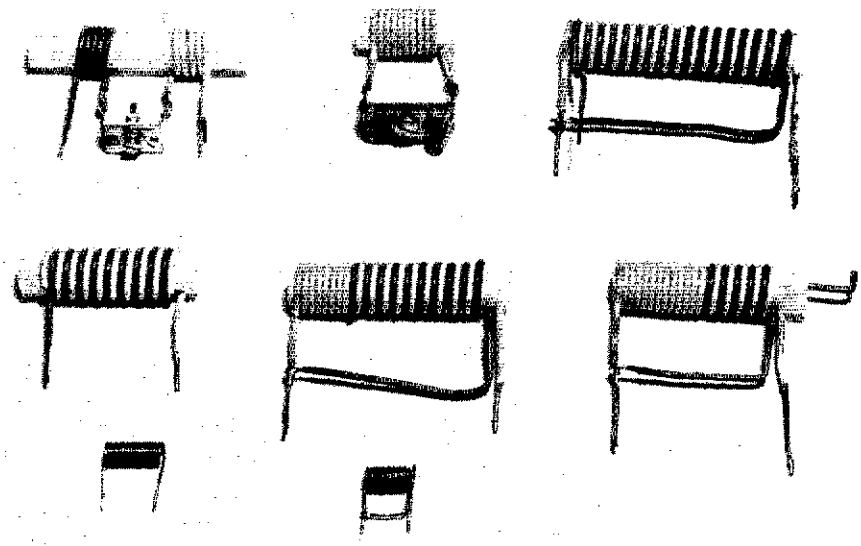
Fig. 5 — The Macnee INCON band-stop filter. This circuit is designed to provide protection to TV and other receivers from interference caused by nearby CB and 10-meter amateur transmissions.

Patent Status of the INCONs

A patent application covering the INCON I and a continuation of this application have been filed by Dr. Michael Scherba, Professor of Electrical Engineering, Wayne State University.

A patent application has been filed by A. C. Doty, Jr., covering the INCON II and the INCON III configurations shown in this article.

Permission is hereby granted by Pyrohm, Inc. (to whom the Scherba application has been assigned) and by A. C. Doty, Jr., for use of the INCON designs shown herein for personal, noncommercial, experimental use only. Readers interested in commercial use must contact the owners of the patentable rights.



The INCONs at the lower left are equivalent to the series-tuned circuit at the top left. Equivalent to the parallel-tuned circuit at the top center are the INCONs shown at the lower center. At the top right is an INCON III unit. An INCON II with tuning slug inserted is at the lower right. The slug is simply a small coil of insulated wire.

where L_s is the series inductance, R_s is the series resistance, and f_o is the series resonant frequency.

In the parallel-parallel connection the equivalent series inductance is least for the equal-turns cases. The data related to this configuration show that this minimum inductance is essentially independent of the number of turns and is about 30 nH for no. 30 wire units. When one winding is made larger than the other, the principal effect is an increase in the equivalent series inductance L_s without changing the capacitance C.

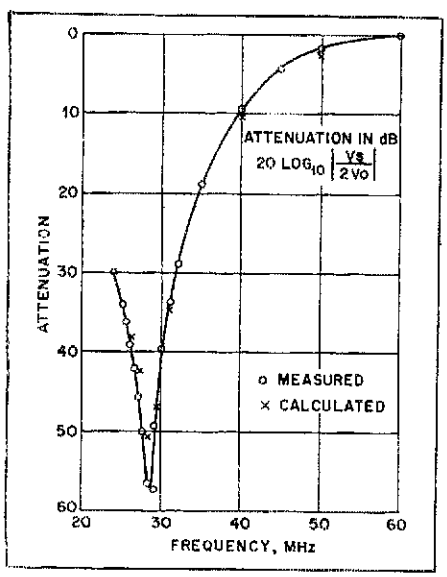


Fig. 6 — The excellent performance of the Macnee INCON band-stop filter is indicated by the deep attenuation notch in this graph. Both the measured and calculated performances are shown.

INCON II

The second member of the family, INCON II, also has two separate but adjacent windings. In this unit, however, the second winding is connected in reverse to the primary. Therefore the equivalent inductance of the two coils gives a parallel resonance with the capacitance resulting from the adjacency of the two windings. Because the coupling between the two coils is less than perfect, this circuit also exhibits a series-resonant frequency which, typically, is three to four times that of the parallel resonance.

Using the circuit shown in Fig. 3 to model the INCON, one can calculate the resonant frequencies of both the INCON I and the INCON II connections. One finds that

$$f_{op} = f_{oa} = \frac{1}{2\pi\sqrt{\left(\frac{L + M}{2} + L_o\right) C}}$$

where f_{op} is the parallel resonant frequency of the INCON II connection. In this case terminals 2 and 3 are tied together and 4 is unterminated. Frequency f_{oa} is the series resonant frequency for configuration A in Fig. 2. Analysis of the INCON II connection of Fig. 3 indicates that the series resonance should occur at

$$f_{os} = \frac{1}{2\pi\sqrt{\frac{LC}{2} \cdot \frac{(1 - k)(1 + k) + (2L_o/L)}{(1 + L_o/L)}}}$$

where $k = M/L$ and is the coefficient of coupling between the overlapping portions of the two windings.

When the INCON II has equal turns on both windings, $L_o = 0$. The expressions for the parallel- and series-resonant frequencies reduce to

$$f_{op} = \frac{1}{2\pi\sqrt{\frac{LC}{2}(1 + k)}}$$

and

$$f_{os} = \frac{1}{2\pi\sqrt{\frac{LC}{2}(1 - k^2)}}$$

where f_{os} is the series resonance of the circuit and the ratio depends only on the coefficient of coupling

$$\frac{f_{os}}{f_{op}} = \frac{1}{\sqrt{1 - k}}$$

Table 2 shows representative data measured from INCON II units having

Table 2

Average Measured Data on INCON II Units.

N_1-N_2 No. of Turns	f_{op} MHz	C pF	L_p nH	R_p Ohms	Q_o
10-10	47.6	35.8	312	1450	15.5
20-20	18.6	95	771	791	8.9
30-30	12.4	134.5	1218	1120	11.7
10-20	34.4	42.6	503	2063	19.0
10-30	32.6	31.2	764	1580	10.1
20-30	15.6	84.7	1229	1090	9.04

various turns ratios. Wide variations of resonant frequency are possible through selection of the turns ratio used, as indicated by the graph of Fig. 4. Additional fine tuning over a range of approximately 10 percent of the resonant frequency of an INCON II can be accomplished by positioning a core inside the INCON. The core can be wire wound, ferrite or powdered iron.

INCON III

In analyzing the application of INCONs to filter designs it became apparent that several circuits could require both series and parallel resonant circuits. INCON III was devised to allow greater flexibility in filling such requirements. Depending on the wiring connections selected for the primary and two secondary windings, a wide range of series- and parallel-resonant circuits are possible.

RFI Filter Designs Using INCONs

As previously noted, the INCONs appear to be ideally suited for use in band-stop, band-pass, high-pass and low-pass filters. The second author has completed a design exercise to develop a three-pole band-stop filter which will provide protection to TV and other receivers against interfering signals from nearby CB and 10-meter amateur transmissions. The result was a simple device using only two INCON I units and a small capacitor. This circuit is illustrated in Fig. 5.

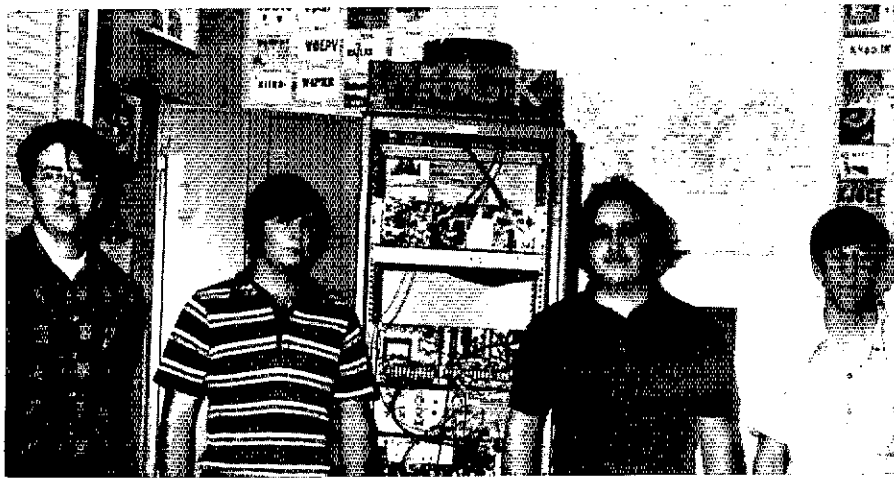
Performance of this filter is excellent, as indicated by the graph in Fig. 6. It provides attenuation above 40 dB from 26.2 to 29.2 MHz and greater than 50 dB from 27.5 to 29.0 MHz. Between 53 and 320 MHz the attenuation is less than 1 dB.

Work has been under way on high-pass and other filter designs developed around the INCON concept. With more than 200,000 interference complaints expected to be received by the FCC in 1979 — the majority resulting from lack of effective filters in TV and other receivers — such designs are sorely needed.

This early disclosure of the basic characteristics of the INCONs is being made in the hope that it will encourage amateurs to use their knowledge and ingenuity to develop additional low-cost yet effective devices to help solve the national RFI problem.

The authors are deeply indebted to Mr. Norman Berry, Sr., president of Pyrohm, Inc., for his cooperation in this project. In the interest of the public, Pyrohm has supported the RFI filter design study reported in this article.

Strays



This 16-76 repeater, W6GK, is on 24 hours a day for use in the Lompoc-Vandenberg AFB (CA) area. It was built with surplus and donated parts by students at Cabrillo High School. Pictured are WD6EEN, AA6CW, AA4CD/6 and WB6YZU, who helped with the project.

After a rainy start in mid-October, clouds parted enough to allow a successful Amateur Radio demonstration by the Morris Radio Club, W2OYH, at the second annual Heritage Celebration on the green in Morristown, NJ. Explaining the hobby to two interested observers are K2AZ (right center) and WA2GZB (far right).

***QST* congratulates . . .**

☐ Ron Williams, WD8NEE, one of 34 finalists (of 40,000 U.S. participants) in the Ford Parts and Service Division's annual certified training program.

☐ Jules L. Freundlich, W2JGR, who has been named general manager of the commercial systems division of Ailtech, Culter-Hammer, and program director of the Suez Canal vessel traffic management system.

I would like to get in touch with . . .

☐ anyone interested in starting a net on 15 or 10 meters for Novices under 18. Rick Todd, KA8AKL, 14470 Bass Lake Rd., Newbury, OH 44065.

☐ teenage hams who are going to be college freshmen next fall, for a cw or ssb net. Todd Fletcher, WDØBLU, P. O. Box 159, Osceola, IA 50213.

☐ any hams who sing in a barbershop quartet. R. C. Thompson, M.D., KA3BKW, Rte. 3, Box 100, Dutchman's Lane, Easton, MD 21601.

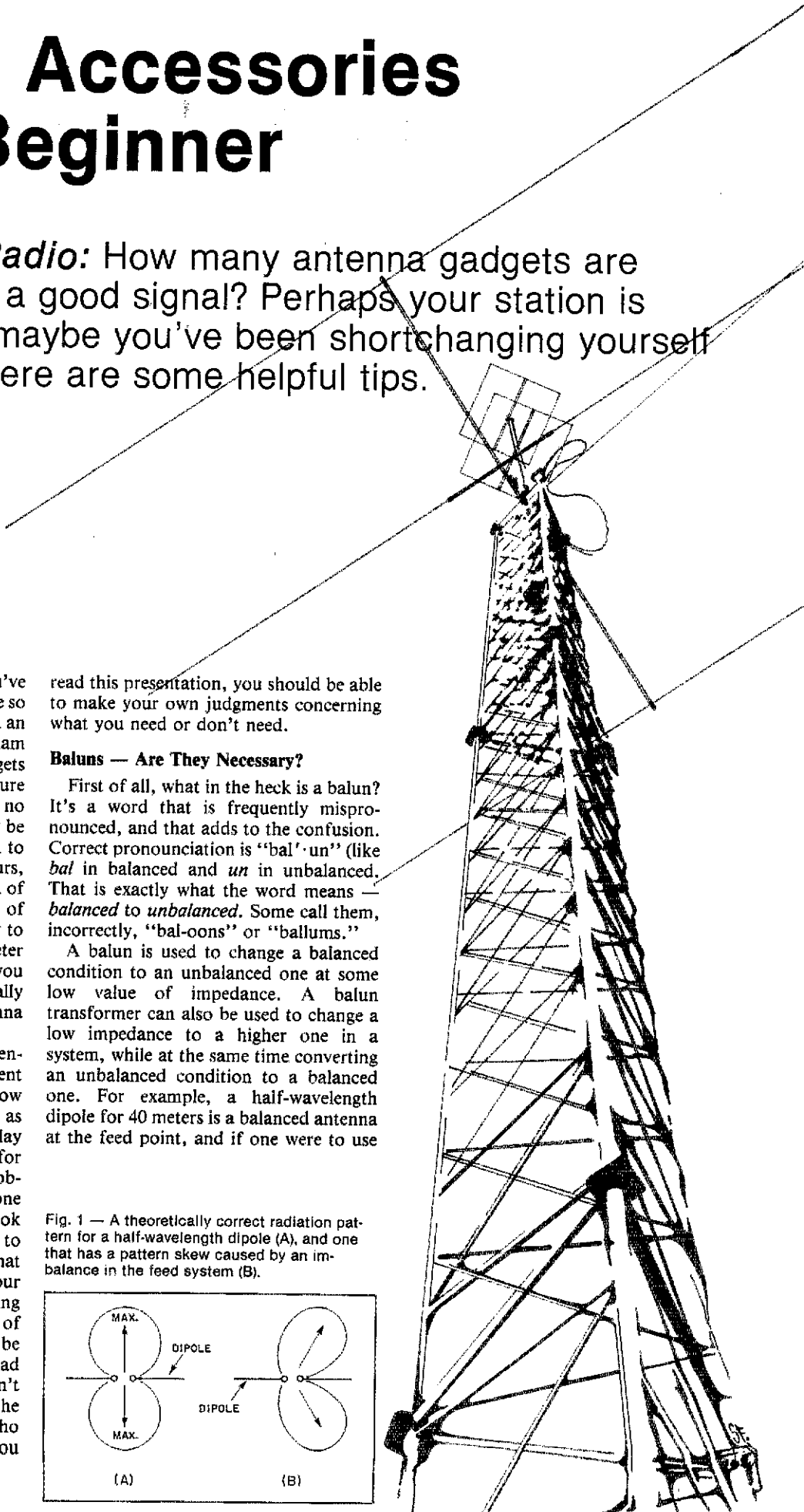
☐ high school and junior high school students who would like to form a net on 10, 15 or 20 meters. Martin Wellington, N6AMI, 7213 Rue La Fleur, Rancho Palos Verdes, CA 90274.

☐ amateurs involved in spelunking (cave exploration). Mike Smith, WA4IBX, 2117 Argyle Way, Gadsden, AL 35901.

Antenna Accessories for the Beginner

Basic Amateur Radio: How many antenna gadgets are needed to put out a good signal? Perhaps your station is overequipped, or maybe you've been shortchanging yourself on accessories. Here are some helpful tips.

By Doug DeMaw,* W1FB



If you're new to Amateur Radio, you've probably been wondering why there are so many gimmicks advertised for use with an antenna system. The ads in the ham magazines show all manner of gadgets that you "should" purchase to ensure maximum results with your antenna, no matter what kind of radiator you may be using. As you study the ads and listen to the recommendations of other amateurs, you may find yourself floating in a sea of dollar signs and wondering why all of those expensive items are so necessary to the health and welfare of your 80-meter dipole. Should you have a balun? Do you need an SWR indicator? Is it really necessary to use a Transmatch (or antenna tuner, as it is sometimes called)?

There is a certain mystique about antennas that makes them fun to experiment with. Almost any amateur wants to know as much as he can about antennas, and as a rule they aren't too expensive to play with. Accessory equipment is useful for experimenting and solving antenna problems, but it is sometimes a luxury that one can do without quite handily. Let's look at the various items that are thrown out to hams as lures for better DX results. That oracle you've been listening to on your favorite amateur band may be nothing more than a "walking encyclopedia of technical misinformation." It could be that no matter how many times you read the ads for antenna accessories, you don't comprehend the benefits offered by the seller. This article is aimed at those who are a bit confused by all this. After you read this presentation, you should be able to make your own judgments concerning what you need or don't need.

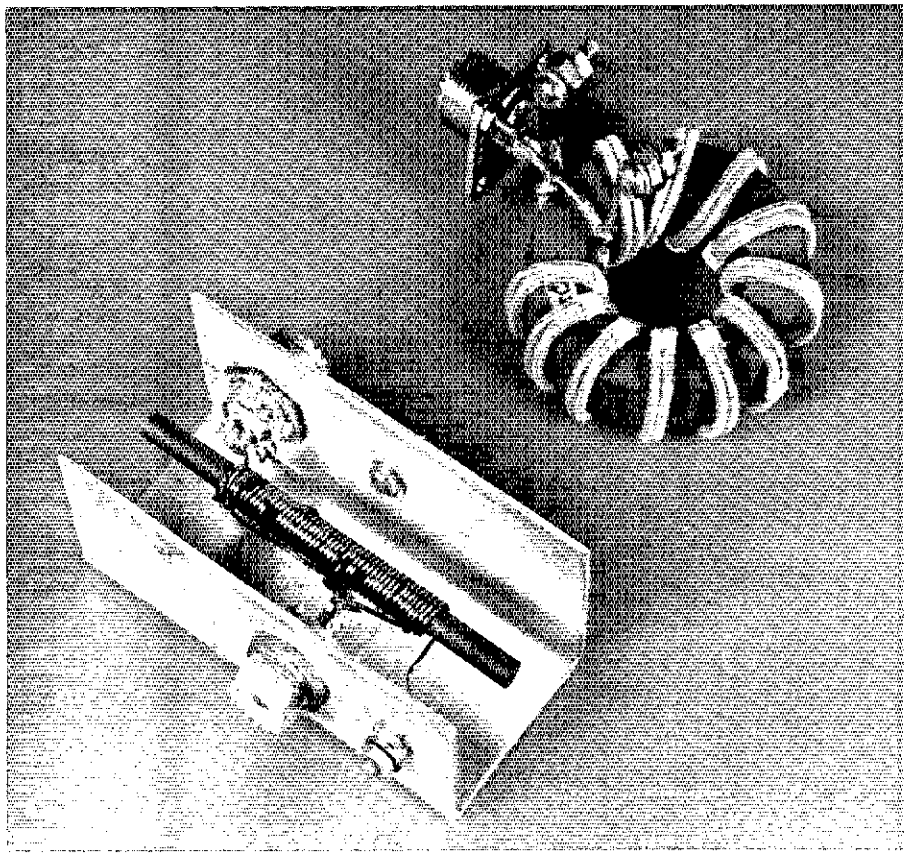
Baluns — Are They Necessary?

First of all, what in the heck is a balun? It's a word that is frequently mispronounced, and that adds to the confusion. Correct pronounciation is "bal'·un" (like *bal* in balanced and *un* in unbalanced. That is exactly what the word means — *balanced* to *unbalanced.* Some call them, incorrectly, "bal-oons" or "ballums."

A balun is used to change a balanced condition to an unbalanced one at some low value of impedance. A balun transformer can also be used to change a low impedance to a higher one in a system, while at the same time converting an unbalanced condition to a balanced one. For example, a half-wavelength dipole for 40 meters is a balanced antenna at the feed point, and if one were to use

Fig. 1 — A theoretically correct radiation pattern for a half-wavelength dipole (A), and one that has a pattern skew caused by an imbalance in the feed system (B).

*Senior Technical Editor, ARRL



Broadband transformers of the type used as baluns. The model on the left is solenoidal. At the right is a toroidal transformer. *(photo courtesy of W2FMI)*

72-ohm twin-lead as the feeder, the entire system down to the station would be balanced. In theory, this would lead to a radiation pattern from the antenna that was uniform in both directions off the broad side of the dipole. However, if 72-ohm coaxial feed line were used, as is the typical case, there could be a slight skew in the radiation pattern (it would be slightly lopsided). This could result from using an unbalanced feeder with a balanced dipole. Fig. 1 illustrates this principle. Assume that you are high above your dipole looking down at it and that you sprayed the rf energy with some magical green paint so you could see the path it was taking as it left the dipole. At Fig. 1A, illustrating use of twin-lead, you would view a clean lobe off each side of the antenna. As shown at B, there could be a distorted pattern. The latter would result from unwanted radiation from the feed line, caused by the imbalance of a coaxial-cable antenna feeder.

At this point it might be proper to say, "So what?" In practice, pattern skewing will never be noticed, and the transmitter and receiver couldn't care less. A slight lobe distortion makes little difference, since dipoles, when used by themselves, do not have a sharp directivity pattern (narrow lobe). In any case, a dipole won't exhibit its normal radiation pattern unless it is well removed from conductive objects (power lines, gutter pipes and the like).

Provision for balanced feed to a dipole *is* important, however, when the dipole is part of a high-gain directive beam antenna, such as a multielement Yagi. The latter will exhibit a fairly sharp pattern in the forward direction, and in order to establish useful beam headings in DX work the pattern should be as distortion-free as possible. This enables the operator to get maximum signal headed in the desired direction. In a stacked array, two or more beams in a combination, it is important to maintain a balanced condition in the harnessing (connecting cables) of the bays. This will help prevent unwanted radiation from the harnessing system. Such radiation could easily spoil the radiation pattern of the beam array, especially in vhf and uhf antenna systems. Balance is difficult to achieve in the latter case.

Are Baluns Black Magic?

Because there is so much antenna nonsense going on these days, a beginner can be misled easily. Just consider the weird TV and fm antennas that you see advertised, or for that matter, the absurd claims being made about some CB antennas! The more spikes, spears and prongs protruding from the booms of commercial TV and fm antennas, the greater the claims made by the manufacturer, and the higher the cost. Many of these antennas defy technical explanation, and are in fact contrary to all antenna theory. Yet, the unsuspecting buyer can succumb to the sales pitch and get "ripped off." Fortunately, this doesn't happen in most of the ads which appear in Amateur Radio magazines and journals. But, there are still some subtle areas of confusion which can cause an amateur to spend his money for something he doesn't really need. The balun transformer sometimes falls into that classification despite the upright intentions of those who sell the product. It's more a matter of insufficient information than one of false claims.

A balun is supposed to be a broadband device. That is, it is manufactured for a particular feed-line impedance, and should be suitable for use from, say, 1.8 to 30 MHz in a typical case. This means that it should not be reactive when it is inserted in a feeder system. But, few baluns satisfy that basic requirement, as observed during some ARRL laboratory tests that were performed on a group of homemade and commercial amateur baluns. The units tested were built on ferrite and powdered-iron cores. Some of the cores were toroidal and others were solenoidal (doughnuts or rods). The baluns were terminated in resistive loads of their rated values, connected to a laboratory-grade RX meter (reactance bridge), and tested in the center of each amateur band for which they were designed. None were flat (zero reactance) in all of the amateur bands from 1.8 to 29.7 MHz. In fact, some were not flat in *any* amateur band! With the latter, the flatness was found at some frequency outside the amateur bands!

There are two important points to consider here. First, a balun transformer is not simply a collection of wire turns placed on a piece of core material. The design rules are fairly rigid if proper wideband characteristics are to be obtained.[1] Second, a poorly designed balun can ruin an antenna system rather than improve it. If it is highly reactive, as some seem to be, it can cause an SWR (standing-wave ratio) which is higher than that which existed at antenna resonance before the balun was connected in the line! Just the opposite effect can occur when the system is operated at a frequency away from antenna resonance. Most transformer baluns behave as true baluns only when they "look into" a purely resistive load. Off resonance, where the load on the balun is reactive, core losses in the balun increase and therefore reflected power decreases. This means the SWR in the line is lower than without the balun, giving you a false indication that your antenna system is broad in terms of frequency range.

A balun transformer is useful when an impedance transformation is desired between an antenna feed point and an unbalanced feeder of lower impedance. An

[1]Notes appear on page 19.

example of this can be seen in Fig. 2 — a 300-ohm folded dipole is fed with 75-ohm coaxial cable. The balun effects a 4:1 impedance transformation *and* converts a balanced condition to an unbalanced one. The same balun could be used to convert a 200-ohm feed-point impedance to 50 ohms, unbalanced. It is desirable to provide the transmitter and receiver with a 50- or 75-ohm unbalanced feeder because most modern amateur equipment is designed to look into that type of transmission line.

Whether or not you need a balun in your antenna system will depend on what you're attempting to accomplish with the system. When it comes to an ordinary half-wavelength dipole for the high-frequency bands, direct coaxial-cable feed will be adequate if the antenna is adjusted for a low SWR. A balun won't give you an increase in radiated power, and that's important to know. If you do purchase a balun, ask the manufacturer to assure you that his unit is *really a balun* at all of the frequencies he specifies — not a reactive device that might degrade your antenna system.

Should You Buy and Use an SWR Indicator?

SWR indicators are known by a lot of names, such as SWR bridge, rf power meter, Monimatch, Bruene bridge, Micromatch and others. Some instruments are built to read forward and reflected power in watts, while others simply indicate when a matched antenna condition is reached (minimum reflected energy, as shown on a meter). SWR indicators come in a variety of sizes, styles and price classes, but fundamentally they serve the same purpose: They help the amateur keep tabs on the condition of his antenna system.

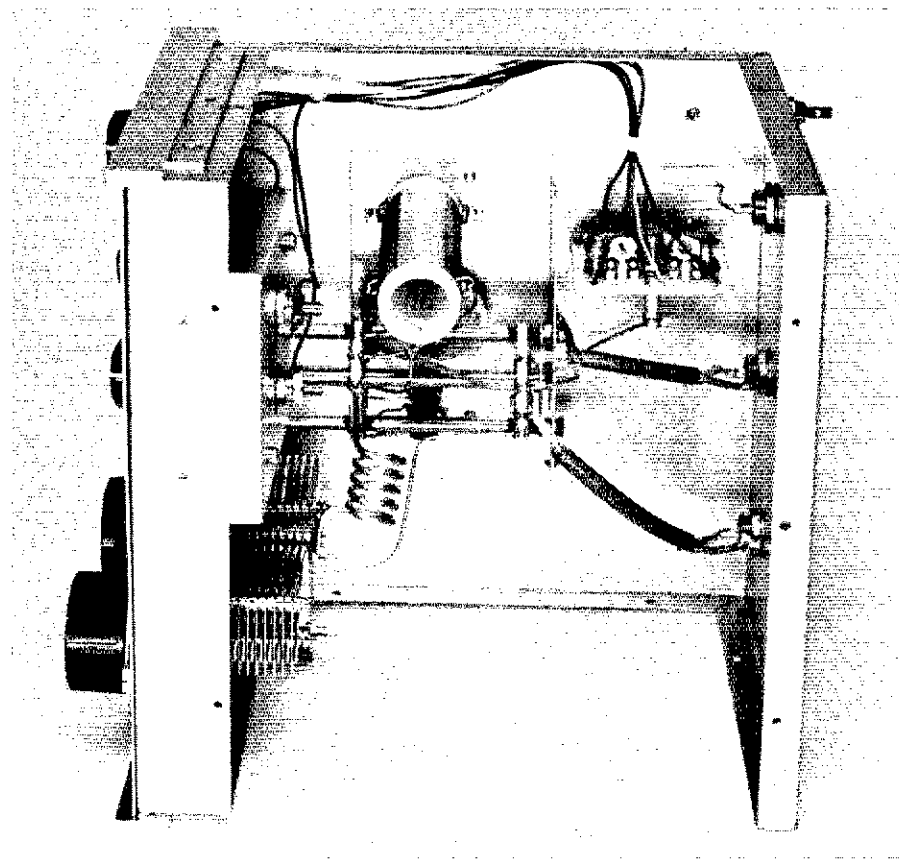
Too much emphasis is placed on acquiring and maintaining an SWR of 1 (1:1 match). In bygone days many amateurs adjusted their antennas for proper performance by a very simple means: They tuned the last stage of the transmitter (loading and plate-tuning controls) for a dip and the desired amount of loading by attaching a nonreactive 50-ohm dummy load to the transmitter output. The dial settings were noted, then the antenna was connected to the transmitter. Antenna adjustments were made until the final-amplifier dial settings, with proper tuning and loading, were the same as when the dummy load was connected. This resulted in an SWR of 1, or nearly so.

Nowadays, our ham shacks are filled with gadgets that are helpful, but not always necessary. An SWR indicator will speed antenna adjustments, especially if a Transmatch is used in the line. For that reason they are probably worth owning. An SWR instrument is designed for a particular line impedance, usually 50 *or* 75 ohms, but not both. If the readings are to be meaningful, the indicator should be designed for the line impedance being used.

It is not unusual to hear a conversation on the air during which one operator will suddenly exclaim, "Oh my goodness, I see that my SWR is up to 1.8 to 1. Stand by until I readjust things." Finally, after he obtains an SWR of 1, he can be heard to say, "There, OM, things are back to normal. How much did my signal increase?" Assuming that his transmitter was capable of loading to full power with the slight mismatch he had, his signal strength would not change by an apparent amount; the entire exercise was one of futility. But SWR indicators have brought on a form of paranoia among some amateurs, and SWR ranks high as a topic of conversation in our amateur bands. Admittedly, it is psychologically satisfying to attack one's favorite ham band with an SWR of 1, but it's not a necessity if the transmitter doesn't object to working into a minor mismatch. Most rigs that have pi networks in the output are capable of being adjusted for proper operation when looking into loads from approximately 40 to 100 ohms. So if the SWR isn't perfect, it will not matter. You'll get out just as well as would be possible with a perfect match.

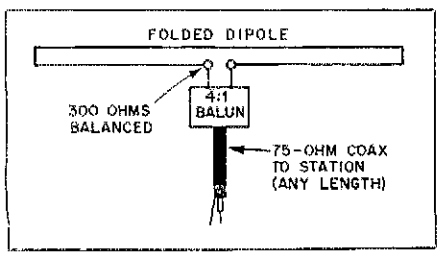
An SWR indicator is of little use when coaxial-cable fed dipoles are in use, or when coax feed is used with beam antennas that were adjusted properly at the time of installation. Sure, the indicator will help you keep an eye on the condition of the antenna, but if anything goes wrong you'll know it without watching an SWR meter: Your transmitter loading will change, and you'll be aware that something has gone amiss!

The most useful application of an SWR indicator is realized during initial adjustments of an antenna. For example, the instrument is placed in the feed line, switched to read reflected energy, and monitored as the length of the driven element (a simple dipole) or the matching section of a beam (gamma match, T match or whatever) is adjusted for the lowest SWR in the chosen part of the band. It is entirely possible that an SWR



Interior view of a medium-power commercially built Transmatch. The unit shown is a Leader LAC-895. SWR-indicator circuitry is visible at the upper right. The coils and capacitors for the tuning network are at the left, along with a band switch (left center).

Fig. 2 — A balanced, 300-ohm, half-wave dipole can be fed with 75-ohm unbalanced line (coax) by installing a 4:1 balun transformer directly at the feed point.



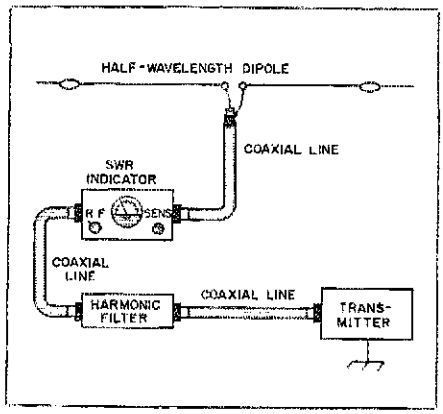


Fig. 3 — Harmonic energy from the transmitter can cause a false SWR reading. Installation of a harmonic filter, as shown here, can correct the problem.

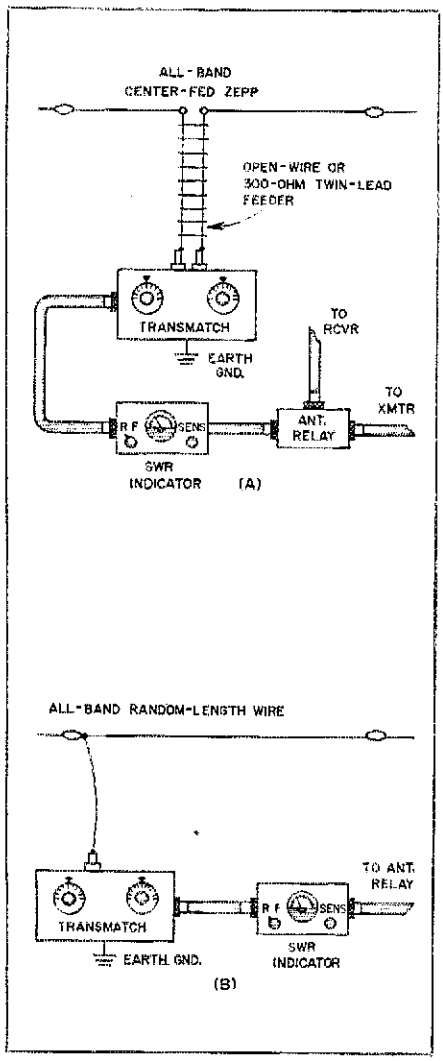


Fig. 4 — A Transmatch can be justified when it is necessary to use the same dipole on several amateur bands. The example at A shows a Transmatch connected to balanced feeders which supply power to a center-fed Zepp antenna. At B, we have a random-length wire being matched to the transmitter by means of a Transmatch to provide multiband operation. An effective earth ground is necessary to reduce the effects of rf appearing on the station equipment.

of 1 will not be obtained when adjusting the overall length of a half-wavelength dipole if a 50- or 75-ohm feed line is used. The actual feed-point impedance will depend on the height of the dipole above ground, as well as its length. However, a close enough match will be attainable, consistent with good transmitter performance — a 2:1 SWR or better in the usual case.[2] These same statements apply to the inverted-V dipole, the enclosed angle of which will also affect the impedance.

If the transmitter has an appreciable amount of harmonic energy in the output, false SWR readings may result. This is because the antenna will not accept the harmonics, and they will register as reflected energy on the meter, even though the antenna may be matched perfectly at the desired operating frequency. By inserting a harmonic filter in the feed line between the SWR indicator and the transmitter, false readings can be eliminated.[3] The filter should have the same impedance characteristic as the transmission line. That is, a 50-ohm filter belongs in a 50-ohm line, and a 75-ohm filter should be used in a 75-ohm line. A suggested hookup is shown in Fig. 3. The references at the end of this article should be useful to those who want to build an SWR indicator.

The Transmatch Syndrome

Here's another ham-shack device that has a host of names. These antenna matching networks are called antenna couplers, antenna tuners and Transmatches. The right name will depend on what is being done with the equipment. If one of these coil-capacitor networks is used at the feed point of the antenna (and some antennas, such as random-length wires, are brought right into the shack), then *antenna tuner* might be a proper title for the device. If the unit is used at the transmitter to tune an overall antenna system (radiator and its feeder) to resonance, Transmatch is a more suitable name for it. The latter signifies "matching the *transmitter* to the *line*."

A Transmatch is a network that is used to correct — as far as the transmitter is concerned — a poorly matched antenna. Since the proper place to correct the mismatch is at the feed point of the antenna, the best a Transmatch can do is make the antenna system look like 50 or 75 ohms at the rig. Let's suppose that some lazy amateur precut an 80-meter, coax-fed dipole, erected it, then discovered by means of an indicator that it had an SWR of 5:1. Being afflicted with chronic lassitude, he refused to take it down and prune it for a low SWR. Meanwhile, his transmitter "hated" what it was forced to look into, refusing to load up. Lazy Joe's answer to his misfortune was to place a Transmatch at the transmitter output, then adjust it so the rig could work into a 50-ohm load. This made everything "hunky dory," and Joe went on his happy way calling CQ. However, the mismatch remained between the line and the antenna. Being inherently lazy, Joe might even elect to force-feed his 80-meter antenna on 40 meters by resorting to the Transmatch. The efficiency of the system on 40 would be poor, but Joe would be happy, and so would his transmitter.

Well, that's one use for a Transmatch. In a more realistic situation the Transmatch could be employed to extend the useful range of a single-band dipole (coax fed) across all of a band. A typical half-wavelength dipole will exhibit a low SWR at only the part of the band for which it has been adjusted. This is true especially on 80 and 160 meters, the widest amateur bands we have in terms of change in frequency percentage. Typically, the amateur cuts his dipole for the favored part of a band, then does the best he can in other portions of the band, as the SWR rises rapidly when the operating frequency is moved above or below the resonant frequency of the antenna. A Transmatch will enable the transmitter to load correctly across all of a given band. The principal danger in operating an antenna with high SWR through a Transmatch is that, depending on the power being used, the high standing waves can cause high rf voltage. This can result in feed-line breakdown and, under extreme conditions, arcing in the Transmatch components (switches and variable capacitors). The Transmatch or the feed line could be damaged seriously. Needless to say, Transmatches can be used in this manner with any type of antenna system — dipoles, verticals or beams.

When to Use a Transmatch

There is justification for the expense of a homemade or store-bought Transmatch in the case of all-band antennas which have a single feeder of some specified characteristic. Here, we are considering an end- or center-fed Zepp type of antenna, or some end-fed, single-wire radiator. Fig. 4 illustrates the application under discussion.

It seems that the lesson to be learned here is that it is uneconomical to buy a Transmatch merely because most well-equipped stations seem to have one or more of the things. One might equate this to installing an air conditioner in a car used by a resident of Alaska. It might be neat to have one for occasional use, but how often would it really be put to practical use?

In Summary

It isn't necessary to clutter the operating position with gadgets unless there is a specific need for them. The decision is yours to make, but chances are that you can do a fine job of shooting that signal out to distant points without baluns, SWR meters and Transmatches.

Using coaxial-line feed for a group of dipoles, cutting the antennas according to the formula, length in feet = 468/f in MHz, then mounting the dipoles well in the clear of conductive objects, should assure good performance. You won't have to invest in an assortment of things that are seen in other shacks.

If you plan to be an experimenter, then we're addressing ourselves to an entirely different matter. Development work can't be done easily without test equipment and accessory items that play an important role in making antennas do what you want them to. *The ARRL Antenna Book* contains descriptions of numerous antennas that don't require the accessories we have discussed in this article. You may want to study this publication before you equip your station with antennas and related apparatus. QST

Notes

[1]Broadband transformer design is treated in the *ARRL Electronics Data Book*.
[2]The effects of height versus feed impedance are covered in *The ARRL Antenna Book*.
[3]Half-wave harmonic filters for 50- and 75-ohm lines are described in the *ARRL Electronics Data Book*.

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Strays

A VISIT WITH HAMS IN THE U.S.S.R.

Each year for 20 years now the Institute of Electrical and Electronics Engineers (IEEE) has had an exchange with the U.S.S.R's All-Union Scientific-Technical Society of Radio Engineering and Electrical Communications — or more simply "the Popov Society," named after A. S. Popov. This is the oldest such continuing exchange between the United States and the Soviet Union.

Although there have been one or two hams in several previous exchanges, last year there were four: George Jacobs, W3ASK; Pat West, W7EA; John Gayer, ex-HB9AEQ; and this writer. Anxious to obtain formal permission to operate in the U.S.S.R., we had rushed our requests through the channels outlined in March 1978 *QST*.

The purpose of the IEEE visit was to participate in the annual Popov Society Congress and to visit various Soviet research institutes and educational facilities in Moscow, Leningrad, Kiev and Lvov. The visits with Soviet hams were generally informal, although the delegation did make a formal visit to the Krenkel Central Radio Club (Box 88) in Moscow, which is located at 88 Volokolamskoye Highway in the northwestern part of the city, across from Tushino Airport. The building also houses the DOSAAF, the Voluntary Society for Aiding the Armed Forces, which promotes Amateur Radio in the U.S.S.R.

At Box 88 we met Central Radio Club (CRC) President Vasilij M. Bondarenko and Radio Sports Federation President Nick Kazansky, UA3AF. W3ASK, leader of our delegation, formally presented Bondarenko with the bicentennial copy of *The Radio Amateur's Handbook* and several awards for U.S.S.R. ham participants in the 1977 CQ World Wide Contest. Our delegation was shown the museum of equipment used by Ernst Krenkel (RAEM), the famous Arctic explorer and ham for whom the CRC is now named. The U.S.S.R. awards for R-100-O, W-100-U, R-6-K, R-10-R and R-15-R were obtained for several Atlanta hams. We were also conducted through the Box 88 QSL bureau, with its wall-to-wall stacks of QSL cards from around the world.

Bondarenko says there are currently 26,000 licensed hams in the U.S.S.R., but there are an additional 2 million designers of radio hardware for sport, study and commercial purposes. In May there is to be a large Amateur Radio festival at Moscow's hugh Exhibition of Economic Achievements. Bondarenko said the CRC club station, UK3A, is some 60 km from Moscow, as "there is too much QRM" in the city.

At the All-Union Electrical Engineering Institute of Communications (for correspondence courses) we met the vice president of the Radio Sports Federation, Professor Konstantin Shul'gin, UA3DA. He is in charge of the scientific-technical research at the institute. Another Moscow ham, Dr. Valentin Makkaveyev, UA3AM, is on the faculty of an institute for handicapped children. We met him at a Popov Society reception.

In Kiev the delegation paid a formal visit to the Institute of Cybernetics, the foremost Soviet institute in computer research and development. There we met two hams on the faculty, Dr. Sergej Bunin, UB5UN, and Dr. Vladimir Yegipko, UB5UAV. Sergej is vice president of the Ukraine Radio Sports Federation and was the first Soviet ham to use ssb. His textbook (jointly authored with UT5AA), *Single Sideband Techniques for Radio Amateurs*, was published by DOSAAF Press in Moscow in 1970. Active with SSTV, Sergej also has a periodic DX program over Radio Kiev.

During my four visits to the Soviet Union since 1971, I have had the pleasure of meeting quite a few hams throughout the country. Ham radio always provides a common bond of friendship; the Soviet hams are really no different from Americans. They usually end QSOs with "DSW," an abbreviation for *do svidaniya* or "good-bye." I usually add "MIR I DX," which means "peace and DX." Sometimes this elicits a similar response from the Soviets. — *Robert S. Duggan, Jr., N4IA* QST

A display of Ernst Krenkel (RAEM) exhibits at Moscow's Central Radio Club. The club station is located about 60 km from Moscow to avoid QRM.

Upgrading Your SB-220 Linear Amplifier

A modest outlay for parts and a few hours on the workbench . . . ingredients for "customizing" this Heath workhorse. The results will be longer life, higher reliability and more operating convenience.

By Kenneth M. Gleszer,* W1KAY

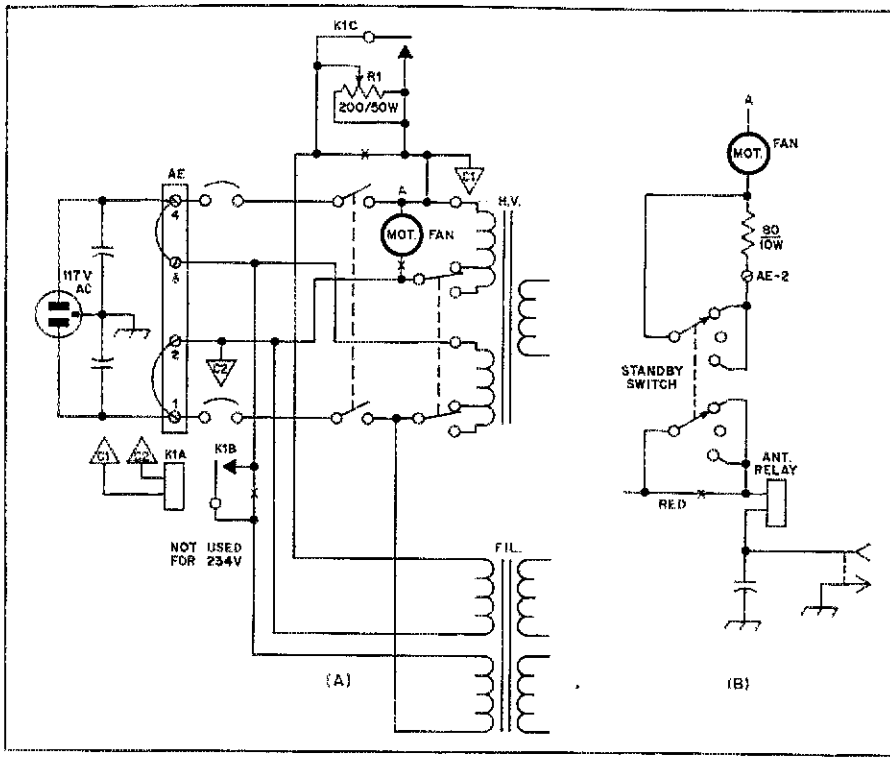
The continued popularity of the Heath SB-220 linear amplifier after eight years in production is not surprising, considering its price and good reputation. Since I was in the market for an amplifier I decided to do a bit of research on the SB-220. I decided to ask some on-the-air questions of present owners.

*P. O. Box 2234, Stamford, CT 06906

As a group, they seemed pleased with the unit's performance; however, most felt that there were a few areas that could be improved upon. A few experienced failure of one or more diodes in the high-voltage power supply. Many found the cooling fan to be excessively noisy. Some mentioned occasional arcing between the top inner shield of the case and the plate connections on the tubes. A STANDBY switch was felt to be desirable to enable on-the-air tests and facilitate tune-up and band changing without constantly turning the high-amperage 3-500Z filaments on and off. A few experienced what they felt was premature failure of the now fairly expensive 3-500Z power tubes. Most owners expressed the desire for a color that would match equipment other than Heathkit.

As none of these problems seemed difficult to correct, I began by purchasing and assembling a kit. It worked quite well and I began to use it on the air. After a short time operating with it, I was convinced that the suggestions made to me were worthwhile. I began to modify the unit one step at a time.

Fig. 1 — Schematic diagram of the modifications for standby switch, two-speed fan, and filament protection.
K1 — Time-delay relay, dpdt 10-A contacts, Potter and Brumfield. Available from Herbach and Rademan Inc., 401 East Erie Ave., Philadelphia, PA, stock no. 21K233.
R1 — Wire-wound resistor, 200 ohms, 50 watts; Clarostat type VP5OKA.



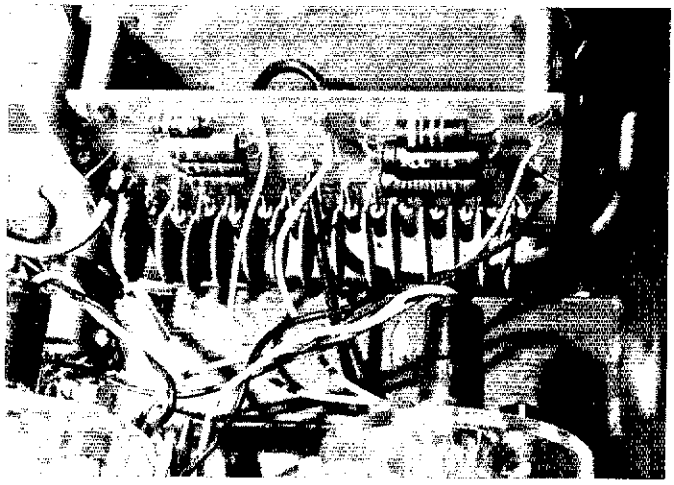
The Power Supply

The power supply circuit board did indeed look sparse with 14 1-A, 600-PIV diodes, unprotected by equalizing resistors and capacitors. Every time I turned the power switch on, I expected noise and smoke to appear because of the high current surge which occurs as the capacitor bank charges.

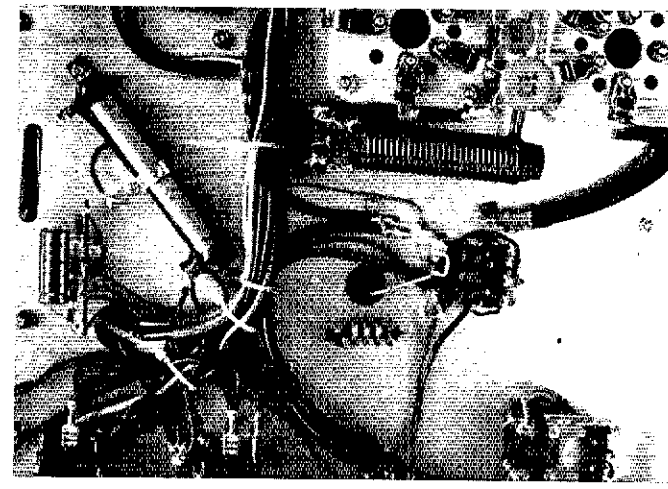
The fix was relatively simple. I removed the circuit board and the 14 diodes. Each diode lead hole was drilled out slightly larger from the foil side, just enough to accommodate two more component leads of about the same diameter. One by one each diode was replaced with a 1000 PIV, 2.5-A silicon diode and bypassed with a 0.01-μF, 1000-V ceramic disk capacitor and a 470-kΩ, half-watt resistor.

There was no difficulty in fitting in these extra components; they may be mounted on the top surface of the circuit board. I then reconnected the board to the appropriate color-coded leads and replaced it in its original position.

It is not possible to reinstall the lower



The modified power supply board for the SB-220. The added components are mounted above the diodes.



At left is the mounting location of the surge protection resistor. If the specified resistor is used, it can be mounted on existing screws.

inner mounting screw without disassembling the front panel. Due to the high strength of the circuit board and the solidity of the mounting arrangement, the loss of this one screw is unimportant.

The modified unit operates normally, although with slightly higher plate voltage. Now there should be no further worry about blown diodes.

Standby and Cooling Modifications

The cooling fan was indeed noisy. Heath told me that the fan motor had been redesigned and they would send a replacement. The new one appeared slightly smaller than the old one, with redesigned bearing mountings. A quick test on the bench disclosed that it was indeed quiet and vibration free.

The power tubes were removed to facilitate fan replacement. The fan lead was removed from terminal 2 of block AE. The other fan wire was cut approximately 1-1/2 inches (38 mm) from the old motor. After the old motor was removed, the nylon fan blade was mounted on the new motor and the assembly reinstalled.

I decided that I did not want my fan to run at high speed during periods of standby. I installed an 80-ohm, 10-watt resistor in series with the motor power leads. One end was soldered to the bottom of lug 2, terminal strip AE. The other end was connected to one of the motor leads.

The other motor lead was cut to a convenient length and soldered to the lead previously cut. Appropriate spaghetti tubing was used to cover the soldered junction. The circuit for this modification, along with the other described in this article, are given in Fig. 1. Anyone not wishing to complete the standby switch project, described below, should not bother with the 10-W resistor, as the fan speed may be too slow for continuous, high-power operation.

A double-pole, double-throw, center-off paddle switch was mounted on the front panel, in a position on line with the two rocker switches and centered between the band switch and the loading control. Care in drilling the mounting hole should be exercised so as not to chip the paint on the front panel.

The switch should be mounted so that the paddle moves left to right in preference to up and down. The red wire is removed from the relay coil and soldered to the lower center lug of the STANDBY switch. Another wire is connected between both lower end lugs of this switch and the relay coil. This permits standby in the center position and normal operation with the paddle left or right.

Solder a 12-inch (305-mm) piece of hook-up wire to the side of the 80-ohm resistor which is connected to the motor, and route the wire through the wiring harness to the front panel. Connect it to the upper center lug of the standby switch. Connect both upper end lugs of the switch together and then to terminal AW.

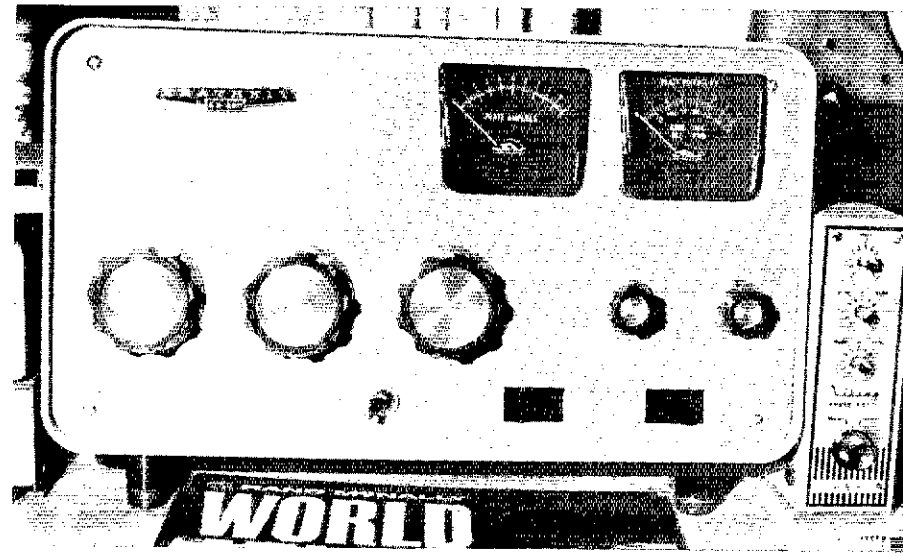
This should now give you low-speed fan operation on standby and high speed on either the left or right OPERATE position of the paddle switch. The fan speed reduction should be approximately 25 percent, which will provide ample air to cool the tubes while idling, but substantially less noise during standby. During standby, the exciter will operate straight through, even through the amplifier filaments are lit.

While the cover is off, bend the solder lugs on the plate connectors slightly downward from their original position. This opens up the space between these connections and the chassis substantially. Arcing will no longer be a problem after reassembly.

Filament In-Rush Current Protection

Eimac makes it clear in their literature on 3-500Z tubes that filament in-rush

The standby switch is mounted below the band switch and loading control. The function is labeled with press-on transfers and protected with a coat of clear acrylic spray.



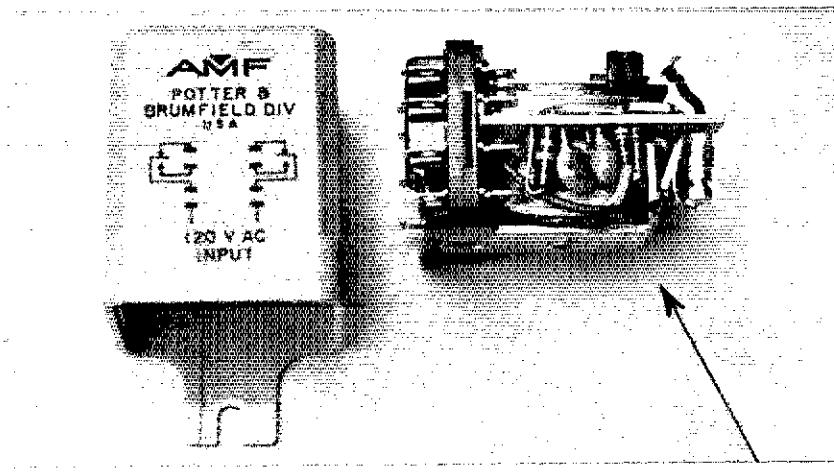
should be limited to two times the normal operating current. As the filaments present almost a dead short to the transformer when they are cold, the initial current passing through them can be far more than two times their rated current. Repeated fast heat-ups can ultimately cause mechanical deformation of the filament and shorts between it and other tube elements. Premature failure of 3-500Z tubes can be traced to this problem.

A relatively simple cure is to install 100 ohms of surge resistance in the primary winding of the filament transformer and, after approximately three to five seconds after turn-on, short this resistor out using a small time-delay relay. For reasons of convenience, I selected a 200-ohm, 50-W Clarostat wire-wound resistor which fit diagonally across the capacitor mounting-bracket screws already available on the bottom of the chassis. The slider should be positioned in the middle of the resistor. Solder a jumper between both end lugs. A 100-ohm, 50-W resistor will do just as well, but finding a space to drill holes in this area of the chassis is difficult.

I spotted a miniature solid-state-controlled time-delay relay in a Herbach and Rademan catalog, their stock no. 21K233. The plastic cover was removed and the existing 120-second time delay was reduced to 5 seconds by installing an 82-kΩ, 1/4-W resistor in parallel with the gray, 1.2-MΩ timing resistor. There is a hole already provided for mounting the resistor on the small circuit board within this relay.

Drill a hole for a no. 6-32 screw 2 inches from the front of the chassis and on a line exactly between the loading and tuning capacitors. Mount the relay with a 6-32 × 1/2-inch screw. A small rubber bushing or grommet should be inserted between the bottom of the relay and the chassis to eliminate the possiblity of hum.

The black filament-transformer primary wire is removed from lug AW and fastened to one end terminal of the resistor. The slider is connected to lug AW, which effectively inserts the resistor in a series with the primary.



The time-delay relay used in the surge-protection circuit. The arrow points to the resistor that must be decreased in value to shorten the time delay.

Two leads are now connected between the contacts of the time delay relay and one end of the resistor and terminal AW. One side of the relay coil is connected to terminal block AE, terminal no. 2. The other coil terminal is connected to terminal AW.

If you plan to operate your SB-220 on 235 volts only, this completes the surge protection project. If you are going to operate on 117 volts, you *must* remove the black-green wire from terminal 3 of block AE; pull it out of the wiring harness and connect it to the lower unused terminal on the time delay relay. The center unused terminal must now be connected back to terminal 3 of block AE. This eliminates one of the parallel windings of the filament transformer until the relay closes.

Reinstall the tubes and the inner chassis cover. Turn on the power switch. The filaments should take approximately three seconds to come up to half temperature. This is a bright red color. Two seconds later the relay closes and the tubes almost instantly reach normal operating temperature. In this hook-up the meter pilot lights follow the same heat-up sequence. This serves as a visual check that the time-delay relay is functioning properly.

Color

I finally had my SB-220 performing to my satisfaction. Now if only the cover and panel could be changed to match the color scheme of my Drake twins, I would be happy. I fired off a letter to Heath asking if they would consider making available a case and panel that would be compatible with most of the black boxes on the market. I did get a very nice answer back, but no encouragement. Maybe sometime in the future, but not now. Those who feel as I do should write to Heath.

The total time for completion of all the modification projects, after the parts are gathered together, should not exceed two hours. These changes are very worthwhile, as you can expect much longer life, reliability and convenience — and you'll have the satisfaction of owning a "custom-built" amplifier.

Strays

PUT YOUR VOICE TO GOOD USE

☐ Can you operate a tape recorder? Or can you read aloud and explain advanced scientific subjects? Could you learn to operate a tape-duplicating machine? Such volunteers are needed by the 29 units of Recording for the Blind, an organization that provides free textbooks to the blind and to those physically unable to handle a book. In addition to such subjects as physics, math, computer technology and chemistry, many Amateur Radio publications have been recorded and maintained in the master library of Recording for the Blind, 215 E. 58 St., New York, NY 10022. Check the phone book to see if there is a Unit in your city. If so — volunteer!

I would like to get in touch with . . .

☐ Novices and experienced traffic men interested in forming a Novice net on or around 21.150 MHz at 1800 UTC. Armond Brattland, K6EA, 1135 Magnolia Ave., Long Beach, CA 90813.

STATION NOW ABOARD *HMS BELFAST*

☐ The Amateur Radio station aboard the *HMS Belfast*, which is moored in the Pool of London, has been granted the use of the special call sign GB2RN for use when the ship is open to the public. The station is interested in establishing schedules with other museum and special-interest stations worldwide. Contact Don Walmsley, 153 Worple Road, Isleworth, Middlesex, TW7 7HT, England.

A First-Class Touch-Tone Encoder

Save some money and have a high-quality T-T pad for your efforts.

By Roy Hejhall,* K7QWR

Touch-Tone devices are ubiquitous in the repeater-control area, and commercial encoders are available from several sources. In the Touch-Tone system, a matrix keyboard is used to select two tones, which are sent simultaneously. Encoders capable of generating either seven or eight different frequencies allow up to 12 or 16 separate codes to be sent. The use of fewer tones also simplifies decoding the signal.

To be compatible with all repeaters and telephone systems, a Touch-Tone signal must be accurate and stable in frequency, and have a nearly sinusoidal waveform. Simpler encoders than the one described here can be built, but they will not provide its high performance.

This encoder features internal voltage regulation, allowing power to be taken from the rig it is used with; there is no need to depend on separate batteries for power. When a tone pair is selected by pressing the keyboard switch, the transmitter is automatically keyed. When the key switch is released, a delay timer keeps the transmitter on long enough for the next tone pair to be selected. It's no longer necessary to hang onto the push-to-talk switch while fumbling with the Touch-Tone pad, and there are no squelch tails between digits. It has a low-impedance audio output which is electronically disconnected from the transmitter audio system when no keyboard switches are pressed. The encoder may be connected to the mic input of transceivers having either high- or low-impedance mic inputs — with negligible loading of the transmitter audio circuitry. The audio frequencies are crystal-controlled, meaning there is no drift.

Theory of Operation

Fig. 1 is a schematic diagram of the

Fig. 1 — Schematic diagram of the K7QWR Touch-Tone encoder. Any properly encoded keyboard may be used with this circuit, but the units specified will plug directly into a row of Molex pins soldered to the circuit board. If the encoder is constructed on a printed-circuit board there should be no difficulties. Should you experience problems, voltage levels at various points in the circuit are included on the schematic diagram.

D1 — 5.1-volt, 400-mW Zener diode, 1N4733, HEP Z0406 or equivalent.

D2 — 20-volt, 1-watt Zener diode, 1N4747, HEP Z0421 or equivalent.

Q1, Q2, Q4 — Silicon npn transistor, 2N4123, HEP S0036 or equivalent.

Q3 — Silicon pnp transistor, 2N4125, HEP S0037 or equivalent.

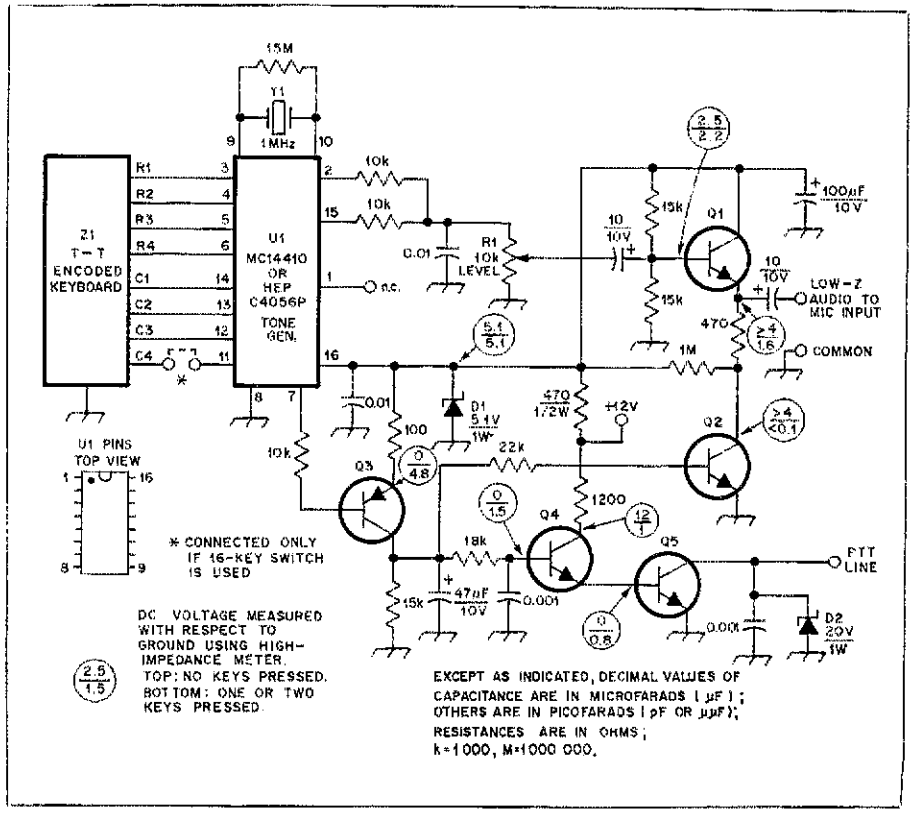
Q5 — Silicon npn transistor, 2N4401, HEP S0015 or equivalent.

R1 — Circuit-board-mounted trimmer potentiometer, 10 kΩ, linear taper.

U1 — Integrated-circuit Touch-Tone encoder, Motorola MC14410 or HEP C4056P.

Y1 — 1-MHz crystal in HC-18/U holder. Frequency tolerance is 0.1 percent; series resistance and load capacitance are typically 540 Ω and 7 pF, respectively. Available from Data Signal, Inc., 2403 Commerce Ln., Albany, GA 31707. Price is approximately $6, plus postage.

Z1 — Touch-Tone encoding keyboard. The circuit-board layout will accommodate Digitran keyboards KL0054 (12-key) or KL0049 (16-key). They are available from distributors in single-lot quantities. For the name of the nearest distributor, contact Bob Privett at Digitran, 855 South Arroyo Pkwy., Pasadena, CA 91105, or call him at 213-449-3110. At the time of this writing, the keyboards cost approximately $6 and $7.50, respectively.



*ARRL Technical Advisor, 4302 East Mulberry Dr., Phoenix, AZ 85018

encoder. Tone generation is performed by U1, a CMOS IC. High-frequency tones from pin 15 are mixed with their low-frequency counterparts from pin 2, and passed through the level control, R1, before reaching emitter follower Q1. Q1 performs an impedance transformation, providing the low-impedance output mentioned previously. Q2, Q4 and Q5 are used as switches. Q2 forces the audio-output impedance high when no keyboard switches are depressed, preventing the encoder from loading the transmitter mic input. Q4 and Q5 are operated as a Darlington pair, keying the transmitter push-to-talk (PTT) line when a keyboard switch is pressed. A single-package Darlington pair was originally used in this application, but its saturated collector voltage was high enough to prevent transmitter keying in some transceivers. Substituting discrete transistors solved the problem.

Q2 and Q4 are driven by Q3, which is turned on by pulses from pin 7 of U1 when a keyboard switch is depressed.

U1 requires a 5-volt supply for proper operation. This is provided by the 470-ohm resistor and 1N4733 Zener diode, D1. With the exception of Q4, the remainder of the encoder circuit was also designed to operate from a 5-volt supply.

The length of time the transmitter remains keyed after a keyboard switch is released is determined by the value of C1, connected to the collector of Q3. On the prototype unit, a value of 25 μF provided a delay of just under one second. If you prefer a longer drop-out time, increase the value of this capacitor. Lowering its value will decrease drop-out time.

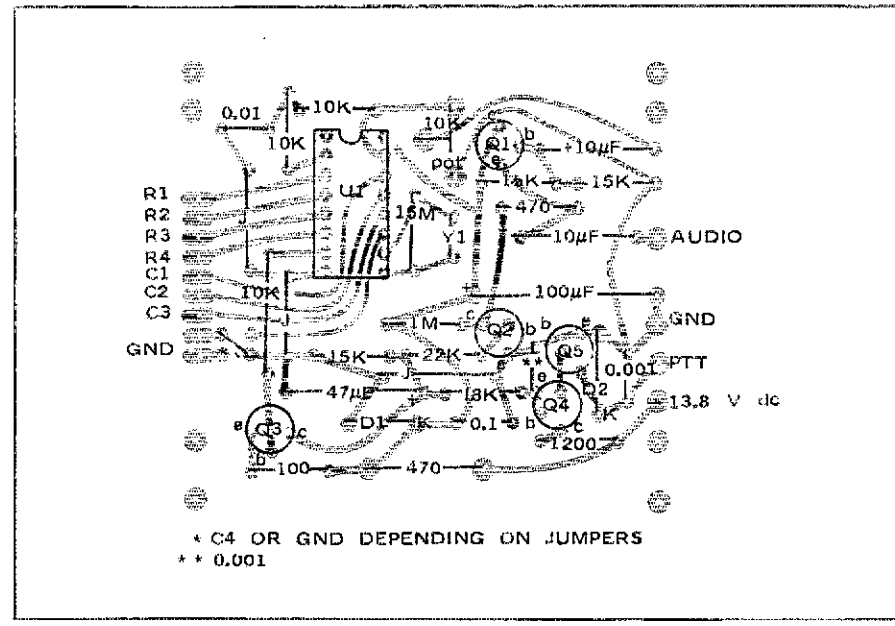


Fig. 2 — If the circuit board is used, this parts overlay will guide you when installing components. A scale-sized template for the circuit board appears in the "Hints and Kinks" section of this issue. Circuit boards are available from Lea Engineering, 1230 E. Loyola Dr., Tempe, AZ 85282, for $5.50 each.

Construction and Testing

I built the prototype on a piece of perforated board, but a pc board is preferable. A board has been designed and is now available. Fig. 2 shows the parts placement for this board; a template appears elsewhere in this issue. U1 should be installed in a socket. The 0.001-μF disk capacitors connected to the base of Q4 and collector of Q5 should be installed as near the transistors as possible. Their function is to bypass rf from the transmitter, which can cause Q4 and Q5 to latch up in the keyed position.

A few simple checks will tell whether the circuit is functioning properly. The following tests may be performed before connecting the encoder to the radio, using only a 12-volt power supply, a high-impedance dc voltmeter, and a scope if one is available.

First ensure that D1 is regulating the encoder supply voltage at +5.1 V dc ±10 percent. U1 may be damaged if more than 6 volts is applied to pin 16.

The two operating states for the encoder are (1) no keyboard buttons depressed and (2) one or more buttons depressed. Connect the 12-V dc supply and measure the voltage at the test points shown on the schematic diagram. Voltages measured should be in accordance with those shown.

If any voltages are incorrect, look for wiring errors. If the collector voltage of Q2 is not at least 4 volts with no buttons pressed, the problem may be a leaky transistor at Q1 or Q2. If a scope is available it may be used to inspect the audio output. Pressing any one button should produce a signal, while depressing any two buttons simultaneously should produce a single tone.

Installation

The electrical portion of the installation simply involves running four wires from the encoder to the transceiver: +12 V, ground, push-to-talk (PTT) and audio output. Shielded audio cable is recommended for the audio output, which is connected to the transceiver mic input. The PTT lead is connected to the hot side of the mic PTT switch. The +12-V and ground leads are self-explanatory. The encoder PTT circuit is designed for rigs with an antenna relay coil which is connected to the +12-V bus and the PTT switch. The latter grounds the cold side of the relay coil during transmit. Assure that your rig has this type of PTT circuit and that the relay coil draws less than 300 mA. I believe all the popular vhf and uhf fm ham rigs have this type of PTT circuit. The mechanical details of the installation are left to the discretion of the reader.

Since the encoder will not load the audio system, it should not be necessary to change the setting of any transmitter mic-level controls. Adjust only R1 in the encoder for proper tone deviation. The prototype unit has provided excellent performance on both a Tempo VHF/One 2-meter rig and a Kenwood TR-8300 uhf rig.

I'd like to thank Lee Walters, W7UXZ, for his helpful suggestions regarding this project.

Strays

I would like to get in touch with . . .

☐ anyone with an owner's manual for a model OBL-1 Cathode Ray Oscillograph. Tom Buckley, WB2TRY, P. O. Box 3086, Long Island City, NY 11103.

BE CAREFUL WITH PR

☐ Amateurs and their equipment are becoming more and more favorable in the public eye — but watch out! According to an item in the Yellow Thunder ARC (WI) *Smoke Signals*, a club member had been a burglary victim. This may not seem so unusual except that a local newspaper had recently published a story about him, with a picture of the gear and even giving the monetary value. The lesson, of course, is that when dealing with public media, downplay the equipment aspect and never state its value.

A 24-Hour-Clock Bonus from the Accu-Memory

The WB4VVF keyer is one of the classics of Amateur Radio. Now for the traffic operator or DX chaser comes the latest update. And it goes hand-in-hand with logging!

By Michael E. Hiehle,* W6RZ

My introduction to the memory keyer came just over a year ago. After using an Accu-Memory Keyer[1] in two Field Day contests, I was determined to build a unit for myself. What luxury it provided! All I have to do now is to use a nimble forefinger to punch the buttons and proceed to log contacts. Literally much hand sending is no longer required since trading the stiff wrist for the calloused finger.

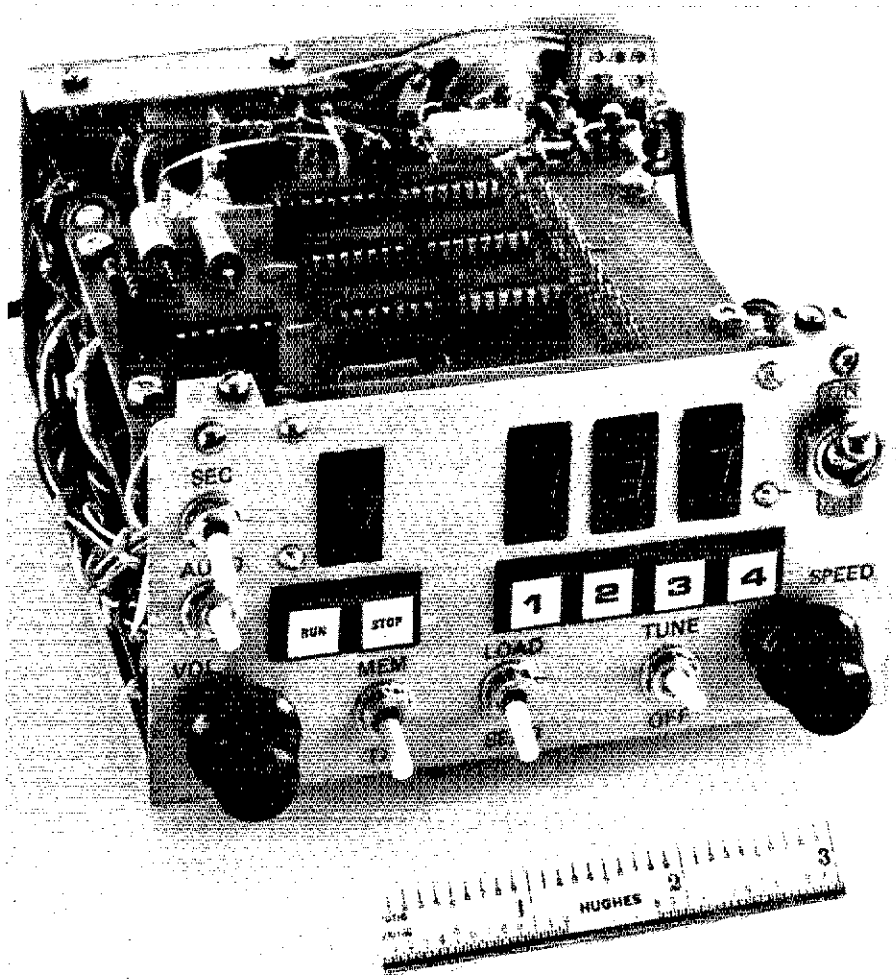
While I relaxed with my new means of enjoyment, watching the LEDs flicker as the ICs cranked out the messages, I sensed a waste — all four of those LEDs just flashing their segments but saying nothing. There must be a better assignment, I reasoned. Reflecting on the matter for a few moments, I asked myself, "How about converting them for use as a 24-hour clock to operate on Zulu time?" In defense of the idea, I rationalized that, after all, such a clock would go hand-in-hand with logging.

Dual Operation Requirements

As I settled down at the trestle board to draw up a set of requirements, these objectives became the guidelines. The 24-hour clock would be continuously running, offering a choice of clock or memory storage display. Switching to the clock display should not cause loss of the memory and switching to the memory should not interrupt the clock. A further provision would allow all power to be turned off except to the clock and the display when the station is not being operated. Additionally, the design should be simple enough that a high degree of technical and manual skill would not be required for construction. The changes to the basic Accu-Memory circuit should be minimal and easy to make.

The Accu-Memory supplies most of what is needed to operate the display. The addition of one clock chip, two push buttons, three resistors, one small capacitor, five diodes, two switches, plus considerable interconnection wiring, will provide the dual capacity. Depending upon an existing supply, one may have to add a negative 6- to 15-volt source capable of handling 2 mA.

While the clock can be constructed from scratch with IC dividers, gates, decoders and buffers,[2] a single clock IC, priced under $5, will save time, trouble, power and probably money. The Fairchild



This version of the Accu-Memory Keyer contains a 24-hour clock and offers the choice of either the clock display or memory-storage display.

*10719 Esterina Way, Culver City, CA 90230
[1]References appear on page 29.

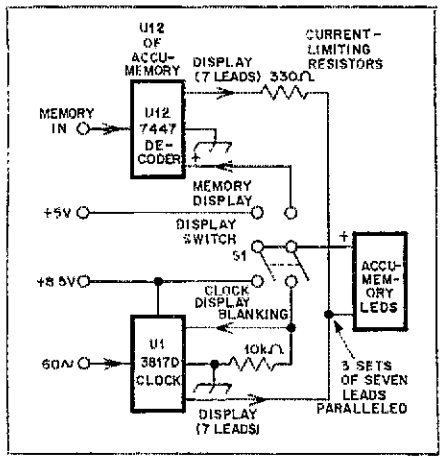


Fig. 1 — The basic LED multiplexing system. For simplicity, only a single LED is shown. The 7447 (U12) at the upper left is in the memory circuit. S1 switches the display from memory to clock and vice versa. U1 is a Fairchild 3817D clock.

3817D clock IC,[1] a dual in-line 40-pin package, uses the ac line frequency (50 or 60 Hz) for the timing base.

Multiplexing

A simple method of multiplexing, as shown in Fig. 1, avoids switching the 28 leads to the LEDs mechanically, which would be too complex. Initially, diode isolation in each of the four sets of seven leads to the LEDs seemed necessary. However, experience proved that complete isolation is not essential.

Incidentally, some clock ICs have a sequential timing scheme so that the display output uses only seven leads to the LEDs rather than 28. While at first the seven-lead clock IC may seem easier to use, there are two problems involved. First, the Accu-Memory is a parallel-output operation as compared to the time-sequential clock output. Second, the time multiplex switching of the device can cause noise that affects a receiver if the IC is not carefully shielded and isolated.

Multiplexing is accomplished for the clock display by removing the +5 volts from the 7447 decoder/drivers in the Accu-Memory. For memory display, the clock IC blanking circuit is activated. Paralleling the seven-segment leads of each LED by the clock and memory outputs becomes practical without other isolation. This method also allows the memory to function independently of the clock operation. It may be loaded, or one may send with the clock display on. Using the clock blanking for display cut-off is necessary to permit the clock to keep running, since no positive leads are brought out for the clock display drivers. Although blanking is available on the 7447 driver ICs, changing the circuit board to isolate the necessary control pins would be too difficult.

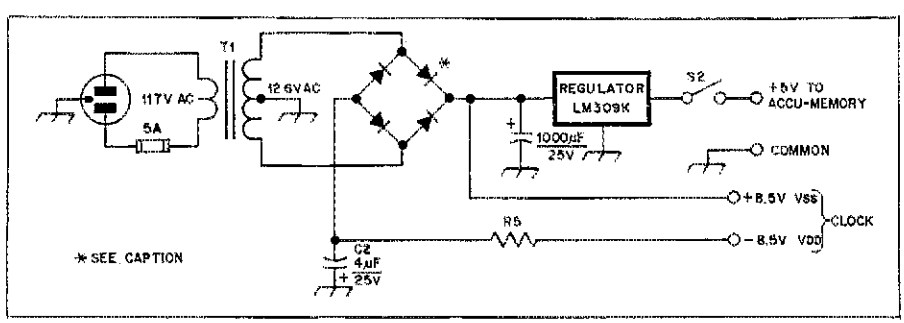
Some diode isolation is required for the clock circuitry. Clock ICs cleverly reduce the number of pins required by paralleling certain LED segments (five segments are activated by outputs from two pins). A total of five isolating diodes are therefore required. These can be a low-current signal type. (For simplicity these are not shown in Fig. 1.)

Power Supply Requirements

The clock IC, depending on the type, requires a minimum of seven to eight volts (unregulated) to operate. Since the Accu-Memory operates at +5 volts, this is less than the minimum requirement. For my unit, I have an 8-volt supply with full-wave rectification. Under load it provides 8.5 volts at the input of the 5-volt regulator. The unregulated 8.5 volts to drive the clock is sufficient, but the light output of the LEDs is marginal. Although operating at only +5 volts, the 7447 drivers in the Accu-Memory require the use of 330-ohm current-limiting resistors in the leads to the LEDs. Even so, the illumination from the LEDs seems adequate.

Either of two methods may be used to increase the output in the clock mode. One might choose an unregulated +15- to +20-volt power supply capable of handling 700 mA (12.6 V with bridge rectifier). Or another choice would be an auxiliary power supply of −6 to −8 volts at 2 mA.

Fig. 2 — A typical regulated power supply system. Other power supply arrangements may be used. S2 is a Radio Shack subminiature spst switch. R5 is approximately 3300 ohms, 1/4 watt but will depend on the individual power supply rating. The diode rectifiers should be rated at 50 PIV, 3 A. T1 is a Radio Shack filament transformer, no. 273-1505 or equivalent.



A suitable power supply is illustrated in Fig. 2. I should point out that initially I tried a half-wave voltage doubler for supplying the Accu-Memory, but the ripple voltage was too high under load. Ripple voltage is not tolerated by the Accu-Memory.

LED devices are quite sensitive to applied voltages. Thus, depending on the voltage output of the power supply, a considerable difference in LED intensity can occur between the memory display and the clock display. Furthermore, when switching off the memory upon shutting down the station, a third level of intensity occurs because of the change in voltage from the unregulated power supply. The circuit in Fig. 2 provides independent intensity control through R5. Values in the parts list are for my power supply. For other power supplies, some adjustment of values may be necessary depending upon the power transformer and filter capacitance. The values, however, are not critical.

Circuitry

For convenience all the added clock circuitry has been placed on a single board. Fig. 3 shows the overall schematic diagram. This consists essentially of the added clock board and control switches.

The 28 LED output leads (4 sets of 7) from the clock IC must be paralleled with the 28 LED output connections from the memory board and driver board and the 28 leads extended to the readout board. This is a total of 84 wires in one small area which gets a little hairy (wirey?). I chose to minimize the changes to the existing Accu-Memory boards. Therefore terminals are provided on the new clock board for tie-ins. Also, as previously mentioned, the outputs of the 7447 ICs require series current limiting with 330-ohm resistors. Paralleling of leads must occur after the series resistors. This poses no problem for the 21 leads from the driver board which includes these resistors. However, the 7447 located on the memory board is connected to series resistors located on the readout board.

Either paralleling for the message-number LED must occur on the readout board (rather messy) or the resistors should be relocated. By removing them from the readout board and relocating them on the clock board, all paralleling can be done on the clock board.

Optionals

Some optional features have been included. The decimal point on the center significant digit (CSD) LED can be used to demark between hours and minutes on the clock display. One additional resistor (R4) and a Zener diode (D1) are required for this addition. (Refer to Fig. 3.)

The clock IC provides other modes of operation besides the 24-hour, four-digit display. I added S3, an spst switch, to per-

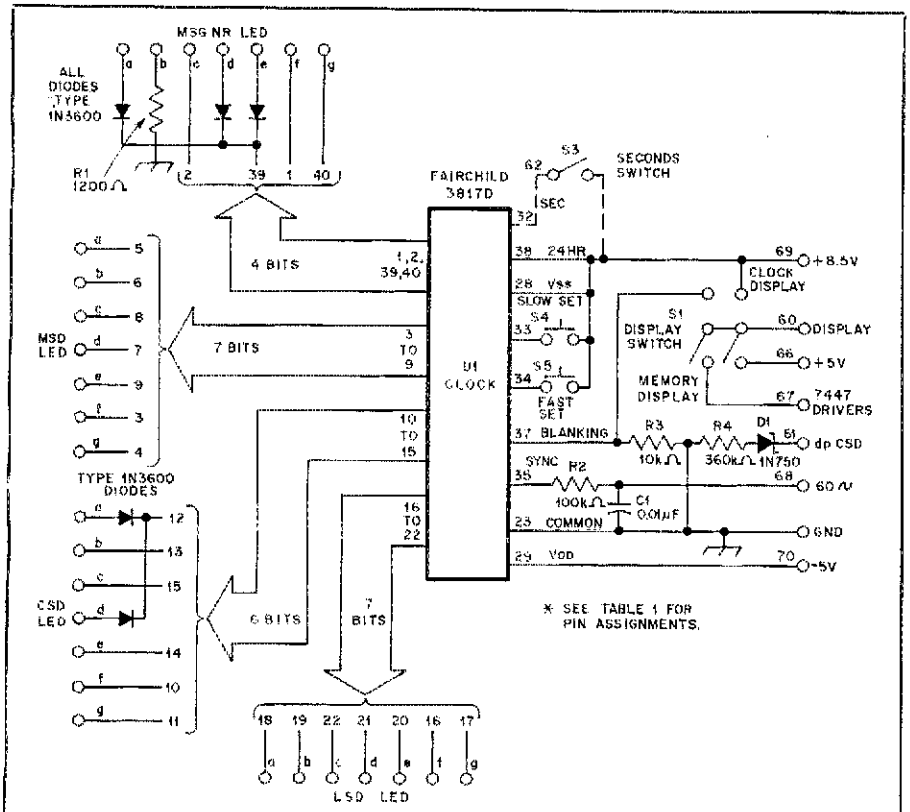


Fig. 3 — A simplified diagram of the clock board and controls is shown above. Letters refer to LED segments. Numbers that are not pin identifications refer to cable wiring. MSD = most significant digit, CSD = center significant digit and LSD = least significant digit. Resistors are 1/4 watt.

R4 — See text.

S1 — Subminiature dpdt switch, Radio Shack no. 275-614 or equiv.

S2, S3 — Subminiature spst switch, Radio Shack no. 275-612 or equiv.

S4, S5 — Push-button switch, normally open, Radio Shack no. 275-1547 or equiv.

U1 — Clock IC, Fairchild no. 3817A, Electronics Arrays Inc. no. EA5316 (obtainable from the Ancrona Corp., Box 2208, Culver City, CA 90230) or equiv.

U1 Pin Identification

Pin no.	*Function*		*Pin no.*	*Function*	
1	AM		18	LSD LED Seg.	a
2	Hrs. × 10		19	LSD LED Seg.	b
3	MSD LED Seg.	f	20	LSD LED Seg.	e
4	MSD LED Seg.	g	21	LSD LED Seg.	d
5	MSD LED Seg.	a	22	LSD LED Seg.	c
6	MSD LED Seg.	b	23	Dr. Comm.	
7	MSD LED Seg.	d	28	V_{ss}	
8	MSD LED Seg.	c	29	V_{dd}	
9	MSD LED Seg.	e	32	Sec.	
10	CSD LED Seg.	f	33	Slow Set	
11	CSD LED Seg.	g	34	Fast Set	
12	CSD LED Seg.	a,d	35	50/60 Hz	
13	CSD LED Seg.	b	37	Blank	
14	CSD LED Seg.	e	38	PM	
15	CSD LED Seg.	c	39	1 Hz	
16	LSD LED Seg.	f	40	PM	
17	LSD LED Seg.	g			

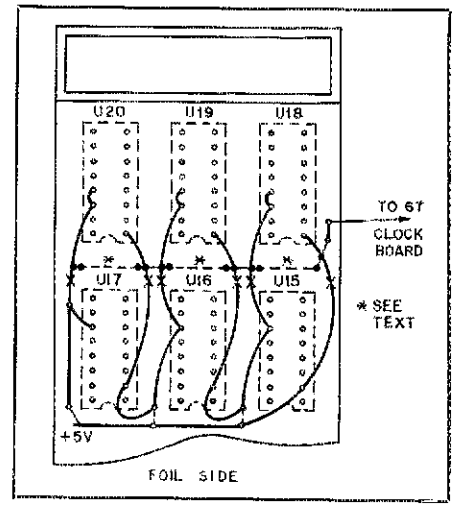


Fig. 4 — Wiring modifications for the Accu-Memory driver board. Connections are opened at the points marked X.

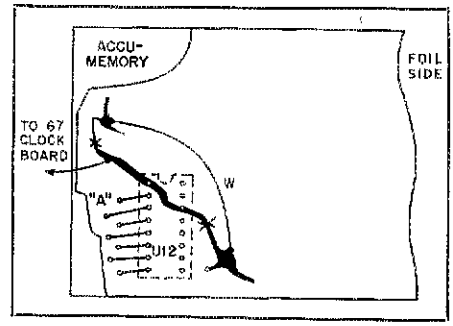


Fig. 5 — Changes to be made in the memory-board wiring of the Accu-Memory. Cut the leads at the X marks. Insert jumper wire W.

mit having a "seconds" display. Closing the switch when in the clock display mode provides a "minutes" (MSD) and "seconds" (CSD and LSD) display. The clock can be set to the second if desired. Detailed information about setting the clock may be found in the specification sheet for the clock IC. Push buttons should be used for the fast and slow set rather than a center-off toggle type switch since simultaneously depressing both push buttons is required to set the clock.

Other modes available from the clock IC are a 24-hour alarm that can be used to turn one's station on a half hour before arising to work early-hour DX, and a turn-off mode. This arrangement is adjustable to one hour (serving as a reminder to get back and make peace with your XYL!). To take advantage of these features, only slight additions are required.

Accu-Memory Modifications

The following changes are required for the modification of the Accu-Memory board. Unless indicated otherwise, numbers refer to terminals on the clock board. See Fig. 3. For reworking solder joints, the use of solder wick to remove solder is strongly recommended.

Readout Board Modification Instructions

1) Disconnect all four 7-wire inputs to board. Label first. These will go to the clock board.

2) Remove the seven resistors in leads "a" through "g" to "MSG NR" LED. These are the seven outside resistors. Leave the decimal-point or dp (center) resistor. Replace resistors with wire jumpers. Alternatively, if this is too much trouble, just short them with wire and buy replacements for use on the clock board.

3) Disconnect the +5-volt lead. Replace with a lead going to terminal 60.

4) Since more than +5 V appears on lead 60 in the clock display mode, it is necessary to provide +5 V to the stop button. Cut the +5-V foil circuitry to the stop button (not lead 19). Resolder the above removed lead to the push button.

5) Connect a wire to pin 6 of the CSD LED. This wire goes to terminal 61 and provides a decimal point between hours and minutes in the clock mode.

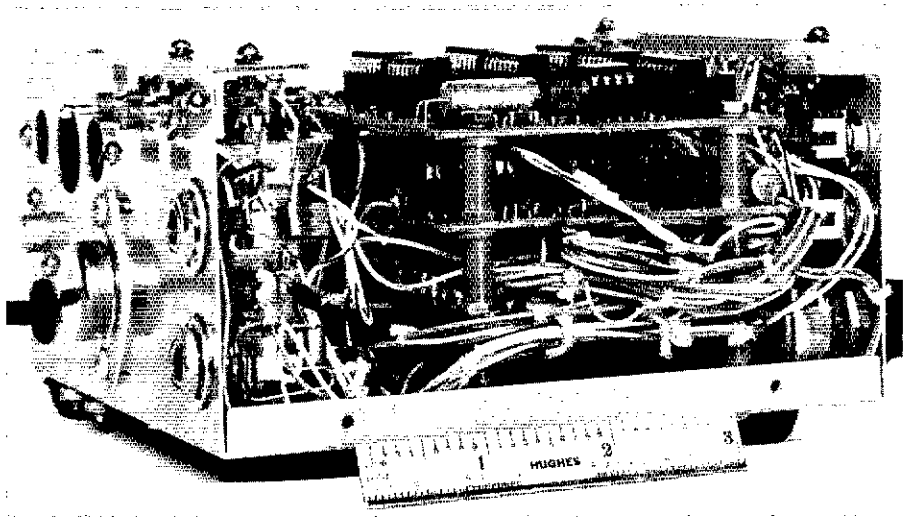


Fig. 6 — The inside of the W6RZ Accu-Memory/Clock keyer. Note the cabling and how the boards are stacked one above the other. S4 and S5 may be seen on the rear panel. The rule indicates the compactness of the unit.

6) Connect four new sets of 7 wires to the readout board. These will go to the clock board. Label them or color code them.

Driver Board Changes

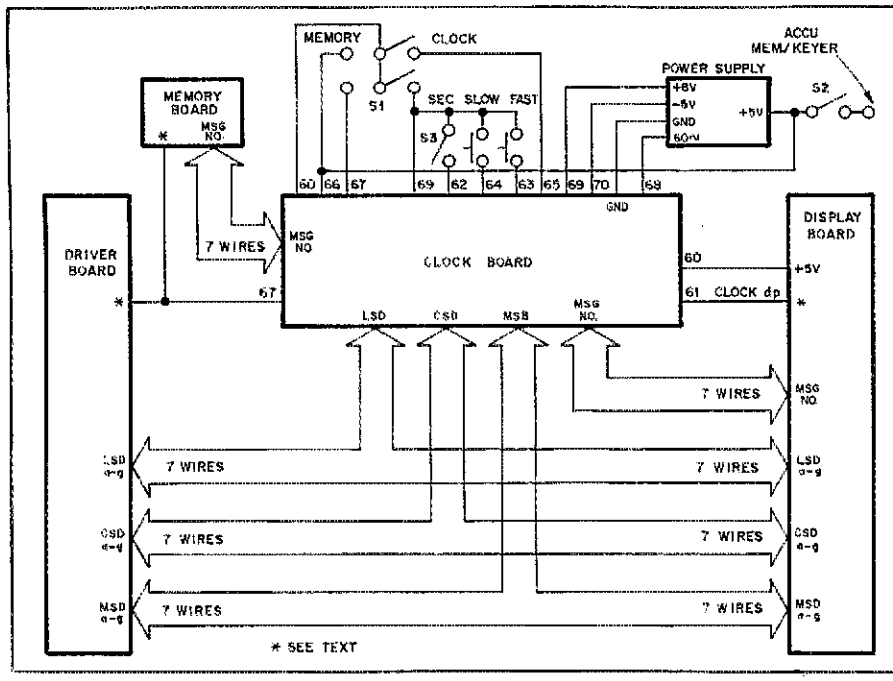
Cut the foil circuitry on the board at six places marked by an "X" in Fig. 4. Drill small holes (I used a no. 66 drill) adjacent to the foil as shown by the solid circles. Solder in jumper wires tying the six strips together. The dotted portion of the jumper is on the component side the board. The jumper wires must be insulated where they cross the foil strips. Run a lead from the jumper wire to terminal 17. Since I had not used the two-hole tie-point for the speaker, I used holes for this lead.

Modification of the Memory Board

1) Cut the foil circuitry on the board at two places as marked by an "X" in Fig. 5. Drill two small holes adjacent to the foil as shown by the circles. Solder a jumper wire "W" on the foil side of the board as indicated. Solder a lead to the isolated strip at "A" and connect to terminal 67.

2) The dp/run wire (no. 13) from the display originally was connected to pin 10 of U4A. This must be changed to U3B, pin 12. The reason: When keying with the clock display on, the first dot of the sending sequence was long. This occurs because pin 10 of U4A is connected to the keyer clock which is voltage sensitive. In the clock mode, unregulated power is used on the LED which, via wire no. 13, feeds back to the clock. The change isolates this voltage through U3B and U4A.

Fig. 7 — The interconnections for adding the clock circuit to the Accu-Memory. Numbers 60 through 70 have been assigned for the new wires associated with the clock modification.



Construction

The entire clock circuitry in my unit is built on a single Vectorbord having the same size as the keyer board (3-3/4 × 2-7/16 inches or 95 × 62 mm). Because I was experimenting with the circuit, I used point-to-point wiring. One could easily design an etched circuit board that would simplify construction. The enclosure contains the keyer, memory, clock and power supply. The overall dimensions are only 2-3/4 × 5-1/8 × 5-1/2 inches (70 × 130 × 140 mm) including the speaker. It is so compactly constructed that a miniature shoe horn is required to tuck it all in! Actually, the basic restriction is the limited panel space which must accommodate all the controls even though subminiature switches are used. Clearance between boards is only 1/16 inch (1.6 mm). If I had to do it over, I would definitely build it in a large breadbox. I must admit that it is difficult to service.

Fig. 6 exhibits the packaging. The power supplies are located at the rear of the unit. On the back panel are located the least-used switches. These include the Accu-Memory/Keyer power switch, straight-key jack, keyer-paddle jack, output jack, clock-reset push buttons and speaker. The regulator (I use the heavier duty LM323K rather than the LM309K originally specified) is also mounted on the rear panel, which acts as a heat sink. Use of thermal grease provides a good heat path and the regulator runs reasonably cool despite the thickness of the case (1/32 inch or 0.8 mm). Two terminal boards accommodate the small resistors, capacitors and diodes associated with the power supply. Interconnection wiring is point to point.

The four circuit boards are stacked one above the other (see Fig. 6) with spacers to control the distance between boards. Thin insulating washers will prevent metallic spacers from shorting to the foil. In order, from the bottom, are the keyer, clock, memory and driver boards. Since the two smaller boards are located at the bottom of the stack, this leaves room for a fuse block (no room on the back panel), the auxiliary power supply transformer and tone control under the two larger boards. Access to the slotted-head tone control is through a side hole in the U-shaped cover.

Because much wiring is needed to interconnect the boards, the following procedure did much to avoid confusion and errors. After completing individual board construction, each was laid out horizontally on the bench, alternating foil sides up. The interconnection wires were then soldered to the boards. I chose color

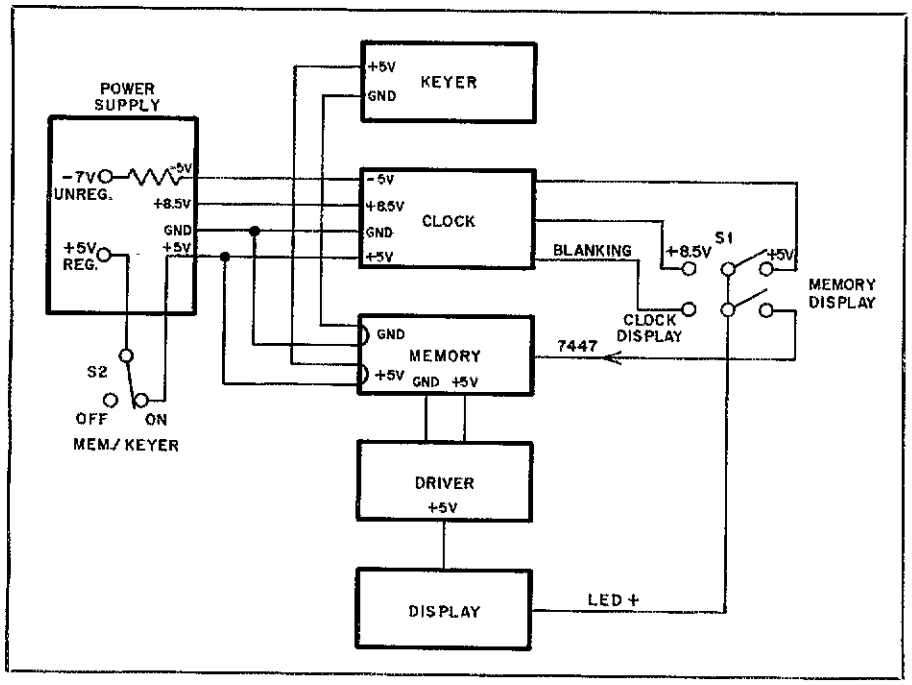


Fig. 8 — Power connections for the modified Accu-Memory.

coding instead of numbered tags for wire identification, and identification is a *must* for the project. Common leads such as grounds, +5 V, +8.5 V, to name a few, have consistent coding. Points where wires are soldered to the boards are touched with a cone-shaped dab of epoxy. When cables are flexed, the epoxy minimizes wire breakage. As each cable was completed, the wiring was harnessed and dressed off one corner of the board.

Because the boards were arranged alternately with foil side up, they could be folded in an accordion-like manner for installation in the box. Good advice for builders is don't stint on cable length. Refer to Fig. 6 for the cable layout in the box. Interconnecting wires should be stranded and no larger than no. 26 for flexibility.

Interconnections for the board and power supply are shown in Figs. 7 and 8, respectively. Numbers 60 through 70 have been assigned for the new wires associated with the clock modification. Seventy-two terminals were pressed into the board for external connections. This number may be reduced if multiple connections are made to single terminals. However, this was not considered desirable. An additional 23 terminals were used to mount components on the board. If an etched circuit board is fabricated, none of these terminals are required.

As a highly practical convenience I installed a socket for the clock IC. How I'd hate to unsolder 40 pins if the 3817 blows! A miniature dual in-line package (DIP) switch is also located on the clock board and wired to permit activating the various clock modes. This is done for convenience during testing of the board prior to complete wiring of the keyer-memory-clock assembly.

To date, the only failure has been the output keyer transistor. By Murphy's Law, it was located on the bottom board of the stack, requiring complete disassembly to replace — a messy job because of the unit size. Miniaturization is not everything it is touted to be.

The addition of the clock to your Accu-Memory adds a very simple method of checking your keyer speed. Merely throw the memory load switch to the LOAD position and push an appropriate storage button. Then switch the memory time switch to TIME position and the display switch to SECONDS. Hold the paddle on either dots or dashes for exactly 12 seconds. The display will then show wpm × 10. To be absolutely accurate, one should subtract 7 from the count before dividing by 10, but this typically is neglected.

Future Plans and Recommended Changes

Several changes are planned for the future. Since many stored messages are used over and over again, a problem occurs when the power is turned off, for the message is then lost. This requires reintroduction of the message when one wishes to use it again. Alternatively, the power could be left on but because the power consumption is considerable, the heat dissipation poses a potential loss of reliability. Rather simple changes to the +5-V bus can be made wherein storage is maintained, but power consumption is greatly reduced during the off period. An alternative is the use of CMOS ICs.[4]

Another change that I believe is desirable is the individual control of dot, dash and space lengths rather than the perfect 1:3:7 dot/dash/word-space ratios that are designed into the circuit. Under certain marginal conditions of transmission, heavier dots help to provide Q5 copy. Likewise, there is evidence that one's ability to copy at slow speeds is improved when the individual characters being received are sent at a high speed, even though the spacing between characters is lengthened. QST

References

[1]Garrett and Contini, "The Accu-Memory," *QST*, August 1975.
[2]"Digital Alarm Clock Circuit," publication no. EA5316, Electronic Arrays, Inc., 550 East Middlefield Rd., Mountain View, CA 94043.
[3]"Digital Alarm Clock," Specification Sheet 3817A/3817D, Fairchild Semiconductors, Inc.
[4]Hinkle, "Accu-Keyer for QRP Operation," *QST*, January 1976.

Feedback

☐ A couple of errors appeared in "A 20-Meter, VXO-Controlled, 6-Watt Transmitter" (December 1978 *QST*, page 11). On page 12, capacitors C3 and C4 listed in the Fig. 1 caption and mentioned in the first column of text should be C17 and C18, respectively. Also in Fig. 1, S2 should have been marked S1, while S1A, B and C are actually S2A, B and C, respectively.

☐ Some call-sign prefixes in December 1978 *QST* were listed incorrectly. Pete Matthews, Southwestern Division vice director, is WB6UIA (page 48), and guitarist Alvino Rey is W6UK (page 85).

☐ Dr. Andrew Peterson, N4EN/W1ZJJ, is alive and well in North Carolina. He had been erroneously reported as a Silent Key in "A Different Kind of Courage" (October 1978 *QST*, page 43).

☐ An item in "Three Feet of Rain" (December *QST*, page 55) that had given W5KR as the source should instead be credited to K5RZD.

