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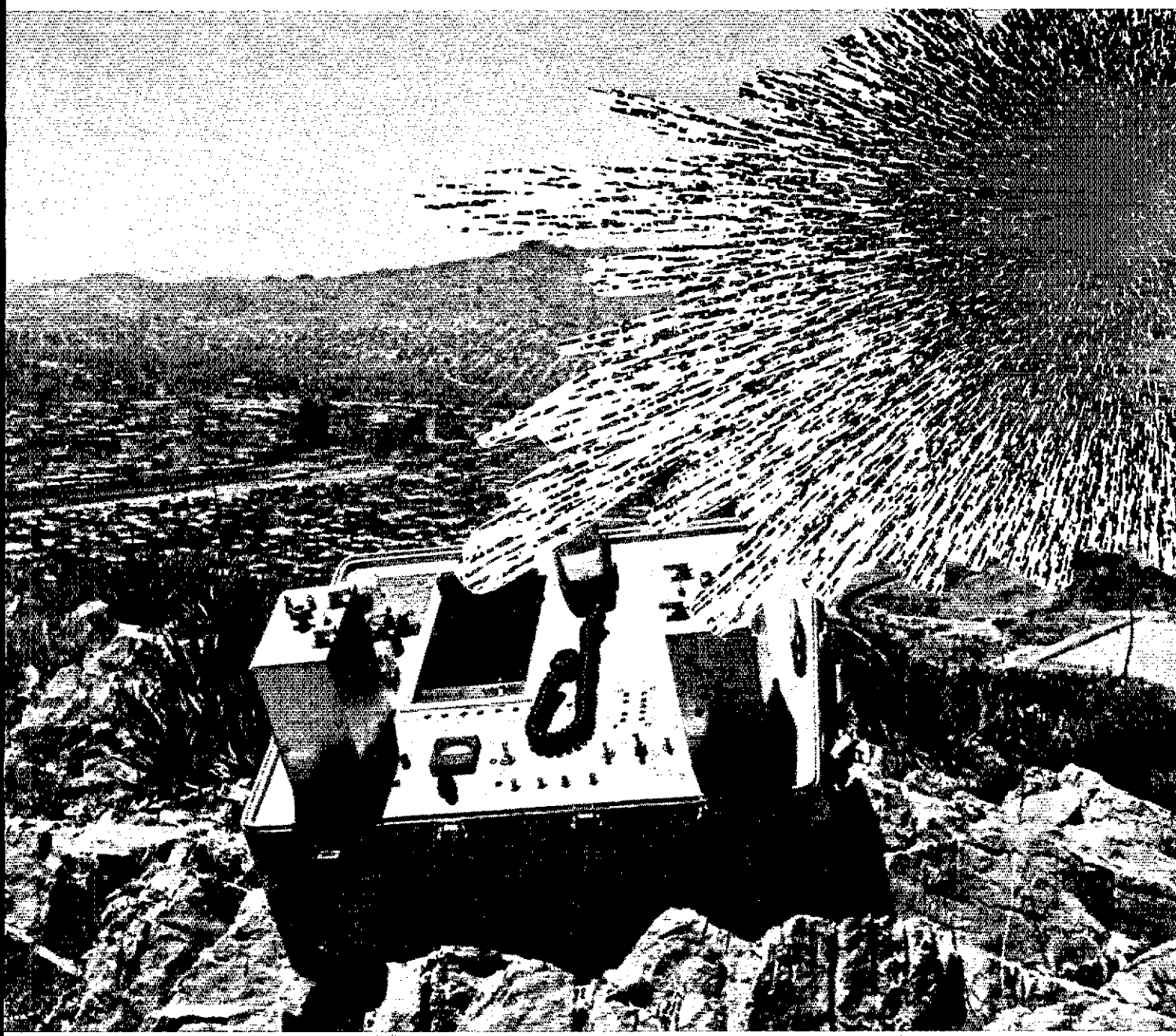
devoted entirely to Amateur Radio

January 1978 $2.00



Energy from the sun powers El Paso repeater!

Page 11

the Tempo ONE is much more than just an inexpensive transceiver

The Tempo ONE is a highly reliable, excellent quality HF transceiver. It has proven itself in worldwide use by thousands of General and Advanced Class amateurs for more than six years. And now under the new FCC regulations the Tempo ONE has become the ideal rig for the Novice and Technician Class also. Study its specifications, talk to any of the thousands of owners, compare the Tempo ONE with other transceivers . . . and we know you can't beat the price. We're sure the Tempo ONE will prove itself to be the "value leader" for you also.

Frequency Range: 80 through 10 meters (28.5-29.0 10M. xtal supplied)
Modes of Operation: SSB upper and lower sideband, CW and AM.
Solid State VFO: Very stable Colpitts circuit
Receiver Offset Tuning (Clarifier): Provides ±5 khz.variation of receiver tuning when switched ON.

Frequency Stability: Less than 100 cycles after warm-up, and less than 100 cycles for plus or minus 10% line voltage change.
Input Power: 300 watts PEP, 240 watts CW.
AF Bandwidth: 300-2700 cps
Receiver Sensitivity: 1/2 μv input S/N 10dB
AGC: Fast attack slow decay for SSB and CW.
Selectivity 2.3 khz. (-6 dB), 4 khz. (-60 dB)
Image Rejection: More than 50 dB.
Audio Output: 1 watt at 10% distortion.
Audio Output Impedance: 8 ohms and 600 ohms
Tubes and Semiconductors: 16 tubes, 15 diodes, 7 transistors
Antenna Impedance: 50-75 ohms
Carrier Suppression: -40 dB or better
Sideband Suppression: -50 dB at 1000 CPS
Third Order Intermodulation Products: -30 dB (PEP)

TEMPO "ONE" TRANSCEIVER	**$399.00**
AC/ONE POWER SUPPLY	**$99.00**
CW FILTER KIT	**$46.00**
TEMPO VF/ONE External VFO	**$109.00**

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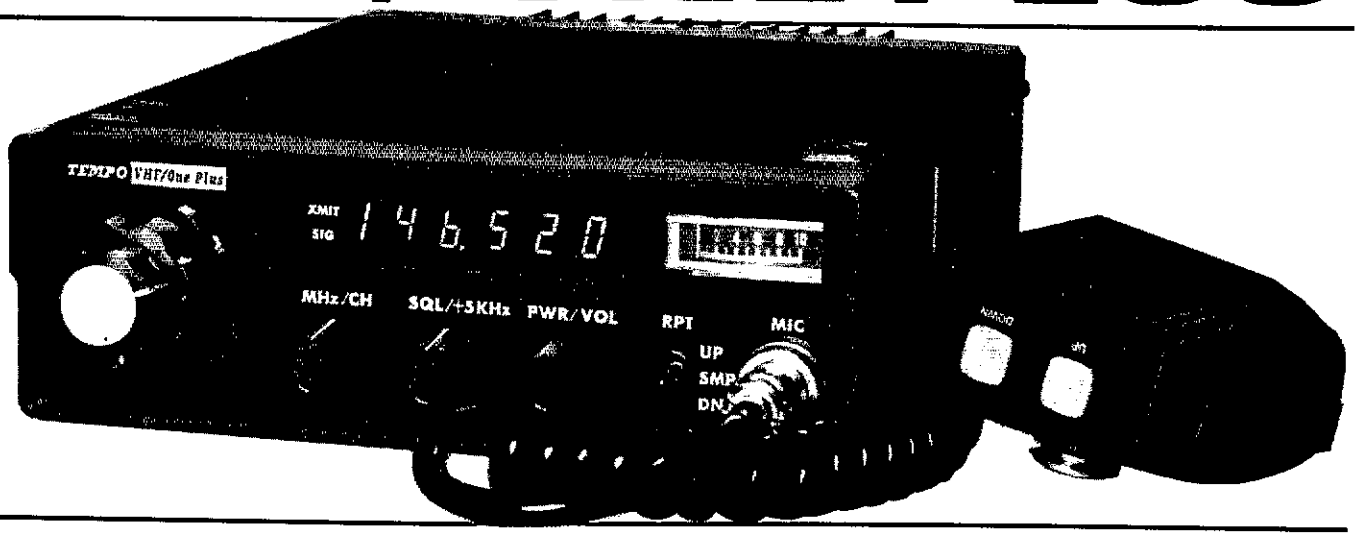
TEMPO

VHF/ONE PLUS



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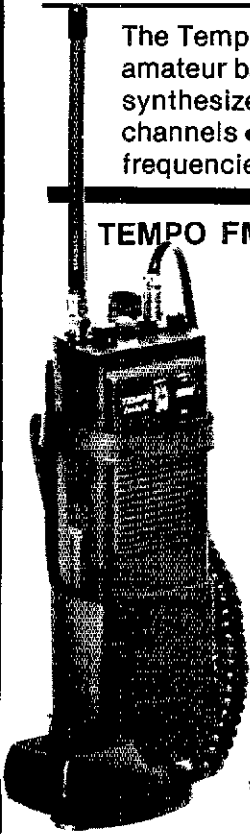
SIDEBAND OPERATION WITH SSB/ONE ADAPTER / MARS OPERATION CAPABILITY / 5 KHz NUMERICAL LED

The Tempo VHF/One Plus is a VHF/FM transceiver for dependable communication on the 2 meter amateur band • Full 2 meter coverage, 144 to 148 MHz for both transmit and receive • Full phase lock synthesized (PLL) • Automatic repeater split—selectable up or down • Two built-in programmable channels • All solid state • 800 selectable receive frequencies with simplex and +600 KHz transmit frequencies for each receive channel.



TEMPO FMH-2, FMH-5 & FMH-42 (UHF)

6 channel capability • selectable 1 or 2 - 1 or 5 Watts output • Solid-state • Battery level meter • Earphone jack • Built-in charging terminals and separate charging jack for Ni-cad batteries • Flex antenna • Carrying case standard • Excellent frequency stability allows use with booster amplifier for high power output over 100 Watts • 8 AA batteries or 10 AA Ni-cads.*

*Not furnished.

FCC Type accepted models available.

TEMPO VHF & UHF AMPLIFIERS

VHF (135 to 175 MHz)

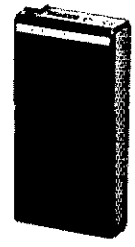
Drive Power	Output	Model No.	Price
2W	130W	130A02	$199
10W	130W	130A10	$179
30W	130W	130A30	$189
2W	80W	80A02	$169
10W	80W	80A10	$149
30W	80W	80A30	$159

UHF (400 to 512 MHz)

Drive Power	Output	Model No.	Price
2W	70W	70D02	$270
10W	70W	70D10	$250
30W	70W	70D30	$210
2W	40W	40D02	$180
10W	40W	40D10	$145
2W	10W	10D02	$125

FCC Type accepted models available.

TEMPO POCKET RECEIVERS



MS-2, 4 channel scanning receiver for VHF high band, smallest unit on the market. MR-2 same size as MS-2 but has manual selection of 12 channels. VHF high band. MR-3, miniature 2-channel VHF high band monitor or paging receiver. MR-3U, single channel on the 400 to 512 UHF band. All are low priced and dependable.

Sold at Tempo dealers throughout the U.S. and abroad. Please call or write for further information.

Prices subject to change without notice

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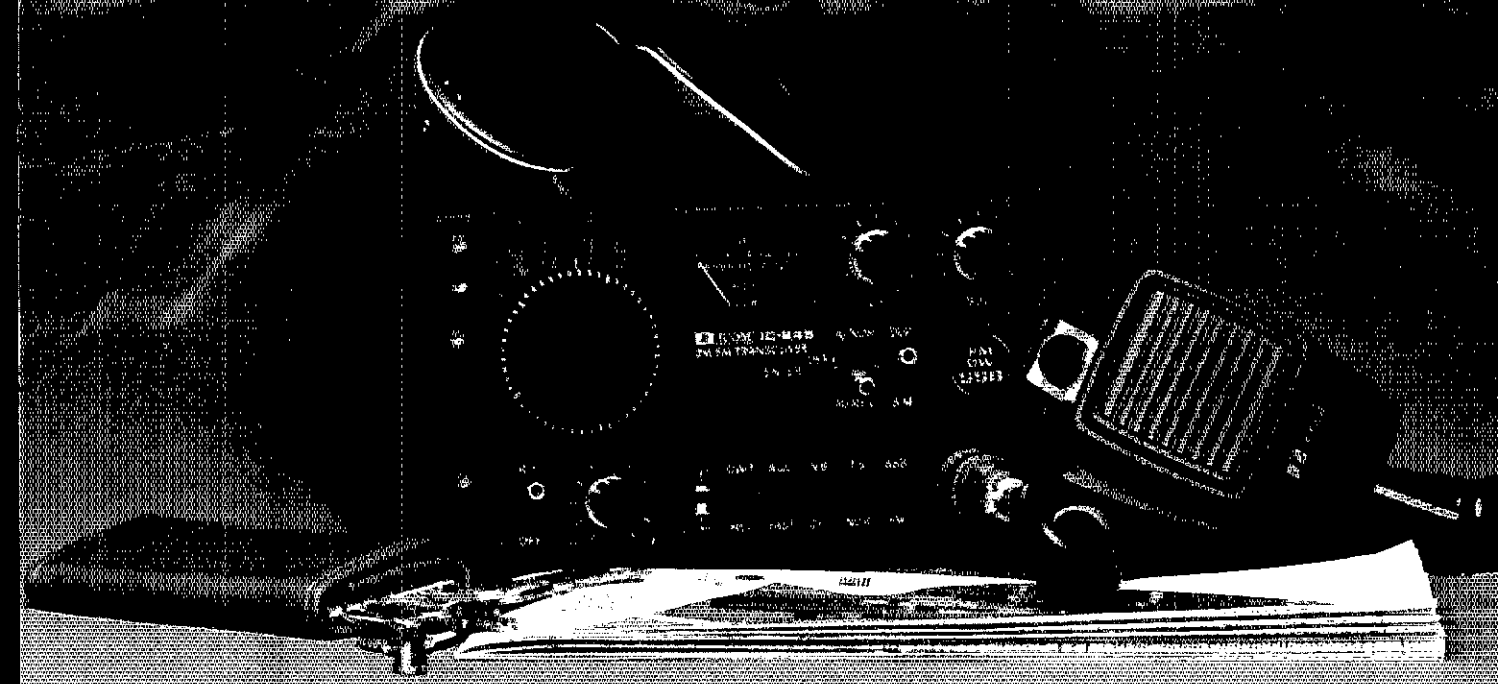

IC-245/SSB, the Mobile Maximizer

MULTI-MODE MOBILE TRANSCEIVER

ICOM's new, fully synthesized **IC-245/SSB** maximizes mobile FM, SSB and CW operations with a very compact dash mounted transceiver like nothing else in the mobile world. This Maximizer's single knob dial makes the most of the mobile modes while totally minimizing manipulations. One fast moving detent knob gives the **IC-245/SSB** accurate tuning in all modes with positively no time lag or backlash in display stability, even when flying through steps of 100 Hz at 5 KHz per second. **And just as easily, you can work the new 144.5-145.5 repeaters regardless of splits or spacing.**

- **Single knob frequency selection:** The **IC-245/SSB** is synthesized with convenient single knob frequency selection over the entire band. No more fussing with two or more knobs just to check what is going on around the band. One easy spin of the 50-position detent knob does it all.