☐ UTC actually stands for Coordinated Universal Time ("UTC: The 'Right-On' Time," November 1978 *QST*, page 52). The abbreviation UTC is taken from the French, *Universelle Temps Coordinaté*.

A Noise Blanker for the Collins S/Line

What to do when your station is near a 66,000-volt power line that rips reception apart with noise? K6CUF took a tip from QST that paid off. He found a solution that slaughtered the interference!

By Doc Lask,* K6CUF

Over the years the Collins S/Line equipment at my station has performed very well. That I have not changed brands is indicative of my devotion to it. What nearly caused this splendid gear to be relegated to packing boxes in the attic was not a fault of the equipment, but rather the upsetting QRN emanating from a 66,000-volt transmission line constructed close to my radio shack.

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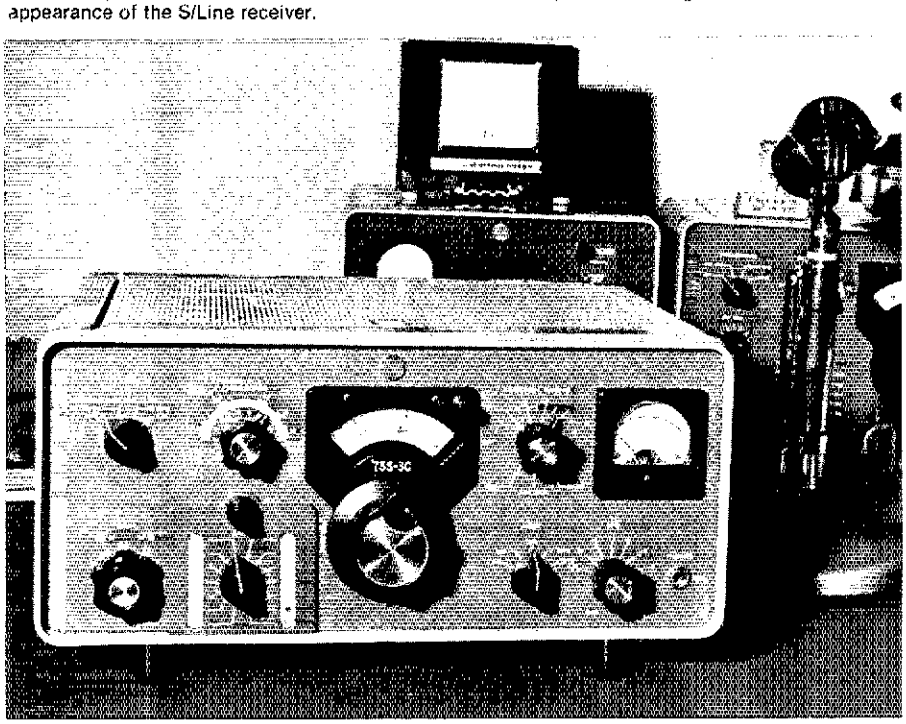
Troubleshooters from the Edison Power Company, who were most cooperative, were not successful in solving the interference problem. The noise, apparent on all my favorite bands, continued relentlessly. Reception was destroyed. After waiting patiently through months for an end to the difficulty, I eventually reached a point of utter dismay. Indeed only the powers of diety seemed capable of invoking a cure.

Then, almost as an answer to a prayer, an exciting article by Henry Frankel, WB2DQP, entitled "A New-Look Noise Blanker That Works," appeared in January 1977 *QST*. My thoughts became glued to his intriguing idea that led me to believe the Heathkit SBA-104-1 noise blanker could be adapted to my Collins S/Line. I immediately placed a long-distance phone call to Mr. Frankel in New York. He patiently listened to my cause, responding with encouragement and an offer to furnish the diagram of his more recent modification, providing a variable threshold control for the blanker. I then turned to my very good friend, Don Button, W6ZSI, a fellow townsman and electronic engineer, for his expertise. His willingness to assist with the project removed any doubt in my mind that the adaptation would be successful.

This Collins 75S-3C at K6CUF, located in the shadow of a severe noise-producing 66,000-volt transmission line, has a new lease on life with the installation of the Heath SBA-104-1 noise limiter adapted to the Collins i-f circuit. The modification requires no change in the external appearance of the S/Line receiver.



Modifying the Noise Blanker

The block diagram in Fig. 1 illustrates the general arrangement of how the noise blanker is tied into the Collins 75S-3C. A photographic view of the underside of the set illustrates how the noise blanker is mounted.

Would or would not the i-f of the blanker and the Collins be compatible? We needed an answer to that at the very beginning. With the aid of a signal generator and a Tektronix 514 oscilloscope we found that the Heath i-f peaked at 3300 kHz. By padding L3 and L4 on the blanker with 36-pF capacitance, we were able to move the i-f of the blanker to 3055 kHz (the center frequency for the Collins first i-f stage). An observed 2- to 3-dB drop in signal strength at 2955 and 3155 kHz did not disturb us. That is an acceptable amount. For those amateurs who do not have a scope, the use of a capacitor, 30 to 40 pF in value, will pad the circuit sufficiently well.

One compromise became necessary. After the Heathkit blanker i-f was moved to 3055 kHz, the gain turned out to be less

than unity. This was not acceptable. To correct the loss, R3, a 33-ohm resistor, was removed from the blanker. This enabled us, by proper adjustment of R15, to restore unity gain at the Collins intermediate frequency. A reference level should be established on the incoming signal before the blanker can be properly set for correct gain.

Our procedure for accomplishing the correct gain setting was to allow the receiver to warm up for 15 minutes. We then placed the receive frequency at 21.3 MHz with the crystal calibrator turned on, taking note of the S-meter reading. (I wish to mention that this same procedure is repeated after the blanker is fully installed.) R15 is adjusted for an S-meter reading equivalent to the original indication. This process has been well described in Mr. Frankel's article, which includes information on tune-up procedure. Amateurs planning to install and adjust the blanker in Collins S/Line equipment are advised to connect a 50-ohm dummy load to the antenna terminals of the receiver in place of the antenna. If no load is available, the antenna should be disconnected from the receiver. And, as Mr. Frankel points out in his article, the blanker does not have to be turned on when setting R15 for unity gain.

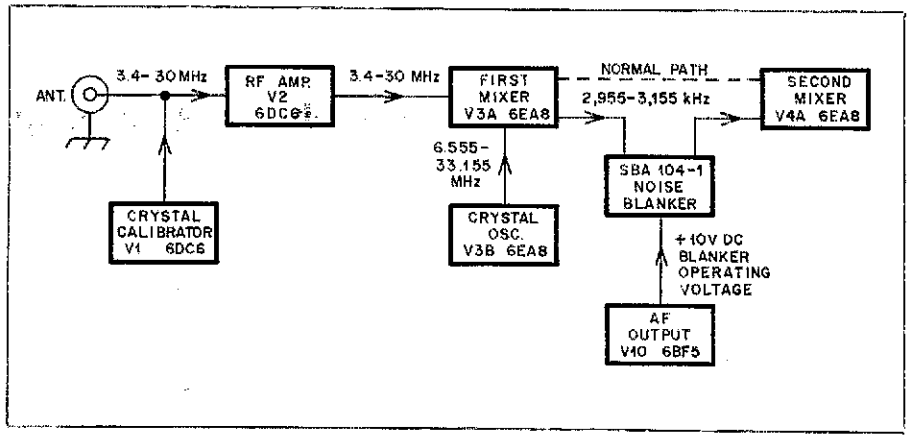


Fig. 1 — This block diagram of a portion of the Collins 75S-3C illustrates the point of insertion of the SBA-104-1 noise blanker. The broken line between the first and second mixer represents the normal rf path, while the route by way of the blanker is shown immediately below.

Preliminary Checkout

In order to better understand the steps taken to install the blanker, refer to Fig. 2A, which shows the original 75S-3 input to the second mixer. Fig. 2B shows that C157 has been reconnected through the noise blanker (pin 5), and out of the noise blanker (pin 1) back to the junction of R8, R27 and C157. For wiring we used slender RG-174/U cable, but other types of shielded cable or wire should be equally satisfactory. The leads, however, should be kept short.

Fig. 3 illustrates the pin connections for the blanker. Note the connection from pin 6 to the arm of the variable-threshold-control potentiometer. This control may be either 5000 or 10,000 ohms. When the potentiometer is turned to the minimum level (no resistance), the blanker is placed in full operation. Maximum resistance shuts the blanker off. By careful manipulation of this control, the proper amount of blanking may be obtained with a minimum of intermodulation. This threshold regulator is a modification that was described in Mr. Frankel's article, "Updating the Noise Blanker," which appeared in August 1977 *QST*.

For the preliminary checkout, an external power supply furnished the needed 10 volts. The blanker drew from 30 to 35 mA from this source. Because the audio-output tube is rated at this current, we lifted the audio-output tube cathode lead from ground, connecting the cathode directly to a 10-volt Zener diode and through the blanker, as shown in Fig. 4.

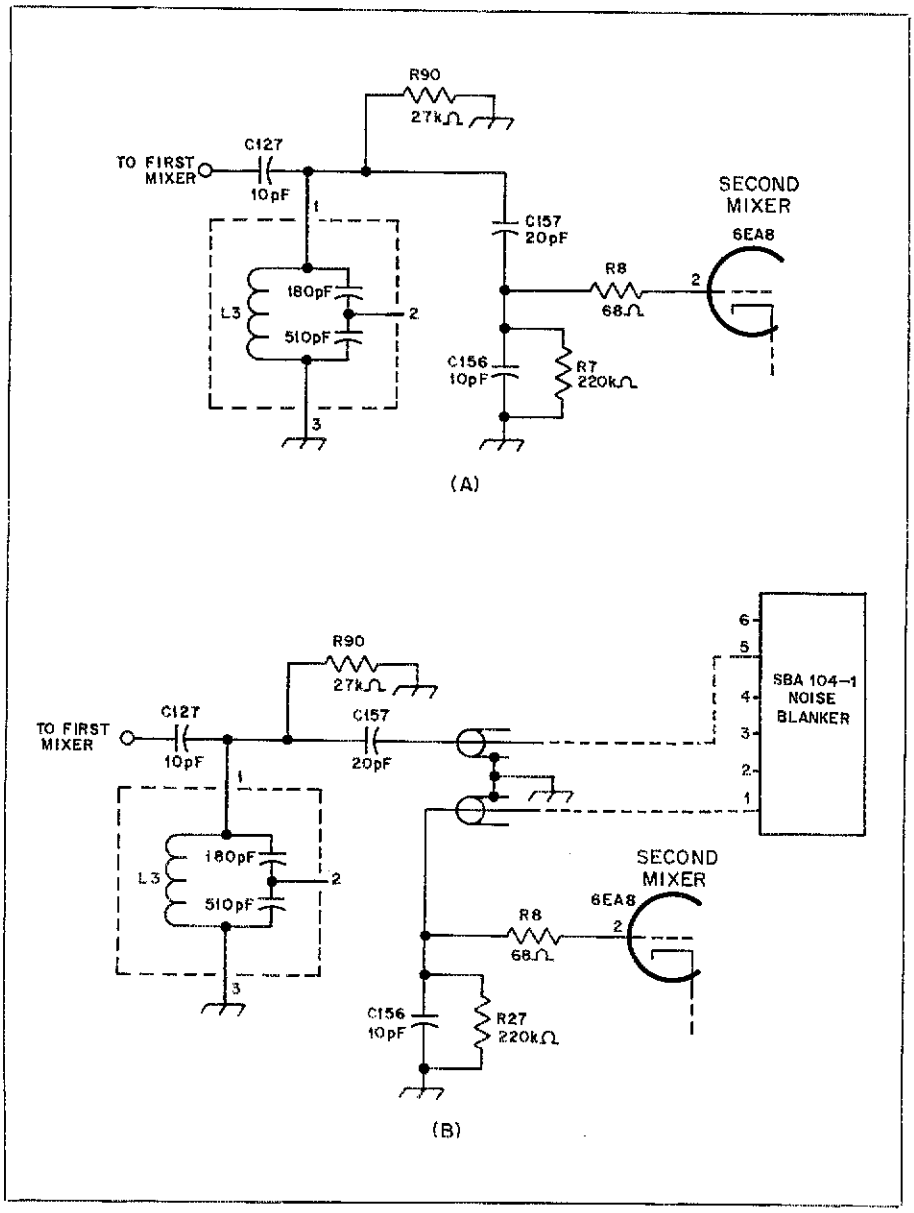
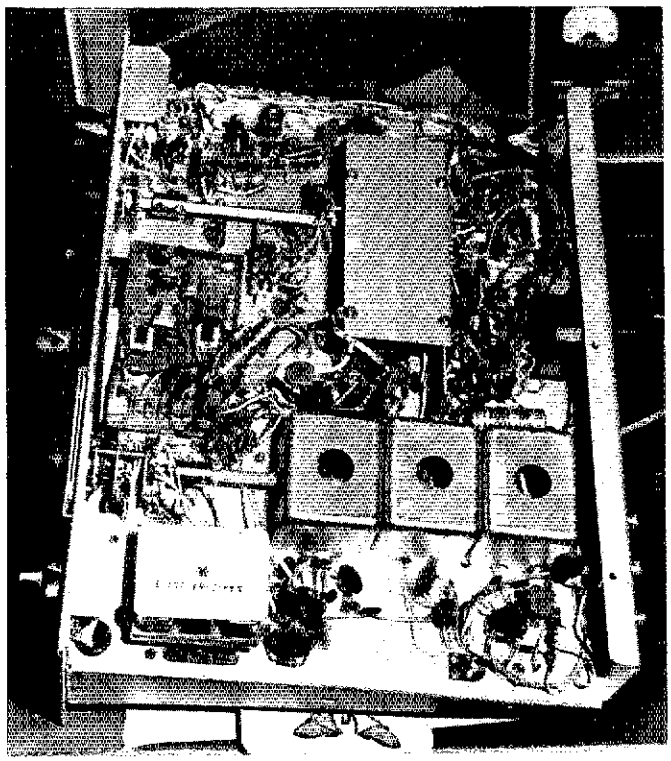
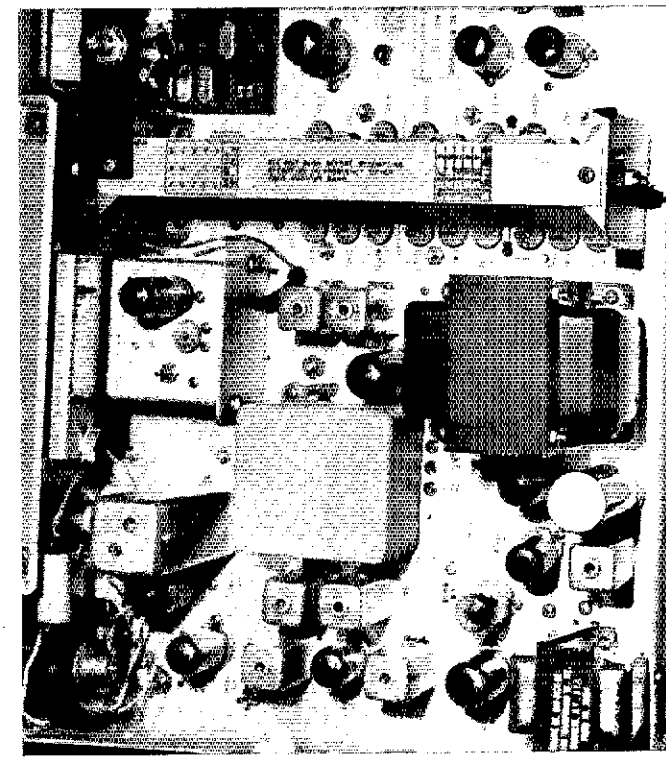


Fig. 2 — The original 75S-3C coupling circuit to the second mixer is shown in drawing A. B illustrates the connections for inserting the noise blanker. Terminals 1 and 5 are on the SBA-104-1 board.





The photograph at the left shows how the SBA-104-1 noise blanker is held in place on the underside of the S/Line receiver by means of two mounting screws. One corner of the blanker circuit board must be trimmed to fit. The photograph at the right depicts how the variable-threshold control is mounted on the preselector arm of the 75S-3C. The potentiometer is visible at the upper left.

Observe that R35 is disconnected from the bias divider of the Collins S/Line and is connected to ground. This change increased the idling current of the 6BF5 which in turn brought up the voltage to the necessary 10 volts with the proper current (see Fig. 4).

Installation of the Blanker

There is sufficient space for the blanker beneath the PTO in the Collins. There is not enough room in this area under the chassis to install the connector board. One corner of the blanker board is trimmed off. The fit is rather tight. Two mounting screws will hold the board flatly in place. Connections are soldered directly to pins on the board.

The control potentiometer for the variable threshold is mounted on a small, homemade aluminum bracket that is attached to the preselector frame.

Fig. 3 — Pin connections for the SBA-104-1 noise blanker. Resistance value of the threshold control may be either 5000 or 10,000 ohms. A minimum amount of intermodulation with proper blanking can be obtained by careful adjustment of the threshold potentiometer.

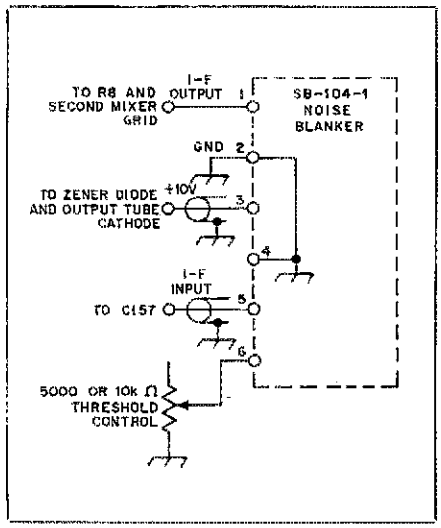
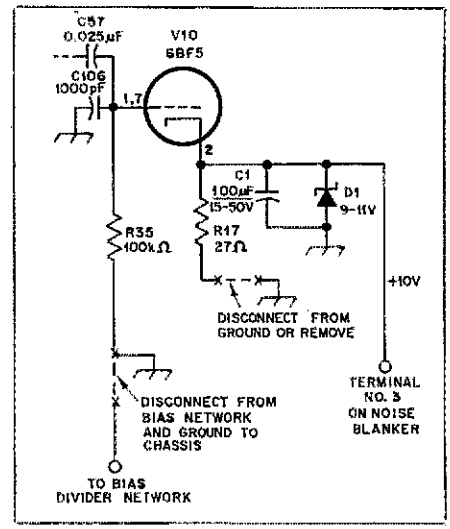


Fig. 4 — Modification of the 75S-3C audio outut stage for powering the noise blanker. R35 is disconnected from the bias network and then connected directly to ground as shown. R17 may be removed or simply disconnected from ground.



Testing the Blanker

After the blanker is installed, the gain is once more set for unity as mentioned earlier. Choosing the noisiest band for the remainder of the check is suggested. We found that on the 10-, 15- and 20-meter bands, the blanker potentiometer would be advanced fully most of the time with very little intermod. On 40 and 80 meters, where signals were stronger, we found that the intermodulation increased. By varying the threshold for lower resistance, this problem was eliminated. There was little need, anyway, for using the blanker with loud signals.

Having the blanker in operation at my station is most rewarding. With 20- to 30-dB noise blanking on 10, 15 and 20 meters, the power-line noise that plagued me for years is now under control and I'm hearing weak DX stations that otherwise would not make it through the line interference. I strongly urge anyone with a Collins S/Line to adapt this blanker to his or her receiver. Those who do will find the performance equal or better than some newer receivers that may be considered the last word in the present state of the art.

The technical drawings for this article were prepared by Don Button, W6ZSL. Fred Brown wired the blanker and the photographs were taken by Overlade, Lancaster, CA.

A 40-Meter Midget

Do you feel that 40-meter DXing is only for those with elaborate antenna systems? Here's an antenna that not only works well, but isn't much bigger than a 20-meter dipole.

By Roy Lehner,* WA2SON

Wanting a good crack at the 40-meter segment of my 5-band DXCC award, I was faced with several alternatives: erecting a monstrous array with 66-foot elements, "planting" a vertical with radials extending into both my neighbors' yards, or reverting back to an inverted V which never seemed to have the punch to get through when things got tough. I wanted an antenna which would prove worthwhile during daylight hours for an occasional ragchew and exhibit some directivity when receiving. After I dug through countless articles, it became apparent that some sort of compromise would have to be made lest I end up undertaking a full-time antenna-rigging chore!

The final plan was to build a shortened single-element rotatable dipole and mount it as high and as much in the clear as possible. Electrically, this seemed to be what I was looking for. By shortening the antenna I would not have to worry about overloading my tower or rotator — or about ruining a friendly rapport with the neighbors.

Theoretically, a shortened half-wave dipole is not as efficient as the full-size version. From a practical standpoint, however, the difference is minimal so long as care is exercised in construction. The most noticeable effect will be a slight decrease in bandwidth, but through judicious selection of length and proper tuning, a small antenna can be as useful as its "big brother."

The design I came up with is 41 feet long and covers 7.0-7.3 MHz with an SWR under 2.5:1. Tuning is accomplished by inductors placed in each half of the dipole with capacitance hats on the element ends. The hats make the antenna more broadbanded and minimize loading inductor losses by reducing the number of turns necessary to maintain resonance.

The center impedance of this antenna was estimated to be approximately 20 to 25 ohms. A helical hairpin of about 1 μH was wound to match this impedance to 52-ohm coaxial cable. (Should the builder elect to use some other form of matching device such as a gamma match, it will be necessary to add a bit more inductance to both element halves, as the hairpin contributes part of the loading inductance.)

Although primary consideration was given to utilizing readily available materials, builders are encouraged to improvise as necessary to keep costs and parts-procurement efforts to a minimum. All aluminum tubing at WA2SON is T-6061 grade with 0.058-inch wall thickness (no. 17 size) which provides 0.009-inch clearance for a slip fit (inches × 25.4 = mm). One word about working with telescoping tubing: Be sure there are no burrs on the ends and *never* force pieces together should they bind!

The values given for the inductors are approximate and should not be regarded as final. Height above ground, slight constructional differences, and proximity to external objects will affect the tuning of this antenna.

Tuning

For initial testing, the antenna should be mounted as near to its permanent position as possible. Apply just enough power to obtain a full-scale "forward" reading on your SWR instrument and make measurements at 50-kHz intervals across the band. Once the frequency of minimum SWR has been determined, return to this frequency and compress or expand the length of the hairpin (like an accordion) until the lowest possible SWR reading is obtained. A reading of 1.2:1 or better should be easily obtained. Should the resonant frequency be too low, it will be

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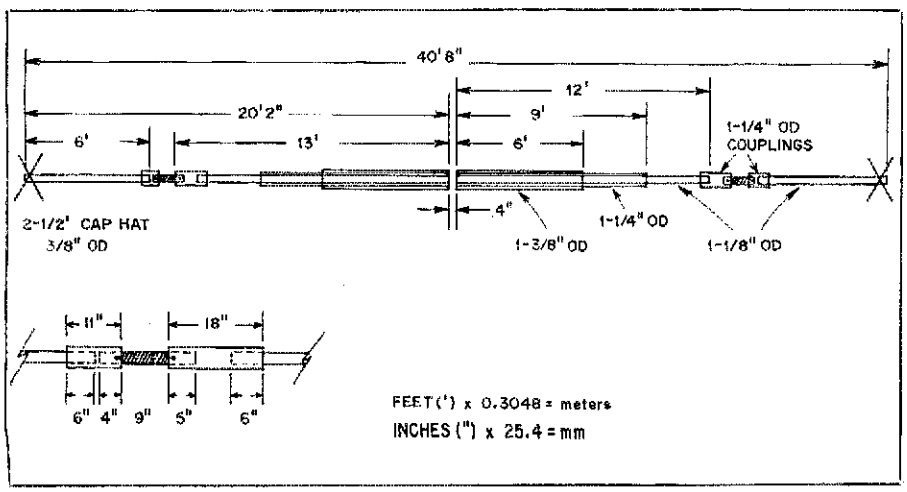
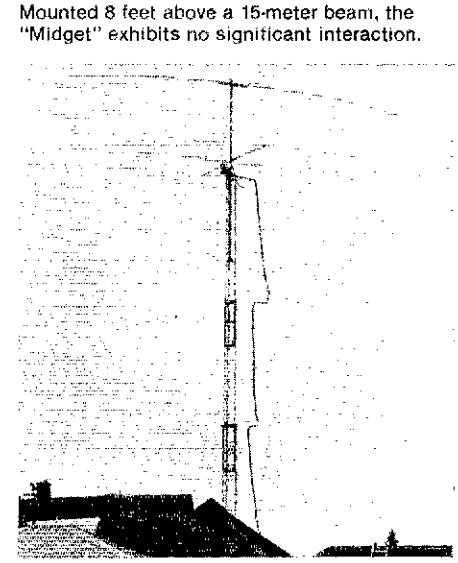
Fig. 1 — Construction of the "Midget." Couplings are secured by slitting the tubing and using hose clamps. The starting value for the loading inductors is 32 turns no. 14 insulated wire close wound on 1-1/8-inch OD Plexiglas rod.



Mounted 8 feet above a 15-meter beam, the "Midget" exhibits no significant interaction.



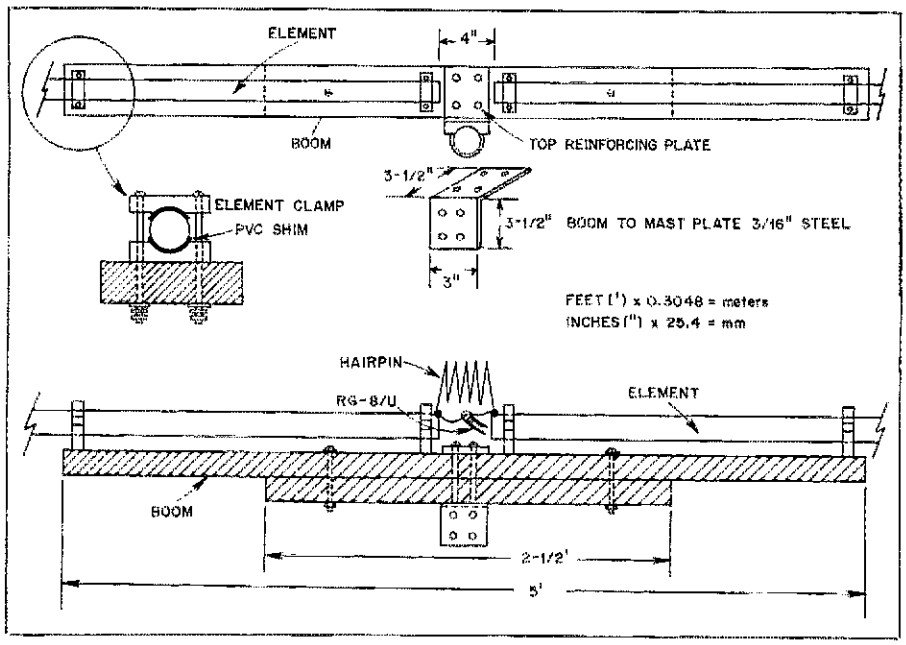


Fig. 2 — Boom assembly. The boom is made of pine or fir 2 × 4. The hairpin is 5 turns of 3/16-inch OD copper tubing, 2-inch ID and 1-1/2 inches long (inches × 25.4 = mm).

necessary to remove a few turns from both loading inductors; if it is too high, turns must be added. Be sure both inductors are always identical. When tuned for approximately 7.12 MHz, the antenna will be useful over the entire band.

Performance

Results so far have been most gratifying. With this antenna at 65 feet, many Europeans, VKs, ZLs and a JA were worked in the first week. West Coast stations which were generally marginal are now usually "ragchew" copy. Directivity is as to be expected with a dipole antenna. Signals off the ends are down one or two S units, making the antenna useful under crowded band conditions. Whether you're out to work DX or simply to enjoy having a solid QSO, you'll find this antenna a real boon for getting on a band that has a lot to offer! QST

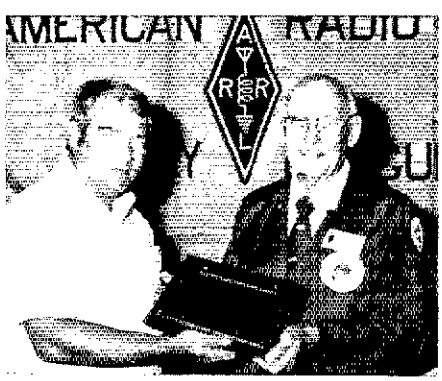
References

The ARRL Antenna Book, 13th ed., 1974.
The Radio Amateur's Handbook, 53rd ed., 1976.

Strays

ROOKIE DX AWARD

Newly licensed and bewildered by the veteran "big guns"? The Eastern North Carolina DX Club wants to stimulate new blood in next month's ARRL International DX Competition, and is offering a plaque to the top-scoring rookie entry. To be eligible, you must have been licensed as a General or higher for less than a year at the time of the contest. Enter by sending a separate letter along with your logs when reporting to ARRL.



Gene Tyree, N4ANV (left), shows the ENCDXC's Rookie Award to ARRL Roanoke Division Director Phil Wicker, W4ACY.

MIDWEST HONORS MAC, W1ICP

Appreciation and anecdotes of W1ICP's nearly 30 years of service to Amateur Radio highlighted the "Lew McCoy" banquet at the 1978 Midwest Division Convention. Held in Kansas City, MO, in October, the deliveries were made by others who have likewise given years of service to the hobby, including Samuel Stelk, FCC Region 4 director, on behalf of Personal Radio Division Chief John Johnston, K3BE; Paul Grauer, KØFIR, ARRL Midwest Division director; and Harry Dannals, W2HD, ARRL president. Mac, the original *QST* Novice editor, has relocated to Silver City, NM.

Many years of service to Amateur Radio are represented in this gathering at the 1978 Midwest convention: (l-r) KØSS, WØFIR, W2HD and W1ICP.

Digitized Speech

Part 2: Various approaches to transmitting speech pulse forms are explained in this concluding section of a two-part article.†

By Stan Lieberman,* WA4SFP

Part 1 of this article explained the power of the pulse as an information-carrying entity in QRN conditions. This final part introduces various ways to transmit speech by digitizing it into pulses of constant shape. The bits are either there (a 1 bit) or not there (a 0 bit).

Speech Sampling

Typically, we are interested only in the speech bandwidth that ranges from 200 Hz to 3000 Hz. This is the usual frequency spectrum of an ssb voice signal and will be, for the purposes of this article, the only spectrum with which we shall concern ourselves. This 200- to 3000-Hz spectrum is known as a band-limited signal which has a maximum frequency of 3000 Hz. Band limiting is accomplished by putting the speech waveform (your voice) through a band-pass filter, very important for limiting speech to those frequencies that enable us to communicate without wasting spectrum space.

Sending the speech waveform continuously is not necessary. If it is sampled at a regular rate, we can reproduce the original speech signal from the samples. But there is a minimum sampling rate which permits such reproduction; that happens to be twice the maximum frequency. Therefore, because the maximum speech frequency is 3000 Hz, the minimum sampling rate (known as the Nyquist rate) *must* be 6000 samples per second, and these samples *must* be equally spaced in time. Fig. 6 shows how a sampled speech waveform is produced.

The switching pulses gate the switch to chop the speech waveform. This results in a series of pulses, spaced at least 1/6000 second apart. The pulse amplitudes vary with the original speech. If this form of pulse formation is used to modulate a carrier we would have pulse amplitude modulation (PAM).

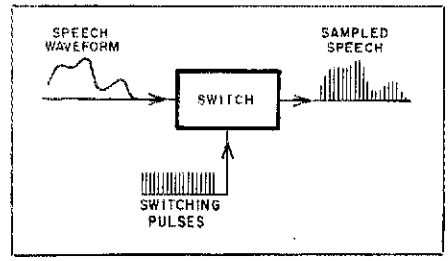
PAM is one form of pulse modulation, but it is very susceptible to noise distortion. Converting the sampled speech into a form whereby all the pulses are the same is a better approach. PAM generation is the first step in generating a pulse-code-modulation (PCM) signal.

PCM

Instead of transmitting the *exact* amplitude of each sample, suppose we send an approximate amplitude of each pulse in the form of a group of 1 and 0 pulses. If the maximum amplitude of the speech is divided into at least 128 levels, the waveform can be reproduced quite faithfully. This was shown in an earlier article[5] for a prototype PCM system. The exact amplitude of each pulse is converted to the one level, from these 128 levels, that is nearly the same in amplitude. This conversion process is known as quantizing. The difference (if any) between the actual sample value (amplitude) and the quantized value is the quantizing error.

In order to quantize speech into 128 levels, we need a 7-bit code whereby each speech sample can have a value ranging from a minimum value of binary 0 (0000000) to a maximum value of binary 127 (1111111), plus a synchronization bit, for a total of 8 bits per sample. Earlier we saw that the slowest rate that speech could be sampled was 6000 samples per second. This means that the time between samples is 1/6000 second and we must send the eight bits of each sample in that time. That leaves only 1/8 of 1/6000 second (20.8 microseconds) to send each bit, which works out to be a bit rate of 48,000 bits per second. The minimum bandwidth for this signal is about 8 (number of bits per sample) times 3000 (highest sampled frequency), or 24,000 Hz. The bandwidth is obviously too wide to be allowed on the lower-frequency amateur bands.

Fig. 6 — This illustration graphically shows how a sampled speech waveform is produced. At least 6000 switching pulses per second are required for speech.



The Basic Arrangement

Shown in block diagram form (Figs. 7 and 8) is the basic arrangement of a PCM system. In the transmitting mode, speech passes through the 200- to 3000-Hz band-pass filter to be sampled at a regular rate by the 6000-Hz sampler. Sample amplitudes are then converted into 7-bit binary code groups (quantized) by the analog-to-digital converter. The synchronizing

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†Part 1 appeared in January 1979 *QST*.

[Notes appear on page 37.]

generator produces a signal that identifies the beginning of each 7-bit quantized sample (needed at the receiver for decoding). What the format control does is to place the 7-bit sample and the sync signal into proper relationship for action by the parallel-to-serial converter (a shift register) which generates a serial pulse train for modulating the transmitter.

In the receiving mode, the speech signal from the wide-band receiver enters the decision circuit which determines whether each serial bit is a 1 or a 0. A serial-to-parallel converter changes the serial pulses into parallel bit groupings. The sync detector reacts to the received sync signal and determines when the serial-to-parallel converter is to send 7 parallel bits on to the digital-to-analog converter. The latter simply converts 7-bit coded samples into analog samples. Final reconstruction of the speech signal takes place as the 3000-Hz low-pass filter removes frequency components above 3000 Hz. All that remains is the audio amplification to drive the speaker.

As you can see, even a simple PCM system is not really that simple. An article could be written about each block in Figs. 7 and 8, which would change this article into a book. Therefore, for practical reasons, we shall not go into any more details at this time.

So, what do we gain by using PCM? One benefit is increased signal-to-noise ratio. But this advantage is achieved at the expense of greater bandwidth and complicated circuitry that's expensive. "Big deal!" you say. Sure it's a big deal to increase the SNR. Don't we erect those multi-element quads and Yagis to get a better SNR? Don't we heat our shacks with kilowatt amplifiers to get a better SNR? Let's see whether we can narrow the bandwidth and simplify the circuitry and still retain the improved SNR that pulses can provide.

Differential PC Modulation

Let's imagine that the previously described 7-bit PCM system, with binary values ranging from 0 to 127, is sending a series of quantized 7-bit groups (written in base 10 notation) as follows

...44...51...58...57...51...45...39...37 ...33...29...

These values represent quantized amplitudes. Did you notice anything? The *difference* between each quantized amplitude is never more than seven.

If we transmitted the above sequence by PCM, each group would have 7 bits. Suppose, instead, the difference between each 7-bit group is sent. Then only three bits (representing the difference) plus a sign bit (representing an increase or decrease) plus a sync bit (total of 5 bits per sample) is needed to send the same information as the PCM system. The receiving end either adds or subtracts this difference to the previous sample, depending upon the sign, to get the current sample value. The method is known as differential PCM, or DPCM. In this example, the minimum bandwidth would be 5 bits/sample times 3000 Hz (maximum speech frequency), or 15,000 Hz. See? Already the bandwidth has been reduced from 24,000 Hz (PCM) to 15,000 Hz (DPCM).

Several improvements to DPCM have been developed whereby even fewer bits are transmitted per sample. These systems use variable-length codes (not all samples have the same number of bits) which contain the sign and sync information. Some systems send each sample with as few as two bits (speech quality is questionable, but nevertheless, recognizable). This requires a bandwidth of only 6000 Hz!

Did we just get your attention? That 6000-Hz bandwidth does not sound bad, does it? That was the good news. The bad news is that the circuits, although simpler than for PCM, are still complicated and only a little less expensive.

But there is still hope. If only there was a way to send each sample with one bit, wouldn't the bandwidth be 3000 Hz? Sure! And you know what? There is a way and (are you ready for this?) it's inexpensive, too!

Delta Modulation

Delta modulation (DM), which was invented in 1945,* is considered a poor man's digital transmission system. The required equipment is less complex than that required for PCM or DPCM systems. Delta modulation does not possess the efficiency that these other systems have because there are only two possible output levels per sample. However, delta modulation offers advantages where good resolution without absolute accuracy is required. Such application is the digital transmission of speech, in which it is the relative change in signal level from one sample to the next that is of prime importance. The absolute signal level can vary within appreciable limits without serious effects.

The operating principle of a DM system is shown in Fig. 9A. Speech is sampled and compared to a staircase approximation of the speech waveform which is generated by an integrating circuit. Whenever the sampled speech exceeds the staircase approximation, a positive pulse (binary 1) appears at the comparator output. Otherwise, a negative pulse (binary 0) is formed.

An important feature is that the receiver need be no more complicated than an integrator circuit as shown in Fig. 9B. The integrator reconstructs the staircase approximation in the same manner as was done at the transmitting end. This, then, is filtered to obtain an acceptable reproduction of the original speech waveform.

The sampling rate is important for DM. If too low, the "steps" in the staircase will be unable to follow the speech waveform. A method to assure that the integrator output follows the speech signal is to in-

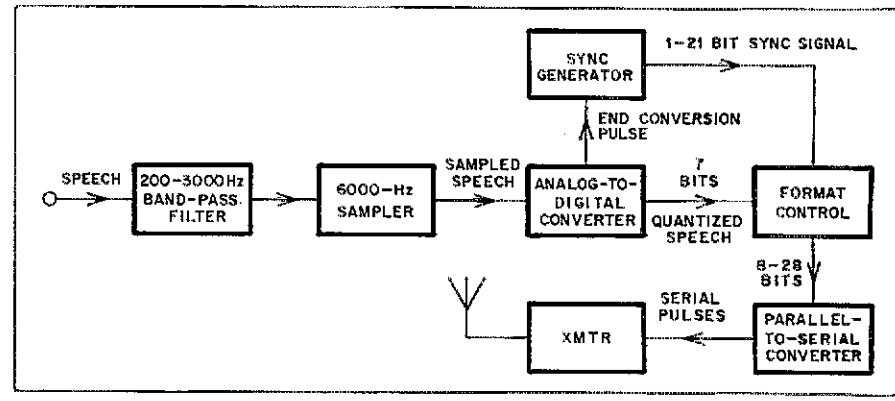
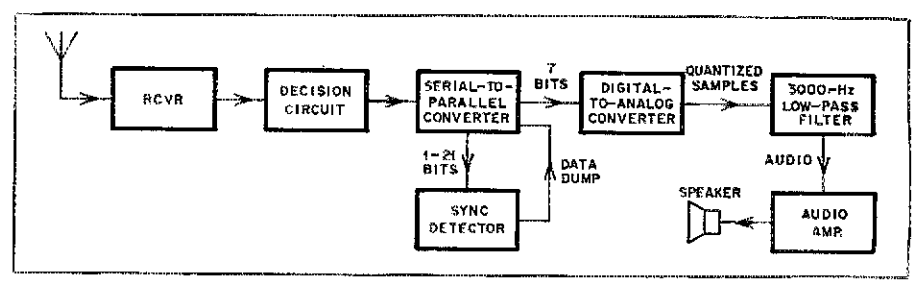


Fig. 7 — Block diagram of a pulse-code modulation (PCM) transmitting system.

Fig. 8 — A PCM receiving system.



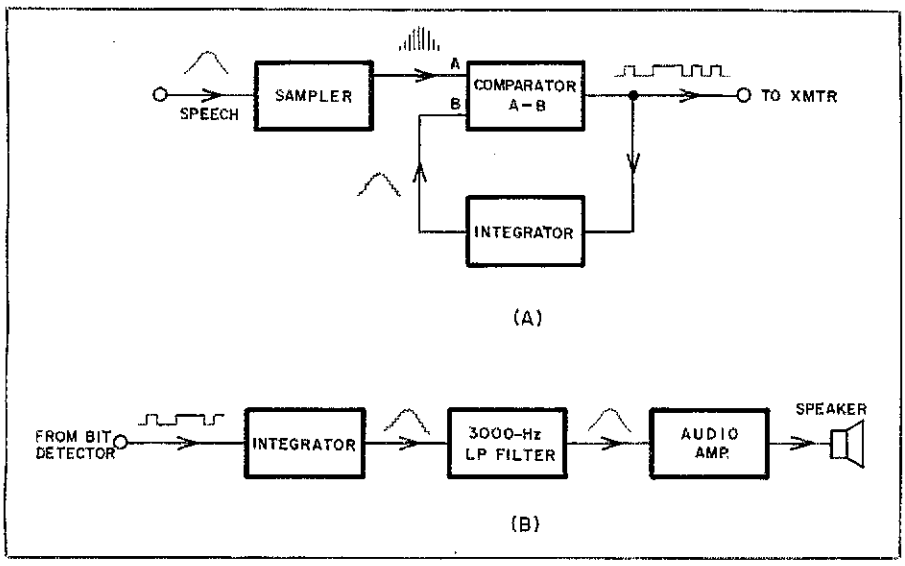


Fig. 9 — A representative functional diagram of a delta-modulation system. Speech that is processed by the transmitting delta modulator (at A) is sampled and compared to an approximation of the speech waveform generated by an integrating circuit. The integrator for the receiving delta modulator (at B) reconstructs the approximation information which is then filtered to obtain a reproduction of the original speech waveform.

crease the sampling rate over the minimum sampling rate (Nyquist rate). Intelligible speech is possible with a sampling rate as low as 16,000 bits per second (baud). However, high sampling rates are more desirable. DM is self-synchronizing because only one bit per sample is required. Therefore, synchronization occurs at the first bit transition.

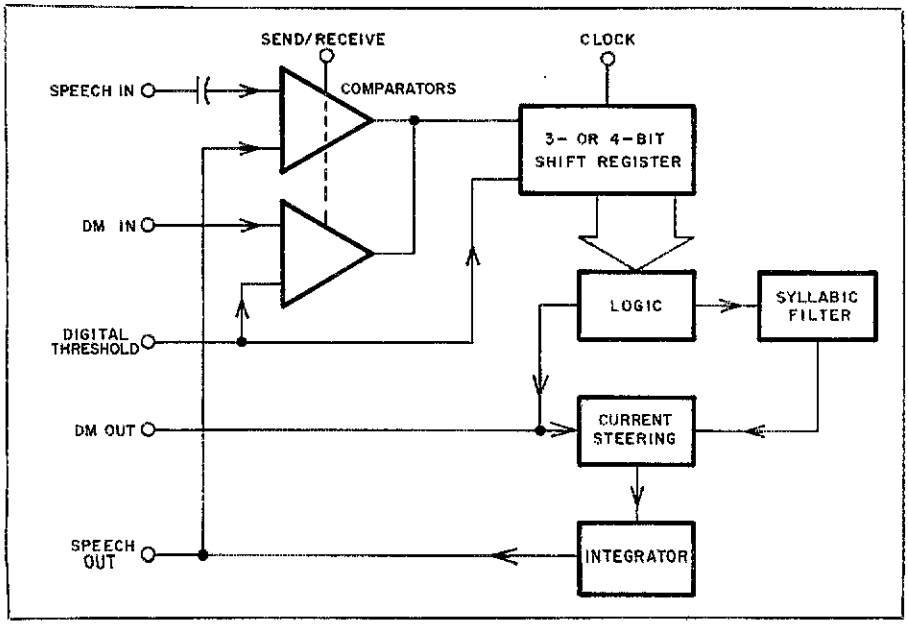
DM Integrated Circuits

The DM circuit described above illustrates the principle of DM operation and for the sake of simplicity, a linear system was used. In practice, however, speech energy occurs in a manner where the small amplitudes occur more frequently than the large amplitudes. In order to improve speech transmission characteristics, various methods of speech compression can be used. Many articles about compression, or nonlinear amplification, have appeared and, therefore, we shouldn't dwell on them here except to mention that digitized speech utilizes compression techniques, too.

DM IC chips have been recently introduced. These chips, which are designed for telephone use, are known as codecs (coders/decoders) that perform the task of converting speech inputs to serial digital outputs and vice versa. With experimentation, there is no reason these codecs could not be adopted for radio communications.

Since codecs perform both the coding and decoding functions, they must also perform an operation which undoes the compression process. This is known as expansion. The compression/expansion function (companding) is built into these ICs and is identified as continuous variable-slope delta (CVSD) modulation. In CVSD, the slope of the staircase signal is always proportional to the rms value of the speech signal. Fig. 10 is a representative functional block diagram of a codec IC and is an example of a current-operated CVSD circuit.

Fig. 10 — This block diagram of a codec IC is an example of a current-operated continuous variable-slope delta-modulation circuit.



SSB Delta Modulation

Considering the simplicity of DM, the concept of single-sideband delta modulation (SSBDM) as a new technique for speech transmission via radio comes to the author's mind. The reasoning for the feasibility of SSBDM is as follows:

Presume speech is sampled 16,000 times per second. One may then reason that a 16,000-baud DM pulse train can be developed to convey the speech information. A DM wave train is a series of pulses having variable widths depending upon the slope of the speech signal at any given moment. The range of this slope is limited between two extremes because of the band-limited (200 to 3000 Hz) nature of speech. Hence, this defines the bandwidth requirements. Because there is no need for pulse modulation to transmit "perfect" pulses with sharply defined edges, we should be able to keep the bandwidth requirements within 3000 Hz by pushing the DM signal through a 13,000- to 16,000-Hz band-pass filter. Heterodyning this 13,000 to 16,000-Hz signal with an rf signal could produce an SSBDM signal which can be amplified by a Class C amplifier. Normal ssb detection would derive the raw digital information which a bit detector converts to a clean wide-band DM signal. The CVSD demodulation process then converts this DM waveform to speech which is amplified in a conventional manner.

This concludes an extremely basic introduction to speech digitizing and, perhaps, a new basic method to transmit speech. For brevity, many details have been omitted. If nothing else, there is the hope that this two-part article will help to get narrow-band digital techniques on the lower radio amateur bands. [Present FCC regulations preclude the transmission of such emissions without a grant of Special Temporary Authority. See February 1969 *QST*, page 63. — Ed.]

Notes

[1]Biancomano, "A Prototype Pulse-Code Modulation System," January 1977 *QST*, p. 24.

[2]Delta modulation was invented by B. Derjavitch, E. M. Deloraine, and S. Van Mierlo, *French patent* no. 932,140. August 1946; U. S. patent no. 2,629,859, October 1947.

Circular Orbits with Simple Computing Systems

Trying to use that computer for Amateur Radio? Here are some hints about designing programs. Azimuth and elevation bearing calculations for OSCAR are used as an example.

By Bryan Leipper,* K1CD

Modern technology is attacking those mathematicians' equations which were once considered to be of horrendous complexity. A look at equations such as those needed to find a satellite in orbit used to cause a hopeless feeling (see Table 1). With inexpensive calculators and home computers, however, this is changing. Now, instead of thinking, "How could I do that?" the thoughts are more likely to be, "How can I get my calculator (or computer) to do that?" Thus we enter the stage in which a person must learn to teach a machine to do the drudgery. He becomes a computer programmer. This gets to be complicated when you face your machine's limitations. Trying to put too much program into too small a computer can be more fun than crossword puzzles! This article is written for those of you who like such a challenge.

An example of this is the task of fitting a program to calculate the azimuth and elevation bearings for a circular-orbit satellite into a limited computer. Consider, for example, the simplest version of Radio Shack's TRS-80 (4 kilobytes or 4 k BASIC in ROM with 4 k of RAM for the program).

This is almost the same as trying to calculate orbits on a $5 calculator! All you have available are the four basic math operators (+ − ÷ and ×) with programming capabilities for decisions and branching. How do we calculate all of these equations in the space available? How can we do these calculations quickly so we don't have to wait all day for an answer?

Organizing

First, you should translate the equations. What input data are needed? What units (hours, minutes, seconds or decimal hours, and degrees or radians) do the equations handle best?

After you find out what input the equations require and what the result is going to tell you, you are ready to determine the best order for solving them. At this point

Table 1
Equations necessary for calculating the position of an orbiting satellite, shown in the processing order.

Input Required

$\sin \alpha$, $\cos \alpha$ where α is the orbit inclination
$\frac{2\pi}{P}$ where P is the satellite period
γ_Q = station (QTH) longitude
$\sin \phi_Q$, $\cos \phi_Q$ where ϕ_Q is station latitude
γ_X = EQX longitude
ω_E = Earth's rotational speed
R = Earth's radius
H = orbit height
t = time after EQX

$$\phi_S = \arcsin \left[\sin \alpha \sin \left(\frac{2\pi t}{P} \right) \right] \quad \text{(subsatellite latitude)}$$

$\sin \phi_S$ $\cos \phi_S$

$$\gamma_S = \gamma_X + \omega_E t - \frac{\cos \alpha}{|\cos \alpha|} \left[\arccos \frac{\cos \frac{2\pi t}{P}}{\cos \phi_S} \right] \quad \text{(subsatellite longitude)}$$

$$\nu = \gamma_S - \gamma_Q$$

cos → sin is indicator for azimuth bearing

$$\delta = \arccos \left[\sin \phi_S \sin \phi_Q + \cos \phi_S \cos \phi_Q \cos \nu \right]$$

$\cos \delta$ $\sin \delta$

$$\beta = \arccos \left[\frac{\sin \phi_S - \sin \phi_Q \cos \delta}{\cos \phi_S \sin \delta} \right] \quad \text{(bearing)}$$

$$\varepsilon = \arctan \left[\frac{\cos \delta - \frac{R}{R + H}}{\sin \delta} \right] \quad \text{(elevation)}$$

Note: $|\cos \alpha|$ = absolute value of $\cos \alpha$

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Table 2
A Functional Listing of Variables in an Az-El Program

Information	*Description*	*Name (Source)*	*Program*	*Calculations*
QTH	Latitude (°N)	(ϕ_Q)	O	
	Longitude (°W)	(γ_Q)	Q	convert to radians
			X	= sin O
			Y	= cos O
Satellite	Height		H	rename H = $R_E/(R_E + H)$
	Inclination to equator	(α)	I	rename I = sin I
	Period		P	
Orbit	Number		N	
	EQX: longitude	(γ_X)	S	convert to radians
	Elapsed time	(t)		
			E	start at 1 and increment in program
			C	= cos (2πE/P)
			B	= sin (2πE/P)
			K	= B*I
Az-El Calculations	Subsatellite latitude	(ϕ_S)	M	= arc sin K
			L	= cos M
	Subsatellite longitude	(γ)	U	= S + ω_EE + arc cos (C/L)†
		(cos ν)	F	= cos (U-Q)
			A(9)	= sin (U-Q)
			Z	= (X*K) + (Y*L*F)
	Angular separation (QTH and satellite)	(γ)	D	= arc cos Z
			G	= sin D
	Elevation	(ϵ)	V	= arc tan $\left(\frac{Z-H}{G}\right)$
				if V is negative — why print?
	Azimuth	(β)	W	= arc cos $\left(\frac{K - X*Z}{Y*G}\right)$
				if A(9) is positive then W needs to be adjusted for a western bearing

†This term is negative for posigrade orbits. In the Southern Hemisphere (M<0) this term needs to be replaced with 2π − arc cos (C/L) for best results.

Constants used:
Earth's radius (R_E)
Earth's rotational velocity (ω_E)
Ratio of diameter to circumference of a circle (π) (° to radians = 180/π)

you can also determine any intermediate results that should be saved for later use to avoid recalculations. Table 1 shows the equations analyzed this way.[1]

Data

The input data for these calculations may be categorized in several ways: by time dependence, by function, or by how often the data change. The data involve QTH and satellite orbit parameters as the more permanent time-independent data. Data about the orbit in question and elapsed time in a particular orbit are time dependent. You will probably want to have your program automatically increment the elapsed time and calculate successive values for every minute or two in a given orbit. It is also possible to have the elapsed time cover a period of several orbits, although the accuracy would be better using a new reference orbit after one orbital period has passed.

This can be done by establishing a loop in your program that increments time from one minute past the satellite's equatorial crossing up to the number of minutes in the satellite period. The program I developed for the TRS-80 printed a table, a new line of output data for each minute, until a full satellite period block of time had been printed. Then the program stopped. It could have been constructed to ask for another reference orbit and then proceed with the calculations for the new orbit.

Variables

Table 2 is a listing of variables needed for input, output and intermediate results. It uses the one-letter variables available with Radio Shack's Level I Basic. They are listed in the order they appear in my program with a description of function, reference to the nomenclature of the source equations in Table 1, and calculations necessary to evaluate them.

For this program, all the letters of the alphabet are used except J. R is not listed because it is reserved for the trigonometric subroutines. A is used as a dimensioned variable to do the work in the subroutines and carry the input and output back and forth. A(1) is the input variable and will come back with an arc tangent or sine, depending upon the subroutine called. A(2) is returned to the main program with a cosine or arc sine of the number given to the appropriate subroutine. This series of variables is also used for constants and work variables for the subroutines, and for flags to tell what manipulations the subroutines had to do in order to process the input — more or less as a scratch pad.

I/O

The data-entry part of the program is the place to choose how data are to be entered (no need to enter QTH and satellite data just for a new orbit), make initial calculations, and decide which input data are needed to dress up the output. For instance, the latitude of the QTH is not needed in the program — only its sine and cosine values. You could save a variable and program space by reassigning this variable to the sine or cosine value, as is done with the inclination angle (see Table 2). But for some variables, it helps to be able to identify pertinent input data in the output. A reminder of which QTH and which satellite as well as the orbit and time help an operator place the output data in their proper perspective.

Conversion of units is also noted. The trigonometric subroutines require angles to be in radians. Therefore, angles used in the program must be changed to radians if entered in degrees. The QTH latitude might seem to be an exception, but it is not used in the program — only the sine and cosine values are used. Leaving QTH latitude in degrees eliminates the need to convert *back* to degrees in the output routine. The sine and cosine values can be obtained by converting at the same time the subroutine is initialized, thereby eliminating several steps altogether.

You can enter all input data in the form the program requires if you really need to save space. But this program didn't use all of the TRS-80 memory, and I felt it a lot easier to enter data straight from that posted in *QST* than to do preprogram calculations.

Trig

One of the biggest headaches occurs when you find out that your computer does not like trigonometry — especially when so many trig functions are needed to solve the az-el equations! To handle this problem, the first thing you need is a good mathematics handbook. The manuals published by the Chemical Rubber Company are very good. You can also find the needed information in some paperback mathematics "encyclopedias."

The information necessary is a list of the infinite series (Taylor's) equations for the trigonometric functions and a table of

[1]Notes appear on page 42.

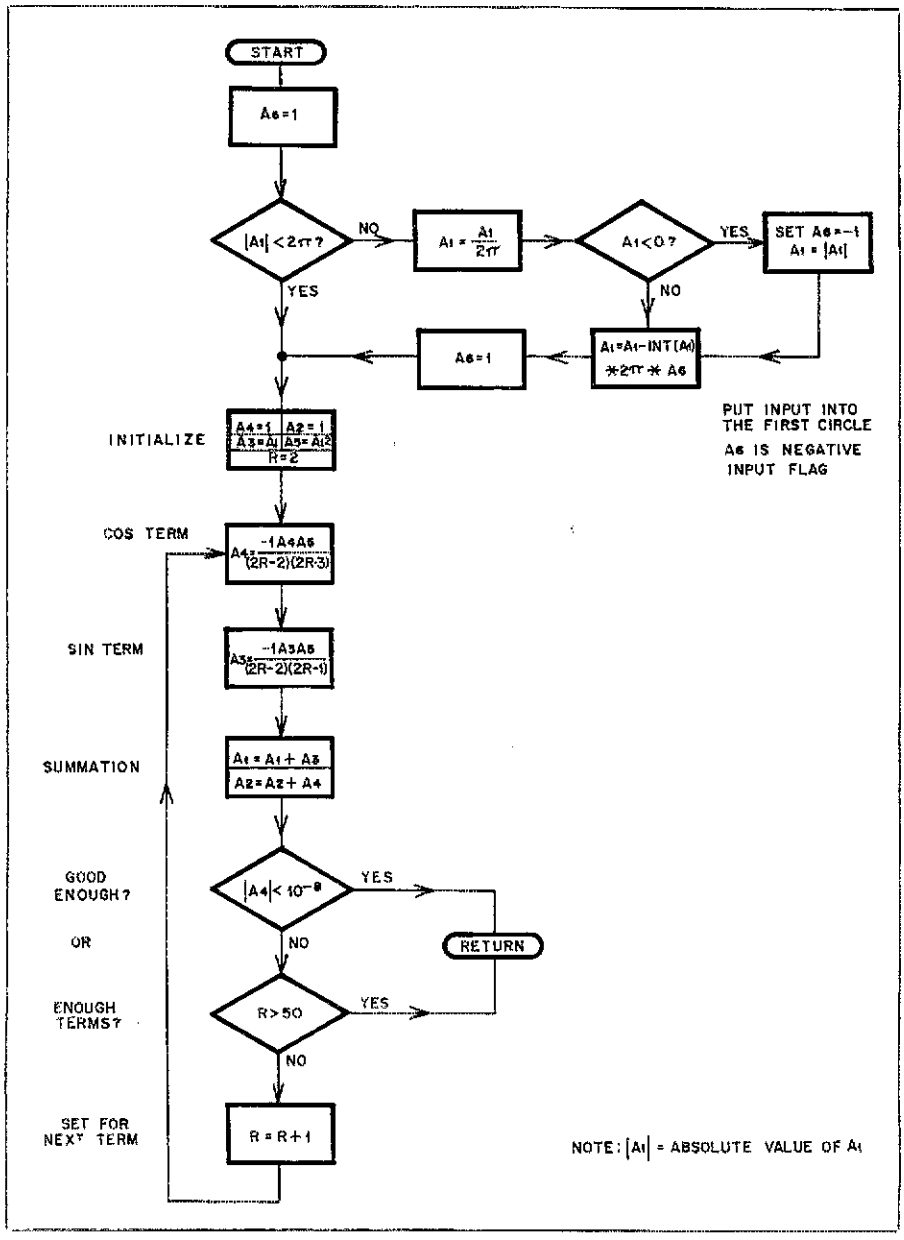


Fig. 1 — Logic flowchart for the sine and cosine subroutine.

trigonometric substitutions. Once you find this information, you are back to page one of this article — organizing and interpreting equations!

These equations, though, are ideally suited to simple computer systems. All they require is a lot of number crunching with the basic arithmetic operations. You do need to keep an eye open for a few problems. Here are the major things to watch out for:

1) The formulas are an infinite series. The more terms added, the more accurate the results.

2) Convergence is a term used to describe how fast an infinite series "zeros in" on an answer. It depends upon both the input and the terms being calculated. Finding the sine or cosine of a value between 0 and 90 degrees can be done accurately enough with only five or six terms. The arc sine of a value near 1 however, may take thousands of terms before you get more than three-digit accuracy.

3) The return range of inverse functions is often limited and requires a look at the real-world situation to interpret. For example, the arc cosine function may be evaluated for any number between +1 and −1, and the result is normally considered to between 0 and 180 degrees. But an azimuth bearing (which is an arc cosine function) should range from 0 to 360 degrees. If we start with a due-north bearing of 0 degrees and rotate clockwise, our bearing increases to 180 degrees in the south. The cosine of this angle starts at a value of +1 in the north, decreases to 0 in the east, and continues to −1 in the south. Now this value begins to increase from −1 to +1 as we continue around to the west and back to the north. Since we are calculating our bearing from the cosine value, which is 0 at both due east and due west bearings, how can we tell which is which?

You can solve these problems in many ways. Part of the fun is choosing the best one for your particular situation.

For the TRS-80, I chose not to use the subroutines listed in the appendix of the Level I manual. These subroutines do not use iterative techniques to find a value of specified accuracy. Instead, they only calculate the sum of the first five or six terms in the series. This works very well for angles up to 90 degrees. The az-el equations, however, require that we be able to find values for angles up to 360 degrees (or 2π radians) and are either positive or negative (i.e., we need to find values for trigonometric functions of angle X where $-2\pi < X < 2\pi$ as a minimum).

The compromises I chose can be determined by analyzing Figs. 1 and 2. The sine and cosine subroutine checks only to make sure that the input variable is between plus 360 degrees and minus 360 degrees.

Fig. 2 shows a more complicated scheme when dealing with finding the arc cosine or arc sine values. Trial and error showed that the TRS-80 would be quite content to sit for hours calculating the angle for which the sine is greater than 0.9 to more than one or two significant digits. Therefore, Fig. 2 illustrates how an input value greater than 0.9 is turned into a smaller value using trig identities and a square-root algorithm. The last input value limitation is for the arc tangent and was determined by conditions in the source equation. This was handled in the main program by making sure a value of less than one was fed to the subroutine. Flags were set to tell whether the input value was positive or negative and when a shift between sine and cosine occurred in order that the result could be properly adjusted for a correct output.

The accuracy of these calculations was tested after each term was calculated and summed. If it was sufficient, a return to the main program was ordered. Otherwise, another term was calculated and added to the series summation. To prevent an endless loop from some kind of error, provision was also made to return, despite the accuracy after a large number of terms had been calculated. For real-time applications, it might be feasible to leave out the accuracy evaluation and adjust the number of calculations to fit time constraints.

The arc cosine problems were solved by establishing a flag to tell the computer whether or not some criteria existed and subtracting the value from 360 degrees if necessary. For the azimuth, it was

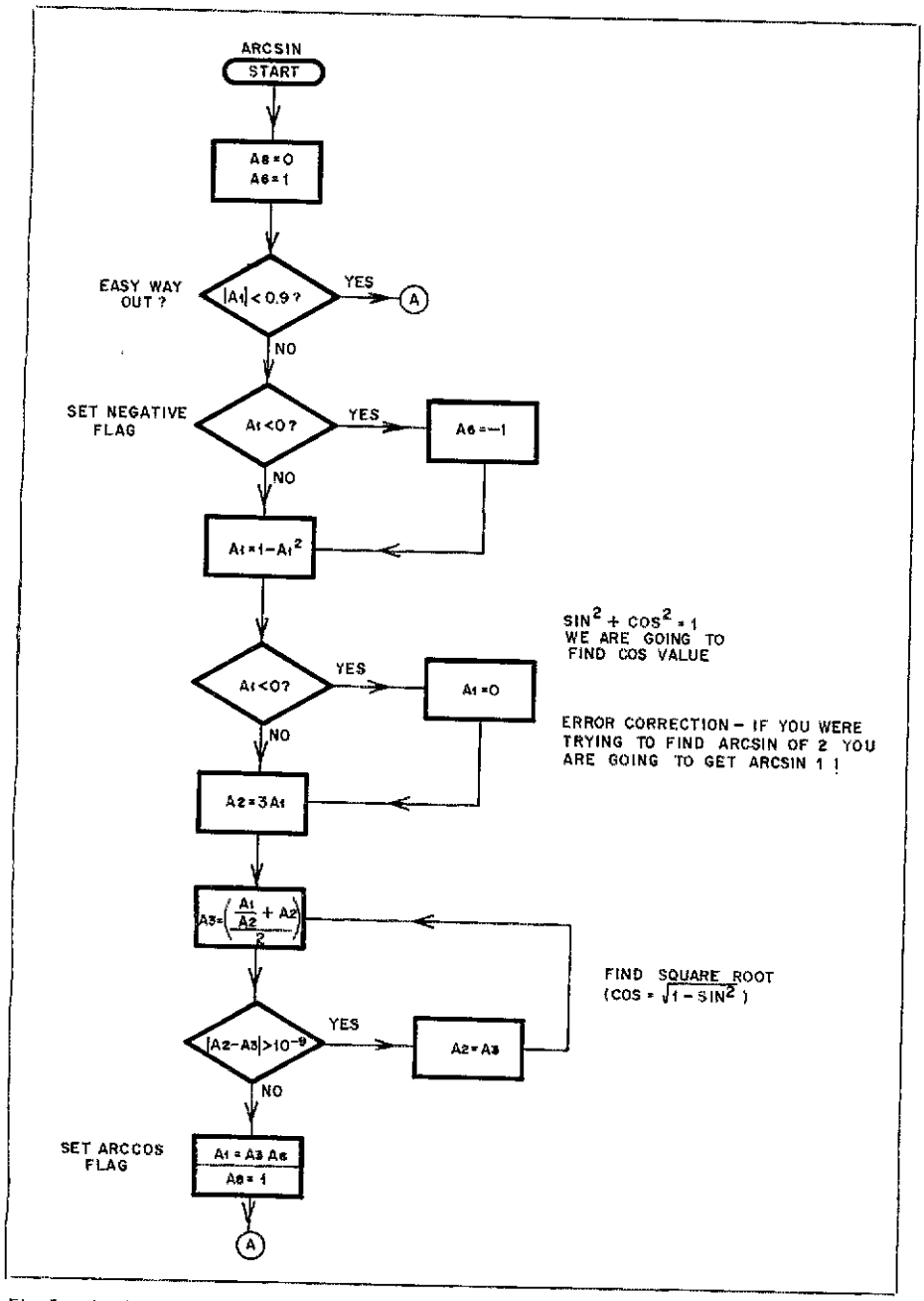


Fig. 2 — Logic flowchart for the beginning of the arc sine subroutine. These manipulations are necessary for values where the series does not converge quickly. The flowchart continues from circled letter A to Fig. 3.

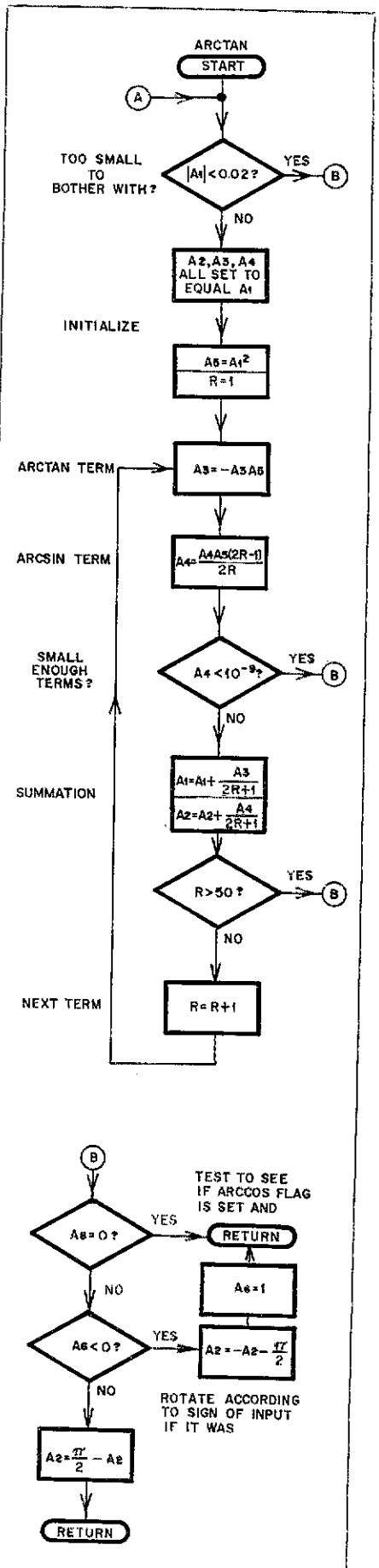


Fig. 3 — Logic flowchart for the arc sine and arc tangent subroutine.

necessary to know if the subsatellite longitude was east or west of the station longitude. The sine of the difference, labeled A(9) in Table 2, works quite well for this. For the subsatellite longitude, two factors creep in. One is whether the orbit causes the longitude to increase or decrease (posigrade or retrograde), and the other is whether or not the satellite is in the Southern Hemisphere. Since both OSCARs 7 and 8 have retrograde orbits, the cosine of the inclination divided by its absolute value may be replaced by -1, which results in the arc cosine term being added to the rest of the factors in the equation. Then the latitude may be used as a flag to tell whether the arc cosine term needs to be adjusted for the proper Southern Hemisphere-latitude result.

The Trigonometric Functions

When all these az-el equations are analyzed treating the trigonometric functions as separate variables, they really do not appear to be all that complex. But looking at how many times we need to find the sine, cosine, arc tangent, arc sine, and arc cosine values can alter this view if we don't have a "button" to push that will find all of them for us. Finding them ourselves is another entire problem in itself, as we have seen.

An interesting fact surfaced upon examination of Fig. 1 resulting in a space-

and time-saving idea. Since there were so many calls for both the sine and cosine values of various numbers, why not calculate them both at the same time? This, coupled with the similarities in the terms, led to a subroutine to do just that.

The arc sine and arc tangent series also have very similar terms which were combined so that one loop could be used for both functions to save space. The resultant flowcharts are shown in Figs. 1, 2 and 3.

Conclusion

This program also has a more mundane use. For example, a DXer could input the latitude and longitude of a choice spot or rare DX (variables M and U in Fig. 2), then calculate an azimuth bearing for the beam. Only the azimuth (W in Fig. 2) need be calculated. The elevation calculation would be skipped as well as all of the calculations used to find the subsatellite latitude and longitude.

The method of analysis described here and the trigonometric flowcharts can also be applied to other problems you might find it interesting to tackle: electronic engineering equations for filter design and circuit analysis; mechanical engineering equations for tower and antenna loading stresses; moonbounce (the moon is a satellite in a circular orbit!); analysis of propagation, and so on. Your imagination and perseverance are the major limits.

Now that you have found the meaning of the mathematician's equations, it's time to tell what you know to your computer. This can be a lot of fun. How do you want to input data? You can program your computer to ask you for it! You can even program it to ask you what input you want to reenter if you wish to avoid entering the same old QTH and satellite data every time you run the program. Then it is necessary to tell the computer how to tell you its results.

I have enjoyed doing this for the TRS-80 and two models of Hewlett-Packard calculators. Now it is *your* turn.

Notes

[1]Thompson, "A General Technique for Satellite Tracking," *QST*, November 1975.

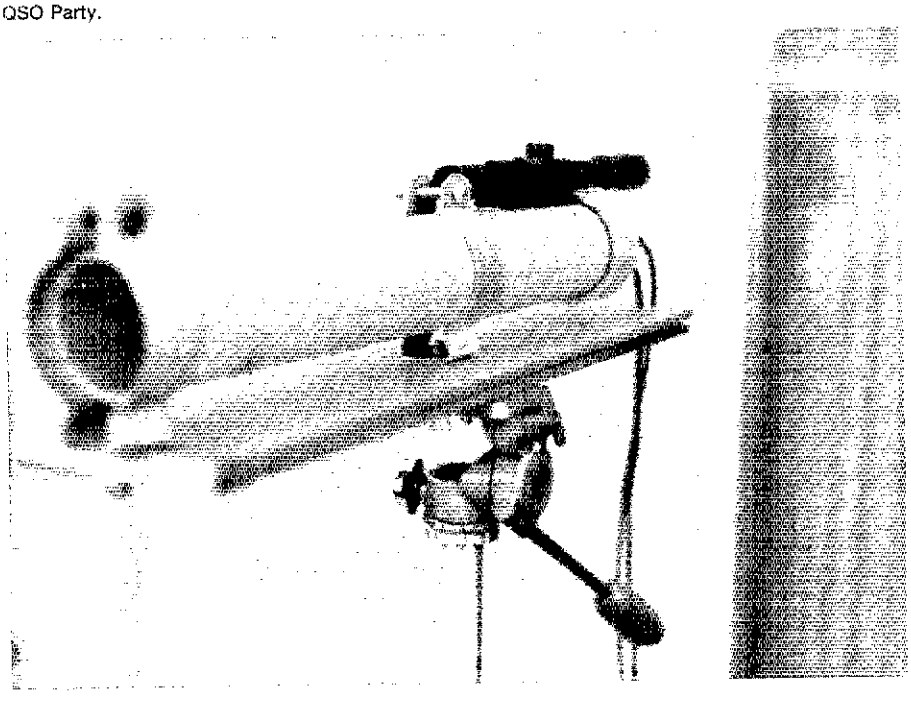
[2]The TRS-80 program is available from Club and Training Dept., ARRL Hq., Newington, CT 06111. With your request please include a stamped return envelope and 50 cents to cover handling.

Strays

LET'S HEAR IT FOR INNOVATION

☐ If you thought the recently popularized 10-GHz (10,000 MHz) band was in the super highs, some Californians have already done work at 474.0834 GHz with a laser. During the 1978 September VHF QSO Party, the WA6EJO bunch managed a one-way with the K6MEP (Ventura County ARC) multioperator station.

Steve Noll, 'EJO, reported, "Preliminary experiments during the June VHF QSO Party led to a successful one-way, tone-modulated cw contact over the 22-mile (35-km) path to K6MEP, via laser. A 4-mW helium-neon laser operating at 6328 angstroms, modulated with a chopper, was located at WA6EJO. K6MEP had a receiver using a 931A photomultiplier constructed by WA6EJO. A second laser and receiver were prepared just before the contest, but did not perform well enough to call it a two-way. Next time, maybe they'll manage a two-way voice contact via laser. Special thanks to the group at K6MEP for their patience and cooperation during the June and September laser and 10-GHz experiments."



The helium-neon laser used by WA6EJO for contact with K6MEP during the 1978 September VHF QSO Party.

At last fall's Radio Expo in Chicago, the Chicago Area Radio Teletype Repeater System operated a booth to familiarize interested amateurs with RTTY. They also conducted a seminar on the related electronics and mechanics. In the CARRS booth, WA8DRZ explains the system.

I would like to get in touch with . . .

☐ hams in the Marriott Corporation who would like to join the Marriott Ham Net; also Eckanar members for the Eckanar Radio Net. Carlos F. Guitierrez, KP4AA, Bldg. 16, Apt. 214, Urb. Lagos de Blasina, Carolina, PR 00630.

☐ hams interested in space exploration manufacturing and colonization. Shelby W. Haukos, KA0CME, 1239 N. Baird Ave., Fergus Falls, MN 56537.

Product Review

Sabtronics Model 2000 Digital Multimeter Kit

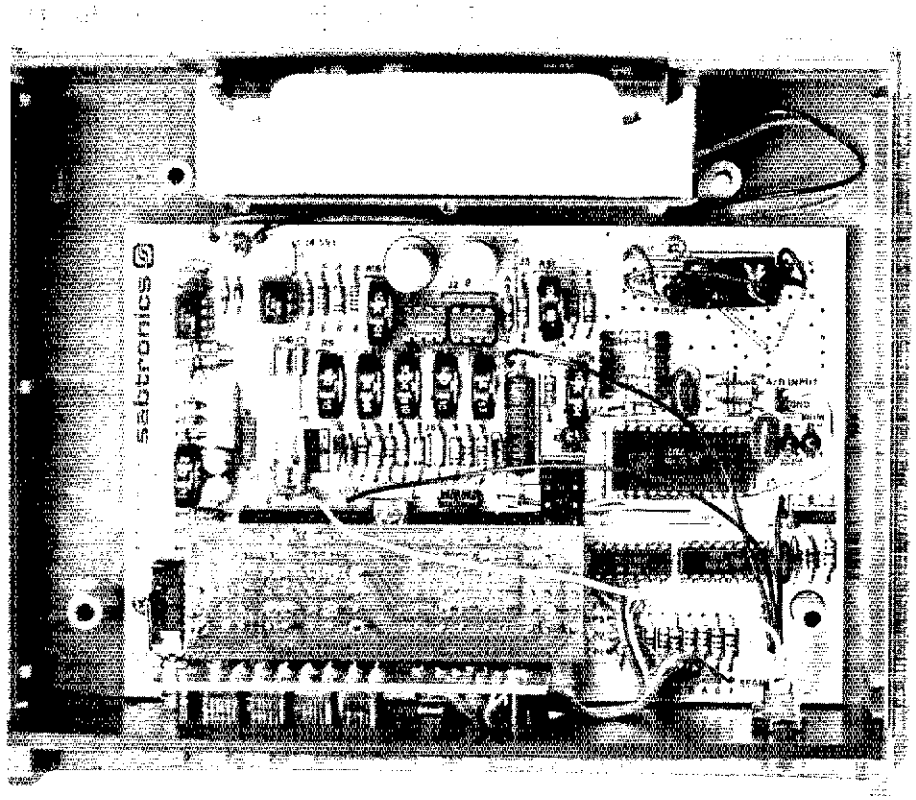
As electronic technology improves consumer products become more sophisticated, and eventually less expensive also. In the last few years, we've seen prices on calculators, digital watches, TV games and so on drop through the floorboards. The prices on new electronic items continue to drop until they're within the reach of almost any consumer. Such is the case most recently with digital multimeters.

One of the lowest-priced DMMs presently available is the Sabtronics Model 2000, which sells for about $70 in kit form. A 3-1/2-digit instrument, the 2000 contains only three pc boards and weighs just under two pounds with batteries and test leads. It will provide reasonably accurate measurement of dc and ac voltage, dc and ac current, and resistance.

Going Digital

Digital meters have many advantages over analog mechanical meters. First of all, they usually sport the same high input impedance (10 MΩ) as VTVMs and FET VOMs. This is combined with an analog-to-digital converter and digital display to give more resolution and an easier-to-read display. Better stability, where time, temperature and humidity are concerned, is also gained — at least in the digital parts of the instrument.

This doesn't mean that you should throw out your trusty VTVM and go buy a digital replacement. Analog meters still have advantages, especially where an observation of a peak, dip, increase or decrease is necessary.



The inside of the Sabtronics 2000. With the top cover removed, the instrument's simple pc layout is exposed. The battery pack is located at the rear of the cabinet (top of photo) and the display board is mounted vertically at the front.

Construction

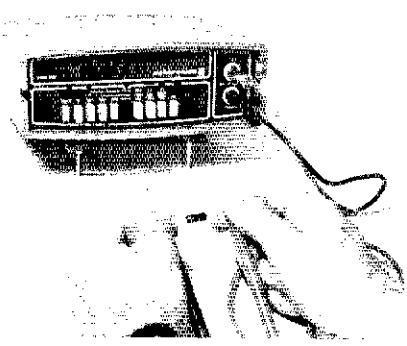
The Sabtronics 2000 kit was a one-evening project. Except for the four LEDs on the display board, all components were installed in the main pc board. The foil side of the board is tin plated and solder masked, and the component side is screened with part numbers and values, making assembly quite simple. The switch assembly slipped into place with over 90 pins dropping neatly through holes in the main pc board. After these were all soldered to their respective pads, another smaller pc board was installed over the pins extending from the top side of the switch assembly. These were also soldered, completing the switch "wiring" without using a single wire!

A multiconductor ribbon cable was stripped and soldered to main-board pads at one end and to the display board at the other. This cable, the power supply leads and some others attached to the test lead jacks, were practically the only wires used in the entire assembly.

Perhaps to help keep the price low, Sabtronics *does not* supply sockets for seven of the eight ICs in the kit. I make it a habit never to install ICs directly unless absolutely necessary. Fortunately, I happened to have some Molex pins in my junk box, so these were installed and the ICs plugged in.

The final assembly steps required that I drill four holes in the plastic cabinet bottom for insertion of the feet, and glue the red plastic LED "window" into position on the front panel.

The Sabtronics Model 2000 Digital Multimeter, shown during a resistance measurement. There is a small minus sign at the left edge of the LED display. This indicates that in this instrument, the positive lead is actually negative with respect to the common lead. Note the wire tilt bail in the down position.



Calibration

Two calibration procedures are given in the Sabtronics 2000 instruction manual (which, by the way, is very thorough). The first explains the steps involved in calibrating the instrument *without* the aid of additional test equipment. Through the use of internal test points and special "calibration numbers" the builder can calibrate the 2000 for reasonable accuracy in a matter of minutes. However, the instructions clearly specify that the *second* calibration procedure should be used if the builder wishes to calibrate the model 2000 to within the company's published specifications. This second procedure involves the use of test equipment that may not be available to the average amateur.

I built and calibrated the kit at home, using the first calibration procedure, without additional test equipment. The specifications listed in the table (measured in the ARRL lab) are representative of this instrument's accuracy after an internal calibration has been completed.

Outside

The blue plastic Sabtronics cabinet consists of two main sections. Slots molded into the plastic top and bottom hold the front panel and three rear-panel sections in place. The case seems fairly resistant to scratching, chipping and cracking.

Plastic feet attached to the cabinet bottom keep the enclosure from rocking on the work surface, but the feet are fairly hard and could slip or scratch easier than rubber ones. Shown

Sabtronics Model 2000 Digital Multimeter

Scales	Accuracy Claimed by Manufacturer† (percent)	Measured in ARRL Lab* (percent)
Dc and (ac) voltage:	100 mV (0.3) 0.1	0.16
	1000 mV (0.3) 0.1	0.05
	10 V (0.8) 0.1	0.1
	100 V (1) 0.2	0.3
	1000 V (1) 0.5	not tested
Direct and (alternating) current:	10 μA (1) 0.1	0.2
	100 μA (1) 0.1	0.5
	1 mA (1) 0.1	0.4
	10 mA (1) 0.1	0.1
	100 mA (0.8) 1	0.8
	1000 mA (0.8) 1	0.6
Resistance:	100 Ω 0.1	0.2
	1000 Ω 0.1	0.2
	10 kΩ 0.1	0.1
	100 kΩ 0.1	0.4
	1 MΩ 0.2	0.2
	10 MΩ 0.5	0.5

Specifications

Dc voltage: 100 μV to 1400 V.
Ac voltage: 100 μV to 1000 V.
Resistance: 0.1 Ω to 20 MΩ.
Alternating and direct current: 10 nA to 2 A.
Display: 3-1/2-digit, 7-segment LED, 3/8-inch (9.2 mm).
Features: Input overload protection, auto polarity, auto zero.
Power requirements: 4.5 to 6.5 V dc, 120 mA nominal.
Operating temperature: 0 °C to +55 °C.
Input impedance: 10 MΩ shunted by 25 pF on voltage and ohm ranges; 1Ω on 100-mA and 1000-mA ranges; 100 Ω on 1-mA and 10-mA ranges; 10 kΩ on 10-μA and 100-μA ranges.
Dimensions (HWD): 3 × 8 × 6-1/2 inches (76 × 203 × 165 mm).
Weight: 1 lb 8 oz (680 gr) without test leads or batteries.
Price class: 2000, $70; EP-12V, $4; AC-115, $7; NB-1200, $17.
Supplier: Sabtronics International, Inc., 13426 Floyd Circle, Dallas, TX 75243.

*Lab measurements taken after unit was calibrated by the internal method.

†Claims made in manufacturer's literature, based upon calibration of instrument using external test equipment.

in the photo are the rubber stick-on feet I attached to the plastic ones. Also visible is the lightweight, but functional, wire tilt bail. This can be hooked between the front or rear feet for up or down tilt.

Operation

As is the case with most DMMs, the Sabtronics 2000 is designed around a digital voltmeter circuit. Here the 2000 uses an integrated dual-slope A/D (analog-to-digital) converter and display driver circuit. The multiplier switch (× 1 or × 10) on the front panel selects the appropriate internal reference voltage (either 0.2 V or 2 V) and the slope time constant.

The reference voltages mentioned above are provided by a precision IC voltage-reference generator and voltage-divider network. Four resistors and a voltage-reference IC are supplied as a special set with accompanying calibration numbers. Although the resistors are five-percent tolerance components, they are premeasured at the factory to within 0.1 percent of their exact values. This information is used to provide the calibration numbers for each unit. These resistors and the voltage-reference IC are installed in sockets to prevent soldering heat from changing their values. These sockets are provided by Sabtronics.

All other measurements are first converted to dc before being displayed. For current measurements, a series of shunts converts the unknown current placed through the input terminals to voltage drops that are then displayed by the A/D converter as current. For resistance measurements, an internal precision current source is applied to the unknown resistance at the input terminals. The voltage drop across the resistor is then displayed by the A/D converted as resistance.

The Sabtronics, like many other DMMs, is an ac-averaging device, scaled to read the rms value for sine waves. Ac voltage is rectified by the ac converter, and a dc voltage proportionate to the rms value is sent to the A/D converter.

Options

The Sabtronics 2000 includes test-probe kit TL-36P. Optional equipment available includes an external power-adapter kit EP-12V, ac adapter/charger (117-V input) AC-115, and rechargeable NiCad battery pack NB-1200. None of these items was tested.

Final Notes

In the resistance ranges, the display of the Sabtronics 2000 always shows a minus sign at the extreme left side. This is a reminder that the positive lead is negative with respect to the common lead. Thus, when you are using the meter resistance scales to check diodes, etc., you'll know which way to connect the leads to forward bias the device under test.

Also of interest are the two sets of ohm ranges. Three ranges place 2 volts across the test leads (enough to check semiconductor junctions). The other three positions allow only 200 mV to be placed across unknown resistors, so as not to cause errors in measurement due to effects of parallel semiconductor junctions. This second group of resistance ranges allows *in-circuit* measurement of resistances. — *Jim Bartlett, K1TX*

RCA COSMAC VIP MICROCOMPUTER

Microcomputers are here, and they're a part of your life! From traffic lights and home energy management to complex video games and Amateur Radio equipment, these little chips and their associated systems serve in ever-broadening ways. Even AMSAT's Phase III satellites will carry two microcomputers aloft to manage on-board housekeeping and communications functions. Is keeping up with this ever-changing technology getting you down? The RCA COSMAC VIP is one way for today's ham to learn a little about microprocessor architecture, machine-level programming and interfacing techniques, while providing his family with an entertainment center from the very start. One minute you may be programming a random Morse code generator, and the next your kids may be playing "Shooting Stars" or drawing video graphics. The VIP is available in either kit or wired form.

The RCA COSMAC VIP is a single-board computer designed around the RCA CDP1802CD 8-bit microprocessor chip. It provides a hexadecimal key pad for data entry, a video interface, an audio tape recorder interface, and a programmable audio output line; you supply the video monitor or modified television set, cassette tape recorder and speaker.

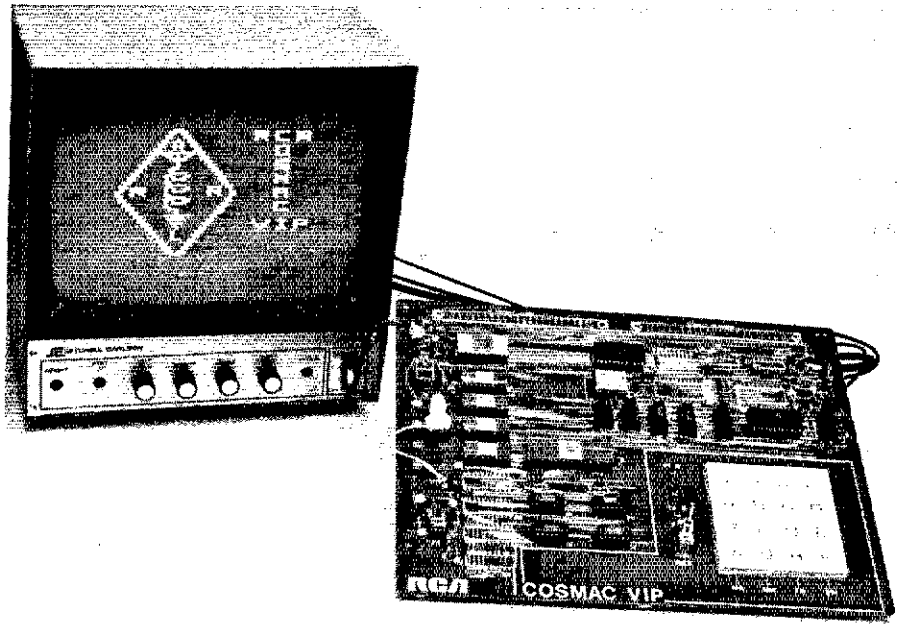
The CDP1802 microprocessor itself was designed using complementary-symmetry metal oxide semiconductor (CMOS) technology and, therefore, requires very low power for operation. The 40-pin DIP IC requires a single +5-V dc supply, has high noise immunity, and can tolerate hostile environments (temperature range of −55 °C to +125 °C). For this reason it was the ideal choice to ride on board AMSAT's Phase III mission. The 1802 has sixteen 16-bit scratchpad registers that give it great programming flexibility, and its 91 machine-language instructions are very well suited to control applications. Other useful features include an on-chip clock, internal direct-memory-access (DMA) capabilities, and no requirement for an external bootstrap ROM at startup.

Around this IC, RCA has designed the COSMAC VIP home computer. The VIP is built on a single 8-1/2 × 11-inch (216 × 279 mm) pc board, double sided with plated-through holes. Included on board are 2048 bytes of CMOS static RAM using four 4 × 1-k-bit chips, with space for another 2-k byte expansion. The ROM monitor resides in a single 512-byte chip and handles READ and WRITE to both memory and cassette tape. The 800-baud (100 byte/s) cassette interface is very handy and reliable, but is not equivalent to any of the emerging "standards." You will, however, have little problem exchanging recorded programs with other VIP users.

Another convenience is the low-resolution video graphics interface provided by the RCA CDP1861 IC. This allows you to feed composite video to a video monitor or modified television set (not supplied). Most of the inexpensive, commercially available rf modulators, designed to allow composite video signals to be displayed on a standard TV, should be adequate to handle the VIP 32 × 64-bit resolution. Also included on board is a crystal-controlled clock (the clock frequency is halved to run the system at about 1.8 MHz), a programmable flip-flop audio output circuit (you supply the speaker in the kit version), and a hex key pad for "communication" with the VIP.

Should you decide to expand the system beyond its on-board capabilities, a 22-pin expansion interface has been provided on the rear edge of the main card. All of the necessary signals are present to develop an expansion bus. A 22-pin input/output (I/O) interface is also available, offering one 8-bit parallel-input port and one 8-bit parallel-output port. An assembled 5-V-dc, 600-mA modular power supply is included. This should be adequate to handle a full complement of 4 k on-board RAM.

Kit assembly was a very pleasant experience. A little over three hours after I began construction and made a careful visual checkout, I fired up the board. It has run flawlessly ever since. This should be attributed more to the simplicity and good design of the VIP than to any unusual construction skills on my part. What few problems did occur turned out to be the inevitable short circuits between the builder's ears! For example, one source of easy misinterpretation (inadequately explained in the early



The RCA COSMAC VIP is a single-board computer designed around the RCA CDP1802CD 8-bit microprocessor IC. (The monitor shown here was provided by the reviewer.) The assembled version comes with sockets, speaker, 22-pin edge connectors, I/O latches and hex buffers that are not pictured in the finished kit version shown here.

RCA COSMAC VIP Microcomputer

Microprocessor: RCA CDP1802CD.
Clock speed: 1.79 MHz.
Power requirements: 117 V ac, 50-60 Hz, 9 watts.
Interfaces provided:
Low-resolution composite video (PL259),
800-baud audio cassette (mini-phone),
8-bit input port — 22-kΩ impedance,
8-bit output port — will drive two TTL loads.
Data entry: Hexadecimal key pad.
Dimensions: 8-1/2 × 11-inch (216 × 279 mm) pc board.
Weight: 2.2 lb (1 kg).
Price class: $220 kit (still available at time of writing), $250 assembled.

version of the manual that we received) is the apparent random fluctuation of a segment of the bit pattern displayed on the screen (when the ROM monitor is brought up, the last page of system memory is visually displayed bit by bit). This is not a malfunction. Rather it is a normally operating stack, chasing its tail 'round and 'round.

The kit comes with low-profile DIP sockets for the more critical (more expensive) ICs, though I suggest that buyers use sockets for *all* of the ICs as I did. This necessitates buying 12 more (various-sized) sockets, though the minimal added expense will really pay off later if *troubleshooting* is required. The usual precautions for working with CMOS circuitry should be taken, as static electricity and excessive heat will bring headaches later — another good reason for using a socket for each IC. Nonetheless, assembly is straightforward. A little common sense, careful soldering and thorough checking for shorts and solder bridges should steer you clear of any problems. If problems *do* arise, RCA maintains a "VIP Hotline" with very understanding and cooperative technicians on hand to assist you with any reasonable request.

Any computer, though, is far more than just hardware. After you've assembled and checked out the board, attached your cassette recorder and video monitor, and fired it up . . . whaddaya do? Back to the manual. RCA has provided a well-written, concise introduction to the VIP ROM monitor and to initial operation. This will lead you step-by-step through loading and examining memory content using the hex key pad, "dumping" programs onto cassette tape, and reading them back into memory from the audio cassette. Once you master these operations, you can turn to several test programs that test the RAM bit by bit — an excellent way to discover any problems before they are deeply buried in an "innocent" program.

From this point on you deal with software, plenty of which comes with the VIP. Foremost is RCA's CHIP-8 interpreter, a 512-byte "high-level" language, which allows you to run the 20 games and graphics programs printed in the manual. Your fingers do a lot of walking around the hex key pad at first, but if you save the programs on tape (I recommend *redundant* recording) you can load them in seconds in the future.

When your family is ready to relinquish the computer to you for a while, you can begin writing your own programs. The 31 CHIP-8 instructions allow you to handle a variety of video applications without concerning yourself with the internal registers as you must do in machine-level programming. And, of course, you're still able to use all 91 machine-language instructions for more complex control applications.

The RCA COSMAC VIP is an excellent learning and recreational tool that provides the user with all the necessary computer interfaces and control capabilities on a single board. There are, however, some cautions for the would-be VIP buyer. Don't forget the added expense of a reasonable-quality cassette recorder and tapes, and a video monitor or TV with rf modulator. If you purchase the kit version, you'll also want to buy a speaker, extra sockets, 22-pin edge connectors, I/O port latches and hex buffers. Anyone interested in machine-level programming or learning more about the internal workings of the 1802 chip will also want to buy RCA's *User Manual for the CDP 1802 COSMAC Microprocessor*. Furthermore, hard-to-get AMD9131 static RAMs were used in earlier versions of the VIP. These are not pin-compatible with the present industry-standard 2114s. If you have a system with 2 k of 9131s on board, you cannot expand on board with the 2114s. Regardless of the memory chip on the main board, however, the 2114s *can* be used on expansion cards. At the time of this writing, RCA offers 9131s to VIP owners at the same price as the 2114 expansion kits.

A final caution to those not familiar with microcomputers. The VIP is neither a "number cruncher" nor a computer you can program (at least in the initial configuration) in English sentences with a typewriter-like keyboard. Programming involves a lot of thinking, pencil work and keying in of hex codes. For example, a very simple program that causes the "Q" line flip-flop to beep at a given rate looks like this: 7A F8 ØF BF 2F 9F 3A 04 31 00 7B 30 01 00 00 00. The VIP is, nonetheless, a flexible tool for video games and a variety of control applications.

On the plus side, the VIP is a very convenient way to become familiar with the new microprocessor technology. A number of user groups and newsletters support the 1802 microprocessor, some dedicated specifically to the VIP. A considerable amount of information, assistance and ideas is readily available. In addition, RCA plans to release a color video board, music-synthesis board, memory expansion boards, expansion keyboard, a version of Tiny BASIC in ROM that will allow rudimentary BASIC programming, and a new book of source codes for additional VIP games. — *Steve Place, WB1EYI*

DSI INSTRUMENTS 3600A FREQUENCY COUNTER

Digital frequency counters have been around long enough to be taken for granted by most amateurs. Surplus frequency meters, such as the BC-221, which used to be hot items at flea markets, now languish on the shelf. If tube-type counters were the first generation, and discrete-IC units were the second, the DSI and many other manufacturers' counters represent a third generation. Where formerly an IC performed only one function, large-scale-integration (LSI) components now permit several functions to be combined. LSI chips are larger than most TTL devices, but smaller than an equivalent discrete-IC combination. This fact, combined with advances in low-power-consumption devices, results in a lightweight counter that consumes less than 5 watts, yet measures frequencies up to 600 MHz!

In this particular unit, the rf components, two prescalers and a waveform shaping circuit are contained on a small circuit board which is mounted directly to the two SO-239 connectors on the rear panel. This board is connected to the counter and display circuit installed on the front panel. Also attached to the front panel is the temperature-compensated crystal oscillator which supplies the time base in this unit. Direct

The DSI 3600A counter is installed in a 2-7/8 × 8 × 5-inch (73 × 203 × 127-mm) molded-plastic case. The 2-lb (0.9 kg) unit is shown here with the plug-in telescoping antenna that is supplied. A two-watt hand-held transceiver was used to activate the counter for this photo. Not shown is the power supply, which plugs directly into a 117-volt outlet.

connection through one SO-239 is used up to about 70 MHz, although the prescaled input may be used above 1 MHz. These modes and the duration of the gating pulse are selectable from the front panel. When the prescaler is used the decimal point is automatically moved, allowing actual frequency to be read, instead of frequency divided by 10.

A 600-MHz counter is obviously designed for use at vhf and uhf. This fact is apparent when one realizes that while the 3600A will measure frequencies down to 50 Hz, sensitivity and resolution are poor, compared to the performance at higher frequencies. The latter are detailed in the adjoining table and were measured in the ARRL lab. Unfortunately, we don't own a signal generator that reaches 600 MHz! Our old model 608 manages to squeak up to 500 MHz. It just came back from a calibration lab so the figure given is presumed accurate. Resolution is 1 hertz on DIRECT, and 10 Hz when the prescaler is used. By the way, a prescaler is nothing more than a frequency divider capable of operation at higher frequencies than most digital logic.

DSI Instruments took pains to keep the price of this counter below $200. Some of the measures may not please readers who are used to high-class (and high-cost) equipment. While the 3600A will operate from 7.5-14 volts dc, a separate calculator-type power supply is supplied. This allows a smaller and lighter box and results in fewer components for the assembly line to handle. The case itself is made of molded plastic, which frankly doesn't have the aesthetic attraction of metal. Never mind class, we're talking about the family budget here and operationally the plastic case has no effect on the counter. It worked fine in close proximity to a 2-kW hf station and the counter internal oscillators (time base and display multiplexing) caused no interference to hf, vhf and uhf equipment in use. I do wish the manufacturer had labeled the two rear-panel connectors, but I'm sure this was an oversight. It certainly convinced me that this was not a specially prepared unit! At least I had an excuse to pop open the case to inspect the workings.

One final point which, while it is applied to the DSI people in this case, should be noted by other manufacturers as well. The manual for this unit gave me all the information I needed, but contained some questionable grammar and several misspelled words. Lest this be taken as an editor's lament, let me say that the manual represents the company as much as does the performance of the unit. High-quality technology is hidden by the cabinet, but the care, or lack of it, that went into the manual is exposed for all to see. It may be wrong to judge a company by the quality of its manuals, but I'm sure many of us do. Surely engineers and marketing men know a schoolteacher or two who could look over a manual and put it in shape before it's printed up. End of sermon. With counters like the 3600A in the $200 price class, there's no excuse for anyone being off frequency anymore! DSI Instruments, Inc., is located at 7914 Ronson Rd., San Diego, CA 92111. — *Jim Kearman, WIXZ*

DSI 3600A Frequency Counter

MHz	*Sensitivity in mV*
10	110
20	80
30	65
50	30
100	10
150	20
225	20
440	40
500	70

Sensitivity of the DSI 3600A frequency counter when the prescaler is used. Measurements were performed in the ARRL lab using a Hewlett-Packard 608A signal generator.

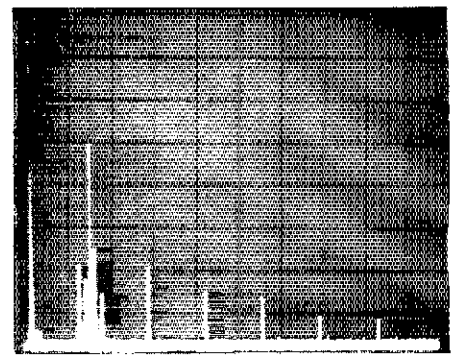
HAMTRONICS XV2 TRANSMIT CONVERTER

Where once a typical New England vhf enthusiast heard only noise, signals are appearing with increasing regularity. The lower portion of the 2-meter band, once only populated during contests and band openings, now reveals a half-dozen or so cw and ssb contacts during an average evening. Two-meter cw sounds like the cw portion of 10 meters when the two bands are open.

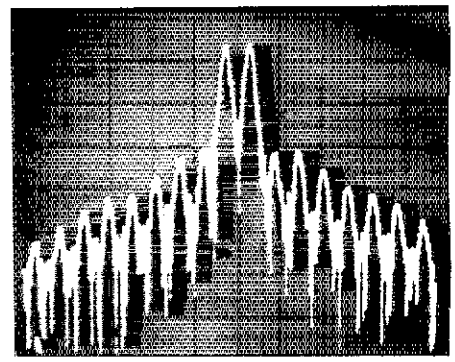
Much of the activity escalation is due to the preponderance of multimode transceivers found today on the band. Unfortunately, these transceivers are rather expensive, and many amateurs are reluctant to purchase a multimode transceiver when they already have a considerable amount of money invested in an hf station.

The Hamtronics XV2 2-meter transverter offers an alternative. In the XV2, low-level 10-meter energy is mixed with an appropriate local oscillator signal, and the hf signal is faithfully reproduced on 2 meters. The low-level mixer output is filtered to maintain spectral cleanliness and amplified to a level suitable for practical communications.

The XV2 comes as a kit. However, if you buy one don't expect a kit complete with step-by-step instructions for every connection. The construction of a Hamtronics kit can be more likened to building a project out of *QST*, except that somebody has thoughtfully provided every resistor, capacitor, coil form and whatever else is to be soldered to the supplied pc board. A certain sense of accomplishment more akin to "homebrew" construction is afforded the builder, without some of the headaches involved.



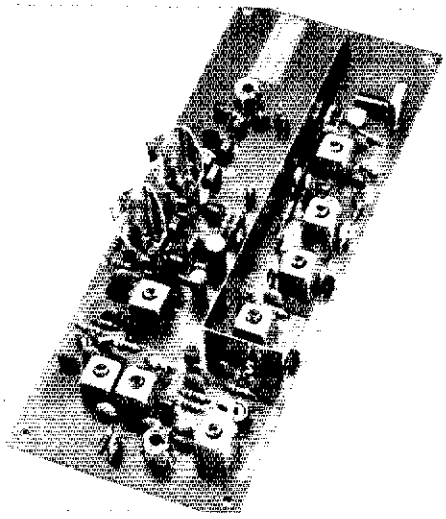
Output of the XV2 as displayed on a spectrum analyzer. Vertical scale is 10 dB per division, and horizontal divisions are each 100 MHz. The top reticle line in the photo represents full amplitude of the fundamental, which is partially notched out here to prevent overload distortion in the analyzer. The most significant spurious emission is an in-band spur occurring at approximately 160 MHz, down 55 dB with respect to the unnotched fundamental. All other spurs are down at least 59 dB. The XV2 meets or exceeds current FCC regulations concerning spectral purity. These measurements were taken in the ARRL lab.



This photo shows the output of the XV2 during full-power two-tone tests at 144 MHz. Each vertical division is 10 dB and each horizontal division equals 2 kHz. Third-order products are approximately 30 dB down from the PEP level. Measurements were taken in the ARRL lab.

No problems were encountered in construction. Total time necessary to complete the unit was less than three hours. A few anxious moments were met during tune-up, though. The instruction sheet clearly points out the potential of (and cure for) instability when the transverter is being tuned. A comparison of tune-up by the book and tune-up with the ARRL lab spectrum analyzer showed little difference in resultant spectral purity between the two methods. The only adjustment that responded better to precise adjustment was the mixer balance potentiometer, which when properly adjusted nulled out some of the low-level products a few more dB (depending on the product). Even when the mixer was not precisely balanced, all the output products were well within FCC requirements.

Power output was measured to be two watts with −6 dBm of 10-meter drive applied. The spectral display of output products is shown above. All the measurements were made with 13.6 V dc applied to the transverter. With



Completed XV2 transmit converter board. Note the heat sinks attached to the final transistors, and the metal strip used to shield the LO chain from the rest of the circuit.

greater drive more output could be attained, but the amplifier transistors become excessively warm under such conditions, and the 2-watt level should not be exceeded.

A problem many prospective 2-meter moguls may run into is obtaining such low-level, 28-MHz drive. Turning down the microphone gain on the exciter achieves this end, but leaves the transverter vulnerable to operator slip-ups and subsequent transistor frying. Many modern hf transmitters and transceivers have an output designed for transverter use. The ICOM IC-701 and all Kenwood hf rigs have transverter outputs directly compatible with the drive requirements of the XV2. The Collins S/Line and KWM-2 also have transverter outputs, but at a somewhat higher level than is necessary for the XV2. A suitable attenuator can be made from three 1/2-watt resistors, as described in the instruction sheets from Hamtronics, to reduce the drive to an appropriate level. Schemes for other radios lacking transverter outputs are described in the XV2 construction manual. Modification of the rig is required to obtain the desired drive level. None of these modifications need be permanent, so the resale value of the hf station is not reduced. The manual dexterity necessary to perform the modifications is comparable to the skill required to build the kit.

One important fact that any would-be 2-meter transverter user should consider is this: Even though the XV2 is a clean unit with regard to its reproduction quality, the 2-meter output is only as clean as the input signal fed to it. The transverter is not a cure for poor hf signal quality. A clean signal on 2 meters is a joy to behold, but because of the relatively small number of signals, a poor signal sticks out like the proverbial sore thumb. With this admonishment in mind, a Hamtronics XV2 owner should carefully choose the hf exciter so as not to incur the wrath of the local 2-meter establishment. Fed with a known-to-be-clean exciter, the output of the review unit was deemed by the ARRL staff critic to be above reproach. On-the-air tests brought the response that this reviewer's voice was recognizable, a situation our critic found to be unusual, or so he claims.

Matched with a quality receiving converter and a good antenna, the XV2 lays a fine foundation for a 2-meter ssb and cw station. The hf operator who wishes to operate OSCAR Mode A would find the XV2 to be just the necessary adjunct he needs. The XV2 is available from Hamtronics, Inc., 182 Belmont Rd., Rochester, NY 14612. Price class is $60. — *Clarke Greene, K1JX*

Hamtronics XV2 Transverter Kit

Power output: 2 watts PEP.*
Frequency output: 144-146 MHz (other ranges possible).
Drive required for full output: 1 mW.
Input frequency: 28-30 MHz (other ranges available).
Input/output impedances: 50 ohms.
Input/output terminations: RCA-type connectors.
Power requirements: 13.6 V dc at 350 mA, regulated.
Drift at 144 MHz: less than 1 kHz per hour.
Dimensions (HWD): 1-5/8 × 7-3/8 × 2-7/8 inches (41 × 187 × 73 mm).
Price class: $60.

*All measurements performed in the ARRL lab.

TUCH-COM 1215 TONE ENCODER MICROPHONE

After an amateur procures an fm rig, what's usually the first accessory he thinks of adding? Without a doubt the answer has to be a dual-tone encoder, more popularly known as a Touch-Tone pad. Most require construction or radio modification or both.

For owners of ICOM models IC-22S, -245, -211 and -215 there is a simpler alternative. The Tuch-Com 1215, when plugged into the mic input, can be used as both a mic and tone encoder. It can't get much simpler!

The Tuch-Com 1215 gets "double duty" out of pin 1 at the transceiver mic jack, normally just the mic input. Since pin 1 is also tied to 12-V dc, it is used to power the tone-generator circuit, while the audio coupling to the 600-ohm microphone-input circuit is done through a 0.1-μF capacitor. Inside the Tuch-Com, similar coupling is used to allow the +12 V and audio lines to "share" the same conductor. The Tuch-Com 1215 employs the popular Motorola MC14410P IC, with pots for adjusting the dual-tone balance and output level. Outside, the case front and PTT switch are similar to the regular ICOM mic. On the back is the array of 12 snap-action keys. An adhesive-backed hang-up hook is included in the package.

Now, the real question — does it work? On my first try on a local repeater, using the 1215 and an IC-22S, I brought up the dial tone and rang my home phone with no problem. The Tuch-Com 1215 was also tested and used successfully with an IC-211 and IC-211E. The tactile-feedback keys are a definite advantage in a mobile environment. Nevertheless, caution should be exercised when using this combination tone-encoder/mic while driving a car, since you may need two hands to operate the encoder — one to hold in the PTT switch, and another to punch the tone buttons.

A similar model is available for use with the Yaesu FT-227R. Use with other rigs is possible with either model if necessary wiring modifications are made to the microphone jack. The Tuch-Com 1215 is distributed by Help Radio, 1055 Liberty St., Jacksonville, FL 32206. It carries a one-year warranty and the price class is $55. — *Jim Morris, K1UJ*

DANIEL ENTERPRISES, INC., GREAT CIRCLE BEARING LIST

Computers are doing more and more these days to help hams with everyday station operation; Daniel Enterprises' Great Circle Bearing List is one such example. Given the coordinates of your QTH, Daniel produces a very comprehensive, easy-to-read operating aid. The following data are included: prefix of the country or state, heading in degrees from your QTH, return heading (for the other fellow), distances in statute miles between your locations, and time difference in hours at the other QTH. This last category is expressed in UTC and is based on standard time zones (EDT, for instance).

More than 765 countries/states are listed; 3-1/2 pages are devoted to cities in the ten U.S. call-sign areas. A random sampling of bearings was tested using the great circle formulas described by K1PLP (now K1TD) in August 1973 *QST* and all checked out well. Each bearing is calculated to the nearest tenth of a degree.

I have had the Daniel Great Circle Bearing List at my operating position since my first tower and tribander were erected in the spring. It's been invaluable, considering that I've often been confused by great circle headings and points on the compass rose!

If you don't have access to a computer that will read out the beam headings for those elusive rare ones, this list offered by Daniel Enterprises is a nice operating aid to have in the shack. The list comes fan-folded with perforations that make for easy, page-by-page separation, should you desire to put the list into a binder. Price class is $12. It is available directly from Daniel Enterprises, Inc., P. O. Box 2370, La Habra, CA, 90631. — *Sandy Gerli, AC1Y*

NEW BOOKS

Photovoltaic Power Generation, by David L. Pulfrey, Ph.D. Published by Van Nostrand Reinhold, a division of Litton, NY, NY 10020. Hard-cover edition, 6-1/8 × 9-1/4 inches (156 × 235 mm), 218 pages, including index. Price: $16.95 U.S. at time of review.

Amateurs and engineers who are interested in a new frontier should find this volume of immeasurable value when seeking knowledge about solar-electric power. The chapter headings are (1) Introduction, (2) Elements of Photovoltaic Power Systems, (3) Solar Cells: Basic Theory and Present Performance, (4) Solar Cells for Unconcentrated Sunlight Systems, (5) Solar Cells for Concentrated Sunlight Systems, (6) Economic Assessment of Photovoltaic Power Systems, and (7) Conclusions.

The narrative is entirely lucid, but the author does not "talk down" to the advanced reader. There is minor emphasis on mathematics and strong delivery of practical data.

The book contains a plethora of diagrams, curves and nomographs, but by no means an excess. *Photovoltaic Power Generation* appears to be *the* present-day manual on solar-electric power. This reviewer feels that it would complement any modern technical library. Those who are interested in utilizing solar-electric power will find this book to be a first-rate primer on the subject. — *Doug DeMaw, W1FB*

Hints and Kinks

A VOX FOR A VERY SMALL BOX MODIFICATION

May I share my comments and modification related to Douglas Blakeslee's "A VOX for a Very Small Box" described in March 1976 *QST*. His idea of using a 555 timer for controlling the transmitter relay works fine because, as he says, the VOX delay becomes independent of voice level or duration. When I tested my unit using this circuit (prior to installation in my ssb transmitter), I noted the following results. If the speech duration was longer than the VOX-delay duration, the relay would be disconnected as soon as the voice ceased with no delay occurring at all.

Investigation revealed that the 555 IC is activated by the positive-to-ground transition of the comparator (U1D) output, originated by the start of the operator's voice. This transition, equivalent to a negative pulse, turns off a transistor in the 555 IC, the collector of which is connected to pin 7 of the timer and holds C1 discharged. C1 starts charging at the same time the relay is switched on. When the voltage across C1 reaches 2/3 of the supply voltage, it is sensed by pin 6 of the 555 and the relay is then cut off. During the charging of C1, the 555 timer is immune to further triggering at pin 2 and it will only be triggered again if a negative pulse is applied after the timing interval ends. After the first timing interval is over, it is unlikely that the operator's voice will produce a negative pulse such as that which can be caused by a brief silent period followed by more speech. However, if the speech continues, pin 2 is kept low and the relay is held on. When speech ceases, the relay is immediately cut off.

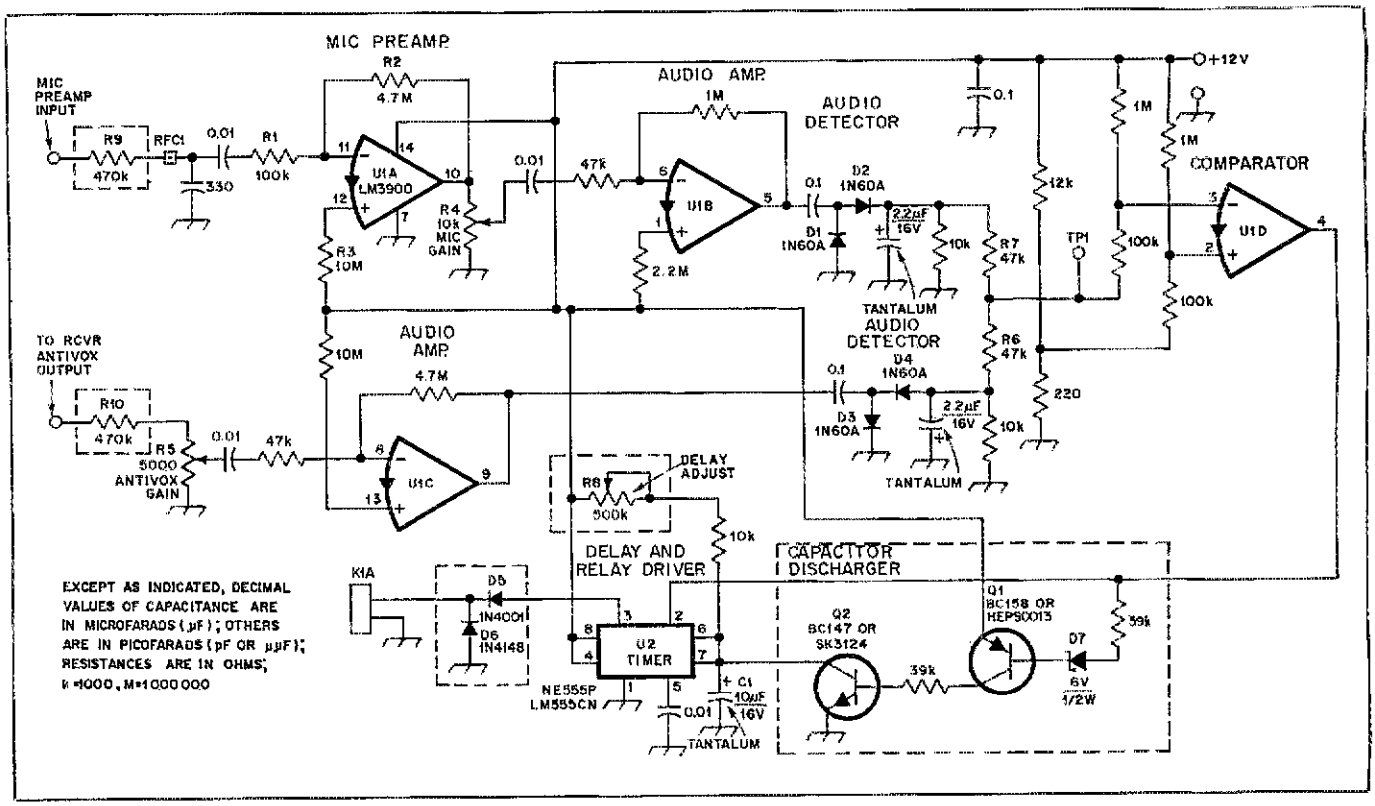
The effect is difficult to notice with very short delays, but as I needed a 1- to 1-1/2-second delay, I devised a method of keeping C1 discharged while I was talking. The modification for obtaining the longer delay is shown inside the dashed lines on the accompanying diagram. This modified section operates in this manner. When pin 4 of the LM3900 goes low, this voltage drives Q1 from cutoff to saturation which in turn saturates Q2, thus discharging C1. C1 is kept shorted all the time the operator is talking. When his voice ceases, Q2 is cut off, permitting C1 to charge and a new timing cycle starts. At the end of the cycle, when the voltage of C1 reaches 2/3 of the supply voltage, the relay is cut off. D6 is a Zener diode providing some threshold for Q2 switching.

The VOX input is connected to the output of my ssb transmitter microphone preamplifier. In order to reduce the amplification of U1A, R9 is added to the circuit. The anti-VOX input is connected to the primary of the audio output transformer in my Drake R4-B receiver. R10 is necessary for reducing the input voltage at the VOX unit.

After the VOX device was installed in my transmitter, speech would actuate the relay. At the end of the delay period, however, it would not turn off. I presumed this happened because of the effects of the rf field, as mentioned by Mr. Blakeslee. The trouble ended with the addition of a 0.1-μF capacitor across K1 but a further modification eliminated the capacitor

Modification of the VOX for a Very Small Box. With the exception of resistors in the megohm range, which are 1/4-watt deposited carbon, all resistors may be 1/8 watt. Polarity-marked capacitors are tantalum. Others are disk. Dashed lines surround the modified areas.

C1 — See text.
D1-D4, incl. — 1N60A germanium diodes or equiv.
D5 — Silicon diode, 50 PRV, 0.5 A or larger, 1N4001.
D6 — Silicon diode, 1N914 or 1N4148.
D7 — Zener diode, 6 V, 1/2 W.
K1 — Miniature relay, 12-V coil, Potter and Brumfield, R10-E1-Y2-185. See March 1976 *QST*, pages 25-26. Current rating may range from 50 mA to 200 mA.
Q1 — Small-signal pnp silicon audio transistor, type HEP S0013 or equiv.
Q2 — Small-signal npn silicon audio transistor, type SK3124 or equiv.
R1-R3, incl., R6, R7, R9, R10 — See text.
R4, R5, R8 — Panel-mount linear-taper potentiometers.
RFC1 — Ferrite bead, Amidon no. 101-43 or equiv.



with D5 and D6 being inserted as shown in the diagram.

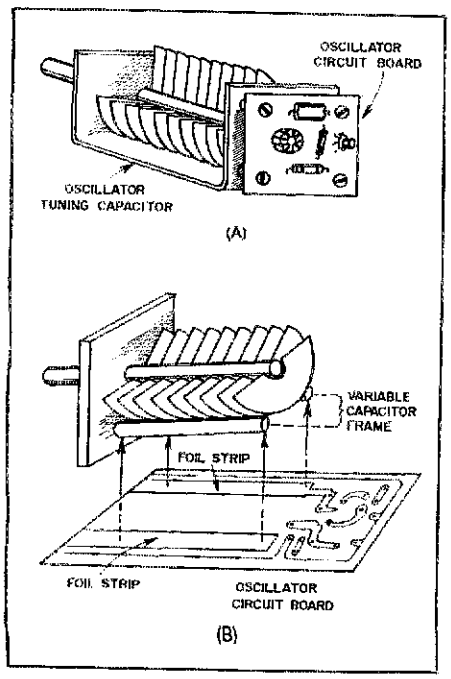
D5, indicated by Mr. Blakeslee in Feedback (*QST* for May 1976), should be a 1N4001 diode instead of a 1N914, a change that permits higher current-handling capability. Rather than inserting D6 between pin 3 of the 555 and ground, I wired it in parallel with K1. Doing so allowed K1 to release properly. R8 was changed to 500 kΩ to provide longer delays. — *Jose I. Cracovski, LU5AFQ*

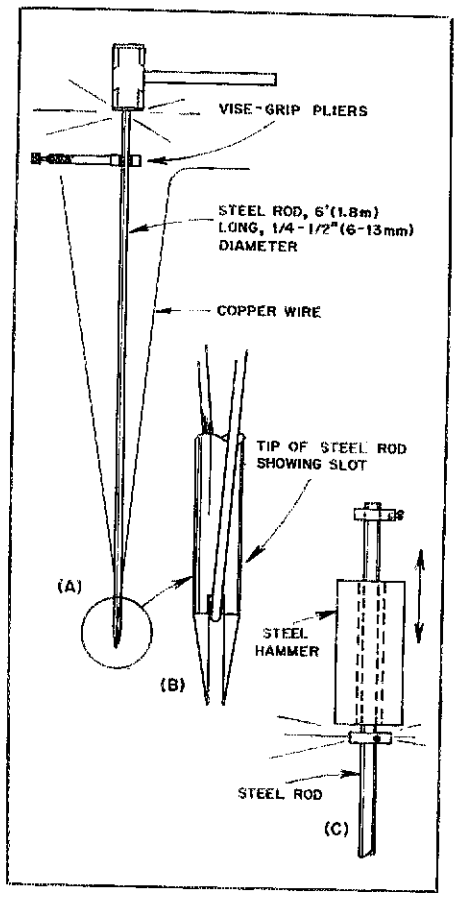
VFO MECHANICAL STABILITY

A possible source of VFO instability is movement of a panel-mounted variable capacitor relative to the rest of the oscillator circuit, the frequency of which it controls. If the entire VFO is built on a circuit board that is secured rigidly to the tuning capacitor, the problem can be eliminated. For receiver type capacitors with a heavy U-shaped frame, an easy way to achieve mechanical stability is to mount the oscillator circuit board directly against the variable capacitor by means of machine screws and spacers as shown in illustration A. For small open-type capacitors a circuit board can be made with two large foil areas which can be soldered directly onto the stator bars or the bottom edge of the stator plates as in drawing B.

A drop of epoxy cement will hold a toroid coil quite rigidly against a circuit board. Other components will be held adequately by their leads. Such construction leads to a VFO that is one rigid unit. The only solid mechanical contact with the rest of the equipment is through the normal mounting of the capacitor. I have used this technique to build exceptionally solid and stable oscillators for a 3.5-MHz QRP transceiver and for a 16-MHz tunable oscillator for the second converter in a 146-MHz transceiver. I have neither the tools nor the skill that would have been required to produce such stability using conventional techniques. — *Albert S. Woodhall, N1AW*

For stability of a VFO, the entire oscillator circuit board can be mounted on the frame of a capacitor by means of spacers and machine screws, as shown at A. Two large foil areas extending forward on the circuit board of an oscillator can be used to solder the entire board to the stator bars of an open-type variable capacitor such as shown at B.





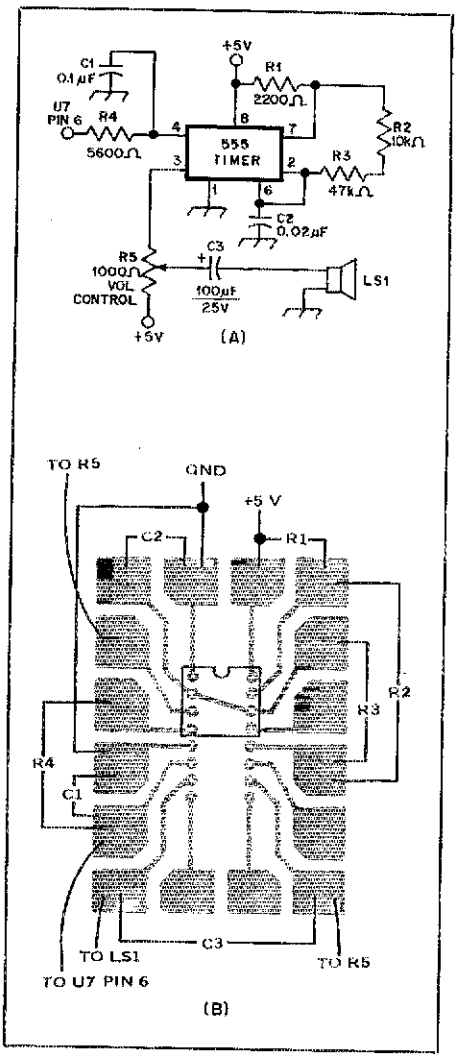
K2GNC, an East Coast DX chaser on the 160-meter band, rigged up this tool for inserting the ends of radials in the ground.

TOOL FOR WIRE GROUNDS

Obtaining a deep ground at a reasonable price is difficult these days with copper products selling at premium prices. For the operator who is seeking to get the best from his 160-meter vertical antenna, such grounding can be expensive, especially if there are over 100 radials that are to be grounded at the far ends plus a few grounds to be inserted at the base of the antenna.

A cost-reducing solution is to use wire grounds. For this purpose I use a stiff steel rod of relatively small diameter (refer to the drawing, part A) with a slot sawed in the pointed end. A doubled-up length of wire or the end of a radial is inserted in the slot and then both the wire and the rod are driven into the earth with the help of a sledgehammer. When the rod is withdrawn the wire remains in the earth.

I find that a vise-grip tool is helpful for holding the rod while twisting and driving it into the ground. Plastic-covered copper house wiring cable, which is available at electrical and hardware stores, may be stripped and used for this purpose. — *Bill Pfaff, K2GNC*



Modification of the WA3WAE Accu-Keyer sidetone monitor circuit. Beneath the schematic diagram is the parts placement guide. The 555 IC occupies the top set of pins in the placement guide and is mounted on the nonfoil side of the circuit board. Other components are on the foil side. Note the jumpers between pins 2 and 6 of the IC and to the ground pad for C1. The etching pattern is given on the next page.

IMPROVING THE ACCU-KEYER SIDETONE

The idea Ron May (WA3WAE) had of using the Radio Shack printed circuit board (276-024) as the foundation for building the Accu-Keyer sidetone oscillator (February 1976 *QST*) is a good one. I found, however, that cutting the foil and drilling holes are unnecessary. The components are arranged differently on the board, as shown, with the 555 socket mounted (if preferred) on the component side of the board. The rest of the components are attached to the foil side, their leads formed into little feet. A fixed value of 10 kΩ is used for R2 and the +5-volt leads are connected to the unregulated +16-volt input of the LM-309 instead, providing room-filling volume.

For those who wish to try my arrangement and who may have missed the Feedback item in *QST* for April 1976, the parts layout drawing accompanying Ron May's article omitted a jumper between R1 and pin 7 on the 555 oscillator. This connection is correctly shown

in the drawings presented here. Note the jumpers from pin 2 to pin 6 of the IC and the ground pad to C1. Also observe that in the circuit-board drawing, the 555 occupies the top set of pins and is mounted on the opposite (nonfoil) side of the board. Other components are on the foil side. — *Paul K. Pagel, N1FB*

PANEL LABELS

When labeling the panel of a home-constructed project, "label gun" tape just doesn't have that professional look. Panel decals that say what you want are sometimes difficult to come by. Sharp-looking labels can be made easily using a typewriter with carbon-film ribbon, translucent Scotch tape and a piece of wax paper. Stick a piece of tape onto the wax paper, insert the wax paper into the typewriter, and type whatever you want on the tape. Then remove the wax paper from the typewriter and stick a second piece of tape exactly over the first, pressing down hard with your fingernail. (The second layer of tape keeps the print from smearing.) Carefully take the tape off the wax paper and apply to the panel of your pride and joy. Again, press hard with your fingernail.

It is important that your hands be clean when making and applying these labels. Also, small particles of dirt on the panel or between the two layers of tape will cause spots to appear on the label. When properly applied, the tape will be nearly invisible, and from a short distance it will seem as though the lettering has been typed right onto the gear! — *Stan Gibilisco, W1GV*

HINTS

Great stuff for holding down keys, mics, rigs, tuners and any piece of Amateur Radio gear is Funtak made by the Permabond International Co., Englewood, NJ 07631. It is available at hardware and other stores. Funtak leaves no stain and can be reused. — *Al Kaufman, W1JVQ*

K5QNY suggests using WD-40 spray lubricant as an aid in dismantling tower sections which are frozen together. He stated in his Hint and Kink that it is a silicone-bearing lubricant. In this respect he is in error, for WD-40, according to information on the can, is silicone free. WD-40, however, is just as good as Dick says. I point this out because someone may want a nonsilicone spray lube and indeed WD-40 is great! — *Robert Wheaton, W5XW*

POINTERS ON THE GEM QUAD ANTENNA

Some owners of Gem Quad antennas have initially experienced a measure of difficulty in making necessary adjustments to obtain low SWR readings. Haydn C. Brisley, VE4RB, president of Gem Quad Products Ltd., has furnished these suggestions for resolving the SWR problem.

Although it may seem elementary to mention this, the directions supplied with the Gem Quad must be carefully read and followed. Experience indicates to the manufacturer that in the haste to assemble the antenna many owners don't take time to thoroughly understand the instructions.

Once the antenna is assembled all solder joints must be examined for flaws, followed by a continuity test at the receiver end of the coaxial cable. With a dummy load and a good SWR bridge, check the balun and wire which should show a maximum SWR of 1.5:1. The balun leads must be kept short with no extraneous loops.

A front-to-back ratio of approximately 25 dB on the 20- and 10-meter bands and 20 dB on 15 meters is most important for successful operation of the Gem Quad. Before being concerned about the SWR reading, owners should try to obtain these ratios. The adjustments which affect front-to-back ratios have a definite effect on the SWR indications.

If the SWR changes with the direction of the antenna, there is a likelihood that the antenna is in the presence of other antennas or metal structures. Should there be reason to suspect that a nearby antenna is causing a problem, a receiver may be connected to the antenna in question followed by an observation of the S meter for changes that might occur as the unexcited Gem Quad is rotated toward and then away from the nearby antenna. A pronounced change would indicate that the Gem Quad is reacting to the nearby offender.

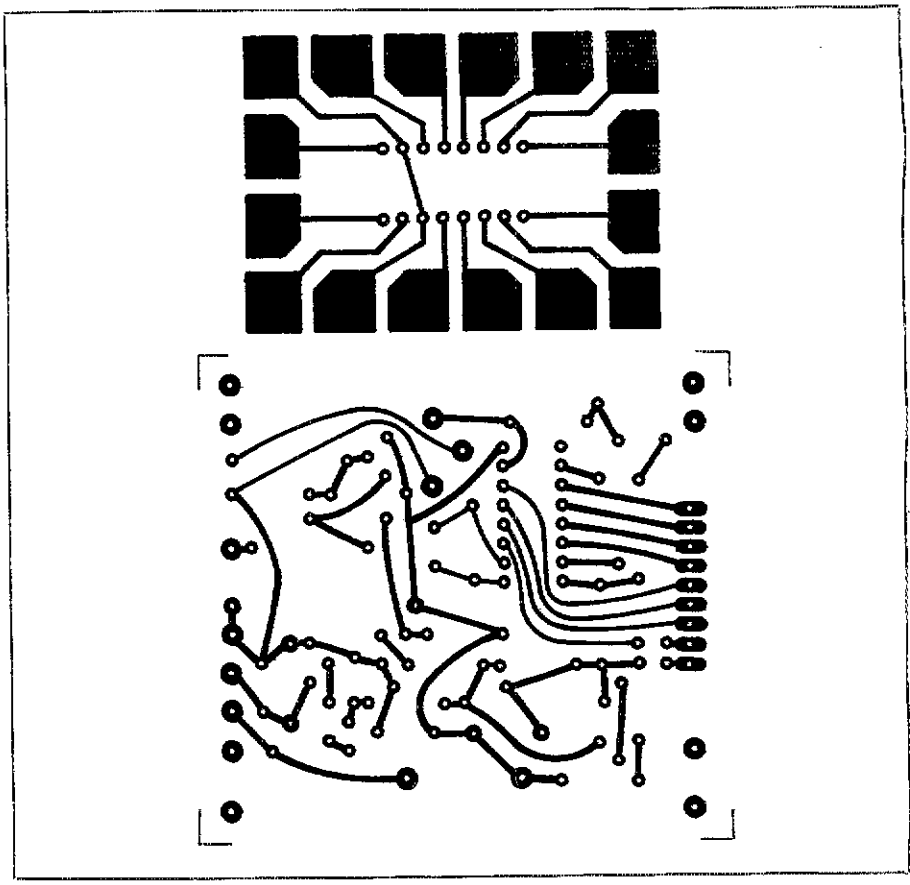
Feed-line pruning has been successfully used by some amateurs in order to reduce the apparent SWR seen by the transmitter. A method of doing this would be to add 10 ft (3 m) of cable to the feed line, pruning the line thereafter in increments of 4 in. (102 mm) until a satisfactory SWR indication is observed. Keep in mind that this bit of legerdemain does not change the actual SWR between the antenna and the transmission line but simply makes the load at the transmitter appear to have an acceptable SWR. (See the editor's note.)

An alternative to the balun would be a choke made from 16 ft (4.9 m) of RG-11/U formed into a 6-in. dia (152-mm) coil. This will provide a flat response with good SWR readings on all bands. Where the SWR is considered of great importance, the use of a Transmatch is recommended. Gem Quad owners should be aware of the fact that there is a compromise effect from the directors in the relationship of the three- and four-element quad spacing.

Mr. Brisley concludes his list of suggestions by departing from the SWR problem, stating that the spider can be attached to the top of a mast by using a rotator as the joining unit. Where this is not desirable, he says, the use of a sleeve of appropriate size is recommended. Because movement results in wear, the sleeve and bolts must be secure. — *Garry Barteis, WB1CPM*

[Editor's Note: with a length of coaxial cable being in the immediate vicinity of a radiating antenna, current may be induced on the outside of the shield of the cable. By changing the length of the cable, it is possible to alter the magnitude and the phase of this current so that the rf voltage potential and the resultant current flowing at the antenna end of the line are the same as if the line were terminated in a matched load.]

Top, circuit board etching pattern for the WA3WAE Accu-Keyer modification (previous page). Bottom, etching pattern for the "First-Class Touch-Tone Encoder," page 24 of this issue. The board is single sided, shown at actual size from the foil side, with black representing copper.



QRN Communication — Myth or History?

More than a century ago, Dr. Mahlon Loomis had a solution to today's energy crisis? Was he right?

By R. S. Naslund,* W9LL

Christopher Columbus has his Lief Ericson, Samuel F. B Morse has his Alfred Vail, Alexander Graham Bell has his Philip Reis, but is Mahlon Loomis a threat to the esteem of Heinrich Hertz, Guglielmo Marconi and Aleksandr Stepanovich Popov?

You may not believe the stories in the *National Geographic* about those intrepid Vikings and the interpreted hieroglyphics from the Runestone on display in Alexandria, MN. And you may find offensive the suggestion that Morse claimed credit for both the apparatus and code that may have been the creation of his assistant, Alfred Vail, or that Reis preceded Bell by 10 years in inventing the telephone.

But who was Mahlon Loomis? Dr. Mahlon Loomis was a Washington, DC, dentist who believed that the ocean of atmospheric electricity, which we hams curse as QRN, could be harnessed for communication, light, heat and motive power. To prove this theory Loomis first demonstrated in the presence of Senator Pomeroy and Congressman Bingham of Ohio as well as others in October 1865 his "aerial telegraph" over the 14-mile distance between Cohocton and Bear's Den Mountains in the Blue Ridge range of northern Virginia. Later demonstrations involved ship-to-ship communication in Chesapeake Bay. The demonstration equipment, identical at each site, consisted of a 600-foot (180-m) antenna held aloft by a kite (à la Ben Franklin), a galvanometer, a ground wire laid in "wet earth," and a means of interrupting the series circuit. By prearranged schedule the circuit was broken at half-minute intervals, first at one demonstration site and then the other over a three-hour period until the "electrical body" of atmosphere moved away. The galvanometer at the receiving station deflected decisively with each circuit change at the transmitting station much to the "solemn feeling" and awe of the witnesses. These first transmissions were concluded at the end of the three hours by the electrical storm moving elsewhere. However, locally supplied power could have produced a system not dependent on weather conditions.

One can theorize that the atmospheric electricity is sufficiently polarized to pulse the grounded antenna, causing it to oscillate and radiate at its resonant frequency much like a simple spark transmitter acting on an antenna. Just how the galvanometer, a dc instrument, responds to the rf from the receiving antenna plus the local QRN is difficult to explain. Also, it would have to be shown if the signaling could be increased to telegraph speeds. This was probably the world's first slow-speed frequency shift keying, with the grounded antenna oscillating at about 400 kHz and in the open-circuit "off" condition at about 800 kHz. Loomis noted that "lowering of one kite would, however, break off communications immediately." He might not have recognized antenna resonance as such but he determined that the antennas should be of equal length; and hence, they were resonant at the same frequency. There is even some evidence of successful experiments circa 1878 using a telephone instead of the galvanometer.

It would be an invigorating challenge to repeat the Loomis demonstration, especially so from the historic Cohocton and Bear's Den peaks of the Blue Ridge, although there might be some concern from the FCC. If, indeed, the demonstration can be repeated — as every worthy scientific experiment can — and the FCC claims jurisdiction, then there is no doubt that Loomis in 1865 was first with wireless communication 20 years before Hertz, Marconi, Popov and all the other early heroes of wireless.

Loomis was well aware of the commercial possibilities of his aerial telegraph; he even sketched the San Francisco-to-Japan circuit. But his efforts to obtain a $50,000 grant from Congress to continue his experiments failed. He continued to form a commercial enterprise, however. Congressman Bingham introduced a bill in the House to incorporate the "Loomis Aerial Telegraph Co." in the District of Columbia in 1869 but it did not pass until three years later.

Loomis was granted U.S. Patent No. 129,971 in 1872 on an "Improvement in Telegraphing." If only Congress had granted the $50,000, wireless history might have been considerably different.

Most of the information existing today about Dr. Loomis is in the radio textbook, "Radio Theory and Operating" by Mary Texanna Loomis, ex-W3YA, in several editions during the '30s. Additional record of the theory and experiments of Loomis is in the November 1922 issue of *Radio News*. Robert H. Mariott, who himself stands tall in radio history, wrote his comments in *Radio Broadcast* for December 1925.

What a pity that historians do not always seem fair in their judgment of contributions to civilization — that monetary success and publicity are often equated. But an even greater pity is that mankind fails to recognize the gifts of individuals who are awarded neither fame nor fortune while they are still living.

*178 N. 8th Ave., Des Plaines, IL 60016

Meet Sam May, AD7F, Volunteer Instructor of the Year

Sam's Idaho hams are living proof that it takes more than experience to make an outstanding volunteer instructor.

By Jeanie M. S. Zaimes,* AB1P

"What would I do without him? Certainly I would have gotten nowhere. So many times I wanted to say 'I just can't do it.' " — WB7UTH

"Just making Extra himself, he had lots of his own studying to do, but he always had time for us and still does." — WB7VMR

"Through his persistent, thorough instruction and unending support, he has helped me to qualify for an Amateur Radio license — a dream I have had for a lifetime and have been able to fulfill since my retirement six months ago." — WB7WFZ

Who is this larger-than-life volunteer instructor? He is Sam May, AD7F (ex-WB7OQB), Instructor of the Year. The above comments are but a small sampling of the letters we received in praise of his work as an instructor.

The Lake County (IN) Amateur Radio Club, in cooperation with the ARRL Club and Training Department, recently awarded the first annual Herb S. Brier, W9AD, Memorial Award to Sam for his outstanding effort on behalf of his students and Amateur Radio. Runners-up were Jack Francis, WB7KYT and Kay Alston, WA3ZCE.

Herb S. Brier, W9AD, was the long-time Novice editor for *CQ Magazine*. He was often bedridden with arthritis from the age of 13, and yet he devoted a lifetime to Amateur Radio: tutoring students, writing articles, building equipment and operating. His dedication was boundless and his efforts introduced thousands to the exciting world of Amateur Radio. What kind of instructor merits an award in his honor?

About the Instructor

Sam May, AD7F, teaches license classes in his home in Post Falls, ID. The type of person who has never given up easily on anything or anybody, he started an Army career as a raw recruit with an eighth-grade education and eventually rose to full colonel before he retired to a "career" in Amateur Radio.

He was first licensed as a Novice on December 10, 1976, at the age of 72. Sam, who passed his Amateur Extra Class exam on May 26, 1978, says of teaching: "I am not a teacher by profession. . . . I had to learn by self-study and it was tough going. I made up my mind when I received the General class license I would do my best to assist others who were interested in Amateur Radio by holding classes. I have no reason to regret my decision."

Indeed he hasn't! Each one of the 34 students in his Novice class passed the exam. Of the 27 students in his General class, 16 upgraded to General and 7 reached Technician class.

And then, in an effort to beat the debut of new FCC examinations, Sam started an Advanced class with 10 students. He held the class three or four times a week. Of the nine who took the exam, five upgraded to Advanced and two Technician class licensees upgraded to General. All in all it was very successful, especially considering the accelerated nature of the class.

That's quite a number of students for about one year of teaching — 71, to be exact. What's the secret of Sam's success? "Perhaps my methods are unorthodox, but . . . you cannot teach all the way by the book," he says. In the words of one of his students, WB7VAQ. "He takes every approach he can think of to explain all the math and theory so it can be understood."

Sam, shown here with his wife, Gerry, seems pleased to have been honored by his students with a testimonial dinner in Spokane, WA. *(photo courtesy* Post Falls Tribune*)*

Runners-Up

And how about the runners-up? Again the overriding opinion of the students is that a good instructor *cares*. A good instructor is patient, answers endless questions, and takes a personal interest in each student. Students were not as impressed by knowledge as they were by time and patience, a willingness to "stick it out" with the student until he or she upgraded.

Jack Francis, WB4KYT, of Catlettsburg, KY, teaches classes at Ashland Oil Company, where he is employed. Another "brand-new" General himself, Jack started his first Novice class soon after upgrading. One of his students has this to say about him: "He went above and beyond his duty as an instructor to invite us into his home to see his equipment in operation, as we were completely newcomers to Amateur Radio." — KA4ECX

Kay Alston, WA3ZCE, of Brentwood, MD, teaches Novice and General classes as well as tutoring students on a one-to-one basis in her home. One of her students says: "It takes a special person to dedicate the many hours necessary to teach a class." — John Reiner

It Takes a Special Person

Yes, that about says it all. It does take a special person to be an instructor. To this year's winners, we say "Congratulations and keep up the good work!" Without your tireless dedication, and the dedication of thousands like you, Amateur Radio would not be what it is today.

Perhaps you know of another instructor worthy of the Herb S. Brier, W9AD, Memorial Award. If so, please write to us here at C&TD. We'd like to make it an annual opportunity to give recognition to the outstanding instructors in Amateur Radio. QST

*Asst. Mgr., Training, ARRL

Why QSK?

Basic Amateur Radio: Whether you handle traffic, jump into contests, or ragchew with a roundtable or buddy, full break-in gives you maximum operating flexibility.

By David P. Shafer,* W4AX

A cardinal rule of Amateur Radio operating is to "listen, listen and listen some more." Full break-in, or QSK as it is popularly known, effectively allows full-time listening even while you are transmitting. With QSK, your receiver becomes fully sensitive during the few milliseconds between each dit or dah. During that brief time your ears and mind may detect a fellow ragchewer making a random comment, a traffic handler asking for a fill, or a DX station going back to another station. Most cw operators are at least familiar with semi-break-in provided by a keyed-VOX system. Once you use *full* QSK you will wonder how you ever got along without it.

Before going further, let us establish that QSK pertains strictly to cw procedures. "Instantaneous" break-in is neither feasible nor desirable for radiotelephony. It would cause the antenna relay to chatter erratically between almost every syllable as the rf level drops to zero. Instead, the author elects to use PTT.

The Case for QSK

Much has been written about units and procedures which provide virtually instantaneous break-in for cw operation. [1] Very little has been said, however, about the advantages of true break-in.

Since QSK is easily applied it is surprising that so many amateurs, well-qualified technically and operationally, have not equipped their stations with it. Let us consider some persuasive situations:

1) You are in contact with a distant friend. He is telling you about his arthritis or perhaps describing a sojourn to some exotic DX location. Your daughter announces, "Long-distance call for you, Dad," or whatever the reason for a fast QRX or QRT. You send BK, but he is not QSK and does not hear it. He goes on and on. You have no choice but to leave him sending to space.

2) The "machine CQer," one who sends lengthy CQs, not only discourages the listener and may cause him or her to tune elsewhere, but also misses a fast response. Many QSOs are lost this way. A short, snappy CQ followed by BK saves a lot of frustration. The old adage that "you have to hear them to work them" applies equally as well *while* you are transmitting, if you use QSK.

A simple K or even a single dit usually suffices between stations in solid contact.

3) You are in solid QSO with a DX station that is S4. While he sends, a local CQer starts on your working frequency. Your BK should alert your contact and also stop the interfering station long enough for you to say, for example, "ZL2____ QRM QRX W6____ QSO HR OM PLS QSY DE W4____." More often than not, though, your plea goes unheeded for lack of QSK.

4) Loss of contact due to fading is frustrating, especially when the band "goes out" before agreement on ending the QSO. When no response is received after a long "blind" transmission, the sender has no way to determine the cause. Obviously, in QSK operation, his contact need only break him to say QSB BAND GOING OUT 73, thus ending the QSO satisfactorily.

5) Doubling (simultaneous transmission by two stations) often occurs through a misunderstanding. For example, the station you are working may fade or pause momentarily, or for some reason you think you are to transmit, when actually he has not "turned it to you." If neither station operates QSK, both of you may find you have been sending to space — doubling.

6) During a net, it is awkward for each station to transmit by passing from one to another in sequence. True, it usually prevents doubling, but it is an unnatural way to converse. On the other hand, friendly remarks, questions, an interchange of technical information, and so on, can proceed in a fast and normal manner (and in a random sequence) if all participants use QSK and transmit on the same frequency.

7) In traffic nets the receiving station customarily acknowledges each completed message. Listen to this worthwhile service — it is operating at its best. A simple K or even a single dit usually suffices between stations in solid contact. QSK is a must, for without it a repeat of a missed initial, phone number or text word may involve delay and confusion in spotting the needed fill-in. With QSK, the receiving station simply gives BK, or a dit or two followed by the appropriate indicator to denote the portion in question. Is it not reasonable to apply this advantage to ragchews, roundtables and DX operating?

8) For the DXer, QSK — along with monitoring the transmitted signal — is particularly useful. He can hear other signals on and near his listening frequency while calling or working another station, he can tell his DX contact QRM ZERO ME, QRM QRX or the like — and, praises be, he can stop calling a DX station who starts a CQ or answers another call. In many instances a DXer can cut through the pileup by a very slight adjustment in transmitting frequency while sending, so as to avoid blending with other signals.

It is well known to experienced DXers that QSK, in combination with a flexibly handled transmitter VFO and the use of narrow-band rf and audio filters in the receiver, can "slot" a station for a solid QSO. Meanwhile, stations in the "pack," sending blindly without QSK, cannot hear what is going on. One can often dig a station out of the pileup by slotting a 1 × 1

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[1]Notes appear on page 54.

call on a frequency even momentarily quiet. If a response does not come immediately, another snappy call may raise him — but it is pointless to add to his QRM by calling him along with others on the same frequency. The advantage of QSK is clear.

Timing also is important. For example, it may happen that a moment after you start your call, and while you are transmitting, another station starts calling on the same frequency. This makes it impossible for the DX station to read either one of you if your signals are of equal strength at his end. However, yours may be the one he responds to if you can make it easy for him to copy you. With QSK you can monitor both inbound and outbound signals simultaneously. Obviously, QSK is essential for the serious DXer with QRP or a poor antenna.

Some Disadvantages

Despite the persuasive arguments for QSK there are some who may not be convinced of its worth. Fairness suggests that negative viewpoints also be considered.

1) QRN and QRM might make it difficult to concentrate while sending. Coping with QRN comes with experience, but we are *supposed* to avoid causing QRM. Use of a sidetone for blind transmission is undesirable.

2) Some operators dislike being interrupted while sending. QSK might add to their problem!

3) "Suck out" may be objectionable to those who use an electronic TR switch for QSK operation. Ordinarily, this is not difficult to correct; use of a vacuum-relay QSK system eliminates this problem entirely.

4) It may be argued that a simple, manually operated, antenna transfer switch occupies less space than a TR switch or QSK box. True; yet most QSK circuitry can be put in a very small enclosure.

"Suck out" may be objectionable . . . however, use of a vacuum-relay QSK system eliminates this problem entirely.

5) Although a TR switch for break-in operation is mechanically noiseless, operation of the antenna relay in a QSK system using one produces an audible click. This may be objectionable. However, a proper choice of components for the timing relay usually overcomes this objection. In the author's modified VE3AU circuit, operation of the small vacuum relay gives a soft, cushioned "thump" which cannot be heard above the slight hum of the transmitter power supply.

6) Cw QSK operation with a transceiver may pose a problem. Transmit-receive switching is usually accomplished either by a PTT switch or a timed VOX control of the changeover relay. Neither method is suitable for true cw QSK operation. There are, of course, other limitations to cw operation with a transceiver that is "locked," for transmission, to the listening frequency or a fixed offset.

For phone operation the author prefers the PTT method and has added a cw/ssb switch in the QSK box to hold the antenna relay on "transmit" whenever the PTT circuit is closed. Several methods of preventing "blasting" while transmitting are available. A mute-control circuit, using a second relay in the QSK box, is an excellent method.

Conclusions

Arguments for and against QSK have been presented. It may be concluded, however, that the amateur who uses his station for *any* cw operation will find full break-in most helpful. Operating practices will improve as QSK systems come into wider use. QST

Notes

[1]Pleuss, "A Fast QSK System Using Reed Relays," *QST*, December 1976, p. 11.
[2]"Code Transmission," *The Radio Amateur's Handbook*, ARRL, 56th Ed., 1979, ch. 11.
[3]Shafer, "Cleaner Break-In with the 32S-3," *QST*, November 1964, p. 46.
[4]McKinley, "A New High-Powered Keyed Antenna Relay," *QST*, August 1967, p. 32.
[5]Saylor, "Full Break-In and RIT for the HW-8 QRP Transceiver," *QST*, July 1977, pp. 22-26; November 1977, p. 20.

Strays

Arriving directly from a trip to Thailand, ARRL Vice President Vic Clark, W4KFC (left), brought the latest WARC-preparation information to the recent New England Division Convention. Seated next to Vic were then-FCC Commissioner Margita White, the banquet speaker, and Eli Nannis, K4JMH, who served as toastmaster.

OSCAR 8 FIRST ANNIVERSARY

☐ In commemoration of its March 5, 1978 launch, OSCAR 8 will operate with *both* transponders, Modes A and J, on from 0000 UTC March 4 to 0000 UTC March 6. An OSCAR 8 QSL card with a special first anniversary sticker will be sent to those who report beacon telemetry from either mode. See page 86 for operational details. On the telemetry report please note equipment type used and any comments, such as stations heard. Send the information, along with a business-sized s.a.s.e. and 25 cents for the sticker, to ARRL Hq., Club and Training Dept., Newington, CT 06111. Happy birthday, OSCAR 8! — *Bernie Glassmeyer, W9KDR*

QST congratulates . . .

☐ *QST* author and Contest Advisory Committee member Wayne Overbeck, N6NB, who received the 1978 John Chambers Memorial Award at the recent Central States VHF Conference.

FCC WARC Proposals Finalized

U.S. preparations near completion; amateurs would make important gains in satellites and at hf, but there are setbacks as well.

By David Sumner,* K1ZZ

Just as the curtain was being drawn on 1978, the Federal Communications Commission announced that it had essentially completed work in preparing its proposals for the general World Administrative Radio Conference (WARC-79). The conference, which opens this September in Geneva under the sponsorship of the International Telecommunication Union, will undertake the first comprehensive review since 1959 of the international regulations which govern radiocommunication. Only some regulations which affect just one service will escape examination; all of the others, most importantly the international Table of Frequency Allocations, will come under scrutiny.

FCC preparations for WARC-79 began more than four years ago. The Commission regulates all users of radio in the U.S. other than the Federal government, and it was the Commission's responsibility to determine the long-term allocations requirements of these nongovernment users. This was done through a series of Notices of Inquiry (Docket 20271) soliciting comments, and through temporary Advisory Committees established for each service. At the same time, the Commission had to coordinate these requirements with those of the Federal government users (referred to as "Executive Branch" in the FCC paperwork) so a single, common position could be developed for both the government and the nongovernment sides.

Extensive Public Participation

The FCC made special efforts to encourage public participation in the formulation and discussion of WARC-related issues. No group was more active in this process than the nation's radio amateurs. Hundreds of individuals and clubs submitted comments at several stages of the proceeding, supplementing those of the League and the Commission's own Advisory Committee for Amateur Radio. The League's comments alone totalled nearly 200 pages. In the Report and Order terminating Docket 20271, the Commission noted: "Throughout this proceeding, thousands of United States citizens contributed countless work hours to this effort. Almost 2000 individual comments were made. These responses have all been reviewed and have provided us with a wealth of information for use in the preparation of proposals for the 1979 WARC. For this, we commend and thank all the parties who have participated."

Coordinated Position — Almost

The Report and Order which sets forth the Commission's proposals is an extremely complex, 560-page document which is said to represent the combined thinking and agreement of the Commission and the various agencies of the Federal government. Now that the Commission has completed its work, the document has been forwarded to the Department of State with the recommendation that it be made the official U.S. proposals for WARC-79. The government side was expected to do the same. We say "was," because the deadline for receipt of the proposals in Geneva will have passed by the time you read this. The one remaining issue which reportedly was unresolved when the Commission released the Report and Order involved International Broadcasting. The FCC and all of the other government agencies, with two exceptions, had agreed on a plan for the expansion of allocations to International Broadcasting by some 865 kHz. Depending on how you figure it, this would represent an increase of some 40-60 percent in the spectrum available to this service. The two holdouts were the Board for International Broadcasting, which operates Radio Free Europe and Radio Liberty, and the International Communication Agency, which

Table 1

Summary of FCC/NTIA Recommendations for Amateur Bands Below 30 MHz

Key: X = exclusive WW = worldwide
Frequencies listed in MHz

Band	*Present Region 2/U.S. Allocation*	*FCC/NTIA Proposal*
160 meters	1.8-2.0 shared, with power/frequency restrictions to protect LORAN-A	1.86-1.90 X WW 1.90-2.00 shared
80 meters	3.5-4.0 shared	3.5-3.9 X 3.9-4.0 shared
40 meters	7.0-7.1 X WW 7.1-7.3 shared w/BC in Regions 1 and 3	6.95-7.25 X WW
NEW BAND	none	10.1-10.2 X WW
20 meters	14.0-14.35 X WW	no change
NEW BAND	none	18.068-18.168 X WW
15 meters	21.0-21.45 X WW	20.95-21.45 X WW
NEW BAND	none	25.11-25.21 X WW
10 meters	28.0-29.7 X WW	no change
Total Allocations	Present: 2600 kHz exclusive 900 kHz shared	Proposed: 3590 kHz exclusive 200 kHz shared

*Assistant General Manager, ARRL

operates the Voice of America. These two agencies insisted that more expansion was necessary, and were forcing a review of the consensus decision at the highest levels of government. If the consensus were to be overruled, the "domino effect" of a last-minute reshuffling could well have an adverse impact on the Amateur Service and the other users of the hf spectrum.

Barring such a capitulation to International Broadcasting, the U.S. proposals which are to be sent to Geneva are, in general, good news for the Amateur Service, although a couple of nasty surprises were included at the last minute and with little or no warning. Tables 1, 2 and 3 show the highlights. Here, using the Commission's words insofar as possible, is the stated rationale for the decisions that were made. You can judge for yourself the validity of the justifications. (All quotes which follow are from the FCC Report and Order.)

Spectrum Below 4000 kHz

"The radio amateurs were most responsive to the Notices of Inquiry in this Docket. Their attempts to define their spectrum needs as well as to comment on the needs of other radio services provided useful information. Although many of their needs have been accommodated, it has proven impossible to satisfy their desire for a low frequency allocation [160-190 kHz]. Power line carrier (PLC) operations and the extreme difficulty of satisfactory frequency coordination due to the unpredictable nature of amateur operations are obstacles to any amateur service allocation being proposed in this spectral range.

"The reallocation of 1800-1860 kHz to broadcasting was questioned by the ARRL as to its suitability for broadcasting use, as well as to the impact on amateur allocations. At these frequencies, the shorter range of the daytime groundwave signal enables more stations to be assigned to each channel than is possible in the existing AM broadcast band. While it is true that nighttime interference levels are greater here than in the existing band, this merely reduces the nighttime service area of the stations. This is consistent with our desire to offer greater programming alternatives in many areas of small geographic extent, such as neighborhoods within cities.

"A proposal to expand the standard broadcasting (AM) band was conceived to provide for the future growth of the service. Access to more spectrum would enable the establishment of new broadcast stations in locations where it is either technically or economically impossible in the existing broadcasting band. This could result in the availability of the first aural service in some communities now denied that service. It also could increase diversity of programming choices available to listeners and result in greater access to the broadcasting medium by minority groups.

"An alternative approach recommended by amateurs, the electric power community and others was to redefine the technical basis for the use of the existing broadcast band, 535-1605 kHz, through the imposition of 9 kHz channel spacing. They argued that the future needs of the AM broadcasting service could be met by the resulting increase in the number of channels without any increase in the total amount of spectrum allocated to the service. The technical feasibility of this concept has been established in Regions 1 and 3 under the conditions which exist in those Regions. Before 9 kHz spacing could be considered for use in this Region (Region 2), studies would be required to determine the technical, operational and economic suitability for Region 2 conditions. This is necessary due to the different approach to broadcast station assignment, protection criteria and antenna design currently utilized in the Western Hemisphere.

"The American Radio Relay League (ARRL) also made an alternative proposal to convert the AM broadcasting service to a form of single sideband emission, and in conjunction, recommended a reduction of the channel spacing to 8 kHz. The technique, known as compatible single sideband (CSSB), was considered by the ARRL to be suitable for use by that service. When combined with the reduced channel spacing, ARRL indicated 27 additional channels would be available within the existing allocation.

"The suitability of CSSB for AM broadcasting use has been extensively explored, both in the United States and by the International Radio Consultative Committee (CCIR). The conclusion given by the ARRL that suitable CSSB systems have been available for at least 25 years cannot be considered consistent with the known history of the international dialogue on the subject. Since the ARRL proposal does not specify the system of CSSB to be employed, we have concentrated our evaluation on the merits of the second part of the proposal — to reduce the existing channel spacing to 8 kHz, assuming an appropriate CSSB system could be found. In that context, the conclusions given above on the proposal to reduce the channel spacing to 9 kHz are applicable. Therefore, we conclude that the ARRL proposal does not constitute a viable alternative to our proposal to expand the AM broadcasting band. However, this does not preclude the use of single sideband techniques or reduced spacing in the expanded part of the AM broadcasting allocation.

"We feel that the proposal to allocate an exclusive band to the amateur service at 1860-1900 kHz will provide more useful spectrum than the existing shared allocation at 1800-2000 kHz. The initially requested larger band between 1715 kHz and 2000 kHz could not be accommodated due to the needs of the broadcasting and radiolocation services. The shared band at 1900-2000 kHz remains in our proposals.

"No change in the band 3900-4000 kHz is proposed. This proposal has been made possible by our formulation of a new proposal which accommodates broadcasting requirements below 6 MHz. Therefore, the proposal for a Region 2 exclusive allocation of 3500-3900 kHz for amateur use and shared use of 3900-4000 kHz, we believe, essentially satisfies the radio amateur requirements in this portion of the frequency spectrum."

Spectrum Between 4 and 27.5 MHz

"Throughout this entire proceeding we have attempted to make proposals which we felt would satisfy the amateur telecommunication requirements during the period expected to be covered by the 1979 WARC. In the Third Notice, we proposed some amateur expansion at 14 and 21 MHz through reduction of certain fixed service bands. In that Notice, we also proposed to rearrange the bands at 7 MHz to reduce the sharing difficulties experienced by the amateurs and high frequency broadcasting; and, although the total spectrum for the amateur service was not increased, the elimination of sharing held promise of relief for amateur users. In the Fifth Notice, we continued our proposals at 7 and 14 MHz, modified our approach at 21 MHz, and proposed an additional amateur band at 25 MHz. In the Eighth Notice, we continued our proposal at 7 MHz, shifted slightly downward the proposed allocation at 25 MHz, proposed new bands at 10 and 18 MHz, and proposed deletion of the previously proposed expansion at 14 MHz.

"In response to the Eighth Notice, the ARRL, in regard to the proposed

Table 2

Highlights of FCC/ NTIA Recommendations for Amateur Bands Above 30 MHz

1. New bands for Amateur and Amateur-Satellite Services at 49.8-50.0 GHz (exclusive), 76-81 GHz, 165-170 GHz, 240-250 GHz
2. Addition of Amateur-Satellite Service in 1250-1260 MHz, 2390-2400 MHz, 5650-5670 MHz; retention of other satellite bands
3. Loss of 1215-1240 MHz to protect Radionavigation-Satellite Service
4. Change in status at 220-225 MHz from co-equal primary (secondary in U.S.) shared with Radiolocation, to secondary shared with Maritime Mobile
5. New bands at 902-928 MHz and 119.98-120.02 GHz shared with several other services
6. No changes at 50-54 MHz, 144-148 MHz, and 420-450 MHz

rearrangement of allocations between 6950 and 7300 kHz, was apprehensive that if the rearrangement is adopted by the 1979 WARC, broadcasting may continue to cause interference to the amateur service. Under these circumstances, ARRL is most reluctant to have the amateurs relinquish 7250-7300 kHz. While we recognize the apprehension of the amateur community in this matter, we believe that, on balance, we must move forward with our proposal for this portion of the spectrum as the best available solution to a difficult problem.

"The ARRL, and amateurs in general, supported the proposed allocations at 10, 18 and 25 MHz; and these allocations are included in the proposed table. ARRL expressed the view, however, that: (1) 200 kHz could and should be added at 10.2-10.4 MHz on a co-equal shared basis between the fixed and amateur services; (2) similarly, the 13.95-14.0 MHz and 14.35-14.4 MHz bands could and should be on a co-equal basis shared between the fixed and amateur services; (3) the 18 MHz band should be expanded to 300 kHz; and (4) the 20950-21000 kHz allocation should be proposed despite the initial objection of the Executive Branch.

"The ARRL recommended co-equal sharing between the fixed and amateur services at 10.2-10.4 MHz, 13.95-14.0 MHz, and 14.35-14.4 MHz based on the assumption that the needs of the fixed service for high frequency spectrum will continue to decline over the next two decades. In the case of the United States and most other industrialized nations, we concur with ARRL's assumption. In the case of the lesser developed countries, and to some extent a few developed countries, however, our bi-lateral discussions revealed that some administrations plan to expand the use of high frequencies to satisfy their need for national communications. These high frequency internal and regional circuits will provide communications not feasible by other means.

"It is our view, and that of the Executive Branch, that the U.S. cannot disregard the stated requirements of other countries. Thus, we are not proposing co-equal sharing between the fixed and amateur services in the bands at 10.2-10.4 MHz, 13.95-14.0 MHz and 14.35-14.4 MHz. Similarly, we are not proposing any further increase of the 18 MHz band proposal. We are, however, including a proposal for allocation of the band 20950-21000 kHz for the amateur service."

Spectrum Between 27.5 and 1215 MHz

"We discussed amateur allocations for the bands 220-225 MHz, 435-438 MHz, and 902-928 MHz in previous Notices. We proposed a secondary allocation in the 902-928 MHz band to provide for experimentation by the amateur service. We also proposed a primary mobile allocation at 220-225 MHz to which amateurs objected, fearing introduction of a CB type service in this band. Proposed [Footnote] No. 320A extended secondary allocations to bands other than 435-438 MHz (specifically, 1250-1260 MHz, 2390-2400 MHz, 5650-5670 MHz, 76-81 GHz, 165-170 GHz, and 240-250 GHz), in which amateur-satellite operations could occur.

"Amateur community comments to our Eighth Notice continued to express concern about a possible CB service at 220-225 MHz. ARRL stated that a total of 320 amateur repeaters exist in the U.S. in this band. There appeared to be no general objections to our other proposals. We propose no change from our Eighth Notice, except for the 220-225 MHz band.

"Upon considering the needs of the maritime mobile service, and our inability to satisfy these needs elsewhere, we are convinced that a primary worldwide allocation between 216-225 MHz should be proposed to satisfy maritime short-range communication requirements. To accomplish this, the amateur service has been proposed for a secondary allocation in 220-225 MHz. We are also proposing that radiolocation continue as a primary service until 1990. No new stations would be permitted after that time, and any radiolocation stations authorized prior to 1990 would continue to operate on a secondary basis. Consequentially, our previous proposal regarding the mobile service is not being made.

"We have recognized the need for proposing additional spectrum to fulfill requirements for short range maritime communications. Comments received from the maritime community to our Eighth Notice continued to identify need for 18 MHz of additional frequency spectrum. The Maritime Service Working Group (M-SWG) stated that data which had been submitted previously is as comprehensive and refined as can reasonably be developed; it also stated that the frequency range 512-530 MHz is preferred for the additional spectrum.

"In arriving at a final allocation proposal to the 1979 Conference concerning the satisfaction of short range maritime communications, a number of factors were considered. Among these were the ability of an allocation to satisfy the maritime requirement, acceptance of the allocation worldwide, and the impact of the allocation upon existing services occupying the band. Perhaps more importantly, the allocation proposal must make a clear, positive showing to the Conference that the U.S. views this as an important, valid requirement which must be satisfied somewhere in the VHF/UHF portion of the spectrum. We are proposing, therefore, to satisfy the requirement through a worldwide primary allocation to the maritime mobile service in the 216-225 MHz band. [A footnote] would be added to the band 216-225 MHz, to reduce the status of the radiolocation service to secondary after 1990. While we recognize the opposition this proposal may receive at the Conference (this band is for television in Region 1), we feel the need dictates that we propose a band to satisfy short-range maritime requirements. National implementation in a domestic rule-making may have to consider phasing out of radiolocation after the 1990 date in some U.S. locations in some small parts of the band. Additionally, this proposal would reduce the Region 2 amateur allocation to a secondary status. While the current investment in this 220-225 MHz band by the amateur service is significant, we believe the requirements of the maritime mobile service necessitate such action."

Table 3

How the FCC Proposals Have Changed Since the Eighth Notice of Inquiry
(See June 1978 *QST*, page 52)

1. The proposed reallocation of 3950-4000 kHz to Broadcasting has been withdrawn. Instead, Broadcasting's needs would be met at 3200-3230 kHz and 4750-4850 kHz.
2. The sharing arrangement at 220-225 MHz is proposed to be modified. The earlier proposal provided for sharing with Radiolocation and Mobile on a co-equal, primary basis; the new one is for sharing with Maritime Mobile on a secondary basis. U.S. amateurs presently share with Radiolocation on a secondary basis.
3. The proposed footnote designating specific 10-kHz portions of the hf bands for disaster communications has been withdrawn.
4. The international *requirement* for Morse code ability for operation below 144 MHz is proposed to be changed to a *recommendation*.
5. Specific listing of Amateur and Experimental Services at 300 GHz and above is deleted; instead, frequencies above 300 GHz would be "not allocated."

Spectrum Between 1215 MHz and 10.7 GHz

"In response to the Second Notice, the Amateur Radio Service Working Group requested that the present allocations at 1215-1300, 2300-2450, 3300-3500, 5650-5925 and 10000-10500 MHz be maintained, and that a small portion of these amateur bands also be allocated to the amateur satellite service in order to permit experimentation with space communications techniques. They pointed out that a 2304.1 MHz beacon on the Oscar 7 satellite cannot be utilized because the international allocation was lacking. In the Third Notice, we proposed to add the amateur satellite service to the bands 1290-1300, 2310-2320, 3400-3410, and 5650-5670 MHz on a secondary basis. The amateur allocations had been maintained as requested.

"In the Fifth Notice, the amateur service was proposed for deletion in the

1215-1240 MHz band because of the safety-of-life feature of the radionavigation satellite service proposed for the band. The 2310-2320 MHz proposal for the amateur-satellite service was shifted to the 2390-2400 MHz band to preclude conflicts with mobile service requirements and other services in the band. Although comments to the Third Notice expressed a desire to include an amateur satellite allocation in the 10.0-10.5 GHz band, this request was not satisfied because of the sharing difficulties with radars that are extensively used in that band.

"In the Eighth Notice, we modified [Footnote] No. 320A in order to include allocations for the amateur satellite service in those bands where the service would share with other radio services in addition to the amateur service. In addition, the amateur satellite proposals for the 3400-3410 MHz band were deleted as being incompatible with the fixed satellite allocation in that band; and the amateur-satellite proposal at 1290-1300 MHz was shifted to 1250-1260 MHz in order to provide greater compatibility with some sensitive radar systems operating in this portion of the band.

"In this Report and Order, we are continuing our Eighth Notice proposals for the amateur and amateur satellite services except that [Footnote] No. 3644/320A has been modified to include (earth-to-space) direction indicators on the 1250-1260 MHz and the 5650-5670 MHz bands. This modification is needed to resolve potential interference conflicts with Executive Branch agency equipments that operate in these bands."

Spectrum Above 10.7 GHz

"In its initial report to the Commission, the Advisory Committee for Amateur Radio (ACAR) requested that the present allocations at 24-24.05 GHz (including amateur satellite) and 24.05-24.25 GHz (secondary to radiolocation) be retained. These allocations have been continued throughout the Notices in this proceeding and are retained in this Report and Order.

"The ACAR requested that the domestic allocations specified in Docket No. 19973, at 48-50, 71-76, 165-170, 240-250 and above 300 GHz be proposed for the international Table. In our Third Notice of Inquiry, we proposed no change to the existing allocations, but we added allocations at 71-76, 165-170, and 240-250 GHz; the band 48-50 GHz was proposed for use by the aeronautical and maritime services. The amateur community generally supported those proposals but asked that an allocation at 50 GHz be reconsidered. As a result, in the Fifth Notice of Inquiry, we proposed an exclusive allocation at 49.8-50 GHz for amateur/amateur-satellite. The comments supported that proposal. In the comments to the Fifth Notice, both ARRL and ACAR noted that the amateur service could operate with the ISM services in the band we proposed at 120 GHz ± 500 MHz, and that an amateur allocation at that order would bridge the gap between the proposed allocations at 76 and 165 GHz. Our proposals herein make provisions for the amateur service at 120 GHz. The ACAR also requested, once again, that amateurs be permitted to use the unallocated frequencies above 300 GHz. The proposal to use the unallocated frequencies above 300 GHz has not been accepted. We are not prepared to discuss allocations above 300 GHz. A proposal of this nature may open discussions that may lead to allocations proposals that are considered premature. Due to the realignment of services in the spectral region 71 to 81 GHz to meet the Executive Branch requirements, the proposed amateur allocations were shifted, in the Eighth Notice, to 76-81 GHz from 71-76 GHz."

No-Code Licensing?

In the Fifth Notice, the Commission requested comments on its proposal to leave unchanged Article 41 of the Radio Regulations. Article 41 contains the miscellaneous rules which apply to amateur stations: licensing requirements, limitations on the content of communications, third-party traffic restrictions, etc. At present, paragraph 1563 in Article 41 reads as follows: "Any person operating the apparatus of an amateur station shall have proved that he is able to send correctly by hand and to receive correctly by ear, texts in Morse code signals. Administrations concerned may, however, waive this requirement in the case of stations making use exclusively of frequencies above 144 MHz." In spite of an absence of comments requesting a change, the Commission now proposes that the paragraph be reworded as follows: "It is recommended that any person operating the apparatus of an amateur station should have proved that he is able to send correctly by hand and to receive correctly by ear, texts in Morse code signals." The stated reason for the change is "to permit administrations to develop their own licensing requirements."

Satellite Matters

The proposed new bands for the Amateur-Satellite Service come as good news to amateurs. Also good news, but less likely to attract attention, is a proposed new Resolution which would ease the notification and coordination requirements which now apply to amateur satellites. The same requirements are imposed by the present Regulations upon the Amateur-Satellite Service as upon the other nonbroadcasting satellite services, despite the fact that it is simply not feasible to supply detailed information on every ground-based amateur station which might use a satellite. The proposed new Resolution would permit administrations, instead, to submit as much information as possible, with the understanding that whatever information is submitted will be considered to be complete.

What Now?

What happens next? The formal step of sending the U.S. proposals to Geneva will occur between the time this is written and the time you read it. The proposals will be very close, though not necessarily identical in every detail, to the FCC proposals described above. Further bilateral discussions will take place between U.S. representatives and those of other countries; these discussions — and continuing dialogue in this country — are bound to shape the thinking of the U.S. delegation which will go to Geneva in September. Where the U.S. proposals align with the thinking in other countries there should be little controversy; where they are radically different, which is true in some cases, the U.S. may well find itself without the necessary support to gain some of its objectives. How this will affect the Amateur Service should become more clear in the months to come, as the official proposals of other countries become known. However, there are encouraging signs that a number of other countries are proposing new amateur allocations below 30 MHz. There are bound to be other encouraging signs — and discouraging ones, too — in store for us before WARC-79 passes into history in early December.

After WARC there will still be plenty of action in the allocations field. As the Commission states in its Report and Order: "By taking this action, the Commission is not substantively affecting the rights of any commentor or licensee. We must once again note that domestic implementation of the results of the 1979 WARC will require extensive consideration in the Rule Making proceedings." In other words, before any changes are made in the domestic utilization of any frequency bands there will be plenty of opportunity for public comment. If some of the late-developing Commission proposals make it to and through Geneva, we know lots of amateurs who will avail themselves of that opportunity!

Strays

I would like to get in touch with . . .

☐ hams and SWLs interested in establishing a Free Mason Amateur International Group. JUSTIGA, 35, Rue Fongate, 13006 Marseille, France.

☐ Kiwanis International members interested in forming an international Kiwanis ham net. Ed Worden, AA4AS, P. O. Box 1241, Mount Dora, FL 32757.

Spark Gap to NBVM

Before rushing headlong into 1979, let's take a moment to reflect on the advances made during 1978.

By Marjorie C. Tenney,* WB1FSN

Commemorating the 75th anniversary (January 1903) of Marconi's first successful two-way radio transmission between the United States and Europe, KM1CC set up operations on the original site in South Wellfleet (Cape Cod), MA, from January 14 to the 22nd. Using a 240-Hz note on mcw simulating the note of the original Marconi spark-gap transmitter, KM1CC logged over 7700 contacts. A review of 1978 brings out the remarkable advancement in radio communication since the completion of that first transatlantic contact 75 years ago. On the edge of tomorrow, 1978's top technical offering was narrow-band voice modulation. In this technique, voice components are folded over on themselves, consuming only half the normal bandwidth.

It has been a year of change brought about by technological breakthroughs in the electronics field and a year of frustration as a result of several FCC actions. Privileges given; privileges taken away. Still pending at year end was the decision on RACES, club and military recreation station licenses (Docket 21135). Secondary and repeater calls will not be renewed. FCC refused to review its Report and Order in Docket 21116 (the 10-meter linear amplifier ban) and we have filed notice of appeal to the U.S. District Court. FCC continues to raise questions about amateur use of autopatch — a policy decision ruled out autopatch over repeaters *when* they are under "automatic control"; that is, without an operator on formal duty. The FCC also proposed limiting repeater operation in the National Radio Quiet Zones and limiting Amateur Radio operation near FCC Monitoring Stations. A total revamping of the U.S. call-sign structure has led to utter confusion. Many excited ham radio operators have become disappointed when they discovered that their rare DX contact turned out to be one of those "newfangled" U.S. call signs. Although deregulation has been proposed by the Commission, tangible results were slow to materialize.

On the positive side, Technician class operating privileges were expanded to include all frequencies above 50 MHz. Amateurs uttered an audible sigh of relief when the Safety and Special Radio Services Bureau advised FCC that 900 MHz was preferable to 220 MHz for a proposed new CB Service. The Novice class license was changed from a two-year, nonrenewable license to a five-year, renewable license.

WARC-79 — IARU

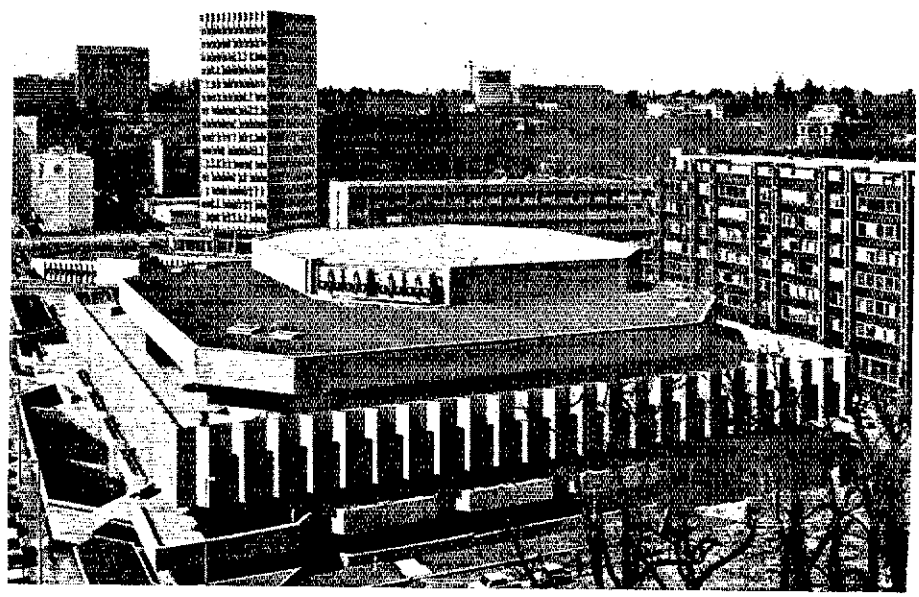
A concerted effort was made to tie up all the loose ends and make sure no avenue is overlooked in the final stages of preparation for the World Administrative Radio Conference in Geneva in the fall of 1979. So much depends on the outcome of the conference: The Amateur Radio fraternity must live with the resultant decisions for the remainder of the 20th century.

With this goal in mind, League officials and ARRL headquarters staff logged thousands of airline miles visiting IARU societies around the world discussing the Amateur Radio position and taking part in regional conferences. Messrs. Dannals, Clark, Eaton, Smith, Hesler, Baldwin, Sumner and Johnson made trips to countries in Africa, Europe, Asia and South America. All three IARU Regional Divisions held conferences during the year, and headquarters was represented at them all. IARU was also present at three important ITU meetings during 1978. Domestic WARC activities also moved closer to completion, as detailed in June and October *QST* articles and in the December editorial.

With the addition this year of the British Virgin Islands, Grenada, Senegal, Antigua and Haiti, IARU membership now totals 104 societies. Representatives from foreign societies who visited Newington to consult with our WARC team came from England, Guatemala, Hungary, Pakistan and Sri Lanka.

"Project Goodwill," funded by donations from U.S. clubs and individual hams, is succeeding beyond all expectations. The "IARU twins" a small,

The Conference Center in Geneva (foreground) will be the scene of WARC-79. Directly behind the Center (skyscraper and adjacent building) is ITU Hq. IARU will occupy office space in the building to the right of the Center for the duration of the Conference.



*Membership Services Assistant, ARRL

inexpensive receiver and transmitter designed by Jay Rusgrove, W1VD, of the ARRL technical staff, are being provided in kit form for distribution in underdeveloped countries as a means of promoting Amateur Radio. Hams hearing the real story of WARC at conventions, hamfests and club meetings realized this project deserved their support. The descriptions in *QST* articles, too, have fired the imaginations of many hams.

Service is the Watchword

The Club and Training Department educational program continued through 1978 at a vigorous pace. If success is judged by numbers the C and T program is tops. Some 60,000 students attended Novice and General class courses taught by 4600 registered instructors. ARRL-affiliated clubs reached a record high of 2094, with the addition of 190 new clubs during 1978. The club officers and instructors deserve a well-earned compliment for their efforts.

OSCAR 8 was launched without a hitch on March 5. To free AMSAT personnel for development of the "Phase III" satellites, ARRL agreed to take operational responsibility for OSCAR 8.

ARRL President Harry J. Dannals, W2HD, and other League representatives met with NASA Administrator Dr. Robert Frosch, to thank NASA for their excellent support of the OSCAR program over the years. They enthusiastically acknowledged Dr. Frosch's support and commitment to education through NASA projects and the hope that the relationship would continue in the future.

On October 26, the U.S.S.R. launched two Amateur Radio satellites named Radio Sport 1 and Radio Sport 2. The Soviets will use these satellites for training and experimenting in the classroom, much the same as we are using the OSCAR series.

Continuing in the educational vein, C and T staff assisted the Candlewood Amateur Radio Association and the Danbury Public Library Video Department in the production of a new 20-session videotape training presentation, "CQ Amateur Radio," which has been booked on cable TV stations across the country through 1980. The second issue of the Smithsonian's new educational magazine *Air and Space* featured an OSCAR article. An article, student projects and a 45 rpm record of OSCAR sounds ran in *Current Science* magazine, which reached over two million science students.

New books added to the ARRL library of publications were *The ARRL Antenna Anthology, Solid State Basics,* and *Radio Frequency Interference.* A revised edition of *FM and Repeaters* was also produced. The 1979 edition of *The Radio Amateur's Handbook,* extensively revised and in the new format, appeared in early November.

Once again this year the membership took advantage of the multitude of services offered by the League. Technical information requests continued in an ever-increasing number; free operating aids, display kits and handout materials for distribution to the general public entered the mail in a continuous flow. Paradoxically, the success of these programs places them, in these days of double-digit inflation, on the "endangered-species list"! Runaway expense could force curtailment of some of these services.

ARRL Satellite Coordinator Bernie Glassmeyer, W9KDR/1 (at right) and Southwestern Division Director Jay Holladay, W6EJJ, look on as solar-array protective covers are mounted for prelaunch protection during the final countdown phase while OSCAR 8 is "mated" to the second stage of its launch vehicle.

It was an exciting year for Amateur Radio PR through the efforts of the ARRL Public Information Office and field organization of Public Relations Assistants. Three new Public Service Announcements for radio were donated by Daryl Dragon of "The Captain and Tennille" fame, movie and TV star Lorne Greene, and Joe Rudi, WA6PVA, left-fielder for baseball's California Angels.

History was made on May 1, 1978, when Naomi Uemura, JG1QFW, became the first man to reach the North Pole alone. Steve Thompson, N4TX, and members of the National Capitol DX Association provided the vital communications link between Naomi's base station on Alert Island in the Northwest Territories and NASA's Goddard Space Flight Center in Greenbelt, MD, where tracking and weather information had been beamed down from the Nimbus 6 satellite. In August, *Double Eagle II,* a helium-filled balloon, landed in France after a six-day trip across the Atlantic from Presque Isle, ME. A trip fraught with anxiety when commercial radio gear malfunctioned was brought to a successful conclusion when amateur gear brought aboard for emergency backup was used to relay flight parameters, weather and other vital information.

The technical field seems to be a case of "to each his own." A group of experimental SSTV hams have received a Special Temporary Authorization from FCC for tests with medium-scan TV on the 10-meter band on a frequency segment of 29.0 to 29.3 MHz (October *QST*). In the next decade or so we may see amateur mobile work in the microwave region of the spectrum (March *QST*). Narrow-band voice modulation (NBVM) may be the technique of the future with new breakthroughs in this field (November *QST*). With experimentation and research we can look to new frontiers.

There were significant increases in the total number of entries in ARRL-sponsored contests and operating events. Field Day, the premier event on the operating calendar, proved its popularity again in 1978 as a record 22,319 operators put 1602 stations on the air. For the first time, we welcomed newcomers to contesting by issuing participation certificates to all Novices and Technicians who submitted valid entries in the Novice Roundup.

Amateurs still seek Headquarters assistance when confronted with legal obstacles in connection with antenna construction, zoning restrictions and restrictive covenants. Requests for the ARRL Legal Kit continue at a steady rate. The League also has provided financial assistance to the Personal Communications Foundation to aid in its efforts to provide the legal background attorneys will need in defending amateurs.

Changes in Command

In July, John R. Griggs, W6KW, regretfully tendered his resignation as director of the ARRL Southwestern Division due to extended health problems. Jay A. Holladay, W6EJJ, assumed the duties of director for the remainder of the term and was automatically elected for a two-year term in November, being the sole candidate for the office.

The sudden death on August 2 of Rocky Mountain Division Director Charles M. Cotterell, WØSIN, came as a shock to all who knew "Chic." Maurice O. Carpenter, KØHRZ, fulfilled the duties of director for the balance of the term. There was a three-way race for director in the division this past fall, and when ballots were counted Maurice was found to be the victor, earning a two-year term.

Lots of us keep lists of things we're going to do in ham radio once we can retire from the daily race. Among well-known Hq. names are these folks who can now whittle away at the roster of "some day, I'll . . .": George Hart, W1NJM; Joe Moskey, W1JMY; Lew McCoy, W1ICP; Bob White, W1CW; and Ellen White, W1YL.

The Future

Webster's definition is "a time that is to come" or alternatively, "an expectation of advancement or progressive development." We certainly hope to see advancement and development in Amateur Radio — the future of Amateur Radio as we know it today could well hinge on the decisions made in Geneva later this year.

Happenings

Conducted By W. Dale Clift,* WA3NLO

RFI: Now or Never!

"That darned ham! There he goes ruining my favorite TV show again. I'm going to write to the FCC and see if I can get his license suspended."

Hams have been faced with the RFI problem for years. However, it is not always the amateur transmitter which is at fault. In fact, FCC studies[1] indicate that a high percentage of the interference complaints received by the Commission's Field Operations Bureau involved deficiencies in the design and installation of the equipment experiencing the interference. But have you ever tried to explain to a layman that his TV set or stereo receiver is at fault for picking up your amateur signals? Lots of luck! It is difficult to fight the following logic: "When you are not transmitting there is no problem, so *you* must be the problem."

Now radio amateurs have a special opportunity to have their views on RFI be heard. FCC has instituted a Notice of Inquiry, General Docket 78-369, to obtain information, views and recommendations from diverse groups affected by the growing RFI problem. The comments the Commission receives in response to this inquiry will be used to reach a decision on how best to achieve a goal of electromagnetic compatibility in our expanding electronic environment.

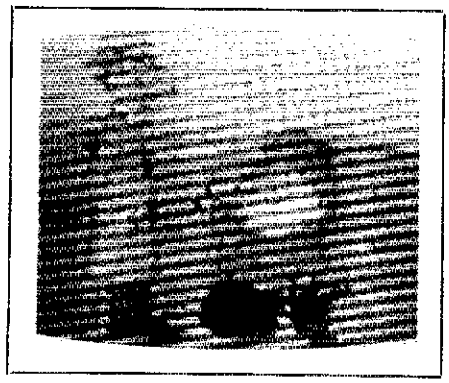
Last month's "Happenings" had a brief article about this RFI Notice of Inquiry, and next month's *QST* will have a special article devoted to the topic. ARRL will be filing comments on behalf of the amateur community, but it is important that as many individuals and clubs as possible file their own comments, too. For those of you wanting to get a head start before the May 1, 1979, comment deadline, this article will provide a general outline of this inquiry.

Consumer Issues

The FCC is especially interested in gathering information about the RFI problems encountered by consumers. In particular, the Commission would like to receive comments addressing the extent to which consumers are affected by RFI and whether RFI victims are aware of the causes and solutions to the problem. Are consumers aware that interference may be caused by deficiencies in receiver and other home-entertainment equipment design, rather than by deficiencies in transmitter design alone? Do consumers presently get enough information about the causes of and solutions to RFI? How much are consumers willing to pay for such information?

Is a product's RFI susceptibility an important factor to consider when purchasing a home-entertainment device? What information do consumers need in order to make an intelligent decision about products and their potential susceptibility to interference?

Would consumers prefer equipment manufactured to be less susceptible to interference prior to purchase, or would they rather be provided with add-on filtering devices after purchase of equipment if equipment does receive interference? (It must be understood that correction after manufacture may be more costly and may or may not be effective.) Would consumers prefer voluntary solutions from



manufacturers, government-mandated solutions, or no change?

The Commission would also like to hear from consumer groups about whether it would be feasible to devise and implement simple tests which either the consumer group or the consumers, themselves, could use in determining a home-entertainment product's RFI susceptibility. FCC would also like to know if consumers have made use of other consumer-oriented, voluntary or government programs, such as the labeling of the energy efficiency of air conditioners. Have these other programs been successful?

Manufacturers' Issues

The Commission realizes that any decision about RFI-susceptibility standards will have a great impact on the manufacturers of electronic home-entertainment devices. Therefore, the Notice of Inquiry directs a number of questions to manufacturers. For example, the Commission wants to know how serious the manufacturers consider the RFI problem to be. It would also like to know what the manufacturers see as the advantages and disadvantages of both voluntary and mandatory rf susceptibility standards. How will the adoption of special design techniques and other methods of reducing rf susceptibility affect equipment performance, costs and the marketplace? To what extent have current retrofit solutions, such as filters, been successful in eliminating interference? These are only some of the questions the Commission wants the manufacturers to address.

Economic Issues

The FCC considers the economic issues of the inquiry to be critical. It needs to know how much establishing standards, testing, enforcement and administration would cost. It would like to know the differences in economic impact of a voluntary program compared to one that was government mandated. Who should pay for increased costs, and how should increased costs be apportioned between receiving/transmitting device owners, manufacturers, government, retailers, wholesalers or any others involved in the manufacture, distribution and sale of receiving/transmitting devices? Would any competitive advantage accrue to a particular group under a self-regulated or a government-regulated program? Is it more economically efficient to manufacture all equipment to be immune to interference, thereby imposing unneeded costs on consumers who are not directly troubled by interference?

Engineering Issues

The Commission also seeks engineering data to help it make a technically sound decision. It would like ideas about how to characterize the radio frequency environment. (A bulletin describing the radio environment and established "immunity grades" in Canada is attached to each copy of the FCC's General Docket 78-369.) Would a plan similar to the Canadian immunity grades serve the interests of the U.S.? Is the measurement of the rf environment necessary? What should be the complexity of such measurement?

How Does One File?

Send your comments to: Secretary, Federal Communications Commission, Washington, DC 20554. Your comments must clearly show the docket number, Gen. Docket No. 78-369, at the top of the first page. FCC Rules require that you send the original and five copies of your comments; however, if you want each Commissioner to receive a personal copy of your comments, you should send 12 copies. Please label your comments, so that it will be clear which topics you are addressing.

For additional information about the inquiry, please contact either Erika Jones, FCC Consumer Assistance Office, 202-632-7000, or Frank Rose, FCC Office of the Chief Engineer, 202-632-7093.

Remember, now is the chance for all radio amateurs to make an important contribution toward solving this problem. Try to encourage others to send comments. And watch for the special article about this RFI Notice of Inquiry in next month's *QST*.

*Deputy Manager, Membership Services, ARRL

[1]"The Extent and Nature of Television Reception Difficulties Associated with CB Radio Transmission," FCC/FOB/PD&E 77-02 (July 1977).

HAMS NEAR MONITORING STATIONS MAY BE RESTRICTED

Citing the "continuing and relentless deterioration of the ambient electromagnetic environment," FCC has announced a proposal to amend the rules of the Amateur Radio Service and other services to provide strong radio signal protection for its 13 monitoring stations. The monitoring stations are located at the following addresses: Allegan, MI 49010; Anchorage, AK 99502; Belfast, ME 04915; Douglas, AZ 85607; Ferndale, WA 98248; Fort Lauderdale, FL 33314; Grand Island, NE 68801; Kingsville, TX 78363; Laurel, MD 20810; Livermore, CA 94550; Powder Springs, GA 30073; Sabana Seca, PR 00749; and Waipahu, HI 96797.

The proposal, if adopted, would amend Section 97.41, *Application for Station License*, of the Amateur Rules by adding the following:

"Protection for Federal Communications Commission monitoring stations:

"1) Applicants for a radio station authorization to operate in the vicinity of an FCC monitoring station are advised to give due consideration, prior to filing applications, to the need to protect the FCC stations from harmful interference. Geographical coordinates of the facilities which require protection are found in Paragraph 0.121(c) of the Commission's Rules. Applications for stations (except mobile stations) which will produce on any frequency a direct wave fundamental field strength of *greater than 10 mV/m* in the authorized bandwidth of service (−65.8 dBW/m^2 power flux density assuming a free space characteristic impedance of 120 ohms) at the referenced coordinates, may be examined to determine the extent of possible interference. Depending on the theoretical field strength value and existing root-sum-square or other ambient radio field signal levels at the indicated coordinates, a clause protecting the Monitoring Station may be added to the station authorization.

"2) In the event that calculated value of expected field exceeds 10 mV/m (−65.8 dBW/m^2) at the reference coordinates, or if there is any question whether field strength levels might exceed the threshold value, advance consultation to discuss any protection necessary is recommended. Prospective applicants may communicate with Chief, Field Operations Bureau, Federal Communications Commission, Washington, DC 20554, Tel. 202-632-6980.

"3) Advance consultation is recommended particularly for those applicants who have no reliable data which indicate whether field strength or power flux density figures in the above table would be exceeded by their proposed radio facilities (except mobile stations). In such instances, the following is a suggested guide for determining whether coordination is recommended:

"i) All stations within 2.4 kilometers (1.5 statute miles);

"ii) Stations within 4.8 kilometers (3 statue miles) with 50 watts or more average effective radiated power (erp) in the primary plane of polarization in the azimuthal direction of the Monitoring Station;

"iii) Stations within 16 kilometers (10 statute miles) with 1 kW or more average erp in primary plane of polarization in the azimuthal direction of the Monitoring Station;

"iv) Stations within 80 kilometers (50 statute miles) with 25 kW or more average erp in the primary plane of polarization in the azimuthal direction of the Monitoring Station.

"4) The Commission will not screen applications to determine whether advance consultation has taken place. However, applicants are advised that such consultation can avoid objections from the Federal Communications Commission or modification of any authorization which will cause harmful interference."

The comment deadline for this proposal, General Docket No. 78-365, was January 22, 1979. ARRL has filed for an extension of this deadline, so your comments may still be considered. If you live close to one of these monitoring stations and want a copy of this Notice of Proposed Rulemaking, send an s.a.s.e. to ARRL, Newington, CT 06111. Please specify "Monitoring Station NPRM."

[Editor's Note: Some members have confused this docket, Gen. Docket No. 78-365, with the Safety and Special docket proposing a quiet zone for amateur repeater stations in some parts of Virginia and West Virginia. This is a different docket. See January "Happenings" for the Quiet-Zone NPRM.]

SELLING RF AMPLIFIER GETS MAN CONVICTED

On September 29, Edward R. Milliken, proprietor of Double J Electronics, was convicted in the U.S. District Court for the Middle District of Tennessee, Northeastern Division, S. Cline Morton, chief judge, presiding, on one count of illegally marketing a linear amplifier. Milliken entered a plea of guilty to one count of violation of 47 USC § 302. The imposition of sentence of imprisonment was suspended and he was placed on five years' probation. The case was presented by Assistant U.S. Attorney Aleta G. Arthur of the Nashville U.S. Attorney's office.

The case arose from an investigation in April by FCC agents from the Powder Springs Special Enforcement Facility at the direction of U.S. Attorney Hal Hardin. In the course of the prosecution, 160 illegal linear amplifiers were seized and later dismantled. — *FCC News Release*

FCC WARNS DEALERS: "CW TRANSMITTERS" ARE CB AMPLIFIERS

A number of manufacturers have begun producing 10- and 15-meter "cw transmitters" which are sold with complete instructions for converting these "transmitters" into rf amplifiers for operation with CB equipment. One manufacturer has even gone so far as to provide a purchaser of one of these units with a new output tube upon return of the "transmitter" circuit board.

The FCC has taken a dim view of these activities, and in a recent public notice it warned that "Marketing or manufacture of the above described equipment will subject a dealer, manufacturer or user to a fine, issued by this Commission under Section 503 of the Communications Act, of up to $5000."

The Commission also stated that such equipment ". . . has obviously been designed for the sole purpose of being used as an external amplifier in the CB service and not for use as an amateur transmitter. This equipment is considered to be an amplifier kit subject to the Commission's amplifier regulations."

Any questions concerning the Public Notice should be directed to Mr. John Reed, Room 7106, FCC, Washington, DC 20554, Tel. 202-632-7093.

PETITIONS FILED

The following petitions for rulemaking affecting Amateur Radio have been filed with the FCC:

RM-3238 requests additional privileges for Amateur Extra Class licensees in the 28.35-28.5 MHz and 21.225-21.250 MHz bands. This petition was filed by Charles Robert Cox, AB5X.

RM-3239 requests A4 and F4 emissions authorization for facsimile on all amateur bands where A5 and F5 emissions currently are allowed, with a limitation that the bandwidth in the 50.1-52.5 MHz band not exceed that of an A3 emission. This petition was filed by Robert J. Roehrig, K9EUI.

RM-3240 requests F1-emission teleprinter operation in the 1.8-2.0 MHz band. This petition was also filed by K9EUI.

RM-3248 requests amendment of parts 2 and 97 of the Commission's rules to allocate additional frequencies in the 30-42 MHz, 72-75 MHz, and 222-224 MHz ranges for control of models in the Radio Control (R/C) Service. This petition was filed by the Academy of Model Aeronautics, Inc.

RM-3272 requests amendments of part 97 of the rules to provide a bandwidth table as an alternative to the emissions table. A 350-Hz maximum bandwidth for present cw frequencies, a 10-kHz maximum bandwidth for phone subbands below 21.450 MHz, and a maximum bandwidth of 35 kHz in the phone subbands from 28.5-225 MHz are proposed. There would be no limits on bandwidth above 420 MHz. This petition was filed by John A. Carroll, AB1Z.

AMATEUR AMPLIFIERS ACCEPTABLE FOR MARKETING

On April 28, 1978, the Commission banned the manufacture and marketing of any external radio frequency power amplifier or amplifier kit which is capable of operation on any frequency or frequencies below 144 MHz unless a grant of type acceptance has been issued for that model of amplifier. This grant would not be issued if the amplifier, as manufactured and marketed, operated in the frequency range of 24 to 35 MHz.

In response to the above requirement, the following models of amplifiers have been submitted for approval and were issued a grant of type acceptance. They may continue to be manufactured and marketed. Dentron Radio Co., Inc., Models CL-1601S, DTR-2000L, GLA-1000, MLA-2500B; Ehrhorn Technological Operations, Inc.(ETO), Models PA-76AF, PA-76PAF, PA-77DF; Heath Company, Model SB-221; Henry Radio, Models 1KD-5, 2K-4A, 2KD-5; R. L. Drake Co., Model L4B-1; Swan Electronics, Models Mark 2A, 1200Z; Trio-Kenwood Communications, Inc. Model TL-922A; and Yaesu Electronics Corp., Model FL-2100F.

In connection with the above regulations, the Commission invited the manufacturers and distributors of amateur amplifiers to apply for a one-year waiver of the marketing cut-off restriction for non-type accepted amplifiers. Such a waiver would allow the continued marketing of those models of amplifiers which were capable of meeting the current technical

specifications necessary for obtaining a grant of type acceptance, exclusive of the 24- to 35-MHz operational ban. The following amplifier models were granted such a waiver and may continue to be marketed until April 28, 1979: Collins Division of Rockwell International Corp., Model 30L-1; Dentron Radio Co., Inc, Models MLA-1200, MLA-2500; Heath Company, Models SB-200, SB-220, SB-230; R. L. Drake Co., Model L-4B; Swan Electronics, Model Mark II; Trio-Kenwood Communications, Inc., Model TL-922; and Yaesu Electronics Corp., Model FL-2100B.

In addition to the above models of amplifiers, the Commission also considered requests for a waiver of the marketing cut-off date for other non-type accepted amplifiers. These requests came from the manufacturers of amplifiers which were not capable of complying with the current technical specifications yet were not readily available for operation in the Citizens Band Radio Service [sic]. Two waivers of this marketing cut-off were issued under this type of consideration and these models may continue to be marketed until the dates indicated below:

ICOM East, Inc., Model IC-50L (Market until December 13, 1978), and KLM Electronics, Inc., Model PA4-80A1 (Market until January 1, 1979).

Effective April 28, 1978, no external amateur amplifiers may be marketed, with the exception of the above-listed models. Only those models of amplifiers listed as having been issued a grant of type acceptance may currently be manufactured.

Any questions regarding this material should be directed to Mr. John Reed, Rm. 7106, FCC, Washington, DC 20554, Tel. 202-632-7093. — *FCC Public Notice*

STAFF NOTES — NEW CD MANAGER

The search has ended! John Lindholm, W1XX, has been appointed the new manager of the Communications Department at ARRL hq., replacing George Hart, W1NJM, who retired in November 1978. John has an impressive history of communications activity. He is a past assistant communications manager at Hq. (1959-1962), past Section Emergency Coordinator for Connecticut, past SCM for Western Massachusetts, past communications manager and past vice president of the Connecticut Wireless Association, and is the trustee of the station of the Greater Hartford Chapter of the American Red Cross, WA1UNE. John has been vice director and assistant director of the ARRL New England Division, and is active on the Connecticut Phone Net and the Nutmeg VHF Traffic Net. Licensed in 1954 as WN1DGL, he is a Life Member of ARRL. Welcome back, John! — *Michele Bartlett, N1AGD*

John Lindholm, W1XX

LEAGUE VICE DIRECTOR RESIGNS

Bev Cavender, W4ZD, has submitted his resignation as vice director effective December 31, 1978. Owing to business commitments and overseas travel, Bev felt he was unable to devote the necessary attention to Southeastern Division affairs. President Dannals has appointed Frank M. Butler, Jr., W4RH, to complete Bev's term of office. Frank has been SCM of Northern Florida (formerly Western Florida) since 1957. He expects to be in Miami for the ARRL Board meeting. — *David Sumner, K1ZZ*

SULLIVAN COUNTY, NY

In response to a petition received from a group of ARRL members in Sullivan County, NY, the ARRL Executive Committee has directed Hq. to poll the members in that county to determine whether they wish to be a part of the Atlantic Division or Hudson Division. Sullivan County is now a part of the Western New York Section, Atlantic Division. The transfer would make Sullivan County a part of the Eastern New York Section, Hudson Division.

BEHIND THE DIAMOND

Hams are involved more and more these days in the motion picture industry, both in front of and behind the cameras. This month, we spotlight L. Phil Wicker, your Roanoke Division ARRL director, who clearly falls into that category.

Phil was born in Jonesboro, NC, and moved to Greensboro at the age of eight. Phil began his business career early on, progressing to the theatre equipment service and supply industry in the 1930s. In 1940, Phil and his XYL, Alice, WA4ZMA, assumed ownership of Standard Theatre Supply Company in Greensboro. An industry leader in the southern U.S., Standard Theatre Supply handles equipment in theaters and movie houses, from snack and popcorn stands to projection and special lighting fixtures. STS, as this family business is known, is in capable hands with Phil as chairman and Alice as secretary.

Phil's real love is Amateur Radio; he's been continuously licensed as W4ACY since 1930, and holds an Advanced class license. Phil is a consummate ham, having many operating awards to his credit: WAS, WAC, DXCC and the 1969 Roanoke Division ARRL Public Service Award. He has served three terms as president of the Greensboro Radio Club. Charter Life Member of ARRL, he is a member of AMSAT, QCWA, OOTC and several other clubs.

Over 25 years ago, Phil joined the "official family" of the ARRL as assistant director of the Roanoke Division. He moved through the vice directorship to his present position in 1974. You name a convention or club meeting in the Roanoke Division, and chances are that Phil's been there. He said recently that there have been only about three weekends in the past year when he hadn't been involved with a club or convention in his division. Phil noted, with a chuckle, "This doesn't leave me much time for ham radio, hi!" A licensed private pilot, too, he says that he still has enough time to do some flying! — *Sandy Gerli, AC1Y*

L. Phil Wicker, W4ACY

ARRL ADVISORY COMMITTEES

ARRL President Harry Dannals, W2HD, has announced the following Advisory Committee appointments for the coming year.

DXAC: W1OT (new chairman), W2XN, N6RJ, WB8EUN, K9AM/W9KNI and VE3QA have another year to go on their terms. W3ZN and N4MM are reappointed. K5YY replaces K5LM, K7LAY replaces W7YTN, and WØSR replaces WØUD.

Contest AC: W1NG (who remains chairman), K2SX, W5MYA, N6NB, K9UIY, KØMM and VE7TT continue their terms. W3HQT and K7GM are reappointed. K4PQL replaces K4PJ, and K8MR replaces K8IA.

Emergency Communications AC: WA3PZO, WA5MLT, W7DO, WB8GGR (who was appointed to fill the remainder of the term of WA8NDY), W9UMH and VE5CU continue. W1XA is appointed to assume the position vacated by K1UAQ. WB2VUK replaces N2JC, N4NK (new chairman) replaces WA4PBG, WB6IZF replaces outgoing chairman W6INI, and WØKL replaces WØPB.

VHF Repeater AC: K2MZ (new chairman), WA6LBV, K7CR and WBØCJX continue. W1GXT, WA4WTX, W8GRG and K9LSB are reappointed. WA5WDW replaces K5FOG, and VE1AIC replaces VE1AKT, in both cases filling the remaining half of a two-year term. W3YVV is appointed to a two-year term.

VHF/UHF AC: W1JR, K2RIW, W3HMU, N5RA and WØLER continue. WB6NMT, WA8ULG and VE3AIB are reappointed. W4WD (new chairman) replaces WAØDYJ/4, W7HR replaces W7FN, and GW3NJY/W9 replaces W9YF. W9KDR becomes the new Hq. liaison, replacing W1XZ.

Correspondence for any of the committees may be addressed directly to the members or routed via ARRL hq. We hope to include more details about these advisory committees and their functions in a future issue of *QST*. — *David Sumner, K1ZZ*

Canadian NewsFronts

Conducted By Ron Hesler,* VE1SH

CARF and CRRL Hold Summit Meeting

Early in 1978, through the offices of Marv Nash, VE3FON, president of the Radio Society of Ontario, the CRRL initiated the proposal of a summit meeting with CARF. The prime objective, as far as the CRRL was concerned, was to attempt to identify the problem and to hopefully arrive at conclusions which could ease the tension which has existed between the two organizations for the past 10 years or so.

The meeting finally took place, in Montreal, the early part of November, with RSO President Marv Nash acting as chairman and incoming RSO President Eric Ilott, VE3XE, as the meeting secretary. CARF was represented by President Bill Wilson, VE3NR and Vice President Fred Towner, VE2NM; the CRRL by Director Ron Hesler, VE1SH and Vice Director Bill Loucks, VE3AR.