- **Two VFO's built-in:** The second VFO, which is a more money tack-on with most other transceivers, is a standard item with every **IC-245/SSB.**

- **Variable offset:** Any offset from 10 KHz through 4 MHz, in multiples of 10 KHz, can be programmed with the LSI synthesizer.

- **Remote programming:** The **IC-245/SSB** LSI chip provides for the input of programming digits from a remote key pad, which can be combined with Touch Tone circuitry to provide simultaneous remote program and tone. Computer control from a PIA interface is also possible.

- **FM stability on SSB and CW:** The **IC-245/SSB** synthesis of 100 Hz steps makes mobile SSB as stable as FM. This extended range of operation is attracting many FM'ers who have been operating on the direct channels and have discovered SSB.

The **IC-245/SSB** is the very best and most versatile mobile transceiver made: that's all. For more information and your own hands-on demonstration, see your ICOM dealer. When you mount your **IC-245/SSB,** you'll have the very maximum in multi-mode mobile.

Maximize the new repeater band: both the IC-245/SSB and the IC-211 operate the new FCC repeater spectrum with no modification. They always have.

All ICOM radios significantly exceed FCC specifications limiting spurious emissions.

Specifications: ☐ Frequency Coverage: 144.00 to 148.00 MHz ☐ Modes: FM (F3), SSB (A3J), CW (A1) ☐ Supply Voltage: DC 13.8V ± 15% ☐ Size: 90mm (h) x 155mm(w) x 235mm(d) ☐ Weight: 6.8 Kg ☐ TX Output: F3, 10W; A3J, 10W (PEP); A1, 10W ☐ Spurious Radiation: 60 dB below Carrier ☐ Microphone Impedance: 600 Ohms ☐ Sensitivity: A3J & A1, 0.5 microvolt input gives 10 dB S+N/N; F3, 0.6 microvolt or less for 20 dB quieting S+N+D/N, at 1 microvolt input, 30 dB ☐ Spurious Response: 60 dB or better ☐ Synthesizer Frequency Range: 144.00 MHz to 148.00 MHz ☐ Synthesizer Step Size: 5 KHz for FM, 100 Hz or 5KHz for SSB

VHF/UHF AMATEUR AND MARINE COMMUNICATION EQUIPMENT

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January 1978
Volume LXII Number 1

Published monthly as its official journal by the American Radio Relay League, Newington, CT, U.S.A. Official organ of the International Amateur Radio Union.

Offices
225 Main Street
Newington, Connecticut 06111
Tel: 203-666-1541

Subscription rate $12.00 per year postpaid, U.S. funds, U.S. & Possessions; $13.50 in Canada; $14.50 elsewhere. Single copies $2.00. Foreign remittances should be by international postal or express money order or bank draft negotiable in the U.S. and for an equivalent amount in U.S. funds.

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

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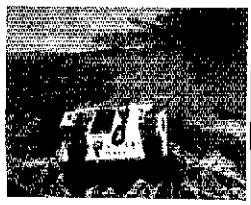
Indexed by Applied Science and Technology Index, Library of Congress Catalog Card No.: 21-8421. Microform editions available from Xerox University Microfilms, Ann Arbor, MI 48106.

THE COVER

Solar energy keeps the El Paso repeater operating. See page 11.



Contents

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The original DenTron Super Tuner. The original Super Super Tuner. The original MT-3000A. And now DenTron brings you the original MT-2000A, an economical, full-power tuner designed to handle virtually any type of antenna.

The sleek styling and low profile of the MT-2000A is beautiful, but be assured that is only a part of the excitement you'll derive from the MT-2000A. The MT-2000A is designed and engineered using heavy-duty all-metal cabinetry, and high quality American components throughout.

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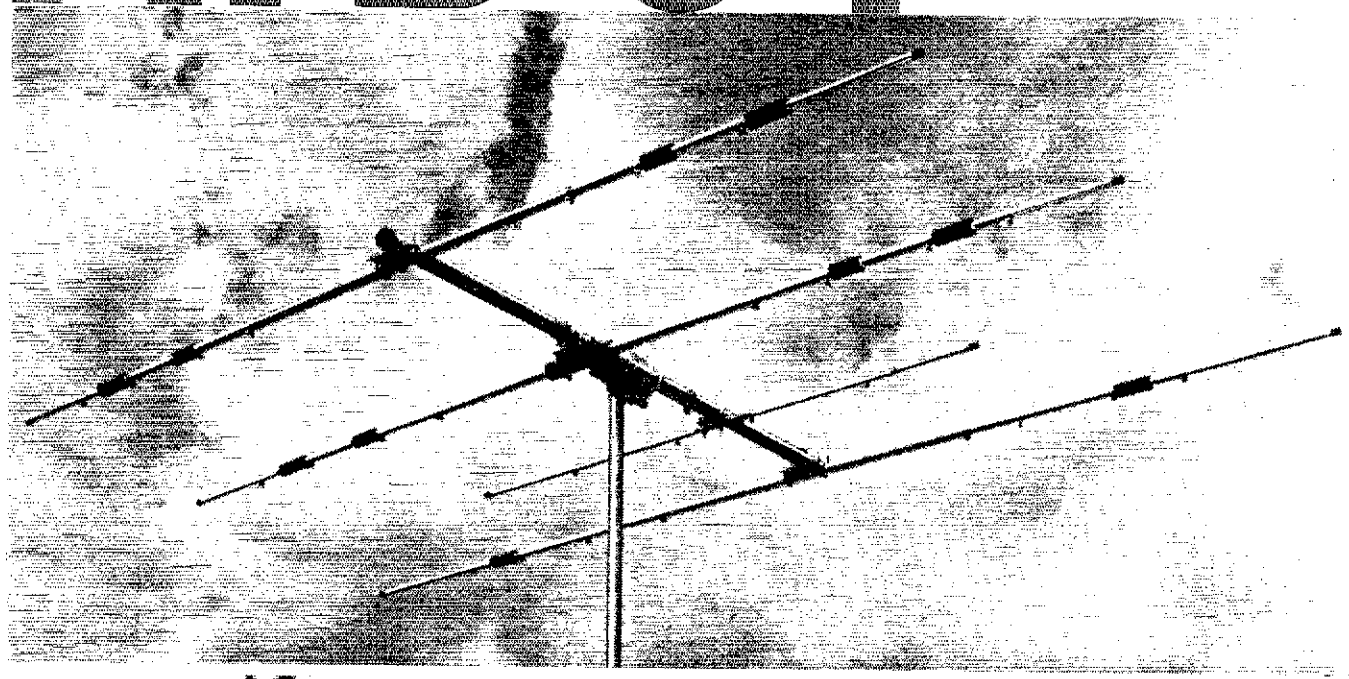
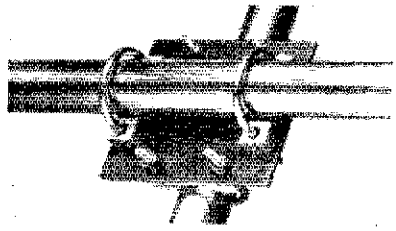
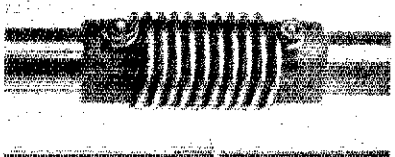
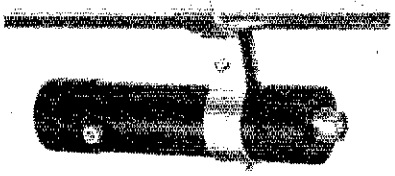
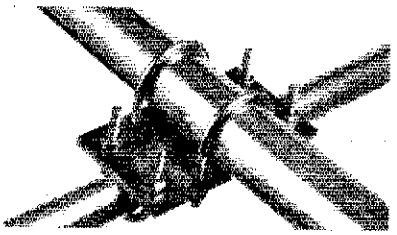
ATB-34











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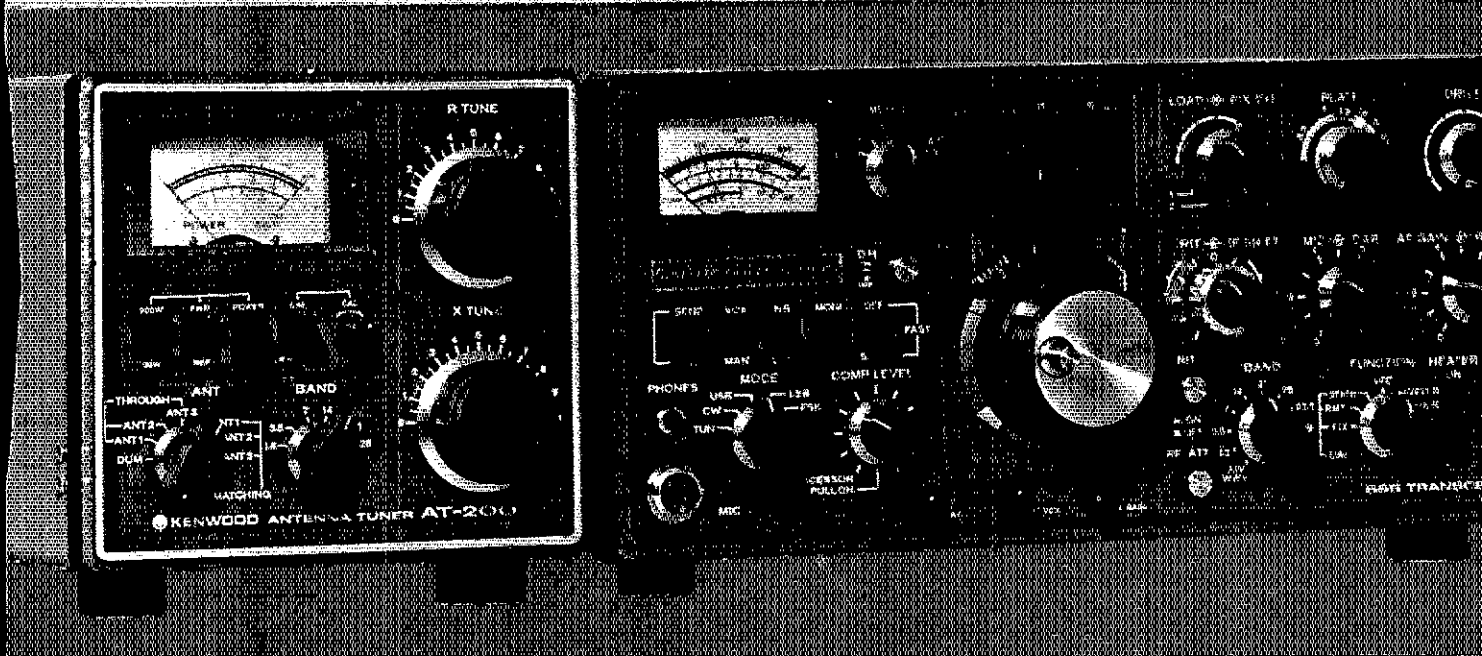
The Pacesetter in amateur radio

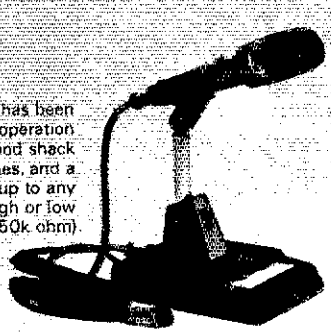
Here's a new and versatile accessory from Kenwood that belongs in every station. The AT-200 is an antenna tuner, but it's also much more. It's an antenna switch, an SWR bridge and an in-line wattmeter. The AT-200 reduces the clutter and increases the operating efficiency of your station . . . and at a surprisingly moderate price.

The AT-200 features a seven-position rotary switch that selects 1 of 3 antennas and connects it through the antenna tuner circuit or directly to the transceiver. The 7th position allows you to connect a dummy load directly to your transceiver for tune-up and testing. Two of the antenna inputs are fitted with SO-239 type coax connectors. A third input allows for easy hook up of a wire antenna with an impedance of 10 to 500 ohms. The AT-200 may be used on all HF amateur bands from 160 to 10 meters. It's handsomely styled to match the TS-820S and TS-520S Series (and TS-820 and TS-520), but can also be used with any HF transceiver or transmitter with less than 200 watts output.

Frequency Coverage: Amateur bands 1.8 to 30 MHz • Input Impedance: 10 to 500 Ohms • Maximum Power Capability: 200 watts • Insertion Loss: 0.5db • Power Meter: 20 watt/200 watt full scale • SWR Meter measures up to 10:1 • Dimensions: 6-17/2" W x 2-3/8" D x 6-9/16" H • Weight: 6.2 lbs.