The following agreements of understanding were reached and signed by all participants:

☐ The agreed purpose of the meeting was to investigate methods of improving the service received by Canadian Amateurs by the existing national organizations working more closely together.

Additionally:

☐ *Liaison with DOC and other Federal Government Agencies.* Agreed to notify one another of submissions being made and to discuss and to try to reach agreement on joint submissions. If no agreement can be reached, each is free to go its own way with no organizational or personal recriminations. In such a case, both organizations will exchange submissions.

☐ *Rapid Dissemination of Printed and Radio News.* CRRL asked if it would be possible to include news from their organization in the present CARF newsletters and radio bulletins. CARF representatives agreed to consult with their directors, prior to making any commitment. This included investigating the possibility of joint newsletters and radio bulletins.

☐ *CARF-CRRL Liaison.* Agreed that there was only one formal channel of communications and that was from the CRRL director and the CARF president (and vice versa), although either could delegate for a particular topic. It was further agreed that other channels will be discouraged and be made invalid.

☐ *National Amateur Symposiums.* CRRL asked if a joint annual symposium could be adopted or, alternatively, if alternate sponsorships could be adopted. CARF agreed to refer this matter to their Board of Directors for a decision.

☐ *Liaison with Provincial Societies.* CARF and CRRL agreed that this would continue in the present manner, i.e., by formal and informal communications as appropriate, between each national society and the provincial society.

☐ *Canadian IARU Membership.* CRRL agreed to accept CARF proposals for consideration by IARU and, if not acceptable, to return them to CARF with reasons for the nonacceptance and without editorial comment. And CARF may publish in the same vein.

☐ *QSL Bureaus.* Each organization would consult with its own bureau in order to determine if there were any problem areas. Delegates were not aware of any problems.

☐ Other agenda items included emergency communications, traffic nets, public relations, contests and training. It was agreed that all of these were of current low priority and no detailed discussion resulted.

☐ *Conclusion:* It was agreed that both organizations have more in common than that which separates them and that both organizations will work to the benefit of radio amateurs in Canada. It was agreed that CARF and CRRL would meet on a quarterly basis, as shall be arranged by the CARF president and the CRRL director. It was further agreed that this summary may be used for publication.

The above represents the exact summary of minutes of this historic meeting which, as previously stated, was signed by all participants prior to the close of the meeting. As of this date of writing, the CRRL has not heard further on the items which CARF representatives deemed necessary for referral to their Board of Directors.

In immediately communicating the meeting summary to CRRL officials, your director specifically requested adherence to the following policy. "Although there is likely to be some die-hards in both organizations and elsewhere, who might not be pleased with the basic detente achieved, I respectfully request all of you to do everything possible in endeavoring to 'keep the peace' in order that the agreements reached will be afforded the opportunity of actually working in practice. Thereby, serving the best interests of the Canadian Radio Amateur."

DOC DIRECTOR BECOMES A HAM

We are pleased to report that Dr. John deMercado, the innovative and progressive director-general of the DOC Telecommunication Regulatory Service, became VE3LBA, *after passing the examination* for the Digital Amateur Radio Operator Certificate. In a recent discussion with your director, John informed him that he now had his "code speed up to 15 wpm" and that after a period of one year would then proceed to his Advanced certificate. Congratulations, John. The radio amateur community is very pleased to have its regulatory "chief" a fellow amateur.

TARIFF BOARD HEARINGS

In late November, the Tariff Board completed their hearings in Ottawa, at which time the official CRRL brief was presented by our Counsel, Bob Benson, VE2VW. Additional hearings, which were well attended by individual radio amateurs and organizations, had also been held in Moncton, Toronto, Edmonton and Vancouver. It will probably be some time before any decision is reached by the Minister of Finance, after recommendations have been made by the Board. From all accounts, it appears as if the Board was suitably impressed with the presentations and the cause of duty relief for radio amateurs.

DOC PUBLISHES NEW BROADCASTING SPECIFICATIONS IN THE *CANADA GAZETTE*

In late October, new regulations were published for "Radio Apparatus Capable of Receiving Broadcasting." After careful examination of this document we (and our technical people) see nothing which suggests bad news for radio amateurs. Conversely, however, we see nothing particularly good either! We are disappointed to note that absolutely nothing has been included in these new regulations on the important subject of overload immunity.

CRRL PUBLISHES ITS FIRST TRAINING MANUAL

Early in 1978, a special Ontario Section meeting was convened to specifically discuss a traffic training program. Soon thereafter, Assistant SCM and Director Noreen Nimmons, VE3GOL (CRRL 1977 Amateur of the Year), together with SCM Larry Thivierge, VE3GT, embarked on the writing and editing of a comprehensive training manual. This manual has been written for on-the-air training and most probably is unique in this respect. Now published by the CRRL under the title of *Traffic Training Manual*, it contains clear and concise instructions for proper traffic-handling techniques for stations participating in Section Traffic Nets . . . with liaison to the region and area nets. Copies are available free of charge from CRRL headquarters (P. O. Box 418, Sackville, NB E0A 3C0) and/or from any Canadian SCM. An s.a.s.e. of 9" × 12" together with 30 cents *Canadian* postage would be appreciated.

POTPOURRI

☐ Well-known Ottawa amateur, Ron Belleville, VE3AUM, made a phone patch of a lifetime when he patched Governor General Leger through to his brother, Cardinal Leger, who works in a leper colony in the French Cameroons. Tnx CARF News Service.

☐ Tom Atkins, VE3CDM, a past president of the Radio Society of Ontario, has accepted appointment as a CRRL/ARRL assistant director. We are very pleased that a man of Tom's experience and dedication has joined our official family.

*Director, Canadian Division

Washington Mailbox

Conducted By Michele Bartlett,* N1AGD

Third-Party Traffic: If In Doubt — Don't!

For over 50 years, Amateur Radio has had the reputation of being the only service which monitors itself for wise spectrum use. Last month we discussed autopatch and control operators. Let's delve into this a bit further, and include third-party communication.

Q. Will you please explain the term "third-party traffic"?

A. Gladly. It is, in the words of 97.3v, "Amateur radiocommunication by or under the supervision of the control operator at an Amateur Radio station to another Amateur Radio station on behalf of anyone other than the control operator."

Q. What does "on behalf of anyone other than the control operator" mean?

A. An unlicensed person cannot be a control operator. Nor can a licensed amateur be a control operator when he operates in bands not authorized to his class of license. So radio communication "on behalf of" *anyone but the control operator* — an unlicensed person at the microphone, a Novice operating in the Amateur Extra Class bands, your Aunt Minnie sitting beside you in the shack, your neighbor down the street who wants a phone patch to England — is illegal *unless* it's within the U.S. or with a country with whom the U.S. has a third-party agreement. (97.114a)

Q. Can a licensed amateur ever be a third party?

A. You bet! If he's sitting at home and another ham calls him on the autopatch, he is a third party, even though he's a licensed amateur. Let's take another example. Say you're a Novice and that I'm an Amateur Extra Class licensee. If you come over to my house and operate my station in the Novice bands, I may designate you to be the control operator of my station, and then go about my business. You may operate my station *using my call sign* in the Novice bands, without my supervision. (97.79b)

However, if you wish to use any non-Novice frequency, I must be present continuously to monitor and supervise the communication. You then are a *third party*. So, in effect, even though you are licensed, in this case the rules apply as though you were not. (97.79d)

Q. What if you come over and operate my station?

A. Then you may designate me to be control operator of your station. If I restrict my operation to the Novice bands, then I would sign your call. If I operate on bands allowed to me but not to you, then I sign your call followed by mine. On cw, they would be separated by a slant (dahdididahdit). On phone I'd say your call "with (my call) controlling." (97.87b) I wouldn't be a third party because I would be authorized by the FCC to operate in all amateur bands.

Q. What does all this mean in terms of allowing someone who is not licensed to be the control operator of my station?

A. In the first place, only a licensed amateur can be a control operator of any Amateur Radio station. An unlicensed person may "participate" in radio communication from your station as a third party. (You and the station you are in contact with would be the first and second parties.) You, or another appropriately licensed control operator, however, must be continuously present to supervise his communication, and he may do so only in bands and modes that the control operator on duty is authorized to use. (97.79 c and d)

Q. Well, who can a third party talk to?

A. The U.S. currently has third-party agreements with Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Equador, El Salvador, Ghana, Guatemala, Guyana, Haiti, Honduras, Israel, Jamaica, Jordan, Liberia, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay and Venezuela. Of course, a third party in these nations may communicate with anyone in the U.S. or its territories or possessions. A list of these territorial prefixes is found in chapter 2 of the ARRL *License Manual*.

Q. Let's assume that I am in communication with a country with whom the U.S. has a third-party agreement. What may I talk about?

A. This falls under Article 41, Section 2, of the International Radio Regulations of the ITU. It says that when transmissions are permitted between countries, they shall be made in plain language and shall be limited to messages of a technical nature, and to remarks of a personal character, for which, *by reason of their unimportance*, recourse to the public telecommunication service is not justified. This law forbids third-party traffic unless there is a third-party agreement between the two countries concerned.

That's why your Aunt Minnie can't say, "Meet my plane in Rio," to her daughter in Brazil: That's not unimportant, and it's not technical. Or if you're talking to an amateur in Israel, and he asks you to say hello to his brother there in your town, you may do so. You may not ask his brother to send him a money order or a plane ticket, or relate any message involving material compensation of any kind. (97.114 b and c)

Q. What if I'm talking to someone in a country with whom we have a third-party agreement, and he wants to talk with a relative in my town. I don't speak their language — what do I do?

A. You have two choices: You can tell the relative what he can and cannot talk about, and hope he understands — and complies! However, the better choice is to *decline to cooperate*, including terminating the conversation in progress, if you think there is a possibility that the communication may be questionable. There are two reasons for this. You may have your license revoked for allowing illegal traffic to pass through your station. But on a broader scale, isn't it better to hurt someone's feelings than to risk the revocation of a third-party agreement? It could happen, if a telecommunication authority in another country decides that its amateurs are conducting illegal traffic.

Q. What if someone wants to pass traffic to a nonprofit organization like a church, or to the ARRL?

A. Chances are, it may be illegal traffic, facilitating the regular business or commercial affairs of the recipient. In this case, the ARRL is a "business." So is a church. We have bank accounts, file for nonprofit status, receive donations, and provide services.

When you send a message to Hq. through the National Traffic System, asking for a *Repeater Directory*, a 610 form, or contest dupe sheets, you are helping facilitate the regular business of the ARRL. *And so is every amateur who passes your traffic!* When you're sending a message of this type, you're asking every amateur in the system to jeopardize his license. (97.114c)

Here's a word on behalf of the amateurs in Washington and Gettysburg: Don't ask them to send messages to the FCC!

Q. What are the rules regarding third-party traffic in an emergency?

A. Emergency communication must directly relate to the *immediate* safety of life of individuals or to the *immedate* protection of property. Immediacy is the key word here.

In a disaster, FCC rules do not prohibit U.S. amateurs from sending and receiving traffic directly relating to the saving of lives or property. For example, you may accept requests for medical supplies, food, shelters, emergency generators, and so on. But after the disaster is over, the normal telecommunications routes are restored and the country begins picking up the pieces, you may no longer pass third-party traffic except as noted above in Article 41, Section 2. You mustn't make an inquiry for your neighbor down the street who wants to know whether her daughter, who was in the country at that time, is safe. This point is confusing to some amateurs, but the rule is quite explicit. (97.3w)

[Note: Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL, have been approved by FCC staff. Interpretations contained herein concur with those of the Personal Radio Division of the FCC. Numbers in parentheses refer to specific sections of the FCC rules.]

*Membership Services Assistant, ARRL

International News

Conducted By Bruce Alan Johnson,* WA6IDN

Amateur Radio à la Sierra Leone

It means "lion mountain." Sierra Leone has more than 3,000,000 people, is a bit smaller than the state of North Carolina, and was settled by the British in the 18th century as a haven for freed slaves (and later for slaves liberated from ships that never got out of West Africa).

The Sierra Leoneans declared themselves a republic in 1961, and have fought valiantly against the threats of poverty, the rivalries of 12 tribes, and a split economy: 75 percent of the people are employed in trying to raise enough food for the small West African nation, while the country's richest export remains diamonds. Palm kernels, cocoa and coffee remain on the list of exports, too, but an average Sierra Leonean still takes home only around $150 per year. Readers of this column will not be shocked by that figure, for it's typical of most developing nations, and goes far toward explaining why Amateur Radio isn't a major enterprise in the Third World.

The Sierra Leone Amateur Radio Society joined the International Amateur Radio Union (IARU) in June 1977. The society's 25 members (eight of whom are licensed to transmit) meet frequently to discuss the problems Amateur Radio faces in Africa, and quite predictably the conversation will usually pivot around *scarcity* — probably the most disheartening problem the African and Asian amateur confronts. During a meeting in November, the SLARS members decided to write a story to show Western readers just what it's like in their part of the world. We hope you'll take a few minutes to read it; you'll never look at African Amateur Radio the same way again. Their story:

The Sierra Leone Amateur Radio Society clubhouse is situated on the campus of Fourah Bay College of the University of Sierra Leone. Overlooking the Atlantic Ocean atop a 1300-foot hill, SLARS members have been given an abandoned Posts and Telecommunications Department vhf station, which is shared with the electrical engineering department of the college. Outside stands a 150-foot tower — one anomaly unique among African amateur societies. So, what's the problem? Listen to the following conversation during the November meeting. About 20 persons were in attendance, including seven of the 20 electrical engineering students from the weekly code class.

SLARS president Vidal Johnson asked for reports of recent activity among club members. Chuck Jones, 9L1CA, reported on the recent multi-single entry in the CQ-WW contest. Vidal, his interest piqued, inquired about the possibility of entering the club station, 9L1SL, in a contest as a society activity. It was decided that the ARRL International DX Competition in March 1979 offered the most likely opportunity.

Vidal then asked, "Could the SLARS members who have radios bring them to the clubhouse for the contest?" The three active members present agreed to do so.

"What antennas will we need for this operation?" was Vidal's next question.

"Six: one for each band we can work," was the reply.

"How will we get the six antennas?"

"That won't be too difficult. We have wire and bamboo. We could make a quad or a ZL-special for 10, 15 and 20 meters. Then maybe we could put up slopers for the low bands."

"What a signal we should put out from this QTH, with that 150-foot tower on top of this mountain!"

"Yeah, but there's another problem. How are we going to feed the antennas? It looks like we'll need a few hundred feet of coax. . . ."

"How much coax do we have?"

"Just this one section feeding the 20-meter inverted V 30 feet up the tower."

"Where can we get more?"

"I heard that one electrical dealer in Freetown has 75-ohm coax."

"Have you checked the price?"

"Well, that is a problem. It's $5 a yard."

"How much money do we have in the treasury?"

"At that price, enough to buy coax to reach from the shack to the base of the tower."

"Hmmm."

"We'll need coax connectors, too. Can we get them here?"

One of the members recounted his experience hunting down connectors in Sierra Leone: "I made the rounds of the electrical suppliers in Freetown, trying to find a PL-259 plug. The only answer I got was, 'A what?' When I showed them one, they all said, 'Oh, no. We don't have that!' "

With little headway made on these problems, the meeting officially adjourned at 10:30 P.M. Members turned toward the FT-101 transceiver brought in by 9L1KB. As the CQ went out, the seven students (who had studied code but not yet seen a real amateur operation) crowded around the rig.

"9L1SL. This is Whiskey America Four India Zulu Kilo in Virginia," came a reply. "WA4IZK from 9L1SL, club station of the Sierra Leone Amateur Radio Society in Freetown. The handle is Ken, and you're five by six."

"9L1SL, Japan America Eight America America calling. . . ." The students' eyes were wide with excitement. "This is JA8AA. Fine business, old man, and thanks for coming back to me. My name is Takeo, Tango Alpha Kilo Echo Oscar. My QTH is Sapporo City, Japan, and you are five by seven."

"JA8AA from 9L1SL. Thanks for the report. We're running 100 watts here into an inverted V up 30 feet. Please send your QSL to Box 10, Freetown. 73, Takeo. Hope to see you on again. 9L1SL clear."

The students were spellbound as the power on the rig was switched off, while at least 20 Japanese stations were still calling.

"What were the numbers you kept giving the other stations?"

"When he said, 'Tango Alpha Kilo Echo Oscar,' how did you know to write down his name as 'Takeo'?"

"Was he really in Japan? You mean you can talk all the way to Japan on that little set and that piece of wire tied to the tower?"

"What is that meter sitting there on the set? What is SWR?"

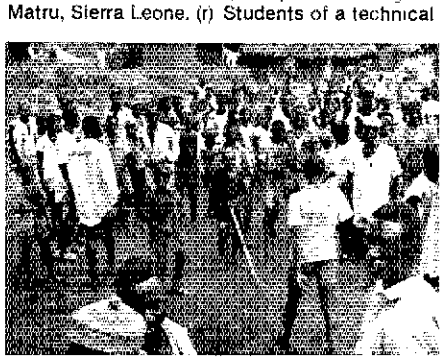
"What is the difference between cw and ssb?"

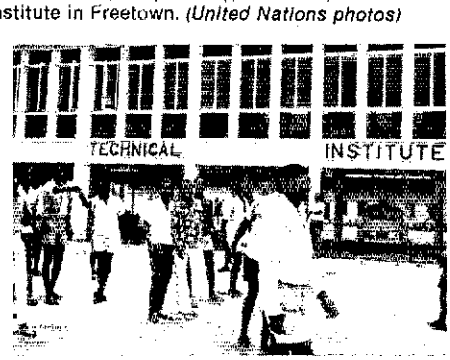
And so the questions continued to pour forth as the shack door was locked and the group walked past the tower toward home. Maybe next year. . . .

No, maybe December 1978, as 10 IARU Project Goodwill receiver kits have been aired to SLARS for these students' use. *You* provided them, with your contributions to the project. So *you're* playing a direct role in helping give birth to the Amateur Radio Service in Sierra Leone. And thus, you're helping a stalwart bunch of Amateur Radio enthusiasts prove to their government that radio amateurs hold the key to providing the technical expertise so vitally needed by developing nations.

*International Services Officer, ARRL

These two photos contrast the tribal lifestyles of many African peoples against their struggles to join the twentieth century's rapid technological growth and development. (l) A friendly tribe from Matru, Sierra Leone. (r) Students of a technical institute in Freetown. *(United Nations photos)*





Correspondence

The publishers of QST assume no responsibility for statements made herein by correspondents.

TWENTY-YEAR FACTS

☐ With the WARC only seven months away, facts from nearly 20 years ago can aid understanding, so here are a few. There were two 1959 ITU conferences. One of them, named the 1959 Administrative Radio Conference, addressed the frequency allocations we have today. There were at least 13 members of the official U.S. delegation to the 1959 ITU Administrative Radio Conference who were licensed by the FCC as radio amateurs, including Mr. Albert McIntosh, formerly K7AL. He was no less than the United States spokesman on the committee which treated frequency allocations. Two official American delegates who were licensed amateurs and who were active in the frequency allocations committee were from the ARRL. The only presently licensed American amateurs to serve as 1959 Administrative Radio Conference delegates are W1JQL, W1RW, W3ASK, W4MB and K4NA. Then, as now, only official members of the U.S. delegation, as opposed to observers and others, may lawfully speak for the United States or negotiate with any foreign country on behalf of the United States. One must be an official delegate to lawfully enter a closed ITU conference. — *Francis K. Williams, N4FK, Washington, DC*

WHY IS RARE DX SOUGHT?

☐ Regarding your item called "Bad Behavior Continues," (November *QST*, page 63). I've been seeing items like this far longer than I've been a ham. It seems that bad operating practices aren't limited to DX chasing, but because of the international nature and size of the pileups, it just naturally garners more attention in DXing than in other areas. In trying to track down the cause I had to ask, "Why is the rarer DX so sought after?" It is apparently a quest to up the country total for the next DXCC Honor Roll in order to have the highest number of countries and to achieve the various levels of endorsement. This quest to be the top dog generates considerable competition and, unfortunately, when the competitive spirit is brought out in most humans, that drive to win goes before any normal sense of fair play or courtesy. The result is frustrating to everyone involved. Rather than treat the symptom, why not treat the cause and do some careful looking at some of the competitive aspects of our hobby? I'm not considering contests. They are scheduled well in advance, are for a specific limited time period, and are well enough published that most U.S. and DX operators should be aware of the event. What I am considering is the DXCC structure itself. Take away the award and you have taken away the reason "rare" DX operators are set upon at their appearance on the bands, and the main reason for all the ill feelings generated by the pileups. This step is just too drastic, even for my semicompetitive blood. I therefore propose you have a basic DXCC award, with cw/phone/mixed endorsements and no additional endorsements over the basic 100. For additional challenge there is still 5BDXCC. An added benefit would be the decreased cost and workload for the Hq. staff. — *Bruce Werner, WB8TVD, Big Rapids, MI*

TUNER-UPPER ZERO BEAT

☐ How about having a reliable frequency on the ham bands for transmitter alignment without general coverage receivability? — *Edison Riblett, WD6BWA, Wasco, CA*

☐ The tremendous recent increase in the number of stations using cw has intensified a long-existing problem of the "tuner-upper" zero beat on the frequency of your QSO already in progress. Perhaps this tune-up procedure will substantially alleviate the problem. Most rigs today have at least a 25-kHz crystal calibration system for dial calibration. An accurate marker identifies each 25 kHz of the tuning dial. If everyone will do their tune-up at zero beat with the marker closest to the area of the intended operation, the 25-kHz span between the markers would be substantially freed of this interference. There still will be a tune-up point within 12.5 kHz of your operating frequency. This doesn't mean that one should not attempt communication at the marker frequency, but he would do so at his own peril. — *Loren Green, W9JIO, Northfield, IL*

ADVICE TO 2 × 1s

☐ Here's some advice to the guys and gals who have the new 2 × 1 calls and are spending time working cw dx. When giving your QTH, after the abbreviation of the state, include "USA" at least twice. I am discovering that the DX stations are so unfamiliar with these 2 × 1 calls that even after I give my state they still answer with, "QTH?" Also, make sure that you are sending your cw call in crisp style. They are unfamiliar with a one-letter suffix and very often misconstrue it as two letters, such as the letter Y mistaken for TW. These 2 × 1s are excellent for picking up DX stations but they also tend to cause some confusion in the process. — *Charles Schwartzbard, AF2Y, Clifton, NJ*

NEED A 610?

☐ If you need a 610 form for renewing your license, check your local telephone directory for the Federal Information Center. It's under "U.S. Government." They have 610s and CB license applications. They even pay the postage! — *Charles Michel, KØQVL, Omaha, NE*

PRIVILEGE EXPANSIONS

☐ I read "It Seems to Us" in the November issue of *QST* and wish to express my opinion that the idea of 220-MHz phone privileges for Novices is a good one. It gives them a taste of what they can get when they upgrade and it increases the use of the band. But, it doesn't go far enough. If you give the Novices a carrot to try, you should give the Technicians one, too. One way to give Technicians an extra push would be to create hf phone bands similar in principle to the Novice bands. Give us some but not all General frequencies, for example, and limit us to a certain power. The only difference between a Technician and a General is his/her code speed. — *David Stocum, WB2BRW, Batavia, NY*

☐ I've noticed several letters in *QST* denouncing incentive licensing, but few writers offer any alternative. I feel that incentive licensing is the way to go. If the FCC gives unlimited privileges to Novices why would anyone bother to upgrade? The only improvement I would suggest is to change the code speed requirement for General to 10 wpm and require 15 for the Advanced. This would be a more logical progression. For those who want a license without any code there is always CB. — *John Fuller, WA1ZRR, Burlington, VT*

☐ In my opinion, people who are not lifting a finger to upgrade are lazy. Lots of people are perfectly happy with the license class they hold and are not griping. I direct this to characters who all have the same complaint about the unused spectrum space. You say all you want to do is work phone, why can't Advanced have full phone privileges and why must a Novice work only cw? Why can't they have full cw and phone privileges? Look at it this way: To become a brain surgeon you first must become a medical doctor. Incentive licensing can benefit you, me and our country's prestige overseas. It can benefit us technically through self improvement and spiritually by the prestige received of peer groups and junior operators. Sometimes your upgrading can win you "leadership by example" and give you the opportunity to set goals within your amateur group. Your own progress will encourage others and ultimately you will feel that you have helped. The system also adds immense credit to the U.S. ham who is applying for a reciprocal license. The Filipinos have a similar system that is well regarded, and they indicated their appreciation for our structure when I applied for my license in the Philippines. One must at least have a General class license here to apply for a permit. If you hold a higher class license you are well received and looked upon as one who might be a potential source of technical advice. — *Tom Dixon, KØAX/DU2, APO, SF*

☐ I just received my Novice ticket in July. I enjoy code very much, but I would love to have 220-MHz privileges. Once a person has gotten the Novice he has decided whether he likes code or not. If not, he will just learn enough of it to get his phone privileges anyway. — *Shawn McGovern, KA2BSC, Malone, NY*

☐ I encourage you to support incentive licensing. I am most certainly enthusiastic about welcoming newcomers to our ranks but there is no stable organization I can think of that does not honor its senior members with privileges of rank. In our case this is reserved bands or subbands. Let's give our Novices something to aspire to. — *Bob Kinner, WB8HWN, Hamilton, OH*

☐ Why must the League insist on endorsing 220 phone privileges for Novices? Many have gotten on 220-MHz to get away from the activity that exists on 2 meters. Neither Novices nor those of us on the 220 band would benefit. As you stated in the article, the problem was that those Novices who went on phone missed out on code practice. As for stimulating activity there: If all 2-meter operators who own more than one 2-meter transceiver would swap for 220 equipment, there would be plenty of activity. — *James Gilchrist, WB5PGE, Crowley, TX*

☐ I suggest there be a special "Spouse" operator's license available only to the legal spouse of a licensed radio amateur. It would be similar to the Third Class Radiotelephone license, involving knowlege of the laws and operating procedures. The station license would be held by the amateur who would be responsible for the technical requirements and overall operation of the station. Such a license, restricted to 220 MHz, would stimulate activity there and make available to ARES a vast number of people who are usually available during the daytime. — *Don Dusty, N9MN, Waukesha, WI*

[Editor's Note: Good idea! Unfortunately, FCC has twice turned down similar proposals.]

☐ By letting Novices have phone privileges on 220 MHz, they would learn the basics by operating on that mode. You really only learn about something by doing it. — *Quinton Gleason, WB7UVB, Gillette, WY*

☐ Suppose the Novice bands were expanded. What would happen to the Tech ops' hf privileges? Where and in what way would (Novice) hf privileges be affected? — *Jon Liechty, WD9FEP/T, Goshen, IN*

☐ I'm against added privileges for Novices. Please don't make this license or any other upgrade easier. Amateur Radio operators should work and study for their privileges. That is what makes us unique and respected. I have tried to upgrade but failed because I was unprepared. I won't fail the next time. — *Dan Shudick, WB9YRT, Hammond, IN*

☐ I would like to see Technicians get voice privileges on the *10-meter* band. That way we would get more use out of the band and encourage more converting of CB rigs to 10 meters. — *Bernard Kirschner, WBØYCQ/6, Tustin, CA*

YL News and Views

Conducted By Louise Moreau,* W3WRE

Best Foot Forward

An old proverb reads "When I meet you I know you a little. When I hear your voice I know you still more, but when I see your actions I know you altogether." For all of us who are active on the air our actions are the procedures that we follow in our nets, our activities during emergency operation, in the contests we enter, and in our friendly chats on the air as we all try to observe the rules of common courtesy as we operate.

The YL nets rank high in net control efficiency and membership observation of the regulations so that no matter how many gals participate in each session there is sufficient time for late-comers, and newcomers who want to know about the net. The net controls all seem to have a special talent that appears again and again as they patiently try to weed out the interference on the frequency so that all the members will have a chance to check in.

Our projecting a good image comes from the lessons we have learned at the start of our activity as we have worked with, and listened to, other operators. Because we liked what we heard, we tried to pattern our procedures from them. They have showed us the methods of contest operation that have improved our standings; they have showed us how to call and then wait through the DX pileups that have proved to be invaluable in logging a new country; and we have learned how to reject contacts with persons whose operating techniques do not conform with the rules of those who operate successfully.

Those actions by which we identify ourselves as a name and a call that will be remembered with pleasure, or just another QSL to add to the growing pile of cards in a file, are not how we look or dress or move, for not every station is equipped with SSTV. Rather they are our adherence to correct procedures. Most of us are patterned by the operators we have heard and tried to copy when the license was still new and we wanted to be able to have the same smooth and enjoyable habits. Thus, because of the example that was set by some now-anonymous amateur whose consideration for others and warm manner was influential, even though he did not know we existed, our on-the-air activity has been improved. To those who by their actions unwittingly helped us we all are exceedingly grateful, for we in turn are being listened to and our mannerisms copied by newcomers who are anxious to do things properly, and, like Kipling's "Old Man Kangaroo" be popular and "very much sought after" by our fellow amateurs.

Ever since 1909, when the first YL appeared, women have been very busy on the air trying to help to maintain a level of operating skill that is best stated in the very beginning of *The Radio Amateur's Handbook* in Paul Segal's six points of the Amateur's Code.

"HOWDY DAYS" RESULTS

The winners: YLRL member high score EA3ARI, 166 points; nonmember high score DJ6JOC, 77 points. Scores: WA1UVJ 120 points; K1WLX 61; WB2OHD 58; N3JC 71; W4KZT 54; WB4PXN 52; K4RNS 48; K6KCI 83; WA6KQC 22; K7CHA 59; WD9HNE 26; WD9KQM 63; WB9LSM 27; WB9MFC 34; WB9QLC 58; WBØJFF 75; KL7JDI 75; DA1GF 102; DF2KG 83; DJ1TE 113; DJØNT 127; DK1HH 72; DK9ZL 73; DL6JOC 77; EA3ARI 166; G4EZI 86; JH1GMZ 5; LX1SM 120; LX1TL 149; OE4YHA 128; OZ1AVV 75; PA3ADR 36; 3D6AG 59.

CONTEST LOG INFORMATION

One of the problems that the YLRL contest custodian has had in the previous years is that many YLs, DX gals in particular, send their logs to the previous custodian who was also the YLRL vice president, and she has to forward them. Sometimes they are received too late to qualify. The incoming YLRL vice president who will handle the YL-OM contest and the DX-YL to NA-YL contest logs will be Margaret Williams, WA4FTJ, 965 Redwood Circle, Virginia Beach, VA 23462. It is requested that all logs for 1979 YLRL contests be sent to her.

DISTINCTIVE NEW CALLS

Add one more YL suffix to the list of U.S. women Amateur Radio operators. Rosaline Victor is now K8YL, representing West Virginia on the YL map. Rosaline, WB8DQX, was the first YL in her state to earn the Amateur Extra Class license, and in 1975 she was named West Virginia Ham of the Year. She is one of a full amateur family with OM Pete, W8PV and their three sons — WB8PKF, WD8BPP and WD8BPQ. Her mother, WB8WET, and her daughter Margaret, WD8TDY, make sure there is no communication gap in their conversation.

Rosie Lamb, formerly WA3NGS, holds, as far as we know, the first single-suffix call issued to a YL. Her Amateur Extra Class license made her eligible for the call KA4S. Women in other countries have a single-suffix call, but Rosie is the first in this country.

VK YL CLUB CHANGE

The Ladies' Amateur Radio Association (LARA), founded in Australia to encourage more YL radio activity in that country, has found that the increased interest makes it necessary to expand the club to national status. The name has been changed to ALARA (Australian Ladies' Amateur Radio Association) to meet the new standing of the club — to indicate the nationwide scope of the membership. The YL net meets each Monday at 1000 UTC on 3.650 MHz, and welcomes all interested participants. They also sponsor a Novice net to help newcomers meet club members and encourage their activity.

*YL Editor, *QST*. Please send all news notes to W3WRE's home address, 305 N. Llanwellyn Ave., Glenolden, PA 19036.

50 Years Ago

February 1929

☐ *QST*'s staff is providing all the help possible to members in modifying station equipment to meet the requirements of the new 1929 regs. Ross Hull, in charge of a technical development program, delves into keying techniques and problems in a major treatise on eliminating thumps and chirps, mostly through better regulation. You can even key in the r.f. feed line — but only on 80 meters, as backwave becomes a problem on the higher bands.

☐ A second piece by Ross carries the good news that self-rectified rigs *can* be made to meet the new standards, with precautions such as a High-C tank and symmetry in construction. Each tube type has its own optimum L/C ratio, and can produce separate sidebands if the layout is not symmetrical.

☐ General Electric engineers describe a new RCA rectifier, type UX-866, which looks like a boon to amateurs with its mercury-vapor advantages of low voltage drop and minimum starting time.

☐ The Editor is pleased to announce that after extensive hearings in Washington where ARRL represented our interests, the 1715-2000 and 3500-4000 kc. bands will be kept exclusively amateur — a situation not true in many other countries.

☐ The Communications Department is overseeing another Governors-President relay, seeking messages from the head of each state to be relayed by Amateur Radio to President Hoover during his inauguration next month.

☐ W9FKH saves the price of expensive r.f. meters by measuring the equivalent d.c. current required to make a flashlight bulb "just show color" when in the feeder circuit.

☐ Another new tube is the UV-861, sort of a screen-grid version of the 852. WISZ shows us his half-kilowatt rig, crystal controlled, with a scheme for getting screen-grid voltage for the new device.

☐ W6AM in "Correspondence" points out that for portable operation (away from the licensed station address) an amateur needs a separate license and call sign.

25 Years Ago

February 1954

☐ Antennas operated on harmonics for multiband purposes show substantial variations in impedances; W4UCW explores these characteristics and provides graphs to aid optimum compromise in design.

☐ Bandswitching a parallel plate feed can invite problems if the high-voltage choke is not effective on all bands; W2OLU describes a simple system using a grid-dipper to measure efficiency.

☐ W1HDQ and W1VLH join in design of a crystal-controlled rig for 220 Mc., a notable advance over the usual modulated oscillator.

☐ Those rock-solid BC-312/342s are excellent receiver buys in war surplus, but need the kind of dual-crystal filter modification W7ESM suggests in order to achieve desirable selectivity in voice operation.

☐ W2PAT wound a toroid to an unloaded Q of 275, then mounted it in a nitrogen-filled sealed container to provide maximum stability in a 3.5-Mc. v.f.o.

☐ Voltage-regulator tubes have an additional application in keying circuits, which W1DX puts to advantage both in basic grid-block keying and a time-delay system for oscillator-amplifier rigs.

☐ A couple of inexpensive transformers and a 6J5 are the essentials of a simple code practice set for beginners presented by Novice Editor W1ICP.

☐ The word from Washington is that after all these years, amateurs (actually, all licensees) are going to be charged a fee by FCC for issuance of licenses.

☐ W1IYB shows us the handy gadget he built to check used capacitors and other components in the junk-box to avoid installing defective units. — *W1RW*

The World Above 50 MHz

Conducted By William A. Tynan,* W3XO

The Standings Boxes

The standings boxes have been a regular feature of this column for over 30 years. To many, the boxes represent a tangible recognition of achievement — sort of a vhf equivalent to the DX Honor Roll. They are the ones who can be expected to promptly send in word of their latest state catches. On the other hand, there are a few active vhfers with excellent records of accomplishment who, for various reasons, have steadfastly avoided submitting information and hence have never been listed. Such voids are unfortunate as many prospective vhfers scan the boxes for an indication of what the bands above 50 MHz have to offer. Nevertheless, these holdouts must, to them, have good and sufficient reasons for not wanting their accomplishments publicized, and their wishes must be honored. The majority of active vhfers lie somewhere between these two groups. They are not particularly concerned if their standings are not absolutely current, but they do submit updates from time to time. Contributions of information for the standings boxes from all active vhf/uhf operators are continuously solicited. This conductor feels that keeping the standings as complete and up to date as possible does represent a valid documentation of what is being accomplished in the world above 50 MHz.

The fact that many value the boxes can be gleaned from the mail: Readers send suggestions pertaining to them every month. These range from institution of regular publication schedules to inclusion of additional information such as the state in which each listed station is located. These comments have caused me to give the boxes — their content and frequency of appearance — considerable thought. As a result, I have developed some ideas of my own which I would like to pass along for consideration by the readers of this column.

One suggestion that has been made by several is that a regular, and rather rigid, publication schedule be established. It might involve carrying the 2-meter and 70-cm boxes twice per year in specific months and the 1-1/4-meter and 23-cm boxes at least once. The remaining months would be devoted to other boxes, such as 50 MHz WAS and EME Annals. This system would certainly have advantages, as people would know when to submit updates. On the other hand, it's not practical in the light of the finite *QST* space allocated to "The World Above 50 MHz." Many months there is just so much news that must get into print that there is no room left for any box, especially one the size that the 2-meter standings has become. There are also months in which I simply cannot find the time, due to travel or other commitments in connection with my regular job, to do the clerical work necessary to update a box. With the present high level of activity, particularly on 2 meters, and the numerous call changes, updating the boxes is a much greater chore than it was when I assumed the helm of this column in April 1975. It is so time consuming that I am trying to find a way of computerizing the process. Once a box must be skipped for one reason or another, of course, any rigid publication schedule goes out the window.

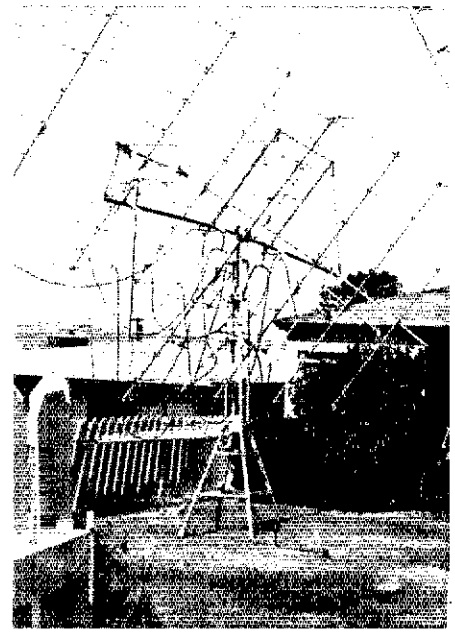
What about content? Is the idea of including the state of each listed station worthwhile? Something else would probably have to be deleted. The most likely candidate to bite the dust would be the distance column. A number have insisted that it has little meaning with so many stations now on EME. I am sure that many of the distances are incorrect, anyway. Is it fair to list those with estimated or exaggerated DX records along with those who have calculated theirs to the nearest fraction of a mile? What about the call area column? When I started conducting the column it was generally considered to mean continental-U.S. call areas; hence the maximum possible number was ten. Feeling that this was not indicative of the accomplishments of some, I began counting KH6 and KL7 some time ago. That's why some stations are listed with 11 or 12 call areas. What about the VE call areas? Some Canadian stations have complained that they have less chance to amass states themselves, as U.S. stations have little incentive to schedule them. Both XE and KP4 have been worked on 2 meters from various parts of the country without EME. Shouldn't such contacts be given some recognition beyond a one-time mention in the column? How about including in the call area column the total of U.S. call areas, VE call areas and DXCC countries excluding the U.S., Canada and the U.N. Building? Or, would it be better to list U.S. call areas separately from the VEs and DX countries?

When I took over stewardship of this column, the standings boxes contained many listings for stations that had not been active in perhaps 20 years. In their day, these early pioneers piled up state totals that must be considered noteworthy even today. I have continued to carry these stations, mostly out of a sense of tradition and respect for their early accomplishments. But, is it fair to the current crop of active vhf operators to ask them to share the standings with those who have been off vhf for years or have not submitted reports for a very long time? Should those who do not submit some kind of report more often than some specified time be dropped from the box? What period of time should that be? I am sure that all can see that adhering to such a policy would considerably increase the clerical work for the person maintaining the boxes. In addition to checking the file for updates since the last publication, it would be necessary to determine when each and every listed station last submitted a report. Computerization would certainly help this process.

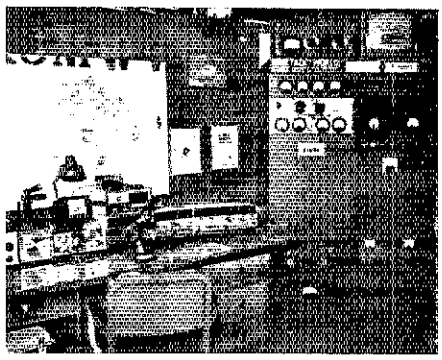
Incidentally, my job of maintaining the boxes is aided considerably by those who use the special forms which I have developed for submission of standings box information. When such information is merely included in a letter containing other column inputs, it is far easier for me to mislay it and not put it into the proper file. Also, information sent on small scraps of paper is quite easy to lose. An s.a.s.e. to the address below will bring these forms.

Many have asked if their states need to be confirmed in order to be listed or whether they must submit QSLs. I have always considered confirmation a matter of individual conscience, but opinions on this approach would be welcome. In any case, I do not need to see the cards and would rather not take on that responsibility. When you have worked them

This piece of backyard sculpture is the 2-meter/70-cm EME array at WB6NMT, the only station so far to make moonbounce contacts on four bands.



*Send reports to Bill Tynan, W3XO, P. O. Box 117, Burtonsville, MD 20730 or call 301-384-6736 and record your message.



The neat layout at K3MWV. This is only one side of the shack!

all, Headquarters must check the QSLs before they can issue a WAS certificate, however.

Another often-asked question concerns the minimum number of states one must have in order to qualify for listing. This varies with the location. A mid-Atlantic station won't make the list with 15 states, but a West Coaster certainly will. The best thing to do is look at the lowest station on the list in your particular call area, but this is not a hard-and-fast rule. Exceptions are made for particularly remote stations. The criterion for getting on the list may have to be changed, however, due to the virtual explosion of 2-meter activity. The 2-meter standings box is becoming unwieldy and is taking far too much of the space available to "The World Above 50 MHz." It may become necessary to limit the listings to a certain number in each call area. This is one reason for considering dropping inactive stations.

Your opinions on these thoughts, or any others you may have on the standings boxes, are earnestly solicited. Let me, or your VUAC representative, know what you think. VUAC members are listed in the June 1978 column.

ON THE BANDS

6 Meters — Many are asking what it takes to open 6 meters. High solar flux alone does not seem to do the job. K7KV is trying to get direct access to satellite data in hopes of coming up with a correlation that will enable him to spot F2 openings in advance. A good example of flare-induced muf enhancement took place on December 12. A flare occurred at about 1500 UTC and at 1715 WB2RLK/VE1 worked WA7ECY OR and K7KV WA. W2AXU has a different idea from that expressed in the December column concerning where this solar cycle is headed. Jack, who along with W1HDQ, has been studying solar phenomena for several years, predicts that Cycle 21 will peak about June 1980 with a smoothed count of only about 155. This is a far cry from the 205 mentioned in December, the prediction of Dr. R. P. Kane of the World Data Center for Solar-Terrestrial Physics. It will be interesting to see who is right.

From Guam, KG6IH writes about openings in that part of the world. Between October 30 and November 12 contacts were made into northern Japan (JA8) as well as with WA4TNV/KL7 Shemya Island. Signals were so good at times that one day ferry worked the Shemya station from his car with 10 watts. On November 11 he and KG6DX caught VE7BLF for a short 559 QSO. But the big day was November 12 beginning at 2041 UTC (0641 the next morning on Guam). N6CT was worked, followed by W6XJ, K6MYC, K6HCP, W6EDE, W6PO, K6UZK, N6HZ and K6RNQ. KG6DX worked these stations plus K6YK, W6SP, N7DB and K6FV. This is thought to represent the first 50-MHz, two-way contact between the West Coast and Guam.

During his November trip to Japan, WB6NMT discussed with several prominent and active JA 6-meter operators the question of frequencies to watch when conditions look favorable for U.S.-to-JA work. The consensus was that on ssb we should call on 50.110, which is not particularly heavily used in Japan. The JAs will transmit around 50.135. In Japan, as here, the first 100 kHz is restricted to cw. For that mode Louis suggests that we call on 50.1 and listen on 50.090. This does not mean that QSOs should not take place on a single frequency; these are merely the suggested places to monitor for signals from across the Pacific.

Don't think of JA contacts as a remote possibility. They are already occurring on the West Coast. A letter from JA1VOK mentions openings in late October and early November in which he worked K6HCP, K6MYC, K6RNQ, N6CT and W6YKM. Hatsuo's note also tells of very good long-haul evening openings via TEP with VK3 and 7. That's a distance of about 5500 miles (8900 km).

As reported last month, Gibraltar is now on for two-ways, as well as having the ZB2VHF beacon in operation. On the evening of December 9 at 2300 UTC, ZB2BL, using his am/cw rig, worked both PY1RO and PY1XB. KZ5NW tells of hearing the ZB2 VHF beacon from Spain, on several days during the week of December 11. K4SYP (listening only) says that he continues to receive the ZS6PW beacon quite often. Bob also hears many Es openings, which bring in all manner of signals from various parts of Europe — but of course no hams. Es has been much more plentiful this fall in this part of the world, too. One such session took place the evening of December 10 (11th UTC). AE9M, formerly WA9CWY, says that on that occasion he hooked up with 17 stations beginning with VE1DXA and ending up with WB3LSY here in the Washington, D.C. area. Jim comments that signals were over S9 for about an hour and a half at his QTH, Taylor Ridge, IL.

WB4OSN reports that the HH2MC operation in late November did not have the good fortune to encounter F2 propagation, but they did run into several Es sessions providing a nice country catch for a lucky few consisting of WA5UFH, WA5UUD, WB5ZRO, WB5ZET and WA4FBH. The Swan 250 they used has been sold to HH2PR, and Pierre is sure to make Haiti available to many more when conditions are right. HH2PR is also operating a beacon under his own call on 50.023, just 2 kHz below the 6Y5RC beacon which he was instrumental in putting into operation prior to his leaving Jamaica.

From the Pacific Northwest, N7DB says that the NW/SMIRK net is still going strong with about 16 check-ins often in attendance. The net meets on 50.120 at 1900 local time Thursdays.

2 Meters — As of this writing, the Geminids has just ended so reports are scarce. From the few I have received, it appears to have been quite a productive shower, particularly for north-south paths. WD4MUO VA completed with K5BMG LA, W5JTI MS, WØXG MN, K4GFG FL and WA4FBH GA. Those, along with a tropo contact with TN, brings John's state total to 30. He says that WA3USC MD and WB2DIN/8 WV also did well. VE3FN boosted his state total to 37 via a successful sked with WBØHBN ND.

The solar flare that occurred about 1500 December 12 triggered an aurora the evening of the 14th. Few reports are in on this, either, but WØSD tells me that fellow Rapid City, SD, vhfer KØPUF was active during the session, completing ssb QSOs with KØHGP and WØVHQ MN and W7JF MT. KØKE CO was heard.

WA4LYS northern FL tells of a good tropo session November 18 and 19. Paul worked stations in LA, MS, AL, TN and VA on 144.2. Among them was WA4EWA, mobile in Birmingham, AL. The set-up at WA4LYS is a kW to a large array at 120 feet. Anyone wanting schedules may call 904-641-2358.

A very interesting report has been received from I2SVA concerning a new Italian moonbounce operation. Sandro says the group consists of I2SXZ and I2ZFN as well as I2MBC (who provides QTH and call), and himself. With eight F9FTs and the rest of what makes up an EME station, the group, in just two months of operating, has completed 15 QSOs with nine different stations, including a FB ssb contact with WA4GPM.

1-1/4 Meters — K4EJQ, well known for putting TN in the logs of many 2-meter and 70-cm stations over the years, is about to do the same thing on this band. Bunky has 100 watts of cw going but will go on to bigger and better things if activity warrants. I think it will, Bunky. In discussions that I have had with a number of vhfers across the continent, I find that a substantial number are considering serious assaults on 220. For many who have worked about all they can on 2 meters, without a major change such as gaining EME capability, the next higher band appears to be a logical new field to conquer.

On the fm side, and from a spot which normally doesn't boast high activity, W2AET Oswego, NY, says that a net meets in his locality every Tuesday evening at 1900 EST on 223.5 simplex. A regular contact for Bob on the frequency almost every evening is W2HBC Oneida, NY.

70 Cm — There is no doubt that conditions on EME vary. The causes are several: Faraday rotation, the position of the moon with respect to the noisy sun, the distance from the Earth to the Moon, absorption in the troposphere and/or the ionosphere, and probably a lot more. Thus, there are good times and bad times. The weekend of November 11 and 12 was one of the good times, according to the *432 EME Newsletter* put out each month by K2UYH. The December issue notes ZE5JJ QSOs with SM3AKW, DL9KR, I5MSH (529 signals both ways) and F2TU, all on CQs. Incidentally, the F2TU contact was the 105th for Peter. Another station finding the second weekend in November to be quite good was one of ZE5JJ's contacts, I5MSH. Piero reports working, in addition, DL9KR, EA1DB on ssb, AD1C, WA1TZV and W1JR. (AD1C is W1JR's son, Jim.)

The contact with WA1TZV made the 45th moonbounce station for I5MSH and boosts the state total to 12. New stations, many representing new U.S. states, are appearing on 70 EME each month. Some recent ones are: KØVXM SD, K4GL SC, WB6NMT CA, W1UHF RI, K1LPS VT and WB5QQG LA as well as DJ8QL, VK6NR, F1AQC and F1JG. It is also reported that UA3LBO is working on a dish. Another station hoping to be on 70-cm EME in the not-too-distant future is W4ATC, the club station at NC State. Club president WD4MBK writes that they are hard at work on the project and are hoping to receive funds for it from their Student Senate. Best of luck to all of you, Charles.

A new 70-cm station, so far having a great time with down-to-earth operation is WA2DKB Bricktownship, NJ. So far, Bob has piled up 11 states using 7 watts to a pair of homebrew 19-element Yagis at 43 feet. Moonbounce capability is in the cards for next year.

23 Cm and Down — Interest in 23 cm seems to be picking up in many areas of the country. From Chicagoland, WB9SNR says that he expects to be on the band by spring using a 2C39 ring amplifier. Jim reports that several others in his vicinity are also planning operation on the band. Among them are WA9HUV, W9ZIH and W9JIY. In addition, WA8HGX and WB8BKC are already on with low power. Another Chicago-area station making the effort on 1296 MHz is WB9HNS. Bob has the handicap of having to keep his antennas indoors, but so far has successfully operated all bands from 160 meters through 70-cm ATV with attic antennas, so he is going to try it on 23 cm, also. He has about 23 watts of fm feeding a loop Yagi through a length of hardline. Receiving capability includes fm ssb and cw. Call 312-325-2065, or write Bob Beaty, 105 Burr Ridge Club Dr., Burr Ridge, IL 60521, if you would like to set up a schedule. From an old, familiar call in a hard-to-get state comes word of another who is taking the 23-cm plunge: Bunky, K4EJQ, near Bristol, TN. He says that about three others in his neck of the woods have similar intentions. Bunky complains that XYL QRM forces him to take down his 4-foot dish after each contest, so he expects to use a loop Yagi the rest of the time. He recommends that more column space be devoted to the higher frequencies in hopes of stimulating greater activity. I agree, Bunky, and will sure try to include any information received. From eastern MA, W1JR reports good results on 23 cm with a 38-element loop Yagi. Joe says that the gain appears to be about 22 dBi, or approximately the same as a 4-foot dish. Out in the Rockies, WØPW laments the lack of 23-cm activity in his part of the country. Don is very much operational and ready for schedules.

EME interest on 23 cm is growing rapidly. In late November, WA2LTM, using K2UYH's 28-foot dish, copied signals from W6YFK at 539 and received an M report to complete a contact. W6YFK was using an 18-foot dish fed by a 900-watt klystron amplifier, while WA2LTM had just 450 watts from six 7289s in a UPX-4 type ring arrangement.

ZE5JJ is making progress toward 23-cm moonbounce, also. Peter, who of course has a 32-foot dish on 70 cm, is building one of the OZ9CR type amplifiers. This is becoming a quite popular unit in Europe. Those seriously interested in high power on 23 cm might write to OZ9CR for information.

The activity and accomplishments of the gang in Europe on 3 cm never cease to impress this conductor. W1JR passes along news of the most recent triumph of the British 10 GHz enthusiasts. It is really a double triumph with a contact first on cw and then one month later on ssb. The stations were G3YGF/A at Oxford University and G3JVL Hayling Island which are about 68 miles (110 km) apart. The path is far from line of sight and includes several obstructions. I'll try to get more information such as signal strengths and descriptions of the equipment used and pass it along in a future column.

How's DX?

Conducted By Clarke Greene,* K1JX

So You Want to Be a DX QSL Manager?

In response to the plea from W1VV (November 1978 "How's DX?"), G. L. Baker, W5QPX, offered his version of how to be a QSL manager. W5QPX is no stranger to the art of managing, as he himself handles cards for several DX stations. Not yet even banned in Boston, here it is:

"Recent months have produced a flurry of chaps aspiring to be DX QSL managers. I would rather suspect a wide variety of reasons behind the malady, ranging from recent upgrading and contracting a severe case of "DX-itis" to just wanting to be a "good ole boy" in this facet of the international scene. Though I have not participated to the degree pet W3HNK, the legendary W2CTN, et al., I have QSP'd a few "pasteboards" for a number of stations since 1968.

"There are several avenues by which one can approach the matter of becoming a manager. One can get a lot of mileage out of just listening to the bands. I find it not too uncommon to hear some foreign chap lamenting the fact that QSL postage will eventually put him in the poorhouse. Additionally, he may make inquiries as to the availability of what to us is a routine item of no consequence. But, to this fellow it borders on a do-or-die situation of considerable magnitude. There are no radio stores or junk boxes in the jungles, remote islands or high-plateau deserts. He may have need of only a used *Callbook*, a discarded antenna manual, a 6UA6 replacement or a couple of paper electrolytics. For a stateside ham the cost of these parts is a mere pittance compared to what the foreign ham has to pay. That's including the airmail shipment, especially if you use AO rates. Here may be your chance. Approach the DX station. In such associations one thing leads to another. As a follow-up to the routine type of thing, exchange letters and develop a more personal relationship with the DX station. While this particular fellow may have no real need of a manager, he may have a chum who desires such a service.

"One sees an occasional notice in the various amateur publications from a DXer looking for a manager. Try contacting some of the folks who propose a DXpedition to some far-flung spot. If you live in the area of a DX club that acts as manager for a DX station in a group effort, stop by the club and help out if you can. Try getting your "feet wet" and see if this sort of endeavor appeals to you before you actually do commit yourself to the real thing.

"You might elect to advertise the fact that you are available for such services. The principal drawback to this approach appears to be that U.S. publications do not enjoy as wide an overseas distribution as one supposes. It might be well to consider a notice in some of the foreign periodicals as an alternative.

"These are but a few of the many ways one can become a manager. I dare say there are other approaches best left up to the individual candidates. By and large I have found that some cultivation must be done in this endeavor. DXers seldom beat a path to your door, good intentions or not on your part. Regardless of the system used, I feel the personal approach is the best, all things considered.

"To reap the benefits of success as a QSL manager you must also pay the associated penalties. Rest assured there are some "rocks" strewn along the way. First of all, be prepared to spend some money out of your own pocket. There is just no way in normal circumstances that you won't be obliged to foot at least a small part of the tab for running such a show. A few fellows who use a manager do so to get the paperwork monkey off their back, and will foot the entire bill. The run-of-the-mill DXer utilizing a manager just is not in that category.

"Your own on-the-air time may be reduced, as being a manager is very time consuming if you want to do your best. There are a fair number of other allied chores to be done in addition to just making out cards. Specific arrangements must be made with the DXer in question. Will you QSL worldwide, or USA/VE or North America only? For ssb or cw contacts only? Will the DX station furnish his own QSL-card stock or have you purchase stock locally? Who pays for the locally purchased stock? How often will he send logs? Bimonthly? Monthly? Will you also handle SWL cards? Depending on the rarity of the station in question, SWL cards can range from 5 to 20 percent of all cards handled by you.

"What will be the disposal procedures for collected cards? Mail to him monthly? Quarterly? Every six months? Held for someone going that way to hand carry? Will you keep a record of his WAS, 5BWAS, etc. and make such applications as necessary? Will you QSL for contest activity, also? After an agreed-upon time limit, will you "blanket QSL" all DX and/or domestic QSLs via bureaus?

"Complicated as it may sound, these are some of the items that must be agreed upon prior to your assuming his managership. If you are serious enough about being a manager, you will concede a point or two along the way.

"Now come the pitfalls. You can expect to receive cards from both DX and domestics in large quantities. Mind you, this is for any and possibly all of the fellows you QSL for! Some North Americans will QSL via both the s.a.s.e. and subscription QSL services route. Some of the overseas chaps send via direct mail (though not necessarily with s.a.s.e.) and via the bureaus. Duplicates, you ask? You bet! A considerable number of domestics send a card as a regular post card — and they expect a reply, too! Some stations will send an enclosed card but no s.a.s.e. In these instances you can either ignore them or you might consider beefing up your NTS traffic count by sending messages to those hombres and advise them to reapply with s.a.s.e.s.

"And there is always that small percentage who insist on using EDT, PDST and such weird times on confirmations. This problem has plagued DXers in general since way back. UTC is an absolute must! It is no fun to go digging through four to seven pages entailing a day or so looking for such contacts. I use a form that, among other items, lists "resubmit with better time-date" for insertions in s.a.s.e.s where provided. These are sent to stations I can't find in the log.

"Bear in mind that some areas do not have IRCs available, even if they are affordable. Therefore, on occasion some of the locals will make up a group packet and send it along to the manager in question. To them it is the best means to an end. Often these arrive with no postage for return of the QSLs. You must determine the cards' disposition — either via the respective bureaus or at your own expense. Let your conscience be your guide in such instances.

"There is a situation of some time standing which is not really understood by most DX operators, particularly those outside of Europe. If a chap is not a member of his national amateur league or society, he cannot enjoy its bureau's services in any fashion. So, should you get a single card with no enclosed postage and return it via said bureau, there is a good possibility he may never get the confirmation.

"If the reader is seriously contemplating being a manager I would suggest not changing call signs, not even if you progress to an "extra" Extra Class. A change of calls really fouls up the machinery and cards float around for years. People get mad, scream and holler and you are classed as a bum. Under this condition, the loose ends never seem to get tied up. I changed QTHs within my own district some eight years ago and I still get occasional mail sent from that address! Many hams, foreigners especially, do not have access to the latest directories, bulletins, and so on associated with DX pursuits. It takes considerable time to compensate for even a minute change to be noted in distant lands. Try to make it as easy as possible on everyone concerned.

"Contrary to popular belief, the post of DX QSL manager is not all as romantic as it's cracked up to be. It takes a substantial amount of one's time, some money, fortitude and dedication. It also has its rewards.

"I have attempted to be neither positive nor negative in this presentation, but rather to briefly outline the procedures as well as some of the pitfalls as has been my experience. Suffice it to say there are variations in a number of areas associated with the post among other managers. We get a lot of abuse at times, but I wouldn't trade it for the top spot on the Honor Roll."

Further suggestions come from N4MM and W2GHK, both also experts in the field. (1) Before sealing the agreement with the DX station, make sure all the details are worked out and agreed upon. This is fairest for all concerned. (2) Make absolutely sure you, as the QSL manager, get copies of the DX station logs. Direct mail is the best way. (3) Cards constantly come into the QSL manager's local

*c/o ARRL, 225 Main St., Newington, CT 06111

bureau. It is up to you as QSL manager to claim them. This is very important and often neglected by managers. (4) QSLs that arrive without return postage can be sent out through the ARRL outgoing QSL bureau. All the standard procedures associated with the outgoing bureau must be followed. (5) Once you are a QSL manager, you are essentially in that position for life. Ten years from now you may still receive requests for a confirmation. (6) Unfortunately, if you are an honest manager, you will make some enemies. Some guys will try all sorts of arguments to get a QSL. Let these comments "roll off your back" and maintain the highest standards for your operation.

There you have it. Any more volunteers?

DX PORTFOLIO

Armed forces personnel stationed overseas help activate many otherwise rare countries. Here are two prime examples:

Glen Fuller, WA8EQO, is now stationed at the U.S. Coast Guard Loran Station on Ogasawara Island. Glen, using the call KA1IW, reports that he is active on 14.220 MHz at about 0700 UTC. Eighty and 40 meters are his building interests. KA1IW is active on 3.797 MHz at 1100 to 1300 UTC, and 7.025 MHz at 1000 UTC every day. Glen will be active through August 1979. QSL via K8DYZ.

Sandy Cole, K1SC, has been making the rounds of the various installations around the world with some of his friends. On September 12, 1978, Sandy operated from Thule, Greenland as K1SC/OX. On September 17 and 18, he and three friends operated from Ascension Island using the temporary call ZD8KG. Before leaving the island, they were assigned permanent calls for future use. Look for them in March 1979, this time with multiple stations from Ascension. Sandy also notes future operations from a number of other "good DX" locations.

Another traveler is making the rounds of the Pacific. David Cammack, WB6HTK, is enjoying a 70-day Pacific cruise. His itinerary includes Australia (VK2BVF), New Zealand (WB6HTK/ZL), French Polynesia, Hawaii, Hong Kong, Tonga Island and Japan. In between stops, he will be operating on board ship during the cruise. Look for WB6HTK to provide many rare DX countries.

A group of researchers from Austria are planning a DXpedition to a number of countries in West Africa in connection with a research project dealing with amateur and other radio activities in that area. While it is too early to provide exact license and route details, some basic information is available. The group will be traveling in a commercial van through Africa from November 1979 through January 1980. They will be active on all modes, 160 through 7 meters (including OSCAR and RTTY) from CN, 7X, 3V, 5U, XT, 5N, HB0, C3J 3A and other countries not yet determined. OE3BBB will be QSL manager for the entire operation. Gerhard Elgigan, OE3GEA, is coordinating the expedition. He reports that the whole operation is being financed by the participating operators, and that any donors would be very much appreciated. For further information, contact OE3GEA.

Jim Madsen, K3ILC, writes from the Republic of Korea that the HL9 QSL bureau has discontinued operation. Jim is active now as HL9WG and reports that all cards now can be sent directly to the station involved.

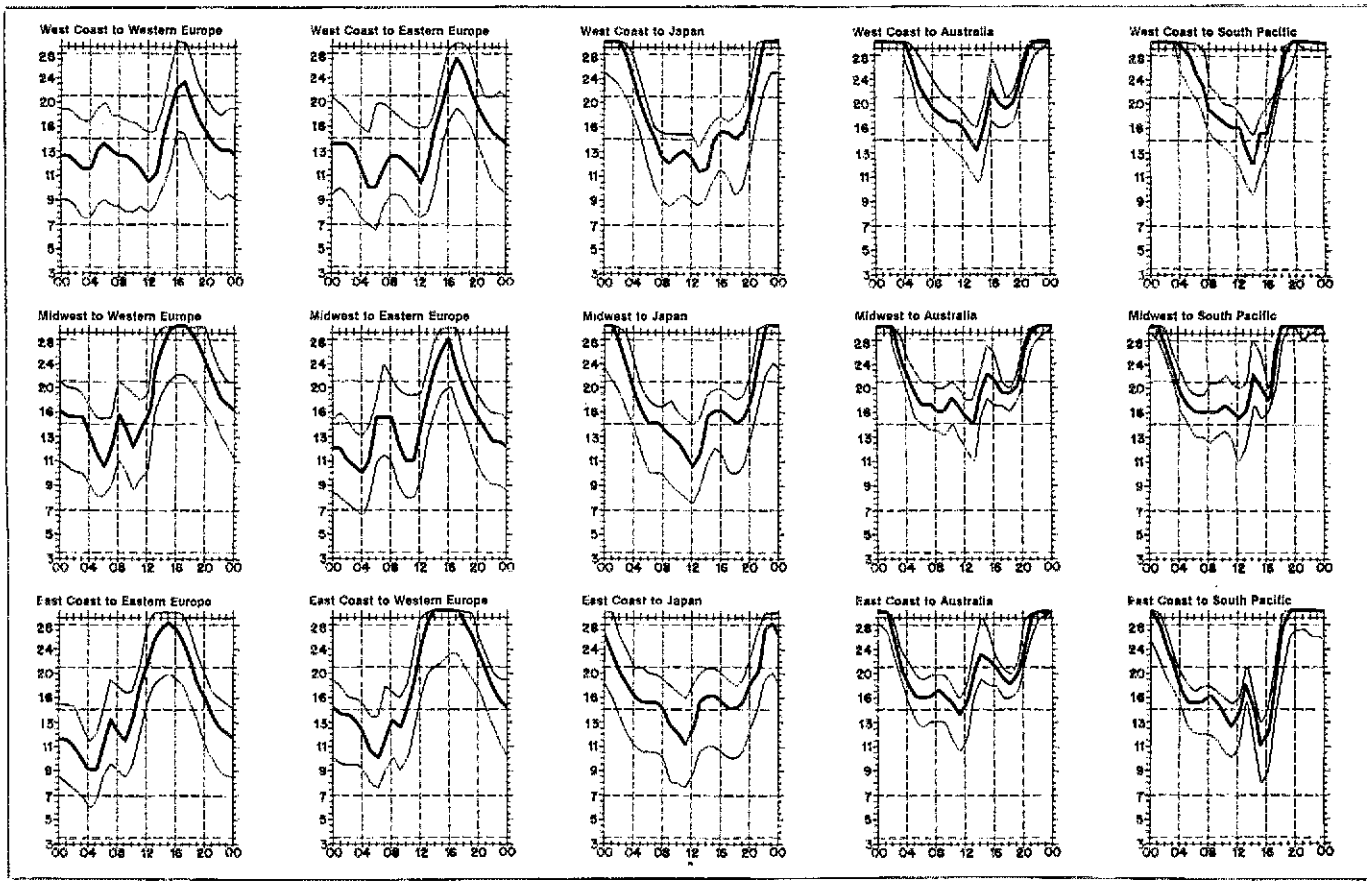
Portugal has revised its call-sign issuing procedure. CT1WB was kind enough to pass the following along. (1) Portugese prefixes are CT1 and CT4 followed by two letters for fixed station and a third letter A or B for mobile and portable operation. (2) The CT4 calls are reaching the end. (3) The Portugese Telecommunications Department has begun using the following procedure for future calls: (a) CT1 followed by three letters. There will be no modifications on the actual calls except if the ham wants a change. (b) There will be no changes on CT2 and CT3 (Azores and Laderia Islands). (c) Foreign hams operating in Portugal, Azores and Madeira will use their own calls plus /CT1, /CT2, /CT3. (d) YLs will use CT1Y plus two letters. Actual calls will stay. (e) CT5, CT6, CT7 — special calls for events and club stations. For same reason, Azores will use CT8 and Madeira CT9. (f) CTØ plus two letters will be for vhf and uhf repeaters. (g) Mobile stations will use fixed call plus /M and portable /P.

A 10-meter DX net has been formed. Meeting on Monday, Wednesday and Friday at 2100 UTC, the participant list has been quite impressive. In the first six weeks of operation, typical checkins included ZK2KJG, KG6, D29, VK, ZL, KH6, KL7, VK8 and several others. WA2BOT is net control for the 28.510-MHz gathering.

The list of volunteers for *QSL managing* grows ever longer. These hams have graciously volunteered their services: AD1S, I7LMR, W1GCM, WA1UUA, WD4HFK, WA5ZNZ, WB6YSF, W7QMU and WD8CBP.

QSL MANAGERS

CL4RCB (CO2FA)
CM2HB (ON5YL)
CN8CW (WA3HUP)
CT1RM (W3HNK)
CT2BB (W1EP)
C21TA (JE2ANM)
C31NB (F6BFH)
C5AAG (LA7GV)
C5AAO (OZ6MI)
C5AAP (G3LZZ)
C5AAQ (WA1SQB)
C5ABM (G4BHJ)
EA6BG (W4JVU)
EL1I (VE1RY)
EP2IA (W4YE)
EP2LI (WA4PYF)
EP2PQ (PAØWGS)
EP2SI (JF1KHK)
EP2WR (K9MKX)
EX9A (UK9AAN)
FØDUL/FC (DK6AS)
FØOV/FC (HB9BEI)
FB8XG (F5VU)
FB8XS (F5VU)
FB8YE (F6BFH)
FG7TD (W5RQ)
FG7XT (F6BFH)
FG0CSC (WA6VNR)
FG0EUU/FS (F6CTK)
FH8CY (F5LY)
FK8CR (W7OK)
FM7AQ (I2YAE)
FM7AV (F6BFH)
FO8FA (REF)
FOØBB (SM2EZE)
FPØBH (W1PFA)
FPØEE (W1PFA)
FPØMB (F6BFH)
FPØMD (VO1FB)
FR7BE (REF)
FY7BF (REF)
FY7YE (W5JLU)
FYØEOG (F6BFH)
FYØEOO (F6DQM)
GJ5BYY (N5RM)
GU5CAA (WA3ZAS)



When are the bands open? These charts predict this month's average propagation conditions for high-frequency circuits between the U.S. and various overseas points. One chart for East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or hpf). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or muf). On 90 percent of the days of the month, it will be at least as high as the

GU5CIA (N6MA)
HB9XJD (F6BFH)
HBØBNP (HB9BNP)
HC5EA (WA5TDY)
HFØPOL (SP2BBD)
HH2A (WA6RPF)
HH2MC (WA4AKU)
HI3JEI (W2KF)
HI8LC (W2KF)
HKØBKX (WA6AHF)
HL9WH (W7WQR)
HM2JN (JA1HBC)
HP3XWB (DL1HH)
HS1AIV (W1YRC)
HV1SL (K5YY)
HW6ITU (F6BFH)
JT1AN (W7PHO)
JT1BG (I8YGZ)
JW4FG (LA5NM)
JW5IJ (LA5NM)
JW5NM (LA5NM)
JW5ZJ (LA5NM)
JW7FD (LA5NM)
JW8KT (LA5NM)
JW8LU (LA5NM)
JW9UV (LA5NM)
JW9WT (LA5NM)
JX9WT (LA5NM)
J3AAG (K1DBA)
J28AZ (I8JN)
J3AJ (W7LLC)
K1SC/OX (K1SC)
K4IIF/TF3 (W4KA)
KØAX/DU2 (WB4OSN)
KA1IW (K8DYZ)
KA1NC (K4JEX)
KG4FW (KG4AN)
KG4KG (YA5ME)
KP4AE (KP4DPB)
KZ5GH (WA6IJZ)
LA1H (LA5NM)
LA2JAM (LA9CT)
LU2KAK (SM5GXW)
LX2NB (F9AP)
N7AEE/mm (W7QMU)
OA4JR (WB9FMX)
OD5MX (WA6YOU)
OX3AK (OZ8KW)
OX3BX (OZ8KW)
OY8KH (W5RU)
P29AR (VK4PY)
PJ9JR (N4MM)
PP8ZAV (WB8CDK)
PYØEG (PY5AA)
PYØGA (PY5AA)
R18SK (UV3AA)
SJ9WL (SMØBMG)
SM2ALH (SM2DLZ)
ST2SA (DJ9ZB)
STØHF (G4GFI)
TF3JAM (TF3BT)
TF3YH (WA8AEE)
TF5TP (DL7MQ)
TFØRH (WBØICT)
TI5EWL (WB1DGD)
TU2IF (HB9APF)
UK9OAD/U8W (UA9OCI)
VE3BWK/4U (WA3HUP)
VK9XW (VK6RU)
VKØGM (VK3OT)
VKØSW (VK4ATS)
VP1EW (VK4LG)
VP1RX (W4SME)
VP2ECW (WA4BQZ)
VP2EEN (K4UTE)
VP2LFL (WB8ZRV)
VP2MBA (W7FP)
VP2MBD (W7VRO)
VP2MH (K8MFO)
VP2MS (W7VRO)
VP2MW (VE3HD)
VP2SAA (W4UG)
VP2VCA (WØYR)
VP2VDH (N6CW)
VP2VDS (N6CW)
VP2VEQ (N6ZZ)
VP2VER (N6CW)
VP2VJ (VE3MJ)
VP2VYR (WØYR)
VP8PV (WA4JQS)
VP9WB (K3QMX)
VR3AK (KH6AHZ)
VRØM (K8NW/K8MRB)
VS6HG (G4CVU)
VU2ACD (W7PHO)
VU2LA (WA6OAT)
VU2TS (SMØGMZ)
WB1RIC/HBØ (DA2RM)
W4PPT/C6A (W4GTS)
WA7RKJ/OZ (K7OEW)
WB7WUA/mm (W7QMU)
XF8J (XE1J)
YBØAB (PAØCLC)
YJ8KW (K6KII)
YS9RVE (WAØJYJ)
YUØRAST (YU2DX)
ZB2DV (G4EMR)
ZB2EM (WA2CBU)
ZB2EN (WA2CBU)
ZD8KG (only for Sept. 17-18, 1978) (QTH of respective operator: K1SC, K8WB, K8NOQ, or W8LCZ)
ZD8RB (W8LCZ)
ZD8SC (K1SC)
ZD8TW (K8NOQ)
ZD8WB (K8WB)
ZF2BC (WD4AXM)
ZF2BP (W4YKH)
ZF2BY (K4VYN)
ZF2CB (N2JJ)
ZK2AZ (N6TR)
ZP5AO (W3HNK)
3B8ZZ (W2GHK)
3B9ZZ (W2GHK)
3D2MD (WB4MNF)
3F75PK (HP1PK)
3Y5DQ (LA5NM)
3Y1VC (LA5NM)
4M1BI (YV1BI)
4N1Z (YU1JRS)
4NØD (YU2CQ)
4079WARC (YU2DX)
4S7VZ (DK8KL)
5N2SR (WB2PFW)
5Z4OL (N4PF/WB4UAN)
6D1MEX (XE1MEX)
6W8DY (VE4SK)
6Y5GB (VE3GMT)
7P8BC (K9RD)
8F3A (G3IES)
8J1JCJ (JARL)
8P6HV (W5EN)
8R1X (VE3LXE)
9A1E (SP2GBL)
9G1JX (DL7SI)
9H1CE (W2KF)
9H1ED (WA1YYX)
9K2EX (SMØBYD)
9K2EZ (WA1ZGR)
9M2BZ (JA1VDJ)
9Q5ITU (K1VSK)
9Q5JH (K1VSK)
9X5NH/m (DL8OA)

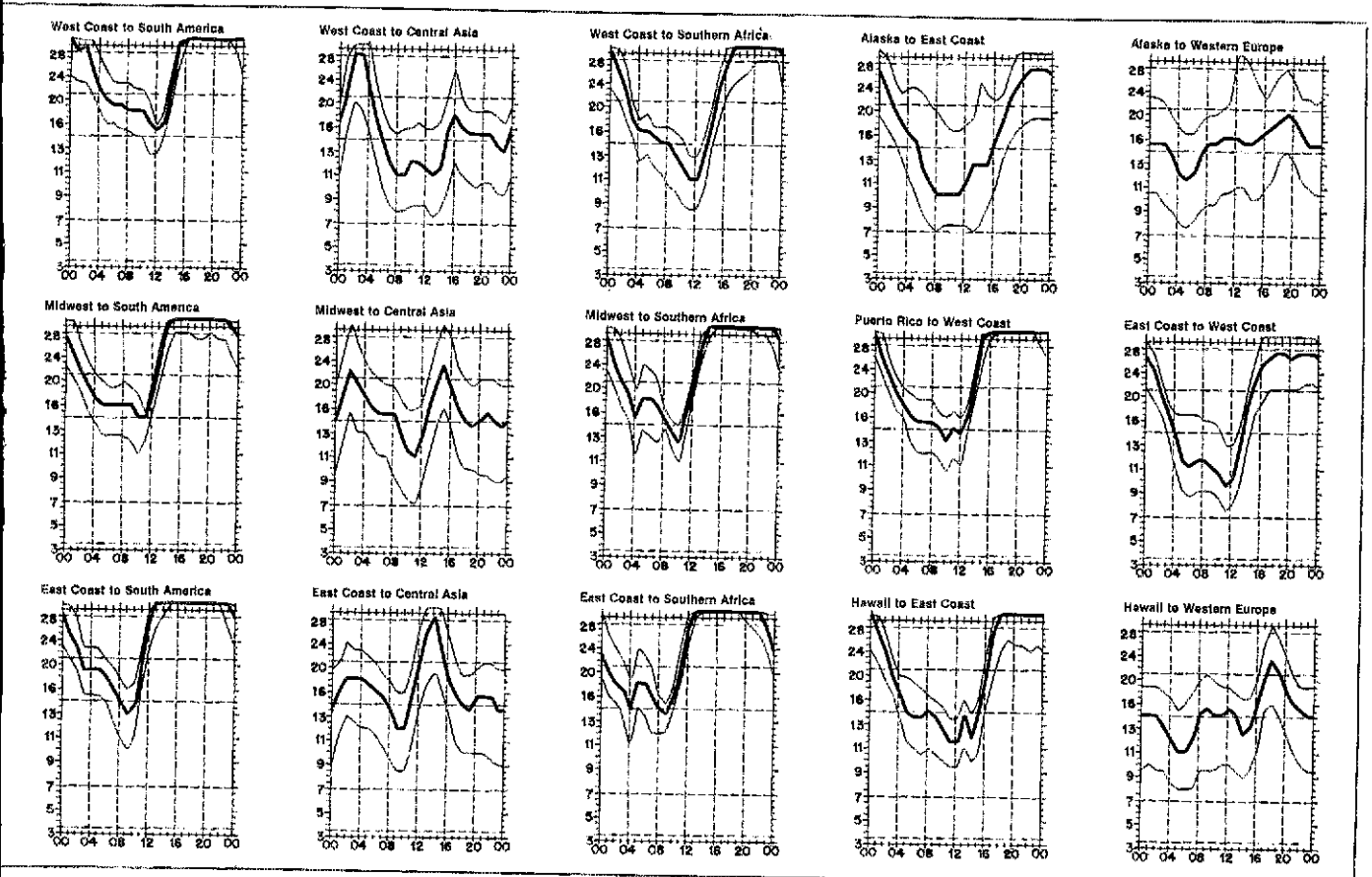
QSL Corner

Administered by Dave DeMaw, KA1BUQ

High 10-meter activity and recent DX contests have made the ARRL-Membership Overseas QSL Service a most popular department! And, with the increased submissions of QSLs for overseas distribution, it is now more important than ever that you adhere to these simple requirements: (1) Pre-sort your QSLs alphabetically by prefix. Please do not separate individual groups of cards with rubber bands or paper clips. (2) Enclose the address label from your current copy of *QST*. This information shows that you are a current ARRL member. (3) Enclose $1 with each submission of QSLs (check or money order preferred, but cash acceptable). (4) Enclose an s.a.s.e. with 15 cents postage for confirmation that your QSLs were received for overseas distribution. The s.a.s.e. may be omitted *only if you include a note stating "no confirmation necessary."* It is imperative that these steps are followed to avoid delays in getting your QSLs to those DX stations.

Here is an updated list of countries for which QSLs may be forwarded. Keep in mind that QSLs destined for countries that do not have bureaus will be held until such time as a distribution point exists. In the interest of economics and efficiency, QSLs cannot be returned.

Afghanistan
Alaska
Algeria
Angola
Antarctica (no KC4A)
Antigua
Argentina
Ascension Is.
Austral/French Antarctic Lands
Australia
Austria
Azores
Bahama Islands
Bahrain
Barbados
Belgium
Bermuda
Bolivia
Brazil
Bulgaria
Canada
Canal Zone
Cape Verde Islands
Cayman Is.
Chile
Colombia
Congo Rep.
Cook Islands
Costa Rica
Cuba
Cyprus
Czechoslovakia
Denmark
Dominica
Dominican Republic
Ecuador
Egypt



lowest curve (optimum traffic frequency, or fot). See 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. Asterisk indicates *long-path* circuits. Data are provided by the Institute for Telecommunication Sciences, Boulder, CO. These predictions for February 15 to March 15, 1979, assume a sunspot number of 125, which corresponds to a 2800-MHz solar flux of 169.

El Salvador
Ethiopia
Falkland Is.
Faroe Islands
Fiji Islands
Finland
France
French Guiana
French Oceania
German Democratic Rep.
Germany, Federal Rep. of
Ghana
Gibraltar
Grenada
Great Britain
(or British Commonwealth)
Greece
Greenland
Guadaloupe
Guam
Guantanamo Bay
Guatemala
Guyana
Haiti
Hawaiian Islands
Honduras
Hong Kong
Hungary
Iceland
India
Indonesia
Iran
Ireland
Israel
Italy
ITU-Geneva
Ivory Coast
Jamaica
Jan Mayen
Japan
Johnston Island
Jordan
Kenya
Korea (no HL)
Kuwait
Lesotho
Liberia
Liechtenstein
Luxembourg
Madeira Islands
Malagasy Rep.
Malawi
Malaysia
Maldives
Malta
Mariana Islands
Marshall Islands
Mauritius
Mexico
Midway Islands
Monaco
Mongolia
Morocco
Nauru
Netherlands
Netherlands Antilles
New Caledonia
New Zealand
Nicaragua
Nigeria
Northern Ireland
Norway
Oman
Pakistan
Panama
Papua New Guinea
Paraguay
Peru
Philippine Islands
Poland
Portugal
Puerto Rico
Republic of China
Rhodesia
Romania
Rwanda
Samoa (American)
San Marino
Scotland
Senegal
Seychelles
Sierra Leone
Singapore
South Africa
Spain
Sri Lanka
St. Helena
St. Lucia
St. Vincent
Surinam
Svalbard
Swaziland
Sweden
Switzerland
Syria
Thailand
Togo
Tonga
Transkei
Trinidad and Tobago
Turkey
Uruguay
U.S.S.R.
Vatican
Venezuela
Virgin Islands
Wales
Western Samoa
Yugoslavia
Zaire
Zambia

The following information may be useful to those wishing to send direct QSLs. The accuracy of this listing cannot be guaranteed.

D2AAJ, P. O. Box 43, Gaberla, Angola
KG4KG, Yasme Foundation, P. O. Box 2025, Castro Valley, CA 94546
VR1AW, P. O. Box 493, Tarawa, Gilbert Is., Micronesia
YS9CHE, P. O. Box 05/43, San Salvador, El Salvador
4S7NE, N.E. Ranasinghe, O.T.S., Negombo, Sri Lanka, Ceylon

A35RZ (VK4RZ)
CT3BQ (OZ1LO)
EL2EV (W3HNK)
EP2LY (W4QO)
FB8XO (F6CRT)
FO8EX (F6AUS)
FPØDE (WB8NBT)
FR7BJ (WB9MFC)
GD5CKM (EI9H)
GJ5CIB (HB9B)
HH2EL (K6KII)
KM6BI (W8TIX)
OE2SIL/YK (WA4WYN)
OE5CA/YK (K4KBL)
TI9CI (TI2CF)
VP1JEC (W4BSO)
VP5WS (W4SME)
VR3AW (WB4CRU)
WDØEHG/HC1 (WBØRJJ)
ZK2AV (DF2RG)
ZS3KC (WA4MAV)
4U1ITU Oct 28-29, '78 (K1ZZ)
4X4NJ (WA4LTG)
4Z4NUT (WB2FTK)
7P8BH (WB9ZKK)
8P6FX (WA4RRB)
9H1L (W3HNK)
9J2JN (WB2IZN)
9J2NL (IT9AF)
9L1CA (WA3HUP)
9L1CD (SM5CD)

This month's QTH/QSL information comes through the generosity of AA4MI, K9DT, N6ZZ, W1JUB, WB2FTK, W4NBP, WB4OSN, W4SME, WA6CTW, W6NLG, W7FP, WA9MZS, W9PIO, WB9ZKK and WBØRJJ.

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmation for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 20-country increments through 240, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from October 1 through October 31, 1978. An s.a.s.e. will bring you the full rules for participation in the DXCC, the DXCC list and application forms.

New Members

Mixed

WB4LFM/263
WB8ZRV/219
K8JK/191
KL7HCC/187
EA8IR/165
JF1KKV/154
W4TJC/143
YU1ADO/142
PY2YP/134
PT2VE/132
W6YQ/132
OH3NE/128
YU3TIQ/125
WA7ZLC/CT1/122
SM6AYM/120
WA5OJI/120
WB2GTB/120
WB6VRE/120
K9AEG/119
K3VW/117
JA1EHA/116
WB7OUL/115
JW2CF/114
F6CWA/113
K3KSS/111
HB9ALY/110
K4XQ/110
W6PKA/110
WA6BLT/110
VP2MBB/109
AB6D/108
WB3GPR/108
WD9ACQ/108
DL1OM/107
SM5BOF/107
SM6CYU/107
WA1LJB/106
WA4GIQ/106
WB9UJP/106
AA6RF/105
OH1AJ/105
WA1URV/105
K1THP/104
W6MZQ/104
WB3BUP/104
WB4RDV/104
YU4EZC/104
JA4ESR/103
JR1KFR/103
K6DZT/103
OZ8XW/103
W8WM/103
WB4ZUW/103
WD4BLI/103
DLØCS/102
K1KTB/102
K2CYX/102
WØQQN/102
WB3DJF/102
WB5PLD/102
WB5WFB/102
KB5CA/101
W6SJC/101
WD5DDW/101
AB5G/100
K8AQM/100
KØCF/100
NØJW/100
W2UKJ/100
W8MD/100
WA9NGP/100
WB2JZK/100
WB4MXI/100

Radiotelephone

W9FNN/227
EA8LD/224
ON5FU/221
W3KFQ/212
K9MK/180
WB4LFM/179
IØSVD/165
CT4GO/145
DK3YY/142
K8JK/135
KL7HCC/134
W9YH/132
YN1EGW/126
PT2VE/124
WA4NEY/124
W4VAB/123
K9AEG/118
K1WB/115
WB5HGI/115
WB7OUL/113
HI8ECS/111
JA1EHA/111
WB2GTB/110
WB6RHC/110
KB8BR/109
WD6BSD/109
WB4KJZ/108
K4XQ/107
K9BJ/107
W3OKO/107
WA2JTX/106
K3MA/105
W9GBC/105
AA6RF/104
K3KSS/104
WB3BGI/104
WB5ZCS/104
EA7ABV/103
VP2MBB/103
WB3GPR/103
6Y5MR/103
K1KTB/102
KL7JDR/102
WA1URV/102
WA1WMS/102
WA2LNL/102
WB1DQC/102
WB5NDN/102
WD9AHI/102
K3HFH/101
W6SN/101
WA1LJB/101
WA1WTP/101
K4NHK/100
WØYNZ/100
WA3ZBK/100
WA4JNE/100
WB4VEJ/100
WB7CEH/100
WD6ADH/100

CW

AC4CRW/143
WB2KXD/142
JF1KKV/135
K2SX/135
N2UN/125
DL7DX/124
WØIUB/124
KL7HCC/120
SM6AYM/120
W2QL/117
K1TG/112
JF3LBD/110
SMØAJU/110
W7DPW/110
W6YQ/107
N6ND/105
K9BK/102
K8HF/101
N1YL/101

5BDXCC

OK3CFA
WØJF
K5VT
VE7WJ
W1RR
F6BKI
JA2XYO
ON4UN
YU3QI
K5LM
OZ1W

Endorsements

Mixed

W1GKK/358
DL7AA/357
WØAIH/345
W1HH/343
JA7AD/337
HB9MO/335
W2GK/334
W4BRE/327
W4AUH/323
K1DFC/321
VE1KG/321
WA9LOT/318
W1QWU/315
W7OM/315
OE8RT/314
IT9SEZ/313
VE7IG/311
VE7HP/305
WA2JBV/305
YU1NYP/299
G3HTA/290
G6VQ/290
SP9AI/290
W3GL/290
W6TC/289
KØGSV/288
HB9RX/287
G3KAA/286
N6JV/283
W7DV/280
W9RY/280
W4PB/277
W8BE/276
SM5BFJ/271
W8GS/271
W8LU/270
SM5BBC/267
WØIUB/267
W6KPC/264
WB8JEY/263
YU3CM/263
HI8LC/261
VE7DP/261
N6ND/256
AA4PP/255
N6OJ/254
W4OHZ/251
K7KD/249
OH3XZ/247
SMØCCM/242
K4RDU/240
K6OYE/226
W1VR/225
W2ZO/224
K4SE/220
W2KN/220
ZL3BK/220
K2OPJ/217
W2QL/217
WØMHK/217
YU1NPG/215
W4BUW/212
PY6TM/210
WA1KUL/209
W5VSZ/205
N9GT/204
K1WB/203
K4WSB/203
AB8K/202
JH7BRG/202
K1NG/202
W2PK/202
K2WS/201
K9JS/201
N2VW/200
N4LL/200
W3UM/200
WA4JWT/200
WB4WSB/200
KA6SS/197
K9MK/193
NØSS/192
JR1URH/186
W6MUS/183
W2FVS/182
WB9YXY/182
KL7AF/181
W1GNC/181
K4CTD/180
N5MM/180
N7DS/180
SM7RS/180
WB4BHQ/180
WB5ZDO/180
WB6WQA/180
W6NHK/173
K8ZE/171
W1OU/170
SM5AKT/169
W4VAB/161
WA5CST/161
AC4CRW/160
W3EEK/160
WB9ZBE/160
WA1RGP/157
G3RTU/154
JA9AGE/150
I1FY/149
WA4DWN/149
JH7LMZ/144
W4TYZ/144
WB8ZRL/144
DJ1ND/141
SMØDGO/141
W3CRG/141
VE8AM/140
W4CEB/140
W8QBA/140
CT1UM/138
YU1NOT/138
AA4NC/136
AC1O/123
WB4FTU/122
JH6KXG/121
K8HF/121
WA4DAN/121
K7EG/120
K9MBO/120
W9BB/120
W9RR/120
WB9ACR/120
WBØSNG/120
WD8IXV/120
W3LDD/119
W5OU/110

Radiotelephone

I6FLD/338
DL7AA/336
W2GK/333
WØQGI/333
W1GKK/325
W4BRE/324
FG7XL/322
K8NJ/320
W1QWU/310
W6ZC/308
W7EPA/301
VE3BX/300
W2PDB/300
W7OM/299
OE3WWB/297
W8NXF/293
W1JJ/271
W3FDP/270
W4NYN/270
W3GL/269
W4CRW/264
K1RAW/263
VE4BJ/260
W3CDL/260
W9ABA/260
W6KPC/256
W9RY/255
W8LU/254
K1DFC/253
KH6BZF/252
K7KD/249
WA4NIB/249
PT2TF/247
AA4PP/242
W3AP/242
W7ELU/241
I8ACB/240
K4RSB/240
W2UI/239
N6OJ/237
EA3ALD/235
W8GS/226
KØGSV/225
W1JR/221
CX7BF/220
N8BO/220
W6ORD/220
I2OMF/219
W4LCL/210
WA1KUL/208
W9MKA/207
ZL3BK/204
CT2SH/203
PY6TM/203
W6PYK/203
AA4CK/202
DJ3LF/200
K6AXC/200
N2VW/200
WA1PEL/200
WA4JWT/200
W2QL/197
W4BUW/192
WAØUXN/191
WA6DTG/186
W5VSZ/184
K1NG/183
WA4AKU/183
CN8AK/181
N9GT/180
W6MUS/180
W3IOA/175
KA6SS/174
SM7RS/173
I8ZTE/170
K6OYE/168
W4AFDE/165
NØSS/164
YU1NPG/164
K4SE/163
PJ3DO/161
K2OPJ/160
W2NCL/160
I8KUT/149
WØIUB/146
AE6T/145
I1FY/145
WD8AHS/145
ISØBYR/144
W1CWG/143
K6NN/139
WB8WZS/139
K6OYE/138
K8EF/136
VK3QT/134
WB8ZRL/134
I8XIW/132
WD8AUX/132
WA4HNL/130
I5NDR/126
W9RR/120
WA2SRM/119

CW

K2FL/238
DL7AA/225
W1JR/220
JH7BRG/203
SMØCCM/184
OH2BN/180
W4NBP/180
WB4KZG/179
JR1URH/176
N6JV/172
N8BM/160
W3AP/160
SM5AKT/159
W3GL/158
KØRP/150
W8UVZ/146
JH7LMZ/144
I1SBU/138
JA1GLT/125
W1WA/125
AG1O/121
DK5AD/W3/120
PY2DFR/120

Public Service

Conducted By Robert J. Halprin,* K1XA

Highlights — NTS Area Staff Meetings

All three of the National Traffic System area staffs held in-person meetings in the fall of 1978. The following is a summary of the goings-on:

The Pacific Area Staff, chairman W7DZX, held its meeting in San Diego at the National Convention September 22-23, 1978. Each manager gave a status report of his net, with assorted darts and laurels. A motion was passed that PAS officially recognize the accomplishments and devotion to NTS and Amateur Radio of the late K6HW. The chairman was directed to investigate further the possibility of RTTY skeds with the Western Pacific Islands. WB6PVH submitted his resignation as RN6-D manager. At the time of the meeting, no replacement was nominated. [Later, WA6ZZL was recommended and appointed by Hq. — Ed.] It was reported that WA7IHS will continue indefinitely as acting manager of RN7-D.

A detailed outline of the present operation of the Pacific Area Net (daytime) was presented by WAØYNP and N6GW. A motion was made by K5MAT, seconded by N6GW, that PAS continue to decline to nominate a daytime TCC director. In addition, if Hq. and the other area staffs wish to consider the stations from their areas which check into PAN-D as TCC type functions, this is encouraged. Unanimously voted.

It was also unanimous that PAS support the idea generated by the Central Area Staff that ARRL fund a meeting of at least three representatives from each of the area staffs at a national staff meeting in 1979.

Modification of transcontinental functions I/F and J/D was discussed extensively with the ultimate recommendation that stations F and D take the traffic into daytime cycle of NTS. PAS also recommends that the Communications Department change the format of the Simulated Emergency Test along the lines of a proposal by N6GW or after further input from the other sources, including the other staffs and the Emergency Communications Advisory Committee. [This is already underway. — Ed.]

The retirement of W1NJM was directed to the attention of the staff, which expressed their appreciation and commended him for his efforts in Amateur Radio.

The Central Area Staff met at the Midwestern Division Convention, Kansas City, MO, on October 13-15, 1978. W9QLW and WØAM were both re-elected members-at-large. W9QLW was elected chairman. W9NXG resigned as daytime TCC director and W9JUJ was recommended to replace him. [Hq. appointed W9JUJ. — Ed.] No official action by CAS was taken on the daytime Pacific Area TCC Director situation. More discussions were recommended.

By unanimous agreement, it was recommended to Hq. that the official NTS organizational structure be modified to reflect a liaison between the daytime and evening cycles at the region level and that the Region Net Certificate be modified to show endorsements for this duty.

CAS defined the member-at-large position: A proficient operator capable of taking over any position on the staff should the need arise. CAS recommended the NTS emergency contingency plan proposed at the 1977 CAS meeting again be utilized in the 1979 SET. [It will be used in the January 1979 SET. — Ed.] W5GHP stated his desire to get more traffic activity on RTTY and requested CAS members to try to locate people in the Central Area who can/would take part in RTTY transcontinental functions.

The need for more trained operators at high NTS levels was discussed with the recommendation that section and region managers put more effort into encouraging and developing more traffic operators. CAS again recommended that an inter-area staff meeting be held, with each area staff sending its chairman and three staff members. The Christmas traffic peak was discussed extensively, in order to arrive at the best procedures to handle it. It was recommended that traffic be broken down to region/area routing at the region level, and that transmit/receive stations should be doubled up. It was moved and seconded that the 1979 CAS meeting be held at the National Convention in Baton Rouge, LA.

The Eastern Area Staff held their meeting at ARRL headquarters on October 28-29, 1978. EAS recommended that WB4PNY become the new Eastern Area Net (daytime) manager and WA4CCK become 4RN-D manager. [Hq. has made these appointments. — Ed.] W1KX, VE3GOL and K4SCL were elected as members at large. EAS requested Hq. to contact the appropriate field officials in Eastern Canada about reforming ECN-D.

It was moved that WA8MCR be publicly commended for his service to NTS during his tenure as Eastern Area Net (daytime) manager. Chairman W2JJ presented W1NJM with a plaque in recognition of his continued dedication to excellence in guiding NTS through its history. An SET study committee was formed to review general emergency preparedness concepts and SET modifications with a report due in fall 1979.

EAS joined the other two staffs in calling for a joint meeting in 1979. Increased contact with the membership about NTS and ARPSC and the desirability thereof was discussed in detail. EAS requested ARRL CD to initiate a Local Net Certificate due to the growing number of local VHF nets. W2JJ was re-elected chairman for another two-year term.

The following motion was passed after extensive discussion: "Resolved, that the EAS notes the lack of TCC liaison between Eastern and Pacific areas during afternoon NTS operation, and hereby notifies the Communications Department of its concern with the position taken by the PAS on this matter at their recent meeting in San Diego."

A committee was formed to identify and recommend ways of reconciling discrepancies between published and actual NTS sequencing and timing. On-the-air meetings were reinitiated to be held the first Sunday of each month on 7240 kHz at 1630 UTC. [This was later changed to 1400 UTC. — Ed.]

Copies of the official minutes of these meetings are available from your conductor.

NATIONAL WEATHER ASSOCIATION PRESENTS AWARDS TO AMATEURS

Dayton L. Phifer, WØVEA, the San Antonio Repeater Organization and the Susquehanna Emergency Net have all been selected for recognition by the National Weather Association in its Awards Program for 1978. The National Weather Association is a nonprofit, scientific organization of professional meteorologists and weather technicians.

WØVEA was selected for an award in the category of outstanding support to operational meteorology by an individual, not a part of the professional meteorological community. The San Antonio Repeater Organization was selected for an award and the Susquehanna Emergency Net was selected for honorable mention recognition, in the companion category for support by an organization.

In his nomination of WØVEA, the official in charge of the NWS office in North Platte, NE, cited Mr. Phifer's efforts in collecting and relaying weather information from amateur stations throughout the Sandhills of Nebraska on the Western Nebraska Weather Net. This data, particularly wintertime observations of snowfall and snow depth, are instrumental in enabling the NWS to meet its mission of issuing watches and warnings for blizzards and snowstorms throughout a widespread and sparsely populated region.

The San Antonio (TX) Repeater Organization, nominated by the NWS Southern Region director, was cited for its support of the SKYWARN program. Members of the organization, trained as severe-storm spotters, played a key role in collecting rainfall and water-level data in advance of and during the Texas Hill Country floods of August 1-3 and again on September 3, allowing NWS to issue timely and accurate flash-flood warnings.

The Susquehanna Emergency Net, active since 1937, was selected for honorable mention in the organizational category. In his endorsement of the nomination, an official of the Baltimore district Army Corps of Engineers reviewed the long years of service of the net as the principal backup capability to the Corps, and cited their assistance during the major floods from tropical storms "Agnes" and "Eloise."

Heartiest congratulations to all hams involved. This awards program, whereby amateurs and amateur groups compete for recognition with many other professional and volunteer individuals and groups, is relatively unique to the Amateur Radio Service. Hams have obviously faired well. The National Weather Association will announce its 1979 awards program in April. Watch *QST* for the announcement. Hams conduct a lot of very valuable public service communications work and this is one more avenue by which Amateur Radio may be recognized for its efforts by the nonham community. — *Bruce Eggers, WA9NEW*

*Asst. Communications Mgr., ARRL

PUBLIC SERVICE DIARY

☐ Laguna Beach, CA — October 2. The South Orange A.R.A. relayed over 2500 pieces of traffic after a landslide sheared houses in half along a line approximately the length of a city block. (W6TIO)

☐ Winona, OH — October 12. A tornado devastated this town and members of the Triangle A.R.C. set up communications between the disaster command post and the various road blocks and completed autopatches to pass emergency traffic. (K8HGY)

☐ Los Angeles, CA — October 30. HC1AG contacted W6OUO and related the plight of a boy in Ecuador who had a tumor in his throat. Stateside help was sought when doctors in Quito were unable to perform the necessary operation. Southern California hams raised $4000 to fly the boy and his mother to California and a successful operation was performed. (W6AQ, WA6CTR, WB6KLU, W6NAZ)

☐ *Repeater Log.* According to reports received to date, repeaters and fm-simplex frequencies were used in conjunction with 144 vehicular emergencies, 12 crime reports, eight search and rescues, six fires, five medical emergencies, one weather emergency and six miscellaneous incidents. Repeaters involved were WR2ADM, K2ASF, WR4s ACB ACN ACY, WR5s ABA ABE ABU ABY ADP AEQ AFP AIB AJG APK APN ARO, WR6s ABW ACY ARQ, WR7s AEL AKM, K7CC, WR8s ABC ACJ ADP AGA AGR AJL, WR9s ABH ABY AGS, WA9ORC, W9TCH, WRØABF.

AMATEUR RADIO EMERGENCY SERVICE REPORTS

☐ Rochester, MN — July 5-19. Amateur Radio operators responded to the worst flood in this city's history and provided communications for evacuations and other operations performed by the Red Cross and Salvation Army. Hams also relayed weather information and took river level readings for the National Weather Service. (KØTS, Asst. EC Olmsted Co., WAØVEB)

☐ SEC Reports. For November, 33 SEC reports were received, denoting a total ARES membership of 15,297. This represents a 14-percent decrease in reports received one year ago (37), but a 6-percent increase in ARES membership (14,397). Sections reporting were Alta, Ariz, Ark, Conn, Del, EBay, ENY, EMass, Ind, Iowa, Kans, Mar/NFld, Mich, Mo, Nev, NLI, NFla, NTex, Ohio, Okla, Ont, SDgo, SF, SJV, SCV, Sask, SNJ, Utah, Va, Wash, WVa, WMass, WPa.

NATIONAL TRAFFIC SYSTEM

November Reports

Area Nets

(evening sessions)
(daytime sessions)

1	2	3	4	5	6	7
EAN	30	2134	71.1	1.761	96.1	
EAN	60	970	16.2	.699	92.8	
CAN	30	1247	41.6	1.075	100.0	
CAN	60	437	7.3	.275	98.3	
PAN	30	1370	45.7	1.190	100.0	
PAN	29	579	20.0	.427	97.1	
Region Nets						
1RN	87	882	10.1	.565	93.9	95.6
2RN	117	928	7.9	.509	88.2	95.6
3RN	90	644	7.2	.574	98.3	95.7
4RN	120	1730	14.4	.581	73.5	100.0
RN5*	62	965	15.6	.638	88.5	100.0
RN6	90	1071	11.9	.382	55.9	98.9
RN7	120	963	8.0	.552	98.3	98.9
8RN	85	639	7.5	.430	85.6	90.0
9RN	90	707	7.8	.375	91.0	100.0
TEN*	60	547	9.1	.415	85.6	97.5
ECN						85.6
TWN						100.0
TCC						
TCC Eastern	180[1]	1086				
TCC Central	203[1]	1077				
TCC Pacific	120[1]	921				
Sections[2]	5403	25276	4.7			
Summary	6563	44173	6.7			
Record	6134	49866	18.4			

*Incomplete report
[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (154): ASN (AK), AENB AEND AENJ AENM AENV APSN (AL), DZK (AR), ATEN HARC SWN (AZ), NCN SCN SPNN WCN (CA), CN CPN NETN NVTN WESCON (CT), DEPN (DE), FAST FMTN FPON FPTN NFPN QFN QFNS (FL), CVEN GASSB GTN NGSN WGN (GA), I75m ITCN (IA), IMN (ID/MT), IEN ILN IPN (IL), ITN QIN (IN), KPN KSBN QKS QKS-SS (KS), KNTN KRN KSN KTN KYN SEKEN (KY), LRN LSN LTN (LA), HHTN NENN WMPN (MA/RI), MEPN MMN MTN WRIN (MB), MDCTN MDD (MD/DC), AEN CMEN MPSN MSN PTN SGN (ME), MACS MITN MNN QMN (MI), MSN MSPN MSSN PAW (MN), METN NEMOE (MO), APN (MR/NFD), MN MSBN MTN (MS), CNCTN NCSSBN THEN (NC), WNN (NE), 34/94CRN (NH), MCN NJN NJPN (NJ), NMRRN (NM), NLI WDN (NY), BN BNR 06mN ONN OSN OSSBN (OH), OAN OFON OLZ OPEN OTWN STN (OK), CMN GBN GBSSN LN ODN OLN OPN OSN (ON), 16/76N ARESTN BSN JCARES OARES (OR), EPA EPAEPTN PFN PTTN WPA (PA), SCSSBN (SC), NJQ SDEN SDN SDWXN (SD), SATN (SK), TN TPN (TN), TEX TTN (TX), BUN UCN (UT), SVSN VFN VN VNTN VSBN VSN (VA), VSBN (VT), WSN (WA), BEN BWN WIN WNN WSBN (WI), WVN WVNN WVPN (WV).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVG.
5 — RATE
6 — % REP
7 — % REP. TO AREA NET

Transcontinental Corps

1	2	3	4	5
TCC Eastern	185	97.3	2791	1086
TCC Central	210	96.7	2130	1077
TCC Pacific	120	100.0	1842	921
Summary	515	98.0	6763	3084

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (November): Eastern Area (VE3SB/N2YL, Directors) — W1s KX NJM OD, WA1s VEI ZAZ, K1s BA EIR GN PAD SSH XA, W2s CS FR MTA RQ, WA2s ICB, K2s NYL PL. N2s TW YL, W3s EAF PQ YQ, WA3WQP, K3s KW NGN, N3HR, W4s MEE SQQ UQ, WA4s CCK YSK, WB4PNY, K4s BKX KNP, N4KB, W8PMJ, K8KMQ, VE3s GOL SB. Central Area (W5GHP/W9JUJ, Directors) — AA4KB, WN4KKN, N4MD, W4ZJY, W5s KLV RB, WA5s BHF INJ IQU RKU, WB5s FDP HHK KKT NKC SDD, K5s GM MC, N5s TC TS YL, W9s CXY DND JIJ JUJ NXG, N9TN, WØs AM HI, WAØTNM, AFØO, KØs EVH EZ. Pacific Area (K5MAT, Director) — N5s MR NG, W5s JOV KH, K5MAT, N6s GW PZ WP, W6s EOT OA VZT, K6OE, N7s AM NO, W7s DZX EP GHT LYA VSE, K7s HLR IWD, ADØA, WØKON, KØs BN DJ, WBØTAQ, VE7ZK.

Independent Nets (November)

1	2	3	4
Amateur Radio Telegraph Society	30	2775	239
Central Gulf Coast Hurricane	30	217	1906
Clearing House	29	246	491
Empire Slow Speed	29	119	409
Hit & Bounce Traffic	9	198	325
Hit & Bounce Slow	16	67	175
IMRA	26	497	1030
Miketarad	26	79	155
North American SSB	24	11	81
North American Traffic and Awards	29	98	1034
Washington Region PON	16	22	350
20 Meter ISSB	26	646	553
75 Meter ISSB	30	642	1121
7290 Traffic	45	783	2585

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Public Service Honor Roll November 1978

This listing is available to amateurs whose public service performance during the month indicated qualifies for 40 or more total points in the following nine categories (as reported to their SCM). Please note maximum points for each category: (1) Checking into cw nets, 1 point each, max. 10; (2) Checking into phone/RTTY nets, 1 point each, max. 10; (3) NCS cw nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned liaison, 3 points each, max. 12; (6) Phone patches, 1 point each, max. 20; (7) Making BPL, 3 points regardless of traffic total; (8) Handling emergency traffic directly with a disaster area, 1 point each message; (9) Serving as net manager for entire month, 5 points. This listing is available to Novices and Technicians who achieve a total of 20 or more points.

71
N5TC

68
KØPVI

64
W9JUJ
AFØD

61
K1BA
W1TN
WA1ZAZ

70
WB2RMI

67
W5KLV

63
AA2H

W2MTA
W5GHP

69
AC3N
W7VSE

66
WD4COL

62
WA3NAZ

VE5HG
WB5NKC

WB6DAB
WA6UAZ
WB8YDZ
WØOYH

59
WA2SPL
WA4JDH
WA5RKU
K5SOR
K5TL

58
K2VX
WA4YIU
WB5LAT
W7GHT

57
AF2L

56
K1BSO
W1GUX
W1KX
WB2KDC
K4BKX
N4NK
VE4PG
WA4VLT
N4WA
WD5DRK
W6OA
W6RNL
WD8NKA
W8SOP
KØEZ

55
K1PAD
WA1YMU
WB4PNY
N5RB

54
W4FMN
WB5SDD

53
WD2AKR
N2TW
WD4LUG
WB8MTD

52
WA1TBY
WA4CCK
WB6UZX
WA7MEL
W8VPW
WB8WTS

51
VE1ST
WD5AHH

50
WA1MJE
WB2EAG
WD4OVR
WA4UYD
N5ES
KØDJ

49
VE1WF
W2XD
VE3DPO
VE3GJG
K3ORW
W3PQ
AA3S
VE4IZ
AF4T
VE5AE
K5DPG
WD5ETD
K7GXZ
WØFT
WAØTNM

48
WB4OXT
K4VHT

WB5NKD
WA7YCM
N8CW

47
WA1QFX
K2GCE
N3AKC
WA3JGP
WA4PFK
AE5I
K5QEW
WD8DMX

46
W1TM
WD4ISN
WD4KPG
WB5JZP
WA6NTI
W8YIQ

45
WA2ZJP

44
W1BJ
WB1DXR
WB1EMU
N1RI
VE1RO
WA1VAB
WB2PJU
VE3FGU
VE3GOL
W3YQ
K4EJ
K4EV
AA4GA
WN4KKN
W4LXB
W4PIM
WB4QBB
VE4QU
K4XE
WA4ZPZ

WB5LBR
W5VMP
N6GW
WA7JRC
WD8MCN
WD8NYN
AF8V
W9NXG
W9XD

43
WA1VEI
K3JL
WB5IYH
KB8BZ

42
W3DP
WA5VBM

41
WB2JAY
K5DG
N5IB
WD6EEN
N6WP
K8KWO
WA8RQQ
WB8SIQ
WB8YRY

40
N1RP
WA2LHV
N5MR
AF8A
W8LCU

27
WA1SMY/
WB2WIM/
WA4VKD/

22
WB2RMJ/
WA4QGV/

Brass Pounders League November 1978

BPL Medallions (see December 1973 QST, page 59) hav been awarded to the following amateurs since la month's listing: W4JK, W8VPW, WDØAIT.

The BPL is open to all amateurs in the United State Canada and U.S. possessions who report to their SCM message total of 500 or a sum of originations ar delivery points of 100 or more for any calendar mont All messages must be handled on amateur frequencie within 48 hours of receipt in standard ARRL form.

1	2	3	4	5	6
W3CUL	413	1199	1486	88	31
K3NSN	310	1345	1210	88	29
WØWYX	47	1160	471	689	23
WA4JDH		678	561	3	13
KØYFK		526	7	519	10
WAØRWM	40	478	17	378	9
WB4PNY	79	447	367	8	9
W5KLV	6	464	402	22	8
W9ZGO		603	209		8
WAØHJZ	30	440	39	295	8
WA2SPL	2	366	388	26	7
W7DZX	21	372	381	3	7
W3VR	198	210	341	14	7
WA3ZRY	60	320	340	14	7
WA4YSK	17	338	354	1	7
K5OUK	307	315	37	42	7
N4MD	2	335	352	8	6
WØZWL		340		338	6
W9JUJ	6	353	287	5	6
K5JGZ	47	248	345	10	6
WØMZI	25	302		302	6
K5OWK	283	26	304	11	6
WB5SDD	29	254	263	56	6
WB5NKC	10	224	353	5	5
W7VSE	4	281	276	29	5
WB4WYG	9	300	259	9	5
WB2RMI	7	284	273	12	5
WA3WQP	40	238	292	2	5
WA1MJE	9	287	251	15	5
W9JIJ	30	281	255	6	5
WA4CCK	1	255	270	9	5
AFØO	56	210	200	48	5
K4TH	14	239	155	105	5
W5TI	18	240	190	58	5
WBØFBS	13	246	246		5

BPL for 100 or more originations-plus-deliveries:

W4LX	196	WBØQEU	1
AA4FG	183	N4BBY	1
WB4TZR	149	K7NTS	1
W3BBN	146	W7SQT	1
WD4NSG	144	W2YJR	1
WA4PFK	119	WDØAIT	1
K5DG	119	K4TXJ	1
WD8KZX	118	WA1ZXB (Sept.)	1

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DEL.
6 — TOTAL

Silent Keys

It is with deep regret that we record the passing of these amateurs:

K1DQX, Carl J. Camp, Concord, NH
K1JFQ, Beatrice M. Bean, Penacook, NH
W1KJ, Charles G. McAuley, Lynn, MA
W1MMB, Theodore R. Mitchell, Rockville, CT
W1NBU, Cyril Jackson, Pascoag, RI
WA1REN, Ralph N. Anderson, Bridgeport, CT
W1SGF, Patrick W. McCormick, W. Newton, MA
*K2EGS, John W. Ruggiero, White Plains, NY
K2EMJ, LeRoy Peters, Morristown, NJ
W2GBN, Floyd Totten, Cobleskill, NY
W2HXY, Roger T. Cheche, Holiday City, NJ
W2JUV, Edward Wozniak, Lewiston, NY
W2JXU, Howard W. Zacher, Springfield, NJ
K2LNM, John Kuzma, Bloomfield, NJ
WA2MYU, John P. Georges, Johnstown, NY
W2OXL, Charles A. Potts, Elizabeth, NJ
W2STA, Herbert F. Keith, Wanakena, NY
W2SWN, George S. Woods, Rome, NY
K2VLL, Gerhard A. Fuss, Schoharie, NY
K3QBL, Maruice J. Bender, Carrolltown, PA
W3UFR, Lloyd W. "Pop" Way, McKees Rocks, PA
WD4AFR, Charles C. Lovell, Apopka, FL
W4AIX, Francis Z. Smitz, Riviera Beach, FL
W4BLP, Donald B. Middleton, DeBary, FL
*K4BS, Donald R. Greenawalt, Vero Beach, FL
W4DFE, Will D. Bankston, Birmingham, AL
WA4FJY, Norman A. Elder, Bowling Green, KY
K4HLH, Helen M. Morse, Orlando, FL
K4IXY, Rose V. Umholtz, Cape Coral, FL
*WB4JAI, Roland M. Fennimore, Naples, FL
W4OEK, Anthony J. Pantuso, Pompano Beach, FL
WB4PAH, Dr. Alexander M. Mackay, Forest Hills, KY
W4SIR, Conrad C. Cook, Miami Springs, FL
WB4TGR, William R. Stringfellow, Jr., Newport News, VA
WA4TWL, Guill T. Wright, Hermitage, TN
K4UDZ, Cleland S. Clayton, Owensboro, KY
*K4UMN, Mildred K. Nickols, Glasgow, KY
W4VW, Raymond L. Smith, Virginia Beach, VA
WA4WLB, Edwin R. Atkins, Apollo Beach, FL

*Life Member

W4YVK, Maj. Clayton W. Blakeslee, Hampton, VA
K4ZQS, Ernest E. Winter, Daphne, AL
K5ALF, Willie Mae Brewer, Houston, TX
WD5BLN, E. W. Johnson, Lake Jackson, TX
W5BOO, James G. Brown, Waco, TX
W5FNT, Thomas A. Spencer, Corpus Christi, TX
W5FWF, Henry C. Neser, Little Rock, AR
W5HKG, George R. Morrow, Brownsville, TX
W5JSK, Andrew S. Webre, Baton Rouge, LA
W5SWV, Daily F. Slagle, Denison, TX
W5VDV, Marion E. Darr, Lubbock, TX
W5ZNI, Azad M. Dombourian, New Orleans, LA
KH6AGB, Ering V. Schoenberg, Honolulu, HI
WA6BYZ, Jose R. Atienza, San Francisco, CA
W6DG, W. Loyd Townsley, Oakland, CA
W6FD, William F. Johnston, Los Angeles, CA
W6FEZ, John S. Pollock, Goleta, CA
W6HV, Howard R. Elvey, San Mateo, CA
K6IKD, John K. O'Neil, Walnut Creek, CA
W6IDU, Robert S. Lunbeck, Newbury Park, CA
K6KW, Joseph L. McKee, Crescenta, CA
W6NSA, Howard R. Willard, Tustin, CA
W6PS, Clarence T. Stevens, Walnut Creek, CA
WA6PVL, Charles F. "Chuck" Deemer, Sylmar, CA
WA6QHZ, John T. O'Mara, Rialto, CA
W6QLY, Earl H. Damm, Fresno, CA
Ex-W6RUY, Clyde Haskins, Los Angeles, CA
K6SPC, Leon W. White, Costa Mesa, CA
W6TEN, Kenneth M. Rude, Monterey Park, CA
WA6TYG, Archie L. Horrell, Ojai, CA
W6UG, Laurence F. Lynde, Long Beach, CA
W6VAD, Lawrence B. Collins, Orange, CA
W6ZU, Joseph H. Russell, Pond, CA
WB7ABI, Charles F. Stewart, Astoria, OR
WB7AJR, Jack D. Haworth, Tacoma, WA
KL7AX, William F. Platts, Hoonah, AK
W7BT, Carl C. Stotz, Phoenix, AZ
W7CYA, Jack E. Dwyer, Murray, UT
W7GD, George E. Faithfull, Roy, WA
W7GZK, Dr. William C. Harstad, Milton-Freewater, OR
K7NCW, Homer Premil, Phoenix, AZ
WA7NYJ, Harley R. King, Clemville, TX

K7SJO, Charles J. Shively, Sr., Portland, OR
K8BJL, Charles M. Ham, Wauseon, OH
WD8ELF, Robert M. Mercer, Rives Junction, MI
W8HHQ, Henry B. "Hank" Wurth, Dayton, OH
K8OMH, Pearl E. Allen, Mio, MI
WA8PEC, Robert A. Patton, Tipp City, OH
W8PNP, George W. McGohan, Monroe, OH
WD8QVU, John F. Noteware, Mt. Clemens, MI
W8RAC, Dr. Jacob J. Gustincic, Euclid, OH
WB8RAO, Horatio W. Bullock, Marysville, OH
W8RHX, Jerome C. Walker, Royal Oak, MI
K8WZQ, Donald E. Roof, Miamisburg, OH
K8YQL, Robert J. Bennett, Lakewood, OH
W9AFQ, Ervin G. Starkweather, Hazel Green, WI
W9AXT, Lloyd L. Beranek, Libertyville, AL
K9BDG, Dennis F. Yanke, Milwaukee, WI
W9CSP, Harry Manfield, Sterling, IL
W9DVN, Maine F. Jacomet, Rock Island, IL
W9ECE, Chester F. Kaney, Forreston, IL
WB9EGW, Albert J. Reed, Crystal Lake, IL
ex-9GR, Victor C. Mazylewski, Chicago, IL
W9JNV, William D. Pracht, Downers Grove, IL
K9LSG, Earl L. Murray, Bellwood, IL
WA9LTJ, Glenn "Bud" E. Johnson, Des Plaines, IL
K9MHJ, James E. Woolen, Sullivan, IL
WA9NFL, Clifford E. Stolite, Galesburg, IL
W9NKL, John W. Hayden, Rock Island, IL
WB9RBW, Derold H. DeLor, Merrillville, IN
W9VFG, Francis L. Wiltrout, Elkhart, IN
W9ZUI, Alfos Sabalensky, Sesser, IL
WØESN, Warren E. McFadden, Independence, MO
WØNQQ, David H. Shaw, Littleton, CO
WØRX, Rex G. Howell, Grand Junction, CO
WAØVJH, Sister Mary H. Eberwein, Leavenworth, KS
WBØWWW, LeRoy R. Ljungren, Wadena, MN
WØYPN, Willard D. Nelson, Forsyth, MO
VE3BBC, Stephen R. Cody, Scarborough, ON
VE3DTT, Robert G. Harmon, Collingwood, ON
VE3HN, John R. Locock, Willowdale, ON
VE3QH, Frederick Neal, Hamilton, ON
FO8AQ, Raymond Natua, Punaavia, Tahiti
ZF2AA, Burrell Parkhurst, Grand Cayman, BWI

Club Notes

Looking for a way to inject a little life into your club and spice up its activities? Why not invite one of the local youth groups to attend a meeting, a club operating activity or the first night of a licensing class? With proper planning, you might just find yourself enjoying the evening and bringing "new blood" into your organization. Give it a try — there must be a Boy or Girl Scout troop, 4H club, church youth fellowship group, Boys' or Girls' Club, YMCA or YWCA group looking for interesting, fulfilling activities.

One example comes to mind: Explorer Post 73 sponsored by the Tompkins County ARC in Ithaca, NY. At minimal club expense, and with the efforts of three or four volunteers who have become post advisors, the TCARC has found a very willing and able group of young people who have contributed that needed spark of youthful enthusiasm to ensure the success and enjoyment of many of the club's activities. Field Day has become a weekend campout with the licensed Scouts filling in ably at the rigs. The annual Halloween "Spookwatch" finds Scouts patrolling with the older club members as they cooperate with local law enforcement agencies in keeping pranksterish damage down to low levels. And what better source of enthusiastic communications volunteers for the annual 80-mile Cayuga Lake bicycle race, the Fall Creek canoe race, 4th of July parades and Tompkins County Airport Day?

Your club's station isn't getting the use that you'd hoped? Not many teens can afford their own stations and they would love to have ready access to a sophisticated setup to try out new modes for which they may not be equipped. Chartering a bus to a local hamfest or flea market? Post 73 helps fill the extra seats on TCARC's annual sojourn to Rochester, NY.

If your club's programs are sagging and you're looking for a new purpose or goal, look to the youth of your community. You might just find a bright young face turning toward you, eager to explore the magic of Amateur Radio. — *Steve Place, WB1EYI*

Strays

For the soft rains of southern California winters, WB6BXM devised this solution for his daily walk to and from work. The umbrella ribs form an excellent 2-meter groundplane. Just watch out for electrical storms, Bob! *(WB6BXM photo)*

MANCHESTER RC PROVIDES HOLIDAY SERVICE

☐ The Manchester (CT) Radio Club furnished all communications for the 42nd annual Thanksgiving Five Mile Road Race, an AAU-sanctioned event. About 3300 entrants participated in the race, sponsored by the Tall Cedars with all proceeds going to muscular dystrophy research. Amateurs with 2-meter fm units were placed at the mile markers and other strategic positions.

In mid-December, MRC again used 2 fm for holiday service by operating a portable unit in the children's ward of Manchester Memorial Hospital as part of an area "talk to Santa" project.

WORKED ALL UNIVERSITIES

☐ With a goal of promoting more activity among educational institution Amateur Radio clubs, the University of Miami (FL) Amateur Radio Club sponsors the Worked All Universities award. The basic WAU certificate requires QSLs (or photocopies) of contact with any five universities, colleges or technical institutions and a $1 fee. Various endorsements are available. Write to University of Miami ARC, K4HYE, 661 McArthur Engineering Bldg., Coral Gables, FL 33146.

I would like to get in touch with . . .

☐ Amateur Radio clubs to exchange newsletters. Sterling Rock Falls ARS, c/o Donald Van Sant, WA9PBS, 1104 Fifth Ave., Rock Falls, IL 61071.

Coming Conventions

March 2-4
Southeastern Division, Orlando, FL

March 17-18
South Carolina State, Greenville, SC

March 30-31
Great Lakes Division, Muskegon, MI

April 21-22
Missouri State, Kansas City, MO

May 19-20
Alabama State, Birmingham, AL

May 25-27
New York State, Rochester, NY

June 15-17
Central Division, Milwaukee, WI

June 16-17
Georgia State, Atlanta, GA

June 30-July 1
West Virginia State, Jackson's Mill, WV

ARRL NATIONAL CONVENTIONS

July 20-22, 1979
Baton Rouge, LA

July 25-27, 1980
Seattle, WA

March 13-15, 1981
Orlando, FL

SOUTHEASTERN DIVISION CONVENTION

March 2-4, 1979, Orlando, FL

Once again, the Orlando Amateur Radio Club is proud to present HAMCATION '79 and a great Southeastern Division ARRL Convention. It will be held at the Sheraton Twin Towers Convention Center, located between Orlando and Disney World.

General Chairman Al Canning, WB4HAK, and his hard-working committee promise a bigger and better affair this year. HAMCATION '78 drew over 5000 attendees, representing 41 states and four foreign countries including Japan. The convention will be called to order on Saturday, March 3, by Larry Price, W4RA, Southeastern Division director, with Headquarters personnel participating. Meetings and seminars are scheduled, including a discussion on narrow-band voice modulation, by George Woodward, W1RN, of the ARRL Technical Department. Other speakers are being lined up as we go to press.

Activities scheduled for Saturday and Sunday include seminars on slow-scan TV, RTTY, OSCAR and UFOs. A highlight presentation will be made by Dr. J. Allen Hynek, astronomy professor emeritus, Northwestern University, world-renowned authority on UFO sightings and consultant to USAF "Project Blue Book." Dr. Hynek will also make a guest appearance at the great Saturday night banquet.

The commercial exhibits will encompass 100 booths, with manufacturers and dealers displaying their latest products. Over 300 tables have been allocated in the swap shop/exhibition hall. A unique activity this year will be a "Midnight Madness" swap shop from 6 P.M. Friday until midnight!

The Ladies Program Committee again has planned an excellent schedule of events to keep the YLs and XYLs occupied while the OM seeks all those "bargains." Transportation to Disney World and shopping at Lake Buena Vista will also be provided.

All in all, the committee has strived hard to make HAMCATION '79 and the Southeastern Division Convention one of our best ever.

Advance registration for HAMCATION '79 is $3 per amateur, and $1 for YL, XYL or OM of an amateur. Children under 14, free. At the door, $4, $2 and again, children free. Swap tables are $5 each per day. Holders of Saturday or Saturday/Sunday table tickets may operate free on Friday night. Banquet reservations are $9. Make reservations early; seating is limited to 250. A great speaker lineup and exciting entertainment will be presented. For further info, s.a.s.e. please. To order all tickets, write HAMCATION Chairman, P. O. Box 191, DeBary, FL 32713.

Hamfest Calendar

Illinois: The Sterling Rock Falls Amateur Radio Society will hold its 19th annual hamfest on March 4 at the Sterling High School Fieldhouse, 1608 4th Ave., Sterling. Talk-in on 94. Free parking, including area for campers and trailers. Bargains, prizes and food. Tickets $2 at door or $1.50 advance from Sterling Rock Falls ARS, c/o Don VanSant, WA9PBS, 1104 5th Ave., Rock Falls, IL 61071. S.a.s.e., please.

Indiana: The LaPorte ARC's winter hamfest is February 25 at the LaPorte Civic Auditorium. Donation $2, tables $1. Plenty of room and good food. Talk-in on 52 and 01/61. More info from LARC, Box 30, LaPorte, IN 46350.

***Iowa:** The annual Davenport Amateur Radio Club hamfest is February 25 at the Masonic Temple in Davenport. Advance admission $2, at the door $2.50. Tables and refreshments available. Talk-in on 28/88 and 52. S.a.s.e. to John S. Birmingham, WBØQCC, 2020 Brown St., Davenport, IA 52804.

Louisiana: The Ruston Amateur Radio Club will hold its annual ham/swapfest on February 25 from 9 to 3 in downtown Ruston on U.S. 167, southbound. Donation $1. Plenty of free parking. Tables available at no charge. Food and prizes. Talk-in on 34/94 and 72/12. Info and tables from Ruston ARC, 1807 Bittersweet Ave., Ruston, LA 71270.

Massachusetts: The Algonquin Amateur Radio Club will hold its annual electronic flea market on February 24 at St. Mary's School Hall, Broad St., Marlboro. Easy access from I-495 via Rte. 20 east. Sellers set up at 9, doors open at 10. Talk-in on 52. Contact Charlie McCarthy, W1BK, 128 Forest Ave., Hudson, MA 01749. Tel. 617-562-5622.

Michigan: The Livonia Amateur Radio Club presents its ninth annual Swap 'n Shop on February 25 from 8 to 4 at a new location, Churchill High School, Livonia. Plenty of free parking, tables, prizes and refreshments. Talk-in on 52. Reserved tables available; 12-foot minimum. S.a.s.e. to Neil Coffin, WA8GWL, c/o Livonia ARC, P. O. Box 2111, Livonia, MI 48151.

Missouri: The Jefferson Barracks Amateur Radio Club will hold its annual hamfest/auction on March 9, 7:30 P.M., at the Electricians Hall, 5850 Elizabeth Ave., St. Louis. Further details from Carl H. Hohenberger, WBØBZP, 5266 Parker Ave., St. Louis, MO 63139.

***Ohio:** The Cuyahoga Fall Amateur Radio Club's 25th annual Electronic Equipment Auction is February 25 from 9 to 4 at North High School, Akron. Use Rte. 8 to Tallmadge Ave. Talk-in on 52 and 04/64. Tickets $2; tables $2 or bring your own. Refreshments and prizes. Details from CFARC, P. O. Box 6, Cuyahoga Falls, OH 44222, or call Bill Sovinsky, K8JSL, at 216-923-3830.

***Ohio:** The Teays Amateur Radio Club hamfest is March 4 at the Circleville Fairgrounds Coliseum. Tickets $1 advance, $2 at the door. Contact Len Campbell, 8951 SR 188, Circleville, OH 43113.

Pennsylvania: The seventh annual Lancaster hamfest is February 18 at the Guernsey sales pavilion, U.S. 30 and PA 896, Lancaster. Doors open at 8 A.M. Admission $3, reserved tables $2. New, larger, indoor flea market area. Food, soft drinks and prizes. Talk-in on 01/61. Write to Sercom, P. O. Box 6082, Rohrerstown, PA 17603.

Texas: The Texas VHF-FM Society will hold its winter convention on February 9-11 at the Ponderosa Motor Inn, Temple. Sponsored by the Temple Amatuer Radio Club, activities include exhibits, transmitter hunt, communications programs, FCC exams and ladies program. Tickets $3 advance, $4 at the door. Prizes. For full info and lodging reservations, send an s.a.s.e. to Convention Committee, P. O. Box 4037, Temple, TX 76501.

Virginia: The Vienna Wireless Society holds its annual Winterfest on February 25 at the Vienna Community Center. Vendors at 6:30 A.M., open at 8. Admission $3, preteens with parents free. First table $5, second $3, additional $2 (limit six). Frostbite tailgating $1. Reservations close February 15; write to Carroll N. Guin, 7533 Oak Glen Ct., Falls Church, VA 22042. Other info from VWS, P. O. Box 418, Vienna, VA 22180.

West Virginia: The Plateau Amateur Radio Association flea market is February 11 at the American Legion Home, 705 W. Maple Ave., Fayetteville. Refreshments available. Talk-in on 52 and 25/85. Contact Roger Chapman, WD8RFJ, tel. 304-574-3010.

*ARRL Hamfest

Rules, 2nd ARRL International EME Competition

Now that you've mastered OSCAR, meteor scatter and aurora QSOs, try another vhf/uhf frontier.

Last year's EME Competition proved to be very successful, with nearly 100 stations participating. The 1979 version should be even better.

The moon will be at or near perigee for both weekends and its declination in the −5- to −10-degree range. No changes have been made in the rules, since things ran very smoothly last year. All of the successful activity was on 144 and 432 MHz last year. Maybe this year will see some 220-, 1215- or 2304-MHz efforts.

Good luck!

Rules

1) *Eligibility:* Amateurs worldwide are invited to participate.

2) *Object:* Two-way communication via the earth-moon-earth path on any authorized amateur frequency above 50 MHz.

3) *Time:* All contacts must be made during the contest period starting at 0001 UTC on April 21 and ending at 2359 UTC on April 22, resuming at 0001 UTC on May 19 and ending at 2359 UTC on May 20. Entrants may operate as much of this 96-hour period as they wish.

4) *QSOs:* For a valid contact to occur, each station must send and receive both call signs and a signal report in any mutually understood format, plus a complete acknowledgement of the calls and report. Partial or incomplete QSOs do not count. Contacts may be made on cw or ssb. However, no station may claim credit for any repeat QSO with the same station on the same band, even if the second contact occurs on a different mode or a different weekend during the contest. If partial or incomplete QSOs are made, indicate them in your log.

No station — single or multioperator — may radiate more than one signal per band at any time during the contest.

Fixed or portable operation is permitted. Stations outside their licensed call area *must* sign portable, identifying the call area of the operating site.

A transmitter, receiver or antenna used to contact one or more stations under one call sign may not be used subsequently under any other call sign during the contest, even if more than one call is assigned to one location by the licensing authority. The intent of this rule is to recognize the difficulty of achieving EME capability and to prevent any entrant from gaining an unfair advantage by working the same station more than once for credit.

Stations using equipment that is not amateur (such as a dish antenna or lab equipment owned by an institution or a government agency) will have their scores listed separately.

There is no specified minimum terrestrial distance for contacts, but all communications must be copied over the moonbounce path, regardless of how strong (or weak) a nearby station's terrestrial signal may be. You *must* hear the other station's call, report and acknowledgement via moon echoes.

5) *Entry Classifications:* Entries will be classified as single operator where all operating, equipment adjusting, and antenna alignment during the contest period are performed by *one* person.

The multioperator class includes those stations where two or more persons operate, adjust equipment or align antennas. It is also open to teams of neighboring amateurs within one call area, but with EME facilities for different bands set up on different team members' premises, as long as no two of the operating sites are more than 50 km (30 miles) apart. Multioperator, neighborhood groups can not use the same call signs at each location. Multioperator listings in the results will list all call signs (e.g., W1XZ-K1ZZ-K1WJ-WA1TZK).

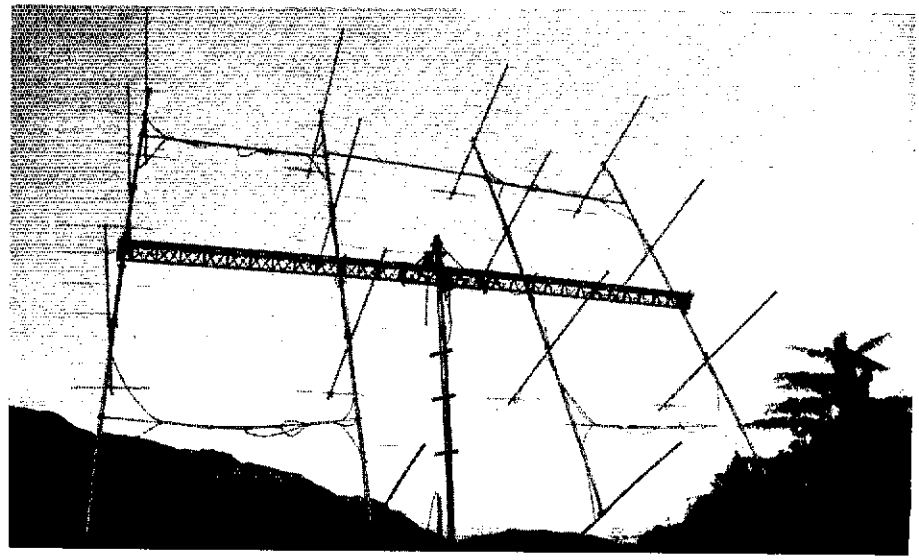
6) *Scoring:* Each completed EME contact is worth 100 points. The final score is determined by multiplying the number of QSO points by a multiplier consisting of the total number of DXCC countries and U.S. and Canadian call areas worked via EME on each band. Example: YV5ZZ works 12 stations in four U.S. and Canadian call areas and three other DXCC countries on 144 MHz plus three stations in two U.S. call areas on 220 MHz. He has 15 QSOs (times 100) for 1500 QSO points times a multiplier of nine (seven on 144 MHz and two on 220 MHz), for a total score of 13,500 points. Contacts with KH6, KL7 and so on, carry multiplier credit as DXCC countries but not as "call areas." No contact may be counted for more than one multiplier.

7) *Reporting:* Entries must be postmarked no later than June 4, 1979 (two weeks after the contest) and must set forth the call sign, report and time of completion for each contact claimed. Entries received after mid-July may not make *QST* listings. An accompanying summary sheet must list the total number of QSOs on each band, multipliers on each band, and final score. Please send along any details of your transmitter, receiver and antenna used on each band, with a picture if possible.

8) *Awards:* The high-scoring single- and multioperator stations in each U.S. and Canadian call area and each DXCC country will receive a certificate. In addition, each station that successfully completes at least one moonbounce contact during the contest period will receive a certificate commemorating his achievement.

9) *Information on disqualification criteria is on page 85 of January 1979* QST.

The 144-element array (consisting of 16 9-element Yagis) put up by YV5ZZ for 144 MHz helped him earn top honors in the 1978 EME Competition.



Results, 1978 IARU Radiosport Championship

Being number two is better!

By Tom Frenaye,* K1KI and Bill Jennings,** K1WJ

When you're number two, you just naturally try harder. The second IARU Radiosport Championship showed a marked increase in activity over last year, judging by the increases in scores. Of the 1467 logs received, 599 were from the U.S. and Canada and 868 from the rest of the world (398 from the U.S.S.R.) down slightly from the 1563 in 1978.

The biggest increase in average scores came in the phone-only category, where the top ten stations posted an average score 104 percent greater than last year. The top ten cw scores were up 22 percent, phone and cw up 31 percent and the multioperator top ten scores were up 43 percent. The lessons learned in last year's contest were put to good use.

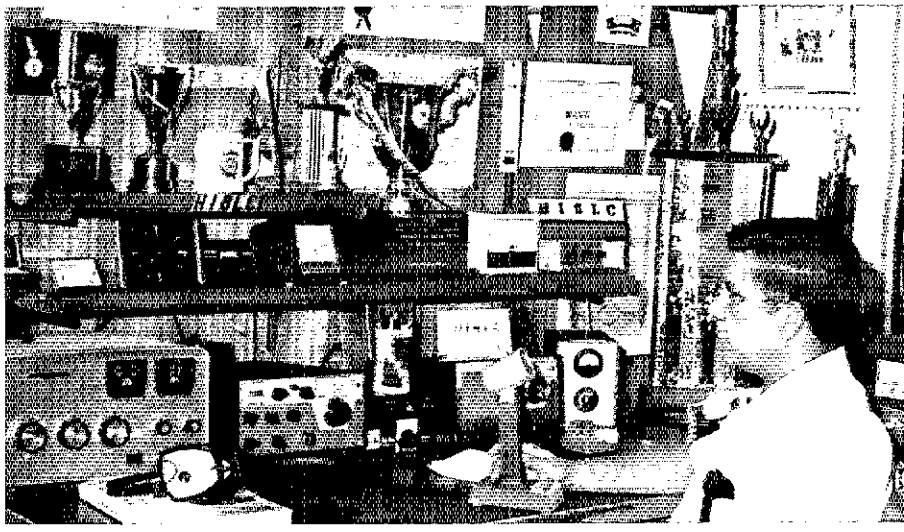
A look at the leaders shows that two were from the Southern Hemisphere (ZL1ADI on phone and cw; LU8DQ on cw) and two from the Northern Hemisphere (UB5WE on phone; W1GNC/PJ2 in the multioperator category).

The sun played an important role in the contest this year. Though the solar flux was higher, so was the geomagnetic activity, making conditions variable. On the second day a large solar flare lasted from 1804Z until 1847Z (peak at 1832Z), causing a radio blackout for all but very-short-distance QSOs. Three other minor flares also caused disruptions.

The IARU ended 1978 with 104 members, up from 99 a year before. The newest members are the Grenada Amateur Radio Club (J3), Association des Radio-Amateurs du Senegal (6W), Radio Club d'Haiti (HH), the British Virgin Island Radio League (VP2V), and the Antigua Amateur Radio Society (VP2A).

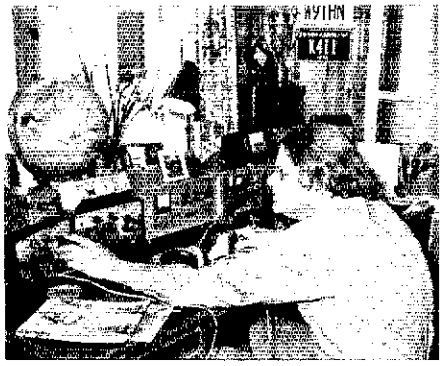
The growth in the IARU during the past few years points to the increased emphasis on a coordinated plan for Amateur Radio to be presented at the World Administrative Radio Conference (WARC) in Geneva later this year.

*Assistant Communications Manager, ARRL
**Communications Assistant, ARRL

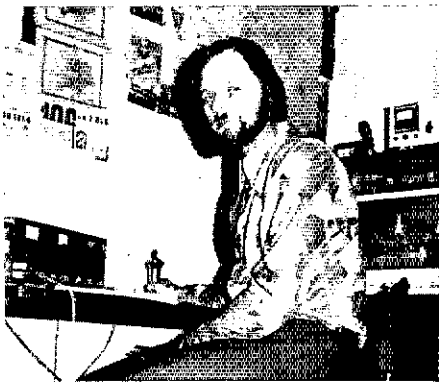


Luis, HI8LC, will soon have another certificate, this for his top phone score from the Dominican Republic in the 1978 Radiosport Championship, to add to his impressive array of awards.

G3FXB shown working his way toward the no. 2 position among the single-op, mixed-mode entrants, worldwide.



OK2BLG posted the top single-operator score from Czechoslovakia.



The Leaders

	DX		W/VE	
Single op mixed	ZL1ADI	1,195,191	CG7CC	899,468
Single op cw	LU8DQ	986,720	N2LT	574,089
Single op phone	UB5WE	1,160,283	K7RI	742,252
Multiop	W1GNC/PJ2	2,404,540	VC7WJ	1,688,711

WØYR and WBØUXI find a little time to ham it during the solar-flare-induced blackout of the bands on July 9. They were with the KØCS multiop effort, number 10 in the W/VE competition.

The IARU Radiosport Championship in 1979 will be a good opportunity for amateurs everywhere to meet friends around the world in the true spirit of Amateur Radio.

Soapbox

I enjoyed my first Radiosport Contest, but after eight hours of work to get the log to balance correctly, I began to wonder! What a nightmare! The "big guns" must have taken a week's vacation. (WB8FEZ) Would be very interesting to determine the relative timing around the world of the "radio blackout" at 1819 UTC, 9 July 1978. I have wondered if these conditions were localized or worldwide. (W2FTY) I think that I speak for all U.S. amateurs in saying thanks for the new rule that redefines a 3-point contact. Forty meters to Europe was disappointing, but super to VK/ZL. (WB8DQP/WB8IBM) One observation: At 1820 UTC on the 9th, a solar flare occurred and suddenly there were no signals on the bands with the exception of a local who was in there calling "CQ TEST." Very unusual as at 1900 UTC the bands had begun to reopen. (N4WX) Fine turnout. This was fine for a first contest. I didn't know that there were that many 1 × 2 call signs in the world. (WB1FNK) I checked these logs on an overnight flight to London and a subsequent long train ride. I found that duping logs at 4 A.M. gives you a lot of insight into what was written in them at 4 A.M. I really like the multiplier structure in this contest (probably the only one!). The high contact-to-multiplier ratio makes DXing a necessary part of it. One can't depend upon calling CQ all the time. Multipliers are too valuable. (K2BMI) All that paperwork was definitely worth the effort after an exciting contest. Actually, cw activity from around the world was pretty sparse. Everyone was on phone, haunting the African pileups. Twenty meters was wide open here on Saturday night and 15 was beautiful on Sunday. My excitement peaked when I swung my beam on 15 meters toward South America to work an FY7. No luck. But when I swung north again, I suddenly realized that nobody was around. Does a solar flare really do that? An hour and a half later things were normal again. Strange! (AA6RX) My first contest in the single-operator class in 27 years of operating. The XYL and I have been in Iran for 2-1/2 years and I have operated EP2RL for 1-1/2 years. It was a struggle to get the license, but it is well worth it to be able to confirm EP for the amateur fraternity. The 1000 QSOs during the contest were fun; I hope my QSL Manager, W3HNK, thinks so also. (EP2RL) If anybody told me before I started that I'd work 61 QSOs an hour on 40 cw using 100 watts and an 80-meter vertical, I'd have punched them in the nose. (K6SSS) Many thanks for a very pleasant contest — my first Radiosport. I used my 160-metre antenna and an antenna tuner. Surprisingly, never heard a W8. I am 70 years old and have been licensed since 1925. Old call was A3GN. (VK3CM) Propagation was "the pits," *then* came the blackout! Fun all the same. (K1YHM) I'd swear some stations never heard of dupe sheets! (K9GS) Friday night was a bummer, but Saturday made up for it. There should be a low-power multiplier or low- and high-power class separation. (WA2OVE) Disappointed that this new contest doesn't have a more meaningful exchange. 599 and a known zone are too predictable. My little vertical works much better on transmit than on receive as 85 percent of reports received were 599. (KA6DX/N1DX) I looked for cw activity briefly a few times but didn't find any. I agree with the comment heard on the air, that this is due to lack of incentive in the scoring system. (I hope that eventually this contest will be divided into separate sessions for phone and cw a la Sweepstakes.) (W8DXT) Wow! What a contest! I'm sure that my score will not win any high marks, but it's not too shabby for an old man with a vertical antenna. I set out to beat my total for last year and ended up with more than twice the number of QSOs. Looking forward to next year. Who knows, maybe I can keep on improving and get up there with the "big guns" in a couple of years. (W6BKY)

Feedback

Because of postal delays, a few logs didn't make it in time to be included with last year's contest results: JT1AN 25,800-335-20-A; JT1KAA 52,108-534-28-D; LU2A 622,914-1353-93-C; UA3AFL check log; UA6HP 7656-142-22-B; UK6LEZ 147,498-761-61-D; UO5ODX check log. Special mention goes to LU2A (LU2AFH) for the excellent score — the number three phone score worldwide.

DX Top Ten

Single Operator Phone & CW		*Single Operator CW*	
ZL1ADI	1,195,191	LU8DQ	986,720
G3FXB	1,010,097	JA1KSO	701,864
UA1DZ	874,174	YBØACT	672,358
UQ2GDQ	763,767	UA4HAL	663,816
UY5OO	733,278	UR2QI	643,599
UC2ACA	649,026	UP2NV	597,112
UR2REZ	431,340	UV9AX	581,716
UP2BAO	391,944	UP2CY	561,925
OE5CWL	317,700	OH1VR	481,151
UL7MAR	305,775	JA1YFL	468,778

Single Operator Phone		*Multioperator*	
UB5WE	1,160,283	W1GNC/PJ2	2,404,540
HB9BAM	930,303	UK9AAN	2,114,064
VK8BG	777,784	UK2GKW	1,413,885
UL7OAO	767,165	UK1AAA	1,264,602
PY3CB	730,170	SK2KW	1,135,240
OH3YI	712,800	UK5MAF	1,063,192
JA6BSM	596,453	N6OP/KG6	952,442
OZ5EV	508,474	KP4KW	948,175
5W1BN	482,406	G4EHF	917,424
EL2T	449,534	F6AQO	671,925

W/VE Top Ten

Single Operator Phone & CW		*Single Operator CW*	
CG7CC	899,468	N2LT	574,089
VE5DX	896,700	K1KI	524,552
N6AR	475,830	N4AR	499,140
VE7CMK	463,904	K5GO	496,910
W1NG	422,500	K2BMI	472,260
K1WB	409,133	W7NI	420,819
AA4S	408,316	WB6JOS	414,072
K5KG	360,715	K4BAI	396,540
W5FL	319,081	KØMM	387,220
N6MI	257,791	K6LL/7	361,712

Single Operator Phone		*Multioperator*	
K7RI	742,252	VC7WJ	1,688,711
K5UR	565,070	K5GA	1,416,480
WA6WZO	440,160	K5JA	993,600
WA1TFF	300,204	N4WW	928,659
WB5TAP	296,912	K6XT	896,658
WA6NEL	291,195	W3LPL	847,788
K6HNZ	279,586	W6YX	804,066
CG5RA	266,651	K6RM	740,622
K5MK	252,075	KØUK	715,509
W2XL	238,280	KØCS	618,144

Scores

Scores are listed by zone (in numerically ascending order), then by country within that zone. Note that the United States and Canada are listed separately, and that scores are further divided into call areas, and ARRL sections. The line score (example OX3VO 57,691-463-31-C) indicates the call sign used, total score, number of contacts, number of ITU zone multipliers, and entry class. The entry-class letters are A — single operator, mixed mode (phone and cw); B — single operator, cw only; C — single operator, phone only; D — multioperator, single transmitter.

W/VE

Zone 1

Alaska

KL7AK 31,958- 267- 29-B
KL7HBK 19,074- 190- 29-B
KL7GRP 221,910- 869- 65-C
KL7CQ 27,192- 244- 33-C
KL7JCF 11,350- 129- 25-C
KL7HRI(+KL7s IUM IVX) 494,109-1920- 69-D

Zone 2

Alberta

VE6AYI 92,976- 602- 39-B
CG6APN 56,600- 360- 40-B
VE6ARW 2492- 30- 14-B
VE6ATT 61,047- 321- 57-C
VE6AGV 46,053- 314- 43-C
CG6QM 23,989- 288- 23-C

British Columbia

CG7CC 899,468-2519-109-A
VE7CMK 463,904-1920- 76-A
VE7AZG 47,150- 274- 50-A
VE7CMF 96,726- 625- 47-B
VE7CSO 5377- 85- 19-B
VC7W(I(+N6KT,WA6s DGX VEF,
VE7SZ) 1,688,711-3455-139-D

Zone 3

Manitoba

VE4OY 197,886-1014- 59-B
VE4XI 3408- 69- 16-B
CF4XK(Multiop) 410,256-1770- 74-D

Saskatchewan

VE5DX 896,700-2706-100-A
VE5AAD 27,248- 340- 26-B
CG5RA 266,651-1023- 77-C

Zone 4

Ontario

VE3GCE 103,398- 472- 57-A
VE3FHZ 46,043- 354- 41-A
VE3FFA 28,296- 250- 36-A
VF4ISW 8[illegible] 68- 9-B
CH3GCO 130,928- 820- 49-C
VE3IKN 92,814- 407- 62-C
VE3CEF 71,744- 356- 59-C
VE3DLR 60,200- 340- 50-C
CG3IPR 888- 20- 12-C
VE3OCU(VE1s BCZ QX ,VE3s JMX
KKU,oprs) 35,970- 328- 33-D

Zone 6

6

East Bay

K6XO 35,448- 301- 42-A
K6CSL 10,038- 182- 21-B
K6ARE 3600- 54- 20-B
W6YL(WD6CHF,opr)
30,748- 270- 38-C
WA6RPF 28,303- 289- 31-C
K6UWR 9174- 100- 33-C
K6ZM(+K6CLV)
145,152- 735- 54-D

Los Angeles

N6AR 475,830-1387-102-A
WB6HELI 106,745-1044- 37-B
K5LIY/6 69,720- 374- 56-B
N6OB 25,297- 213- 41-B
WA6TAF 18,975- 252- 25-B
W6TGL 11,088- 154- 24-B
N6OU 1040- 37- 10-B
WB6KOU 226,584-1243- 55-C
N6AW 117,924- 530- 62-C
AB6D 102,541- 802- 41-C
W6YRA(WB6WKY,opr)
71,810- 596- 43-C
W6ORD 54,879- 541- 33-C
W6GNS(WB6RXW,opr)
48,858- 483- 34-C
W6CN 28,512- 280- 36-C
WD6CEG 13,005- 324- 17-C
WB6RUP 296- 33- 4-C

Orange

N6SY 42,912- 48-A
W6TDO 21,168- 266- 28-A
N6PE 122,232- 627- 66-B
K6SSS 57,556- 439- 45-B
WA6WZO 440,160-1441- 96-C
WA6YQW 83,040- 641- 40-C
WB6KRI 21,276- 227- 27-C
KB6AV 17,758- 263- 26-C
WB6OMV(+WD6GKS)
59,996- 458- 53-D

Santa Barbara

N6MI 257,791-1237- 66-A
WB6JOS(AA6RX,opr)
414,072-1474- 81-B
WB6BWZ 12,480- 148- 25-B
WB6HJW 223,745- 976- 73-C
N6MB 46,948- 356- 44-C
WB6BVD 8322- 146- 19-C
WA6IJZ 5112- 90- 18-C
WB6NZL(+WD6EYM)
9120- 154- 20-D

Santa Clara Valley

W6BKY 67,390- 528- 46-B
W6SUJ 61,512- 610- 33-B
WB6ITM 27,126- 257- 33-B
N6ADW 1758- 113- 6-B
WB4TJV/6 160- 16- 2-B
K6HNZ 279,586- 966- 86-C
WB6SWH 32,016- 217- 48-C
WA6OCV 9136- 359- 9-C
N6NE 9520- 70- 24-C
W6YX(AA6UO,K6XO,N6s IG NE,
W1ARR,WA6ITV,N7MH,oprs)
804,066-2531-102-D
K6RM(+N6s BT TU,WA6HJV)
740,622-2210-106-D

San Diego

WA4TKR/6 31,154- 256- 37-A
AA6EE 5928- 100- 19-B
WA6NEL 291,195-1185- 81-C
N6CK 9932- 136- 26-C
K6XT(+N6s AGT ND,WD6EQI)
896,658-2496-111-D

San Francisco

N6KL 9240- 162- 21-A
WA6KWM 7623- 141- 21-A
K6LRN 2280- 69- 15-B
N6KM 1330- 35- 14-B
N6QC 38,610- 275- 46-C
W6SSC 24,514- 245- 34-C
N6OJ 15,318- 257- 18-C
AA6DX(+WA6s GSR TOE,WB6s
QPG SYQ) 374,244-1487- 78-D
W6BIP(+WA6DJI)
268,944-1016- 78-D

San Joaquin Valley

WA6KMW 46,008- 272- 54-A
K6YK 29,136- 162- 48-A
AA6R 190,340- 953- 62-C
WA6WRS 55,084- 379- 47-C
WA6CPP 39,273- 311- 39-C
WA6PXH 21,456- 316- 24-C
WB6YKY 18,148- 258- 26-C

Sacramento Valley

N6JM 13,430- 103- 34-A
WA6POC 30,420- 286- 36-B
WB6RDA 49,042- 570- 31-C
N6WR 18,507- 191- 31-C

7

Arizona

WB7PST 82,148- 639- 44-A
K6LL/7 361,712-1458- 74-B
WB7PXS 13,132- 161- 28-B
N7MW 3497- 94- 13-B
WA7YUL 2784- 84- 12-C
N2KK/7(+N7DD)
452,922-1363- 87-D

Idaho

K7QD 46,488- 29-B
K7MM 26,381- 324- 31-B

Montana

W7JYW 103,180- 784- 44-A
W7TVN 50,940- 463- 44-A
K7CPC 28,246- 364- 29-B

Nevada

W7IA 6080- 106- 19-A
WA7VHP 97,100- 592- 50-B
W7ISG 34,201- 446- 23-C

Oregon

WA4HRG/7 135,609- 923- 51-A
W7XE 97,656- 750- 39-A
WB7ECW 20,822- 258- 29-A
WB7NMM 7656- 125- 24-A
W7NI 420,819-1409- 87-B
W7TC 146,166- 990- 51-B
W7LT 495- 20- 11-B
WA7GZA(+WA7IJB)
47,790- 333- 45-D

Washington

W7BCS 7562- 146- 19-A
N7DX 215,358-1111- 66-B
K7NF 56,938- 306- 49-B
WB7FFF 50,578- 441- 38-B
K7RI 742,252-2417- 98-C
WA7GVM 40,517- 409- 31-C
WA7RDJ 26,356- 314- 34-C
WB7SXF 312- 19- 8-C

Zone 7

5

Arkansas

WB5STD 59,136- 724- 32-A
K5GO 496,910-1586- 85-B
WA5SOG 5900- 116- 25-B
W5EIJ 1875- 41- 15-B
K5UR 565,070-1767-114-C

Kansas

K5GN 140,001- 661- 69-A

Louisiana

K5KLA 135,408- 576- 62-A
K5PR 34,150- 443- 25-A
N5LN 55,883- 376- 41-B
WB5UWI 8112- 230- 12-B
WD5IOI 66- 10- 3-B
WD5DUD (74,165-1179- 51-C
N5TV(+WB5YAN)
103,950- 545- 66-D

Mississippi

WA5DYH 128,850- 538- 75-A
N5XA 92,176- 476- 56-B
K5MK 252,075-1054- 75-C

New Mexico

W5YZ 40,086- 382- 34-B

Northern Texas

W5FL 319,081-1254- 79-A
N5JB 106,794- 606- 51-A
WB5TDO 89,305- 567- 52-A
K5IS 19,685- 205- 31-A
K5MR 174,285- 896- 59-B
WB5RPU 21,996- 300- 26-B
WB5PKH 6776- 168- 14-B
WB5TAP 296,912-1018- 88-C
K5LAC 128,222- 662- 61-C
WB5KTD 34,353- 341- 33-C
WD5COF 8580- 97- 30-C
WD5JLF 8492- 130- 22-C
K5JA(+K5FUV,N5s AU TR,
WB5PIP,WD5EWP)
993,600-2723-108-D

Oklahoma

W5KI 53,557- 361- 49-B
W5AS 18,032- 259- 23-B
WA5MLT 49,440- 695- 48-C
WB5MSU 15,792- 210- 24-C

Southern Texas

K5KG 360,715-1139- 95-A
K5NU 39,765- 193- 55-A
K5EI 20,550- 219- 30-A
W5PF 15,652- 73- 52-A
WB5FND(WA3QVC,opr)
219,065-1189- 55-B
W5UW(WD5ABR,opr)
190,930- 987- 61-B
K5PE 166,600- 976- 50-B
K5DL 22,290- 251- 30-B
WB5VME 12,410- 272- 17-B
W5NR 11,946- 175- 22-B
K5OOU 113,431- 546- 67-C
WA5IYX 60,060- 358- 55-C
K5GA(+K5s RC ZD)
1,416,480-3150-130-D
K5TM(+WD5EHB)
492,300-1657- 90-D
N5RU(+WD5IXJ)
46,664- 396- 38-D

0

Colorado

WD0FLW 30,051- 413- 27-B
K0CI 1404- 60- 9-B
W0RTB 384- 22- 6-C
K0UK(K9MWM,K0s CL FX,
N0ACW,W0KEA,oprs)
715,559-2038-107-D
N0ST(+N0DV) 154,638- 768- 66-D

Iowa

K0MM 387,220-1407- 76-B
W0WP 158,348- 694- 62-B
WB0PYD 120,735- 790- 45-B
WB0NSF 31,487- 284- 37-B
WB0UCP 10,028- 157- 23-B
N0BB 8755- 204- 17-B
WB0CHS 39,818- 306- 43-C
WB0VRN 4956- 130- 14-C
W0PPF 4656- 93- 16-C
WA0YYL 2030- 77- 10-C

Kansas

WG0UB 228,994-1159- 61-A
K0VGB 116,040- 612- 60-A
W0RT 84,550- 505- 50-A
K0RU 14,094- 186- 27-A
WA0WJX 1824- 52- 12-A
WB0YLP 5778- 93- 18-B
WB0ISW 56,604- 302- 53-C
K0EQH 14,640- 215- 16-C
WB0HGG 528- 24- 8-C
K0LS(+K0s VBU XP,W0YR,
WA0AGN,WB0s EZQ ULO UX!)
618,144-1836- 94-D
K0WA(+AB0S)
396,264-1549- 79-D

Minnesota

K0MPH 74,235- 479- 49-A
K0UFV 32,296- 350- 37-A
WB0OUH 45,308- 526- 47-B
K0IR 34,300- 355- 28-B
WB0YUU/0 33,453- 440- 27-B
K0ET 13,940- 300- 17-B

Missouri

N0DX 223,050- 826- 75-A
WB0UGX 15,903- 227- 27-A
W0GWS 39,028- 399- 28-B
WB0MSZ 19,604- 226- 26-B
K0SI 4284- 80- 18-B
WB0LTD 3878- 101- 14-B
K0VUW 170,871- 729- 77-C
K0FA 22,248- 330- 24-C
WB0TPK 10,810- 166- 23-C
WB0MPH 3363- 63- 19-C
WA0ITU 3245- 101- 11-C
W0MJ(+W5XZ)373,736-1296- 88-D
WD0ELL(+WB0ZGD)
19,448- 194- 34-D

Nebraska

K0SGM 36,295- 353- 35-A
WB0SYV 8512- 186- 16-A
N0WB 8520- 118- 20-A
W0OYW 22,533- 403- 21-B
K0SW 17,226- 146- 33-B
K9AR/0 3213- 163- 7-B
K0CQB 32,178- 267- 39-C
WB0MNW 19,928- 250- 22-C

South Dakota

K0JV 37,245- 305- 39-A
WA0ZXV 820- 30- 10-B
N0SD 40,128- 364- 38-C

Zone 8

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Connecticut

W1NG 422,500-1268-100-A
K1WB 409,153-1341- 89-A
W1WEF 74,620- 514- 52-A
N1JW 53,124- 360- 57-A
WB1AIE 22,925- 250- 35-A
N1CC 9096- 155- 24-A
WB1ENK 7885- 195- 19-A
WA1RLV 4460- 73- 20-A
W9KDR/1 366- 23- 6-A
K1KI 524,552-1138-116-B
W1BWS 49,248- 290- 54-B
W1VH 27,778- 231- 38-B
W1CNU 25,806- 203- 46-B
WB1CEG 16,848- 250- 17-B
WB1FKO 900- 36- 12-B
W1EWD 511- 15- 7-B
W1AW(W3AZD,opr)
81,532- 918- 34-C
KIWJ 54,810- 255- 63-C
WA1LOU 53,636- 366- 53-C
WB1ARC 45,666- 405- 43-C
K1YXG 39,646- 290- 43-C
WB1DBV 20,256- 256- 30-C
WB1DLA 7912- 112- 23-C
W1HB 5355- 73- 17-C
K1MUJ(WA1HYN,WB1AJJ,oprs)
33,264- 286- 42-D

Eastern Massachusetts

K1PTE 37,333- 309- 37-A
WA1ZXB 2020- 100- 10-A
WB1ANT 715- 79- 5-A
W1MX(K1MK,opr)
350,058-1355- 82-B
W1PL 55,930- 323- 47-B
WA1UHA 35,454- 311- 38-B
N1EE 23,595- 255- 33-B
W1QY 30,640- 255- 32-B
W1OPJ 4320- 88- 18-B
WA1ZAZ 3328- 57- 19-B
WA1KSF 1836- 24- 18-B
W1BB/1 1- 1- 1-B
WA1SSX 71,240- 401- 52-C
K1YHM 49,440- 295- 48-C
K1IR(+K1EA) 576,972-1861- 94-D
K1GSK(+WB1FPF)
126,045-1027- 45-D

Maine

K1SA 43,852- 296- 38-B
N1RC 2977- 113- 13-B

New Hampshire

WA1VKM 18,624- 218- 32-A
K1LKP 16,537- 285- 23-B
WA1NPZ 27,642- 302- 34-C

Rhode Island

K1ZRS 16,718- 263- 26-A
W1YNE 16,014- 138- 34-A
WA1KIP 13,772- 250- 22-A
WA1WXB 6831- 109- 24-A
N1RI 4731- 112- 19-A
K1AO 67,652- 421- 52-B
K1KX 36,720- 342- 36-B
WA1IFF 300,204-1262- 93-C
WB1CRG 53,018- 314- 49-C

Western Massachusetts

W1ZT 17,884- 280- 17-B
N1PF 5780- 135- 20-B
WA1YGA 100,224- 548- 58-C
W1GG 81,720- 517- 60-C

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Eastern New York

K2MN 21,588- 130- 42-A
WA2OTC 41,976- 424- 44-B
WA2AUB 4599- 103- 21-B
W2DW 3696- 61- 22-B
WB2SNT 3114- 73- 18-B
WA2FFX 2833- 57- 17-B
N2EF 1725- 41- 16-B
W2XL 238,280- 916- 92-C
WB2ECA 82,550- 370- 65-C

New York City - L.I.

AB2K 12,292- 28-A
W2HD 3840- 132- 12-A
KZ5K 59,940- 419- 54-B
K2HVN 29,444- 282- 34-B
WA2MUA 19,236- 257- 28-B
N2UN 2322- 47- 18-B
W2LEJ 81,510- 398- 65-C
WB2SKW 720- 30- 9-C
K2YIaM(+N2GC)
398,070-1349- 90-D
WB2OUV(+WA2BOT,WB2LJH)
88,412- 569- 62-D
N2BU(+WA2JBY)
87,220-1059- 35-D
WA2VNV(+WB2VKU)
25,506- 248- 39-D

Northern New Jersey

W2GD 155,878- 800- 59-A
K2BK 109,497- 803- 57-A
WA2DVE 52,668- 438- 42-A
WB2POG 20,748- 265- 26-A
K2PF 16,680- 174- 34-A
WA2EPK 7350- 116- 26-A
N2LT 574,089-1626- 93-B
K2BMI 472,260-1267-102-B
WB2QPL 94,393- 556- 53-B
WB2FGZ 21,824- 270- 29-B
K2YZ 5607- 91- 21-B
W2HCA 2004- 65- 12-B
WA2TJF 3080- 74- 14-C
WB2LUD 1530- 60- 15-C

Southern New Jersey

AA2Z 159,328-1031- 52-A
W2KI 151,768- 874- 61-A
W2HAZ 22,050- 133- 42-A
WB2OOG 16,770- 270- 26-A
WA2VKG 11,664- 187- 24-A
K2HPV 2565- 58- 15-A
N2IT 50,796- 245- 51-B
N2CQ 32,760- 304- 30-B
N2CC 6656- 150- 16-B
WA2CUW 2288- 82- 13-B
WB2JAX 1738- 58- 11-B
WA2FZS 50- 4- 2-B
W2MWJL 70,594- 482- 47-C
W2HXF 34,600- 154- 50-C
W2FGY 17,670- 125- 38-C
WB2RRJ 11,804- 160- 26-C
WA2PAT 7830- 105- 26-C
WA2HCV 3289- 99- 11-C
N2MM(+N2ME,WA2HGM,
WB2SST) 535,580-1434- 70-D

Western New York

N2MF 70,620- 629- 43-A
K2ZJ 27,028- 266- 29-A
WA2QAU 4470- 64- 15-A
W2FTY 89,320- 502- 60-B
WA2EYA 35,980- 374- 35-B
WB2ABD 34,056- 306- 36-B
WA2IGK 9833- 211- 21-B
K2IGW(WA2GNE,opr)
91,938- 851- 42-C
WB2AIO 38,094- 280- 42-C

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Delaware

WB3GXD 22,836- 272- 33-C

Eastern Pennsylvania

WB3FNZ 44,000- 262- 50-A
K3SWZ 32,409- 277- 39-A
WB3JGP 14,271- 292- 23-A
K3VW 118,260- 555- 60-B
W3ARK 71,040- 302- 64-B
AA3B 55,088- 480- 44-B
N3KR 12,742- 142- 23-B
WA3YJZ 10,785- 264- 22-B
AA3C 4554- 83- 18-B
K1TK/M 2444- 91- 13-B
K3QM 56,703- 279- 47-C
W3YFV 44,235- 253- 45-C
K3MA 23,735- 127- 47-C
K3FD(+W3QM,WB3BKV)
505,785-1468- 95-D
K3UC(+K3s SY VDU,WA3VQK,
WB3s ELV FXF)
251,100-1068- 75-D
K3PA(+K3YL) 129,224- 633- 58-D
WA3ALW(K3HR,W3MO,WB3s ELX
KEW,oprs) 32,594- 258- 43-D

Maryland - D.C.

K2PLF/3 237,825- 953- 75-A
W3MR 69,108- 437- 52-A
N3RL 46,600- 252- 50-A
WA3VPL 40,721- 326- 43-A
N3II 21,889- 99- 53-A
WA3YSW 15,805- 211- 29-A
K3NS 68,355- 325- 63-B
W3RD 1,125- 95- 25-B
K2SCU/3 63,810- 319- 58-C
LU1BAR/W3 32,336- 162- 72-C
W3JPT 25,623- 197- 39-C
WB3FAF 23,142- 292- 42-C
WA3EEE 1620- 64- 12-C
W3LPL(+W3XY,WA3ZAS)
847,788-2018-124-D
N3GB(+WA3ECT)
15,720- 145- 40-D

Western Pennsylvania

W3KWH(N3MC,opr) 129,328- 757- 59-A
WB3DKT 23,100- 282- 30-A
K3LVO 1188- 23- 12-A
W3IW 48,150- 360- 49-B
KB3AT 20,692- 255- 28-C
WB3EKB 8046- 174- 18-C
WB3KJD 294- 18- 7-C
K3UA(+W3AS,WA3s FET JFW) 536,613-1714-101-D
K3TO(+WA3WZR) 117,956- 620- 73-D

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Alabama

WB4ASV 71,220- 315- 60-A
W4DZZ 65,962- 378- 59-A
WA4FMX 132,248- 709- 61-B
WD4PZN/N 783- 43- 9-B
N4KG(+WA4VKD,WD5EEF, WN4KKN) 601,992-1867-108-D

Georgia

AA4GA 110,700- 778- 54-A
K4KKJ 32,508- 258- 42-A
K4BAI 396,540-1402- 90-B
AA4U 47,344- 362- 44-B
WA4BDE 36,800- 258- 46-C
WD4ICC 22,048- 255- 32-C
W4GKI 2592- 56- 18-C
WB4BDP(WA4UNV,WB4IRU,oprs) 36,084- 394- 31-D
N4OL(+N4RJ,Net) 28,968- 328- 34-D

Kentucky

WA4QMQ 62,373- 353- 51-A
WB4FOT 51,315- 270- 55-A
AA4RR 20,736- 211- 32-A
N4AR 499,140-1426- 94-B
K4TXJ 28,866- 267- 34-B
N4XM 27,027- 286- 33-B
WB4ZRQ 25,326- 414- 27-B
WA4PAB 96,224- 494- 62-C
WB4OSS 52,140- 199- 66-C

North Carolina

AA4S 468,316-1487- 97-A
N4PY 86,790- 566- 55-A
AB4Z 79,595- 482- 54-A
WA4NHP 52,780- 252- 58-A
N4WX 109,424- 517- 56-B
WA4LWO 63,066- 598- 46-B
WB4ERM 46,614- 354- 51-B
K4HF 34,352- 271- 38-B
WD4JRS 149,850- 751- 74-C
WD4AAM 67,065- 431- 51-C
N4ZC 66,348- 461- 38-C
N4UH 11,466- 141- 26-C
K4VAA 7436- 108- 22-C
WA4YOM 4100- 55- 20-C

Northern Florida

W4DFU(WA4BZV,opr) 31,850- 418- 35-A
KL7IUW/4 6760- 80- 26-A
W4WHK 147,820- 746- 76-B
AA4ES 20,700- 258- 30-B
W4SME 15,630- 120- 30-C
N4WW(+N4s EF GG SA,AA4KA, K8OO,oprs) 928,659-2223-131-D
WB4SKI(+WA4s MYF RQH, WB4QBB) 490,947-2014- 93-D
N4UF(+N4ID,WA4s OFE QFJ QGW WB4YEY) 277,400-1475- 73-D
WD4IIO(W4ILE,WD4FNX,oprs) 7911- 91- 27-D

South Carolina

WA4VXG 47,588- 426- 43-A
WB4TDH 164,214- 792- 54-B
K4CNW 92,610- 559- 63-B
WB4AFP 6182- 100- 22-B
WA4TNI 2114- 65- 14-B
WB4YXA 21,600- 520- 18-C
WA4RYN 18,480- 360- 21-C

Southern Florida

K4LQ 32,922- 169- 62-A
WA4FYZ 15,432- 262- 24-A
WB4FYS 15,210- - 30-A
W4MJ 355,308-1183- 87-B
K4PB 87,966- 585- 54-B
N4YB 22,308- 182- 33-B
W4BV 19,040- 150- 34-B
W4YN 14,310- 124- 27-B
WD4AHZ/N 4340- 156- 14-B
W4LCL 66,294- 353- 58-C
K4WSB 43,554- 298- 51-C
K4BNC 26,845- 109- 59-C
WB8LZX/4 21,420- 325- 28-C
WD4FGI 7636- 130- 23-C
N4BP(+WA4FKM,N8RC) 582,912-2442- 92-D

Tennessee

KB4CG 27,459- 391- 27-A
N4IR 60,528- 553- 48-B
WA4ELW 21,012- 248- 34-B
AA4H 17,688- 137- 33-B
WD4HUT 11,638- 255- 23-C

Virginia

WB4BVY 184,716- 959- 63-A
K1ER/4 43,560- 262- 45-A
AA4M 113,560- 568- 68-B
W4EI 96,512- 516- 58-B
N4ZR 93,496- 520- 62-B
W4XO 44,077- 273- 33-B
K5OGU/4 29,643- 349- 41-B
WD4KUK 16,500- 267- 20-B
WB4DNL 3760- 93- 16-B
W4ZRJ 72- 10- 4-B
N4MM 106,056- 400- 72-C
WA4NTP 41,712- 319- 48-C
N4HB 39,480- 387- 35-C
W4KMS 29,040- 200- 40-C
WB4NFO 22,428- 161- 36-C
N4DW(+WA4s KYS OGV OHG PMQ SCE,WB4PAT) 326,025-1329- 81-D

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Michigan

WB8FEZ 20,524- 313- 28-A
K8OT 6993- 114- 21-A
K8PUJ 4080- 74- 24-A
W8EGI 492- 30- 6-A
WA8RRR 197,504- 901- 64-B
WD8DIB 70,110- 782- 38-B
K8SIA 18,538- 302- 23-B
K8DD 7967- 257- 31-B
WD8OMS 7434- 144- 21-B
WB8SYA 294- 30- 6-B
WD8OZM 23,905- 251- 35-C
WD8NIJ 11,865- 239- 21-C
WD8BDT 5888- 80- 23-C
WD8DNJ 3172- 86- 13-C
K8CC 3077- 181- 17-C

Ohio

WA4RIJ/8 157,383- 879- 67-A
K8MN 151,128- 699- 72-A
WD8ALG 55,260- 510- 45-A
WD8LLD 21,402- 265- 29-A
WB8TRW 15,827- 311- 19-A
W8LT(K8ND,opr) 164,808- 805- 63-B
WB8KKI 71,184- 555- 48-B
W8GOC 55,468- 317- 49-B
W8UPH 35,595- 337- 35-B
K8AAZ 23,184- 274- 36-B
K8DL 18,308- 114- 46-B
K8IP 7491- 53- 33-B
WB8VWM 2570- 107- 10-B
WD8QMP 2110- 85- 10-B
K8HF 1188- 40- 11-B
WD8KDR 216- 14- 6-B
K8EF 93,771- 407- 69-C
K8MR 73,580- 360- 65-C
WB8VPA 54,150- 292- 57-C
K8RJI 50,508- 336- 46-C
WB8ZRL 9476- 128- 23-C
W8ILC 6327- 77- 19-C
WB8HWF 4396- 106- 14-C
W8DXT 2652- 97- 12-C
K8URE(+N9AG,WA8EEA, WB8ENR) 391,160-1068-110-D
WB8JBM(+AA8S,WB8s DQP LSN, oprs) 375,570-1436- 78-D
K8OCL(+K8BV,KB8AC,WB8s MMW YIJ YUO,WD8JLM) 166,248- 827- 72-D

West Virginia

W8AH 65,984- 393- 64-A
N8II 204,408- 775- 72-B
K8JQ 132,840- 706- 54-B
W8JWX 3440- 56- 20-B

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Illinois

K9CT 83,564- 502- 52-A
K9TI 57,434- 598- 47-A
W9QWM 49,840- 324- 56-A
K9ZO 27,520- 382- 40-A
WD9INS 13,160- 182- 28-A
K9UQN 3887- 97- 13-A
AA9F 1976- 60- 13-A
WB9ZKK 163,625- 952- 55-B
W9OA 39,410- 364- 35-B
K9CW 36,652- 311- 44-B
N9UN 26,160- 221- 40-B
K9GS 25,060- 447- 28-B
K9BK 24,815- 291- 35-B
W9AG 24,375- 266- 39-B
W9REC 5253- 110- 17-B
AA9R 1500- 46- 15-B
WD9IIX/N 1351- 90- 7-B
WA9PQY 891- 25- 11-B
WA9KVE 28,530- 269- 45-C
WD9AEU 15,873- 129- 39-C
WB9TDR 13,794- 235- 22-C
WB9QHV 406- 20- 7-C
W9LYN 336- 18- 8-C
W9RW(+K9s HDE JK MR, WA9PQY,WB9IWN) 435,872-1369-106-D
AA9D(+N9ABK,WB9ZHK, WD9DVZ) 261,460-1330- 68-D
WD9COA(+W9AYH) 70,818- 345- 58-D
WB9NEH(+WD8QJB) 48,444- 433- 44-D

Indiana

K9CLO 206,448- 930- 69-A
AA9S 77,469- 485- 49-A
WB9PIR 4- 2- 2-A
K9FN 160,090- 694- 70-B
N9NO 31,808- 463- 32-B
K9FG 768- 22- 12-B
WB9ZMA 15,132- 110- 39-C
K9IU(WA2s BIJ ECZ,W3EP,WB9s SJB VVV,WD9IKJ,oprs) 95,568- 462- 66-D

Wisconsin

W9YT(N9XX,opr) 161,202- 988- 67-B
N9EZ 24,480- 304- 34-B
WB9YLR 17,754- 259- 22-B
WB9FTC 17,480- 360- 23-B
K9GDF 15,548- 273- 26-B
W9HE 10,327- 180- 23-B
WB9OBX 12,305- 223- 23-C
W9OEJ 1496- 62- 11-C
WB9ZJW(+WD9FCN) 40,840- 327- 40-D

Zone 9

Maritime - Newfoundland

VE1AMB 16,164- 127- 36-C
VE1UNB(VE1s BEC BHA,oprs) 369,308-1627- 68-D

Quebec

VE2HY 53,587- 397- 41-B
VE2EOH 37,800- 456- 25-B

DX

Zone 8

4U1UN(HB9RS,N2KW,N2UN, K2SX,oprs) 55,650- 623- 42-D

Zone 10

Mexico

XE1VV 211,347- 902- 69-A
XE1LLS 208,010-1090- 61-C
XE1AE 41,856- 572- 24-C
XE1YO 24,309- 260- 37-C

Region 2

SM5CCT/MM 61,204- 431- 44-B

Zone 11

Dominican Republic

HI8LC 8658- 200- 13-B
HI8MDB 11,196- 202- 18-C
HI8GBG 8030- 269- 10-C

Panama

HP1CY 66,859- 527- 37-C

Puerto Rico

KP4BC 162,944- 678- 64-B
KP4KW 948,175-2886- 97-D

Netherlands Antilles

W1GNC/PJ2 2,404,540-4432-109-D

Zone 12

Ecuador

WA4UAZ/HC1 49,302- 300- 33-B

Venezuela

YV5GMN 49,644- 239- 42-C

Zone 13

Brasil

PY8ZLC 43,791- 271- 33-A
PY1ZBJ/PY8 31,080- 180- 35-C
PY8EMM 9108- 120- 23-D

Zone 14

Argentina

LU8DQ 986,720- -112-B
LU1HE 214,632- 660- 66-C

Zone 15

Brasil

PY1DHG 15,928- - 22-B
PY5WSS 15,768- 118- 27-B
PY3CB 730,170-1546- 95-C
ZZ2ITU 22,848- 138- 34-C
PY1BAR 8975- 73- 25-C
ZV2ITU(CT2LS,opr) 1700- 34- 10-C
PY1BKA 1620- 22- 15-C

Zone 17

Iceland

TF3US 2286- 53- 9-C
TF3CW 311,808-1379- 56-D

Zone 18

Norway

LA9HW 61,740- 436- 42-A
LA3UG 51,912- - 42-A
LA5SH 74,462- 281- 62-B
LA5KW 2030- - 10-B
LA5QK 17,892- 157- 36-C
LA9CQ 6118- 74- 23-C
LA4EU 1946- 41- 14-C
LA5YV 402- 21- 6-C
LA6UL 246- 11- 6-C

Finland

OH7NW 48,243- 300- 39-A
OH4RH 31,744- 250- 32-A
OH2BSL 3570- 79- 14-A
OH1VR 481,151-1480- 83-B
OH8PF 176,469- 811- 59-B
OH6RC 45,448- 250- 46-B
OH1AF 23,720- 329- 20-B
OH1FM 22,325- 123- 47-B
OH9TD 5125- 47- 25-B
OH7SQ 4378- 53- 22-B
OH1EH 3504- 74- 12-B
OH2BAH 2297- 50- 23-B
OH9UW 476- 22- 7-B
OH3YI 712,800-1445-110-C
OH2PM 305,204- 888- 82-C
OH2KP 19,800- 256- 25-C
OH3WS/4 2394- 34- 19-C
OH2AA 64,864- 343- 32-D

Denmark

OZ6XT 209,820- 748- 65-B
OZ1EE 187,514- 687- 61-B
OZ7BW 88,587- 400- 51-B
OZ1LO 23,958- 200- 33-B
OZ6KS 13,384- 157- 28-B
OZ1BII 12,495- 170- 21-B
OZ1EEH 8162- 112- 22-B
OZ5EV 508,474-1180- 97-C
OZ5FY 67,815- 271- 55-C
OZ8PG 5698- - 22-C
OZ1ZE/A 3360- 46- 20-C
OZ3ZK 910- 44- 7-C

Sweden

SMØDJZ 155,960- 604- 70-A
SM5BRW 63,801- 307- 51-A
SM3DNI 199,001- 651- 79-B
SM4AJV 93,288- 515- 52-B
SM5FKF 89,376- 388- 56-B
SM6ID 57,061- 395- 43-B
SMØBDS 27,438- 209- 34-B
SM5BAX 25,116- 195- 28-B
SM6AYM 14,848- 130- 32-B
SM7CZC 11,008- 78- 32-B
SM6JY 7856- - 16-B
SMØJHF 4410- 60- 21-B
SM1DIE 500- 20- 5-B
SM5CSS 39,960- 206- 45-C
SM2HZQ 33,696- 180- 54-C
SK2KW 1,135,240-2524-101-D

Zone 19

European Russian S.F.S.R.

UA1DZ 874,174-1781-119-A
UA1OE 2260- 31- 20-A
UW1GI 144,690- 765- 53-B
UW1YY 69,020- 556- 34-B
UN1CB 30,624- 268- 33-B
UA1OBQ 11,804- 262- 13-B
UK1ZAS 337,050- - 70-D
UK1CAB 242,496- 894- 72-D

Zone 20

Asiatic R.S.F.S.R.

UA9XS 65,562- - 42-B

Zone 21

Asiatic R.S.F.S.R.

UK9JAE 196,354- 711- 62-D

Zone 23

Asiatic R.S.F.S.R.

UAØQWO 51,948- 376- 39-B
UKØQAH 178,579- 913- 43-D
UKØKAH 8964- 110- 18-D

Zone 26

Asiatic R.S.F.S.R.

UKØKAM 91,485- 523- 45-D

Zone 27

France

F3AT 54,336- 270- 48-B
F8TM 14,592- 105- 38-B
F8VJ 7056- 91- 16-B
F9LM/P 103,191- 561- 53-C
F6EXQ 75,697- 346- 59-C
F3NG 1404- 29- 12-C
F6AQO 671,925-2124- 75-D

England

G3FXB 1,010,097-2153- 99-A
G3ESF 180,544- 759- 64-B
G8DI 20,274- 196- 31-B
G6NK 13,860- - 21-B
G4CSB 7360- 108- 16-B
G4CVZ 62,238- 462- 41-C
G5CFZ(WA2FAO,opr) 6032- 137- 13-C
G4EHF 917,424-2230- 92-D

Scotland

GM3OXC 149,812- - 67-B

Wales

GW3SLA 11,803- 103- 29-C

Luxembourg

LX1SG 5742- - 18-C

Belgium

ON6GB 5220- - 18-A
ON6ZW 75,984- 423- 48-B
ON4XG 48,268- 307- 44-B
ON6JG 52,415- 253- 55-C

Netherlands

PAØUV 74,932- 373- 52-B
PAØTA 38,775- 179- 55-B
PAØVB 13,504- 124- 32-B
PAØGT 8360- - 20-B
PA3ABA 4100- 57- 20-B
PAØWRS 344- 13- 8-B
PAØIJM 13,858- 155- 26-C

Zone 28

Federal Republic of Germany

DK8KC 54,288- 355- 48-B
DF2NG 28,638- 250- 32-B
DL8JL 26,784- - 36-B
DA1CS 24,134- 323- 22-B
DF9SI 12,600- 134- 28-B
DK4HD 6534- 94- 22-B
DL3CW 5705- 77- 18-B
DK8FS 299,300- 799- 82-C
DL8PC 11,682- 110- 33-C
DF2RG 4020- 63- 20-C

German Democratic Republic

DM4OLG 70,023- 413- 51-A
DT3XM 61,200- 367- 48-A
DT2AJH 36,720- 274- 40-A
DM4WPF 26,452- 222- 34-A
DM3XPE 5940- 88- 22-A
DM4HN 3604- 74- 17-A
DM4OL 1928- 57- 8-A
DT3LF 1089- 35- 11-A
DM3BF 211,919- 803- 73-B
DT3NKF 123,420- 595- 60-B
DT5AA/P 64,736- 340- 56-B
DM2CWB 62,608- 439- 43-B
DT2FDM 17,894- 232- 23-B
DM4YZM 13,676- 174- 26-B
DT4JJ 11,520- 128- 24-B
DM4NJJ 4875- 89- 13-B
DM2FBM 3552- 73- 12-B
DM2GML 2670- 42- 15-B
DM2CMA 2422- 67- 14-B
DT2AYH/A 2350- 79- 10-B
DM5VVL 2002- 58- 13-B
DM4ZRM 1495- 44- 13-B
DM2CHE 945- 45- 9-B
DM2BWA 342- 29- 6-B
DM5TGL 43,784- 292- 52-C
DM2GWL 3906- 108- 14-C
DM4ZOM 3608- 54- 22-C
DT4YUL 2816- 63- 16-C
DM2BRK 1860- 60- 12-C
DM2CQA 1612- 38- 13-C
DT2BPB 1557- 69- 9-C
DM3TNA 1104- 36- 12-C
DM3GM 583,605-1904- 81-D
DM4DA 331,039-1168- 87-D

Zone 28

Hungary

HA5KDQ 286,104- 883- 78-A
HA7SQ 116,793- 551- 57-A
HA8EK 179,740- 680- 76-B
HA8UY 135,054- 660- 54-B
HA7PL 110,106- 525- 54-B
HA1ZU 53,124- 277- 57-B
HA5LZ 44,892- 276- 43-B
HA5BA 28,600- 252- 40-B
HA3GO 27,972- 258- 37-B
HAØMM 15,904- 156- 28-B
HA1ZG 10,944- 192- 18-B
HA4YG 8960- 114- 28-B
HA8WU 7940- 151- 20-B
HA7LM 6040- 236- 10-B
HA3PT 5984- 211- 11-B
HA2MG 5355- 65- 21-B
HA7KSR 4320- 72- 18-B
HA8KAX 1989- 85- 9-B
HA7PQ 1564- 36- 17-B
HA7TQ 1548- 100- 9-B
HA7UG 510- 50- 5-B
HA3KHC 43,440- 360- 40-C
HA1ZD 18,676- 189- 29-C
HA6KVB 493,688-1410-101-D
HA1KSA 461,448-1601- 78-D
HA3KNA 398,820-1372- 85-D
HA5KBM 394,518-1385- 94-D
HA7KSV 260,585-1083- 65-D
HA5KFL 212,860-1002- 58-D
HA4KYH 158,100- 782- 60-D
HA1KYY 105,250- 600- 50-D
HA8KVK 83,168- 537- 46-D
HA1KSL 28,158- 253- 38-D
HA2KMG 20,820- 201- 30-D
HA5KAA 4389- 99- 19-D
HAØLL 2327- 49- 13-D
HG1KYY 79- 36- 1-D

Switzerland

HB9DX 18,748- 154- 43-B
HB9BAM 930,362-1550-106-C
HB9LP 200,655-1010- 45-D

Italy

I7PXV 48,160- 454- 35-B
I2MQP 72,968- - 56-C
I2PKF 40,404- 266- 42-C
I2LVN 6496- 70- 28-C

Bulgaria

LZ1IA 40,530- 357- 35-B
LZ2VP 6510- 219- 15-B
LZ2ES 62,188- 720- 28-C
LZ2PO 1386- 21- 14-C
LZ1KWZ 99,306- 600- 54-D
LZ2KKK 32,480- 310- 29-D
LZ2KSU 25,674- 253- 33-D

Austria

OE5CWL 317,700-1081- 75-A
OE3HOW 13,875- - 37-A
OE1TKW 79,404- 435- 52-B

Czechoslovakia

OK2BLG 221,680- 723- 68-A
OK3ZWA 143,451- 752- 63-A
OK2QX 63,555- 301- 57-A
OK3KFO 51,120- - 45-A
OK1KZ 50,186- 328- 46-A
OK2BSA 43,440- 221- 48-A
OK2BPO 31,148- 157- 52-A
OK2SGW 31,144- 227- 34-A
OK3TDN 13,022- - 34-A
OK1EP 11,328- 101- 32-A
OK2BBJ 8232- 86- 21-A
OK1OXP 5018- - 13-A
OK1KCF 3924- 111- 12-A
OK1DKW 95,368- 471- 56-B
OK1BLC 82,908- 409- 49-B
OK2PBG 32,448- 194- 39-B
OK2BEM 26,810- 191- 35-B
OK3YCA 20,468- - 28-B
OK2BEI 19,360- - 22-B
OK3BA 27,706- 218- 26-B
OK2PAW 12,348- 180- 21-B
OK3TBG 10,934- 162- 22-B
OK1MWN 10,300- 160- 20-B
OK1DMJ 8884- 142- 18-B
OK1DAV 6960- 64- 29-B
OK3ZWX 5520- - 15-B
OK2PFQ 5491- - 17-B
OK2BCJ 5434- - 19-B
OK2AII 4896- - 17-B
OK1AEH 4047- 69- 19-B
OK1OFK 3927- 71- 17-B
OK2BQP 3172- - 13-B
OK1AHQ 2580- 65- 12-B
OK3TCK 2180- - 10-B
OK3CAU 1807- 45- 13-B
OK2SMO 1512- 34- 12-B
OK3KXD 1251- - 9-B
OK2BBQ 1004- 72- 12-B
OK2SWD 235- 15- 5-B
OK2BKR 53,970- 361- 35-C
OK1DKS 23,800- 204- 34-C
OK2BBL 7476- - 28-C
OK1AJY 7207- 115- 19-C
OK2JK 1815- 35- 11-C
OK1KKH 257,382- 834- 79-D
OK3RJS 41,250- - 33-D
OK1KOK 29,844- - 36-D
OK1KIV 3168- 72- 16-D
OK1KIR 1456- 24- 14-D
OK1KTW 582- 37- 6-D

Poland

SP9CTW 208,236- 766- 74-A
SP2FAP 79,640- 407- 55-A
SP6FER 36,348- 265- 39-B
SP1AEN 33,234- 360- 29-B
SP2HMT 2796- 64- 12-B
SP9ZD 580- 22- 10-B
SP5ALP 92,096- 437- 64-C
SP5BSG/4 4932- 78- 18-C
SP9BDQ 440- 13- 8-C
SP6DVP 371- 21- 7-C
SP6AGD 330- 24- 5-C
SP6PAZ 222,820-1061- 65-D
SP9BN 119,088- 706- 48-D
SP2ZHB/2 86,204- 532- 54-D
SP5JTF 40,425- 323- 33-D
SP4KNC 980- 20- 10-D
SP2ZFJ 583- 17- 11-D

Greece

SVØWTT 2160- 28- 18-B

Romania

YO3AC 257,079-1024- 67-B
YO3JJ 211,378- 950- 71-B
YO3RF 207,108- 948- 66-B
YO3CR 163,868- 764- 71-B
YO7DL 78,182- 596- 31-B
YO7BGA 28,275- 256- 39-B
YO8FR 27,683- 299- 31-B
YO2BEO 26,224- 345- 32-B
YO9YE 18,354- 280- 21-B
YO2BEH 8496- 168- 18-B
YO7NM 7077- 125- 21-B
YO9HP 6272- 229- 14-B
YO3JG 6118- 194- 14-B
YO4ZF 5418- 92- 21-B
YO9KPL 5412- 175- 11-B
YO3AQJ 5340- 168- 12-B
YO7BSN 2800- 154- 8-B
YO3AWD 2416- 132- 8-B
YO5BRZ 2010- 147- 6-B
YO5AY 1792- 42- 14-B
YO4CAH 522- 74- 3-B
YO6BLU 426- 76- 3-B
YO8BDQ 112- 10- 4-B

YO6AVB	60- 10- 3-B
YO6KEI	133,596- 713- 54-C
YO7APM	9729- 155- 23-C
YO6AJI	2990- 122- 10-C
YO3JW	1630- 63- 10-C
YO6LV	1220- 34- 10-C
YO4KAK/P	16,797- 151- 33-D

Yugoslavia

YU1NZW	42,226- 285- 43-A
YU3TAN/2	27,144- 335- 26-B
YU3TUT	18,228- 165- 28-C
YU3GHI	63,124- - 43-D

Zone 29

European Russian S.F.S.R.

UA6LBO	189,514- 789- 74-A
UW3EH	75,803- 428- 49-A
UA6AJG	68,556- 281- 58-A
UA3EAL	61,488- 458- 42-A
UV3CE	54,960- 446- 40-A
UA6EAL	47,520- 398- 40-A
UA6AKB	33,538- 271- 41-A
UK6AJA	29,614- 251- 34-A
UA4ACA	28,938- 357- 26-A
UA3TAM	21,315- 281- 29-A
UA4QK	16,740- 253- 20-A
UA6HHD	11,186- 263- 17-A
UA0QBB/UA6	5848- 118- 17-A
UW3HV	395,364-1272- 94-B
UA1TBA	188,646- 892- 69-B
UA3AFQ	167,700- 858- 65-B
UA1AWO	135,546- 733- 58-B
UA4CK	109,772- 695- 52-B
UA3EZ	107,900- 735- 52-B
UA3SBW	96,849- 589- 51-B
UA3DLN	87,720- - 43-B
UA3AGL	84,318- 541- 47-B
UA6LFX	73,990- 418- 49-B
UZ3ER	67,074- 515- 42-B
UA4CCZ	63,336- 474- 42-B
UA3MBD	62,532- 313- 27-B
UA3QEL	61,404- 532- 34-B
UA3YBG	57,564- 436- 41-B
UA6YAK	51,720- 471- 40-B
UA3TDK	44,578- 420- 31-B
UA3GO	40,545- 270- 45-B
UW6CV	35,529- 265- 39-B
UA6LLI	34,895- 339- 35-B
UA3TBQ	29,997- 282- 33-B
UA3ACD	29,408- 304- 32-B
UA3DCZ	28,000- 277- 35-B
UA4MX	22,854- 270- 26-B
UA6AJM	21,882- 303- 21-B
UA3DOA	21,600- 302- 24-B
UV3AP	21,312- 168- 37-B
UA6AAO	17,336- 330- 22-B
UA4PGO	16,123- 154- 32-B
UA3AAH	13,060- 285- 20-B
UA4OP	10,488- 120- 23-B
UA4CDL	10,098- 210- 17-B
UA1CFF	9180- 201- 20-B
UA4LBN	8721- 243- 17-B
UA3VEF	7320- 119- 20-B
UA3EAU	6678- 174- 14-B
UA3YR	6289- - 19-B
UA6AKP	4800- 120- 15-B
UA4CCF	3276- 90- 12-B
UA4AEE	959- 72- 7-B
UA6LBC	381,930-1189- 87-C
UA3QDW	194,328- 747- 72-C
UA4PW	165,066- 596- 82-C
UA3DJS	93,030- 359- 70-C
UW3ZU	65,160- 434- 45-C
UA3TN	56,935- 281- 59-C
UA3RAI	55,568- 398- 46-C
UA4NAA	54,432- 382- 36-C
UW1BM	34,850- 248- 41-C
UA1MU	32,004- 283- 36-C
UA3PDC	29,885- 266- 43-C
UV3GW	16,558- 147- 34-C
UA4ACP	16,470- 209- 27-C
UA4FAU	4192- 104- 16-C
RA3DFN	135- 9- 5-C
UK1AAA	1,264,602-2919-114-D
UK4LAC	504,603-1620- 99-D
UK6LEZ	477,644-1653- 86-D
UK6APA	407,888-1766- 53-D
UK3ACW	382,202-1263- 82-D
UK6LKP	365,788-1342- 76-D
UK3DAH	336,776-1033- 86-D
UK6EAA	200,408- 890- 63-D
UK4ABW	182,880- 768- 72-D
UK4CAC	178,652- 960- 59-D
UK6HDA	155,844-1021- 52-D
UK6AJS	92,514- 544- 51-D
UK4FAA	84,120- 542- 40-D
UK3AAO	78,210- 650- 33-D
UK3TAF	64,027- 626- 43-D
UK4ABZ	54,910- 499- 34-D
UK3DBV	49,440- 532- 30-D
UK3DAU	40,040- 319- 35-D
UK4ABU	22,968- 445- 24-D
UK4ABE	16,654- 329- 22-D
UK3LAY	4896- 97- 17-D
UK6AJN	621- 18- 9-D

Kaliningradsk

UA2DM	51,576- 272- 56-A
UA2EC	154,725- 559- 75-B
UA2DC	35,648- 564- 32-B

Ukraine

UY5OO	753,278-1664-102-A
UB5MDL	273,024- 999- 79-A
UB5MAB	87,256- 485- 52-A
UB5AAQ	56,920- 427- 40-A
UB5ABJ	56,279- 355- 53-A
UB5LCN	51,606- 323- 47-A
UB5LCV	48,052- 380- 41-A
UB5VAA	38,655- 315- 45-A
UB5MAV	36,859- 339- 41-A
UB5LDP	29,036- 300- 34-A
UB5HCU	27,030- 252- 34-A
UY5OQ	26,009- 274- 31-A
UY5YB	23,256- 409- 19-A
UB5UCH	22,620- 298- 30-A
UY5ZM	20,385- 271- 27-A
UB5MOD	5012- 129- 14-A
UB5ZDK	2828- 60- 14-A
UB5ZAT	378,675-1287- 85-B
UB5BAZ	272,821- 960- 83-B
UB5KAK	125,824- 542- 64-B
UB5GBJ	120,180- 693- 60-B
UB5ZA	79,332- 507- 44-B
UY5TF	77,469- 538- 49-B
UB5HAF	66,538- 549- 38-B
UB5UBJ	65,956- 399- 44-B
UB5TAM	65,052- 408- 52-B
UB5IFX	64,740- 431- 52-B
UB5AAL	63,000- 578- 36-B
UB5KBF	50,389- 407- 41-B
UB5IAN	46,805- 416- 37-B
UY5NY	44,733- 335- 39-B
UB5VY	43,956- 302- 44-B
UY5ZI	40,992- 340- 42-B
UY5VA	40,052- 339- 34-B
UY5AO	33,552- 316- 36-B
UB5RS	29,859- 254- 37-B
UB5HK	27,985- 299- 29-B
UB5WBS	27,984- 418- 24-B
UB5TAG	25,368- 290- 28-B
UB5QBC	23,900- 310- 25-B
UB5UDH	23,826- 241- 22-B
UB5SG	19,926- 361- 18-B
UB5JGN	16,960- 276- 20-B
UB5LCO	15,264- 254- 24-B
UB5UBU	14,706- 270- 19-B
UB5QCP	12,112- 239- 16-B
UB5IJZ	10,184- 271- 19-B
UB5MBP	9086- 115- 22-B
UB5FAP	6672- 112- 24-B
UB5UWG	5467- 217- 11-B
UB5JGQ	1784- 71- 8-B
UB5ZCT	138- 23- 2-B
UB5WE	1,160,283-2357-111-C
UB5HDX	79,365- 391- 65-C
UB5HBT	38,594- 265- 46-C
RB5TBA	13,644- 256- 18-C
UB5RBD	9882- 239- 18-C
RB5TBM	4200- 142- 13-C
RB5IOV	76- 7- 4-C
UK5MAF	1,063,192-2502-104-D
UK5JAO	245,916-1397- 54-D
UK5QAV	162,512- 778- 56-D
UK5VAA	115,596- 656- 57-D
UK5UBB	88,669- 567- 53-D
UK5MCP	74,284- 504- 49-D
UK5CAO	46,462- 385- 26-D
UK5QAC	36,903- 326- 39-D
UK5EAG	32,524- 295- 38-D
UK5IFL	26,962- 397- 26-D
UK5DAD	13,965- 265- 19-D
UK5MBV	8586- 154- 18-D

White R.S.S.R.

UC2ACA	649,026-1328-126-A
UC2AAP	195,500- 905- 68-B
UC2CED	15,624- 273- 24-B
UC2AF	1025- 41- 5-B
UC2AFA	198,330- 797- 66-C
UC2BA	65,018- 272- 59-C
UC2BF	32,043- 273- 33-C
UK2AAB	142,603- 894- 59-D
UK2AAG	115,652- 627- 58-D
UK2CAZ	20,132- 265- 28-D
UK2WAF	8240- 172- 20-D
UK2CAU	4770- 118- 18-D

Azerbaijan

UD6DKW	64,125- 475- 45-B
UD6DLJ	49,780- 448- 38-B
UD6DFK	24,990- 255- 30-B
UD6CN	11,858- 137- 22-B
UD6DFD	249,990- 889- 78-C

Georgia

UF6CX	19,944- 275- 24-B

Armenia

UG6GAE	24,750- 390- 22-B
UG6GAI	1048- 54- 8-B
UG6AW	10,820- 46- 13-C
UK6GAA	19,700- 258- 25-D

Kazakh

UL7PBY	105,200- 587- 50-A
UL7OE	42,810- 258- 30-B
UL7OAO	767,165-1646-115-C

Moldavia

UO5SA	126,209- 734- 61-B
UO5ODA	10,816- 290- 16-B

Lithuania

UP2BAO	391,944-1250- 84-A
UP2BAR	54,302- 355- 38-A
UP2NV	597,112-1510-101-B
UP2CY	561,925-1473- 95-B
UP2BAT	68,220- 335- 60-B
UP2BEL	40,920- 401- 33-B
UP2DV	37,474- 300- 41-B
UP2BB	31,746- 344- 33-B
UP2BAD	25,868- 254- 29-B
UP2BBF	23,968- 295- 28-B
UP2BF	19,958- 168- 34-B
UP2BFB	14,832- 351- 16-B
UP2BDX	9660- 132- 21-B
UP2BEB	6855- 201- 15-B
UP2BCT	3225- 93- 15-B
UP2BFU	3141- 149- 9-B
UP2ND	25,440- 282- 32-C
UP2AV	12,272- 169- 26-C
UP2BCD	3685- 149- 11-C
UP2PBW	1616- 100- 8-C
UK2BBK	342,342-1433- 58-D
UK2PAO	136,287- 771- 57-D

Latvia

UQ2GDQ	763,767-1700-113-A
UQ2PJ	13,700- 169- 25-A
UQ2GCP	6787- 126- 19-A
UQ2PP	224,202- 783- 79-B
UQ2OC	135,828- 504- 77-B
UQ2PQ	90,516- 561- 57-B
UQ2GEC	4544- 122- 16-B
UQ2GBJ	1232- 52- 7-B
UK2GKW	1,413,885-2712-123-D
UK2GDZ	483,990-1554- 78-D
UK2GAC	421,855-1382- 85-D
UK2GAB	126,272- 578- 64-D
UK2GBL	75,430- 615- 38-D
UK2GJG	59,819- 456- 41-D
UK2GBN	1106- 32- 7-D

Estonia

UR2REZ	431,340-1300- 84-A
UR2QI	643,599-1813- 99-B
UR2RSA	54,529- 388- 31-B
UR2RHF	16,478- 315- 22-B
UR2OI	4056- 138- 12-B
UR2QD	213,014- 681- 73-C

Zone 30

European Russian S.F.S.R.

UA4HAL	663,816-1702-102-B
UA4HBR	66,670- 327- 59-B
UA4PWF	3396- 90- 12-B
UK4WAB	504,840-1606- 84-D
UK4WAA	24,100- 314- 25-D
UK3TAY	22,428- 253- 28-D

Asiatic R.S.F.S.R.

UA9QAQ	61,902- 362- 38-A
UV9AX	581,716-1397- 92-B
UA9CBM	322,707- 945- 77-B
UA9ADY	229,878- 969- 54-B
UW9AT	220,534- 809- 62-B
UA9NN	113,400- 478- 54-B
UA9WDV	87,945- 525- 39-B
UA9FGJ	70,391- 361- 43-B
UA9CM	68,000- 297- 50-B
UA9CAM	51,065- 300- 35-B
UA9AHS	46,228- 400- 28-B
UA9CKC	42,311- 300- 29-B
UA9SDB	40,544- 346- 28-B
UA9SBM	36,932- 400- 28-B
UA9WEE	36,870- 283- 30-B
UA9ADE	23,782- 259- 22-B
UA9CIH	17,280- 244- 16-B
UA9LBM	5643- 69- 19-B
UA9WCQ	4092- 84- 11-B
UA9MY	320- 18- 5-B
UW9CL	122,590- 582- 46-C
UA9FBC	39,501- 259- 33-C
UK9AAN	2,114,064-3137-159-D
UK9WAA	356,278-1129- 71-D
UK9LAA	198,660- 680- 66-D
UK9CBZ	59,745- 387- 35-D

Turkoman

UH8DC	41,866- 496- 38-B
UH8CS	825- 38- 5-B
UK8BAJ	113,974- 522- 49-D

Uzbek

UI8ZAC	11,377- 142- 21-C
UI8LAF	2048- 57- 8-C
UK8AAA	174,041- 842- 47-D
UK8AAK	24,772- 258- 22-D

Kazakh

UL7MAR	305,775- 889- 75-A
UL7PBI	52,904- 398- 34-A
UL7PQ	41,509- 307- 31-A
UL7LBM	44,695- 317- 35-B
UL7EAH	42,104- 254- 38-B
UL7PBB	31,825- 379- 19-B
UL7TA	30,464- 214- 34-B
UL7CBD	27,782- 272- 29-B
UL7CT	22,990- 276- 22-B
UK7LAA	89,804- 509- 44-D
UK7PBE	2915- 75- 11-D
UK7NAA	512- 23- 6-D

Zone 31

Asiatic R.S.F.S.R.

UA9YCN	28,754- 302- 22-A
UA9OCI	138,603- 687- 47-B
UA9UGA	48,040- 301- 40-B
UW9PT	38,991- 199- 41-B
UA9HM	37,296- 284- 28-B
UA9OFH	33,696- 313- 24-B
UV9PP	73,424- 326- 52-C
UA9ODK	42,126- 309- 34-C
UK9OBI	284,207- 942- 79-D
UK9MDA	26,334- 439- 21-D

Kazakh

UL7GAV	26,541- 222- 27-B
UL7GBP	6804- 86- 18-C

Kirghiz

UM8NNN	10,274- 113- 22-A
UM8MAO	208,254- - 61-B
UM8MBA	58,972- 294- 46-B
UM8MBW	51,720- 438- 40-C
UM8MAU	31,786- 312- 23-C

Zone 32

Asiatic R.S.F.S.R.