AT-200 WITH THE TS-820S





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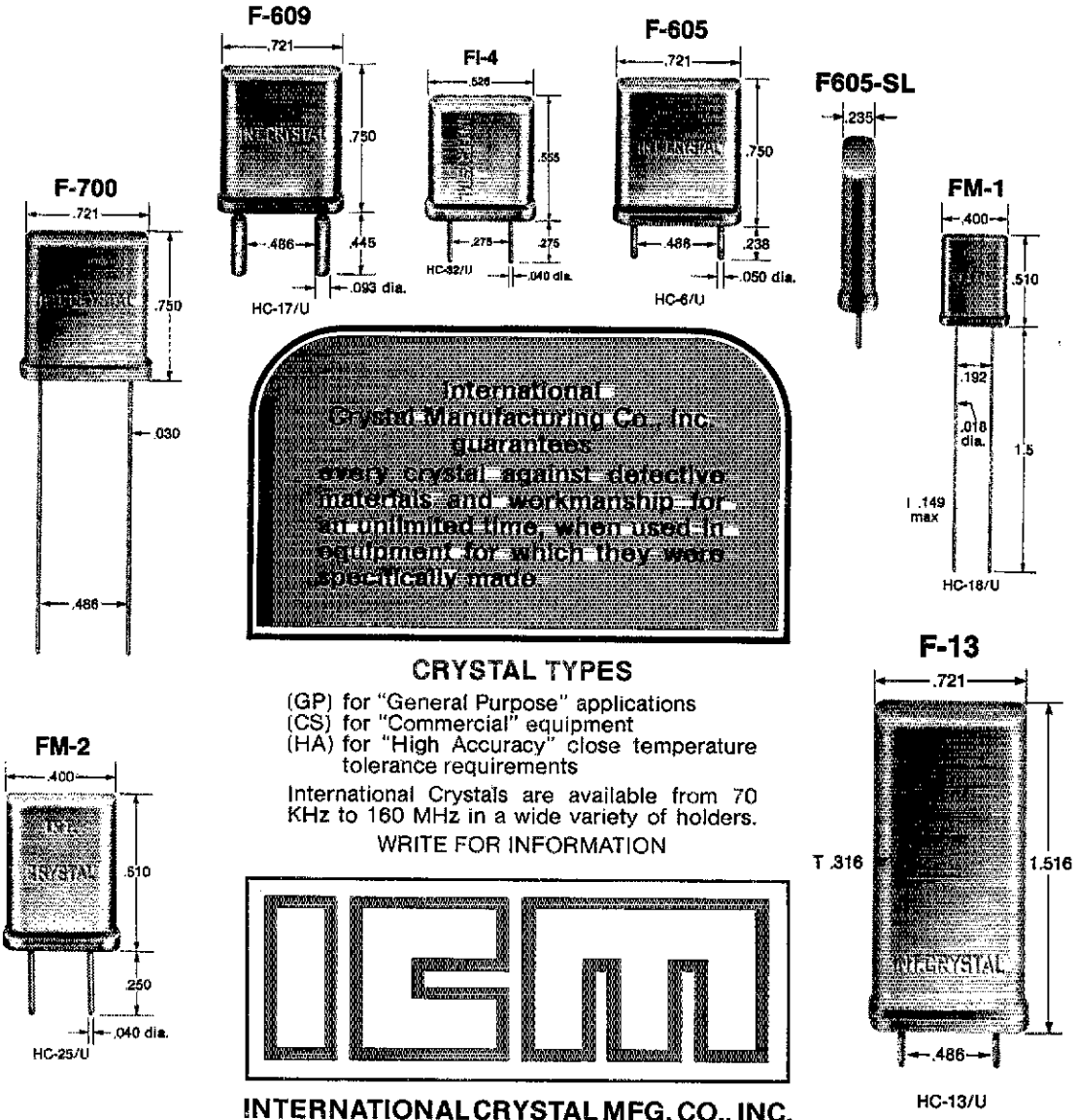

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Northwestern Division
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Idaho — Ed Hamlin, W7KDB, 1506 Rim View Dr., Caldwell 83605
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Oregon — Dwight J. Albright, W7HLF, 1678 Orchard Home Dr., Medford 97501
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Pacific — J. P. Corrigan, KH6DD, P. O. Box 698, Kaneohe 96744
Sacramento Valley — Norman A. Wilson, N6JV, Rte. 1, Box 730, Woodland 95695
San Francisco — Mark L. Nelson, WB6NHF, 2023 Kent Ct. Arcata, CA 95521
San Joaquin Valley — Charles P. McConnell, W6DPD, 1658 W. Mesa Ave., Fresco CA 93711 209-431-2038
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THE AMERICAN RADIO RELAY LEAGUE, INC.

"It Seems to Us..."

The American Radio Relay League, Inc., is a noncommercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur," it numbers within its ranks practically every worthwhile amateur in the nation and has a history of glorious achievement as the standard-bearer in amateur affairs.

Inquiries regarding membership are solicited. A bona fide interest in amateur radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisite, although full voting membership is granted only to licensed amateurs.

All general correspondence should be addressed to the administrative headquarters at Newington, Connecticut 06111.

Code Of Ethics Update

November *QST* announced the League's Code of Ethics, a program designed to help keep amateur transmitting equipment out of the hands of unlicensed operators. Membership response was immediate and overwhelmingly favorable: Almost universally, the Code was recognized as a needed step toward self-regulation by the amateur community. Even more encouraging was industry's response: Nearly a hundred firms, *QST* advertisers and nonadvertisers alike, immediately returned signed Code of Ethics forms.

The basic idea of the Code is quite simple. Manufacturers, importers, distributors and retailers are invited to sign the following statement:

WE SUPPORT THE ARRL CODE OF ETHICS

The legal use of amateur radio transmitting equipment requires an amateur license. We support the Amateur Radio Service and its long tradition of operating in the public interest. Therefore, it is the policy of this organization that amateur radio transmitters, transceivers and amplifiers be sold at retail only to persons who can show that they are properly licensed to operate that equipment.

Affirmation of this policy was to be required of *QST* advertisers engaged in trade of amateur transmitting equipment, optional for others. Unfortunately, for some the matter was not that simple. Responding to dark threats of legal action, some firms felt that they needed more time to study the implications of signing the Code. As an accommodation, since they were known to support the Code's objectives, implementation has been delayed until March *QST*, which has an advertising deadline of January 25.

Other firms, after studying the situation, concluded that they could not accept as a business risk the possibility of having to defend themselves against nuisance lawsuits brought by private parties. It is unfortunate that in today's world the threat of lawsuit, no matter how baseless or irresponsible, can move people from a course of action they know to be right; nonetheless, we had to face this harsh fact. By signing the Code as a condition of advertising, a firm might conceivably be named in a lawsuit as a "conspirator" to restraint of trade, despite the rather obvious fact that the Code has no anticompetitive impact. If the Code was to have its intended effect of separating the good guys from the bad guys, some minor changes had to be made to eliminate this risk. Therefore, actual signing of the Code has been made voluntary for all, including advertisers. However, only those who sign the Code will be permitted to display the special Code of Ethics emblem in their advertising or other printed literature, or at their place of business. The League reserves the right to rescind this privilege on showing good cause.

Making signing of the code voluntary in no way weakens the program. The wishes of League members are clear: Sale of amateur transmitting equipment to nonamateurs who will use it illegally *must* be curtailed. The League will *not* back away from its commitment to the Code of Ethics program. The League has every legal right to refuse to deal with any classification of potential *QST* advertiser as long as there is no discrimination within that classification. The Editor of *QST* intends to exercise this right as much as is necessary to achieve the objectives of the Code of Ethics program. *QST* advertising space will be denied to any firm which, in the opinion of the Editor, is not meeting the high standards of business ethics and support of the Amateur Radio Service which have been required of *QST* advertisers for decades. Evidence of a willingness to sell amateur transmitting equipment to nonamateurs, who will use it illegally, will be treated as strong evidence that these standards are not being met. Strict adherence to this principle, and support of our members, will make the Code of Ethics program a success. — *WISE*

League Lines...

John Souvestre, K5NY, was sentenced to 18 months in jail (to be suspended after serving 90 days) for transmitting obscenities and for malicious interference to two-meter repeaters. Keith Schexnayder, WB5AWN, was given a suspended sentence for his conviction of malicious interference. See this month's Happenings for complete details.

KM1CC will be operating from Cape Cod January 14 through 22, using a 240 hz note on mcw to simulate the note of the original Marconi spark-gap transmitter. Operation is planned for all bands 16 through 2 meters, all modes including some SSTV and OSCAR. This may be the last Special events station to operate under a distinctive call sign from the United States (except NN3SI). See December Happenings for details. QSL via W1GAY (SASE please).

"Present Day Solid-State Design Trends" is the title of a presentation that League staffers W1ICP and W1FB have proposed for inclusion in IEEE Electro-78. If the proposal is accepted, the speakers will be Merle Hoover, W3TLH, Dana Atchley, W1CF, and Doug DeMaw, W1FB.

Some members have commented that the old License Manual (75th or earlier edition) is "better than the new one" for the Advanced and Extra exams. As it happens, they're right; FCC has been using old exams, originally written about 1968, instead of exams based on the new syllabi released two years ago. FCC staff claim the new exams will be in circulation "early this year," so this problem soon should be a thing of the past.

A SASE will bring you a calendar of 1978 major ARRL Operating Events and scheduled conventions--up to date as of press time. Flip side will detail U.S. amateur frequency/mode allocations in addition to license renewal information.

Have we got a deal for you? Your club can get a complete set of ARRL publications at half price for donation to a local library. Three conditions: a) The purchaser must be an ARRL affiliated club; b) must send a letter from the library agreeing to display and circulate the manuals; and c) must send $40.00 with order. Sorry, we cannot bill.

New DX Record of over 3000 miles on 2 meters set by YV5ZZ and LU1DAU on October 29. See International News for details.

Braille copies of the International Q Signals, International Radio Amateur Prefixes, ARRL DXCC List, FCC Examination Points and other aids are available from the National Braille Association's Braille Book Bank, 422 Clinton Avenue South, Rochester, NY 14620

Amateurs of the U.S. and of Ghana may now exchange third party traffic with one another, provided the traffic is completely devoid of business content, and conforms with Part 97.114 of the U.S. Regulations and Article 41 of the International Regulations. (See page 71, August 1977 QST).

New Jersey amateurs (as well as all other private citizens) are currently subject to a misdemeanor penalty if they have a receiver capable of receiving public safety band (police, fire, etc.) installed in their cars. W2XQ has pursuaded his representative to introduce bill number A-3471 in the New Jersey Assembly that would exempt amateurs from this law.

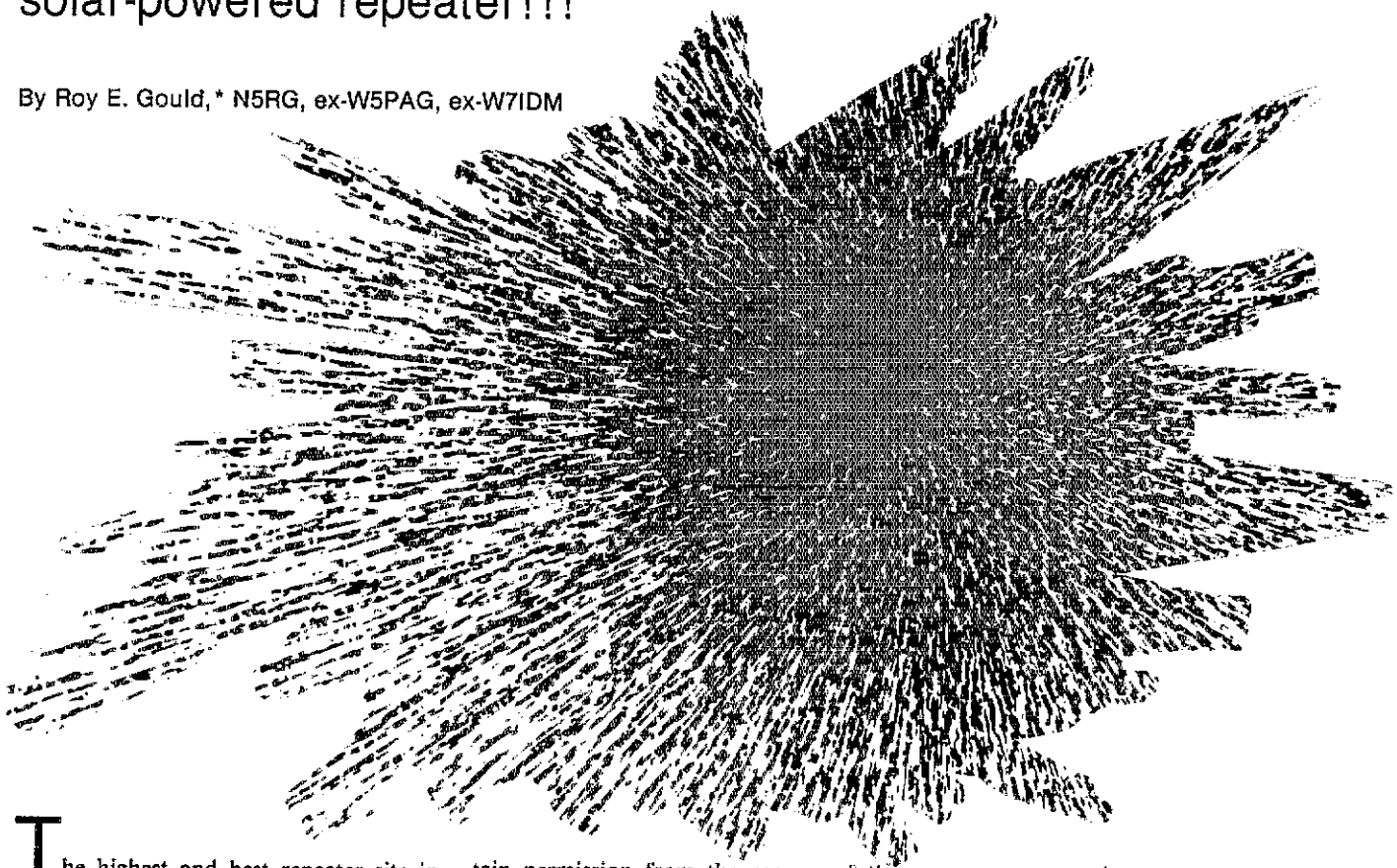
Pins for holders of the 5BDXCC and 5BWAS awards are now available. They are round, 1-3/8 inche in diameter, and have a black globe and ARRL emblem against a white background. Either "5BDXCC or 5BWAS," as appropriate, is printed in red at the bottom. Price is $2.00 each postpaid; when ordering specify the serial number of your award to facilitate checking.

The President of the United States has signed an order transferring the Office of Telecommunicatio Policy to the Department of Commerce. However, this move does not change the personnel involved in the Government's preparations for the World Administrative Radio Conference; they will continue these duties in Commerce.