UA0ACM	120,257- 523- 53-B
UA0AG	67,650- 319- 50-B
UA0TO	60,065- 407- 41-C
UA0PJ	8920- 107- 20-C
UK0AAB	612,180-1634- 95-D
UK0SAA	244,260-1141- 60-D

Zone 34

Asiatic R.S.F.S.R.

UW0LT	326,854- 916- 83-B
UA0CBW	56,717- 308- 43-B
UA0CCW	59,964- 287- 57-C
UK0LAK	456,456-1578- 77-D
UK0FAA	93,152- - 41-D

Zone 36

Canary Islands

EA8NL	146,146- 413- 73-C

Zone 37

Portugal

CT4OQ	64,305- 413- 45-B
CT1GG	250,496- 910- 64-C
CT1TM	5456- 60- 22-C

Spain

EA2OP	92,273- 459- 53-B
EA7LL	61,863- 311- 51-B
EA2IA	34,844- 281- 31-B
EA7ALG	26,709- 257- 29-B
EA4BV	12,532- 122- 36-B

Balearic Islands

EA6EQ	29,280- 254- 32-C

Zone 39

Jordan

JY4NA	50,400- 281- 40-C

Israel

4Z4TA	7429- 149- 19-B

Zone 40

Iran

EP2RL	358,820- 999- 77-C
EP2II	83,308- 308- 59-C

Zone 41

India

VU2DRZ	73,878- 418- 42-C
VU2GO	67,005- - 45-C

Zone 44

Korea

HL9TP	184,230-1199- 46-C
HL9UD	27,882- 476- 18-C

Zone 45

Japan

JA1IBX	141,060- 531- 60-A
JA6CNL	126,711- 582- 57-A
JA1WAE	74,880- 318- 52-A
JG1ODC	67,116- 302- 51-A
JR1KYC	66,129- 309- 47-A
JA3KMM	62,328- 264- 53-A
JK1BRR	48,300- 324- 46-A
JH2FFR	41,882- 272- 43-A
JA1PCY	41,070- 245- 37-A
JH8KAN	22,707- 626- 27-A
JA2YAC(JE2QIZ,opr)	14,630- 113- 38-A
JH4DRB	10,556- 90- 26-A
JA7UFZ	8788- 91- 26-A
JA4UDP	4431- 55- 21-A
JG1WRN	3568- 121- 16-A
JI1KUV	3496- 40- 23-A
JA0GZ	864- 20- 9-A
JA1KSO	701,864-1336-118-B
JA1YFL(JA0JCJ,opr)	468,778-1136- 94-B
JA0CUV/1	196,664- 718- 62-B
JR1IJV	109,308- 435- 63-B
JA1IDY	74,628- 301- 54-B
JA0YAN	72,981- 325- 51-B
JA9CWJ	69,187- 341- 43-B
JA2UA	62,221- 313- 43-B
KA6DX	48,180- 177- 60-B
JK1LUY	44,462- 250- 43-B
JR3COZ	43,619- 259- 53-B
JA1JCA	40,794- 224- 30-B
JA4CTL	36,036- 277- 28-B
JA1HQS	33,554- 245- 38-B
JG1EEE	30,349- - 31-B
JA2MYA	17,748- 111- 36-B
JF1RPZ	13,468- 63- 52-B
JA3BQU	11,868- 107- 23-B
JA1OP	11,160- 96- 30-B
JF1SEK	9030- 106- 21-B
JA3JF	8316- 62- 33-B
JE2TFR	6969- 85- 23-B
JH0KJF	6727- 55- 31-B
JH2JEV	6669- 57- 27-B
JF3NTS	5724- 62- 27-B
JA3ARM	5321- 55- 25-B
JA3MFE	4900- 46- 25-B
JA1DNZ	3624- 41- 24-B
JR2BDG	2268- 34- 14-B
JE2JML	2028- 43- 13-B
JA3BCT	1856- 116- 16-B
JH7ADR	1290- 27- 10-B
JE3CYH	924- 33- 12-B
JH7WEE	612- 26- 9-B
JA6BSM	596,453-1832- 97-C
JR1WHW	271,880- 904- 70-C
JA7KCD	64,960- 314- 58-C
JA3UB	27,950- 227- 50-C
JA9BFZ	19,628- 149- 28-C
JH1UUT	6854- 134- 23-C
JH4WTE	6375- 295- 15-C
JA0TUV	4991- 45- 23-C
JK1GDD	4239- 250- 13-C
JA6PL	2544- 43- 16-C
JH4UVU	2204- 28- 19-C
JA3XRC	1625- 29- 13-C
JA6JRI	1456- 24- 14-C
JR6CMS	1152- 48- 9-C
JG1RDV	748- 14- 11-C
JA7JGD	495- 21- 5-C
JE2XZY	128- 24- 4-C
JA2GLM	120- 6- 5-C
JE3ABH	9- 9- 1-C
JA3YKC	438,430-1205- 85-D
JA9YBA	370,944-1070- 72-D
JA4YFH	187,734- 686- 67-D
JA7YCQ	111,200- 695- 50-D
JR1YKP	41,250- 233- 50-D
JA4YBU	14,816- 168- 32-D
JA0YCW	13,283- 137- 37-D

Zone 46

Liberia

EL2T	449,534-1244- 73-C

Nigeria

5N2NAS	248,080- 888- 56-C

Zone 49

Thailand

HS1ABD	50,850- 411- 30-B
HS1ALW	14,175- 143- 25-B
HS1ALP	53,268- 298- 46-C

Zone 50

Philippine Islands

DU6EG	13,286- 105- 26-B
WA4MOA/DU2	189,980- 560- 70-C
K9PNT/4D2	35,984- 284- 26-C

Zone 54

Indonesia

YB0ACT	672,358-1295-106-B
YB2SV	221,970- 655- 70-C
YB0BJ	16,080- 118- 30-C
YB0IZ	4966- 116- 13-C

Zone 55

Australia

VK8BG	777,784-1446-119-C

Zone 57

South Africa

ZS6APL	61,060- 287- 43-B
ZS6ABO	191,640- 653- 60-C
ZS5YA(W4LPD,opr)	61,700- 286- 50-C

Zone 59

Australia

VK3CM	19,795- 109- 37-B
VK5WC	165,100- 536- 65-D

Zone 60

New Zealand

ZL1ADI	1,195,191-1990-123-A
ZL1BOQ	93,660- 699- 28-C

Zone 61

Hawaii

AH6A	353,360-1016- 70-B
KH6NO	273,056- 986- 56-B
KH6HC	109,594- 996- 37-B
KH6JTW	64,818- 505- 26-B
KH6GMP	448,366-1106- 83-C
KH6WF	324,288- 920- 72-C

Midway

KM6FC	179,248- 544- 68-C

Zone 62

Western Samoa

5W1BN	482,406-1192- 82-C

Zone 63

Easter Island

CE0AE	193,584- 815- 48-C

Zone 64

Guam

WA9JAZ/KH2	220,720- 751- 62-C
N6OP/KG6	952,442-1814-109-D

Check Logs

DK3OI,DT2ADC,DT2BTO, DM2CBA,DM2CPD,DM2DXO/A, DM2GHL,DT2YLO,DT3CF, DM3EN/DM3SWA,DM3OAA, DT3SQU,DM3VTL, DM4CI/DM2FEI,DM4YSL, DM5JBN/3HN,F2RO,K1ZZ, K8PYD,KP4ERK,LA9GV, LU5EPI,LZ1UA,OH2KI,OH3PB, OK1ARH,OK2BBQ,OK3CAW, OK3EQ,RA9XWQ,SM5CIL, SM5FBL,SP5EAQ,SP7ENU/7, UA1NBD,UA1OAD,UA1ODK, UA1TAJ,UA2FBO,UA3AH, UA3DCY,UA3DEV,UA3DFV, UA3DNC,UA3ET,UA3PAE, UA3PAZ,UA3XBK,UA4LF, UA4YAB,UA4YAZ,UA6AKT, UA6ALD,UA6HZ,UA6JAY, UA6LLE,UA6LXC,UA6YBH, UA9GF,UA9JCA,UA9OFE, UA9SAW,UA9XAB,UA0JDD, UA0LBY,UB5FBC,UB5LAN, UB5ML,UB5QAY,UB5QCR, UB5QDE,UB5WCW,UB5ZBM, UF6FDS,UK2BAS,UK2BAT, UK2BCC,UK3WAB,UK3WAZ, UK3XAK,UK4FAV,UK4UAC, UK4WAR,UK4YYY,UK5FAB, UK5HAB,UK5ICD,UK5JAH, UK9CAA,UK9MAB,UK0AAC, UK0ZAA,UL7DBA,UL7EAJ, UL7EAR,UL7QF,UL7TA,UM8MCA, UP2BV,UQ2GYG,UT5BP,UT5CF, UV3DN,UV3FL,UV9DU,UW0IQ, UY5YY,W2LKH,W4RAL,WA1RDN, WB6WCY,WD9ATB,YO3JX, YO9KAG,DL-237/12237,VK2AOI, FE-7022

Folks That Make The Multis Run

KP4KW(+KP4EHP)W1GNC/PJ2 (+K1s TO XA,K3OX),PY0EMM (PY1ZBJ + PY8AFD),TF3CW (+TF3JB),OH2AA(OH2s BNP BRW),SK2KW(SM2s DLZ OMU HAK HTF,SM0OGU),UK1ZAS (UA1s ZCP ZCR),UK1CAB(UA1s CAW CAX CAY)UK9JAE(UA9s JBC JBJ LU),UK0QAH(UA0s QWN RE),UK0KAM(UA0s KAJ KAP KBO KBP),F6AQO(+F5IN, F6BBJ),G4ENF(+G3s XBN ZQW), DM3GM(DM3s BGM SGM, DT2AGM),DM4DA(DM4s PDA RDA SDA VDA),HB9LP (+HB9BNW),SP6PAZ(SP6s HEK IGQ)SP9BN(SP2ASJ,SP9s AMH JAT UZV),SP2ZHR/2(SP2s FHY GRI HJL),YO4KAK/P(YO4s ATW XF),UK1AAA(UA1s ADN AFN ALZ ARF BX,UW1AE),UK4LAC (UA4s LAD LAJ LAR LAS LM), UK3ACW(UA3s ABD ADY AEZ), UK6HDA(UA6s HCE HEU HFO, RA6HPE),UK5MAF(UB5MDC, UY5LK),UK5QAC(UB5s QA QGL), UK5MBV(UB5s MFR MIA), UK2AAG(UO5s OGU OWH), UK2BBK(UP2s BAS BBB MB), UK2GDZ(UQ2s GEA GHA), UK2GAC(UQ2s GIN GIY),UK9AAN (UA9s ACZ AIS),UK8AAA(UI8s ADR AEG AFA),UK7PBE(UL7s PCU PN),UK7NAA(UL7s NAT NAU NCC),UK0AAB(UA0s ADR AFA,RA0ANN),UK0FAA (UA0FBX,UW0FM),JA3YKC(JA3s ODC WJJ,JH3PKS,JR2SQU,JR3s KEG WJU,JA5TDH),JA9YBA (JA9s DZS GLL LWB,JH1VAX, JH2s FKX HQM,JR2NKG), JA7YCQ(JA7RQK,JG1SLY,JH7s CUU IMX,JI1FLB),JR1YKP JH1AET,JK1RKS,JR1ERU), JA4YBU(JH4s CBM HVA SDI, JR4s BRY DKC),JA0YCW(JH0s BFB CZC DDE ELZ),VK5WC(VK5s AJB ARR MQ OL SZ ZWO), N6OP/KG6(+KG6DX,KH6JSG) HA1KSA(HA1s SK TJ TV TY) HA7KSV(HA7s SH UF)HA4KYH (HA4s YO YQ XX)HA1KYY(HA1s VQ YO)HA1KSL(HA1SL)

Operating News

A Recipe for Space

December 12, 1961 . . . OSCAR 1 is on the air! That short-lived, three-week experiment has set the pace of adventure in Amateur Radio. With two active international satellites in the OSCAR family now orbiting, Amateur Radio operators are learning more every day about operating through linear translators.

Phase III, described in *Getting to Know OSCAR — from the Ground Up*,[1] is just around the corner. Literally thousands of amateurs worldwide have used one or more of the OSCAR spacecraft to extend their horizons and to foster the growth of knowledge regarding vhf and uhf operations. The concept of the future as presented by Phase III gives us reason to discuss better operating habits to be applied to satellite operation, by the user and nonuser alike.

Uplink power levels have become a problem for satellite users. Many times the required effective radiated power (erp) is routinely used by amateurs worldwide. The various satellite managers (K1HTV for OSCAR 7, W9KDR for OSCAR 8, and RS3A for RadioSport) have all expressed disappointment at the irresponsibility demonstrated by a few satellite users who have consistently exceeded the minimum required erp to fully access the spacecraft concerned. This causes excessive battery drain, mode falsing by the spacecraft and often complete shutdown by automatic controls in the spacecraft for protection of output devices. For some time, satellite operating information which has appeared on the facing page, public requests from AMSAT, and bulletins sent over W1AW have all asked that Amateur Radio operators observe the erp limitations. Most satellite users honor this request, but some still exhibit behavior much like a "bull in a china shop."

Full break-in operation is available on all spacecraft, yet many folks just don't use the mode correctly. Once a station hears his own signal in the downlink passband, he should (while still sending) carefully tune around that point, listening for stations calling him. As soon as a station calls, you should stop and reply. Satellites are the best teaching tool that Amateur Radio has in regard to duplex operation. Once you get the hang of duplex QSK you will want to have it to use on all your equipment.

As the maximum usable frequency is pushed higher each day, traffic on the 10-meter band has shown a tendency among phone operators to expand into the 29.3-29.5 MHz segment, reserved by gentlemen's agreement for satellite downlink signals. During several recent international contests, phone stations filled the downlink passband for hours on end. One cannot assume that his signals will not interfere with another's satellite communications just because one does not hear the downlink signal. Your terrestrial signal, running hundreds of times as much erp as the spacecraft, is captured by the ionosphere and propagated over much of the world 24 hours a day. Your signals may pop out several thousands of miles distant, strong enough to render the downlink unusable by stations in a remote part of the world.

General contacts are the most important part of communications through the current generation of spacecraft. The techniques we learn from these spacecraft open new vistas for the future. But don't forget experimentation! All of the spacecraft managers eagerly seek experiments that will extend the knowledge of spacecraft communications. Bulletins are regularly sent on OSCAR 7 and OSCAR 8, and it is quite possible that Phase III satellites will carry W1AW bulletins to remote parts of the world not usually accessible due to propagation.

Seventeen years have elapsed since Amateur Radio's entry into the space age. Recently the Western world was joined by the USSR with the launch of the RadioSport devices. Now that the amateur space program is truly interna-

[1]Available from ARRL.

W1AW Operating Schedule (October 29, 1978-April 29, 1979)

PST	CST	EST	UTC	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
6 A.M.	8 A.M.	9 A.M.	1400 *	Slow[1]	Fast[2]	Slow[1]	Fast[2]	Slow[1]		
7	9	10	1500 *	←		Cw Bulletins[3]		→		
8	10	11	1600 *	←		RTTY Bulletins[4]		→		
1 P.M.	3 P.M.	4 P.M.	2100 *	Fast[2]	Slow[1]	Fast[2]	Slow[1]	Fast[2]	Slow[1]	Slow[1]
2	4	5	2200	←		Cw Bulletins[3]				→
3	5	6	2300	←		RTTY Bulletins[4]				→
4	6	7	0000	Slow[1]	Fast[2]	Slow[1]	Fast[2]	Slow[1]	Fast[2]	Fast[2]
5	7	8	0100	←		Cw Bulletins[3]				→
6	8	9	0200	←		RTTY Bulletins[4]				→
6:30	8:30	9:30	0230	←		Phone Bulletins[5]				→
7	9	10	0300	Fast[2]	Slow[1]	Fast[2]	Slow[1]	Fast[2]	Slow[1]	Slow[1]
8	10	11	0400	←		Cw Bulletins[3]				→
9	11	12	0500	←		RTTY Bulletins[4]				→
9:30 P.M.	11:30 P.M.	12:30 A.M.	0530	←		Phone Bulletins[5]				→

[1]Slow code practice on cw bulletin frequencies, 8 minutes each session; 5, 5, 7-1/2, 7-1/2, 10, 13, 15 wpm.
[2]Fast code practice on cw bulletin frequencies, 8 minutes each session; 35, 30, 25, 20, 15, 13, 10 wpm.
[3]Cw bulletins, 18 wpm, on: 1.835, 3.58, 7.08, 14.08, 21.08, 28.08, 50.08, 147.555 MHz.
[4]RTTY bulletins 60 wpm/170-Hz shift on 3.625, 7.095, 14.095, 21.095, 28.095 147.555 MHz.
[5]Phone bulletins on 1.835, 3.99, 7.29, 14.29, 21.39, 28.59, 50.19, 147.555 MHz.
Please note that all footnoted frequencies are approximate.

Normal W1AW visiting hours are 3:30 P.M. to 1 A.M. seven days a week (local Eastern Time). The station address is 225 Main St., Newington, CT 06111 (about seven miles south of Hartford). Note: ARRL office-visiting hours are 8 A.M. to 5 P.M. Monday through Friday. Maps with local street detail are available upon request. If you wish to operate when visiting, you must have your original operator's license with you. The best time for visitors to operate is on weekdays between 1 and 4 P.M. local time. (Schedules can also be arranged to work W1AW.) The station will be closed February 19, 1979. *Staff:* Chief Operator/Asst. Communications Mgr. C. R. Bender, W1WPR; Chris Schenck, W1EH.

In a communications emergency, monitor W1AW for special bulletins as follows: *phone* on the hour, *RTTY* at 15 minutes past the hour, *cw* on the half hour.

To improve your fist by sending in step with W1AW (but not over the air!) and to allow checking the accuracy on certain tapes, note the UTC dates and QST text to be sent in the 0300 practice from the issue of *QST* two calendar months past: February 2, It Seems to Us; February 6, World Above; February 12, League Lines; February 15, Public Service; February 23, Happenings; February 28, Operating News.

tional, all Amateur Radio enthusiasts should consider the implications of their behavior on the air when in the proximity of satellite uplink and downlink passbands and equally their own "space flavor" when using satellites. Learning is a prime motive of Amateur Radio. Let's give satellites a fair chance to teach us! — *W9KDR and NICC*

SCM ELECTION NOTICE

To all ARRL members in the Alberta, Nevada, Rhode Island, Northern New Jersey, San Joaquin Valley, Canal Zone, Utah, Maryland-DC and New Hampshire sections: You are hereby solicited for nominating petitions pursuant to an election for Section Communications Manager. 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*. No member may sign more than one petition. It is advisable to have a few more than five signatures on each petition.

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

(Place and date)

Communications Manager, ARRL
225 Main Street, Newington, CT 06111

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

SCM candidates must have been a member of the League for a continuous term of at least two years and a licensed amateur of General Class of higher (Canadian Advanced Amateur Certificate) immediately prior to receipt of petition at Headquarters.

Petitions must be received at Headquarters on or before 5:30 P.M. Eastern Local Time, March 9, 1979.

Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on April 2, 1979, returns counted May 22, 1979 and SCMs elected as a result of the above procedures will take office July 1, 1979.

If no petitions are received for a section by the specified closing date, such section will be resolicited in July 1979 *QST*, and an SCM elected through the resolicitation process will serve a term of 18 months.

Vacancies in any SCM office between elections are filled by appointment by the communications manager.

You are urged to take the initiative and file a nominating petition immediately.
John Lindholm, W1XX
Communications Manager

REPEAT SCM NOMINATING SOLICITATIONS

Since no petitions were received for the Saskatchewan and Nebraska sections as a result of notices in July and August 1978 *QST*, nominating petitions for these sections are herewith resolicited. See the above notice for details on how to nominate.

SCM ELECTION RESULTS

Balloting results: In the Eastern Massachusetts Section, Richard P. Beebe, K1PAD, defeated Frank L. Baker, Jr., W1ALP, 817-507.

In the Quebec Section, Harold Moreau, VE2BP, defeated Bruce Balla, VE2QO, 158-134.

In the South Carolina Section, Richard McAbee, W4MTK, defeated William Lawson, WB4MXW and Richard H. Miller, W4OCX, 344-121-99.

In the Western Pennsylvania Section, Otto L. Schuler, K3SMB, defeated J. Richard Hanna, K3VYY, 467-364.

In the Southern New Jersey Section, William C. Luebkemann, Jr., WB2LCC, defeated Raymond F. Clancy, WB2GTE, 316-301.

Uncontested

The following were elected for two-year terms of office beginning April 1, 1979:

Arkansas	S. M. Pokorny, W5UAU
Iowa	Max R. Otto, WØLFF
Montana	Robert E. Leo, W7LR
Northern Texas	Phil Clements, K5PC

	OSCAR 7			OSCAR 8			SOVIET RS		
DATE (UTC)	*Ref. Orbit*	*Time (UTC)*	*Long. W.*	*Ref. Orbit*	*Time (UTC)*	*Long. W.*	*Ref. Orbit*	*Time (UTC)*	*Long. W.*
1 Feb.	19272	0043:43	71.8	4636A	0133:27	65.8	1170	0012:41	23.3
2 Feb.	19285	0138:00	85.4	4650A	0138:40	66.3	1182	0017:21	26.0
3 Feb.	19297	0036:20	70.3	4663J	0000:39	41.8	1194	0020:02	28.8
4 Feb.	19310	0131:38	83.9	4677J	0005:52	43.1	1206	0026:42	31.5
5 Feb.	19322	0030:58	68.7	4691A	0011:05	44.4	1218	0031:22	34.2
6 Feb.	19335	0124:16	82.3	4705A	0016:18	45.7	1230	0036:02	36.9
7 Feb.	19374	0024:36	67.2	4719X	0021:32	47.9	1242	0040:43	39.6
8 Feb.	19360	0118:54	80.7	4733A	0026:45	48.4	1254	0045:23	42.4
9 Feb.	19372	0018:15	65.5	4747A	0031:58	49.7	1266	0050:04	45.1
10 Feb.	19385	0112:32	79.1	4761J	0037:11	51.5	1278	0054:44	47.8
11 Feb.	19397	0011:52	64.5	4775J	0042:24	52.3	1290	0059:25	50.5
12 Feb.	19410	0106:10	77.5	4789A	0047:37	53.6	1302	0104:05	53.2
13 Feb.	19422	0005:30	62.4	4803A	0052:50	55.2	1314	0108:45	56.0
14 Feb.	19435	0059:48	76.3	4817X	0058:03	56.3	1326	0113:26	58.7
15 Feb.	19448	0154:05	89.6	4831A	0103:16	57.6	1338	0118:06	61.4
16 Feb.	19460	0053:25	74.4	4845A	0108:29	58.9	1350	0122:47	64.1
17 Feb.	19473	0147:43	88.6	4859J	0113:42	60.2	1362	0127:27	66.9
18 Feb.	19485	0047:03	72.9	4873J	0118:55	61.5	1374	0132:08	69.6
19 Feb.	19498	0141:21	86.5	4887A	0124:08	62.9	1386	0136:48	72.3
20 Feb.	19510	0040:41	71.3	4901A	0129:21	64.2	1398	0141:28	75.0
21 Feb.	19523	0134:59	84.9	4915X	0134:34	65.5	1410	0146:09	77.7
22 Feb.	19535	0034:19	69.7	4929A	0139:47	66.8	1422	0150:49	80.4
23 Feb.	19545	0128.36	83.3	4942A	0001:47	42.3	1434	0155:29	83.2
24 Feb.	19560	0027:57	68.2	4956J	0007:00	43.6	1446	0200:09	85.9
25 Feb.	19573	0122:14	81.8	4970J	0012:13	45.5	1457	0004:27	58.4
26 Feb.	19585	0021:35	66.6	4984A	0017:26	46.3	1469	0009:07	61.1
27 Feb.	19598	0115:52	80.2	4998A	0022:39	47.6	1481	0013:48	63.8
28 Feb.	19610	0015:13	65.1	5012X	0027:52	48.9	1493	0018:28	66.6
1 Mar.	19623	0109:30	78.7	5026A	0033:05	50.2	1505	0023:08	69.3
2 Mar.	19635	0008.51	63.5	5040A	0038:18	51.5	1517	0027:49	72.0
3 Mar.	19648	0103:08	77.1	5054J	0043:31	52.9	1529	0032:29	74.7
4 Mar.	19660	0002:29	62.4	5068J	0048:44	54.2	1541	0037:09	77.5
5 Mar.	19673	0056:46	75.5	5082A	0053:57	55.5	1553	0041:50	80.2
6 Mar.	19686	0151:03	89.1	5096A	0059:10	56.8	1565	0046:30	82.9
7 Mar.	19698	0050:24	74.3	5110X	0104:23	58.1	1577	0051:11	85.6

Have you listened to OSCAR 8 yet? It is available to anyone with a good-quality, 10-meter or 70-cm receiver. To track it, you'll need an OSCARLOCATOR and the above reference-orbit information (also available on W1AW bulletins). It orbits the earth every 103 minutes; the morning and evening passes occur at approximately the same times each day. Decoding the telemetry from the beacon is a simple matter using the ARRL OSCAR telemetry forms, available from Hq. for an s.a.s.e. When you return it, we'll send you a colorful OSCAR 8 QSL card.

To keep abreast of the latest developments, tune in to the regular phone and cw bulletins over W1AW, AMSAT bulletins transmitted around 29.440 MHz on Mode A, 145.960 MHz on Mode B, during O 7 reference orbits, and AMSAT nets (East Coast at 0100 UTC Wednesdays; Mid States at 0200 UTC; West Coast at 0300 UTC, all on 3850 kHz lsb); (international net at 1800 UTC Sundays on 14,280 kHz usb).

Notes

1) The times and longitudes are for the satellites' first equator crossing each day, which is called the reference orbit.
2) Due to spacecraft problems, OSCAR 7 will not be maintained in any specific mode.
3) All Monday orbits are reserved for QRP use only. Use a maximum of 10 watts erp. Wednesdays are reserved for special experiments. Schedule O 7 experiments through AMSAT, O 8 experiments through ARRL. At no time exceed 10 W erp using RS-RS.
4) The OSCAR 7 Mode B and OSCAR 8 Mode J transponders invert signals. Upper sideband into the uplink becomes lower sideband on the downlink.
5) O 7 progresses an average of 28.737647° W. per orbit in a period of 114.945255 minutes. O 8 progresses an average of 25.808409° W. in a period of 103.229831 minutes. RS period is 120.3925 minutes. RS progresses 30.227° W.
6) O 8 modes of operation are Mondays, Tuesdays, Thursdays and Fridays — Mode A. Saturdays and Sundays — Mode J. Wednesdays are for experimental use on Mode A or J or recharge Mode D. RS transponders are on Saturdays and Sundays for QSOs. Wednesdays are for experiments only.

Spacecraft Frequencies

Spacecraft	*Uplink*	*Downlink*	*Beacon*
O 7			
Mode A	145.850-145.950 MHz	29.400-29.500 MHz	29.502 MHz
Mode B	432.125-432.175 MHz	145.975-145.925 MHz	145.972 MHz
O 8			
Mode A	145.850-145.950 MHz	29.400-29.500 MHz	29.402 MHz
Mode J	145.900-146.000 MHz	435.100-435.200 MHz	435.095 MHz
RS			
Mode A	145.880-145.920 MHz	29.360-29.400 MHz	29.401 MHz

Further information on the radio amateur satellite program can be obtained free of charge from ARRL hq.

Operating Events

FEBRUARY

1: West Coast Qualifying Run, (W6OWP prime, W6ZRJ alternate), 10-35 wpm at 0500Z. The run takes place at 9 P.M. PST the night of January 31. Frequencies are approximately 3590/7090 kHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send to ARRL for grading. Please include your full name, call (if any) and complete mailing address. A large, stamped, self-addressed envelope will help to expedite your award/endorsements.

3-11: Novice Roundup, January, page 87.

3-5: NH QSO Party, two periods starting 2000Z February 3 to 0500Z February 4, and 1400Z February 4 to 0200Z February 5. Sponsored by the Concord Brasspounders, W1OC. Open to all amateurs who contact NH stations once per band per mode. Exchange RS(T) and NH county, non-NH stations send RS(T) and ARRL section or country. (10 New Hampshire counties) Suggested frequencies are 1810 3555 3730 7055 7130 14055 21055 21130 and 28130 on cw, 1820 3935 3975 7235 14280 21380 28575 50115 and 145015 on phone. Awards. Score 5 points for each NH station contacted times the number of NH counties. NH stations score 1 point for each QSO times total ARRL sections and countries. Logs with summary sheet and dupe sheets should be mailed not later than March 12 to C. Halloway, 9 Via Tranquilla, Concord, NH 03301. **FOC Marathon,** open to FOC members only, most activity around 25 kHz up from the low end of cw band. Details mailed direct to members by First Class CW Operators Club headquarters.

4: Ten-Ten International Net Winter QSO Party, January, page 91.

7: W1AW Qualifying Run, 10-35 wpm at 0300Z. This is 10 P.M. EST on February 6. Transmitted simultaneously on 1.835 3.58 7.08 14.08 21.08 28.08 50.08 and 147.555. Other details per the February 1 listing.

10-11: QCWA Membership QSO Party, January, page 91.

11: Frequency Measuring Test, Ten-Ten International Net Winter QSO Party (part 2), January, page 91.

17-18: YL-OM, phone, December, page 88, **2-Land QSO Party,** January, page 91.

18: North American Sprint, from 0100Z to 0500Z on February 18. Sponsored by the *National Contest Journal*. Open to all amateurs. Single-operator stations contact as many North American stations as possible with as many multipliers as possible. (Continental U.S. states, Alaska, Canadian provinces, Maritime [VE1, VO1 and VO2] and VE2 through VE8 as well as 40 different ARRL DXCC countries classified as North American stations for a total of 98 possible multipliers.) Exchange must include both your call sign and the station being contacted, serial number, your name and state/province or ARRL country. Suggested frequencies are 3530-3550, 7030-7050 and 14030-14050. You may contact each station once per band. Stations who call CQ, QRZ or QRZ? must move 1 kHz after each contact before contacting another station or at least 5 kHz before calling CQ again. Team competition of up to 10 stations may be submitted, providing the contest committee is notified in writing at least 24 hours prior to the start of the sprint period. Awards. Disqualifications at discretion of the NCJ Contest Review Committee. Reports must be received not later than 30 days after the sprint to be eligible. Log sheets, summary sheet, dupe sheets and a separate check sheet for each band to Rusty Epps, N6SF, 1030 Bush St., Apt. 6, San Francisco, CA 94109.

21: W1AW Qualifying Run, 10-35 wpm at 2100Z. This is 4 P.M. EST on February 21. Other details per the February 7 listing.

24-25: French Contest, December, page 90, **40-Meter Contest,** sponsored by the FAROUT Amateur Radio Club. Starts 1700Z February 24, ends 2300Z February 25. Open to all amateurs. Work each station once on cw and once on phone. Exchange RS(T), serial number, and ARRL section or country. Operate no more than 24 hours. Scoring count 5 points for each FAROUT club member worked, all others count one point, multiply total QSO points times multiplier for final score. Awards. Logs and dupe sheets must be mailed by March 31 to Frank Stilwell, WB8OFR, 5326 Brainard Dr., Kettering, OH 45440.

MARCH

3-4: DX Competition, phone, January, page 86.

7: West Coast Qualifying Run, (W6OWP prime, W6ZRJ alternate), 10-35 wpm at 0500Z. The run takes place at 9 P.M. PST the night of March 6. Other details under the February 1 listing.

10-11: QCWA Membership QSO Party, phone, **Virginia State QSO Party, Commonwealth Contest,** cw, January, page 91.

15: W1AW Qualifying Run, 10-35 wpm at 0300Z. This is 10 P.M. EST on March 14. Other details under the February 7 listing.

17-18: DX Competition, cw, January, page 86.

24-25: CQ World-Wide WPX SSB Contest, January, page 91.

24-26: BARTG RTTY Contest, from 0200Z March 24 to 0200Z March 26. No more than 30 hours of operation is permitted. Times spent in listening count as operating time. The 18-hour, nonoperating period can be taken at any time during the contest, but off periods may not be less than three hours at a time. (Note times on/off on your entry.) Separate categories for multiop and SWLs, in addition to single op, are 80 through 10 meters. Stations may not be contacted more than once on any one band. Additional contacts OK if different bands used. Multipliers are countries per the ARRL DXCC list, and — in addition — each W/K and VE/VO call area will count as a separate multiplier. Exchange: time in UTC (full four-digit figure), RST and message number (starting with 001). All two-ways with stations within one's own country earn two points, contacts with stations outside one's country earn 10 points; a bonus of 200 points per country worked (including your own). Scoring: two-way exchange points times total countries worked; add to this the total country points times bonus points times number of continents worked. Use one log for each band and indicate rest periods. Logs must contain date/time(Z), calls, exchanges. Logs must be received by May 31, 1979 to qualify. Awards. The judges' decision will be final. Send entries to: Ted Double, G8CDW, 89 Linden Gardens, Enfield, Middlesex, England EN1 4DX.

26: W1AW Qualifying Run, 10-35 wpm at 1400Z. This is 9 A.M. EST on March 26. Other details as shown under January 9 listing.

31-April 1: North Dakota QSO Party, Starts 1800Z March 31, ends 2359Z April 1, 1979. Open to all radio amateurs. Contact North Dakota stations once per band per mode, ND mobile stations can be contacted again each time they change counties. Exchange QSO number and county for ND stations, others send QSO number and state, province or ARRL country. Suggested frequencies are 3560 3775 7060 7125 14060 21060 21150 28060 and 28150 on cw, 3895 7230 14385 21355 28600 and 29005 on phone. Scoring one point for each QSO, ND stations multiply times total multiplier, others multiply times a maximum of 53 ND counties. Awards. Mail log information not later than April 20 to Fargo Repeater Association, WDØCCL, 2826 Evergreen Rd., Fargo, ND 58102. Include a large s.a.s.e. for results. **Canterbury Chapter 10X Contest,** from 0000Z March 31 to 1200Z April 1, sponsored by the ZL3 Canterbury Chapter of Ten-Ten International Net. Open to all amateur stations. Exchange call sign, name, QTH, 10X number (if any). Canterbury Chapter number, and local chapter number if any. Suggested frequency 28800. Score 5 points for working ZL3ACA, 3 points for other Canterbury Chapter members, 2 points for any 10X member and one point for all others worked. Awards. Logs should be posted to arrive by May 15 to C. J. Bramley, ZL3ME, 198 Greers Rd., Christchurch 5, New Zealand.

APRIL

7-8: Open CD Party, cw, **QRP ARC International QSO Party, SP-DX Contest,** cw, **Gagarin Cup Competition,** details next month.

11-12: DX-YL to NA-YL Contest, cw, details next month.

14-15: SP-DX Contest, phone, details next month.

18-19: DX-YL to NA-YL Contest, phone, details next month.

21-22: Open CD Party, phone, details next month, **EME Competition (Part 1).**

28-29: PACC Contest, Zero District QSO Party, Helvetia 26 Contest.

MAY

12: Frequency Measuring Test
19-20: EME Competition (Part 2)

JUNE

9-10: VHF QSO Party
23-24: Field Day

JULY

4: SKN
14-15: Radiosport

AUGUST

4-5: UHF Contest

SEPTEMBER

8-9: VHF QSO Party
16: Frequency Measuring Test

OCTOBER

6-7: Simulated Emergency Test
13-14: CD Party, cw
20-21: CD Party, phone

NOVEMBER

3: Frequency Measuring Test
3-4: Sweepstakes, cw
17-18: Sweepstakes, phone

DECEMBER

1-2: 160-Meter Contest
8-9: 10-Meter Contest

Strays

Stanley Vandiver, WD9ILO, and Susan Jones were married in October in an open-air ceremony on Jacks Peak near Monterey, CA. After the ceremony, the newly married couple walked through an honor guard of Stan's fellow club members with "crossed rubber duckies" instead of sabers. From left to right the honor guard includes KA6DCU, N6AHW, W6OII, WD9BFW, WD6COR, WB6BSY, N6ALS and KA6ACH. *(photo courtesy of Paul Herschaft, WB6PXR)*

Station Activities

SCM ≤ AREC ≤ ORS ≤ OVS ≤ SEC ≤ OBS ≤ TCC ≤ OO ≤ NTS ≤ WAC ≤ CP ≤ A-1 OPR ≤ EC ≤ DXCC ≤ CLUBS ≤ RM ≤ OPS ≤ RCC ≤ PAM ≤ WAS

CANADIAN DIVISION

ALBERTA: SCM, Sydney T. Jones, VE6MJ — SEC: VE6XC. Net Manager (APSN) VE6AFO. Net Manager ACWN VE6BBL. The Northern Alberta Radio Club held a very successful Xmas party on Dec. 2nd. Congratulations to VE6AAG for the job well done. VE6XD is awaiting the arrival of a new rig and is off the air until it arrives. VE6OA now a life member of ARRL. Traffic: VE6CEY 65, VE6AVV 40, VE6AMM 31, VE6AAT 17, VE6CE 8, VE6BBL 7, VE6CJT 6, VE6ABC 6, VE6YW 6, VE6MJ 6, VE6CFQ 4, VE6XD 4.

BRITISH COLUMBIA: SCM, H. E. Savage, VE7FB — British Columbia Net Newsletter ran a questionnaire and the findings are that the net is sound but they could do with an Asst. Net Manager. Manager of the B.C. ARPSC Net, VE7QC, has retired and moving to a new home. Sil's activity with the phone net goes back before 1948. New Horizons Amateur Radio Clubs are a very active group. They are located in Vancouver, Vancouver Island, Okanagan, Vernon, Chilliwack and South Vancouver Island. VE7LL VE7CB VE7PI are south with the snow birds. Traffic: VE7ZK 225, VE7FB 81, VE7COA 37, VE7BLO 21, VE7BOT 19, VE7BLS 10.

MANITOBA: SCM, Peter Guenther, VE4PG — Asst./SCM: VE4JP. SEC: VE4TR. NMs: VE4s NM TE VJ IZ. Cold weather has arrived and with it more QNI on all nets. Gone south for the winter VE4GB is keeping in touch with VE4JA and VE4QJ in Winnipeg. We welcome VE4LM in Thompson to the CW Net. Thank you all for a very good year on all nets and a Merry Christmas and Happy New Year to you and yours. MEPN QNI 1347, QTC 44, 30 sess. MMN QNI 442, QTC 36, 30 sess. MTN QNI 233, QTC 72, 30 sess. WRIN QNI 33, QTC nil, 4 sess. Traffic: VE4PG 90, VE4IZ 60, VE4QU 52, VE4RO 28, VE4TE 28, VE4AED 16, VE4JA 15, VE4FK 14, VE4HR 11, VE4LU 9, VE4ID 8, VE4IX 8, VE4AAD 6, VE4LB 6, VE4NE 6, VE4AX 4, VE4CR 4, VE4IM 4, VE4JP 4, VE4AAU 2.

MARITIME-NFLD.: SCM, Aaron D. Solomon, VE1OC — A/SCM: VO1FG. STM: VE1WF. NPN Mgr.: VO1JN. Silent Keys: VE1AKU VE1BM. Hosp. VE1BAT VE1QU VE1TJ. VE1DI resigned as SEC. New app't pending. VE1WF new STM totaled 89,000 pts. in CD party, winner of Bert Whittaker Mem. plaque. Congrats! VE1s AIP BVN sailing St. Thomas call VE0NEN; co-ord, VE1AUT MAARC rpts. 22 Ama participated in Witch Patrol and Car Rally. VE1RI relates Navy Sub. exp.; VE1IG rpts. on RTTY in C.B. Amateur. VE1ZB appeared on TV, Nat. Am. Radio Wk. VE1ALP 1st V.P. NSARA paid SARC official visit. VE1AJ back on air with brother Vernon as opr. VE1FQ had pleasant visit to Bermuda quest or RSB. SONRA elected VO1FX, pres.; VO1IM, vice-pres.; VO1MG, secy.; VO1CR, treas. VO1CA has 20 mem. in class; VO1OU passed new Adv. lic. VO2BK has re-act. Goose Bay Am. Club — new call VO2CF. APN sess. 30, QNI 124, QTC 59/56. Traffic: VE1WF 172, VE1RO/LCR 95, VE1ST 53, VE1LJ 15, VE1ASW 12, VE1OC 11, VE1YO 5.

ONTARIO: SCM, Larry Thivierge, VE3GT — Asst. SCM and STM: VE3GOL. I am pleased to announce that VE3APK, Oakville has been appointed SEC for our Section. This will be a big boost for ARES activities in Ont. Let's give Charlie the support and assistance he needs to promote amateur emergency communications. VE3ITN will be the new EC for Oakville. Repeater VE3PBO switching over to all solid state. AMSAT Canada has been reorganized with VE2DNM, prez.; VE3AAS, vice-prez.; VE3JDZ, treas.; VE3ACF, secy.; VE3s FUA KHG BNO, directors. New two-letter calls are: VE3DJE as VE3UH, VE3DJF as VE3WP, VE3EFK as VE3CF and VE3ISB as VE3LY. KWARC amateur of the year award goes to VE3CHQ. Presentation was made by VE3IXY at the annual club banquet. New calls in Welland County are VE3s KYP KYO and KYN. Sudbury amateurs participating in the Boy Scout JOTA were VE3s GVH IEE ATM JIJ and GKV among others. VE3FDL, pres. of the Thornhill RAC presented a plaque to VE3ILP, in appreciation of his efforts in forming the TRAC. New Asst. Dir. of the ARRL/CRRL is VE3CDM, former pres. of RSO. Let's see more Ont. amateurs active in future CD contests, we're becoming "rare" DX. BARTG spring RTTY contest dates are Mar. 24-26. Mark your special events calendar for Oct. 14, 15 and 16th, 1979 for the next RSO Convention, in Ottawa and hosted by the Ottawa ARC. Cambridge DX Club sponsoring a very nice certificate to amateurs who effect 5 QSOs with Cambridge stations plus a QSO with the new club call, VE3DM. VE3ISW, NM of OSN has his keyboard keyer working like a charm. Regretfully, I report the following Silent Keys, VE3s BBC EBS and ENV. Rideau ARC manned check points and supplied communications for the Circle V Flying Club during a recent rally. Seaway Valley repeater VE3SVR was used and VE3s KE GVD GNW AJN FHN DPN GUX BKA JRH and VE3IDG were involved. OVMRC long time editor VE3GX stepping down after 15 years in this capacity having never missed an issue nor was the Rambler ever late, quite a record. Traffic: (Nov.) VE3GOL 325, VE3SB 231, VE3JIR 230, VE3KK 212, VE3GJG 148, VE3HGJ 144, VE3DPO 133, VE3GFN 124, VE3JRT 118, VE3ISW 103, VE3GT 79, VE3CYR 59, VE3GNW 59, VE3FZG 50, VE3IMR 48, VE3EWD 43, VE3ATR 40, VE3FHZ 39, VE3ANJ 32, VE3HCS 32, VE3EHL 30, VE3FGU 25, VE3JKC 22, VE3DVE 21, VE3GYD 20, VE3EKF 18, VE3HFS 13, VE3EST 12, VE3JGX 11, VE3FRG 6, VE3GCC 6. (Oct.) VE3AWE 35, VE3FRG 29, VE3IZC 7, VE3APK 4.

SASKATCHEWAN: SCM, P. A. Crosthwaite, VE5RP — It was very nice to have VE5XZ receive the Brass Pounders League certificate. Keith had a total of 185 for his traffic count. I am expecting VE5AE to be the next one to receive the BPL. VE5AE has built a windcharger for his own use. Sounds like a good idea for conserving energy. VE5HG is now Net Mgr. and also Asst. EC. VE5DN is now EC for the city of Saskatoon. Traffic: VE5XZ 180, VE5AE 65, VE5HG 41, VE5RP 20, VE5AAT 4, VE5KF 4, VE5PD 4, VE5LK 2, VE5LN 2, VE5NJ 2.

ATLANTIC DIVISION

DELAWARE: SCM, Roger E. Cole, W3DKX — SEC: W3PQ. STMs: W3WD W3QQ. PSHR: W3PQ 49, N3AKC 47, K3JL 43. AC3T under his former call WB3BNZ finished 1st in Class 2B in 3rd Call Area 1978 FD. "Snowbird" W3WYO is /4 at Titusville FL with W3FEG and W3BSS poised to head south for the winter. XYL KA3BUH is the new ham at the WA3YTB house. 1979 First State club officers are W3EVE, pres.; WA3HDS, vice-pres.; K3YBW, treas.; WA3RYH, act. dir.; WB3HEL, newsletter editor; K3DX, trustee. DEPN: QNI 60, QTC 6. DTN: QNI 387, QTC 107. Traffic: W3PQ 248, N3AKC 135, W3DKX 39, W3QQ 37, K3JL 26, W3WD 23, WA3WIY 20, WB3DUG 17, WB3FUP 9, AC3T 8, WA3DLH 2.

EASTERN PENNSYLVANIA: SCM, G. S. Van Dyke, Jr., W3HK — SEC: WA3PZO. NMs: K3KW K3NGN W3VA W3IAZ. Net repts.: EPAEP&TN QNI 383, QTC 137. PEN QNI 371, QTC 795; PTTN QNI 363, QTC 175; EPA QNI 586, QTC 320; AREC (2) QNI 8. OVS repts K3YD WA3BJQ W3GOA; OBS repts K3NSN W3VA W3ID K3EBZ W3AVJ; OO repts. K3NSN WA3RPG; BPL: W3CUL K3NSN W3VR WA3ZRY WA3WQP; PSHR: WA3JGP WA3JZA W3DP AA3B N3AIU WA3TAV W3GOA. The big guns W3CUL & W3VR still handling FL Shows from this end. WA3WQP eats while on nets can't afford the time! NCS reports are not all coming in to NMs. This holds down EPA totals. WB3JGP is really going all out on tfc. and contests! WA3JZA found a way to eliminate local QRM — buy his gear! WA3JYZ knocked off 65 countries on ten! The time shift back to EST sure makes QRM a problem for a while. N3AIU took this month to rebuild. WB3CAI has arm in sling, 221 cw contacts in contest with straight key! W3ID still plumbing. W3GMK redoing ants. W3EU reports his ant up 30 days and still counting. New officers LVARC N3EX W3JWX N3ACZ WB3HVJ & WB3KDK, no one said who was what! Central Columbia School Dist. ARC WB3GZV, pres.; WB3KZZ, vice-pres.; WB3KRH, secy.; WB3HDN, treas.; K3AKZ, trustee. Hope all of you traffickers had a hand in Christmas traffic especially from out-of-state areas. Also hope ole' Saint Nick went all out for those new items you wanted so much! Will have to await results of the SET to see how it went. PR note — if you have a TVI complaint try to solve it no matter who is to blame. Much better results will be obtained! Traffic: W3CUL 3176, K3NSN 2953, W3VR 763, WA3ZRY 744, WA3WQP 572, K3KW 400, W3BI 366, WA3THT 262, K3NGN 242, W3IPX 146, WB3JGP 141, W3FAF 132, WB3JZA 107, W3DP 88, AD3X 78, WB3JYZ 65, AA3B 64, W3VA 61, WB3GZV 57, WB3BKV 46, K3IAZ 38, W3PD 31, N3AIU 28, WA3TAV 20, K3NB 20, WB3CAI 19, W3ID 17, WA3CKA 16, K3EBZ 7, W3AVJ 3, W3HK 3, WA3BJQ 2, K3YD 2, WA3YDC 2, K3AI 1, W3EU 1, W3GMK 1, W3GOA 1, WA3RPG 1, WA3VDQ 1.

MARYLAND — DISTRICT OF COLUMBIA: SCM, Karl R. Medrow, W3FA — SEC W3HJH is on a short trip to South and West USA. KB3AP formerly WB3KMU is interested in Section Activities. WA3WGO upgraded to Advanced — soon a KB3 — Congrats. OOs reporting W3MR K2SCU/3 W4MLR/3 and W3WBY. W3BHE reports another fox hunt by the Mt. ARC. W3CDQ took it easy this month. WB3CGG completed his happy year as MARA prexy. Tnx to FAR and the AARC for news bulletins. N3FN is coming along fine after his severe heart attack. W0VJD/3 is taking a big load of DC traffic. W3ZNW expects to cover the Eastern Shore thru the new Salisbury repeater. WB3GZU leads the tfc. men this month. N3IT finds the early AM nets are busy places. N3RL opines 3 big contests in Nov. is much! WA3WTK keeps Denton on the map. W3ECN discovered the fun of MDD. W3WBY finds it quiet on the repeater front and not much on 6 and 2, DX wise. WB5FIX/3 will be from Nebr. come April. Murphy accompanied WA3HEM to his new QTH. N3QA busy at work. N3SJ takes a stab at CW now and then. WA3EHK is surrounded by RTTY machines. K3ORW is doing his operating from flat on his back in bed where the doctor put him to rest a pulled back muscle. AD3H is looking for a place to put all his talents to work. AA3S makes quick cross country trips. W3MR visited G and ON on business. W3FZV keeps pluggin' away. K3IU had all the rigs working well in the contests. WB3CES delivers traffic on 2 meters, N3CL was busy in the contests. KA3BHK mans the home rig which is funny because she is a gal! K3ON teams up with WB3ANV to work DX at WA3NAN. With the nets: Net/Mgr. Sessions/Tfc./QNI avg. MDD/W3PQ 60/225/9.9. Top Brass W3PQ N3AKC and W3QQ all Delaware! MEPN/AA3S 23/95/27.6, with WA3ZRY 100%. Others were WD4BIT W3HWZ W3JQN W3LDD AA3S WA2YFM and K3YUC. MDCTN/K3ORW 16/22/21.9 with top honors to WA3ZRY W3DKX K3ORW and AD3H. WR PON/W3DFW 16/22/21.9. MDC/PON/W3OYY 5/13/22.2. Traffic: WB3GZU 209, W3FA 120, N3CL 97, N3IT 80, K3ORW 63, AD3H 56, N3SJ 56, K3IU 55, N3QA 47, W0VJD/3 47, W3FZV 46, WA3EHK 38, AA3S 36, W3ECN 10, KB3AP 8, WB4FIX/3 8, W3WBY 8, WB3CES 7, WA3WTK 5, N3RL 4, W3ZNW 4.

SOUTHERN NEW JERSEY: SCM, Raymond F. Clancy, WB2GTE — Bill Luebkemann, WB2LCC, 116 Country Farms Rd., Marlton, NJ 08053 now your SCM. Send all your reports from now on to him. SJRA: AB2Y, pres.; WA2VYA, treas.; W2TDN, secy. KA2AGU now N2AHM, WB2NBI is N2AHU, WB2LEU is KB2BA, WA2WFY is KB2AR, WA2HSS is AB2X, W2EVD is N2EZ, K2KVT is K2KBT, K2JV is K2JW. Burlington Co. RC: WB2UMQ, pres.; WB2YHA, vice-pres.; W2CSV, treas.; N2VW, secy. New General WA2MND. Advanced N2AEM. WA2KWW flew WB2YMJ & WB2RDT to ARRL in Hartford. SEC W2HOB reports 7 co. ECs reported past month. W2ZI reviews active career. Just wish all the reports were like AA2H's. Did you hear W2OB on 2M? New rigs at KA2BWI KA2BVT KA2BVV. RCA Astro-Electronics ARC members are putting together a 450 MHz Xcvr kit.WB2ONW visits 8P6 Land and receives 8P6KL call. W2AFX gets ARRL 25-year pin. FB! W2JI returns to FL for winter. May 1979 be kind to all the hams in this section. 73! Traffic: AA2H 245, WB2VFT 189, WA2RDT 96, WA2KWW 87, WA2EVL 30, WD3AHO 19, N2AJG 18, WB2UGA 17, WB2GTW 12, K2UL 9, N2FC 7, WB2SQD 6, AG2Y 2, W2PU 2.

WESTERN NEW YORK: SCM, Lonnie J. Keller, WA2AOG — STM: W2MTA. SEC: N2JC. Please arrange to have your Station Activities Reports to me by the seventh of the month. Congratulations to new BARRA officers K2JGI, prez.; WB2CJL, vice-prez.; WB2FTX, secy.; K2GUG, treas. W2EUP, WA2UJR and WA2OLW, dir. Reelected officers of the BADXC were WA2AOG, prez. and WB2YQH, sec/treas. Congratulations to newly upgraded KA2BBD and ex-WA2GNG. WA2OMN visited his hometown Auburn family and friends while vacationing from Aberdeen, Scotland where he is licensed as GM3BVR. WA2CBU and AF2K's early Nov. DXpedition to Gibralter netted 1587 exchanges. They are pleased to accommodate those that worked ZB2EM or ZB2EN and need a confirmation from the Rock. QSL via WA2CBU. WA2AIV gave a talk at Lockport ARA, Squaw Is. ARC and BARA on traffic handling and was well received. WA2ZKD had a VHF DXpedition to RI slide showing at the Auburn ARA and GRAM meetings in Nov. and Jan. WB2BEJ was our rep as Oneida County EC at a special dinner Nov. 30 given by the Oneida American Red Cross Disaster and Communications Unit. WA2MBM WA2SON and WB2ABD presented a talk on DX to the ARATS Nov. meeting. WB2WOQ is signing /4 in FL till after the snow melts. ESS mgr. W2WSS reports QNI up but traffic down for Oct. WA2JKG is now settled in his new QTH and has a new antenna system up. W2ZOJ sends OSCAR and Radiosport satellite orbit info along with WWV/PFB info and forecasts as part of his Mon. thru Wed. OBS assignment on 146.31/91, 04/64 and 147.90/30 in Syracuse. KA2CFK also active as AFP2CFK on the USAF MARS Repeater in Weatherstield. K2DNN back QRV on HF after losing 10 feet of his tower in Oct. Nov. PSHR to W2MTA, N2TW, WA2ZJP and WB2PJU. Traffic: (Nov.) N2TW 321, W2MTA 282, WA2ELD 250, W2RUF 175, WB2PJU 120, W2FR 98, AF2A 76, W2PZL 66, WA2HSB 61, WA2MFV 48, WA2ZJP 38, W2TZ 32, AB2KQS 28, WB2KHT 24, W2ZOJ 19, W2RV 16, AF2K 12, WA2UAR 6, N2DM 4, WB2LMS 4, WA2ZKD 4, WA2AIV 2, KA2CFK 1. (Oct.) WA2HSB 337, W2PZL 66, K2GWN 64, W2FR 56, WA2LOG 6.

WESTERN PENNSYLVANIA: SCM, Otto L. Schuler, K3SMB — STM: W3YQ. SEC: W3VUP. Asst. SEC: WA3LJW. NMs: K3LL W3NEM W3KUN W3MML.

Net	kHz	Time/Day
WPA CW Tfc.	3585.0	7:00 PM Dy
WPAPTN	3983.0	6:30 PM Dy
PA Tfc. & Training	3610.0	6:30 PM Dy

In Penn Township (Westmoreland County) C. D. Disaster Drill Oct. 8, amateurs provided coordinated communications between services involved — this is where amateur radio is tops. Indiana County ARES and RACES participated in a drill and I understand it was successful, also it gave the planners a chance to detect necessary changes to cover problem areas. Amateurs should participate in any drills, walk-a-thons, etc. It provides good practice for emergencies. New club is Alliance College ARA, Cambridge Springs welcome. New Extra WB3DKT, K3KAP now AB3X, WB2IYM is N3ALJ. New General is WB3KFC XYL of N4DR, new Novice is KA3ALV. New officers, Skyview Radio Society; WB3FYP, pres.; W3ICB, vice-pres.; K3VRV, treas.; K3WM, secy.; WA3YNX, RO; W3UKX W3LPQ and WB3BPB, dir. Gtr. Pgh. VHF Society: WB9IHC, pres.; K3RGU, vice-pres.; WA3JBQ, secy.; K3JZD, treas.; N3EE and W3BWU, trustees. Steel City ARC: WA3SYB, pres.; W3WHY, vice-pres.; WA3VXJ, treas.; W3IOH, rec.secy.; W3UUH, corr. secy. More next month. Nov. WPA CW sess. 30, QNI 442, QTC 196, WPAPTN sess. 30, QNI 318, QTC 71, WPA2MTN sess. 30, QNI 560, QTC 177. 73s and thanks for giving me a chance to a full term as SCM. Traffic: W3EGJ 231, AC3N 113, K3LL 97, N3FM 86, W3YQ 80, WB3DKT 77, WB8PAV/3 65, W3SMV 64, WB3EYY 54, K3SMB 50, WA3UNX 34, W3MML 29, WB3IAB 29, WB3GWJ 24, W3SN 18, W3RUL 18, W3AS 18, W3ATQ 15, WA3QNT 15, W3KUN 14, N4NR 13, AB3X 12, N4DR 11, W3EXC 11, WB3GZR 10, K3UA 8, K3CR 4, W3LOD 4, K3HI 2, K3VQV 2.

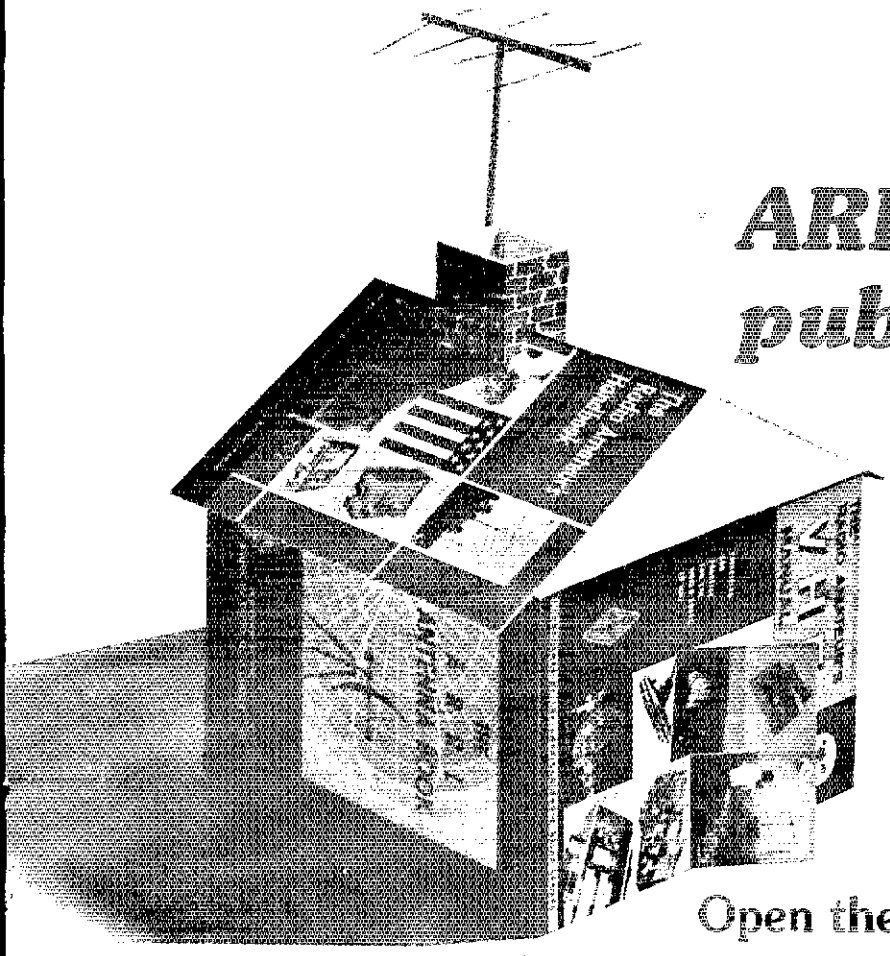
CENTRAL DIVISION

ILLINOIS: SCM, Edmond A. Metzger, W9PRN — Asst. SCM: Harry Studer, W9RYU. SEC: W9AES. NMs: WA8KFK and WB9JSR. Cook County EC: W9HPG.

Net	Freq.	Times(Z)Days	Tfc.	Sess.
ILN	3690	0030/0400 Dy	374	60
Ill Phone	3915	2245 Dy	146	30
NCPN	3915	1200/1700 M-S	215	52
IEN	3940	1400 Su	9	42

WD9DMV scored 360 messages in the SS. K9AXS reports that the W9VEY memorial station had a traffic total of 8. WB9UBN is on two meters with a new Yaesu CPU-2500R. WD9IUE now N9AMF. WA9TWW K9ZWU WD9BBG K9ZWV WD9GDA. WA9MJJ K9USW and WA9RER were elected officers of the Six Meter Club of Chicago. WB9SCR and WD9IUD have upgraded to General and KA9ACU is now a Tech. Our sympathy and condolences to the families and many friends of W9YZR and WA9NFL who recently joined the ranks of Silent Keys. The new officers of the Sterling Rock Falls Amateur Radio Society are: WA9NXE WB9RZQ WA9PBS and WD9EHQ. K9JH spoke on his experiences in undersea craft of WW II at the Nov. meeting of the Moultrie Amateur Radio Klub. Their new repeater receives on 146.055 and transmits on 146.655. WB9SFT WD9CMB WB9PBR WD9IUG N9UN W9IGB WB9MMM and WA9APA were elected to head the new year of the Rockford Amateur Radio Assn. The Princeton area has a new repeater on 146.07/146.67. The Hamfesters of Chicago also elected a new slate of officers which include: WD9IIX, Dan Burba, WD9CYR WB9TZE WD9GKF WB9ZPN K9MDK K9PAJ WD9GVY and K9AKC. K9RZN has a new Kenwood TS-520 rig. New hams in the Illiana Repeater System area are: KA9BUA WD9AFH KA9AVW KA9BVZ WD9IOL KA9CJD KA9APP WB9YLO who is now an Extra Class. W5KLV reports that the CAND had a traffic count of 437 during 60 sessions and that the Ill. check-ins were W9HOT W9NXG and W9JIJ. W9HOT NM of the 9RND reports that their passed traffic was 133 messages with 58 sessions and Ill. participation was 97% with stations W9JIJ W9YCE W9NXG W9HOT and W9RXO checking in. WB9VKC WB9YRH K@MGG and W9LMT are the newly elected officers of the Western Ill. Amateur Radio Club (Quincy). W9JIJ is the only BPL recipient for the month. Traffic: (Nov.) W9JIJ 552, N9TN 248, WA9BSH 242, W9NXG 214, WD9DMV 207, K9BVE 174, WB9JSR 131, WA9KFK 130, W9OK 129, N9DR 123, W9DBS 120, W9HOT 93, K9EED 76, W9KR 66, W9HBI 58, W9LNQ 44, W9OYL 35, K9FW 35, W9PRN 26, W9YCE 25, WA9AQN 19, WA9BFV 10. WD9DSG 10, WD9E8Q 5, WB9RFC 4, WA9UMA 2, N9NA 1. (Oct.) WD9DMV 174.

INDIANA: SCM, J. M. Kell, W9LTU — SEC: W9UMH.



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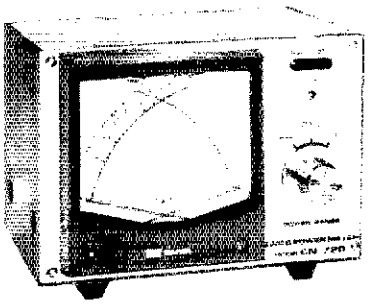

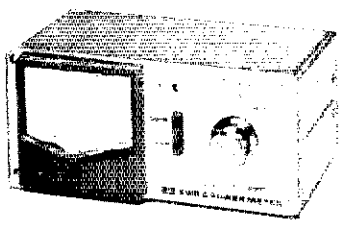

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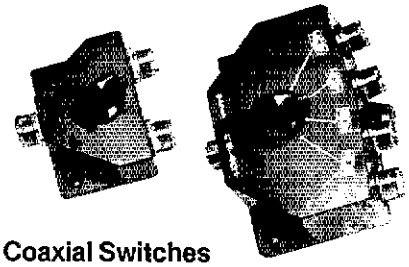

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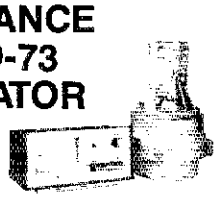

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	12	29.02 "		12	29.42 "
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	18	29.08 "		18	29.48 "
	19	29.09 "		19	29.49 "
	20	29.10 "		20	29.50 "
	21	29.11 "		21	29.51 "
	22	29.12 "		22	29.52 "
	23	29.13 "		23	29.53 "
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	40	29.30 "		40	29.70 "

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Modulation: F3. ± 5kHz dev.
Rec. sensitivity: 0.5uV for 20db quieting.
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Equipment supplied: Mic. w/coil cord/plug, mtg. bracket, pwr cord.

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The photograph, channeling table and brief highlights should provide sufficient details to consider **FM-80** as an investment in added operating enjoyment. Its pricing represents excellent value.

COMTRONIX is presently formulating its national marketing organization and invites inquiries from established dealers/distributors.

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NMs: K9CGS (ITN), W9JUJ (QIN), WB9YXN (ICN), W9PMT (Hoosier VHF). Net time in UTC and freq. in kHz.

Net	Freq.	Time(Z)/Days	QNI	QTC	Sess.
ITN	3910	1330/2130/2300 Dy	3443	489	90
QIN	3656	1400/0100/0400Dy	980	396	88
ICN	3737	0015 Dy	81	27	31
IPON	3910	1300 Su	116	1	120

Ind. was represented 100% in Nov. on the daytime 9RN and CAN. Well done. I believe that's a first. Ft. Wayne ARC elected new officers for '79. WA9RAP, pres.; WB9RUS, vice-pres.; WB9SSE, secy.; K9DC, treas.; WD9BEY WD9DGA K9TUS WB9UJP, dir. Also I'm proud to announce the Ft. Wayne ARC has donated $50 for a receiver/transmitter kit for underdeveloped countries. Let's hear of more. South East Ind. net meets on 3910 kHz at 1830Z on Sun. Boonville repeater on 147.075/875 is up and doing well. That's a reverse split. Seventeen members of QIN met at Ft. Wayne hamfest. Enjoyable time had by all. Hamfest was pretty good too. Sorry I missed it. Afraid to check into a CW net because it runs too fast? Try the 9AM session of QIN. It runs at 10 wpm. Food for thought. Some of the repeaters in Ind. have tone access tapes. I would like to propose putting the latest ARRL bulletins on one of the tapes. This would make the latest news available to hundreds more amateurs at any time of the day. Interested? Contact me for an OBS appointment and help getting started. Now while its still fresh in your mind review your SET activity. Think about how to improve your group's procedure and encompass more local agencies. ECs don't forget your annual report. Traffic: W9JUJ 651, W9FC 239, WB9UYU 151, WB9IHH 121, W9QLW 70, W9XD 70, WA9QCF 49, W9DKP 44, W9TG 37, W9RTH 31, W9DLF 27, W9HUF 25, WA9TJS 25, N9AEI 22, AA9T 17, WA9GJZ 15, WA9OHX 15, N9PS 12, K9TKE 11, K9CGS 10, WB9FIC 9, W9CMT 7, W9BF 6, W9BDP 5, K9FG 5.

WISCONSIN: SCM, Roy A. Pedersen, K9FHI — SEC: W9FZC. NMs: W9AYK K9UTQ W9IEM WB9ICH K9KSA WB9KPX K9LGU K9EN. Nets, freq., time, QNI, QTC, Mgr.: BWN, 3985, 1245Z M-S, 711, 628, W9AYK. BEN, 3985, 1800Z Dy, 556, 45, W9IEM. WSBN, 3985, 2300Z Dy, 1135, 256, K9UTQ. WNN, 3725, 2315Z Dy, 10, 0, WB9ICH. WSSN, Vac. WIN-E, 3662, 0100Z Dy, 329, 182, WB9KPX. WIN-L, 3662, 0400Z Dy, 270, 133, K9LGU. WRN, 3662, 0130Z Sat., K9EN. Wi ExPO, 3925, 1801Z M-F, 535, 25, WA9NIX. K9KBE monitors 13-73 while on duty as State Patrol Officer. WB9HJP monitors 31-91 while on duty at Waukesha Headquarters. WSBN certificate to K9WVM. Watch for ARES conference next Oct. 20, 1979. Plan to attend Central Division Convention June 15-16, 1979. St. Croix Valley ARC swapfest Sat. Apr. 14, 1979. WB9VVH WB9QNK have their Generals. Yellow Thunder hamfest May 19, 1979. WD9AQA is now N9AGE. W9ZGQ made BPL. New officers for WNA: K9LGU, chairperson; K9ANV, secy.; WB9ICH, treas. Any new Novices are invited to check into the Wisconsin Novice Net. All stations are welcome to all the nets. Does your county have an EC? Contact your SCM. WB9IYA is now KB9DZ. Manager for WSBN effective Jan. 1, 1979 is WB9ICH. Manager for WNN effective Jan. 1, 1979 is WB9ZRE. K8UTQ has appointment as STM effective Jan. 1, 1979. Traffic: (Nov.) W9ZGQ 812, WD9COC 398, W9DND 239, W9CXY 219, W9SFL 202, K9FHI 128, W9IEM, 107, W9YCV 103, W9DM 76, AD9X 65, WD9DHF 61, K9UTQ 49, W9AYK 47, K9LGU 44, K9AKG 42, WB9MPF 42, W9IHW 40, WB9YPY 40, WB9ICH 39, WD9AJA 38, W9UW 32, K9AQ 31, K9JPS 30, WB9ZRE 30, WB9JSW 29, W9FDY 27, WB9RRU 25, W9YYL 25, WA9ZTY 25, W9LDO 24, W9TXB 21, N9CP 20, WB9ESM 18, K9KSA 16, K9UU 11, K9ANV 9, WB9GYF 8, WB9YPZ 8, W9VBQ 3, K9ASC 2 (Oct.) W9YCV 63, K9VSO 16, K9KSA 14, WB9RRU 9, KB9CT 9. (Sept.) W9CXY 220.

DAKOTA DIVISION

MINNESOTA: SCM, Helen Haynes, WBØHOX — SEC: WØSA. Minn. Nets.

Net	Freq.	Time/Day	QNI	QTC	Manager
MSN 1	3685	6:30 P	307	123	NØHY
MSN 2	3689	10:15 P	92	45	KØPIZ
MSPN N	3945	12:05 P	444	57	WBØJYT
MSPN E	3929	5:45 P	697	165	WØDUW
PAW	3925	9-12/1-5	3273	277	WAØYVT
MWX	3925	6:15 P	372	285	WBØUKI
MSSN	3710	5:30 P	91	52	AFØO

Attention all amateurs in MN: KØHJC is the newly appointed SEC of MN. He welcomes comments, questions, suggestions and constructive criticism. Thanks to WDØEMB for taking over during the absence of KØPIZ in Nov. Welcome to new ECs KØDEG, Goodhue Co. and NØAHA Stevens Co. KØZBI now an OBS. WAØTGM now AEØM, WDØEKL General to Advance and KAØCJQ a new Tech. Public relations was demonstrated in Nov. which helps to realize that public service can and is done by amateurs. On Nov. 21, WBØQUE and K9MOE/9 assisted in a truck accident on the outskirts of Superior, WI. K9MOE/9 reported the crash to WBØQUE via 52 simplex who then contacted the Douglas County Sheriff. NØAHA, Morris, MN, had an excellent write up in the local paper and was interviewed by several people wanting to know more about amateur radio. Traffic: AFØO 514, WBØQUE 313, WAØYVT 184, WØHKF 178, WAØTFU 172, WAØQIT 168, WDØBFR 121, WØDUW 111, NØHY 101, WBØUKI 95, WDØFSL 60, WBØRCW 52, WBØNZB 48, WBØPKG 48, NØAHA 47, WØRIQ 44, WAØRKV 44, KØCS 43, KØPIZ 35, WBØYUA 32, WBØYMI 29, KØRMX 28, WDØGYQ 23, WØOPX 22, WDØEKL 21, AEØM 16, KØZB 12, WBØSYT 10, KØFLT 3.

NORTH DAKOTA: SCM, Lois Jorgensen, WAØRWM — Fargo Radio Club sponsoring the ND QSO Party Mar. 31-Apr. 1. Details in QST. Forx Radio Club had successful banquet and swaptest with District Director WØGA as main speaker. New Novice at Valley City is KAØCRJ. Novices upgraded to Techs are WDØHOC, WDØHPW and WDØHPU. WØAUH moved from NE to Bottineau, WØBHT to Portal, and WØQC to Kulm. WBØOAJ and WAØVGJ put up antenna for WBØFMM. KØFRP has antenna problems during contests. RTTY enjoyed by KØATK WDØDFT and WAØCRH. Good check-ins on nets:

Nets	kHz	CDT/Days	Sess.	QNI	QTC	Mgr.
Goose River	1990.0	0900 Su	4	45	0	WØCDO
DATA	3996.5	1830 S-S	20	392	80	WBØWSO
YL WX	3996.5	0730 S-S	30	642	569	WAØRWM

Traffic: WAØRWM 908, KØFRP 108, WBØOAJ 9, WAØCRH 83, WØCDO 77, WBØWIB 69, KØGGI 54, NØAF 52, WBØWSO 29, WAØREW 27, WØWWL 26, WBØGJM 1, WØDM 18, WAØJPT 3.

SOUTH DAKOTA SCM, Lydia S. Johnson, WØKJZ — Asst. SCM: WØDVB. SEC: WAØTNM. NMs: WØZW

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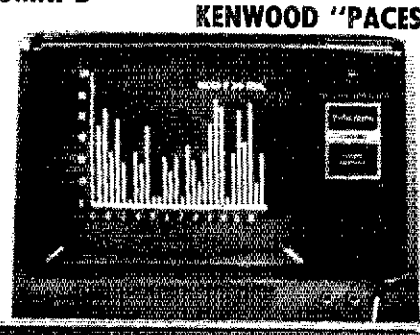

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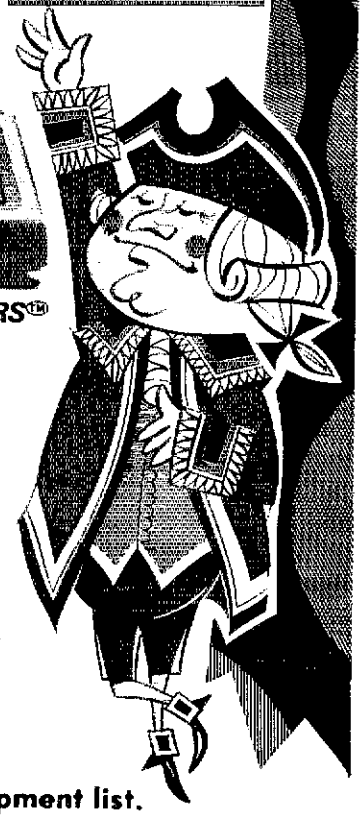

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Conley Radio Supply, Billings

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Communication Center, Lincoln
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Electronic Exchange, Souderton
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Ham Buerger Inc., Willow Grove

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South Carolina
ANR Electronics, Newberry

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WAØTNM WAØUEN WAØVRE WØWE. 2 mtr. Emergency Net Sisseton repeater on 146.28-.88, Wed. at 0300 GMT, NM WDØBMR reports. SFARC voted to sponsor the 1979 ARRL Dak. Div. convention. WØLX Chairman. New Novices WDØAFY KAØBMT CMG. New Techs WDØs EDA EXR FBC. TEN: QNI KØFRE WAØTNM WAØMZA WBØEVQ WDØEMB CXF with 73% rep. New OTS is WDØBMR. Congrats to WØZWL and WØMZI on BPL; TNM for PSHR. Traffic totals nets: WX 668, NJQ 22, Eve 47, SDN 43. Still need qualified OO and OBS oprs. Luck to all in '79! Traffic: (Nov.) WØZWL 678, WØMZI 629, WAØVRE 229, WØDVB 130, KØFRE 95, WDØBMR 53, WØHOJ 34, WØKJZ 22, WDØGVZ 18, WBØEVQ 17, KØZMA 15, WØIG 13, KØDUR 9, KØJV 1. (Oct.) WBØEVQ 26.

DELTA DIVISION

ARKANSAS: SCM, S. M. Pokorny, W5UAU — SEC: WA5VNV. NMs: AD5D W5MYZ W5POH WA5ZWZ. Nets, kHz, Time/Day, QNI, QTC, Mgr.: ARN, 3995, 0030/Dy, 1330, 128, AD5D. OZK, 3760, 0100, 142, 18, W5MYZ. APN, 3937, 1200/M-S, 1026, 62, W5POH. M-Bird, 3928, 2230/M-F, 806, 42, WA5ZWZ. SCARC, 28.7, 82, 6, WD5HJC. NEAWN, 146.28/88, 0130/M-F, 181, 28, WB5WJH. Anyone interested in a Novice net contact WD5CAA Rte. 3, Clinton. OZARK radio class by W5ASD has 15 prospective hams in the making. 12 AREC Ozark members active in Baxter Co. CD test. W5KL visited son W4YE in VA. W5KL worked SS CW and 160 test. Regret to report W5RQT as Silent Key, our sympathy to his family. Razorback Chapter QCWA net Sun. on 3905 at 1900. WB5NDR now chief at new radio sta. K-HAM at Horseshoe Bend. PSHR W5POH 39. OBs WB5WWA 2, W5UAU 2. Traffic: W5POH 42, AD5D 37, WB5WJH 25, W5UAU 20, W5KL 12, K5DW 9, K5BIL 6, WB5WWA 6.

LOUISIANA: SCM, S. T. "Tom" Losey, Jr., K5TL — Asst. SCM: K5DPG. SEC: WB5IYH. STM: N5YL. Net Mgrs.: W5GHP N5ES N5IB N5RB WB5IYH. My wholehearted congratulations to the Amateurs in the Shreveport-Bossier City Area who participated in the emergency procedures because of the tornado damage to Bossier City. The LEN was activated for 22 hours, had 196 QNI, handled 552 pieces of H&W traffic. Super job. Officers for BARC are: K5EOA, pres.; WB5RYD, vice-pres.; WB5SEP, secy.; WD5GDZ, treas. Officers for SELARC are: W5BAV, pres.; W5TJY, vice-pres.; WB5VRO, secy-treas. K5BLV WB5CDX WA5TQA WB5LBR N5EK and WA5JNL all active on DRN5. Officers for SARC are: WB5KFY, pres.; W5VMY, vice-pres.; WD5ELM, secy.; WB5POB, treas. N5AN K5FNQ and WD5DBV have applied for DXCC Award. Officers for GNOARC are K8BN, pres.; WB5UYH, vice-pres.; AA5L, secy.; WB5GDN, treas.

Net	Freq.	Time(PM)/Days	QNI	QTC	Mgr.
LAN	3615	7&10 Dy	510	175	W5GHP
LTN	3910	6:30 Dy	566	121	N5ES
LSN	3703	7:30 M-F	213	32	N5IB
LRN	3587.5	6:30 Su-W	13	10	N5RB
RACES	3993.5	8:00 AM Su	79		WB5IYH
LEN	3910	9:00 AM Su	56		WB5IYH

Traffic: (Nov.) W5GHP 232, WA5IQU 147, N5ES 96, WB5LBR 93, K5TL 89, N5YL 88, N5RB 62, K5BLV 45, N5IB 44, WB5EMU 40, K5DPG 34, WB5USS 21, WB5IYH 20, WA2NYR/5 16, K5ARH 14, KB5AS 8, WD5GJB 8, N5EK 4. (Oct.) W5MI 129. WA2NYR/5 30, N5YL 28, N5EK 14. (Sept.) N5YL 8.

MISSISSIPPI: SCM, E. Ed Robinson, III, W5XT — SEC: WB5FXA. Had fine visit with Vicksburg ARC, activities good! News from Tupelo ARC of good activities, new officers including K5HU, pres. MSN cert. and NCS to WD5GNR. WD5BWI now AI5R, WD5JIO is KB5GJ. WD5JXW upgraded to Tech and welcome back KB5DB (old W5HA). K5FI active with new harmonic (girl, 4 lb. 11 oz.) on Nov. 24. Bob also put on ham demo for college class with good interest and newspaper coverage. Welcome new ham KA5CJA (K5QNE's XYL). CAND (W5KLV) sess. 60, QTC 437, DRN5 Rep. 100% by WD5GNR. CGCHN (WD5BDC) sess. 30, QNI 1906, QTC 217. MSBN (K5WSC) sess. 30, QNI 2376, QTC 104. MTN (K5OAF) sess. 15, QNI 166, QTC 48. MSN (WA5IDF) sess. 15, QNI 91, QTC 13. MN (WA5JWD) sess. 26, QNI 588, QTC 19. Jackson Cty. AEN (WD5CDI) sess. 19, QNI 219, QTC 10. Capital AEN (WB5SNB) sess. 4, QNI 76. Traffic: K5OAF 200, WD5GNR 62, K5AKM 46, WD5BVY 37, WB5SNB 32, W5EDT 22, W5XT 21, WB5YGQ 16, WA5IDF 14, WA5OKI 11, WB5NGF 3, WD5CSU 2.

TENNESSEE: SCM, O. D. Keaton, WA4GLS — Asst. SCM: WB4PRF. SEC: WB4DYJ. STM: W4ZJY. WA4KHJ has been appointed an OTS. N4UC reports the late TN doing well and invites more participants. W4ZJY is doing a great job as STM, give him your support, he requests all NMs to get your net reports to him immediately after the end of the month. TNN certificates have been awarded to WD4SEB WD4LHN & KA4DTA. New officers of the BMRC & KARC are: N4AEO, pres.; WD4NMQ, vice-pres.; KARC, KB4JM, vice-pres.; BMRC, WD4IME, secy-treas.; KARC, WA4ZUQ, secy-treas. BMRC, WA4IVG, act. chmn.; WB4MLN, editor Zero Beat Newsletter. Congrats to Sevier County Amateur Radio Club upon their affiliation with ARRL. CW Nets report 80 sess., QNI 564, QTC 228. Phone nets report 132 sess., QNI 5230 & QTC 671. This is another reminder for you to support your local clubs and encourage your club to join and support the Tenn. Council of Radio Clubs; this is more important than you may realize. WB4NFI has been appointed NM of the ETTMN & OTS. The RATS club of Nashville is now meeting at Nashville Tech. Bldg., join them there. Traffic: AF4T 289, K4FSK 282, WA4NIF 221, WB4PRF 189, K4CNY 142, WB4GZF 77, W4ZJY 57, K4XE 56, WB4BKF 50, WB4YPO 31, WB4ZSZ 28, WA4GLS 17, WA4DKC 16, W4VJW 14, W4TYV 10, K4VM 10, K4WOP 9, K4DEC 7, K4AMC 6, WA4WVW 5, WB4EOE 4, W4PSN 4, K4UMW 4, W4RUW 3, W4SGI 2.

GREAT LAKES DIVISION

KENTUCKY: SCM, Ted Huddle, W4CID — SEC: WB4ZML. BPL: K4TXJ. Nov. Nets:

Net	QNI	QTC	Net	QNI	QTC
KRN	385	45	KYN	193	61
MKPN	1082	121	K8N	117	40
KTN	1334	197	SEKEN	53	1
KPON	48	2	CARN	217	11
5DARES	41	3	4DARES	27	7
6DARES	64	6			

Louisville RACES conducted a Ham Radio demo at a shopping mall and handled over 250 messages. K4AVX reports the Hazard Repeater has a new antenna for expanded coverage. The Lexington Repeater has been moved to a new site and is now back up to snuff. New officers of the Bluegrass ARC are: WB4FQU, pres.; WD4LWH, vice-pres.; WA4RCD, treas.; A4AA, secy. W1UCL and WB4AUN have new rigs while WA4CDB and

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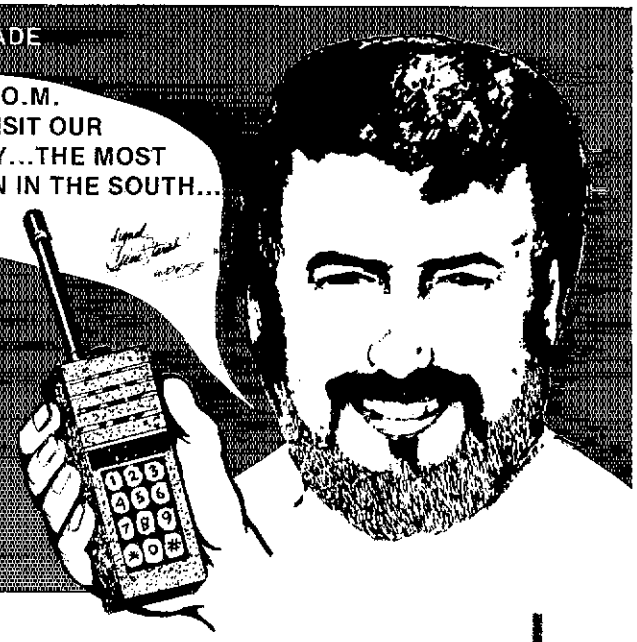

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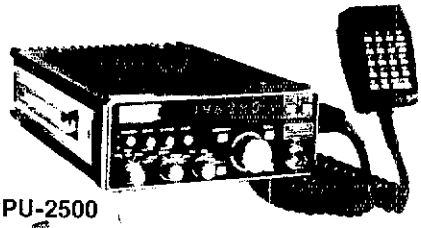

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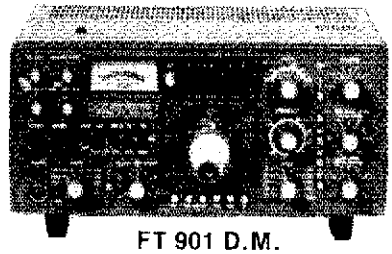

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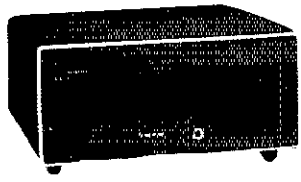
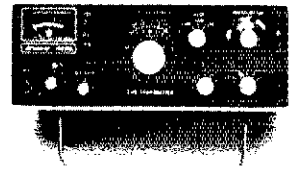


HF-700S



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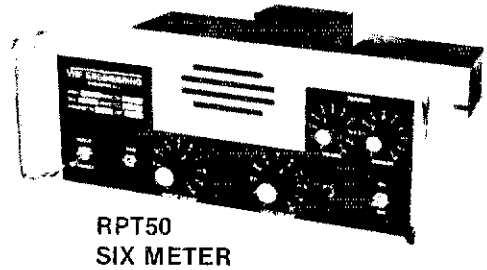

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K4HRF are now Extras. Traffic: K4TXJ 244, WD4ITJ 107, WA4AVV 137, WB4NPD 96, WD4KBG 64, W4CID 56, W4HKT 56, WD4LXX 55, WA4EBN 51, WA4UIH 41, WA4JAV 38, K4HOE 35, WB4RRI 32, WB4ABE 29, K4HRF 28, WA4IGS 27, K4AML 24, WD4CQF 24, K4AVX 23, WA4FAF 21, WA4EFG 21, WB4AUN 19, WA4YPQ 18, WA4DMH 16, WA4AGH 13, W4CDA 10, WD4OAM 8, KB4CF 8, WB4RIT 6.

MICHIGAN: SCM, Stanley J. Briggs, W8MPD/K8SB — Asst. SCMs: WA8DHB W8SOP. SEC: WA8EFK. STM: WB8MTD. NMs: K8LNE KB8AI K8RV K8KMQ WB8YDZ WD8LSV.

Net	Freq.	UTC/Day	QNI	QTC	Sess.
OMN*	3663	2300/0300 Dy	1295	401	89
MiTN*	3953	0000 Dy	609	295	30
GLETN	3932	0230 Dy	1221	287	30
MACS*	3953	1600 Dy	964	219	30
UPEN	3922	2230 Dy	794	119	34
MNN*	3722	2230 Dy	299	86	30
WSSBN	3935	0000 Dy	742	57	28
BR	3930	2230 M-S	400	36	24
ARES	3932	2230 Su	98	19	4
MEN	3930	1400 Su	170	5	4
SEMTN	147.60	2330 Su	26	0	8
VHF Local Net: 10 reports			599	24	39

*NTS Section Nets. About 30 amateurs including ECs OTS and others interested in emergency communications and traffic work attended the U. P. edition of the ARPSC Workshop in Escanaba. The Great Lakes Emergency and Traffic net held a Radio Rally with 44 members reminiscing about the early history of the net. The STM and the liaison officer for the section traffic nets are conducting weekly seminars on procedures after the Wed. MiTN (3953 about 7:30 P.M.) Welcome to our newest affiliated club: The Chelsea Amateur Radio Assn. Club elections; Genesee Co. RC: AC8T, pres.; 1st: WB8IEK, 2nd: WD8CBP, 3rd: W8WXO, 4th: WD8CCG, vps: WA8JND, secy: K8KMQ, treas. Saginaw Valley ARA: K8DO, pres.; W8IJS, vp; WD8POK, secy.; N8RW, treas.; K8OT WB8PLO W8HZF, bd-at-large. New appointments: VHF Net Mgr.: WD8LSV. Please send local net reports to him. EC for Clare Co. WD8JFF. OTSs: WA8YVR WD8BDF WA8DHB N8AOA WA8OAF. Reports: OO: W3GQJ/8 WB8IKJ K8JH. Stations reporting traffic went over 100 for the first time! Traffic: (Nov.) WB8MTD 232, K8KMQ 228, WD8KZX 226, W8VPW 218, WB8YDZ 215, K8RV 210, WD8NKA 200, W8MPD 178, K8DTG 151, KB8BZ 117, N8ABA 113, WD8DMX 101, WA8DHB 92, N8AKY 89, WD8NYN 88, AF8V 78, K8LNE 73, WB8YIG 71, WB8WYO 71, WD8CSA 63, WB8ITT 63, KB8AI 60, WD8LRT 60, WB8TTA 59, W8YIO 59, W3GQJ/8 57, WB8AXI 55, WA8WZF 54, W8IHX 53, K8DD 51, WD8BSF 49, W8LCU 48, WB8YRY 48, WD8MCN 45, W8SOP 41, W8DSE 35, K8DYI 34, W8IDT 34, W8HIN 32, WA8MAM 31, WB8SYA 28, K8ZJU 27, W8DYH 26, N8ACL 26, K8GXV 24, WA8QAF 24, WD8BDF 23, KB8FK 21, K8UPE 21, W8VIZ 21, W8WVL 21, W8RNO 20, AC8F 20, WB8POL 20, WB8DJS 18, AC8Y 17, N8AOA 16, WA8YAN 16, WB8QYU 16, WA8AXF 16, WD8EGO 14, W8GUP 13, WB8HSN 12, KB8BS 12, WA8VBZ 12, W8TBP 12, WA8FXR 11, K8JED 11, K8AXL 10, K8QBZ 10, WB8UUJ 9, W8PVB 9, WA8VBF 9, W8HKL 9, W8SCW 9, WB8NCD 9, KA8CPS 8, WB8AFO 8, W8PBO 8, WB8UZM 8, WD8LSV 7, W8DT 7, W8CUP 7, WD8OKU 6, WD8PAF 6, WA8PIM 6, W8LDS 6, WA8WVV 6, W8WOJ 6, WB8VAI 6, N8AFZ 6, W8QFQ 6, WD8PZS 6, KB8GC 5, WA8EOW 5, WA8MDK 4, KA8CUT 3, W8FSZ 2, WB8IEK 2, WN8NII 2, K8CN 1, WB8GKB 1, WB8HPZ 1. (Oct.) K8KMQ 176, W8LCU 10, WA8EFK 3, WB8VVF 2.

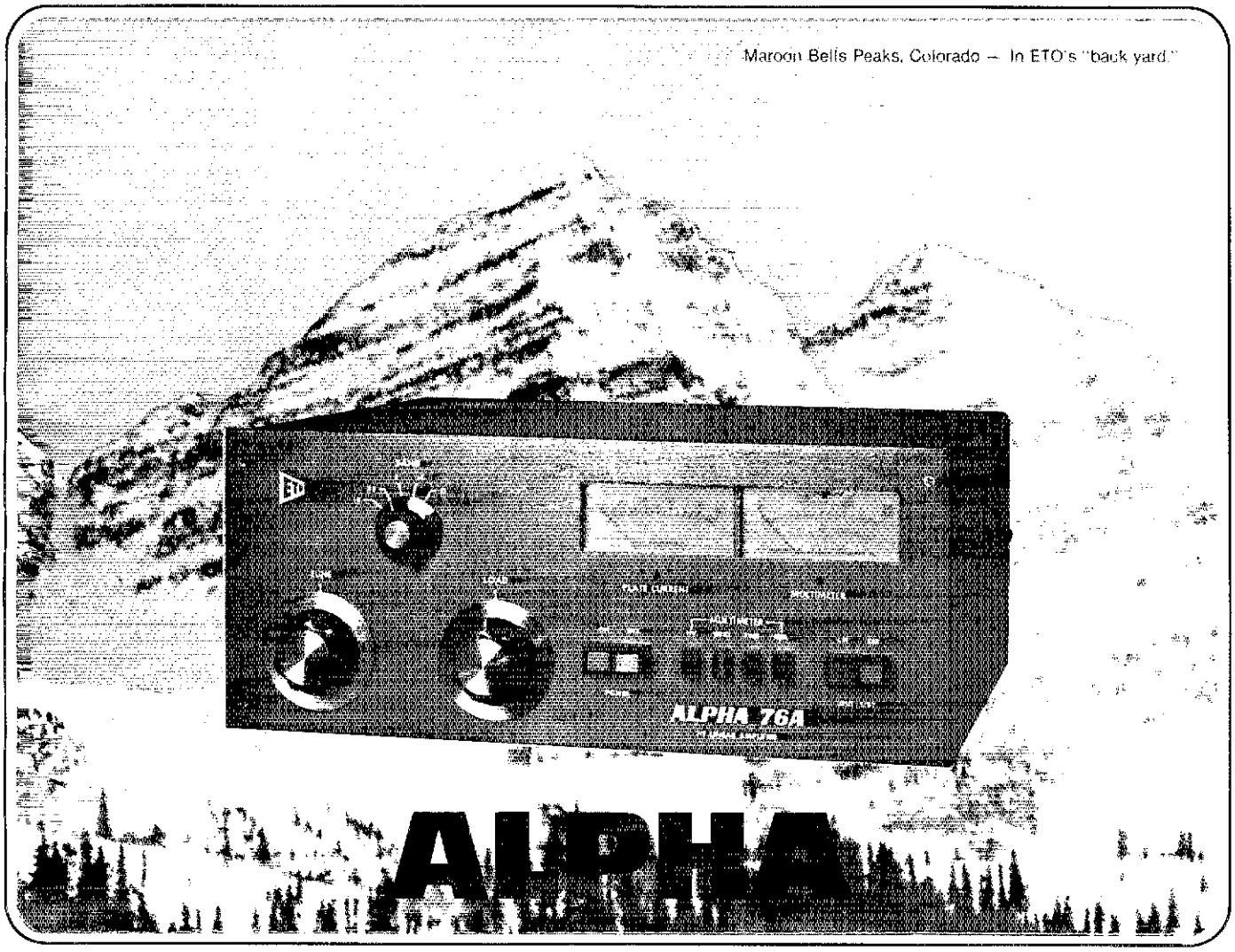
OHIO: SCM, Harold C. Chapman, WB8JGW — Asst. SCMs: WA8MCR W8TP N4VV. SEC: K8AN. NMs: N8CW W8DIL WB8KWD K8OZ WA8SSI WB8WTS. Net reports (Nov.)

Net	QNI	QTC	Sess.	Time(Z)	Freq.
OSN	239	95	30	2310	3.577
OSSBN	2714	724	90	1530/2115/2345	3.9725
BNR	116	277	30	2300	3.605
BN	493	255	56	0300/2345	3.577
O6mN	351	51	30	0200	50.160
ONN	112	83	28	2330	3.708

By the time this column is read the first session of SET '79 will be history. Your participation has been enjoyed and appreciated. Let's start planning now for Oct. Support your EC, the ARPSC-ARES programs and amateur radio in general. Sometime in Mar. we will hold an ARPSC workshop, probably on a Sat. in Central Ohio. All ECs and traffic operators will be involved in common and separate sessions. You will be advised details by letter and/or announcements on the nets. Your attendance and participation will make the meeting complete. JOTA-21 provided many Boy Scouts the opportunity to view Amateur Radio during their "Jamboree on the air." Many groups reported participation, interest was shown in equipment, QSL displays and traffic handling. What an ideal opportunity to create interest in our hobby among the young! Let's plan for next year with a follow-up on the scouts participating. Get them involved with hopes of retaining as many as possible in the hobby. Continue to get reports of contributions to the fund for supplying low cost transmitters and receivers to Third World countries. BN certs issued WD8QMP and K3RC. Upgrades to Extra: WB8BGX WD8LIU/AF8O. Appointments: OES: K8NU; OO: WB8KKI; OTS: K8PE WD8DOS WD8OYK W8UPH WB8AYC WA8ZNC K8DL W8RG WA8MHO WA8MCR W8EK W8QZK WD8BZD WA8YIB W8TH WD8LOL W8QIL K8OZ WD8DIP WB8QMQ WB8KXV WB8UBR N8VT WB8INY W8LT WA8MAZ W8OUU W8JMD; OVS: W8LT WB8JTS. Champaign-Logan County net now meeting 3914 kHz Sun. 2 PM. Van Wert Co. Emergency Net QNI 34, QTC 2 in 4 sess. BRTN QNI 218, QTC 45, sess. 30. Traffic: WB8KWD 484, W8PMJ 413, K8AAZ 288, W8ENI 230, WA8HGH 200, K8OZ 187, WB8WTS 152, K8BYR 134, W8TH 126, N8CW 103, W8DIL 102, WB8UBR 95, K8KWO 93, WA8RQQ 88, WD8QMP 82, W8JMD 77, WB8SIQ 74, WB8SRC 74, WD8DTG 73, WB8JGW 72, W8MGA 72, W8OZK 72, WB8OMQ 71, WD8KBW 64, W8TP 63, K8ONA 55, WA8GMT 52, WB8CJU 45, WA8SSI 45, AF8A 39, W8WEG 39, W8DCX 36, K8FE 36, WB8TRK 34, K8BFS 28, WB8YTI 28, K3RC 28, N4VY 26, WD8MEK 25, WB8QHV 23, W8LZE 20, W8MOK 20, W8RG 20, K8CKY 17, WD8KFN 17, WB8GVI 16, K8HLJ 16, WB8PIY 15, W8BYGW 15, N8JR 14, K8DL 12, WA8MHO 12, WD8PEI 12, WA8TSX 11, WD8CTX 10, W8EK 10, W8IMI 10, WD8QZM 10, WB8LWY 9, WB8MRL 9, W8BHL 8, W8DYF 8, AB8P 7, K8PE 7, KB8GM 6, WB8MKC 6, WB8VLR 6, W8IM 5, WB8VZX 5, WB8UJM 4, WD8EKI 3, WB8HMI 3, WA8MAZ 3, AF8O 3, W8UPH 3, W8QCU 2, WB8KKI 1, WA8ZNC 1.

HUDSON DIVISION

EASTERN NEW YORK: SCM, Guy L. Olinger, K2AV —



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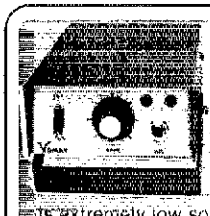

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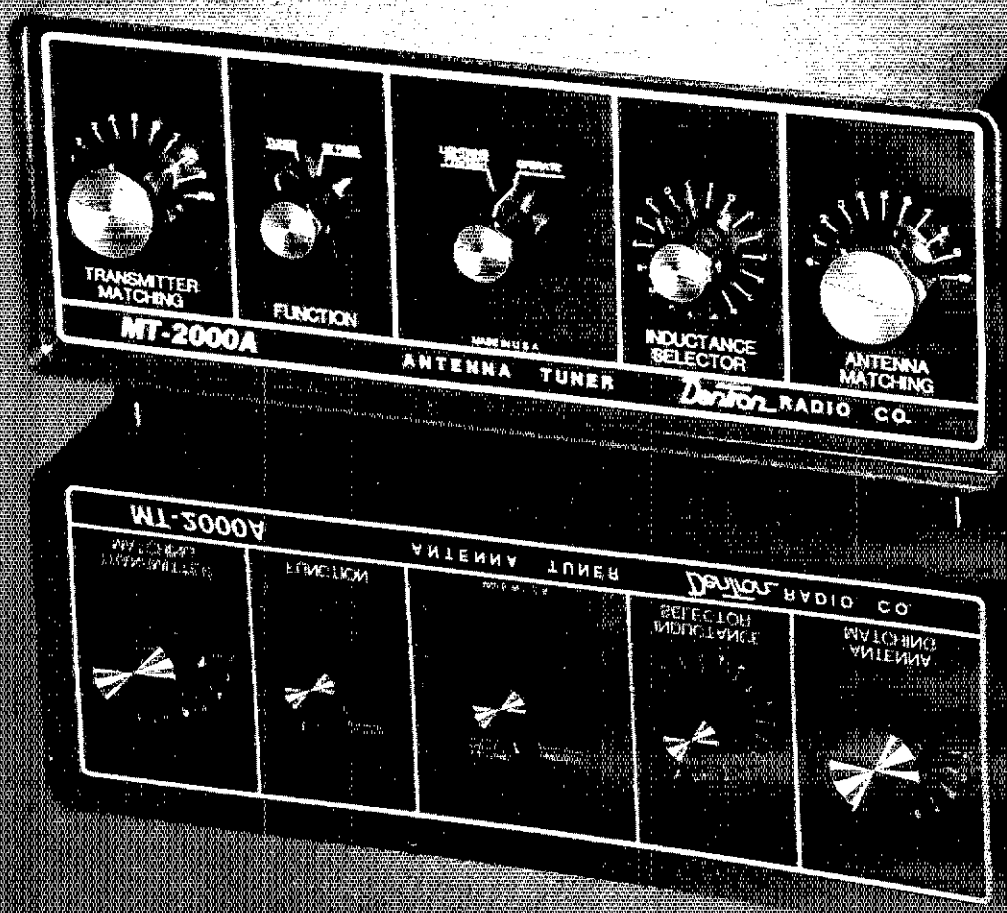

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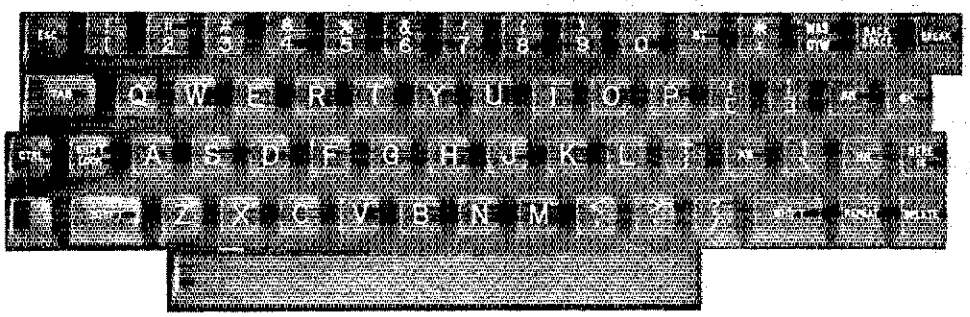

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ASCM/SEC: WB2VUK. ASEC: K2AYQ. STM: WA2SPL. NMs: W2CS W2WSS. Nets: NYPON 5PM 3913; ESS (slo) 6 PM 3590; NYSPTEN 6 PM 3925; NYS 7 & 10 PM 3677; SDN 9:30 PM M-F 147.66/06. Congrats to N2TW new asst. mgr. for NYS to spell W2CS when Gary's out globetrotting. Blush Dept.: after carefully describing schedule for stuff in QST, putting season's greetings in wrong month's col. O my . . . New OM/YL Extra Class combo in Albany Club, WB2SHB & WA2SHH. New Novices a year ago. Have it from reliable source that WB2SMR auctioned the suit off his back again at AARA Nov. Auct. Some say he had to be restrained from selling off the grounds, cars in the parking lot, etc. Albany ARES sponsoring a Novice Class at Cohoes firehouse with 35 attending. W2UU & WB2CQK going on dream cruise in 46-ft. ketch from Taiwan 1st week Feb. Look for them /MM fone/cw up 25 from band edges & in 10/15M Novice band. N2EF stalkin 'em on 40M in DX test with 90W & dipole. (Did|a beat out 'PV Bob?) Definition corner: Iron Man — certain op with traffic total over last 12 mo. . . 930 431 355 550 867 737 679 846 791 806 735 782. We regret to report the untimely passing of WB2JAT, aged 16, son of the late K2CQG. Nov. PSHR WB2EAG WB2KDC WA2SPL. BPL: W2YJR WA2SPL. Traffic: WA2SPL 782, W2YJR 496, WA2OTC 140, WB2EAG 109, WB2KDC 94, W2BIW 80, WA2EQW 58, N2EF 51, WA2ZSG 47, WA2MKQ 30, K2HNW 16, WA2ENM 14, N2JK 13, WA2CJY 12, W2AFU 10, WA2FFX 4.

NEW YORK CITY — LONG ISLAND: SCM, John Smale, K2IZ — The following are traffic nets in and around the section:

Net	kHz	Time/Day	Mgr.
NLI*	3630	1900/2200 Dy	WB2EUF
NLI Phone*	3928	1730 Dy	WA2UWA
NLS*	3728	1745 Dy	WA2UWA
ESS	3590	1800 Dy	W2ESS
NYSTPEN	3925	1800 Dy	WA2RSP

*Denotes Section Net, all times are local, please try to help out by checking in. It's hard to believe that this is my last column after five years. Don't forget to send your report to WA2UWA now and if your club has an empty month on the schedule and you need a speaker, why not invite WA2WUA and get to meet your new SCM. New officers for LIMARC are: WB2ALW, pres.; K2MZ, vice-pres.; W2NL, secy.; WB2DXD, treas.; N2FE W2KPO WB2RYC W2TRP WA2WKV WB2BON K2UDT, dir. W2ZAI is moving out to CO. WA2SUB is now the new EC for the town of Babylon. Beach Channel H.S. ARC, with the help of WA2CBZ, now has a ten-meter beam — a Hustler 4BTV and 15 and 20-meter dipoles. Starting in the spring, they will be giving classes in the B.C.H.S. Adult Ed Center. K2GCE spent an enjoyable Thanksgiving with his brother-in-law in Maryland. Welcome to newly affiliated Kingsborough (Community College) ARS in Brooklyn. K2UB is recovering nicely and will be up and around soon. W2LH and W2EEO had as their house guests 4Z4JT and his XYL. W2GXT and W2GLB held an open house for their guests 3D6AC and 3D6AD. WB2IMX has a new kW amp on the air. A lot of local clubs now have their own jackets with the club's emblem on it. Officers for Grumman ARC are W2DKM, pres.; W2CJN, vice-pres.; WB2QDT, secy.; W2INJ, treas.; W2ZVJ, trustee; W2ZUN K2UAT WA2FGB K2CNE K2MC, board members. Welcome to 2 new Novices from Grumman KA2CWS and KA2CWT. Congrats to W2ZZE now an Extra, and W2FIB is now a Life Member with the ARRL. WA2VOS transmits his OBS sked on Mon., Wed., and Fri. on 21.150 at 2030 local and N2ABD is conducting a slow-speed net on Thur. evenings at 2100 local on 21.125, speed is about 8 wpm. Traffic: (Nov.) K2GCE 71, K2LIE 59, W2GP 21, W2DBQ 10, K2IZ 10, N2LI 10, WA2MIT 4, WB2TWY 4, K2UB 2. (Oct.) K2GCE 105, WA2CZY 28.

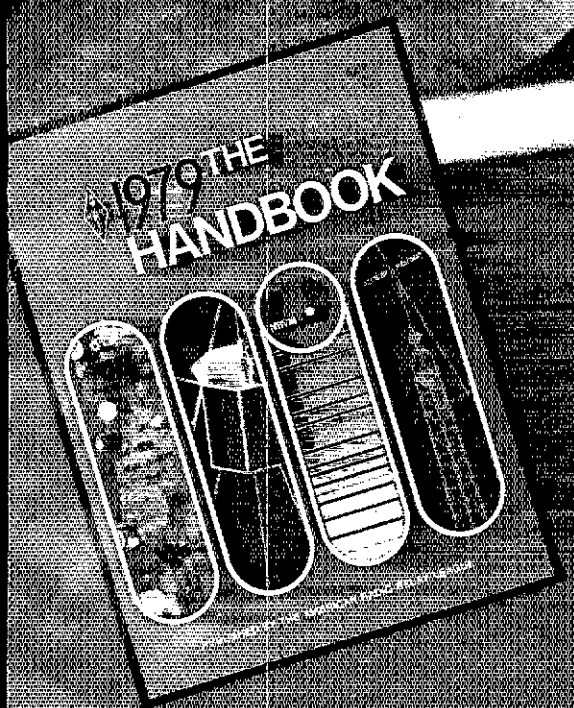
NORTHERN NEW JERSEY: SCM, Bob Neukomm, WA2MVQ — STM: W2XD. SEC: WB2VUF. NMs: W2XD WA2LHV K2VX.

Net	Mgr.	Freq.	Time/Days	Sess.	QNI	QTC	QSP
NJN	W2XD	3695	7:00 PM Dy	30	462	274	187
NJN	W2XD	3695	10:00 PM Dy	30	293	251	143
OBTTN	WA2WIM		Dy	30	327	119	102
NJPN	K2VX	3950	6:00 PM Dy	30	598	329	271
NJPN	K2VX	3950	9:00 AM Su	4			
NJSN	WA2LHV	3735	7:00 PM Dy	29	107	13	2

WA2SNA the 550 Club station meets Sun. at 0130Z on 49/49. N2AAU to General, W2LVT and AI2K to Extra. The following became grandparents AG2N, KB2EW and WA2MVQ. 550 Club elections: K2BJG, pres.; WB2ARS, vice-pres.; WB2JUO, secy.; WA2UPK, treas.; W2TFM & WB2ARS, vice-pres.; WB2JUO, secy.; WA2UPK, treas.; W2TFM & WA2HLE, trustees; W2PSU, RTTY; WB2LBP, ATV; N2AAZ, VHF DX Contest; WA2HLE Trng.; W2BCC, chmn. election comm. K2YDH to Advanced. KA2CNY/NY new Tech and her OM gave her a Tempo S1 synthesized HT for her "purse." WA2DLZ enjoying a new Wilson SY-2 especially on 10. Local SET scheduled for Jan 13/14. WB2WIM experimenting with simplex & repeaters. WD2AKR at 11 years is youngest NJN/NJPN member who made PSHR in 2nd month of tfc. handling. Mark your calendar for the Tri-County "Flea Market" May 20th. Nice copy of Dec. TCRA newsletter received and its noted that WB2RNJ will talk on "Operating Procedures in Contests and Operating Events" on Jan. 8, 1979. Welcome the "Panasonic Amateur Radio Club" who meets in Secaucus, NJ. WB2MCB upgraded to Extra and is retaining his old call! He also reports he has completed requirements for WAS/WAC. WA2UDT put up new Oscar antennasiquagis on 2/432. He is working a lot of CW on 10/15 and qualified for WPX award. I regret to announce W2OK is a Silent Key. Traffic: (Nov.) WB2RMI 576, K2VX 249, AF2L 240, W2CQB 182, W2XD 96, WA2LHV 73, WA2MVQ 73, N2NS 73, WD2AKR 61, N2IC 56, WB2HSG 49, WA2OVE 45, WB2WIM/T 43, W2UEZ 34, WA2NPP 35, W2SWE 34, K2SE 33, WB2RMJ/T 27, W2ZEP 26, W2CC 18, N2GJ 18, W2UH 12, WB2KLF 11, K2ZFI 10, WA2DLZ 6, WB2CNF 4,WB2KAK 4, W2KB 2, W2ODV 2. (Oct.) W2CQB 123, K2SE 22. (Sept.) K2SE 16

MIDWEST DIVISION

IOWA: SCM, Max R. Otto, WØLFF — Last month I reported WØKLC recovering. I regret to report he is a Silent Key. Burlington has a replacement repeater. Mahaska Co. forming a disaster group. WDØFEW has new 55-ft. tower complete with TH3MK3 plus twenty-two elements on 2M. WBØRAT and KAØCAW sharing new TS-520S. WØSXK has new Icom 701, and KØGP a new Wilson MK-IV. WØSJ adds a SM220 scope. The Amateur Radio Auction at Sioux City went well. KØLGI needed only 31 minutes to find the fox in Cedar Rapids. Congrats to WBØZPY on becoming Advanced. Nishina Valley Club presented WBØSRT with new Ringo Ranger. WBØVRQ/R



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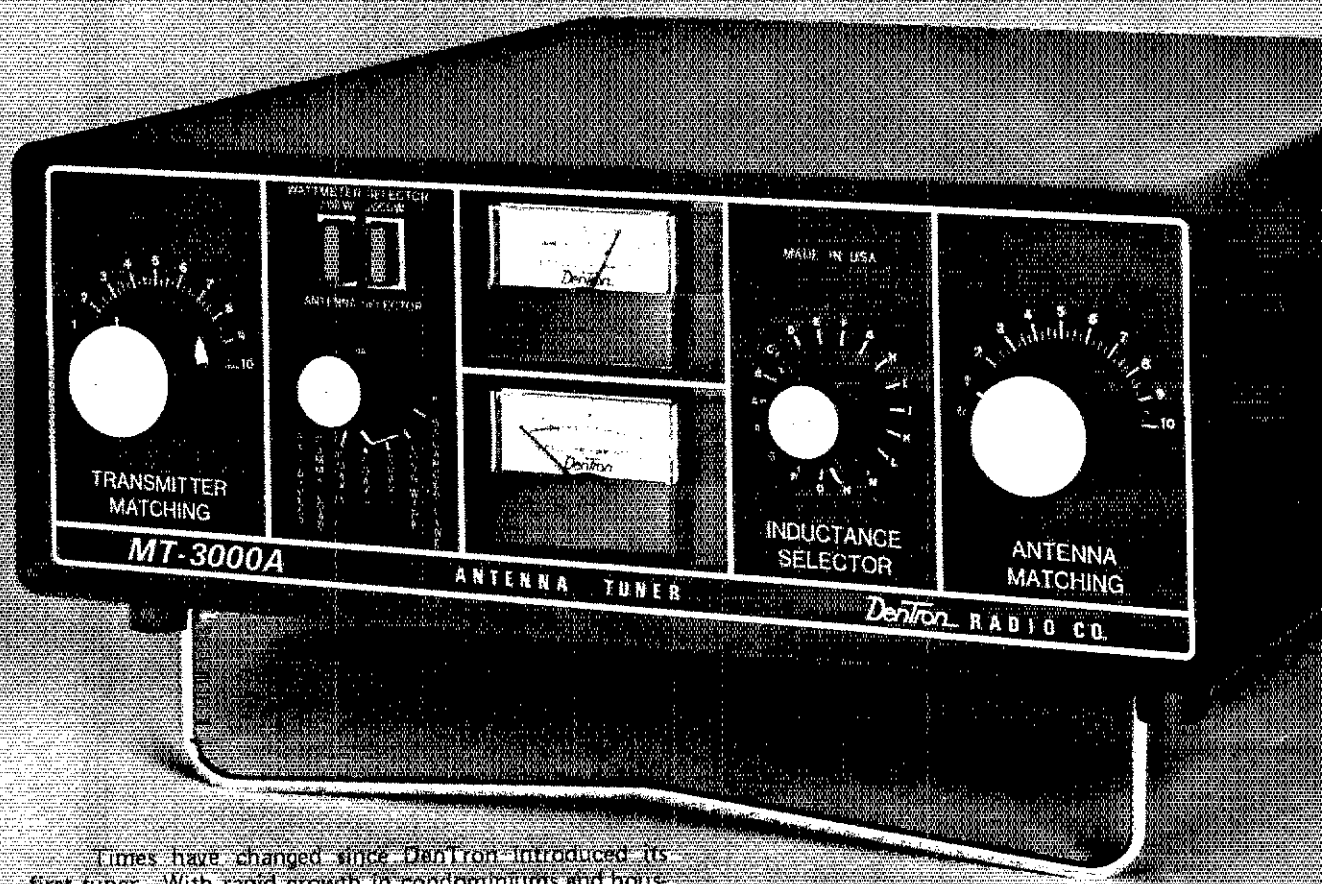

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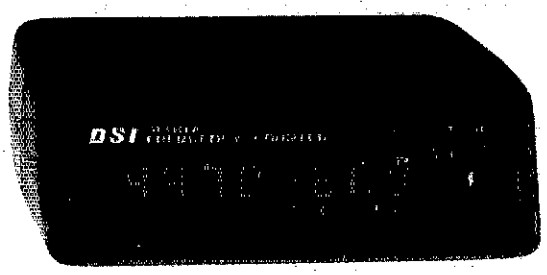

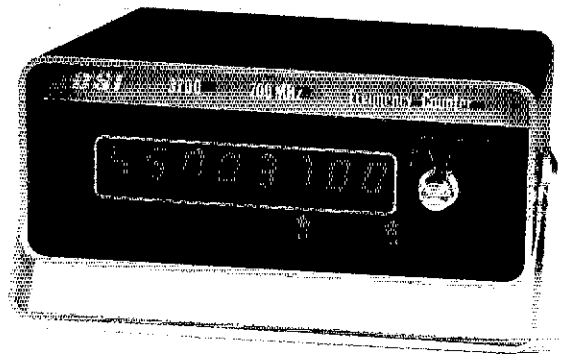

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3700	50Hz - 700MHz	Proportional Oven .2 PPM 0° - 40°C	10MV	10MV	50MV	8	.5 Inch	115 VAC or 8.2 - 14.5VDC	3"H x 8"W x 6"D
3600A	50Hz - 600MHz	Oven .5 PPM 17° - 37°C	10MV	10MV	50MV	8	.5 Inch	115VAC or 8.2 - 14.5VDC	2¼"H x 8"W x 5"
3550W	50Hz - 550MHz	1 PPM 65° - 85°F	25MV	25MV	75MV	8	.5 Inch	115VAC or 8.2 - 14.5VDC	2¼"H x 8"W x 5"

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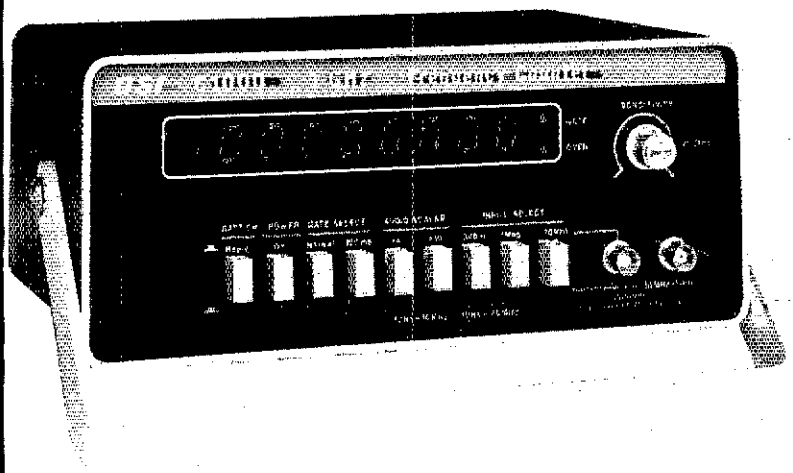

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MODEL C700 50Hz to 700MHz

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- **INCLUDES BATTERY PACK**
- **AUTO ZERO BLANKING**
- **AUTO DECIMAL POINT**
- **10MHz TIME BASE**

ALL NEW! All UNPARALLELED DSI QUALITY! The model C 700 700 MHz frequency counter features . . . **.2 PPM** 0° to 40° C proportional oven time base . . . 25db preamplifier with a 60db adjustable attenuator. Built in battery charger with a rapid or trickle charge selector . . . Combined in a rugged (.125" thick) aluminum cabinet makes the C700 ideal for the communication industry and professional service technician.

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Model	Frequency Range	Proportional Oven Accuracy Over Temperature	50Hz To 75MHz	75MHz To 500MHz	500MHz To 1GHz	Number Of Digits	Size Of Digits	Power Requirements	Size
C700	50Hz to 700MHz	.2PPM 0° to 40°C	50MV	10MV	NA	8	.5 Inch	115 VAC-BATT 8 to 15VDC	3"H x 8"W x 6"D
C1000	10Hz to 1GHz	.1PPM 0° to 40°C	20MV	1MV	>50MV	9	.5 Inch	115VAC-BATT 8 to 15VDC	4"H x 10"W x 7½"D

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Ant. 210 Telescopic Ant./BNC Adapter	**$11.95**

is on 147.96/36 in Iowa City, Denison moving to 147.69/09. The Muscatine PD got help from K0HCD K0IIR WB0MEW K0EPD WA0AUQ WD0COW KA9AQR AB0M WB0YRN WA0VUS WD0GEP WA0DOW WA0KGH and WB0GTQ with vandalism patrol. K0MM ARRL Contest Advisor can probably be persuaded to come to your club. Congrats to WB0AXU for leading the single ops in VHF contest. W0SS AE0R W0YLS N0SM WB0NSS K0EVH WB0UPF K0FLY and WB0PYD gave Iowa 100% on NTS-TEN and again WA0AUX all alone gave 95% to DTRN. Celebrate Ground Hog Day with sausage.

Net Mgr.	Freq.	Time(Z)/Days	QNI	QTC	Sess.
Iowa 75M WA0VZH	3970	1830 M-S	1285	121	26
Iowa 75M W0YLS	3970	2330 M-S	938	80	26
TLCN W0YLS	3560	0030 Dy	313	116	60

Traffic: (Nov.) WA0AUX 479, W0SS 187, W0YLS 182, AE0R 105, WB0NSS 43, K0GP 36, WD0GDL 34, WD0FEW 24, W0LFF 22, K0OFI 9, W0BW 8. (Oct.) N0CT 6.

KANSAS: SCM, Robert M. Summers, K0BXF — Election of officers for the coming year will be the topic for most clubs this coming month of Dec. Be sure and drop your SCM the list of new officers elected. The Air Capitol ARA elected WB0QGC, pres.; AA0G, vice-pres.; WA0ZBL, secy-treas.; WB0ODQ, members. Congratulations to new ARRL affiliated club Miami County ARC, from Osawatomie. The new 147.63/.03 repeater now on the air. The Lawrence gang is to be congratulated on winning the first place prize at the festival held in Baldwin recently. The Johnson Co. RAC is getting ready for QRP — going to build a bunch of "Sardine Senders." Central KS ARC setting up message booth in Mall for holiday traffic. Have you exchanged bulletins with the Topeka gang? New bulletin "Transceiver" is a fine publication. W0KL reports 866 members are registered in the ARES program. Are you one of these? Traffic: K0EZ 210, W0OYH 163, W0AM 89, WA0LBB 76, W0FT 53, W0FIR 47, W0IX 44, W0FDJ 32, K0BXF 23, WD0ESF 23, W0RBO 18, W0ZUX 13, W0PB 12, KA0BUT 8, W0RT 8, W0KL 7, K0YTA 7, N0IN 3.

MISSOURI: SCM, L. G. Wilson, K0RWL — Asst. SCM: Joe Flowers, W0OTF. SEC: WB0FKY. W0BMA had a traffic total this month of 755. His entire count was handled on cw. The new officers for the PHD club for the coming year are: WB0AUW, pres.; WB0MPH, vice-pres.; WA0VHZ, secy.; WB0OCW, treas. Congratulations all. W0HH gave 4 lessons in proper traffic handling during METN sessions. WB0WGG has proposed a new 6-meter repeater for the Ozark-Springfield area. Here's wishing a speedy recovery to the XYL of W0GCL who recently had surgery. W0JXT is retiring and moving from Kansas City to the Rolla area. WB0AXO N0AJI and WA0SOK set up operations in a trailer in the Shepherd Park in Liberty, MO and participated in a recent Boy Scouts JOTA. At this time it appears the Kansas City DX Club will show an impressive score in the recent contests.

Net	QNI	QTC	Net	QNI	QTC
METN	202	79	HBN	330	16
MEOW	399	75	NEMOE	89	0
MOSBN	886	56			

All stations are invited to give suggestions to the SCM as to what they would like to see in print. Please be sure to let me know of any goings-on you would like to have written up in QST. Don't forget to report your traffic. We know there are a lot of stations out there and we'd like to hear from them. Congratulations to the following licensees: Novice: KA0s CLY CMA CMF CMJ CMK CMN CMV CNB CNC CNG CNI CNL CNR CNU COD COE and COM. General: WD0HVC N0AMR and N0AMV. Tech: KA0AUU and KA0AVK. Advance: WB0AXO WB0RKS and WD0BWY. Traffic: (Nov.) W0BMA 755, W0HH 392, K0ONK 341, WB0VHN 94, K0SI 93, W0OTF 82, W0QUD 64, K0SSN 48, N0WM 47, W0QAU 18, K0RWL 15, W0GBJ 9.

NEBRASKA: SCM, Ed O'Donnell, WB0GWR — The PM Net again holding regular sessions. The 160-Mtr weather net back in operation. Congrats to the Lincoln ARC on reaching a membership of 233 this past year, also the club again assisted in a successful Toyathon in Dec. Using Repeater WR0AEV (146.25/85), members were dispatched to pick up toys. Net reports: 160 Weather Net, QNI 496, QTC 3; Cornhusker Net, QNI 1192, QTC 24; Mid-Nebr. ARES 2-Mtr Net, QNI 248, QTC 0; Nebr. Morning Phone Net, QNI 1359, QTC 63; Nebr. ARES 75 Mtr. Net, QNI 171, QTC 0; Nebr. Storm Net, QNI 1424, QTC 23; Pawnee ARC 2 Mtr. FM Net, QNI 155, QTC 0; Platte Valley 2 Mtr Net, QNI 51, QTC 0; PM Net, QNI 283, QTC 40; QCWA Net, QNI 58, QTC 0; WESTern Nebr. Net, QNI 562, QTC 13. Traffic: W0VEA 98, K0BRS 45, WA0CBJ 31, WA0PCC 31, W0HOP 28, W0VYX 25, W0ZNI 18, W0EUT 14, W0HTA 14, WB0NFG 13, W0FOB 12, WB0GWR 9, W0RJA 8, W0GEQ 7, WB0GMQ 6, W0WHY 5, WA0BOK 4, W0NIK 4, K0ODF 4, WB0TEX 4, WA0QEX 4, WB0GAK 3, WA0OQX 3, W0YFR 2, WA0AHV 1, WA0LOY 1.

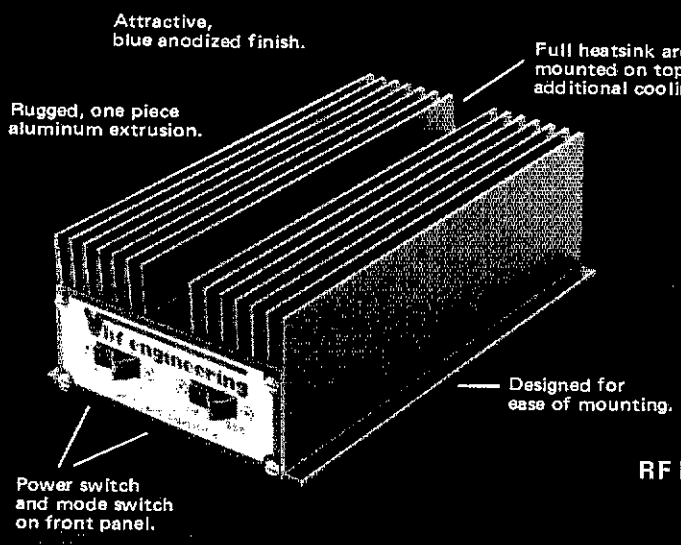
NEW ENGLAND DIVISION

CONNECTICUT: SCM, Bill Pace, W1ID — SEC: W1XX. STM: WB1AIU. NMs: K1EIC K1EIR WA1ELA WA1LOU.

Net	Freq.	Time/Day	Sess.	QNI	QTC
CN	3640	1900/2200 Dy	60	239	254
CPN	3965	1800 M-S 1000 Su	30	495	162
WESCON	78/18	2030 Dy	30	631	131
Nutmeg	28/88	2130 Dy	30	481	102

High QNI: CN — W1KV W1EFW K1GF. CPN — W1NQO AD1O W1HMJ. Congratulations in order! W1XX new Communications Manager at Headquarters. Thanks to W1WEM for mimeograph donated to be used for WESCON newsletter. Much excitement and participation in weather reporting system. Info being passed on to public via TV-3 in Hartford. Attention clubs; your SCM needs your newsletters. Congrats to FARA — their newsletter judged best in New England for 1978. GBVR, who flies the skies more often than a Canada Goose, is a sometimes NCS on WESCON. Recent appointments: W1HAD and WB1ASH as OTS. Nice to hear all the activity during Conn. QSO Party sponsored by CARA. And a job well done, as CARA members provided communications during a Military Reenactment of Conn. Valley Forge at Putnam Memorial State Park. Avid DXer, N1UN, tells of a couple of DX nets you may not know about, in Dec. issue of the Squelch Burst. The 285 net on 14.285 at 0440Z, and the 10-meter DX net on 28.510 at 2100Z. K1EM braves the cold to put up a new quad! Go get 'em Clem. Nice to be close to Headquarters. A group of ops journeyed to Newington to operate W1AW during the

Don't depend on your antenna to do all the work...



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BLC 2/70	144 MHz	2W	70W	174.95
BLC 10/150	144 MHz	10W	150W	269.95
BLC 30/150	144 MHz	30W	150W	249.95
BLD 2/60	220 MHz	2W	60W	164.95
BLD 10/60	220 MHz	10W	60W	169.95
BLD 10/120	220 MHz	10W	120W	269.95
BLE 10/40	420 MHz	10W	40W	159.95
BLE 2/40	420 MHz	2W	40W	189.95
BLE 10/80	420 MHz	10W	80W	289.95

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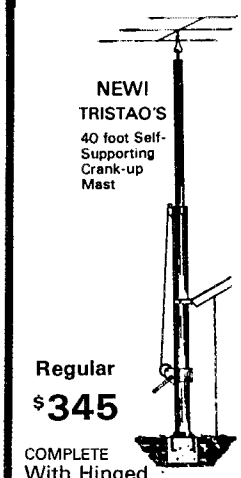

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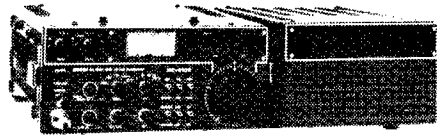

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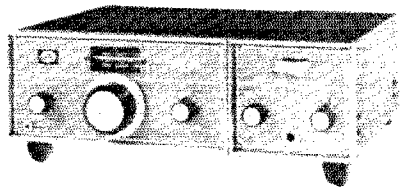

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first weekend in Dec. They logged close to 2,000 contacts, and made a lot of U.S. and DX stations happy. Need Net Rosters? For CN and CPN ask K1QQG or WA1HYN. For Nutmeg and WESCON ask W1DPR. Your SCM, SEC, STM and Net Managers are all willing to speak at your club meetings. Don't be afraid to ask! Traffic: K1GF 560, W1EFW 294, WA1HYN 189, AA1G 116, WA1ZMK 104, W1OD 99, WB1DGR 84, WB1CPF 83, W1BDN 70, WB1AIU 59, K1DFS 53, K1AQE 43, WB1ASH 38, W1KV 37, W1JA 35, W1RLV 35, N1ADE 34, W1JTD 26, WA1LOU 21, WB1AIE 18, W1GVT 17, W1BDI 16, W1QV 4, W1VS 3.

EASTERN MASSACHUSETTS: SCM, Frank Baker, W1ALP — Asst. SCM: WA1OWQ. SEC: W1AOG. STM: WA1ZAZ. W1PAD now in Hendersonville, NC, and on 20. South Shore ARC had meeting. W1NF will be 85 in June. T9 Club met at Marty's Steak House in NH. W5VRD is ex-W1KXQ in W. Bridgewater. K1KYB went to NYC and met her 3 brothers WA1YXM retired. W1GXT active on 10 FM mobile. The 10-10 chapter Minute Man met at Valle's in Brookline, W1FFT, chmn. NEEPN had 55 QNI, 19 QTC. W1AFD got married, went to Hawaii. Silent Keys: W1JCX W1DXN W1NR WA1QIJ K1BRF K4BJS ex-W1DGM K1OZO W6GWD. KA1AHD wrkd K2SQM in VE1-Land on 2 repeater. WB1s DJP FAY now Generals. W1XA and Foxboro ARC helped out for 26-mile Marathon. WA1VMU had TS-820, watch out W1MX. AVCO ARA and Sturdy Memorial Hospital ARC, now affiliated with ARRL. W1UOH in FL for the winter, has HW-12A on 75. W1HY in Wareham for the winter and on 2. Our STM sent out a bulletin to all Nets, give him your support. K1UN EC for Needham, says they have 220 machine on 222.360/223.960. W1UN returned from 4Z4-Land and has a CX11A from Signal 1 in Phoenix. K@JHH spoke at the Quanapowitt RA. WA1ZJG now a Tech. Chelmsford ARA had Christmas Party. W1IAE spoke at the Middlesex ARC. W1CUY showed some very nice pictures of his trip across the pond. WA1YLT-YLU moved to So. Cal. W1DTB has new TR4OW. Capeway RC met at WA1CDQs QTH. AC1M new call of W1LZP. As of Jan. 1, 1979, K1PAD is your SCM. WA1ZAZ STM. WA1FNM DX on 10. K1PZU handling traffic. WB1s DGM CPJ now General. WB1GEX wrkd Wash. on 10 am. Wellesley ARS held it's two meetings in Nov. Framingham ARA had very successful "Flea Market." WB1FHT starting classes in the use of C.P.R. Our SEC received reports from ECs: K1s FMM PAD NFW, W1s XA BK BHB ZMO, WA1s BLG HPS. New appointments as asst. NMs: WA1OWQ W1FJI K1CE WA1VAB. KA1AHD as OTS. WB1EVP as OTS-OVS. Endorsements: W1ATX WA1VEI K1BA as OTS. W1HL as OO. WA1QMZ as OBS. EMRIPN had 327 QNI, 186 QTC. So. Eastern Mass. ARA, W1AEC and WR1ADR has new Clubhouse on it's own land and plan to have a new repeater. FB! Officers of the Sturdy Memorial Hospital ARC: WB1HFM, pres.; N1AEQ, educational officer/vice-pres.; KA1AAD, secy-treas.; Peter Cardoosi, act. mgr. WB1DXR starting a club at High School. So. Shore Repeater Assn. had its xmas party at the Alamo. WB1EYE has WAC. EASN had 79 QNI, 13 QTC. The EM2MN had its 20th anniversary on Dec. 4th 1978, congrats to all. Traffic: (Nov.) W1PEX 354, K1BA 313, WA1VAB 292, K1PAD 273, WA1ZAZ 234, WA1YMU 205, WA1VEI 201, WB1DXR 184, WA1TBY 176, WA1EYY 168, KA1AHD 74, K1ES 70, W1DMH 65, WA1LAD 65, WB1EMU 63, W1FJI 56, K1BSO 55, K1GN 47, W1NF 40, WA1FNM 29, WA1OWQ 28, W1ATX 24, K1PZU 23, W1AOG 22, WB1GEX 20, WA1IFE 17, WA1QAJ 14, K1BZD 12, W1XA 12, WA1YND 12, K1LCQ 10, WA1YGJ 6, WB1EYE 4, WA1BLG 2, WA1VMU 1. (Oct.) WA1VAB 224, WA1TBY 208, K1PAD 172, K1GN 116, WB1EMU 70, WA1OWQ 30, W1EMG 26, WA1IFE 17, N1EE 3.

MAINE: SCM, Bill Mann, W1KX — SEC: WA1YUW. NMs: W1RWG K1GUP WA1SMY WA1YUW WB1AOD. Lewiston, Dec. 9 — Androscoggin ARC mbrs. set up exhibit stn. at Central ME Arts & Crafts Guild, originating traffic. First meeting of Somerset ARA Nov. 28. Central ME Emerg. Net now 2000 local on 146.10/70. Hams to supply comms. for Sugarloaf races in Feb. Contact WB1EYS or WA1QIK to help. K1DYG, ME SCM 1964-69, Silent Key. New Portland AWA officers: WA1UFW, pres.; WA1ERJ, vice-pres.; WB1AIY, secy.; WB1GLV, treas.; K1SA, chief op.; WB1HIM, asst. chief op. Yankee ARC mini-flea-market auction huge success. Aroostook ARA welcomes seven new mbrs. Waldo Co. ARA now printing "Class A Modulation" newsletter. Sess./OTC/QNI. PTN 39/191/246. SGN 26/181/1213. MSN 13/12/37. CMEN 13/24/208. MPSN 5/8/104. AEN 4/9/56. BYN 27/31/900. Oct. rpts.: PTN 30/105/269. SGN 26/100/1178. Traffic: (Nov.) W1KX 300, N1RP 192, WA1QFX 132, WB1AOD 98, W1BJ 80, W1HDC 61, WA1JHT 47, WA1MUX 41, WB1BYR 36, WA1SMY 30, W1GU 26, WA1JZP 15, W1AHM 13, K1TVT 12, WA1PXD 11, W1JTH 8, K1TZH 8, WB7VKH/1 8, K1BZ 5, WA2MEQ/1 2, N5YX/1 2, WA1JCN 1. (Oct.) W1RWG 99, K1TEV 2.

NEW HAMPSHIRE: SCM, Robert C. Mitchell, W1SWX/W1NH — SEC: K1RSC. NMs: W1TN N1NH. The Nashua Area RC Amateur Radio Exhibit at the Nashua Mall was well attended. The club did a super job of showing amateur radio to the public. New OVS is K1UQX who displays call letter plates on car and motorcycle. The Port City ARC held its annual banquet at the Hotel Ashworth with 47 present. WB1ELP is recuperating after a stay in the Exeter Hospital. WA1PS has new Inverted Vs for 40 & 75. World Traveler/TWA pilot W1GUX looking forward to retiring in Apr. '79. WB1FPD & WB1ALS visited The Great Bay ARC. WB1CAG, W2OZA visited K1BCS. W1FYR is on 80 RTTY. The Keene Machine now has autopatch, crystal control & punch-up for Concord Weather. K1WER & crew relocated WA1HOB to the Air Traffic Control Center. K1BCS spoke on the importance of public relations to amateur radio at the White Mountain ARC. Interested in a challenging Fox Hunt? Contact K1JUL of the Nashua Area ARC. Many of the radio clubs need guest speakers. If you are one let me know and a list will be sent to the clubs. Traffic: K1BCS 345, W1TN 145, W1GUX 89, N1NH 66, KA1CB 30, WA1PEL 13, W1FYR 10, WA1HOB 6, W1SWX 4, W1UN 2, W1NH 2.

RHODE ISLAND: SCM, John Titterington, W1EOF — SEC: AB1D. NMs: N1RI N1DM. The Sub Sig ARC now has 58 members. WB1EKA makes Extra and is waiting for new call, congratulations. All clubs busy with annual xmas parties. N1RI is busy with 160-meter contest, and is QSL mgr. for SNEDXA. NCRC furnishes communications for "Crop Walk Marathon" with W1AGB WA1OSS WA1YDU W1LO W1JFF WA1NPF & K1UFR participating. It was another slow month for station reports and to all amateurs, clubs, or interested people — I can't submit your news or activities if I don't know about them! RI participation in the traffic nets has reached a new low. The only net showing growth is the RIEM 2-Mtr

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RX28C	28-35 MHz FM receiver with 2 pole 10.7 MHz crystal filter	$ 64.95
RX28C W/T	same as above wired & tested.	129.95
RX50C Kit	30-60 MHz rcvr w/2 pole 10.7 MHz crystal filter	64.95
RX50C W/T	same as above wired & tested	129.95
RX144C Kit	140-170 MHz rcvr w/2 pole 10.7 MHz crystal filter	74.95
RX144C W/T	same as above-wired & tested	131.95
RX220C Kit	210-240 MHz rcvr w/2 pole 10.7 MHz crystal filter	74.95
RX220C W/T	same as above-wired & tested	131.95
RX432C Kit	432 MHz rcvr w/2 pole 10.7 MHz crystal filter	84.95
RX432C W/T	same as above-wired & tested	142.95

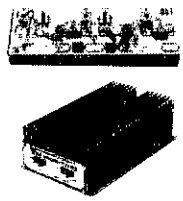
RXCT	accessory filter for above receiver kits gives 70 dB adjacent channel rejection	9.95
RF28 Kit	10 mtr RF front end 10.7 MHz out	13.50
RF50 Kit	6 mtr RF front end 10.7 MHz out	13.50
RF144D Kit	2 mtr RF front end 10.7 MHz out	18.50
RF220D Kit	220 MHz RF front end 10.7 MHz out	18.50
RF432 Kit	432 MHz RF front end 10.7 MHz out	29.50
IF 10.7F Kit	10.7 MHz IF module includes 2 pole crystal filter	29.50
FM455 Kit	455 KHz IF stage plus FM detector	18.50
AS2 Kit	audio and squelch board	16.00

TRANSMITTERS

TX50 Kit	transmitter exciter, 1 watt, 6 mtr	44.95
TX50 W/T	same as above wired & tested	71.95
TX144B Kit	transmitter exciter-1 watt-2 mtrs	34.95
TX144B W/T	same as above-wired & tested	65.95
TX220B Kit	transmitter exciter-1watt-220 MHz	34.95

TX220B W/T	same as above-wired & tested	65.95
TX432B Kit	transmitter exciter 432 MHz	49.95
TX432B W/T	same as above -wired & tested	87.95
TX150 Kit	300 milliwatt, 2 mtr transmitter	24.95
TX150 W/T	same as above-wired & tested	43.95

POWER AMPLIFIERS

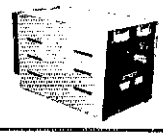


PA2501H Kit	2 mtr power amp-kit 1w in-25w out with solid state switching, case, connectors	69.95
PA4010H Kit	2 mtr power amp-10w in-40w out-relay switching	69.95
PA50/25 Kit	6 mtr power amp, 1w in, 25w out, less case, connectors & switching	59.95
PA144/15 Kit	2 mtr power amp-1w in-15w out-less case, connectors and switching	49.95
PA144/25 Kit	same as PA144/15 kit but 25w	59.95
PA220/15 Kit	similar to PA144/15 for 220 MHz	49.95
PA432/10 Kit	power amp-similar to PA144/15 except 10w and 432 MHz	59.95

Blue Line ... RF power amp, wired & tested, emission-CW-FM-SSB/AM

Model	Band	Power Input	Power Output	
BLC 10/70	144 MHz	10W	70W	149.95
BLC 2/70	144 MHz	2W	70W	174.95
BLC 10/150	144 MHz	10W	150W	269.95
BLC 30/150	144 MHz	30W	150W	249.95
BLD 2/60	220 MHz	2W	60W	164.95
BLD 10/60	220 MHz	10W	60W	169.95
BLD 10/120	220 MHz	10W	120W	269.95
BLE 10/40	420 MHz	10W	40W	159.95
BLE 2/40	420 MHz	2W	40W	189.95
BLE 10/80	420 MHz	10W	80W	289.95

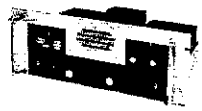
POWER SUPPLIES



PS15C Kit	15 amp-12 volt regulated power supply w/case, w/fold-back current limiting and overvoltage protection.	99.95
PS15C W/T	same as above-wired & tested.	134.95
PS25C Kit	25 amp-12 volt regulated power supply w/case, w/fold-back current limiting and overvoltage protection	139.95
PS25C W/T	same as above-wired and tested	169.95
PS25M Kit	same as PS25C with meters	159.95

PS25M W/T	same as above-wired and tested	189.95
O.V.P.	adds over voltage protection to your power supplies, 15 VDC max.	14.95
PS3A Kit	12 volt-power supply regulator card with fold-back current limiting	11.95
PS3012 W/T	new commercial duty 30 amp 12 VDC regulated power supply w/case, w/fold-back current limiting and overvoltage protection	274.95

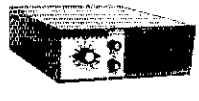
REPEATERS



RPT50 Kit	repeater-6 meter (less crystals)	599.95
RPT50 W/T	repeater-6 meter, wired & tested	899.95
RPT144 Kit	repeater-2 mtr-15w complete (less crystals)	599.95
RPT220 Kit	repeater-220 MHz-15w-complete (less crystals)	599.95
RPT432 Kit	repeater-10 watt-432 MHz (less crystals)	649.95
RPT144 W/T	repeater-15 watt-2 mtr.	899.95
RPT220 W/T	repeater-15 watt-220 MHz.	899.95
RPT432 W/T	repeater-10 watt-432 MHz.	949.95

DPLA50	6 mtr close spaced duplexer	680.00
DPLA144	2 mtr, 600 kHz spaced duplexer, wired and tuned to frequency	409.95
DPLA220	220 MHz duplexer, wired and tuned to frequency	409.95
DPLA432	rack mount duplexer	379.95
DSC-U	double shielded duplexer cables with PL259 connectors (pr.)	29.95
DSC-N	same as above with type N connectors (pr.)	34.95

TRANSCEIVERS



TRX50 Kit	Complete 6 mtr FM transceiver kit, 20W out, 10 channel scan with case (less mike and crystals)	259.95
TRX144 Kit	same as above, but 2 mtr & 15w out	259.95
TRX220 Kit	same as above except for 220 MHz	259.95
TRX432 Kit	same as above except 10 watt and 432MHz	284.95
TRC-1	transceiver case only	34.95
TRC-2	transceiver case and accessories	54.95

SYNTHESIZERS

SYN II Kit	2 mtr synthesizer, transmit offsets programmable from 100 KHz-10MHz, (Mars offsets with optional adapters)	169.95
SYN II W/T	same as above-wired & tested.	239.95
SYN 220 Kit	same as SYN II Kit except 220-225 MHz	169.95
SYN 220 W/T	same as above-wired & tested	239.95

OTHER PRODUCTS BY VHF ENGINEERING

CD1 Kit	10 channel receive xtal deck w/diode switching	$ 8.95
CD2 Kit	10 channel xmit deck w/switch and trimmers	16.95
CD3 Kit	UHF version of CD1 deck, needed for 432 multi-channel operation	14.95
COR2 Kit	carrier operated relay.	23.95
SC3 Kit	10 channel auto-scan adapter for RX with priority	21.95
CWID Kit	159 bit, field programmable, code identifier with built-in squelch tail and ID timers	42.95
CWID	wired and tested, not programmed	59.95
CWID	wired and tested, programmed	64.95
TD3 Kit	2 tone decoder	39.95
TD3 W/T	same as above-wired & tested	64.95
HT144 W/T	4 pole helical resonator, wired & tested, swept tuned to 144 MHz ban	34.95
HL220 W/T	same as above tuned to 220 MHz ban	34.95
HL432 W/T	same as above tuned to 432 MHz ban	34.95

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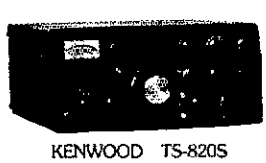
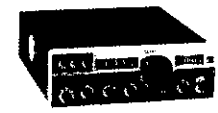
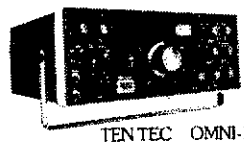

KENWOOD TS-820S

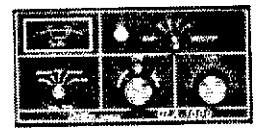

YAESU FT-901

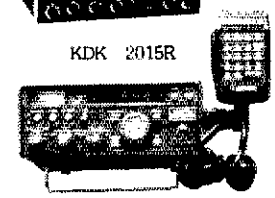

ICOM IC-701


KDK 2015R


IC-701


TEN TEC OMNI-D


GLA-1000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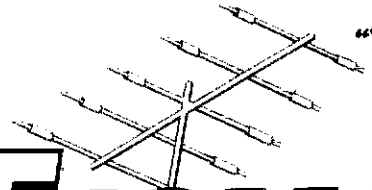

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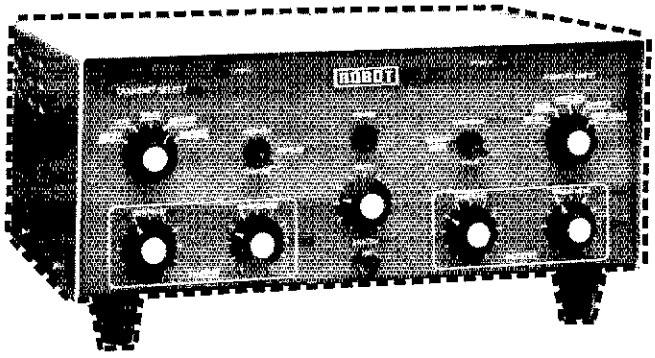

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Tfc. net on the Newport repeater. WA1CSO, net mgr. reports sess. 22, QNI 187, and tfc. 55. Traffic: N1RI 44, W1EOF 43.

VERMONT: SCM, Bob Scott, W1RNA — SEC: W1VSA. Jay Peak 2 meter repeater, 146.145/146.745, operates a net 1930 daily. They welcome anyone wishing to call in. WA1TXI passed his Extra, congrats, now has 140 confirmed for DXCC. Burlington ARC running an Opinion Survey of the club. Some of the questions should get interesting responses. Hil Tabulation of results will be quite a chore. VT SSB 30/564/90; GMN 26/580/68; Carrier 26/556/58; VPN 4/77/4; VT RPD 4/65/13. Traffic: K1SQB 131, AA1E 29, WB1KFQ 11, WA1TXI 8, W1RNA 7.

WESTERN MASSACHUSETTS: SCM, Bill Lowe, W1TM — SEC: WA1DNB. STM: W1KK. NM: WA1MJE. License class at HCRA has 16 Novices with WB1EMN instructor. CMARA has 20 Novices and 5 Generals with WA1LEA WB1CJS and WB1QSO as instructors. WB1AUV assisted W1BVR with new end fed Zepp antenna, with W1DVW advising. WA1VYF debugging rig problems for WA1OPN. N1CQ on Tfc. nets with 2-ft. coiled dipole. K1BE now OBS. N1YY now OTS. W1UD now with big signal on 80M thx to new antenna. W1ZPB now using Triton IV. WB1CSL as a Novice bought new rig and his XYL gave him 30 to pass General exam or return it. He qualified in 15 days and now very active. Congrats to W1GG who now has 300 countries on DXCC list — *a difficult plateau.* WA1MJE again attains BPL. Traffic: (Nov.) WA1MJE 562, W1TM 221, K1SSH 167, WB1AUV 64, W1KK 62, W1DOY 48, W1ZPB 42, K1IJV 41, W1UD 35, N1CO 31, W1EFC 22, W1BVR 19, WB1EHS 15, K1PUG 10, WA1OPN 9, N1YY 7, K1BE 5. (Oct.) WB1AUV 51, W1BVR 21.

NORTHWESTERN DIVISION

ALASKA: SCM, Roy Davis, KL7CUK — Again this month we have another Silent Key. This time it is KL7ALA, a long-time Alaskan and a member of the Old Timers of Alaska. Our newest cw net The Alaska Gold Net reports 41 check-ins this month, who said cw is on its way out. The Alaska Snipers Net as usual leads the pack with 1543 ck-ins and a whole list of traffic. The Alaska Pacific Civil Preparedness Net reports 898 ck-ins with also an impressive traffic list. WL7ACW in Cordova reports that he is teaching a 10-week course on Ham Radio in the Community College there, FB! I need input from South Eastern Alaska, if I do not get input I can't report it, it's that simple. KL7JDH and KL7JDI now report into 4 traffic nets, namely AK-Pacific, DPAN, ASN and Sourdough. Traffic: KL7JDI 211, KL7JDH 104, KL7JHD 3.

IDAHO: SCM, Lem Allen, W7JMH — The Kootenai KARS Bulletin welcomes new amateur WD6BLK. KA7AGR now a General! Classes doing great, thanks to K7ID and K7MM. 59 persons attend the Pocatello Club's annual xmas party. Tribute was paid to retiring pres. W7BDL. Congrats to new Generals WB7PTX and WB7SEW; Tech. WB7SDW and Advanced WB7RSJ! It was my pleasure to give a short address to this fine gathering. Approx. 30 members of the Lewiston Club met Nov. 16 to discuss formation of an AREC organization. An address was given by SCM W7JMH and standing offer of any ARRL assistance in furthering this cause. K7MM reports the Mica Peak repeater on 449.5/444.5 and Coeur D'Alene repeater on 146.37/97 have been cross-linked for greater utility. WB7SQE now N7APA, WB7UEX now AE7L.

Nets	Freq.	Time/Days	Sess.	QNI	QTC
FARM	3935	0200 Dy			
CD	3990	1510 M-F	22	516	9
IMN	3635	0230 M-F	22	158	74
TV Emg	145.44	0400 Su	4	137	0
Ida Fls	146.34/94	0300 M	4	91	0
Mini-Cassia	146.94	0300 S	4	9	1
SW Emg (Boi)	146.34/94	0330 Su	4	384	20

We have many fine nets. Let's use them more by generating message traffic. Traffic: W7GHT 203, W7JMH 112, WB7NSW 12, WA7NRP 2.

MONTANA: SCM, Robert Leo, W7LR — 79 Gallatin Ham RC officers: N7AIK, pres.; W7GP, vice-pres.; WB7OYP, secy-treas. WB7SSC new Tech. K7QA big SS gun. WA0EDH Missoula badly injured falling from roof. Be careful in antenna work. K7LK & crew have 9600-ft. elevation wind power repeater going well. WAS for WB7NFK. Nov. IMN QTC 74, QNI 158. W7LBK QRX with knee brace. His open wire feedline under 2-ft. snow, so high SWR. New ARRL clubs: Gallatin Ham RC; Lower Yellowstone ARC, Glendive. W7TGU reports MTN Sept. QTC 95, QNI 604; Oct. QTC 89, QTC 921. Havre AREC nets Thur. 2 mtrs. 7 PM, 75M 8 PM. WB7EQV joined AF MARS. WA7OBH has new OSCAR system. Hardin 2-meter net Wed. 8 PM. Traffic: W7IXD 51, W7NEG 18, WA7KMP 12, W7LR 10, W7HAH 4, W7LBK 3.

OREGON: SCM, Dale T. Justice, K7WWR — ASCM: Jeff Freedmen, K7JF. SEC: W7HLF. Net reports:

Net	Freq.	Time(Z)	Days	QNI	QTC	Sess.	Mgr.
OEN	3980	6 & 7 P	Dy				W7VIF
OSN	3585	0245	Dy				N7NO
BSN	3908	0145	Dy	638 52		30	WB7POU
AREST	3993.50100		Dy	384 42		30	W7HLF
OARES	3993.50300		Dy	272 16		30	WB7RUW
1676	146.750330		Dy	561 78		30	K7KVV
PdXAARES	147.320330		Dy	900 30		30	K7WWR
JCARES	147.06			135 10		9	W7VSE
Linn-Benton ARES	147.390330		Dy				WA7SSQ
NW SMIRK	50.1200300		Th				N7DB

K7DUE an active OO and sends in nice reports. WA7BYP sending code practice Mon. on 3590 kHz at 0400Z (5-30 wpm). WB7DIP made 17 OB transissions during Nov. Many clubs send the SCM their newsletters. Are you sending yours? Sunset Empire RC (Astoria) is planning a potluck for Jan. 23. Your SCM attended the Nov. meeting of the Coos Co. ARC. A lot of information was presented to the club. Also, the annual EASS dinner was during Nov. Many League officials were present. The Oregon Region Relay Council has a list of NW two-meter repeaters available for an s.a.s.e. to Box 10672, Portland 97210. N7DB reports F2 skip on six meters. He worked KH6BZF and had some other partial contacts. Traffic: (Nov.) W7VSE 590, K7NTS 258, WA7IHS 136, K7KVV 48, W7HLF 42, WB7POU 22, K7WWR 22, WB7RAP 19, W7LT 17, W7GUH 12, WA7BYP 9. (Oct.) WA7IHS 161, K7IWD 108, W7LT 20. (Sept.) K7IWD 140.

WASHINGTON: SCM, Bob Klepper, W7IEU — Net Reports received: NTN QNI 1811, QTC 99; WARTS QNI 3207, QTC 122; NWSSB QNI 725, QTC 36; WSN QNI 397, QTC 132; SCARES QNI 132, QTC 5. SEC WA7RWK reports 27 ECs in Section, 882 signed up in ARES and striking for the kW mark. WB7VRE jubilant over first contact with Dad in Nebr. Dad is 72-yr. young Novice KA0CGX. K7GXZ re-elected to second term as Mgr. of WSN. WA7GCI's presentation on NBVM at LCARA was

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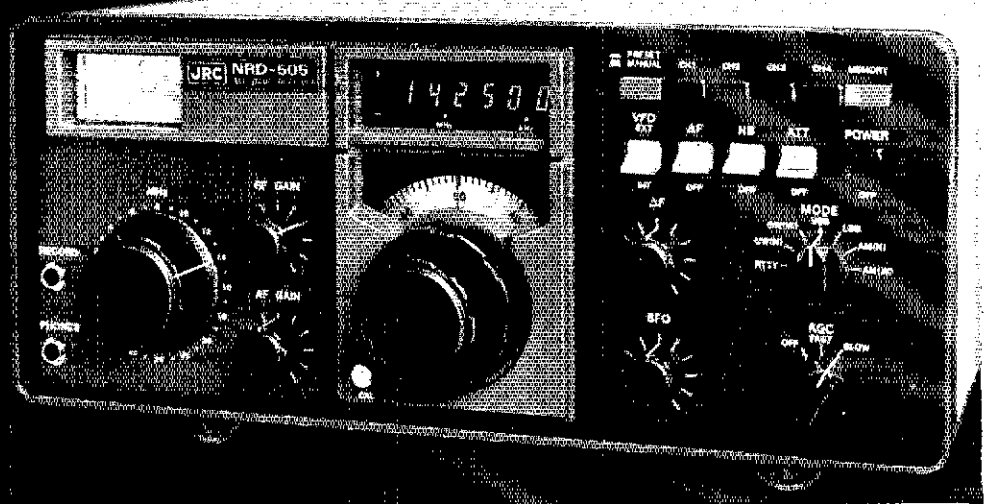

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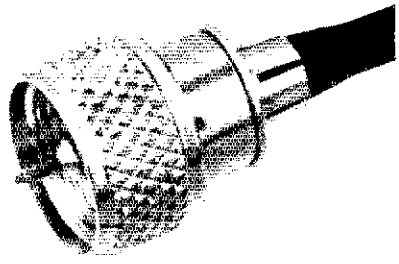

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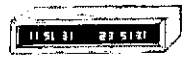

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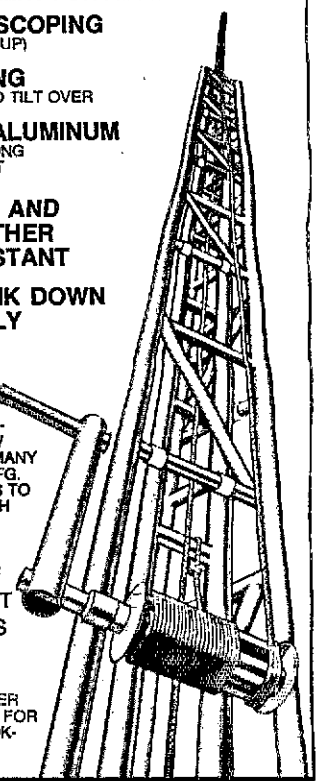

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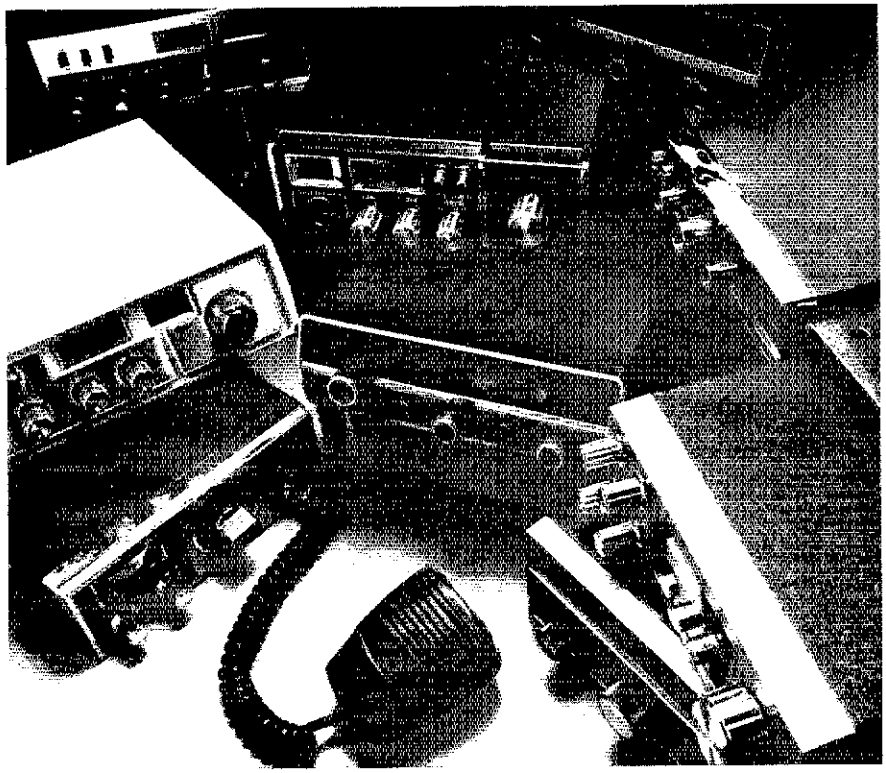

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well received. New ECs: KL7JEB Skagit; WA7ZZA Pierce; KB7CZ Lewis; KB7BK Mason; W7JIE Salvation Army. Sorry to report W7DX WB7AJR WB7TCS are Silent Keys. N7ML demonstrated new autopatch to North Seattle ARC. ECs W7DRD WA7TWB both involved in providing communications for minor emergencies. RASC Club received "clear channel" for new rptr. WB7VXN WB7SXK upgraded. New members of Clark Cty ARC are KA7CGC KA7ANW. WB7QVL now N7ANE. With all the new calls I'm going to miss some of you, if you want your old and new call to appear here, let me know. W7FCH successfully demonstrated RTTY for MBARC. K7VNI K7IWX working hard to get MBARC Comvan ready for winter callouts. W7BCS having problems with 40 Mtr. doublet. W7PGY having problems with Jet lag. WWDX Club was No. 1 Club in WPX contest. Remember SEA-NARK-80, that's the name of the ARRL National Convention the last weekend of July 1980. W7LUP has new TenTec rig and is NCS and Director of WCN. A reminder to all ORS and OPS appointees, you automatically became an OTS when the change was made. K7ZR is new editor for WWDX Club "Totem Tabloid" and K7UR is new Contest Chairman. WARTS net officers are: WB7BTO, mgr.; W7BUN, secy-treas.; W7TNL WB7OTA WA7RCR K7JAJ W7QGP, dir. KL7JEB very active on nets and DRN7. WB7TQF has some good ideas about putting HF rigs on boats. W7ERH has new 80W 2-Mtr. amp for emergency work. N7AM's antenna system worked well in SS and CQWW tests. W7LG WB7EGL helped rescue W7HXP and XYL from severe snowstorm by using 16/76 PA Rptr. W7JIE working hard on IW an giving talks at Club Mtgs. WB7QWC active in WARNS and ARES nets. WB7FDE and OM AE7PL (ex-WA7ATU) made 5BWAS just one day apart. K7RS reports BEARS Washington State QSO Party participation good but down from last year. Traffic: W7DZX 779, W7AR 374, KL7JEB 182, N7AM 157, K7GXZ 122, K7RBR 92, WA7YCM 86, WA7BDD 63, W7IEU 50, W7BUN 49, N7AJ 48, WA7PHD 41, W7LUP 40, W7EBU 32, WB7EBP 30, WA7RCR 30, W7APS 16, W7ZEV 15, W7BCS 11, WB7FDE 11, W7LG 10, W7PGY 9, W7ERH 3, KB8FO 2.

PACIFIC DIVISION

EAST BAY: SCM, Bob Vallio, W6RGG — Asst. SCMs: K6UWR W6ZF VE2AQV/W6. SEC: K6UWR. PSHR for Nov.: W6OA WB6UZX WA6NTI N5MR/6. K6UWR and I attended the Nov. meeting of EBARC, at which I was pleased to accept for the League their $50 check made out to Project Goodwill. WD6BMX has become a 15-meter ragchewer. Newly elected officers for ACRC (RACES): K6JNW, asst. RO; WD6EVM, operations officer; K6CSL, training officer; WB6UZX, secy.; KB6DU & WA6BOB, net mgrs. NCN gearing up for the Christmas rush, 3630 kHz at 1900 & 2030 PST daily. WA6OFG now N6ATN. KA6ACY & WD6FFJ have upgraded to General, and WA6UDZ now Extra. Others who have upgraded are KB6CM, waiting for his new Extra call; WA6MTU, Advanced; WD6FMT, General. Special congratulations to W6RIL who recently celebrated his 50th year in Amateur Radio. Vern received his first call, W9GEZ, while attending high school in Denver. The Fremont-based NCCC scored 16 Megapoints in the Nov. SS & seem to be on their way to a 4th consecutive gavel. Traffic: (Nov.) W6OA 164, N5MR/6 129, WA6NTI 62, WB6UZX 56. (Oct.) N5MR/6 68.

NEVADA: SCM, Leonard M. Norman, W7PBV — SEC: K7ZAU. The bi-weekly informal dinner gathering on Tue. at the 76 truck stop on I-15 south of Las Vegas has generated a lot of fellowship, thanks to W7OK. The Reno gang have the OK for another Pacific Division convention in Reno and are getting geared up for the event. A new site has been selected for the 78/18 repeater in Clark County. Traffic: W7ILX 210.

PACIFIC: SCM, George Morton, N7HR/KH6 — KH6EKQ turns the HARC gavel over to KH6IPQ at the annual Christmas bash; Ft. Shafter NCO club again, Kauai ARC Yule party at Hanapepe will be gourmet affair, wish I could be there. QRPp opr KH6JBU qso EU w/1W! He awaits KH6? after extra upgrade. Congrats! KH6JJX, the latest fox got so far back in the boonies, that he needed DF to find his way out. That is hidden! W6BOY soon to skipper 55 ft ketch fm Hong Kong to Hono plans first OSCAR MM fm Pacific. QSX OSCAR. Pacific Div Director, Stevens plans to attend Big Isle ARC ARRL Charter party, Jan 9, me to! AH6P promised fun in Hilo. Wish all you snow bunnies could be here too. Aloha!

SACRAMENTO VALLEY: SCM, Norman Wilson, N6JV — Asst. SCM: W6NJU. W6RNC a new OBS in Nevada City. AA6DX (SCM SF) has been carpetbagging from Redding weekdays. K6RI spoke at the North Hills RC with information and answering questions on FCC policy. The RAMS won the FD mobile aggregate competition. W6DZ is the new NHRC repeater chmn. SV Section was represented at the Div. Dir. meeting in Los Altos by Asst. Dir. WB6PHK and the SCM. K6XB (EC Modoc Co.) has signed up half the hams in the Co. into AREC and has been chasing DX on 6 meters. W6RSP continues to provide articles on traffic handling procedures in the "Relay" of the Northern Calif. Net. NCN meets nightly on 3630 kHz at 7 and 8:30 PM local time. The second sess. is slow speed. NCN-VHF meets nightly on WH6ADC on 144.81/145.41 at 7:30 local. Traffic: W6RSP 149, W6SX 33, K6RPN 29, W6DEF 20, WA6OWH 3.

SAN FRANCISCO: SCM, Mark L. Nelson, AA6DX — SEC: N6KM. WA6KWM now active on tfc. nets from Ferndale — about farthest west city in 48. Contest Ops — NCCC meets Tue. nites, 3815 at 1930 PST. All are welcome. New pres. for SFRC is WA6YPN; W6VV, vice-pres.; WD6DMM, secy.; W6BYS, treas. SFRC is planning "T" Hunts. Humboldt Co. OSCAR users are WA6ICB WB6MYF and WB6SXJ. WA6YBL a Silent Key. W6GGR WA6KWM N6VA and WB6FAJ working on microprocessors. W6BFZ looking for 1916 "QSTs." W6IPL requests more check-ins for NCN from SF Section. How about it? NCN VHF session roster boasts 96 amateurs! Crescent City available on WCARS via WA6BXJ. AA6DX running 140 watt 2M Mobile, W/4WD. WA6GSR back on air from McKinleyville. Traffic: W6NL 342, W6IPL 292, WB6AMP 201, W6RNL 199, K6TP 165, K6PB 159, WB6RTE 51, W6GGR 14.

SAN JOAQUIN VALLEY: SCM, Charles McConnell, W6DPD — SEC: WA6YAB. ECs needed in Amador, San Joaquin, and Tulare Co. Officers of Central Valley Chapter QCWA are W6UZ, pres.; W6BVM, 1st vice-pres.; W6MEL, 2nd vice-pres.; W6BYH, secy.; W6TRP, treas. K6PMG is OTS. K6CPC K6PMG W6DPD WA6YAB and WA6JDB made NCN Honor Roll for Oct. All traffic handlers should report traffic totals to the SCM on ARRL Form 1. WA6PJW a Silent Key. AF6Y made DXCC. WA6CPP made DXCC-220 on ssb. WB6IRV and

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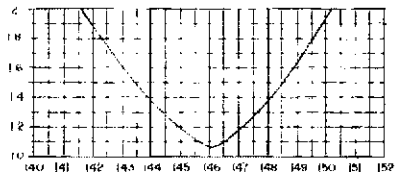

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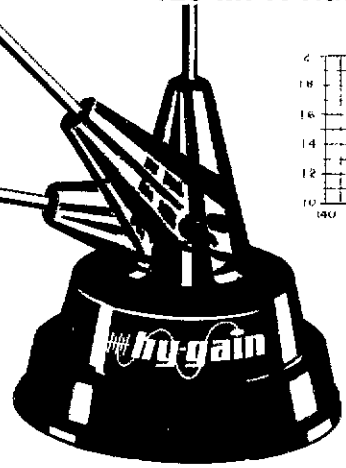

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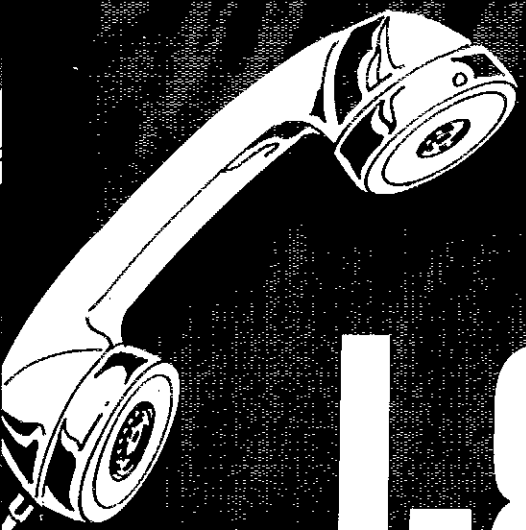

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SANTA CLARA VALLEY: SCM, Jettie Hill, W6RFF — SEC: WB6IZF. NM: W6RFF. Many SCV clubs sent reps to the Pac. Div. Directors meeting in Los Altos Hills. New officers of WVARA are WB6CDY, pres.; WA6MZF, vice-pres.; WB6EOS, secy.; W6JOC, treas. WVARA going all out to make 1979 a big year. W6KZJ finds time for traffic handling on NCN. W6ZRJ and W6VZT spoke to the G. Ladd Pioneer Radio Club of Antennas. W6AUC reports lot of net and traffic activity. W6OII also busy with tfc. and nets. K6FD spoke to PAARA on the Saga of G7DW. PAARA active during 1979 SET. Prepare ahead for conventions — Bay area Convention in Oct. and Pac. Division again in Reno during Aug. SEC WB6IZF and his ECs are getting SCV well organized and can always use some new emergency operators and ECs. K6PU has returned from Europe and moved to a new QTH near W6CF, where he is busy on all bands. WA6HAD busy during CD parties and passed his 4500th QSO since becoming a ham. W6ZRJ very QRL but finds time to check into NCN often. First Aid Techniques for Amateurs were presented to the Santa Cruz County ARC by the Red Cross. Officers of SCCARC for 1979 are WB6RWU, pres.; WA6SVW, vice-pres.; W6TUW, secy.; WA6OCV, treas. WB6AYJ WD6GUA WA6JWK WA6NMQ W6RFF W6TYV W6YBV N6YE and K6YKG all made the Northern Calif. Net Honor Roll. NCN meets 7 and 8:30 PM daily on 3630 kHz and on WR6ADC 144.81/145.41 at 7:30 PM. New EC appts. are WD6COR W6HWW W6TWU. Father and son, W6MMG and WB6HBL busy with DX and contests. N6KG has a new memory keyer. SCV ARES net meets Wed. 7 PM on WR6ADX, with WB6IZF as net control. Traffic: (Nov.) W6YBV 294, W8AUC 76, W6RFF 57, W6KZJ 42, W6OII 20. (Oct.) WA6HAD 10, W6ZRJ 6.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Bill Parris, AA4R — STM: N4UE. SEC: K4CJZ. Congratulations to WA4YSK on achieving BPL for the third straight month. Several clubs have new officers for the coming year including: Western Carolina ARS WB4DRN, pres.; WA4LWO, vice-pres.; KA4BZC, secy.; WB4JMG, treas.; WD4AVY WD4IJT, board. Forsyth ARC WD4EQL, pres.; WD4LGG, vice-pres.; WB4ZWS, secy.; WB4BGL, treas. Brightleaf ARC WA4MOK, pres.; KE4I, vice-pres.; WA4VDJ, secy-treas.; WA4DAN, editor. Cabarrus ARS N4ASD, pres.; N4ASE, vice-pres.; WD4KCN, secy-treas.; WD4KEN, act. mgr.; W4KJV WA4UPS, board. Special recognition should be given to the Cabarrus Club for electing YLs to the offices of pres. and secy/treas. Congrats to KA4CMC on passing General and being elected as a Life Member of the Cabarrus ARS. Mecklenburg ARS offices for '79 include W4FKT, pres.; WB4NDB, vice-pres.; WB4ZIQ, secy.; W4MHF, treas.; WD4AKZ WD4JWO K4SFI WA4ZQQ AA4R, board. Central NC Weather Watch Net active on K4ITL Rptr. in Raleigh on 28/88 each Wed. at 1900 local time. Over 30 counties have checked in. K4ITL Rptr. now at tremendous location at 1800-ft. on side of new 2000-ft TV tower. Raleigh ARS reports good participation with station set up at Red Cross First Aid Station at NC State Fair, good publicity. Congrats to WB4CES elected as NM of NCSSBN. Appointees this month inluce N6DR/4 OO, and WB4PLA EC Buncombe Co. Traffic: (Nov.) WA4YSK 710, WB4ZIQ 250, K4MC 151, K4VHT 138, WB4MXG 124, K4FTB 117, AA4RW 115, WD4CNQ 101, N4UE 92, W4FMN 76, WA4SRD 59, W4EAT 57, KB4IZ 52, AA4R 37, WD4AIE 32, W4ACY 30, WB4QXT 28, WA4UTG 27, WB4TOP 27, WA4IHG 25, W4OFO 24, WA4CUD 21, WD4LMM 21, WB4VQZ 16, WA4UYS 14, WB4WII 13, N4ALE 12, K4AIH 10, W4WXJ 10, K4BUH 10, WB4CYN 9, W4IZI 9, W4EHF 8, W4OCZ 8, WA4WFY 8, W4TY 8, WD4ABZ 6, WA4AKB 6, WD4NTE 5, K4KA 5, WD4HYM 2. (Oct.) N4ZH 53, K4BIZ 39, W4TY 7, WD4HYM 2, W4OCZ 2.

VIRGINIA: SCM, Rick Genter, K4BKX — Asst. SCM: W4YE. SEC: WB4ZNB. STM: N4NK.

NTS Net:	kHz:	Time(PM)	NM:
Va. Noontime Tfc.	3907	Noon	WA4FDV
Virginia Sideband	3947	6/10:15	W4JK
Virginia Slow	3680	6:30	WA4YIU
Virginia	3680	7/10	WB4FLT

AA4CK working on 160 meters and getting ant. ready for winter. W4KFC attended New England Div. conf. and IARU conf. in Bangkok. W4KX retiring from 50+ yrs. of broadcasting. N4SD signing up members for Norfolk ARES. W4SQQ and K4BKX met in NoVA. WB4DBK made DXCC. W4NWM has new Drake TR-7, is new EC for Chesterfield Co. ARES. N4IF working with Highland/Bath ARES. K4GR says slow month. WB2JAY/4 reports 56K in SS contest. WD4OVR enjoying new NCS spot. WA4NTP having fun with early Christmas — a new Yaesu FT-901. N5BAI/4 got 50th card for WAS. W4JUJ placd 2nd in USA in NC QSO party. K4LEF says wife keeping him busy with remodeling. W4YE busy with CQWW and SS contests. WB4QAX plans making more HF nets. WA4JUO is putting up 50-ft. tower and tribander. WA4FDV and K4BKX are now ARRL Life Members. WB4ODZ says AEC. W4PRO did FB job in his absence. W4PVA planning to help Ole VA Hams with Manassas Christmas parade. N4YE hs new Ten Tec Omni. KF4Q, ex-WA4FTJ, enjoying HF mobile. WA4STO hunting new members for Shenandoah Co. ARES. N4FN says overtime and Novice classes are cutting into VH time. K4LKQ elected pres. of Lynchburg ARC and WA4RTS is new LARC board member. LARC received Certificate of Merit for their work in making the public aware of Amateur Radio and its public service role. W3BBN/4 new EC for SVEN. K4LMP with help of AECs is organizing Scott Co. ARES. BPLs: W3BBN/4 WA4CCK WB4PNY. PSHR: K4BKX WA4CCK K4EJ WB2JAY/4 W4LXB N4BK WD4OVR WB4PNY WA4UYD WA4YIU. Traffic: (Nov.) WB4PNY 901, WA4CCK 545, N4NK 463, K4KNP 356, W3BBN/4 327, W4SQQ 293, WB4FLT 238, W4UQ 208, N4ZO/4 172, K4KDJ 152, K4BKX 143, WB4DBK 127, W4LXB 107, WA4STO 106, WA4YIU 92, WB4DQZ 90, WB4ZNB 89, W4NWM 87, K4GR 76, WA4ONR 75, W4YVG 74, K4JM 70, WA4UYD 64, N4IF 62, WB4KIT 61, K4EJ 53, WB2JAY/4 53, WD4OVR 53,

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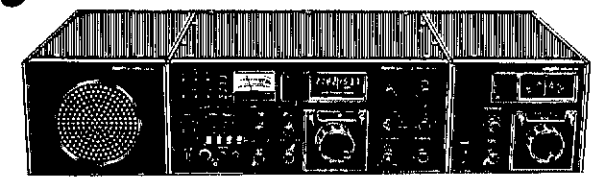

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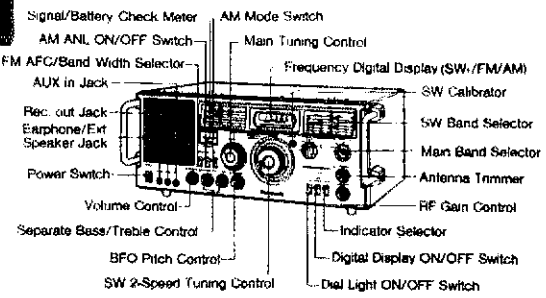

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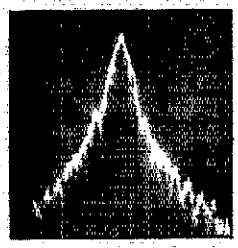

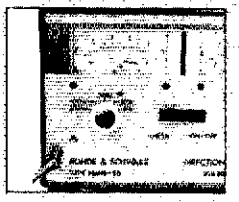

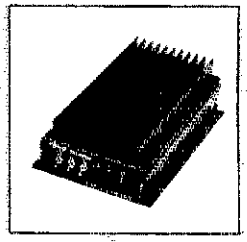

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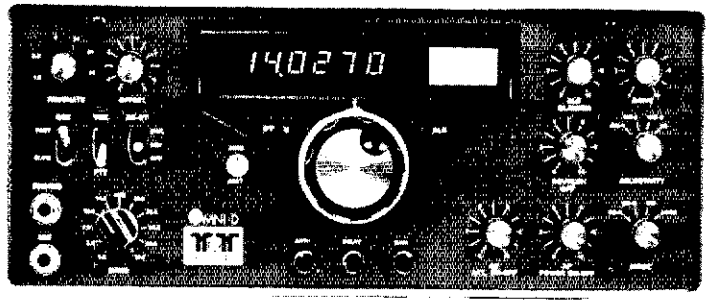

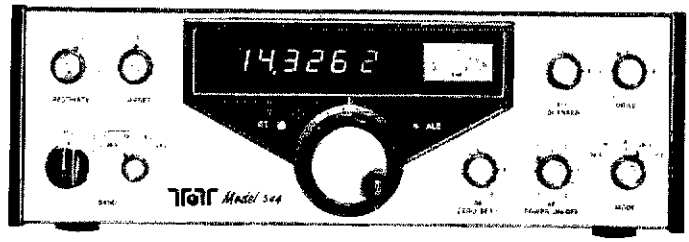

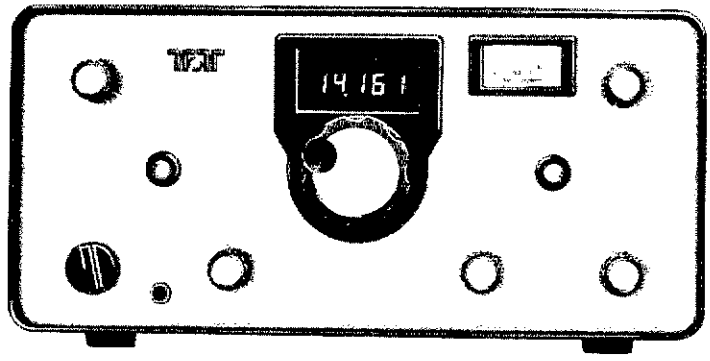

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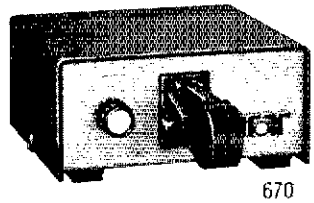

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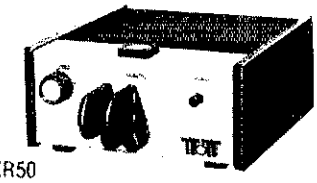

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WEST VIRGINIA: SCM, Donald B. Morris, W8JM — Asst. SCM: K8KT. SEC: WA8NDY. NMs: Phone, W8YP; Novice, WD8JYM; CW, WA8WPW. WB8ZBA, David Gray of Wheeling winner of Aug. cover plaque award. WD8SCW now a Silent Key. Listen for TRS-80 Users Net, 1900Z, Su on 14285. WD8EAV upgraded to General. Kanawha Valley hams assisted Red Cross blood drive in Dec. K4CQA/8 faculty advisor for WVU ARC. New KARC officers: WA8OKG, pres.; N8LW, vice-pres.; N8AJC, secy.; WD8OZT, treas.; K8LZ, prog chmn.; WB8WWF, pub dir. Radio Council Meeting at Jackson's Mill in late Feb. Traffic Handling Forum at convention this year.

Net	Freq.	Time(Z)	QNI	Tfc.	Sess.
Hillbilly	14290	1700 Su	141	48	4
Phone	3990	1700 Dy	401	32	28
Phone	3990	2300 Dy	706	97	30
Novice	3730	2215 Dy	156	44	30
WVN	3567	0000 Dy	186	57	29

Traffic: WD8DHC 86, W8YP 49, WB8AKQ 44, W8HZA 36, WD8JYN 30, WD8JYM 26, WD8LDY 25, W8LYV 22, W8CKX 18, WD8INS 11, N8AJC 10, WB8NQB 10, K8KT 8, WD9KKV 7, WB8VAZ 6, W8JWX 6, K8MHR 5, K8IXO 4, WB8NXA 4, K8ZDY 4, WD8MZW 4, K8BYR 3, K8TCM 2, WA8SAK 2, W8GSN 2, K8YL 2, WA8RUZ 2. Correction: (Aug.) WB8TDA 135.

ROCKY MOUNTAIN DIVISION

COLORADO: SCM, Robert W. Poirier, K0DJ — SEC: W0GOW. STM: WB0MCL. NM: K0CNV WB0ZOG. Pueblo Ham Club Net on Wed. night is enjoying plenty of participation. The success being attributed to three fixed links, near Salida on 147.57, one at Trinadad on 147.57 and one on La Veta Pass on 147.01; gives the net coverage for most of Southeast Colorado. Plans for an avalanche net are near completion and being coordinated by W0WYX. K0CI got his hand in DXing by working a rare XZ5 prefix in Burma. WB0HZL and WB5JZP/0 organizing general several nets for the ARES in District 13. New and experimental antenna working beautifully at WB0YKH. W0GO QSYing to a new house. This writer has new job and commuting to Pueblo means more use of the old 2-meter rig. Traffic and net participation was up in 1978, let's keep it going in 1979! Net tfc. Nov.: CWN 30 sess., QNI 172, QTC 288, QNF 973, HI Noon 29 sess., QNI 928, QTC 33, informals 321, QNF 959. Traffic: (Nov.) W0WYX 2367, K0YFK 1052, WA0HJZ 804, WB0FBS 505, K0DJ 250, WD0AIT 209, WB0ZQG 160, WB5JZP/0 94, WA0YNP 89, W0GO 88, W0RE 73, K0DAP 70, K0PVI 66, W0HXB 37, WB0UWE 33, WB0HZL 28, K0CI 4, K0SPR 2. (Oct.) K0CI 16.

NEW MEXICO: SCM, Joe T. Knight, W5PDY — SEC: W5ALR. NMs: W5JOV K5KPS. Southwest Net (SWN) meets daily on 3585 kHz, at 20:00 local time and handled 169 msgs with 165 stations reporting in. New Mexico Roadrunner Net (NMRRN) meets daily on 3940 kHz at 1800 local and handled 135 msgs with 1094 stations reporting in. New Mexico Breakfast Club meets daily on 3940 kHz at 0700 local, handled 125 msgs with 821 check-ins. Regret to report sudden passing of W5AK, long time DXer. FB, newsletter from Gila ARS, WB5TGL, pres & their 37/97 rpt., WR1ABH. Welcome to NM W1ICP. Congrats to K0HRZ & K0PGM. New Rocky Mt. Div. Dir. & V. Dir. Los Alamos & Albuquerque had much search & rescue activity, lost hunters; downed aircraft, etc. New 39/97 repeater on 9,250 ft. Capilla Peak near Mountainair, NM. Traffic: W5UH 670, N5NG 334, W5JOV 169, K5KPS 140, WD5AHH 94, WA5MIY 22.

UTAH: SCM, Carl R. Ruthstrom, W7GPN — More station activity reports are needed and should arrive no later than the 5th of the month. This applies especially to appointees. The UVHF Soc. reminds repeater users that your membership is due for the new year. Please remit to treas. UVHFS, Box 94, Centerville, UT 84014. The UVHFS road and weather net now active on 146.34/94 daily at 1400 and 2130Z. K7WG new EC in Washington Co. W7HKC active in UCN filling NCS function. WA7BWF moved to NV creating an EC vacancy in Box Elder Co. K7MD and WB7DEY working with WA7GTL to establish an amateur station at McKay-Dee hospital as a part of the OES system in Weber Co. Two 220 MH repeaters are active in SLC signing K7DOU 222.34/223.94, and WB7QGE, 223.18/224.78. WR7ACM will be signing W7GPN/R by the time this is in print. This call letter will occupy all of the program space available. Traffic: K7HLR 208, WA7MEL 86, WA7JRC 81, KB7DC 32, K7VQ 16, W7UTM 13, W7FYR 10, W7OCX 10, W7HKC 5.

WYOMING: SCM, Chester C. Stanwaity, W7SDA — SEC: WB7EIN. NMs: K7KSA WA7WFC.

Net	Freq.	Time(Z)/Days
Wyo WX	3923	1330 M-S
Jackalope	7260/3923	1915/1930 M-S
Colo/Wyo	3715	0130 Dy
Wyo Cowboy	3923	0145 T-S

WB7TBH new General in Ranchester, KA7ACM and WB7WNN new Generals in Sheridan and WB7UGH new General in Rock Springs. W7VB in hospital in Billings, MT. W7NK vacationing in NV. WB7NHR reports the Wyoming Cowboy net held 22 sess. with 739 QNI, 2 QTC. Traffic: W7SQT 357, W7LYA 316, K7VWA 11, WA7SGG 48.

SOUTHEASTERN DIVISION

ALABAMA: SCM, Frank B. Brown, W4LNN — SEC: K4WYT. STM: WA4JDH. Congrats to W4IBU the 197 AENM net mgr., also WA4SNQ the 1979 AENS net mg. Mobile ARC election results, WD4KMB, pres.; KB4AC vip; WD4FKK, secy.; N4AKY, treas. Sand Mtn has a new repeater, try it, 147.66/06. WA4VKD issues AEND net certificates to WD4SEB WD4LHN KA4DTA. K4NJY is loud and clear with his new Dentron Amp. K4QMH is busy with a new TRS-80 computer. N4MD and WN4KNN join TCC/C. Birmingham ARC provide communications to some 2000 Boy Scouts during the International Boy Scout Jamboree on the air. Members included WA4SI WD4BXA WA4CYF N4ALK WB4ZKA WB4AXN WB4ME WB4VYQ WB4ZWF. The alertness of WA4WFU resulted in the recovery of a stolen ICOM-22A. W4CUE used computers for sending and receiving cw, and log keeping during the ARRL Sweepstakes contest. KA4AOK gives run down on six meter operations to Twin Base ARC

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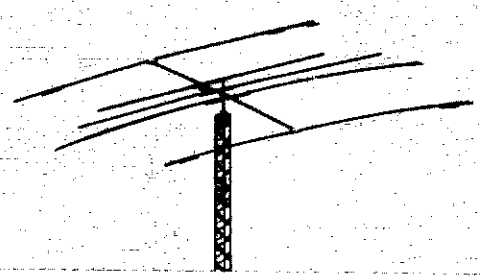

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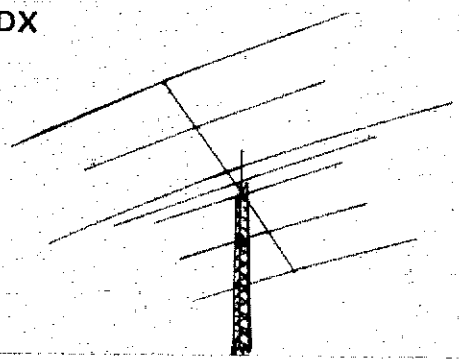

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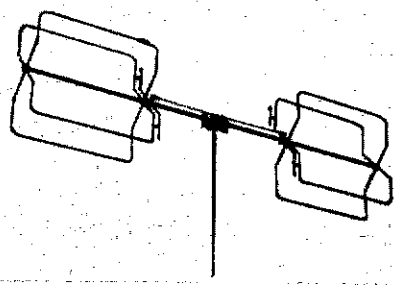

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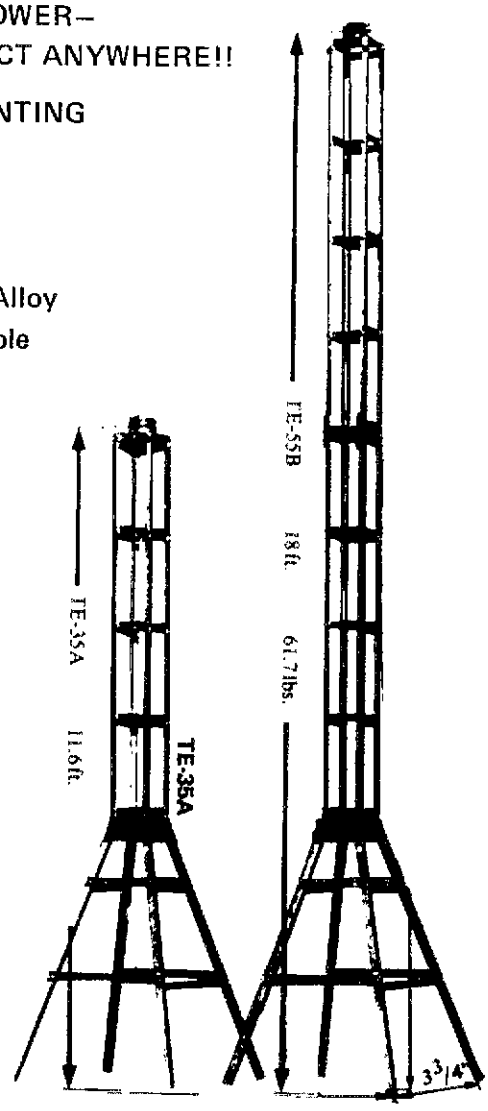

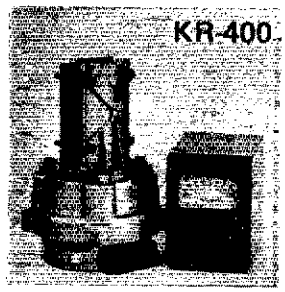

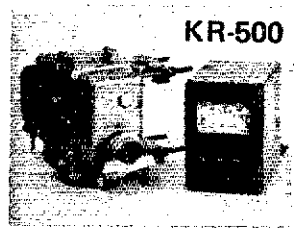

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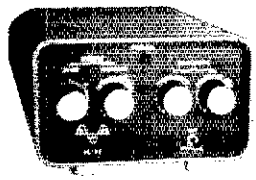

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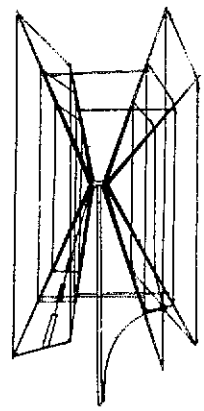

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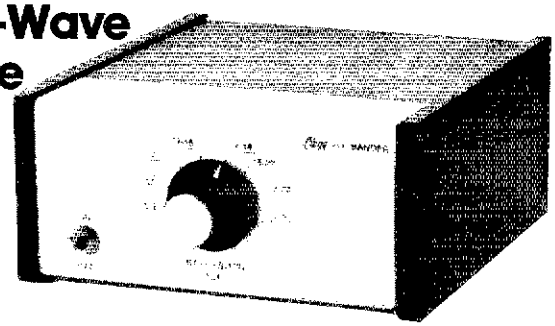

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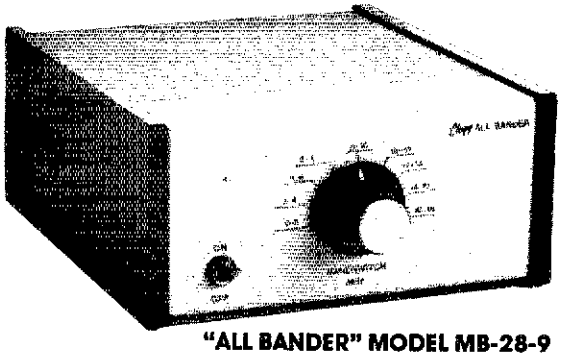

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Congrats to WB4TKU and gang on their second annual visit to area hospitals so Pediatric ward kids can talk to Santa via two meters. WB4UAY again played Santa. Net reports for Nov.: AENB QNI 225, QTC 107, 30 sess. AENM QNI 2344, QTC 109, 34 sess. Traffic: (Nov.) WA4-JDH 1343, N4MD 697, WN4KKN 290, WA4VKD 103, K4AOZ 76, WA4ZPZ 48, WA4FYO 40, W4LNN 29, WB4E-JK 25, W4IBU 20, WB4TKU 16, W4EF 9, WB4TVY 7, N4AIJ 3. (Oct.) WA4VKD 71, WB4KSL 44.

CANAL ZONE: SCM, Alvin Sholk, KZ5AS — 1979 CZARA Club Officers are KZ5JM pres.; KZ5AS vice-pres.; KZ5PM secy-treas. CQWW contest made 4,534,740 total points on all 6 bands, thanks to KZ5JM et al using KZ0DX call. KZ5EK traveled to ZL-Land on a container ship and operated as VP1EK/MM on CW. He was impressed by the hospitality extended by New Zealand hams. Several QSO parties are planned to allow the world to get KZ5 QSL cards before the call becomes deleted in Oct. 1979. Watch QST for further details. The CZARA club secy. will petition FCC to allow KZ5s returning to U.S. to continue to retain their KZ5 call and operate as KZ5 in U.S.

GEORGIA: SCM, A. H. Stakely, K4WC — SEC: K4SWJ. NMs: K4JNL WA3NAZ. Congrats to WA3NAZ K4EV AA4GA W4PIM making PSHR and to WB4ZOJ doing same for Oct. Congrats to WD4IBZ making General. Welcome to C.W. ARC of Trion now ARRL affiliated. New QCWA officers: N4UZ, pres.; W4HL, veep; W4JWO, secy-treas.; K4EZ and K4VN, directors. QCWA net 1400Z Sat. on 3.830 New directors of Albany ARC are KB4AJ WA4BDE K4DDM WD4IBO WD4IBT WA4KCL N4MY K4XA. Newnan Emerg. Net on 19/79 Sun. at 0200Z (Mon.) CVEN No. 1 QNI 55, CVEN No. 2 QNI 970, QTC 73. Cntrl Ga. VHF net QNI 90, QTC 6. NGSN QNI 41. Oct. reports: GSN QNI 404, QTC 245, GTN QNI 211, QTC 99. WGN fm QNI 61, QTC 5, cw QNO 6, QTC 13. West Ga. ARES cw net now expanded statewide will be GA Emergency Novice Net on 3.725 Sat. at 2200Z with WB4FAS net mgr. WD4ADV assisted vaccine shipment to Honduras. WB4ZOJ now on 75 with HW12. AA4GA made 75 sections in phone SS. WA4SSU has great time on Navassa Is. DXpedition. N4UZ got KL7 and KH6 same week on 80. Traffic: (Nov.) W4GH 316, W4FOE 230, W4PIM 210, WA4NAZ 152, WA4PUP 106, N4UZ 88, AA4GA 72, K4NM 53, K4EV 42, K4WC 12, W4FIZ 10, AK4T 10, K4BAI 5, K4PIK 5. (Oct.) WB4ZOJ 202, N4UZ 72, W4AAY 10.

NORTHERN FLORIDA: SCM, Frank M. Butler, Jr., W4RH — SEC: AA4FG. STM: N4WA. NMs: WD4LUG WB4PGB. The All-FL Phone Net now oeprating on 7251 kHz at 1730Z daily, seven days a week, with W4WNY NM. It will be the daytime equivalent of QFN (early), with TPTN providing the late sess. Net will liaison between FL phone nets and D4RN/DRN5. SNCs for QFN earned by N4EC KB4T and WD4LUG. New calls: WB4WYX now KB4B; WB4AOY is N4BBY; WB4ZTD is N4BEY; WA4ZSX is W5IJU/4. WB4PGB did FB job preparing NFPN report for QFN Bulletin; likewise WD4LUG and QFNS. WB4PKW upgraded to General; WD4OCI and WD4PYT to Advanced. WB4DYF joined VHF RTTY crowd in Pensacola. PARC pres. WD4CFO spent a few weeks in the cold North, along with WB4PFV. WD4CZQ new Editor of Relay Chatter. WD4HDT conducting Novice classes for PARC. He, W4MMW and WB3IUQ acquired new 2m HTs. Tallahassee moved its 31/91 repeater to a 600 ft. tower; their 16/76 machine still working well also. Autopatch service has been terminated for now. K4YLX is '79 Jax Hamfest chmn. N4KE K4UTE and N4UF set new world record from Haiti during CQWW contest. New RANGE officers: WB4GDJ, pres.; WA4DUD, v.p.; WB4EEK, secy.; WB4YTJ, treas. K4OAC and WB4SWV put a completely homebrew 450 MHz repeater on the air. Daytona Beach planning Hamfest for May 12-13, 1979. New DBARA officers: WA4QQQ, pres.; WA4MYG WB4OAC N4PL WA4ZTT. W4MGO new Editor of Groundwave. Volusia County RACES has its own repeater now — 146.385/146.985. K4RNS active in last YLAP. Traffic: AA4FG 408, WB4TZR 361, WD4HIF 291, N4WA 243, N4BBY 243, WA4CRI 243, W4MGO 225, WD4LUG 219, W4FZX 157, W4JL 150, WB4RIS 149, WD4IIO 149, K4DDY 136, KB4T 135, K4RNS 107, WD4NYY 101, W4LDM 92, WA4VLT 72, WA4OEM 69, W4KIX 59, WB4DTS 59, WB4QBB 57, W4FP 52, W4RH 48, WA4EYU 45, WB4VAP 43, KB4B 32, WA4HHC 31, W4MVG 24, N4ARJ 23, KB4DF 22, WA4QWX 21, W4DFU 19, W4DTV 19, WD4PK 14, WB4WOO 12.

SOUTHERN FLORIDA: SCM, Woodrow Huddleston, K4SCL — Asst. SCM: W4KGJ. SEC: AA4WJ. New appointment this month: WB4CDQ Net Manager TPTN. K4TH added TENTEC OMNI DELTA to station equipment. W4BK hopes to get a new HAM III rotator for Christmas replacing one that failed. W4MML reports Belle Glades repeater 60/00 has autopatch. St. Petersburg 66/06 machine should have autopatch early in Jan. with new Spectrum repeater. Convention at Clearwater put on by Florida Gulf Coast ARC was well-attended despite Thanksgiving. Ladies of St. Petersburg ARC hosted hospitality room, which proved very poular. Important traffic symposium resulted in establishment of All Florida Phone Net supporting Daytime NTS and officially representing Northern and Southern Florida Sections. First session meets at 1730Z on 7251 kHz. Tropical Phone Traffic Net has modified their mode of operation to conform to NTS guide lines and act as second session at 2200Z on 3940Z. SECs AA4WJ and AA4FG announced plans to hold state-wide Simulated Emergency Test on weekend of Feb. 3 and 4. Cooperation between ARES and REACT moved a step closer with plans made for publishing a list of ECs and REACT officials. N4XR had a great time operating CQ DX contest from HH2CQ with North Florida DX group. Vic is now practicing with his newly constructed WB4VVF accu-keyer. N4KB took 5 extra TCC skeds to help Xmas traffic in Dec. W4GPL reports making his first contact via OSCAR. Congrats! Traffic: (Nov.) WB4WYG 577, K4TH 513, K4SOL 478, W4MEE 445, WA4PFK 411, WA4NBE 410, W4LX 392, W4YCL 356, K4ZK 325, WD4NSG 290, WD4ISN 289, WA4SCK 288, WD4COL 268, WA4JPV 251, WB4FVV 233, K4EUK 225, WD4KPG 205, N4KB 190, K4YX 183, W4NTE 117, WB4AID 98, WA4GYF 92, W4GPL 90, W4WYR 79, W4ESR 71, WB4PIB 66, WB4AOC 61, WB4CDQ 60, W4KMN 58, W4NFK 57, W4IRA 42, WD4IUD 41, W4GDK 39, W4BK 38, WD4HYS 35, W4KGJ 29, WD4HMC 28, WA4HXU 28, W4AZJ 26, K8PXM/4 26, WB4KYE 23, WA4RLV 21, WA4EIC 19, W4MPV 19, WB4SNX 19, W4SMK 15, N4AUO 14, W4TJM 14, WA4QGV 12, KA8LM 11, WA4BYT 9, AA4BN 7, WB4GSV 6, WA4ESX 5, W4MML 4, N4XR 4. (Oct.) K4TH 216, K4YX 151, W4MML 10. (Sept.) K4TH 380. (Aug.) K4TH 530. (July) K4TH 396. (June) K4TH 242. (May) K4TH 284. (Apr.) K4TH 274.

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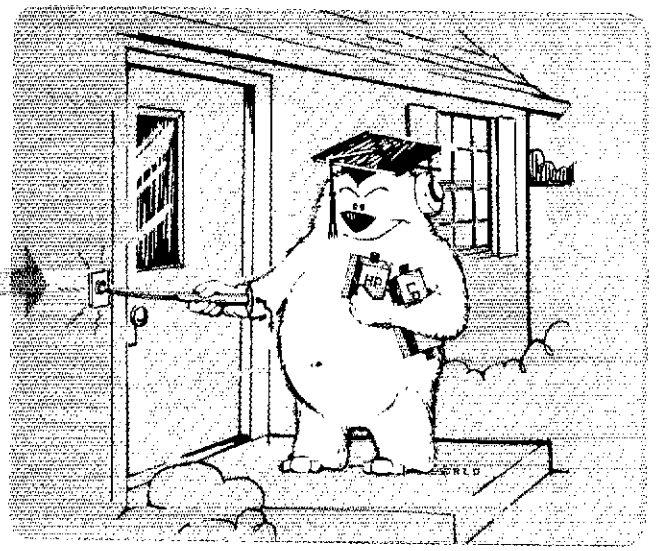
this fellow could be the "bearer" of the SOLUTION...



Don't let your several thousand dollar investment in a ham station sit idle for the want of a TVI filter

— let Drake solve the TVI problem.

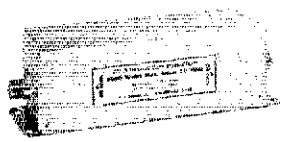
Although TVI/RFI is a complex subject, basically it has two forms: (1) Harmonics generated by the transmitter which fall on TV/FM channels. (2) Direct radiation from a strong fundamental signal directly into a nearby TV receiver. This is possible because strong signals at ham band frequencies can sneak around the tuned circuits in a TV and cause interference within the set. Even though the signal may be clean, direct radiation interference can occur as far away as several blocks, depending upon your power, antenna system, and the design of the TV.

DRAKE TVI FILTERS ARE THE ANSWER:

"Low Pass" Filters will reduce or eliminate TVI caused by harmonics from amateur transmitters. All transmitters generate some harmonics which might be just strong enough to cause TVI. We believe every station should be equipped with a Low Pass Filter, designed to cut off at 41 MHz, the TV i-f frequency. Drake filters are down 80 dB at 41 MHz to provide maximum protection.

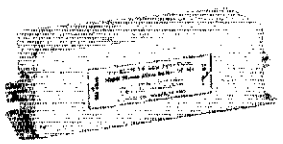
"High Pass" Filters are used to reduce or eliminate direct radiation interference at the TV set. There are less expensive High Pass Filters on the market for the TV set, but do they really work? Drake HP Filters provide 40 dB attenuation below 52 MHz; some others have measured at only 3 to 6 dB down.