The El Paso Solar-Powered Repeater

Everybody is talking about solar power; its use will become more and more important in the future. The El Paso amateurs have already done something about it — a solar-powered repeater!!!

By Roy E. Gould,* N5RG, ex-W5PAG, ex-W7IDM



The highest and best repeater site in the El Paso, TX, area is the top of North Mt. Franklin. The summit is at an elevation of 7192 feet, more than 3100 feet above most of the city. It is located about 10 miles from downtown El Paso and only about three miles from the northeastern section of the city. Las Cruces, NM, is about 33 miles northwest and Alamogordo, NM, is about 66 miles northeast. A repeater at this location would provide line-of-sight coverage to virtually all of El Paso and the surrounding communities of Las Cruces and Alamogordo, tying the whole area together on one repeater. At the 1975 annual meeting of the El Paso VHF Repeater Association, it was decided to actively pursue construction of a 2-meter repeater at this site.

The first major hurdle to be overcome before a repeater could be built was to obtain permission from the owners of the top of the mountain to use it for a repeater site. A lawyer in our group, WB5LCN, began working on this and in a few months had obtained a license from the owners granting permission. We were now ready to begin seriously working on the repeater itself.

Unfortunately, the closest road is about 2-1/2 miles from the summit and there is *no* electricity anywhere near. A trail extends about halfway up. From that point you are on your own over moderately rugged, rocky terrain. The vegetation on this desert mountain consists mainly of various types of cacti and small bushes. It is not an easy location to build or operate a repeater.

Solar or Wind Power?

A basic decision that had to be made was to decide what power source to use. Among the possible candidates were a propane-powered generator, a windmill and solar cells. The windmill and solar cells quickly became the primary candidates. After considerable discussion, solar power was chosen.

Some of the reasoning that went into this decision was that while a windmill could generate considerable energy, a large amount of energy is not really required. A windmill would be difficult to transport to the top of the mountain. It would be susceptible to damage from the 100 mi/h spring winds. It would probably require periodic maintenance and would probably be by far the most *unreliable* component in the system.

On the other hand, solar panels can generate sufficient energy at an affordable cost. They are small and lightweight, require no maintenance and should have a very long lifetime. Also, solar power seems destined to become an important power source in the future and

*4752 DeBeers Dr., El Paso, TX 79924.

would be interesting to experiment with.

The Solar Panels

A set of six solar panels was ordered from Sensor Technology.[1] These panels are rated at 8 volts at 0.6 amperes when illuminated by 100 mW/cm² (1 kW/m²). This amount of illumination is apparently close to that present in El Paso during a typical hot summer day because the output from the panels equals their rated output under that condition.

The solar panels were connected in a series-parallel arrangement, Fig. 1, with a diode connected in series with each set of series-connected panels. This diode prevents the battery from being discharged by the panels during periods of darkness and protects the power source from loading by shorts or low voltage in one or more of the panels. A combination of six panels produces a power source capable of delivering 16 volts at 1.8 amperes when illuminated by bright summer sun. In winter, the current drops to about 1.2 amperes in bright sunlight. Heavy clouds can reduce output to as low as 50 to 100 mA.

As shown in Fig. 2, the solar panel looks electrically like a constant-current source. As illumination decreases, current output decreases, but the voltage decreases only slightly.

[1]Sensor Technology, Inc., 21012 Lassen St., Chatsworth, CA 91211.

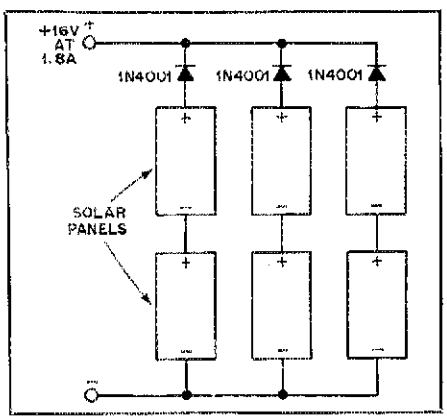


Fig. 1 — Series-parallel-connected solar panels with isolation diodes.

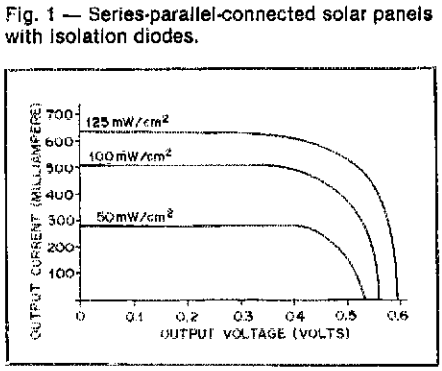


Fig. 2 — Typical solar-cell output. *(Courtesy of Sensor Technology, Inc.)*

The amount of energy collected in summer is higher than in winter both because the sun is brighter and because the days are longer. The amount of solar energy collected during the winter is the critical case if the repeater is to operate at full capacity the year around.

The amount of energy collected in winter is difficult to determine exactly, but an estimate can be made. The shortest day in El Paso in winter is about 10-1/2 hours long. With the panels mounted at 45 degrees from the vertical and facing south, the array supplies about 100 mA just after sunrise and just before sunset. At noon, the output will be about 1.2 amperes. The amount of energy collected can be approximated by integrating the curve shown in Fig. 3. Assuming a cloudless day, the solar panels should collect about 8.48 ampere-hours (Ah) per day in winter.

The collected energy is stored in a sealed automotive battery. If it is assumed that 85 percent of the energy input to the battery is recoverable from the battery, then about 7.2 useable Ah are collected on a typical cloudless winter day. Armed with this figure, it is now possible to describe the type of repeater that will be practical for use with the solar panel.

Repeater Requirements

The major user of power in the repeater is the transmitter. A typical 2-watt transmitter (output) draws about 500 mA.

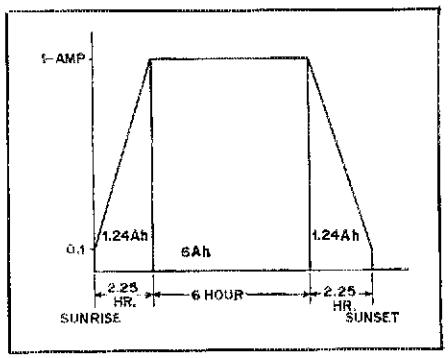
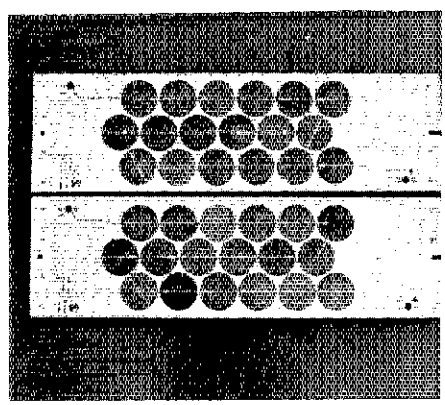


Fig. 3 — Approximate solar-collector output in winter.



This pair of solar panels from Sensor Technology can supply 16 V at 600 mA when connected in series. *(WA5FCV photo)*

With 10 hours use a day, the energy consumed by the 2-watt transmitter will be 5 Ah. This leaves 2.2 Ah to operate all other components in the repeater. A 2-watt output repeater therefore seems to be a practical power level.

If the combined energy consumption of the nontransmitter load can be kept below 2.2 Ah per day, the energy budget will be satisfied. A design goal of 20 mA was set for the average current consumption for the nontransmitter load in the repeater. This amounts to 0.48 Ah per day, well within the energy budget, leaving an excess to charge the battery to compensate for cloudy weather.

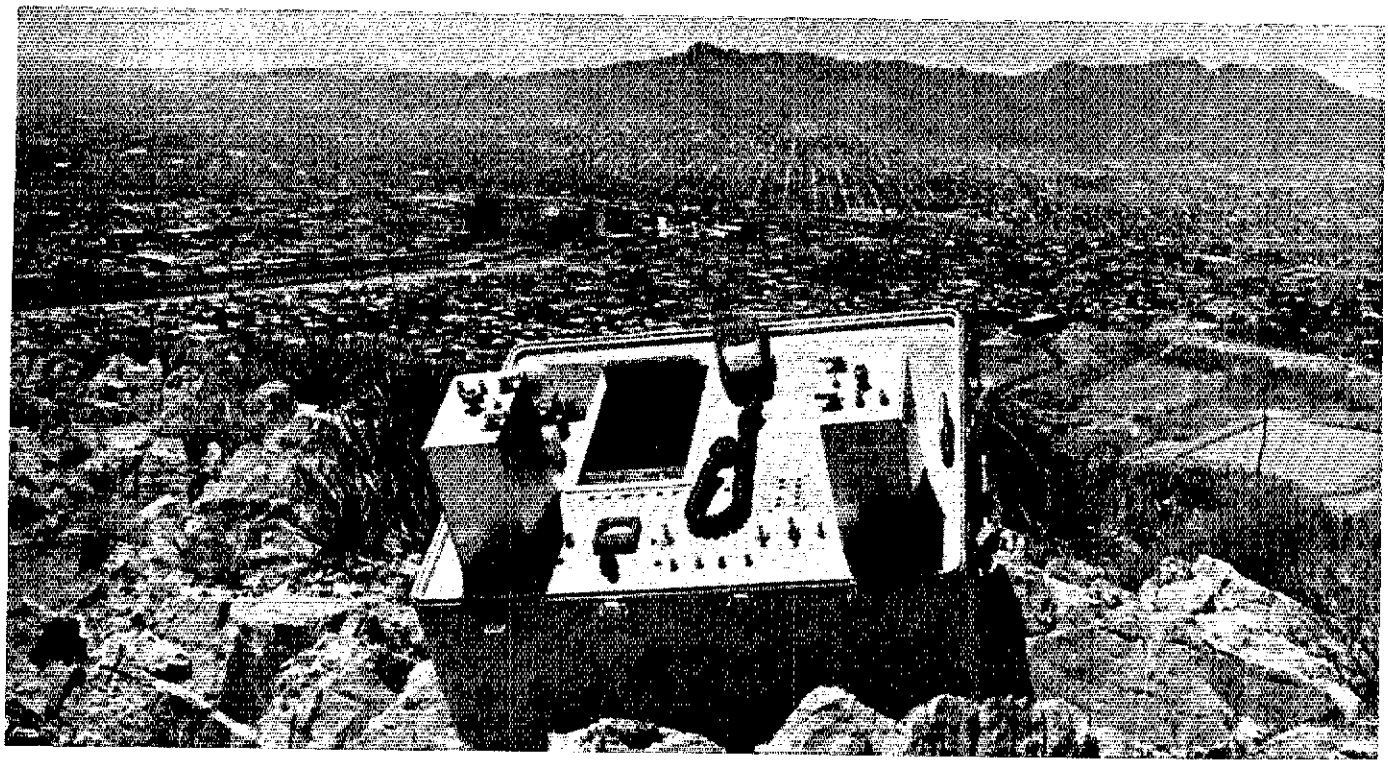
Build or Buy?

Partially because there does not seem to be a commercial repeater available that uses energy efficiently enough, it was decided to custom build a repeater just for solar power. Hallicrafters operated a manufacturing plant in El Paso until it was closed in 1974. A piece of equipment they manufactured was a two-channel vhf transceiver built for commercial and industrial use in both foreign and domestic markets. Factory fallout units were available and many are in use in this area. The repeater association already operates one repeater using two Hallicrafters boards. These boards contain a complete 2-watt transceiver. The receivers were designed for low-power consumption and draw only about 12 mA, very suitable for use in a solar-powered repeater.

To meet the design goal of 20 mA total nontransmitter current, the combined average consumption of the carrier-operated relay (COR), the identifier, the control and the telemetry circuits had to be kept below 8 mA. The primary methods used to achieve this goal were to use CMOS logic wherever possible and to shut off power automatically to sections of the system not in use.

The COR is the master controller of the system and consists mainly of logic and timers. CMOS was used throughout for logic, and unijunction transistors were used for timers. The repeater is VOX-operated to save power by reducing "ker-chunking" from both intentional and unintentional sources. The VOX circuitry is included on the COR. When the op amps used in the VOX circuitry are not required, their power is disconnected. The COR draws only about 0.5 mA when in standby and about 3 mA when the repeater is transmitting.

Since a second receiver is available in the repeater on the transmitter board, it was decided to include a lockout receiver to satisfy the requirements of the FCC rules. The COR controls the lockout receiver. When a signal is first sensed at the repeater input, the lockout receiver is turned on to check for activity on the repeater output frequency. If no signal is sensed in 0.35 second, the transmitter is



Solar-powered repeater with downtown El Paso, TX, and Juarez, Mexico, in background. This photograph was taken at the Commanche Peak (4800-ft elevation) repeater site operated by the El Paso VHF Repeater Association. *(WA5FCV photo)*

turned on. A timer in the COR prevents lockout receiver activation for two minutes after the transmitter is turned off. Because the lockout receiver is only on for short periods, its energy usage is quite low.

A diode-matrix, cw identifier was designed and built using CMOS logic. The identifier was designed to perform the complete identification function and includes an i-d interval timer and an audio oscillator on the board. The matrix is large enough to hold a cw message of up to 126 bits in length. The identifier draws only 0.5 mA.

The control portion of the repeater could be quite a power hog, so the following scheme was adopted. A timer on the control board turns the control receiver on for one second once a minute. If a signal is detected, the control receiver remains on for the next minute and the type 567 tone decoders and control logic are turned on. The control operator has one minute to execute his commands. When the control receiver first senses a signal the control audio is broadcast over the repeater output for 10 seconds. This allows the control operator to determine when he has access to the control circuits and to determine the quality of his signal at the repeater. The control receiver being used draws about 15 mA. But because it is only on for one second every minute, the average control receiver current is less than 1/4 mA when the repeater is not being controlled.

A section of the control board monitors battery voltage. If the voltage drops below a preset limit, the repeater is automatically turned off and can only be turned back on by either remote or local control.