HERE ARE THE "BEAR" FACTS:



Drake TV-3300-LP

1000 watts max. below 30 MHz. Attenuation better than 80 dB above 41 MHz. Helps TV i-f interference, as well as TV front-end problems.



Drake TV-5200-LP

200 watts to 52 MHz. Ideal for six meters. For operation below six meters, use TV-3300-LP or TV-42-LP.

Drake TV-42-LP

For transmitters operating at 30 MHz and lower. Rated 100 watts input.

Drake TV-300-HP

For 300 ohm twin lead. New connectors for "no-strip" installation.

Drake TV-75-HP

For 75 ohm TV coaxial cable; TV type "F" connectors installed. Ideal for master antenna systems for apartments and condominiums.

Certain situations require both a Low Pass and a High Pass Filter to solve the problem, and Drake can provide both types.

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Co-Dax Keyer	95

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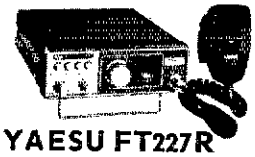

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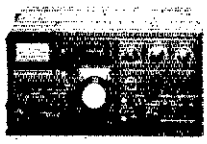

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TS820 — $1055.00

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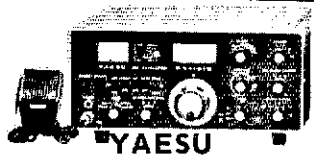

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FT101E — $799.00

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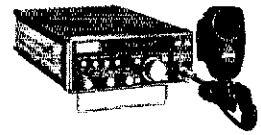
FT101EX — $699.00



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ARIZONA: SCM, Marshall Lincoln, W7DQS — NMs: WA7KQE W7UGG W7EP. W7GX, elected pres. of Ariz. QCWA, underwent major surgery at this writing (in early Dec.) and is reported recovering. New officers of the Ariz. Repeater Assn. are WA7PNY, pres.; WB7NKH, v-pres.; WB7CNY, secy.; WB7UWW, treas.; WB7BYK, prop. cust.; K4ESA K7RAC and K7VOR, directors. Tucson 2-meter amateurs provided communications for the Sabbar Shrine Circus and the Halloween Mardis Gras. Phoenix 2-meter amateurs provided communications for the Ariz. Diabetes Assn. bike-thon, the American Cancer Society desert run, and the Skull Mesa endurance ride. With regret, WA7ACD W7RVS and W7BT are reported as Silent Keys. WB7CDO, EC for Coconino County, conducted an emergency drill, simulating winter storm conditions. A month later, the first severe storm of the winter hit. Practice pays off in preparedness. Nets: (Nov.) SWN 169, Cactus 157, ATEN 128. Traffic: (Nov.) W7EP 392, K7MC 92, W7LVB 80, K7UXB 67, WA7KQE 47, K7NMQ 42, WA7VLA 18, K7NTG 16, N7EH 14, K7JKM 10, WA7WEB 9, W7DQS 2. (Oct.) N7EH 3.

LOS ANGELES: SCM, Perry Masterson, W6RHS — Not a great amount of news from the section this month. Received just a few reports. W6INH reports he has his new antenna up for 10 and 15 meters. His new 20-meter beam is still on the ground, same as mine. K6ASK had a ball during the SS CW contest. His new memory keyer working FB. N6PZ put up a zepp for 80 meters. How many people remember what a zepp is? the San Fernando Valley Radio Club (W6SD) put on a public demonstration at the Laurel Plaza Mall in North Hollywood Nov. 19. Among the displays were slow scan TV and RTTY. WB6NMO has been active on SCN/2 from Pomona. For you traffic hams, the Southern Calif. Net Freq. and times are as follows: SCN/1 at 6:30 PM daily 3598 and SCN/2 at 8:30 PM daily at 3598 kHz. SCN/2 is a slow speed 13 wpm only. A good place for newcomers to get started. Anyone wishing additional info call K5DYI6. K5DYI6 reports lots of traffic for the L.A. area. K6CL reports not much activity for the month. He has been traveling. WB5EKU/6 is interested in traffic and would like a traffic appointment. Those are the kind of guys we like to hear from. K6EA still working with the Novices. It is SET time again. Hope there will be much more activity this year in the Los Angeles section. Let me hear from the clubs along this line. Good luck. 73 for this time — W6RHS. Traffic: W6INH 265, W6OEO 216, K5DYI6 214, AD6M 171, N6PZ 145, K6EA 52, W6QAE 51, WB5EKU/6 43, WB6YID 34, W6BWG 22, W6BRO 11, K6CL 8.

ORANGE: SCM, Fred Heyn, WA6WZO — ASCM: K6KNC. SEC: AE6N. STM: WB6DAB (new appointment). NMs: W6CPB K6JT. ECs: WB6ARK K6GGS W6LKN W6WPP WA6YWS. Congrats to OO WA6IQL for a 77 HZ average in his first FMT; also, he reports many positive responses to his discrepancy reports. Congrats to WA6FIT on being reelected as pres. of the Orange County DX Century Club as well as his appointment as vice chairman of 1979 ARRL SW Division convention (to be held Oct. 19-21 at the Sheraton-Anaheim Hotel). Top officers for 1979 of the Riverside County ARA are K6CID, pres.; WB6PLR, vice-pres.; K6UIZ, treas.; KA6AEM, secy. South Orange ARA are WA6CUE, pres.; WA6ARN, vice-pres.; WA6SID, treas.; WB6SZO, secy. Orange County ARC WB6IHZ, pres.; WA6MOK, vice-pres.; WA6VKZ, treas.; WA6WZN, secy. The Hemet Valley Repeater Assn. reports that WR6BAQ (144.82 MHz input — 145.42 MHz output) is now in full operation including the airing of ARRL bulletins, announcements and weather information at 8 AM and 7 PM daily. On Nov. 13 AMSAT Coordinator W6CG gave a fine program on OSCAR to a joint meeting of the Sun City ARC, Lake Elsinore ARC and Lee de Forest RC of Hemet which included an introduction of the new SCM. In recent months W6MBA and other local hams have had the honor of visits from 9N1MM, 9V1OI and ZE6JP. Traffic: (Nov.) WB6DAB 190, W6RE 87, WB6BZZ 60, W6NTN 55, WB6QBZ 36, WA6QCA 34, K6WI 9. (Oct.) K6WI 41, W6NTN 20.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — Northern (SD County) Dist. ARES participated in an emergency medical drill Nov. 16. A "well done" to EC WB6HFE and WA6BCC, WD6BRT WD6BRU WD6DFK WB6HMY WB6HTS WB6LNH WB6LUD W6OTE WA6SVN W6WRM AD6Z WB6ZFV WD6AHX N6AMF. Also noteworthy are N6BB WA6BCC and WA6ENS for providing ground communications at Gillespie Field for the Women's Pacific Air Race. North Shores ARC 1979 officers: K6OBS, pres.; WB6RKK, v-pres.; W6JXA, secy.; W6JMA, treas. Upgraded: WB6BVH WD6BRP W6NWF to Extra; N6AQV to Advanced; KA6BVG to General. New Novice: KA6DIF. S.D. Repeater Assn. meets third Wed. at the Bonanza Restaurant, 2633 El Cajon Blvd. S.D. Contact SCM (see page 8) for details on appointment to Official Traffic Station (OTS), Official Bulletin Station (OBS), Official Observer (OO), and Official VHF Station (OVS). Palomar ARC, Poway ARS, and North Shores ARC have contributed to WARC Project Goodwill which provides transmitter and receiver kits to prospective amateurs in developing countries. SOBARS held an informal dinner at Barrett Junction. WA6ZZL has been appointed Net Manager for daytime RN6. Traffic: (Nov.) WA8UAZ 420, WB6PVH 414, N6GW 132, N6AT 73, K6HAP 62, WA6ZZL 58, W6HUJ 57, WA6UFY 4, WB7SUA 2. (Oct.) WB6FTY 194, W6UOF 8.

SANTA BARBARA: SCM, D. Paul Gagnon, N6MA — AJ6Y is hosting a 160M net on 1813 at 2000 on Wed. after the Section net on 3935 at 1900. Santa Maria ARES net meets at 1930 Mon. on 34/94. N6GC has been QNI for Cal CW Net. WD6EEN is asst. EC and mgr. of Lompoc ARES Net. WB6JKM sent 70 bulletins thru WR6AOX Satellite ARC Board is WD6DSK W2KVA WB7OPE KA6AKC WA6VNO W6PRN and N6MB. WA6VVN spoke at Santa Barbara ARC on his boat trip to an eskimo village. N6VR spoke on his trip to Africa at Ventura County ARC. Simi Settlers have issued nearly 100 Worked Simi Valley Awards. Contact WA6GUT for yours. W6ZH spoke at Satellite ARC on WARC. K5BNH and WA6TLP were active with a demo at Santa Maria Town Center. N6MA spoke at the Central coast QCWA meeting. Sulphur Mountain officers are WA6IJZ, pres.; K6VK, vp; WB6BPL, secy.; N6MA, treas.; WB6JKM, VHF rpt. AVERT held a Search and Rescue ELT drill with many amateurs participating. N6YH vacationed in the Midwest. K6YD has an Omni on SCN. K6SZS is sending code practice on WR6ASJ. WA6OHX K6KCI and WD6EZY were active in the YL contest. WB6RUO and W6HMI are Silent Keys reports Key Klix. WA6EQ recovering from an operation in Palo Alto. New equip: W6MTU-TR33C, WA6TLP and WD6BNA-FT7, WB6LDT ST6000, WA6KAA-TU170 for RTTY. Upgrades: KA6AU

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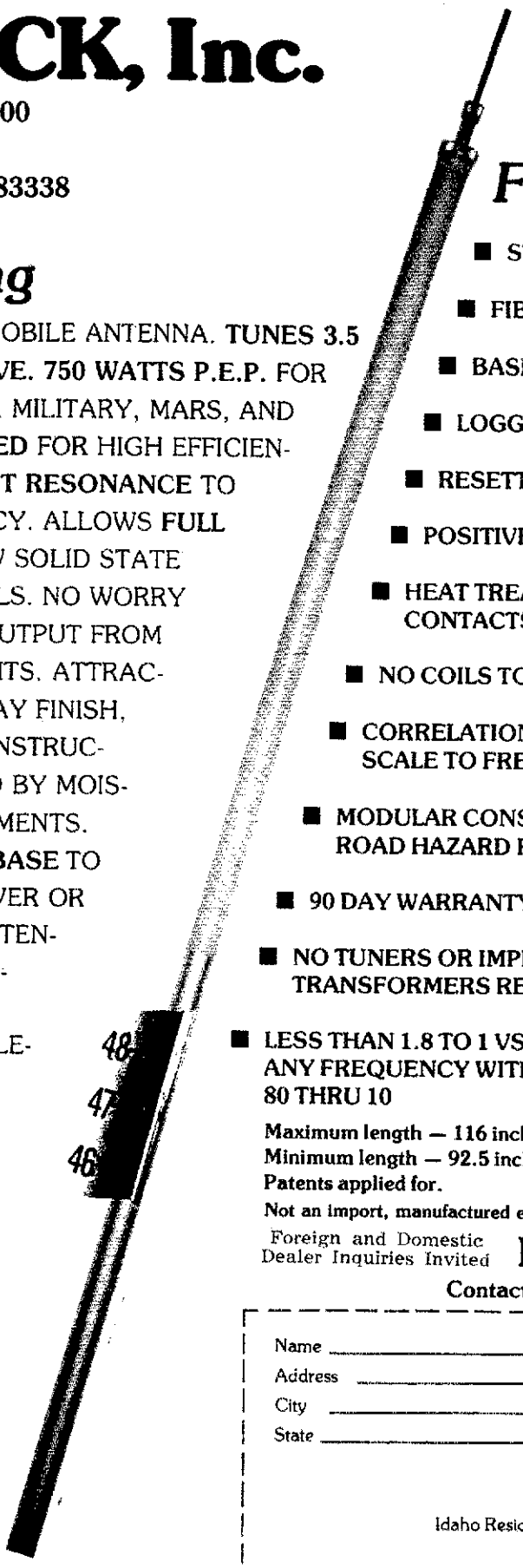

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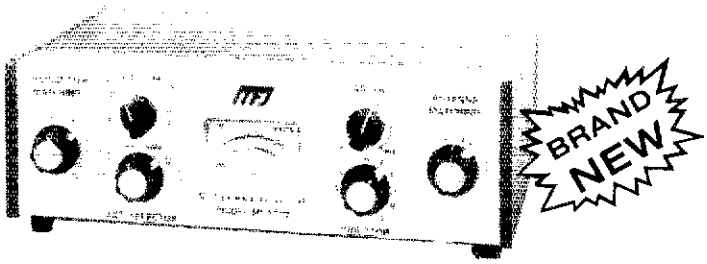

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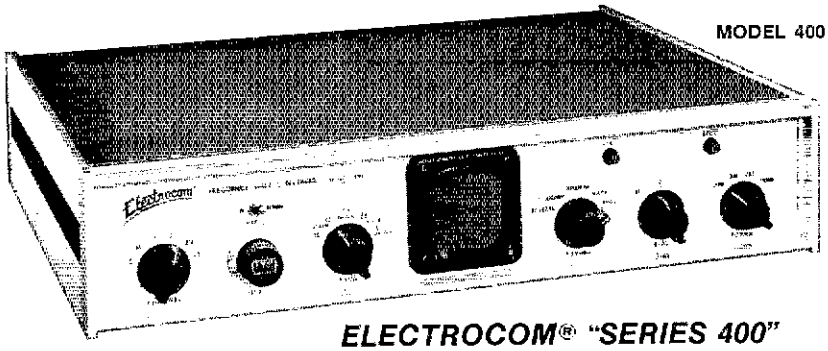
RTTY for ALL Systems



ELECTROCOM® "SERIES 400" FREQUENCY SHIFT CONVERTERS

Professionally engineered for outstanding performance, stability, and reliability, the Electrocom* Models 400 and 402 add new dimensions of compatibility between radio and teletypewriter systems. Manufactured to highest quality standards—an Electrocom tradition for nearly two decades—these units are ideal for military, government, commercial, civil defense and amateur applications. The Model 400 front panel digital knob accurately selects shifts up to 1000 Hz., while two such knobs on the Model 402 independently set the mark and space frequencies. Both models may also be preset with any tone pair between 1000 and 3200 Hz.

Optimum performance with FSK or AFSK systems is assured by matched filters, precision linear detectors, baud rate selector, bias compensation, and semi-diversity circuitry. Operation is enhanced by a CRT monitor, autostart with solid-state motor switching, antispace, markhold, EIA/MIL output voltages, and a constant current loop supply. In addition, various options are available including rack mounting and polar current output.

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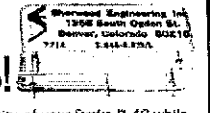
16-POLE R-4C SSB!



Improve the early-stage selectivity of your Drake R-4C while adding 8 additional poles (total 16) with an internally-mounted, switchable set of first-IF crystal filters. Reduce QRM, leakage, overload. Ideal for DX and contest work. Overall shape factor better than 1.4. Maximum skirt selectivity with maximum intelligibility. Total bandwidth with CF-2.1K/8: 2100 Hz at -6dB, 2900 Hz at 60 dB. Modest variable bandwidth. Other bandwidths available. Filter set can be mounted in receiver and relay switched with our kits which start at $53.00. 3 and 4 filter switching options can include our CF-600/6 and/or existing 8-kHz first-IF filter, all internally mounted, controlled from rear or front panel. USB and LSB CF-2.1K/8 pair is $120.00 per set. Money back if not satisfied. Add $3 shipping per order; $6 overseas air. Dealer inquiries welcome.

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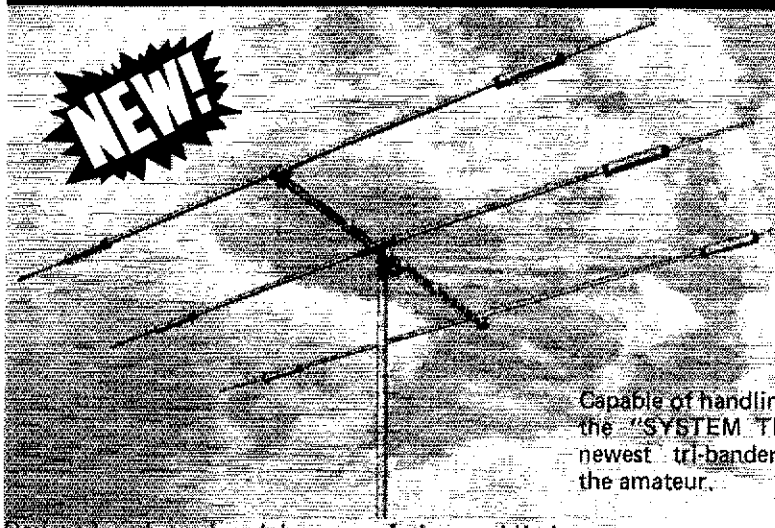
THE SYSTEM THREE TRIBANDER ANTENNA . . .

Top Performance for 20 - 15 - 10 Meters!



Wilson SY-3

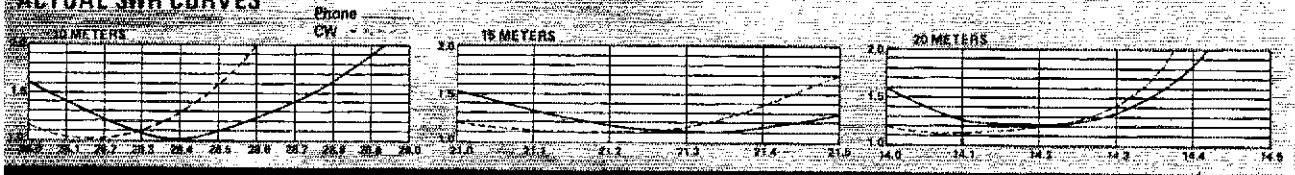
Capable of handling 2,000 watts, the "SYSTEM THREE" is the newest tri-bander available to the amateur.

SPECIFICATIONS

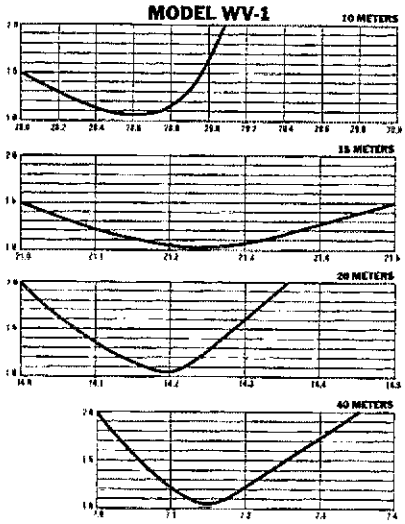
Band MHz	14-21-28
Maximum power input	Legal limit
VSWR at resonance	1.3:1
Impedance	50 ohms
Boom (O.D. x length)	2" x 14' 4"
No. of elements	3
Longest element	27' 4"
Turning radius	15' 9"
Maximum mast diameter	2" O.D.
Surface area	6.7 sq. ft.
Wind loading at 80 mph	114 lbs.
Assembled weight (approx.)	37 lbs.
Shipping weight (approx.)	42 lbs.
Direct 52 ohm feed or balun	
Maximum wind survival	100 mph

Designed and produced by one of the world's largest antenna manufacturers, the traditional quality of workmanship and materials continues on with the "SYSTEM THREE". The special heavy-duty vise-like extruded aluminum clamps on the reflector and director are a key point in the design of strength and durability. Superior clamping power is obtained with the use of a rugged ¼" thick aluminum plate for boom to mast mounting. The use of large diameter High-Q Traps in the "SYSTEM THREE" makes it a high performing tri-bander with a very economical price. A complete step-by-step illustrated instruction manual guides you to easy assembly and the lightweight antenna makes installation of the "SYSTEM THREE" quick and simple.

ACTUAL SWR CURVES



40 THRU 10 METERS VERTICAL TRAP

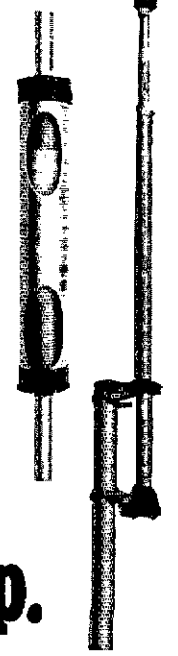


WV-1 WILSON VERTICAL TRAP ANTENNA

No bandswitching necessary with this vertical. An excellent low cost DX antenna with an electrical quarter wavelength on each band and low angle radiation. Advanced design provides low SWR and exceptionally flat response across full width of each band. Featured is the Wilson large diameter High-Q traps which will maintain resonant points with varying temperatures and humidity. Easily assembled, the WV-1 is supplied with base mount bracket to attach to vent pipe or to mast driven in the ground. The new WV-1 Antenna is value priced . . . and ships via UPS!

SPECIFICATIONS

Input Impedance: 50 ohms • Powerhandling capability: Legal Limit • Two High-Q Traps with large diameter coils • Low Angle Radiation Omnidirectional performance • Taper Swaged Aluminum Tubing • Automatic Bandswitching • Mast Bracket furnished • SWR: 1.1:1 on all Bands • 1¼" O.D. heavy wall aluminum tubing • Does not require guying • Overall length: 19' 8".



Consumer Products Division

Wilson Electronics Corp.

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Prices and specifications subject to change without notice.

and WA6VNO to Advanced, WD6CYW to General, WB6JKM WB6LPE to Extra. Santa Ynez Bike Race comms. were provided by WB6BWZ W2KVA WB6ORS WA6TLP N6AJA and WB6SIX. PSHR: WB6BWZ 13, N6WP 41, K6YD 22, WB6MXM 9, WA6TLP 15, N6MA 12. Traffic: (Nov.) N6WP 209, WA6MBZ 164, WA6TLP 125, K5BNH 106, K6YD 63, N6YH 53, WB6BWZ 47, WB6MXM 37, WD6EEN 24, N6MA 14, WB6JKM 10, K6SZS 4. (Oct.) WB6BWZ 53. (Sept.) WB6BWZ 43.

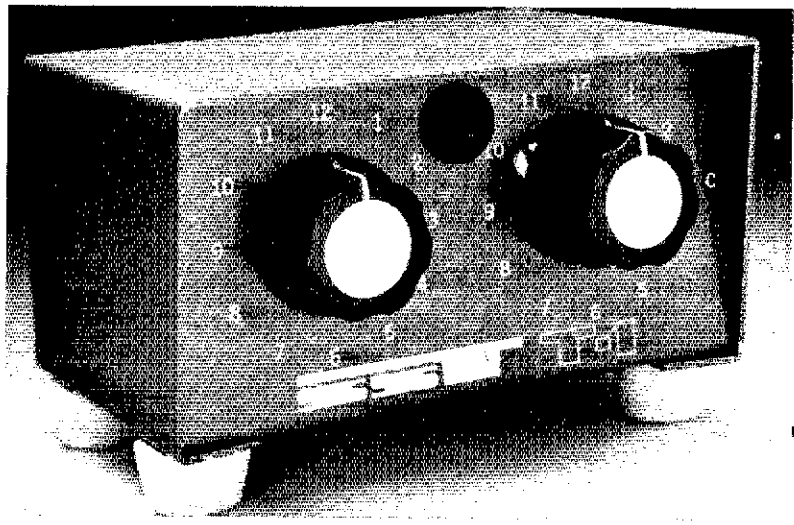
WEST GULF DIVISION

NORTHERN TEXAS: SCM, Ted Heithecker, W5EJ — Asst. SCM/SEC: K5PC. NMs at large: W5GN/AE5I. WD5EPC working with class of 8 on Novice tickets. W5YK new OBS for Centex Emerg. Net. OO/WA5UBK rpts. Local 10X chapt. "Plainsmen" placed No. 5 in summer 10X QSO Party. WB5ZGM now AI5S. EC/WA5WYI won free use of Scout plus gas for 1 yr. Nice mobile, James' Howard Co. Emerg. Net (new) meets on 146.22/82 WB5MTN and K5QKM working on joint ARES/Skywarn trng. program. WB5KTD rpts 17 full members in Bell Co. ARES now, with big SET plans. EC/K5DOI made several Asst. EC appts: WB0LIL/ops. WD5HHK/trng. K5JP/St. liasion N5OY/NTS K5WQH/Salv. Army. Looks like Tarrant Co. will be "big gun" in SET! New Club plus net in Van Zandt/Rains Cos. Free State ARC and Free State Net (Fri. at 2100L 146.49) with rptr. plans in the mill. WB5MTN passed Extra, congrats, Sid! K5SOR worked a KP1 on 160 mtrs. Panhandle ECs met on air for area-wide planning session Dec. 4th. What a beautiful set-up they have built up! K5OUK WB5SDD and W5TI all made BPL this month (a modern-day record for N. Tex.)! PSHR for Nov. K5SOR WB5LAT WB5SDD AE5I W5VMP and WD5DRK. Traffic: K5OUK 701, WB5SDD 602, W5TI 506, AA5J 234, W5CTZ 156, WB5LAT 125, K5MC 119, K5PC 108, W5VMP 107, AG5W 74, WB5OXE 69, K5SOR 69, WD5DRK 50, AE5I 37, WA5EZT 30, WB5MTN 15, WB5UHO 8, W5YK 8, WA5KZA 6, AE5U 4, N5BT 4, WD5EPC 4, WA5ZNZ 4.

OKLAHOMA: SCM, Leonard Hollar, WA5FSN — WOW! Three of our OK ops on the BPL list this month, K5JGZ K5OWK WB5NKC with 4 more ops with traffic totals of 100 or more. If my figures are right, the bulk of our deliveries are in the Oklahoma City area. Surely there is a lot of traffic going in to Tulsa that is not being reported.?? WD5ETB working very hard to get ARES off and running in Caddo Co. with some very good publicity. Our ECs could and should be providing some of our best publicity, not just during SET or FD but every time ARES is in operation. Both cw nets showing increases, both in QNI and QTC. But all nets still need YOU. FB meeting at Woodward in Dec., should see more activity from there soon. Next report from SEC should show another increase in ECs. Do hear that 2M SSB activity is on the increase in the Tulsa area. Okmulgee and Muskogee also show plenty of activity. Traffic: (Nov.) K5JGZ 650, K5OWK 624, WB5NKC 592, W5REC 387, WB5NKD 243, W5RB 180, WD5ETD 137, WB5MVR 84, W5BYC 75, WB5ELG 75, W5UYH 68, WB5EAY 65, WA5OUV 50, W5SUG 44, WD5ETB 43, W5FKL 36, K5CAY 34, WB5OCZ 29, W5VOR 27, WA5FSN 20, KB5EK 18, WB5TTU 14, WB5KVA 8, W5JJ 5, WB5TZZ 5. (Oct.) WD5ETD 44 WB5OCZ 21.

SOUTHERN TEXAS: SCM, Art Ross, W5KR — Asst. SCM: N5TC. SEC: WB5LHK. Net Managers-at-large: N5TC, phone; WA5RKU, cw. OOs reporting this month: K5DL WB5CIT K5MEN. OVSs rprtg this month: WB5CIT N5AJO WA5QCP. OTS N5FN reports that his wife is now KA5CSA; also says Brazosport ARC repeater (147.99/.39) will be operational in Jan. WD5IQN became Novice in Feb. '78, General in Oct. '78; now active in traffic nets when shift work permits. OPS K5RVF reports Amateur Radio Ops provided communications for Good Will Industries and Boy Scouts in drive on Nov. 5. OPS W5SPD continues to be active on ARES and traffic nets. OO K5MEN built a "J" pole antenna for 10 meters, says it works great. OO/OVS WB5CIT moving into traffic nets, is alternate NCS for TTN Sun. evenings; working on amplifier using pair of 813s. OVS N5AJO submitted first report; seemed disappointed with having nothing unusual to report; just a note to say THANKS and that all reports are welcomed because they show continuing interest. OVS WA5QCP reports good 6-meter opening on Nov. 26; worked several W6 and W7 stations; logged K6XB for 35th Calif. county. Traffic: (Nov.) W5KLV 893, N5TC 271, K5HZR 260, WA5RKU 255, K5DG 210, K5PE 87, N5FN 34, W5BHO 29, K5QEW 28, W5KR 26, WD5IQN 17, W5SPD 12, K5RVF 10, AE5X 6, WB5CIT 2, K5MEN 1. (Oct.) K5PE 74.

SST T-1 RANDOM WIRE ANTENNA TUNER



All band operation (160-10 meters) with any random length of wire. 200 watt output power capability—will work with virtually any transceiver. Ideal for portable or home operation. Great for apartments and hotel rooms—simply run a wire inside, out a window, or anyplace available. Efficient toroid inductor for small size: 4-1/4" x 2-3/8" x 3", and negligible loss. Built-in neon tune-up indicator. SO-239 connector. Attractive bronze finished enclosure.

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The Original Random Wire Antenna Tuner . . . in use by amateurs for 7 years.

SST T-2 ULTRA TUNER

Tunes out SWR on any coax fed antenna as well as random wires. Works great on all bands (80-10 meters) with any transceiver running up to 200 watts power output.

Increases usable bandwidth of any antenna. Tunes out SWR on mobile whips from inside your car.

Uses efficient tapped inductor and specially made capacitors for small size: 5-1/4" x 2-1/4" x 2-1/2". Rugged, yet compact. Negligible line loss. Attractive bronze finished enclosure. SO-239 coax connectors are used for transmitter input and coax fed antennas. Convenient binding posts are provided for random wire and ground connections.

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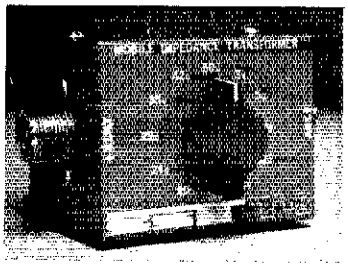

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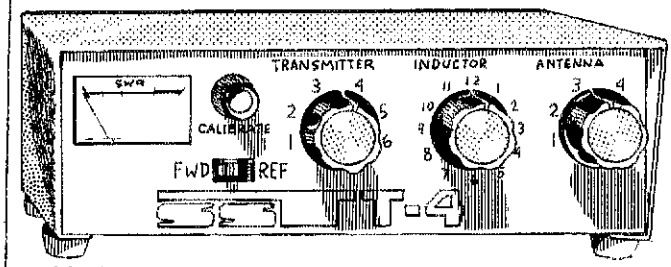
SST T-3
Mobile Impedance Transformer

Matches 52 ohm coax to the lower impedance of a mobile whip or vertical. 12-position switch with taps spread between 3 and 52 ohms. Broadband from 1-30 Mhz. Will work with virtually any transceiver—300 watt output power capability. SO-239 connectors. Toroid inductor for small size: 2-3/4" x 2" x 2-1/4". Attractive bronze finish.

SST T-4 ULTRA TUNER DELUXE



Matches any coax fed antenna or random wire. Works with any transceiver. Great for mobile, portable, or home operation. Antenna switch selects between two coax fed antennas, random wire, or tuner bypass. Attractive bronze finished enclosure with exclusive SST Styling. Compact size: 9" x 2-1/2" x 5".

Features:

- 300 watts **output** capability.
- All bands---1.8-30 MHz.
- SWR meter built in.
- Antenna switch on back panel.
- Efficient tapped inductor.
- 208 pf 1000 v. capacitors for flexible, reliable operation.

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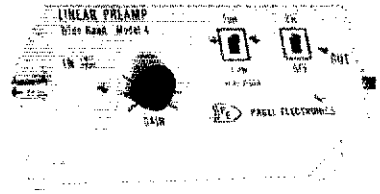
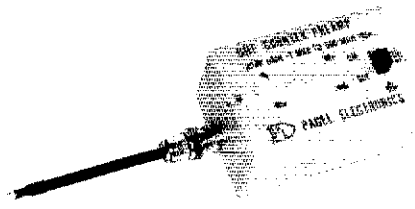
PREAMPS FOR SCOPES, COUNTERS, INSTR.





The Model 4 LINEAR PREAMP has performance to match lab type scopes, counters, and instruments which need wide band width and flat freq. response. It has 40dB gain (34 dB into 50 ohms) for IF, RF, pulse, video, audio, and a full range variable gain control. The band width switch reduces noise for low freq. measurements. Good pulse response with 10 nanosec. rise time. Freq. response is 10 Hz to 30 MHz at —3dB. Standard 1 Meg/20pF input matches scope probes. Max. output is 2 volts p-p into 1 Meg ohm and 0.5 volts p-p into 50 ohms. Resistive output will drive any impedance of 50 ohms or more.
Model LP-4, less batt. (6 pencells) .. $69.95

The Model VP-2 and UP-3 COUNTER PREAMPS are wide band with 20 to 30dB gain and will increase the sensitivity of counters at least ten times. Can be used with the probe to sniff weak oscillators or as in-line preamps for signal generators to allow a lower output setting and avoid frequency shifts. High Z input, output is 200 to 400 mv into 50 ohms. With probe, less batt. (3 pencells).

Model VP-2, VHF Counter Preamp, 100 KHz to 200 MHz $39.95

Model UP-3, UHF Counter Preamp, 1 MHz to 500 MHz $54.95

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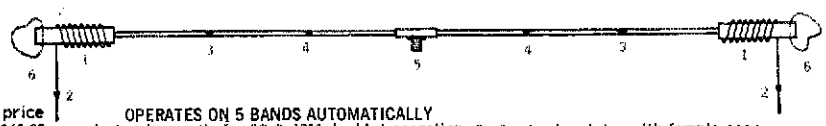
LRL-66 ANTENNA 66' LONG. 80 THRU 10M

Power rating 2 Kw. P.E.P. or over on 80, 40, 15 On 20 and 10 1 Kw. P.E.P. Transmitter input



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OPERATES ON 5 BANDS AUTOMATICALLY
1. Loading coils for 80 & 40M doublet operation
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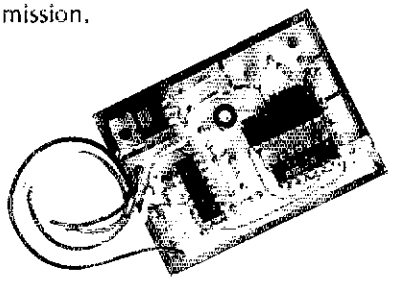
Identify your FM transceiver with automatic code on each transmission.



SMALL: 1 3/4" X 2 1/4" X 5/16"
Perfect means of RTTY code ID

WARRANTY
Returnable for full refund within ten day trial period. One year for repair or replacement.

PRICE $39.95 Ppd
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Your call sign programmed at factory, please be sure to state call sign when ordering.

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NEW! MFJ INTRODUCES THE *GRANDMASTER* MEMORY KEYERS

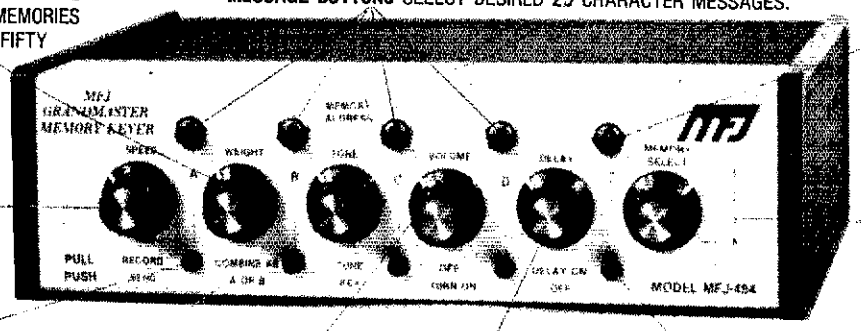
At $139.95 this MFJ-484 GRANDMASTER

memory keyer gives you more features per dollar than any other memory keyer available — and Here's Why . . .

WEIGHT CONTROL TO PENETRATE QRM. **PULL** TO COMBINE MEMORIES A AND B FOR 1, 2, OR 3 FIFTY CHARACTER MESSAGES.

MESSAGE BUTTONS SELECT DESIRED 25 CHARACTER MESSAGES.

RESETS MEMORY IN USE TO BEGINNING.



SPEED CONTROL, 8 TO 50 WPM. **PULL** TO RECORD.

MEMORY SELECT: POSITIONS 1, 2, 3 ARE EACH SPLIT INTO MEMORY SECTIONS A, B, C, D (UP TO TWELVE 25 CHARACTER MESSAGES). SWITCH COMBINES A AND B. **POSITION K** GIVES YOU 100, 75, 50, OR 25 CHARACTERS BY PRESSING BUTTONS A, B, C, OR D.

LEDs (4) SHOW WHICH MEMORY IS IN USE AND WHEN IT ENDS.

TONE CONTROL. PULL TO TUNE.

VOLUME CONTROL. POWER ON-OFF.

DELAY REPEAT CONTROL (0 TO 2 MINUTES). **PULL** FOR AUTO REPEAT.

LED INDICATES DELAY REPEAT MODE.

NOW YOU CAN CALL CQ, SEND YOUR QTH, NAME, ETC., ALL AUTOMATICALLY.

And only MFJ offers you the MFJ-484 Grandmaster memory keyer with this much flexability at this price.

Up to twelve 25 character messages plus a 100, 75, 50, or 25 character message (4096 bits total).

A switch combines 25 character messages for up to three 50 character messages.

To record, pull out the speed control, touch a message button and send. **To playback,** push in the speed control, select your message and touch the button. That's all there is to it!

You can repeat any message continuously and even leave a pause between repeats (up to 2 minutes). **Example:** Call CQ. Pause. Listen. If no answer, it repeats CQ again. To answer simply start sending. LED indicates Delay Repeat Mode.

Instantly insert or make changes in any playing message by simply sending. Continue by touching another button.

Memory resets to beginning with button, or by tapping paddle when playing. Touching message button restarts message.

LEDs show which 25 character memory is in use and when it ends.

Built-in memory saver. Uses 9 volt battery, no drain when power is on. Saves messages in memory when power loss occurs or when transporting keyer. Ultra compact, 8x2x6 inches.

PLUS A MFJ DELUXE FULL FEATURE KEYER.

Iambic operation with squeeze key. Dot-dash insertion.

Dot-dash memories, self-completing dots and dashes, jamproof spacing, instant start (except when recording).

All controls are on front panel: speed, weight, tone, volume. Smooth linear speed control. 8 to 50 WPM.

Weight control lets you adjust dot-dash-space ratio; makes your signal distinctive to penetrate QRM.

Tone control. Room filling volume. Built-in speaker.

Tune function keys transmitter for tuning.

Ultra reliable solid state keying: grid block, cathode, solid state transmitters (−300 V, 10 ma. max., +300 V, 100 ma. max.). CMOS ICs, MOS memories. Use 110 VAC or 12 to 15 VDC. Automatically switches to external batteries when AC power is lost.

OPTIONAL SQUEEZE KEY

for all memory keyers. Dot and dash paddles have fully adjustable tension and spacing for the exact "feel" you like. Heavy base with non-slip rubber feet eliminates "walking". $29.95 plus $2.00 for shipping and handling.

THIS MFJ-482 FEATURES FOUR 25 OR A 50 AND TWO 25 CHARACTER MESSAGES.

- **Speed, volume, weight, tone controls**
- **Combine memory switch**
- **Repeat, tune functions**
- **Built-in memory saver**

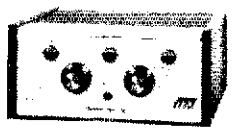
$99.95

Similar to MFJ-484 but with 1024 bits of memory, less delay repeat, single memory operating LED. Weight and tone controls adjustable from rear panel. 6x2x6 inches. 110 VAC or 12 to 15 VDC.

THIS MFJ-481 GIVES YOU TWO 50 CHARACTER MESSAGES.

- **Repeat function**
- **Tune function**
- **Built-in memory saver**

$79.95



Similar to MFJ-482 but with two 50 character messages, less weight controls. Internal tone control. Volume control is adjustable from rear panel. 5x2x6 inches. 110 VAC or 12 to 15 VDC.

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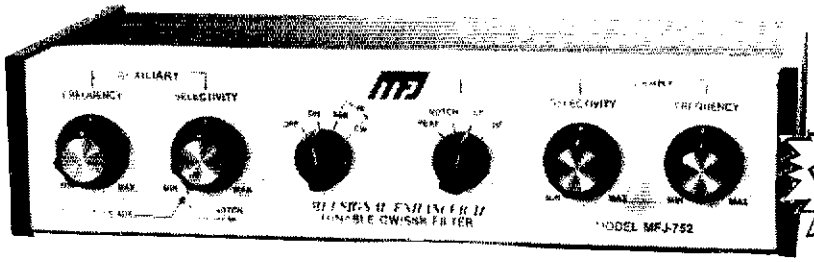
NEW MFJ Dual Tunable SSB/CW filter

lets you zero in SSB/CW signal and notch out interfering signal at the same time.



Ham Radio's Most Versatile Filter

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$79.95

The MFJ-752 Signal Enhancer is a dual tunable SSB/CW active filter system that gives you signal processing performance and flexibility that others can't match.

For example, you can select the optimum Primary Filter mode for an SSB signal, zero in with the frequency control and adjust the bandwidth for best response. Then with the Auxiliary Filter notch out an interfering heterodyne . . . or peak the desired signal.

For CW, peak both Primary and Auxiliary Filters for narrow bandwidth to give skirt selectivity that others can't touch. Or use Auxiliary Filter to notch out a nearby QSO.

The Primary Filter lets you peak, notch, low-pass, or highpass signals with double tuned filter for extra steep skirts. The **Auxiliary Filter** lets you notch a signal to 70 db. Or peak one with a bandwidth down to 40 Hz.

Tune both Primary and Auxiliary Filters from 300 to 3000 Hz. Vary the bandwidth from 40 Hz to almost flat. Notch depth to 70 db.

MFJ has solved problems that plague other tunable filters to give you a constant output as a bandwidth is varied. And a linear frequency control. And a notch filter that is tighter and smoother for a more effective notch.

Works with any rig. Plugs into phone jack. 2 watts for speaker. Inputs for 2 rigs.

Switchable noise limiter for impulse noise; trough clipper removes background noise.

Simulated stereo feature for CW lets ears and brain reject QRM. Yet off frequency calls can be heard.

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Every single unit is tested for performance and inspected for quality. Solid American construction, quality components.

The MFJ-752 carries a full one year unconditional guarantee.

Order from MFJ and try it — no obligation. If not delighted, return it within 30 days for a refund (less shipping).

To order, simply call us toll free 800-647-1800 and charge it on your VISA or Master Charge or mail us a check or money order for $79.95 plus $3.00 for shipping/handling.

Don't wait any longer to use Ham Radio's most versatile filter. Order your MFJ Dual Tunable SSB/CW Filter at no obligation, today.

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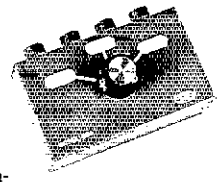
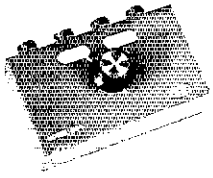


Model 593

- ***Single Pole*** 3 Position with grounding of all unused positions
- ***Crosstalk*** (measured at 30 MHz) is -45db between adjacent outlets and 60 db between alternate outlets



Model 594

- ***2 Pole 2 Position***
- ***Crosstalk*** 45db (measured at 30 MHz)

Specifications for both switches

- ***Power*** 1 KW-2 KW PEP
- ***Impedence*** 50-75 ohms
- ***VSWR*** 1.2:1 up to 150 MHz
- ***Dimensions*** 1¾" high, 5" wide, 3" deep
- ***Weight*** 1 lb.
- ***Mount*** Wall or desk

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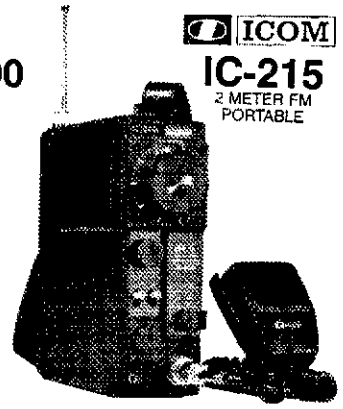

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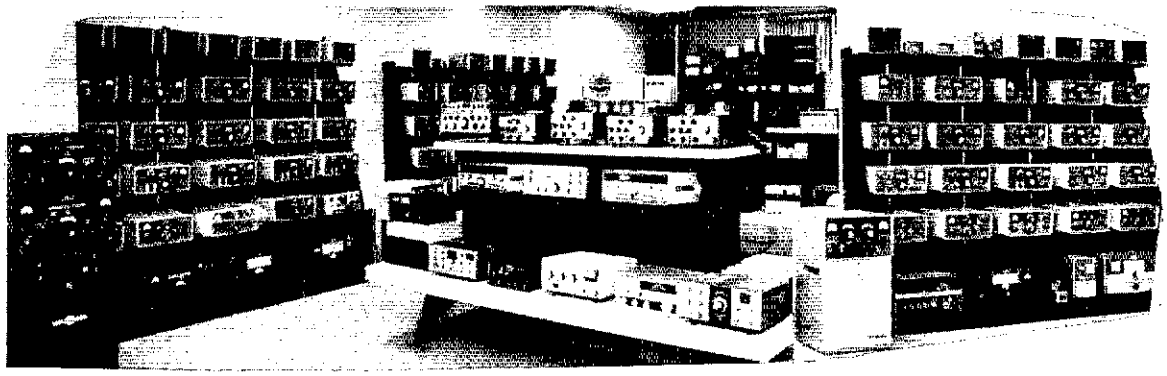

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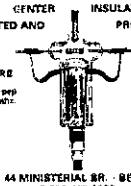

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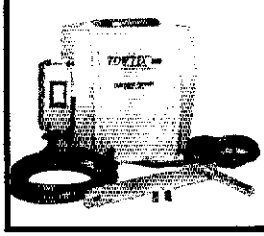

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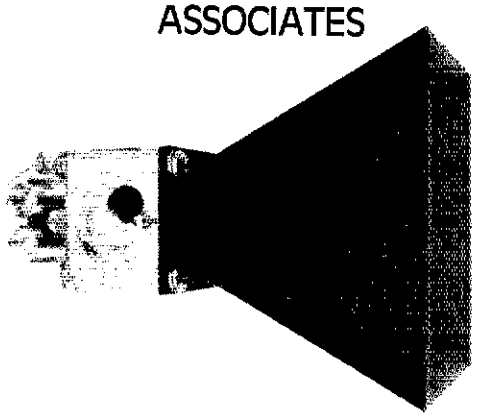

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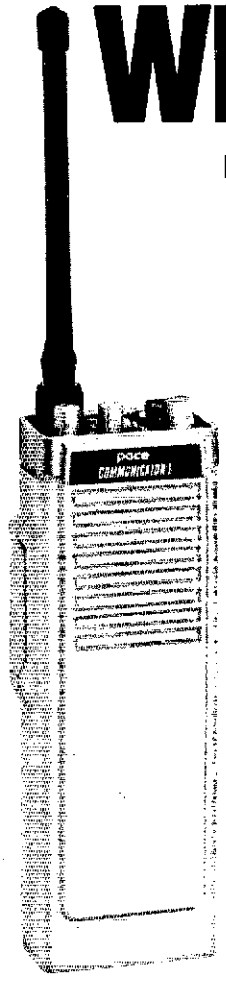

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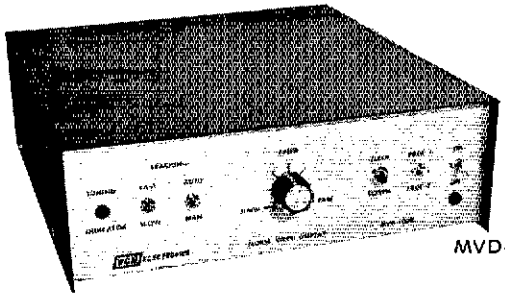

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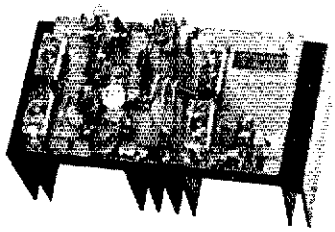

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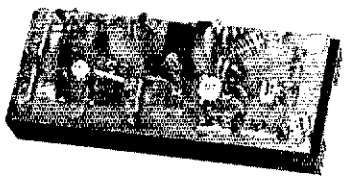

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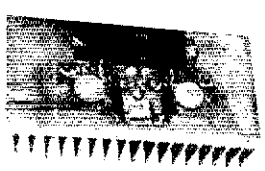

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C145	145-147	28-30
C146	146-148	28-30
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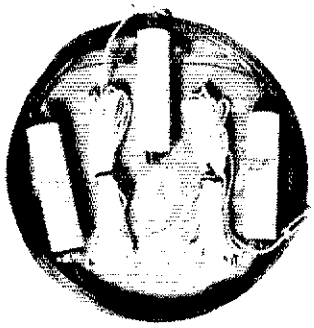

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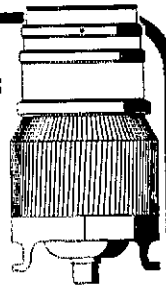

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LM-703H	.45	.46
LM-709H	.29	.30
LM-710N	.79	.80
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☐ SN7406	.29	.30	☐ SN7472	.29	.30
☐ SN7410	.18	.19	☐ SN7474	.35	.36
☐ SN7420	.20	.21	☐ SN7480	.50	.51
☐ SN7426	.29	.30	☐ SN7496	.65	.66
☐ SN7437	.25	.26	☐ SN74164	.89	.90
☐ SN7440	.20	.21	☐ SN74165	.89	.90
☐ SN7450	.20	.21	☐ SN74182	.79	.80
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50 watts	50H	50A	50B	50C	50D	50E
100 watts	100H	100A	100B	100C	100D	100E
250 watts	250H	250A	250B	250C	250D	250E
500 watts	500H	500A	500B	500C	500D	500E
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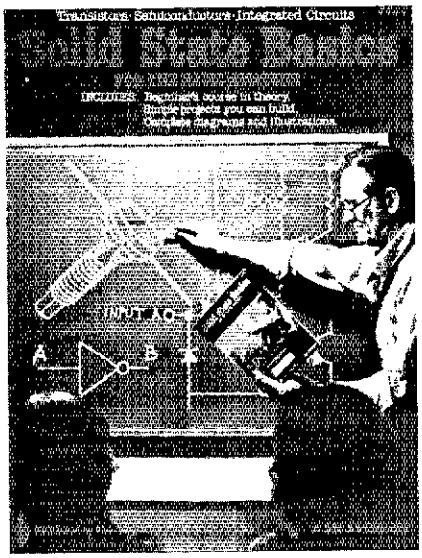

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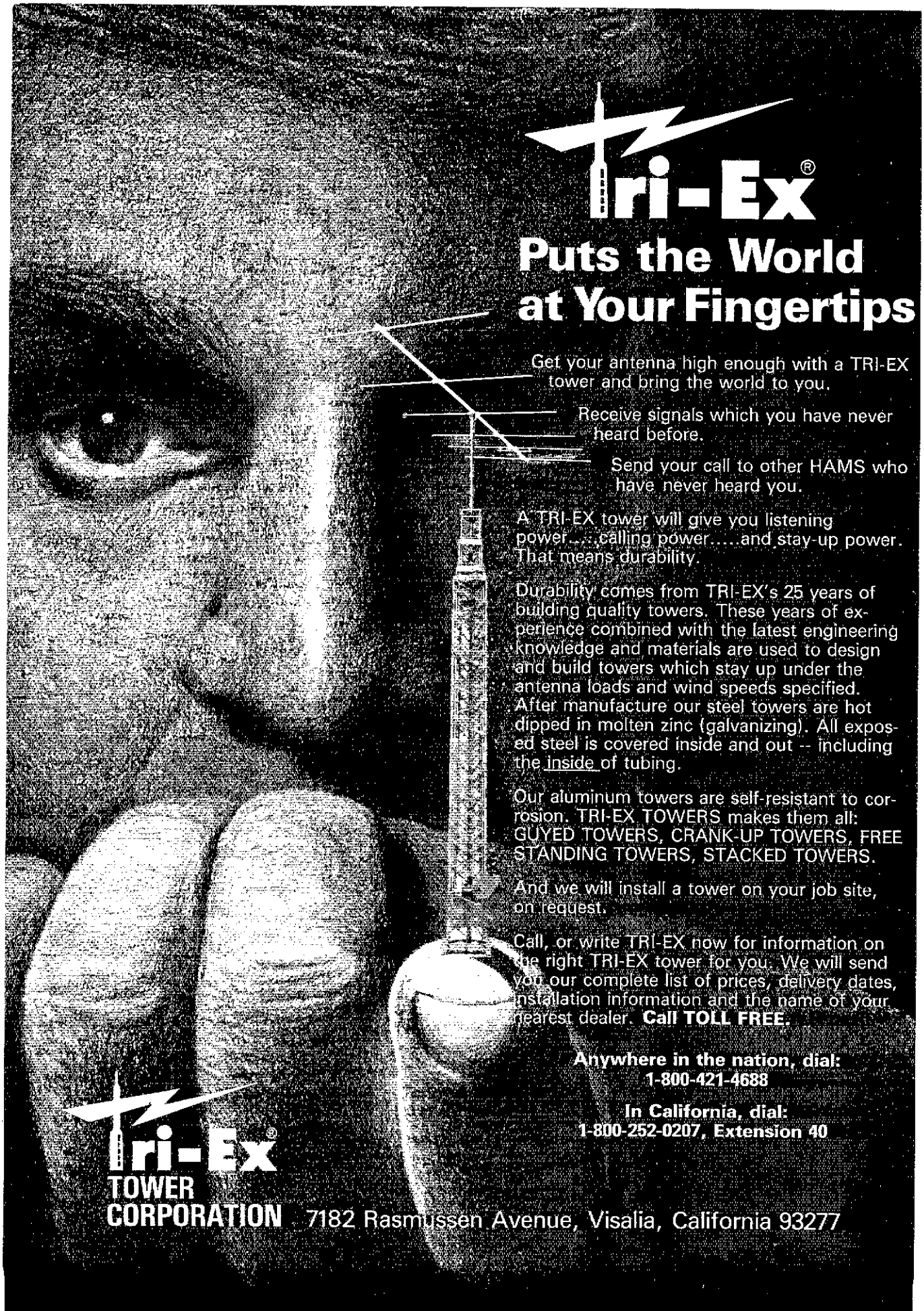
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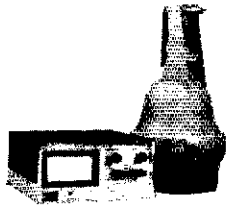

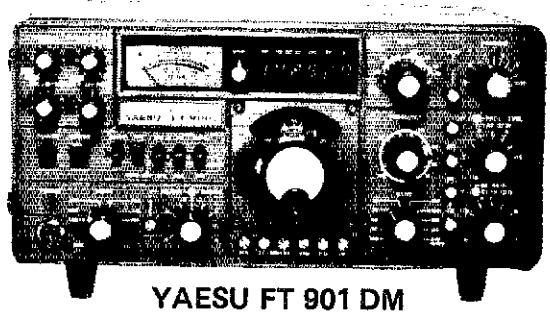

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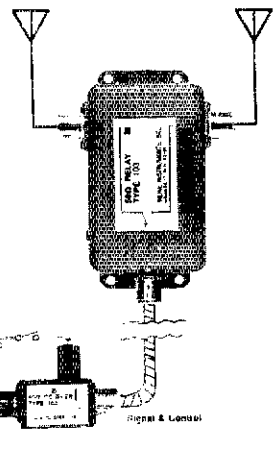

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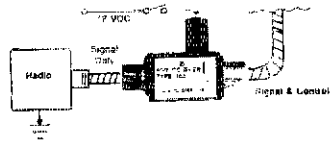

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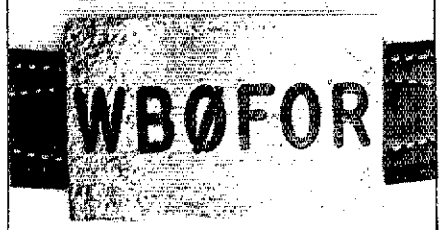

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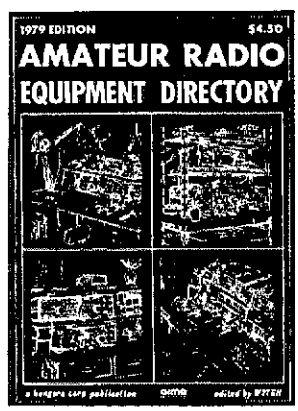

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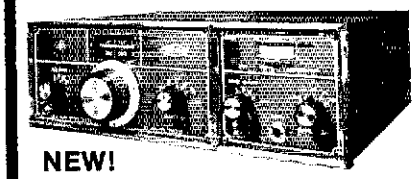

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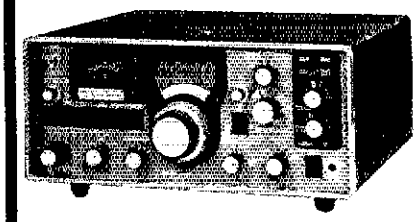

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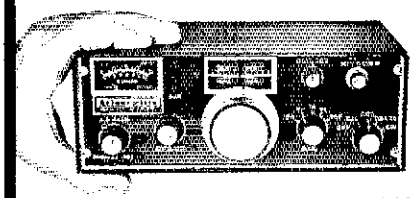

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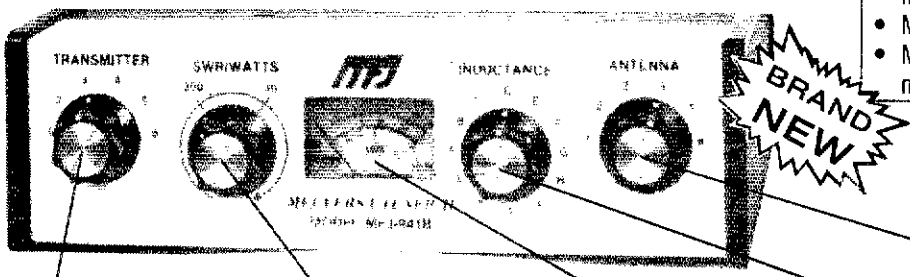

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A 1:4 balun for balanced lines. 1000 volt capacitor spacing. Mounting brackets for mobile installations (not shown).

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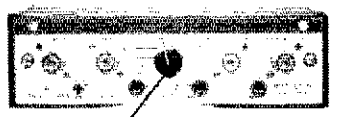

ANTENNA SWITCH lets you select 2 coax lines direct or thru tuner, wire/balanced line, dummy load.

You can tune out the SWR on your dipole, inverted vee, random wire, vertical, mobile whip, beam, quad, or whatever you have.

You can even operate all bands with just one existing antenna. No need to put up separate antennas for each band.

Increase the usable bandwidth of your mobile whip by tuning out the SWR **from inside your car.** Works great with all solid state rigs (like the Atlas) and with all tube type rigs.

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This beautiful little tuner is housed in a deluxe eggshell white Ten-Tec enclosure with walnut grain sides.

SO-239 coax connectors are provided for transmitter input and coax fed antennas. Quality five way binding posts are used for the balanced line inputs (2), random wire input (1), and ground (1).

NEW 300 WATT MFJ VERSA TUNER II'S: SELECT FEATURES YOU NEED.

NEW MFJ-945 HAS SWR AND DUAL RANGE WATTMETER. NEW LOWER PRICE

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Same as MFJ-941B but less 6 position antenna switch.

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NEW MFJ-943 MATCHES ALMOST ANYTHING FROM 1.8 THRU 30 MHz. NEW LOWER PRICE

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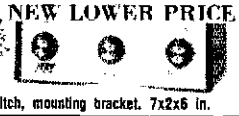

Same as MFJ-941B, less SWR/Wattmeter, antenna switch, mounting bracket. 7x2x6 in.

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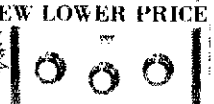

Efficient 12 position air inductor for more watts out. Matches dipoles, vees, random wires, verticals, mobile whips, beams, balanced lines, coax. 200 watts RF, 1:4 balun, 5x2x6 in.

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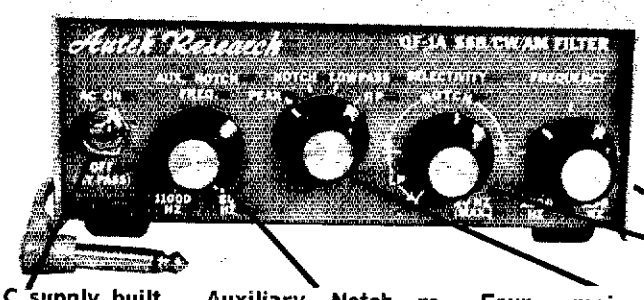

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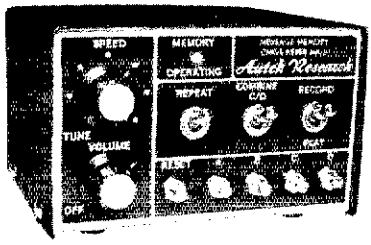

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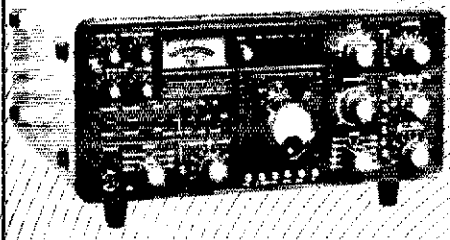

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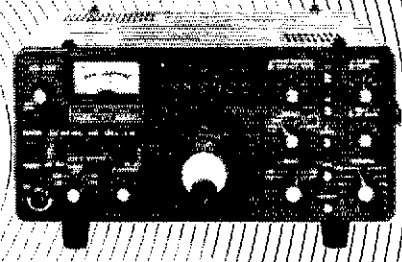

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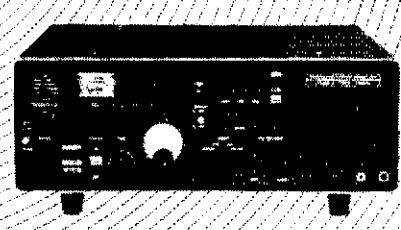

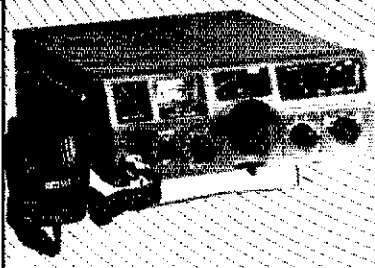

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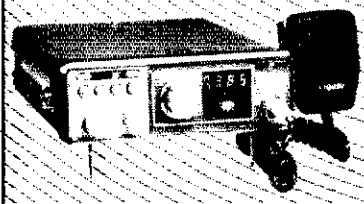

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RADIO Expo '79 September 15th and 16th, 1979, Lake County Fair Grounds, Routes 120 and 45, Grays Lake, Illinois. Manufacturers displays, flea market, seminars, ladies programs. Advance tickets, $2. Write EXPO, P. O. Box 305, Maywood, IL 60153. Exhibitors inquiries: Expo Hotline 312-345-2525.

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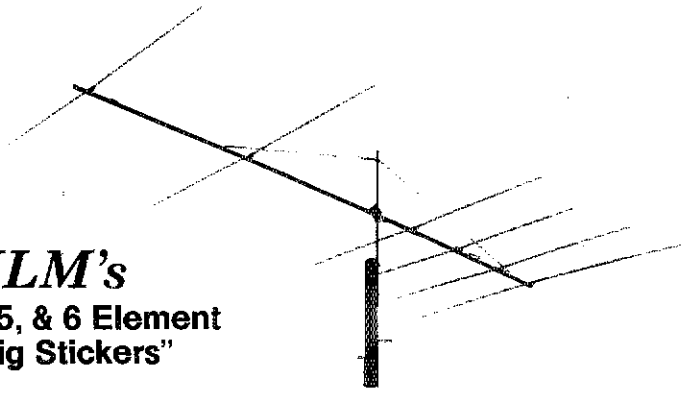

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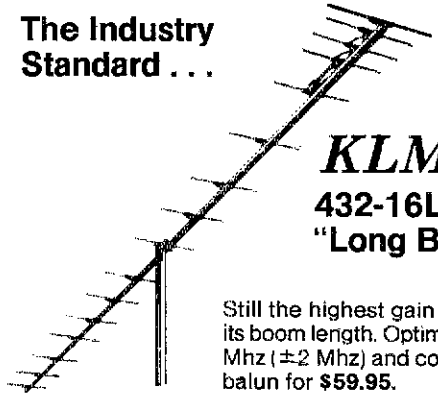

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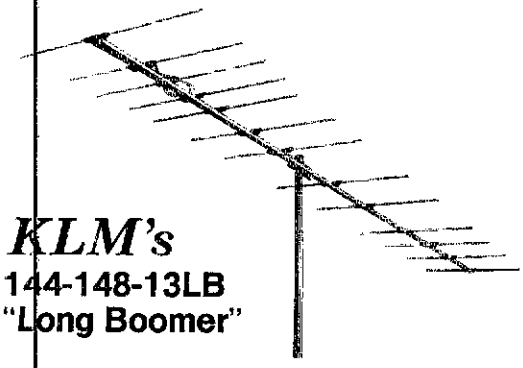

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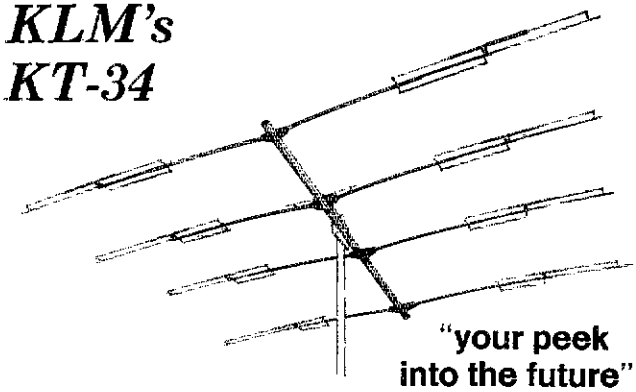

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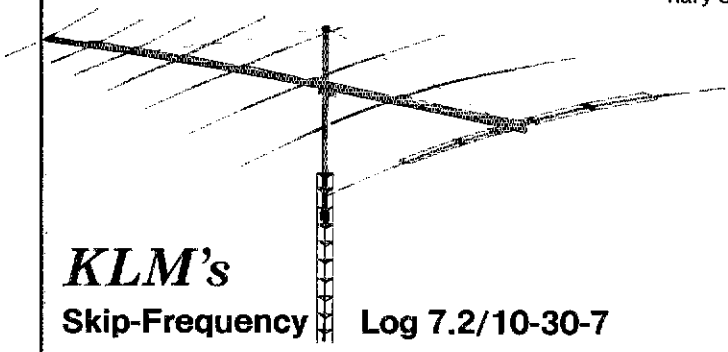

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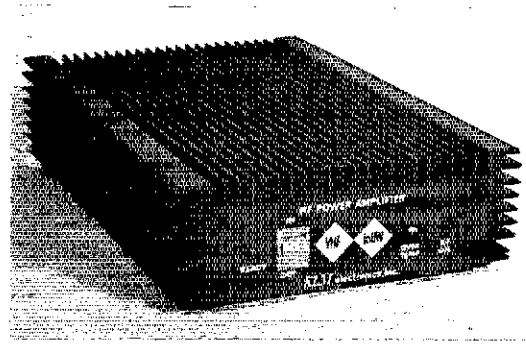

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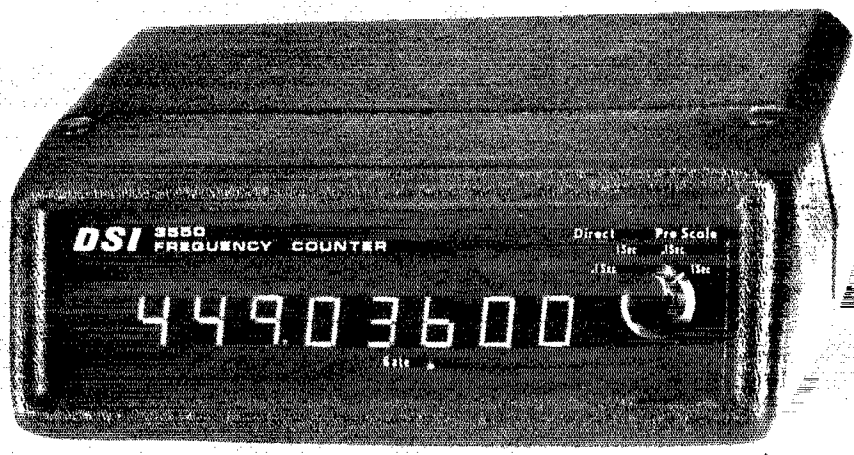

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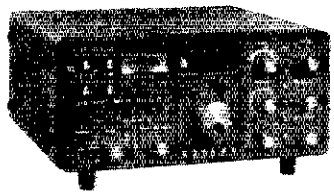

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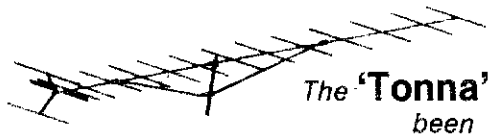

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QST magazines wanted (pre-1924). W6OU, 529 Kevin Way, Placentia, CA 92670.

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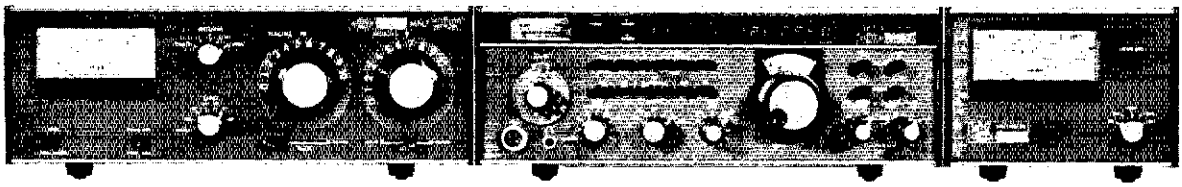

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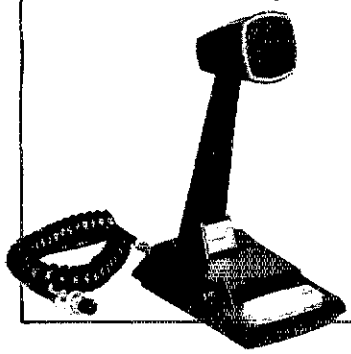

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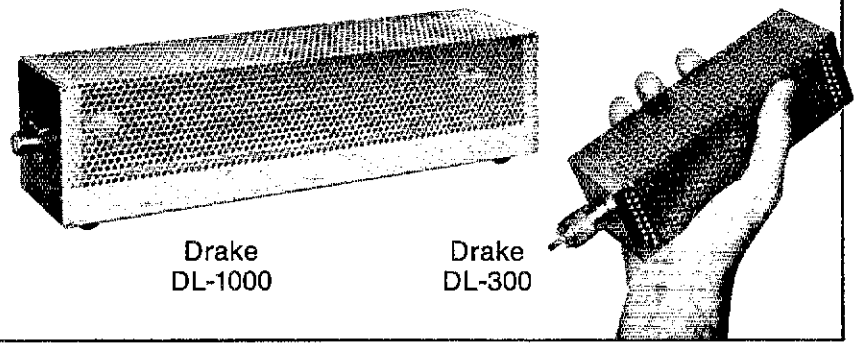

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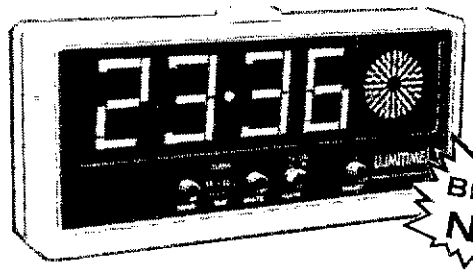

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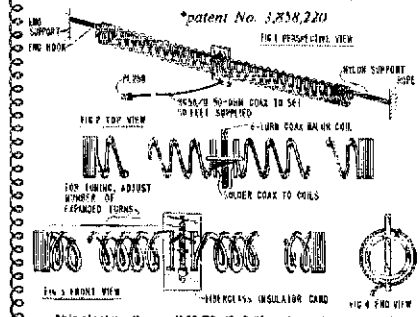

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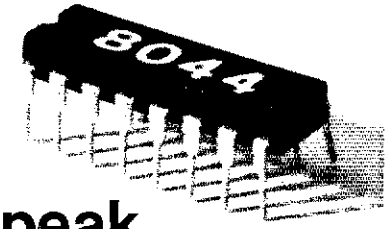

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WANTED: GE MASTR EP-38 power supply, also Progress Line ac supplies, VO type cabinet. Fred Findling, Box 125, Littleton, NH 03561.

FOR SALE: Boonton Q Meter model 160A $150; TS-413C/U sig. gen. $110, plus UPS. R. Honeywell, 726 Sabur Ct., Cape Coral, FL 33904.

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UNDERWOOD capacitors, type J101, s.a.s.e. Leo Schaaf, WA8ZHE 2648 North Aragon, Kettering, OH 45420.

WANTED: RCA publications on television (especially color), radios, including technical literature, customer instruction books, sales literature. RCA ham gear info. Also RCA Broadcast Equipment Catalogs, RCA Broadcast News magazines. Write with description and price. Carleton Sarver, 256 West 88th Street, New York, NY 10024.

C6A — LAND Adventure aboard completely equipped 42 ft. sailboat; Yaesu FT-301D, FRG-7, Atlas 210X, ICOM 22S, Dentron MT-3000A tuner, long wire antenna, electronic keyer; crew wanted to share expenses; sailing experience not necessary. Phone WD4OCI 904-387-3647 evenings.

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DX HOUNDS: computerized list: geographic, compass bearings, distances from your QTH to over 200 world cities. $2. Benchmark, Box 385-Q1, Providence, Utah 84332.

WANTED: HW-16, HG-10B with manuals, will pay top price for good condition. Gerald Woodrow, 12 Dakota St., Portland Maine 04103.

DESPERATELY Wanted — 4D32 final ampl. tube for Collins 32v-2. WA6UUX 5032 San Julio Ave., Santa Barbara, CA 93111.

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YAESU FR-101 digital receiver with all filters — crystals and converters, mint $500. KLM 160 watt 2 meter linear also mint — $170. Pat Brown, 713-481-1275, 12702 Gotham, Houston, TX 77089.

COLLINS 51S-1 gen. cov. receiver, absolutely flawless mint, must sell A.S.A.P. $1250 or trade. Mr. Goldsmith, WB6OIY, 213-927-3341 ext. 293. You won't find better.

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WANTED: Heath SB-620 Scanalyzer in good condition. Reda, WB2RUW, 9 Battlegreen, Rochester, NY 14624.

WANTED: Collins S/Line, 30L1, 312-B4, any condition. W9QYH, 1605 Ridge Rd., Green Bay, WI 54304.

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WANTED: HG-10B VFO for HW-16. B. Bookmyer, 806 Sandusky St., Ashland, OH 44805. 419-289-7682.

DRAKE L4B linear. "My spare" in mint mint condition. 80-10 meters. $950 local pickup. W1XX. 203-677-2206.

COMPUTER: Heath H8, 16K, (2)H8-5's, cassette, H8-13. Up and running. $900. A. Thornburg, RR2, Thompsonville, IL 62890.

YAESU FT-101EE, fan — $570; Dentron MT-3000A $275; Charlie Tepper, 212-268-2654.

SIGNAL/One CX7B Late California modified with LED counter by Cunningham, like new, $1395; Kenwood PS-8 power supply $90; ICOM IC3PA $60; Atlas PS-200 ac supply for 210 $85; dc cord for Atlas 210 $10; VX5M VOX for 210 $30; Kenwood Twins, T599A and R599 with speaker, $550; Ten-Tec 252 18 amp dc supply $80. Special prices on some demo equipment in ICOM and Kenwood, write for quote on what you need. Contact Bob Douglas,

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Before you make the choice of a new hand-held, ask about these important features:

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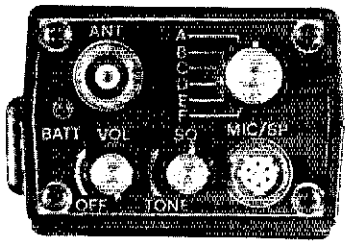

Conveniently located on top of the radio are the controls for volume, squelch, accessory speaker mike connector, 6 channel switch, BNC antenna connector and LED battery condition indicator.

MARK IV: ≃ 1 & 4.0 watts

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- BNC Antenna Connector
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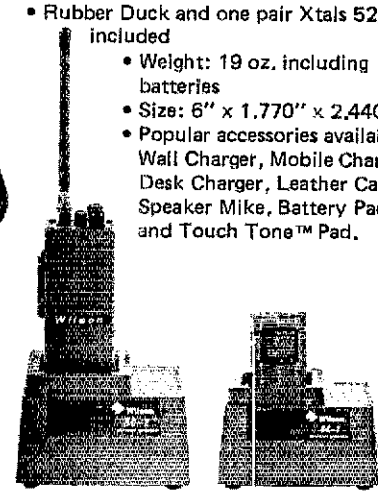
- Size: 6" x 1.770" x 2.440"
- Popular accessories available: Wall Charger, Mobile Charger, Desk Charger, Leather Case, Speaker Mike, Battery Packs, and Touch Tone™ Pad.



Illustrated is Wilson's BC-2 Desk Top Battery Charger shown charging the Mark Series Unit or the BC-4 Battery Pack only.

Optional Touch Tone™ Pad available.

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W5GEL, Douglas Electronnics, 1118 South Staples, Corpus Christi, TX 78404. 512-883-5103.

HEATH DX-60B transmitter, HR-10B receiver $100 both. HW-22 ssb transceiver $85. All in excellent cond. James Blattner, 3217 West, Ames, IA 50010. 515-292-5965.

TEN-TEC 570 Century 21 with 21 and 28 MHz xtals, internal preamp for receiver gives sensitivity better than 0.1uV $250. Dave K2VX, 18 Wilbur, Neward, NJ 07112. 201-575-1570 days 201-923-5322 evenings.

SELL: Collins 75S-3B, 32S-3, power supply, station control, round emblem, like new. W1WHO 1-203-875-9225.

KENWOOD ssb transceiver TS-900/PS900 supply new condition. With Mosley Classic 33 Tri band and mike, total on air station. $790. Prefer pick up. K3BSX/4, Karl Rittinger, 6875 S. A1A, Melbourne Beach, FL 32951. 305-7244664.

CODE practice cassettes — computer generated, perfect doe. High quality, full 90-minute cassettes. QSO tapes very much like new FCC code exam. Printed text included. 25 QSOs at 22.5 wpm order no. C8. Other types and speeds available. All cassettes $5.95 each ppd. S.a.s.e. for catalog. MC and Visa welcome. K5SMG, 810 Cardigan, Garland, TX 75040. 214-495-3604. Dealer inquiries invited.

SELL-Mint Swan TV-2 2-meter transverter, 240 watts, with coax switch and cables. Jerry, WB2KZX 212-278-0897.

HW-16 with HG-10B VFO $135. DX-60B $100. Add $5 if I ship. Manuals with each. Bert Lockard, WA3YTB, Box 1356 Sea-Air, Rehoboth, DE 19971. 302-227-9239.

CX-7 with improved power supply, audio and counter/display. Excellent condition; with manuals. K2KIR/W2JJ. 315-458-0940.

WANTED: Drake TC-2 2 meter transmitting converter. Barry Wright, 121 West Hermosa, Santa Maria, CA 93454.

SIGNAL/ONE CX-7A $1050; Motorola 2 meter repeater pick-up only $250; Heath 2 meter HW-2036 $250; ICOM 22S with synthesized switch $260. UPS prepaid. N4WF, 217 Bluegrass, Hendersonville, TN 37075.

TELETYPES (2) ASR33, 4 yrs old, good condition, $499, shipping. Jim Reagan WBØCHL, 1706 Mckinley Dr. Northfield, MN 55057. Tel: 507-645-6203.

SELL QST (1920's, 1930's), IRE Proceedings Special issues, Old Handbooks, ARRL publications, s.a.s.e. for list. WØKC, 10 Taylor Estates, Kirkwood, MO 63122.

DRAKE T-4X, 10M xtals, $290; R-4, 10M xtals, $270; AC4/MS-4 $100; HX-20 with ac supply $160; SBE-34 $190; Ameco CN-6m conv. $20, 2m CB-2 $10; mobile supplies MP-1 $20, HP-10 $30; grid dipper GD-1B $15; Finco 6 & 2m beam $25; Johnson Matchbox $40; SX-23 $60. W2OQX. 518-371-5513.

SALE: Kenwood TR-7200A, good condition. Crystalled 15 pairs, $175 or best offer. I ship. WA1NCN, Robert Waldo, 118 Quten St., Danbury, CT 06810.

YAESU FT-101EX, FL-2100, Gonset-III, 6m, Kenwood TR-2200A. Best offer. K4STR, McGuire AFB, NJ, 08641. 609-723-7290.

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FOR SALE: Elmac AF-67 transmitter, PMP-7 receiver, M-1070 power supply, all manuals, extra parts, tubes. Complete $100. K1JVJ Jack Plane 42 Penn. Ave., Niantic, CT 06357.

QUAD Kits, $16.25 to $30. Send s.a.s.e. for information. WAC, 404 Sanders Rd., SW, Huntsville, AL 35802.

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LOWEST Prices electronic parts. Confidential catalog free. Knapp, Dept. Q, 4750 96th St N., St. Petersburg, FL 33708.

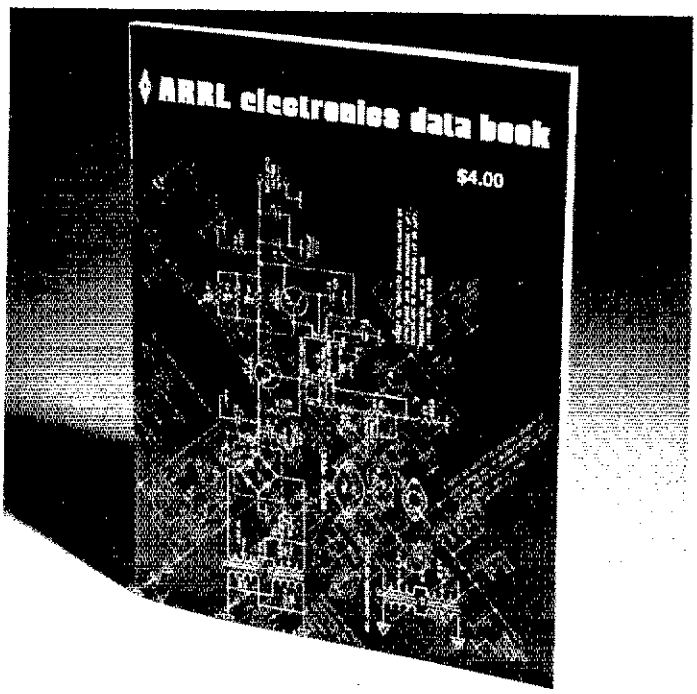
QST 1915 to 1921 — All in superb condition. Call Dave W3ZD 215-675-4539.

WILSON Mark II complete with battery pack and carrying case $247.95. Write or call for prices on other Wilson products. Iowa ham supplies 511 5th Ave., Coralville, IA 52241. 319-354-4478.

WANTED: Cathode ray tube for Tektronix 516 scope. Part number 154-06-4 or 154-0764-00. Bernie Glassmeyer W9KDR, Grove Beach, Westbrook, CT 06498.

WANTED: SB-610 scope, in repairable or good condition, also need SB-600 speaker. Will pay good price plus your shipping. WD5IAA 504-897-3178 4-10 P.M., CST.

SELL: Late Drake TR-4, AC-4 supply $450. Kenwood R-599A receiver, $325. New Autek QF-1 ssb/cw filters, $40. Elco model 950B R/C bridge, $40. Johnson T-R switch $25. Ameco model OM code practice oscillator $10. Antique cannon-ball (Dixie) headphones $10. Misc new tubes. Jake Bara, W7TF, Box 464, Newport, WA 99156. 1-208-437-4146.



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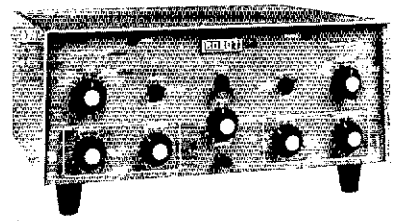

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TABLE Top linear GG 813s 80/10 and Eico triband 753 w/FET VFO both supplied solid state $400 or best offer. W4EMN, 3520 Lakeview, Pfafftown, NC 27040. Phone 919-924-8095.

51J3 $255. SB-500 $100. Nagata, 1330 Curtis, Berkeley, CA 94702. 415-526-7345.

SALE: Drake 2b mint condition best over $160. W4OGG 901-398-4340.

WANTED: Manuals for Pierson KE-93 receiver or Knight VFO. John Schutt, 1416 Rossi Street, Boise, ID 83706.

USED Gear: FT-101B $550, SB-220 $450,(10m) and more. Please write or call for list. WB9OCU 414-878-2969.

RTTY, HAL Communications ST-6000 demodulator/keyer with scope, cables, manual — purchased new Feb. 78, never used, cost $595 — will sell for $350. Mike Parsons, Wellborn, FL 904-963-3456.

DRAKE 2B 2BQ manual, Ameco preamp, $190. Heath HW-202, 5 channels, $100. WA1MDO, 40 Maplewood Ave., Marlboro, MA 01752. 617-481-1751.

FOR SALE: SB-301, SB-401, all cables, $400: Wanted: FT-101B, will trade. Mike Craig, 1711 Fremont, Casper, WY 82601.

SELL mint SPR-4/FS/4, all mods for SWL plus buffer for digital readout, SPR-4 factory aligned 6/14/78, synthesizer under warranty, both $695 or make offer. Brookwell, 714-429-9728.

KENWOOD: TS 700A Good condition. All mode cw, ssb (upper and lower), fm and am, $465. Money order or certified check. Bernie Glassmeyer, W9KDR, Grove Beach, Westbrook, CT 06498.

WANTED: Heath SB-620 spectrum analyzer, SB-610 signal monitor, SB-630 station console, GC-1092D calendar/clock. Good condition only. George Bailey, 600 West Kiehl, N. Little Rock, AR 72116.

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SELL: 4CX250F, 1625 tubes. S.a.s.e. WA1WLW.

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YAESU Twins FT-101B, FL-2100 $900; Swan broad banded SS-200A with PS-20 supply $800; SB-610 monitor $95; new Genave GTX-200 $129; Johnson Match Box $75. K4AET, Rte. 1, Box BB15, Saluda, VA 23149. 804-758-5147.

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SELL SP600-JX. With manual and hard to get spares (transformers, chokes, tuning condensr etc.) Excellent general coverage receiver .55 to 54 MHz, $275 local or shipped collect. Ken Kinderman, WB9OZR/2, 8 Coventry Rd., Wayne, NJ 07470, 201-628-0361.

SELL 10 MHz scope. Dumont 303 with service/calibration manual. Internal voltage and time base calibrators permit direct frequency and voltage measurement. $85 local or shipped collect. Ken Kinderman, WB9OZR/2, 8 Coventry Rd., Wayne, New Jersey, 07470. 201-628-0361.

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TEN-TEC Argonaut 509, p.s., cw filter. New. $298 postpaid. WB7VOO 602-298-4820.

DRAKE Station: R-4C, T-4XC, L-4B, FS-4, MS-4, AC-4, 3 xtra filters. Mint, little use. $2295. Local only, K1CM. 617-773-4421.

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COMPLETE RTTY setup consists of homebrew ST-6 w/Butterworth filters; 28KSR (floor stand); Model 14-TD Kleinschmidt typing reperf. This equipment won 4th

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HQ-110 excellent condition, needs alignment. $75 firm. W5TTJ 505-622-6138.

SELL: KWM-2, wing, 516F2, round, Telex boom mike, with head set, all manuals, mint, $700. Henry Van der Waarden 516-735-5804 after 7 P.M.

SKYCLAW, 160 meter vertical, new, $59.50, Electronics World. 601-769-2586.

SELL: SB-102 transceiver, completely checked by Heath. HP-23A power supply, SB-600 speaker, SB-630 console (SWR meter, phone patch, clock), fan, Electro-Voice mike, key, phones, manuals. $395, package deal only. Bob, K4JBI, 1068 sw 13th Place, Boca Raton, FL 33432. 305-391-1659.

HEATH HW-2036A transceiver with Micoder II $250. HW-2036-3 p.s. $30. Excellent condition with manuals. W4MGG 919-768-0623.

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WANTED: TR-4C & AC-4 supply. State condition & price. KØUEV, P. O. Box 127, Camdenton, MO 65020.

WANTED: Collins VFO unit 3.455 mc to 2.455 mc. Best price. Heard Lowry, 915 Madison St., Manchester, TN 37355.

FOR SALE: Estate of W2AGS. Super-Pro BC-794 1.2 Hz-20 MHz, speaker and p.s. Needs new phasing shaft. $75. Halicrafters HT18 3.5-28 MHz $50. Viking Ranger Trans $75 FOB. National NC-98 receiver with speaker $75. W2AOM — 67 Juniper St., Dumont, NJ 07628.

SELL Dentron MLA-2500 with 10 m. Yaesu FR-101 digital

rcvr with 250 Hz cw filter. Hal Rvd 1002 converter. ICOM IC-22S write/call. Fred Ring, W1NHS 456 Sportsman Rd., Orange, CT. 06477. 203-795-5478.

COLLINS KWM-2 transceiver, $1200; with Spectronics digital display DD-1C @ $150; Magnum Six rf speech processor; $150; 516F-2 power supply; $150; 75S-3 receiver; $750. All like new in mint operating and appearance. W3NV, 8258 Brittany Place, Pittsburgh, PA 15237.

WANTED: uhf GE mastr pro and vhf Harris mobiles. Sell: AN/URM-25 signal generator $235. Rapid charge nicad battery for HT-220 Omni $25. W4BCS, 6112 Lakeshore Drive, Mableton, GA 30059 404-941-3461.

TEKTRONIX SC-502 scope, DC-501 counter, TM-503 power cabinet $1500. W3GCH, P. O. Box 402, Aberdeen, MD 21001. Phone 301-272-0548.

SELL: HW-101, w/cw filter, p.s., speaker, good condition. Grover, WA2MNR, 310 W. 77th St., N.Y., NY 10024.

HW-8 mint $100. Lee Nelson, 318-232-7957.

R390-A Just re-aligned — Hot. $375, you ship. WA3KVN 215-943-4475 after 6:00 P.M. EST.

SB-200 Heath linear with 10 meters, unopened carton, $450. Drake AA-22 2 meter linear $50. Plus shipping. K4HEM, P. O. Box 16237, Ft. Lauderdale, FL. 33318. 305-791-7481.

TEN-TEC Triton-II with supply, MN-4, Shure 444, $650 complete station. siegel 212-242-0811.

DRAKE R4C w/500 cy, mint $485. New MN-2000, $185. K8DR, 614-457-1486.

BACK issues QST and CQ, past 20 years. Make offer. Include shipping. W4AX, RFD 4 Box 71, Glen Allen, VA 23060.

VACUUM relay, new, TORR TVS-1 7050, spdt, 24 ohm coil, glass, full kW. $45. W4AX, RFD 4, Box 71, Glen Allen, VA 23060.

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COLLINS: 32S3 — $595, 75S3 — $425, 516F-2 — $150. Want: Signal/One, reasonable; Alpha. R. Schaaf, RR3, Kankanna, WI 54130.

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USED/Demo Specials: Used 51S-1 super-mint $1399, used S/Line 75S-3B & 32S-3 & 516F-2 $1499, used FT-7 $399, used Bird 43 W/2 slugs $149, Demo IC-701S complete $1379, Demo TS-600 $589. All prices include UPS delivery and insurance. Ham Radio Outlet, 800-854-6046, ask for Jim, N6RJ.

SELL: Collins KWM-2A (round) recent, 516F-2, 312B-4, MM-1, SM-1, two crystal packs, 75S-1, all for $2500. Bird 1.5 kW DL/wtmtr $200. Regency HR-2A loaded $125. NEw Motorola HT-220 hi-band slimline, batt, case, chgr $425. Tom 916-422-8592. 6510 Surfside W., Sacramento, CA 95831.

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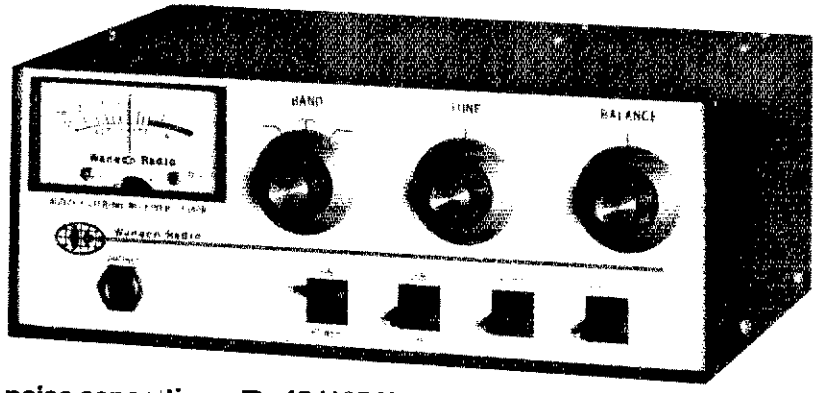

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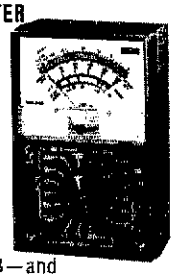

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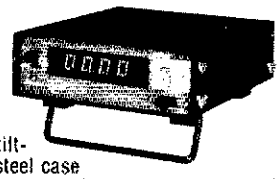

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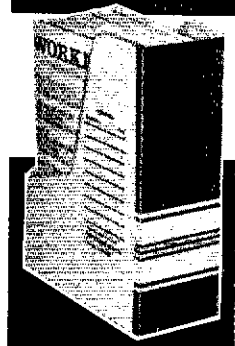

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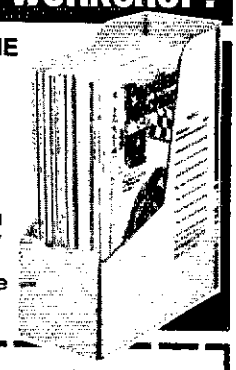

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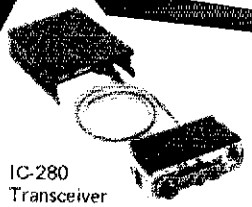

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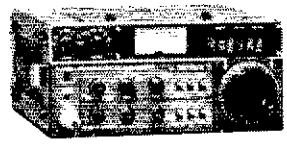

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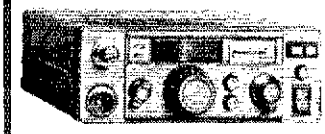

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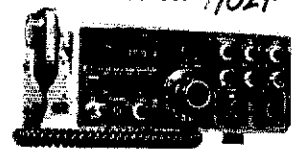

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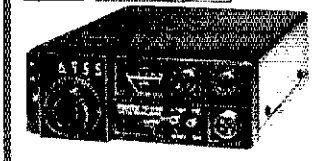
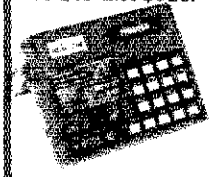


ICOM Transceiver 2M FM
IC 245 List $620. **$484.95**



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Computer-Controller for 701, 211, 245 SSB
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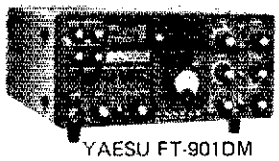

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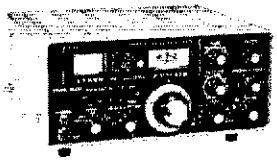

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FT 101E, 160 thru 10M **$799.**
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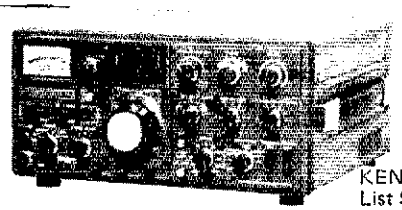

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List $1249. **$1074.95**

KENWOOD R-820
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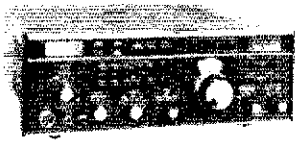
DRAKE



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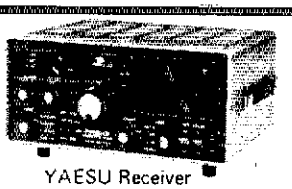

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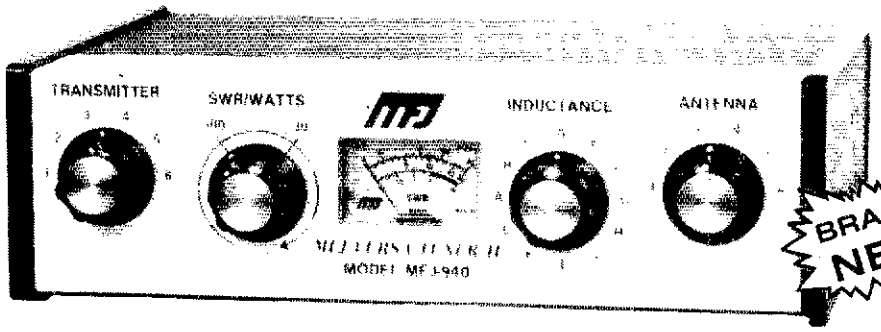

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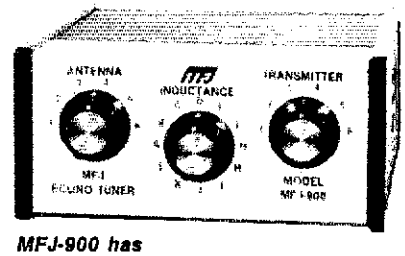

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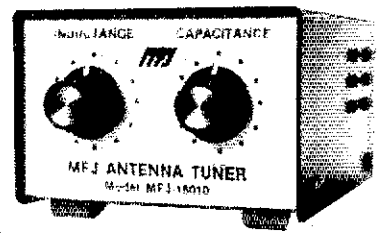

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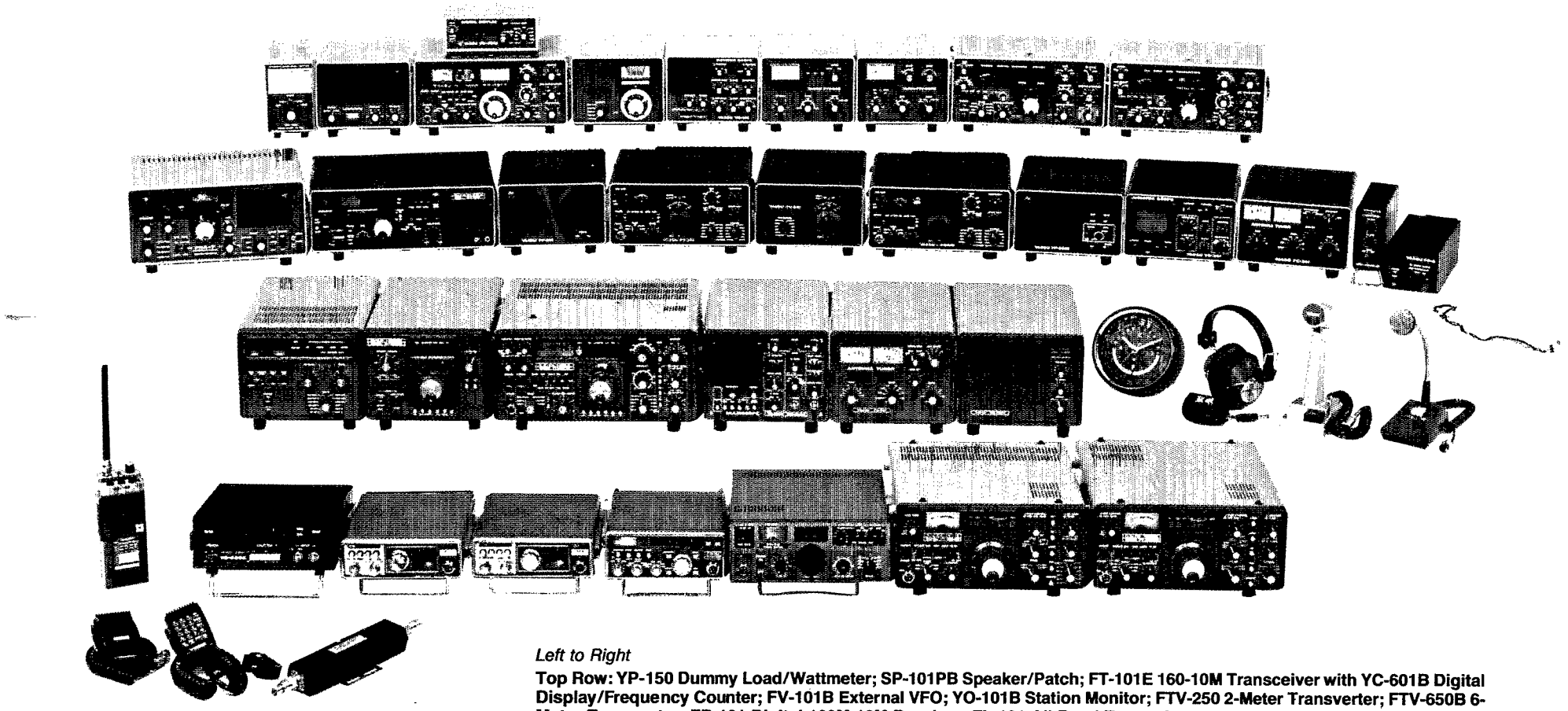

Left to Right

Top Row: YP-150 Dummy Load/Wattmeter; SP-101PB Speaker/Patch; FT-101E 160-10M Transceiver with YC-601B Digital Display/Frequency Counter; FV-101B External VFO; YO-101B Station Monitor; FTV-250 2-Meter Transverter; FTV-650B 6-Meter Transverter; FR-101 Digital 160M-10M Receiver; FL-101 All Band Transmitter.

Row 2: FRG-7 General Coverage Receiver; FRG-7000 General Coverage Digital Receiver; FP-301 13.8VDC Power Supply; FT-301 Solid State 160-10M Transceiver; FV-301 External VFO; FT-301D Solid State Digital 160-10M Transceiver; FP-301D 13.8VDC Power Supply with Clock & Identifier; YO-301 Station Monitor; FC-301 Antenna Coupler; LL-301 Landliner Phone Patch; FP-4 4A Power Supply.

Row 3: FTV-901 Three Band Transverter; FV-901DM Synthesized Scanning VFO; FT-901DM 160-10M "The Smart Radio" Transceiver; YO-901 Station Monitor/Analyzer; FC-901 Antenna Coupler; SP-901P Speaker/Patch; QTR-24 World Clock; YH-55 Super Soft Headset; YD-844A Hi/Lo Imp. Desk Microphone; YD-148 Hi/Lo Imp. Flexible Neck Desk Microphone.

Row 4: FT-202R Hand Held 2M Transceiver; YC-500E High Precision Frequency Counter; FT-227R 2M FM Mobile Transceiver "The Memorizer"; FT-227RA 2M FM Mobile Scanning Transceiver-4 Memory; CPU-2500R/K 2M FM Mobile Computerized Transceiver; FT-7 20W PEP Mobile Transceiver; FT-225RD 2M All-Mode Digital Transceiver; FT-625RD 6M All-mode Digital Transceiver.

Row 5: YM-24 Speaker/Microphone (FT-202 Accessory); YM-2500 Keyboard Microphone; FFDX-50 52 Ohm Low Pass Filter.

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