Telemetry and Monitoring

Because of the remoteness of the site and the desire to monitor the operation of the solar panels, telemetry is included in the repeater. A telemetry board, designed by VU2XP and WB5FKC, generates eight channels of tone-encoded commutated data. Two of these channels are used for calibration, one for ground and one for a reference. Data to be transmitted includes solar-panel current, battery voltage, transmitter current, rf-output voltage and ambient temperature. The telemetry is commanded on by the control link and transmits its data on the repeater output. The data is commutated so that each frame is available for about five seconds. It is received by measuring the frequency of the tone transmitted in each frame with a frequency counter connected to the listener's 2-meter receiver. The data is decoded by referring to a curve or solving an equation for each parameter.

Another telemetry section monitors battery voltage. If it drops below a preset level, the telemetry places a tone on the repeater squelch tail to signal that battery voltage is dangerously low. The frequency of this tone is the same as generated by the battery-voltage frame of the telemetry. Since most of the telemetry is not powered up unless specifically commanded on, it draws less than 2 mA average current.

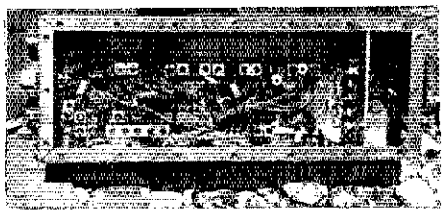
A repeater monitor board contains an audio power amplifier and an LED driver. The power amplifier can be switched on to monitor the repeater audio locally. Six LEDs are used to indicate repeater functions such as power on, repeater receiving signal, repeater being keyed by i-d, repeater is locked out, etc. The LEDs and audio amplifier are used only for testing and are not left on during normal operation.

A relay is needed to turn the repeater on and off from the control link. If a conventional relay were used for this function, considerable energy would be used to energize the relay. To avoid this source of power drain, a latching relay was used. Only a pulse of current is needed to change the state of a latching relay and no power is needed to maintain that state.

The power-saving techniques described have been effective and the 20-mA average current consumption goal for the nontransmitter load was easily met.

As stated earlier, a sealed automotive battery is used for energy storage. This battery has sufficient capacity to power the repeater for at least a week even if it receives no charge. This should be sufficient reserve to keep the repeater in operation during most periods of stormy weather.

Because the solar panel voltage is 16 volts in bright sunlight, it can overcharge the battery. To prevent this, a 13.8-volt shunt voltage regulator was designed using a Zener diode and a Darlington power transistor. The regulator is designed so that no usable energy is lost in the operation of the regulator. The voltage regulator module also contains an am-



An interior view of an rf module. Note rf shielding at right end made up of feedthrough capacitors and ferrite beads. *(WA5FCV photo)*

meter for monitoring solar-panel current and a voltmeter to monitor battery voltage, as well as fuses to protect the system.

Some Construction Notes

Because of the difficulty in reaching the repeater site and because it will be very difficult to service the repeater while on the mountain, the repeater is constructed in a modular manner. The repeater contains two rf modules: One serves as the repeater receiver and the other as the transmitter. These modules are identical to each other and each contains a complete transceiver. Their function in the repeater is determined by the socket into which they are plugged in the repeater. The modules are well shielded and each lead from the module has an rf filter. A third module has been built as a backup unit. In case of trouble, the spare module can be taken up to the repeater and simply plugged in. The defective module would then be brought down and repaired on the bench. It would then become the backup unit.

For easy servicing, the rf modules contain a metering switch to select various transceiver monitoring points such as the individual multiplier stages and the receiver discriminator. A meter built into the repeater allows easy checking of the operation of the repeater. A card cage holds the five cards making up the system logic as well as the control receiver. In case of difficulty a malfunctioning card can be replaced with a good one.

The repeater is built into a military surplus aluminum box. This box has dimensions of about 22 × 26 × 15 inches and has carrying handles. The lid snaps on securely and is tightly sealed by a rubber gasket. The box is rf-tight and makes a convenient enclosure for the repeater.

The solar panels will be enclosed in an aluminum box with a Lexan cover to protect the panels from the elements and vandalism. The panels will be mounted on the antenna tower at a 45-degree angle from the vertical. The optimum angle in winter is about 54 degrees, however use of a 45-degree angle will result in collection of 99 percent of the available energy in winter and improve efficiency at other times of the year.

With the exception of the Hallicrafters transceiver boards and the control receiver, the repeater has been designed and built by El Paso amateurs. This includes even the cavities which were beautifully built by WA5GGU from the plans contained in *FM and Repeaters for the Radio Amateur.*

Progress

At the time this is being written, the repeater has not yet been placed on top of North Mt. Franklin. Before this can be done some sort of enclosure will have to be built on the mountain to house the repeater. This structure will probably be small, perhaps about four feet square. The problem of transporting building materials to the top of the mountain still remains to be solved. This will probably be done using a helicopter or perhaps a mule train.

The repeater is still not quite finished as portions of the control and telemetry circuitry have yet to be completed and checked out. However, the repeater was placed on the air under local control on October 9, 1976, using solar power. We have not heard of another amateur repeater using solar power,* so claim the distinction of operating the first solar-powered amateur repeater. If you know of an earlier solar-powered repeater, please let me know.

Our thanks go to ARRL hq. and Lew McCoy in particular for assistance and advice in a response to our questions. It was very helpful and aided our successful completion of the project. Special thanks go to the many El Paso amateurs who contributed their time, equipment and money, thereby allowing this repeater to be built.

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FM and Repeaters for the Radio Amateur, ARRL.

*[Editor's Note: On a recent visit to Los Alamos, NM, we found that a local group had installed, and had working, a completely solar-powered repeater. We'll be happy to hear of other groups using wind or solar power.]

Strays

IARU WHEELS

☐ This car and its owner, HB9AJU, are very well known in IARU circles. Located in Geneva, Switzerland, Gerald Lander and his Austin-Mini have provided transportation for one ARRL president, two IARU presidents, two IARU/ARRL secretaries, about a dozen European amateur society presidents, the entire International Working Group of the IARU, several ARRL and IARU vice presidents, the secretary and several other officials of Region 1 IARU, the president of Region 2, a couple of directors of Region 3 and a host of other IARU society staffers and employees.

HB9AJU holds no official position in IARU, but it would be difficult to find a single individual who has provided so much assistance so willingly and so frequently. After 11 years of yeoman service, the Mini is about to be retired — a number of us have shed a tear. — *WIRU*

QST Congratulates . . .

☐ Bill Osborne, K4LN, who was named the outstanding radio amateur in Tennessee for 1977 by the Tennessee Council of Radio Clubs.

I would like to get in touch with . . .

☐ participants for the International Ragchew-Relay Net for younger hams (old-timers and foreign hams welcome, too). John Purnell, WD9CYV, 405 Miller Ave., Madison, WI 53704.

The Groundshade Antenna

Tired of hanging those antennas from your living-room ceiling? Try this groundshade antenna for a light touch to your station.

By Spencer Allen,* KØREC

I call it a "groundshade." While it can't compare with the now-stored extended Ringo Ranger which graced the chimney of my former residence, the groundshade in the new QTH, a first-floor apartment, performs surprisingly well on 2 meters. It is adequate for the local repeater and for simplex operation around town. And I can raise the Jefferson City, MO, machine 30 miles away with 10 watts out.

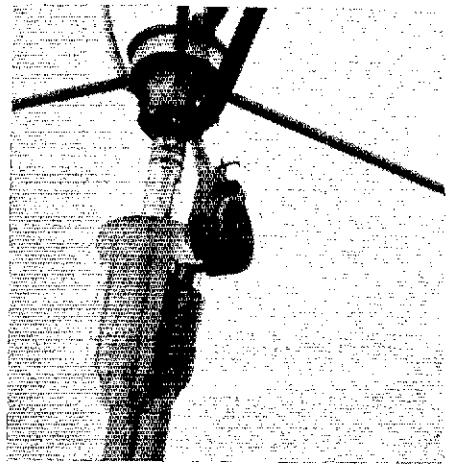
With no outside antenna privileges in my apartment complex, an indoor installation had to be devised. A convenient mount for a quarter-wave antenna appeared to be the cylindrical lampshade on the operating desk lamp. A metal bracket secures the shade to the lamp base, and a wire frame shapes and supports the parchment shade. (See Fig. 1.) This configuration, I calculated, should act as the groundplane for the quarter-wave radiator.

My first attempt at feeding the coax directly to the telescoping replacement antenna, with the radiator insulated from the lampshade, was a failure. The SWR was excessively high and no variation in the length of the radiator made an appreciable difference.

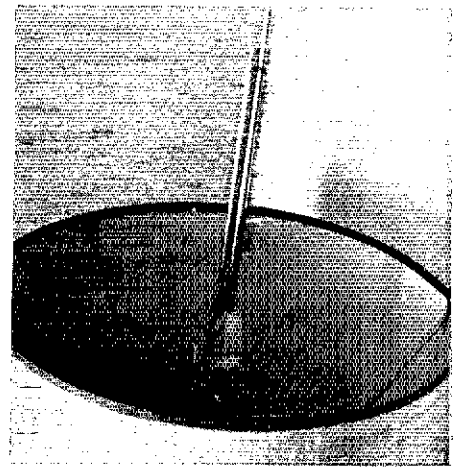
The second try was successful. This time, I secured the base of the radiator directly to the metal lampshade bracket and applied a gamma match, using a 1/4-inch rod as the stub. With three variables (the capacitor, the shorting bar, and radiator length) it is relatively easy to obtain a good match.

Starting with a radiator length of 19 inches (483 mm) and the shorting bar at nine inches (229 mm), I first adjusted the 5- to 25-pF ceramic capacitor for minimum SWR. This is critical as just a slight change in capacitance will cause the SWR to soar. After finding the minimum reading with the capacitor, I adjusted the sliding bar and radiator length for 1:1. These changes are not critical. Final radiator length was 20 inches (508 mm) with the shorting bar at 9-1/2 inches (241 mm). These dimensions probably will differ with various lampshades.

I checked the SWR with the lamp turned on, then off — no change. I have not investigated for RFI in my upstairs neighbor's quadraphonic monster. And I don't intend to.



Coupling and mounting detail of the groundshade antenna; the insulator/spacer is a polyethylene furniture caster insert.



A 1/4-inch rod is used as a gamma rod.

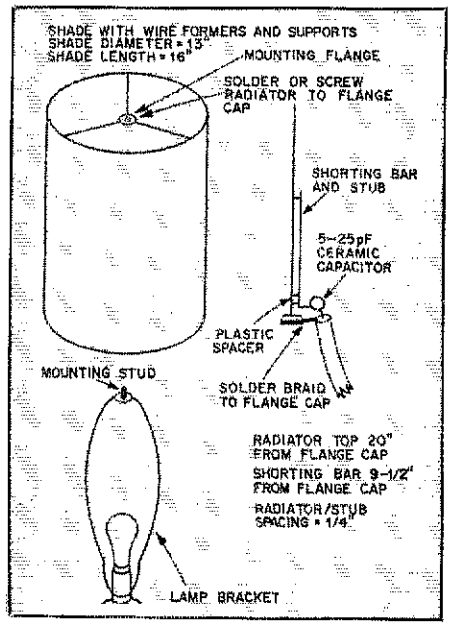
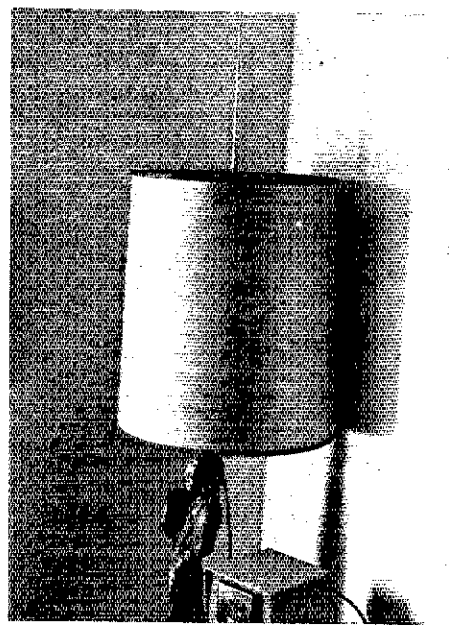


Fig. 1 — Construction details for the groundshade antenna.



The completed groundshade antenna; can you find it?

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A 220-MHz Transmit Converter

Crowded bands bothering you? Try VHF! Recent FCC rulings have removed the immediate threat of CB invasion into the 220-MHz band, making it the next logical step up from 2 meters. Here's a way to get your signal on the wide-open stretches of 220!

By Fred J. Merry,* W2GN

If you're lacking vhf experience, don't let the high frequencies scare you. This well-proven straightforward design can provide an interesting way to get your feet wet. And those familiar with vhf-uhf construction techniques will find no unusual difficulties in duplicating this transmit converter.

All-mode transceiver availability has closed the equipment gap for complete utilization of the 2-meter band: ssb, cw, fm or what have you. But the next higher ham band has been conspicuously void of signals in the small-signal or "exotic mode" segments of the band. In the past, this situation developed because most hams were afraid to invest their money in gear for a band with a dubious future. Now the air has been cleared, and the menace to the 220 band is no longer!

For those who dove headfirst into the 2-meter scene with an ultra-sophisticated all-mode transceiver, 220 may prove to be more challenging! Lacking commercial equipment of this complexity at this stage of the game, the vhf man must be content with transmitting and receiving converters which are "state of the art" for 220. This article describes a 220-MHz transmit converter (TC) which is patterned after a 432-MHz TC originally made and sold by the Carmichael Communications Company, Carmichael, CA.

This converter is a compact unit built on a Bud CU247 chassis, utilizing a solid-state local-oscillator chain, a 6939 mixer and a 6939 amplifier. Power supply requirements are 250 V dc at 140 mA and 6.3 V ac at 3 A. Power output on 220 is a minimum of 6 watts with approximately one-watt drive on 28 MHz. The 15-volt supply for the transistor section is derived from a voltage-doubler circuit off the 6.3-V ac source. The dc bias for the 6939 amplifier is supplied in the same manner. The circuitry is similar to that published in various articles of the past, particularly on 432 TCs. The ARRL *Handbook* also has a description of a similar TC for 144 MHz; the difference is that the local oscillator drive is supplied by tubes. Many of these TCs are in use on 432 for uplinking to OSCAR 7 Mode B. They have been used under a wide range of conditions and

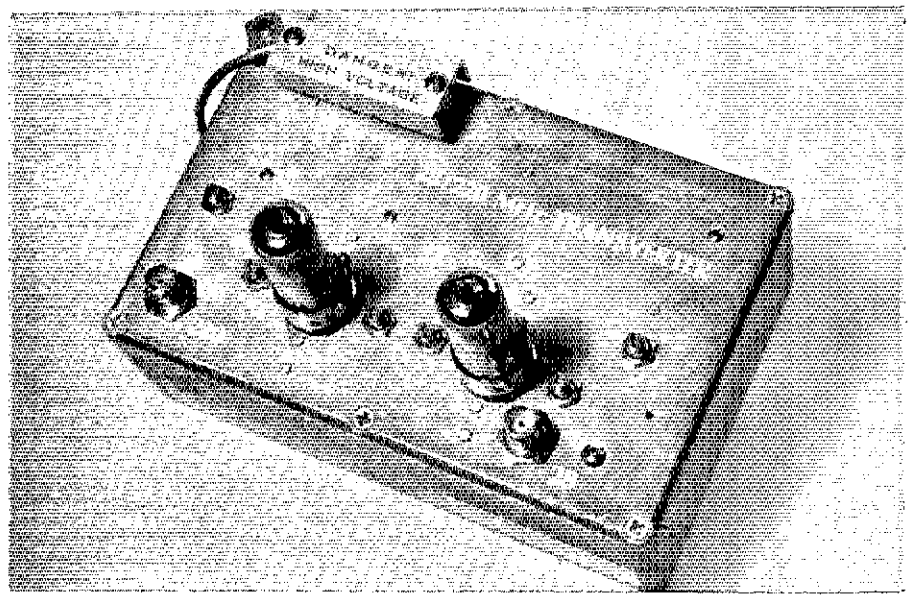

Fig. 1 — The 220-MHz transmit converter shown with the tubes in place. The 28-MHz drive enters at the right and the 220-MHz output is at the left. Note that an aluminum channel is used to cover the high-voltage terminals. This feature should be incorporated into the unit as a safety precaution.

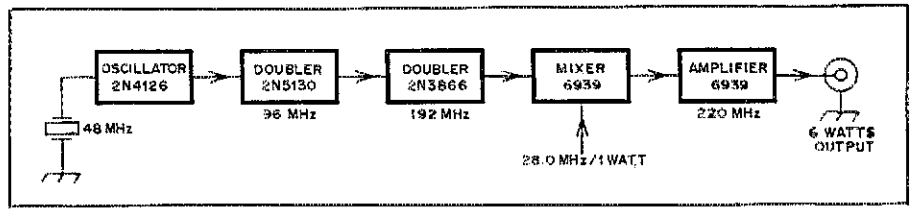

Fig. 2 — A block diagram of the 220 transmit converter. The oscillator, first doubler, and second doubler comprise the local-oscillator chain which is contained on the circuit board. The 192-MHz output from the LO goes to the first 6939 tube where it is mixed with 28-MHz rf from the hf exciter. The second 6939 tube is used to amplify the 220-MHz rf to a six-watt level.

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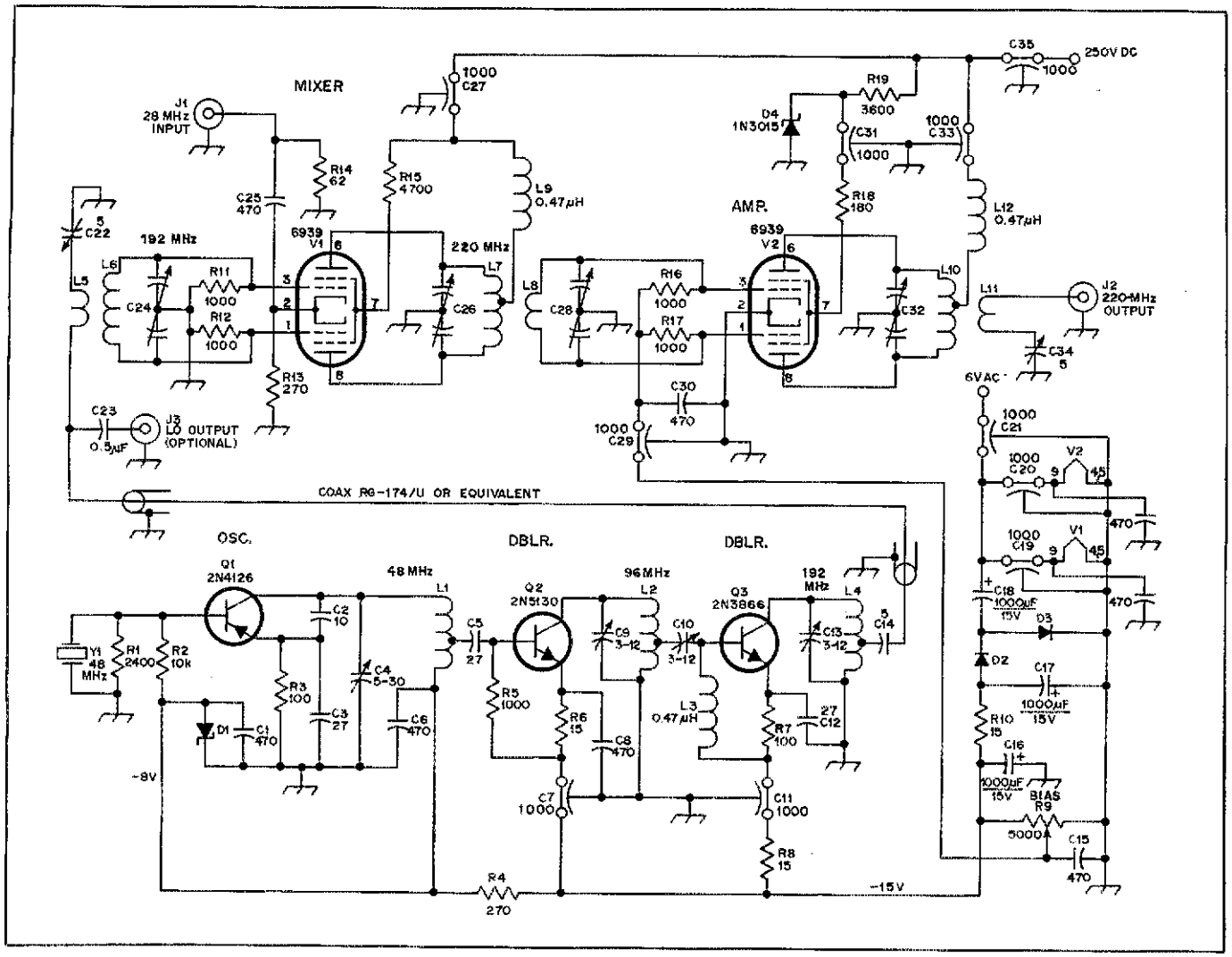


Fig. 3 — A schematic diagram of the 220-MHz transmit converter. Note that J3 is an optional LO output. It can be added if the builder wishes to use the LO in a receive converter also. All resistors may be 1/4 watt unless otherwise specified. All capacitors are in pF and resistors in ohms unless marked otherwise.

C1, C6, C8, C15 — 470 pF, low drift (ARCO MCA-C).
C2 — 10 pF, low drift (ARCO MCA-C).
C3, C5, C12 — 27 pF, low drift (ARCO MCA-C).
C4 — 5-30-pF variable (Johnson 275-0430-005).
C7, C11, C19, C20, C27, C29, C31, C33 — 0.001-μF 600-V feedthrough, circuit-board type (Erie 2404000).
C9, C10, C13 — 3 to 12-pF variable (Johnson 275-0112-005).
C14 — 5 pF, low drift (ARCO MCA-C).
C16, C17, C18 — 1000-μF 15-V electrolytic (Mallory TC1501B).
C21, C35 — 0.001-μF 600-V feedthrough, bulkhead type (Erie 2443007X5S0102M).
C22, C34 — 5-pF midget type, air variable (Johnson 189-0564-001).
C23 — 0.5 μF (optional — only used if LO output is installed).
C24, C26, C28, C32 — 8-pF butterfly type, air variable (Johnson 160-028-001).
C25, C30 — 470 pF, low drift, ceramic (ARCO MCA-C).
D1 — 8-volt, 1-watt Zener diode (G.E. ZD8.2).
D2, D3 — Power supply rectifier diodes (INT. R170 B).
D4 — 180-volt Zener diode (1N3015).
L1 — 12 turns No. 18 wire, 3/4 in. long, 1/4 in. diameter. Tap at 1-3/4 turns.
L2 — 6 turns No. 18 wire, 3/4 in. long, 1/4 in. diameter. Tap at 2 turns.
L4 — 3 turns No. 18 wire, 3/4 in. long, 1/4 in. diameter. Tap at 1 turn.
L3 — 0.47-μH rf choke (Miller).
L5, L6, L7, L8, L10, L11 — See Table 1.
L9, L12 — 0.47-μH rf choke (Miller).
Q1 — 2N4126.
Q2 — 2N5130.
Q3 — 2N3866.
R1 — 2400 ohm.
R2 — 10 kilohm.
R3, R7 — 100 ohm.
R4 — 270 ohm, 1 watt.
R5, R11, R12, R16, R17 — 1000 ohm.
R6, R8 — 15 ohm.
R9 — 5000-ohm circuit-board type potentiometer.
R10 — 15 ohm, 1 watt.
R13 — 270 ohm, 1 watt.
R14 — 62 ohm, 2 watt.
R15 — 4700 ohm, 2 watt.
R18 — 180 ohm, 1 watt.
R19 — 3600 ohm, 2 watt.
V1, V2 — 6939.
Y1 — Crystal, 48 MHz; HC-6/U (ARCOS).

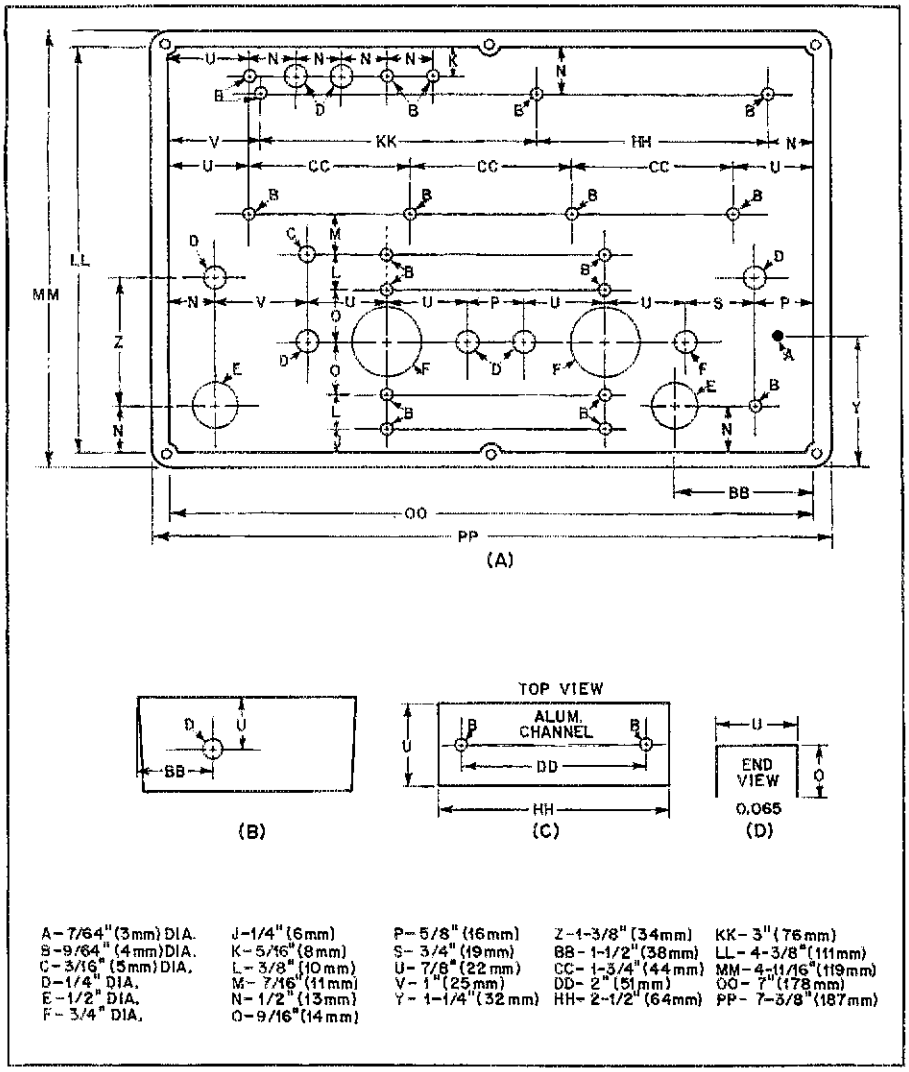
Miscellaneous

Chassis box (drilled), Bud CU247 (ARCOS).
Tube sockets, Cinch 9JC2.
BNC bulkhead-type connector, Cannon DIC22497 (3 required if LO output is used; UG-657/U if 3/8-in. hole is used).
Circuit board (etched and drilled).
Brass partitions/hardware — see text. (ARCOS)
Wire — 3 feet No. 16 silver-plated; 3 feet No. 18 silver-plated.
Coaxial cable — RG-174/U.
Terminal strip, 2-point.

seem to be standing the test of time in good shape. (See Editor's Note, page 20.)

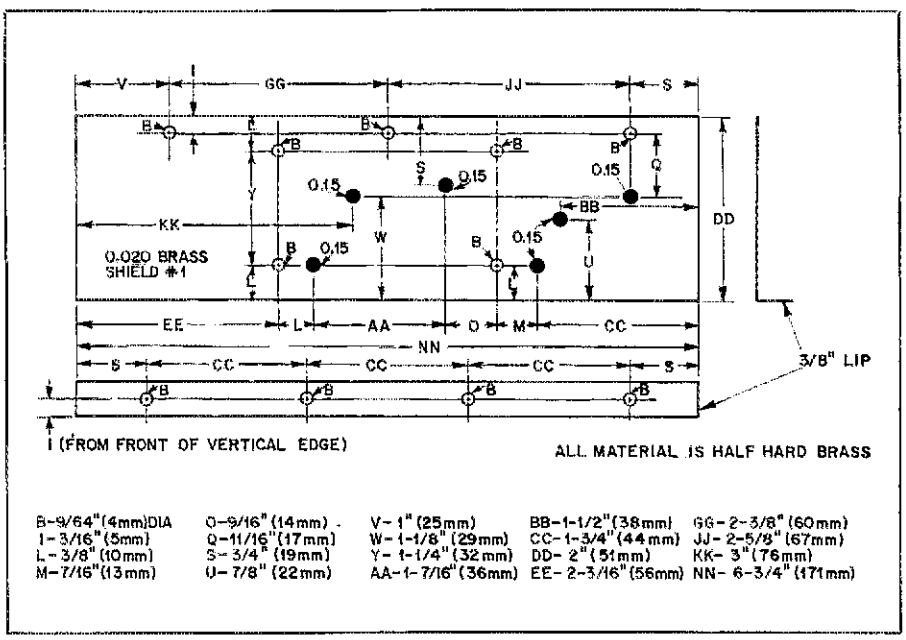
Those who are familiar with vhf-uhf construction techniques will find no unusual difficulties in duplicating this 220 TC. Others may find it an interesting way to get their feet wet with a well-proven straightforward design.

Fig. 2 shows the circuitry of the 220 TC in block form. The local oscillator chain develops about five volts of rf at the output of the 2N3866, just enough to drive the 6939 mixer. Although expensive ($17.50 to $22 each), the 6939 mixer and amplifier tubes offer an economical alter-



A–7/64" (3mm) DIA.	J–1/4" (6mm)	P–5/8" (16mm)	Z–1-3/8" (34mm)	KK–3" (76mm)
B–9/64" (4mm) DIA.	K–5/16" (8mm)	S–3/4" (19mm)	BB–1-1/2" (38mm)	LL–4-3/8" (111mm)
C–3/16" (5mm) DIA.	L–3/8" (10mm)	U–7/8" (22mm)	CC–1-3/4" (44mm)	MM–4-11/16" (119mm)
D–1/4" DIA.	M–7/16" (11mm)	V–1" (25mm)	DD–2" (51mm)	OO–7" (178mm)
E–1/2" DIA.	N–1/2" (13mm)	Y–1-1/4" (32mm)	HH–2-1/2" (64mm)	PP–7-3/8" (187mm)
F–3/4" DIA.	O–9/16" (14mm)			

Fig. 4 — The drilling template for the lid of the Bud chassis is shown at A; B shows the hole location for bias adjustment on V2. The dimensions at C are for the aluminum-channel safety guard.



B–9/64" (4mm) DIA	O–9/16" (14mm)	V–1" (25mm)	BB–1-1/2" (38mm)	GG–2-3/8" (60mm)
I–3/16" (5mm)	Q–11/16" (17mm)	W–1-1/8" (29mm)	CC–1-3/4" (44mm)	JJ–2-5/8" (67mm)
L–3/8" (10mm)	S–3/4" (19mm)	Y–1-1/4" (32mm)	DD–2" (51mm)	KK–3" (76mm)
M–7/16" (13mm)	U–7/8" (22mm)	AA–1-7/16" (36mm)	EE–2-3/16" (56mm)	NN–6-3/4" (171mm)

Fig. 5 — A template for the long brass shield used in the chassis construction. Material is half-hard 0.020-in. brass.

native to transistors for equivalent power, output, linearity and relative freedom from spurious responses. With only two stages for 6-watts output, this unit is possibly easier to duplicate than an equivalent solid-state mixer and amplifier chain. A study of the schematic will reveal the rest of the circuit details including the built-in low-voltage power supply.

Construction

A good place to start construction is to drill the top plate of the Bud CU247 box. A drilling chart is shown in Fig. 4A. Note that measurements are referred to the ridge on the underside of the cover — actually the inside dimension of the box. The two 1/2-inch holes toward the bottom of Fig. 4A will be 3/8-inch instead of 1/2-inch if you are using 3/8-inch type BNC bulkhead connectors. Also note that there is an optional hole to be drilled if you plan to use the local oscillator output to drive a receiving converter.

Fig. 4B locates the bias adjustment hole on the end of the box. Fig. 4C gives the dimensions and drilling for a piece of aluminum channel used as a cover over the feedthrough capacitors terminating the 250-V ac power leads.

The dimensions and drilling of the brass partitions are shown in Figs. 5 and 6A. Make five small brass angles which are used to ground the partitions to the bottom of the box. (See Fig. 6C.) The locations of these angles can be seen in the photos. The angles may be soldered or bolted to the partitions. Put a solder covering on the angle part that will be in contact with the bottom of the box.

Next, assemble the partitions and mount the tube sockets. Do the preliminary wiring as shown in Figs. 7 through 9. This will include the grounding of pins 4 and 5 of the tube sockets to the center pin which is in turn soldered to the brass partitions. Use a small piece of folded braid between the center pin and the brass partition to facilitate this connection. Pin 2 of V2 is also soldered to the brass partition. The feedthrough capacitors on the long partition are installed and wiring done as shown in Fig. 7 for the filament of V2. A 470-pF filament bypass capacitor is connected from pin 9 to the brass partition for each tube. These are not shown on the schematic or indexed in the parts list.

Mount capacitors C22, C24, C26, C28, C32 and C34, the input and output BNC connectors and the two-point terminal strip for L5. Make and mount inductors L5, L6, L7, L8, L10 and L11 using the dimensions of Table 1.

Note the position of the coils as shown in Fig. 8. The leads on L6 and L10 are pushed through the butterfly (variable) capacitor terminals to the tube socket pins. L7 and L8 are soldered to the stator terminals of their respective butterfly capacitors. L7 and L8 are connected to

the socket pins with short pieces of No. 16 wire from the capacitor terminals. Try to follow the coil dimensions precisely. If you have an accurate grid-dip meter, check them out — remember that L6 is tuned to the local-oscillator frequency of 192 MHz.

Check the schematic to verify that all parts are installed and connected for the mixer and amplifier section. A review of Figs. 9 through 12 will reveal the assembly details of the local oscillator section of the converter. Note that the small brass partitions as shown in Fig. 6B are mounted on the circuit board to form a shield between the input and output of the two doubler stages. The circuit board is mounted with three small brass angles. Before mounting, however, it is best to check out the circuit-board operation. Connect 6.3 V ac to the board and verify that the power supply is operative by checking for proper voltages at the oscillator collector and the first and second doubler emitters.

Adjustments and Testing

Shut the 6.3-V ac source off. Using a grid-dip meter, set the oscillator-tuned circuit to the crystal frequency. Turn on the 6.3-V ac source and observe the oscillator output at the base of the first doubler with an rf probe and meter. Make sure the oscillator starts readily when power is applied.

Connect the rf probe to the base circuit of the second doubler and peak the collector circuit of the first doubler. Similarly peak the second doubler with the probe at the output cable connection point on L4. At this test point, a minimum of 4 volts of rf should be obtained after final peaking of the doubler tuning and coupling capacitors. Mount

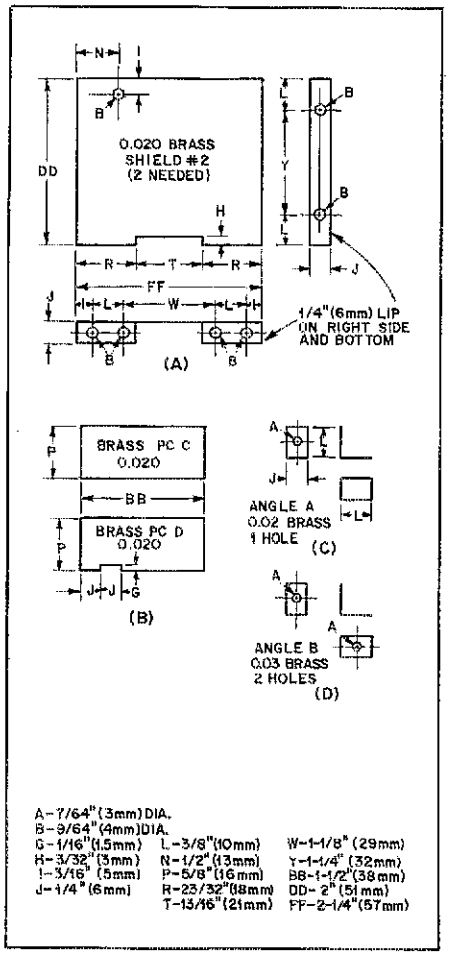


Fig. 6 — At A, the small shield used in the transmit converter chassis. Two of these 0.020-in. brass shields are used. The brass partitions, B, are used to isolate the input and output sections of the doublers in the LO chain. C and D show the brass angles used for mounting and grounding the partitions to the box bottom when closed. The angles with two holes are used to mount the pc board.

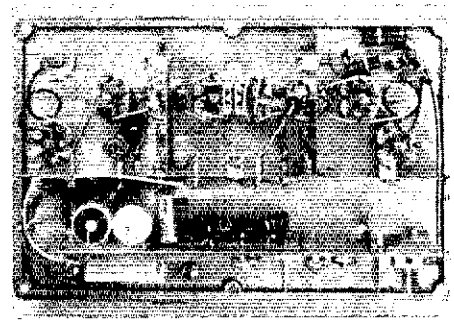


Fig. 7 — The inside of the transmit converter. Coil dimensions are given in the parts list and in Table 1.

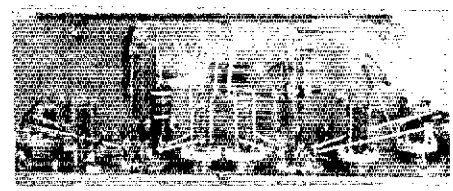


Fig. 8 — A side view of the tube section in the 220-MHz transmit converter. Note the position of the coils in the photo.

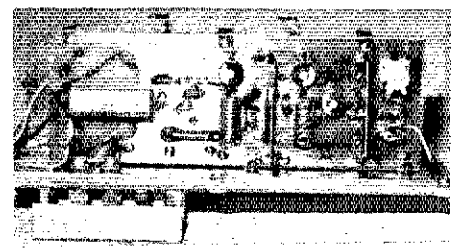


Fig. 9 — This photo shows the parts placement on the foil side of the converter circuit board. Dimensions for the coils are given in the parts list. Note the partitions used to shield the input circuits from the outputs, and the L brackets used for grounding the pc board and tube-section partitions to the chassis box bottom.

Fig. 10 — Shown here at actual size is the pc-board template for the local-oscillator chain of the 220-MHz transmitting converter. The template is shown from the foil side of the board, with black representing copper.

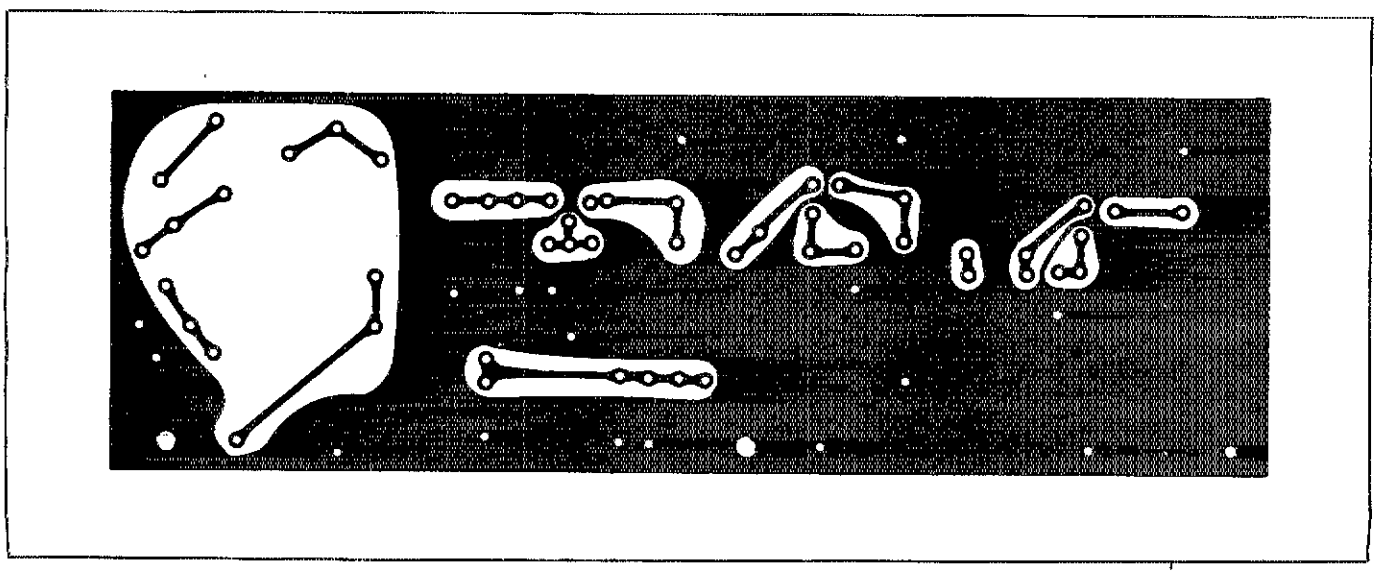


Table 1 — Dimensions for Winding Inductors. All Use an Air Core.

L5 — 1 turn, 1/2-in. dia, 3/4-in. leads; No. 22 insulated wire.
L6 — 1-1/2 turns, 1/2-in. dia, 1-in. leads; No. 16 wire.
L7 — 1-1/2 turns, 5/8-in. dia, 3/16-in. leads; No. 16 wire.
L8 — 1/2 turn, 5/8-in. dia, 3/16-in. leads; No. 16 wire.
L10 — 1-1/2 turns, 5/8-in. dia, 1-1/4-in. leads; No. 16 wire.
L11 — 1 turn, 1/2-in. dia. 3/4-in. leads; No. 22 insulated wire.

the circuit board and complete all power connections. The unit is now ready for test.

Hook up the power supply with a 150-to 250-mA meter in the B+ (250 V dc) lead. Adjust all tuning capacitors (C22 through C34) to minimum capacitance. Turn the power supply on and adjust the bias potentiometer for the total current of 65 mA. Connect the 28-MHz excitation (approximately one watt) to the mixer input, and a dummy load and rf indicator to the output circuit. Adjust C22, C24, C26 and C28, in that order, for maximum plate-current indication on the meter. Adjust C32 and C34 for maximum output power. Then repeak C22 through C28 for maximum output. C22, C24, C32 and C34 may require multiple adjustments for best results. The output power should be at least six watts. Spurs in the output of the converter are at least 45 dB down from the desired output. Do not run the 28-MHz drive up beyond where the output flattens out. Once the output has been maximized following a 10-minute warm-up, no further adjustment should be required unless tubes are changed or a change occurs in the input or output circuits.

Good luck on 220!

[Editor's Note: The circuit information and coil data for the 432 and 144 versions of this TC will be furnished by the author on request for an s.a.s.e. The converter and its 432- and 144-MHz counterparts are all available as assembled units from Amateur Radio Component Service, P. O. Box 546, East Greenbush, NY 12061. Circuit boards and all parts are also available individually from the same source. The 220TC package price for all parts except tubes at the time of this publication is $105.]

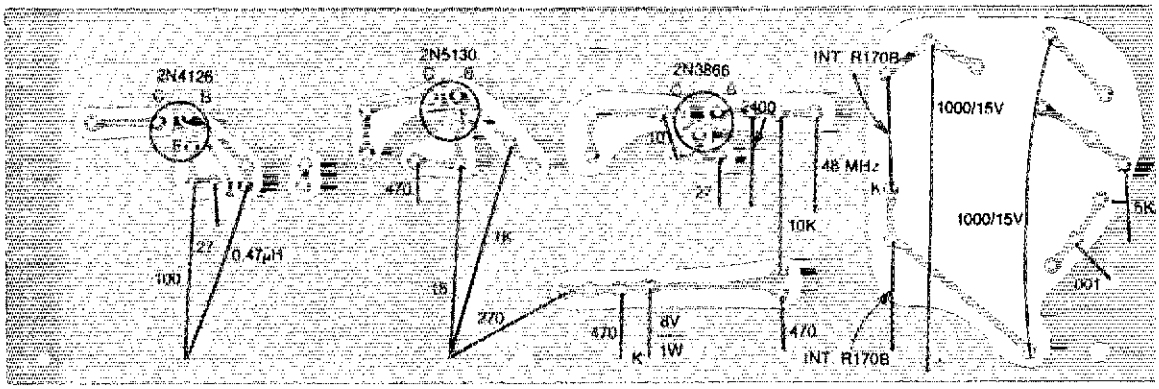


Fig. 11 — This parts overlay diagram is for the non-foil or component side of the pc board shown in Fig. 10. Parts are labeled here for convenience but the builder should refer to the schematic diagram and parts list for more specific information on component values. Gray represents the foil pattern on the opposite side of the board. K indicates the cathode end of a diode.

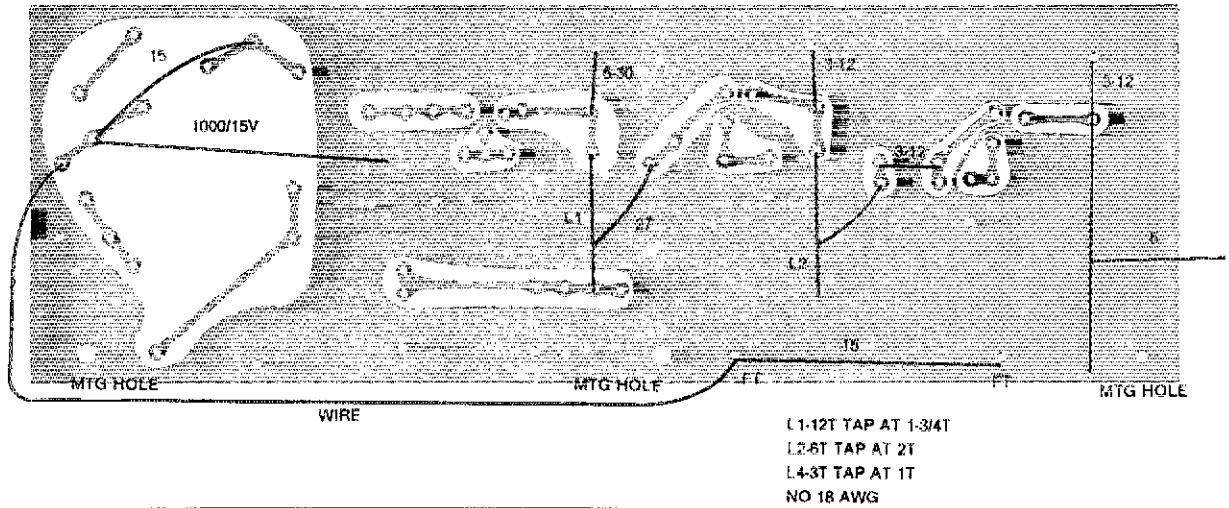


Fig. 12 — Parts placement for components which are placed on the foil side of the circuit board. Gray represents copper.

Twisted-Wire Quadrature Hybrid Directional Couplers

That title scare you off? Well, don't let it. Just read this and we'll make believers out of you.

By Reed Fisher,* W2CQH

In a previous article[1] it was shown how 3-dB directional couplers or quadrature hybrids could be used to effectively parallel two uhf amplifiers or attain circular antenna polarization. The quadrature hybrid is clearly a very useful circuit. Unfortunately, the uhf strip-line models cannot be scaled down to the high-frequency amateur bands since their dimensions could become prohibitively large. This article shows how compact, low-cost, lumped-element, quadrature hybrids can be easily constructed for use in the hf amateur bands.

Theory

Figs. 1 and 2 show, respectively, the circuit diagram and photograph of a twisted-wire hybrid suitable for use in the 40-meter band. The coupling transformer consists of two insulated copper wires tightly twisted together, thereby forming a bifilar pair. The pair is then wound around a small ferrite toroid (at vhf an air-core solenoid will be suitable). The transformer is then connected to the four BNC connectors along with two molded mica capacitors. The circuit is then placed in a suitable metal enclosure. This four-port (connector) circuit will function as a hybrid or directional coupler if constructed properly.

What should a hybrid do? Let's reiterate the hybrid functions given in Ref. 1. When the hybrid is driven by a generator and connected to matched (Z_o) loads, as shown in Fig. 1, it should perform as follows:

1) There is transfer (coupling) of power from port 1 to port 2.

2) There is transfer of power from port 1 to port 4.

3) There is *no* transfer of power from port 1 to port 3.

4)There is *no* reflected power back out of port 1 (VSWR = 1:1).

5) The voltage V_2 and V_4 differ in phase by 90 degrees, hence the name quadrature hybrid.

Conditions 3, 4 and 5, above, are *theoretically independent* of frequency. Thus, for certain applications, the hybrid can be used on more than one amateur band. The term *coupling*, which *is* frequency dependent, refers to the ratio of power leaving port 2 (or port 4) to that entering port 1.

$$\text{Coupling (dB)} = -10 \log_{10} \frac{\text{Power leaving port 2 (or 4)}}{\text{Power entering port 1}}$$

Fig. 3 shows the coupling characteristics of the twisted-wire hybrid. Note that at frequency f_o the coupling is 3 dB, meaning that equal power emerges from ports 2 and 4. Thus the hybrid, when operated near f_o, functions as a *matched power splitter*. This means that the loads connected to ports 2 and 4 not only receive equal power, but also see a matched (Z_o) generator. Therefore, when the hybrid is inserted into any transmission line, it will split the power into two parts without introducing any impedance mismatch.

Hybrid Design

A twisted-wire hybrid may be designed by considering Fig. 4, which shows the coupling transformer and capacitors removed from the baseplate and reconnected in two ways. In Fig. 4A, the connections are arranged such that the transformer "looks like" a simple inductor. The inductance, L, measured at points x-x, is found by connecting the circuits to an impedance bridge or using the grid-dipper technique described in the *Handbook*.[2] The capacitors are, of course, shorted out and can be removed for this measurement.

In Fig. 4B the connections are rearranged such that the transformer interwinding capacitance and external capacitors together "look like" a single capacitor. The capacitance C, at points y-y, can be measured by a 60-Hz capacitance bridge.

When reconnected as shown in Fig. 1,

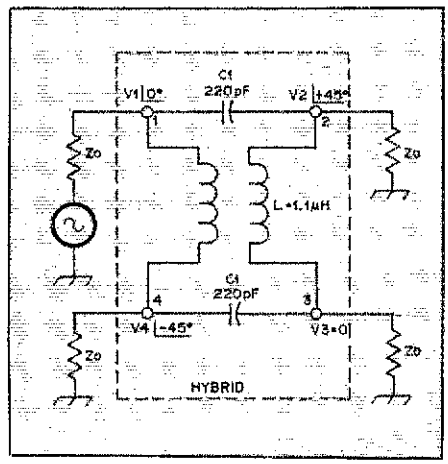


Fig. 1 — 7-MHz hybrid circuit.

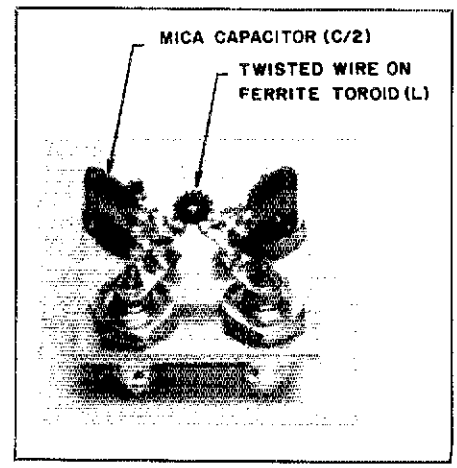


Fig. 2 — The 7-MHz hybrid.

*2 Forum Court, Morris Plains, NJ 07950

[1]References appear on page 23.

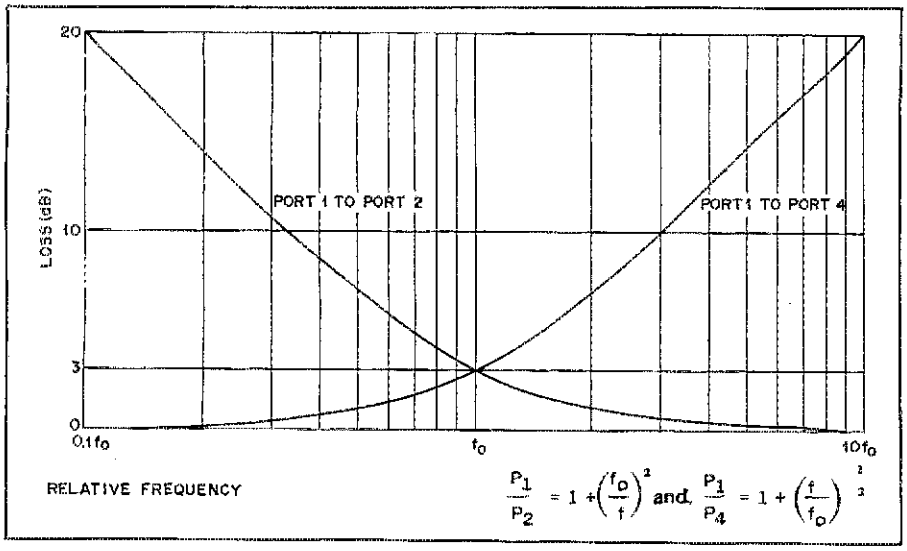


Fig. 3 — Quadrature hybrid theoretical insertion loss versus frequency.

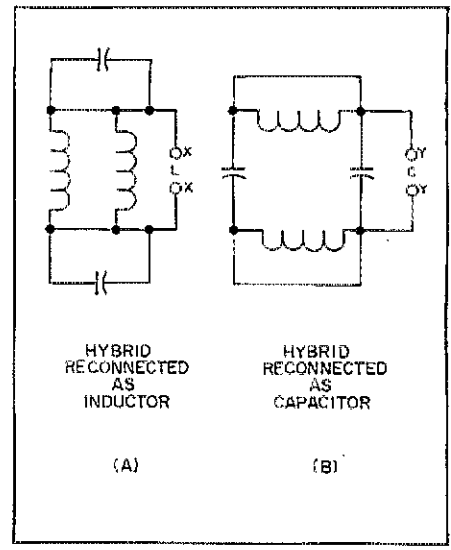


Fig. 4 — Measurement connections.

the hybrid will perform properly when

$$Z_o = \sqrt{\frac{L}{C}} \qquad \text{(Eq. 1)}$$

Equal power division (3 dB) between ports 2 and 4 will occur at a frequency f_o where

$$2\pi f_o L = Z_o \qquad \text{(Eq. 2)}$$

and

$$\frac{1}{2\pi f_o C} = Z_o \qquad \text{(Eq. 3)}$$

Eq. 2 simply means that the reactance of L (as measured per Fig. 4A) must equal Z_o (the desired load impedance) at the "3-dB" frequency f_o shown in Fig. 3. Eq. 3 means that the reactance of C (as measured per Fig. 4B) must equal Z_o at frequency f_o. The values of L and C necessary to obtain the required reactance also can be found by consulting a reactance chart.[3]

Example of Hybrid Design

Suppose we want to design the 7-MHz hybrid shown in Fig. 2. Then

$$Z_o = 50 \text{ ohms} \qquad \text{(Eq. 4)}$$

and

$$f_o = 7 \text{ MHz} \qquad \text{(Eq. 5)}$$

A reactance chart shows that to satisfy Eqs. 2 and 3,

$$L = 1.1 \ \mu\text{H} \qquad \text{(Eq. 6)}$$

and

$$C = 450 \text{ pF} \qquad \text{(Eq. 7)}$$

The transformer is constructed by taking two strands of AWG No. 30 Formex magnet wire and twisting them tightly together to form a bifilar pair having approximately 10 twists per inch (the wire size and twist are not critical). It was found that when 12 turns of this pair were wound on a small ferrite toroid,* the inductance (measured as per Fig. 4B) was nearly 1.1 μH.

The measured capacitance between bifilar wire pairs was found to be 12 pF (typically 35 pF/foot). Therefore, the end terminal capacitors (C1 in Fig. 1) must each be

$$C1 = \frac{450 - 12}{2} = 219 \text{ pF} \qquad \text{(Eq. 8)}$$

When assembled as shown in Fig. 2, the hybrid functioned correctly the first time without requiring any trimming of inductance or capacitance.

Hybrid Applications

Fig. 5 suggests some applications for the quadrature hybrid. In Fig. 5B, two receivers are fed from a common antenna or vhf converter. If the 3-dB (f_o) frequency of the hybrid is near the output frequency of the preamplifier or converter, each receiver will receive an equal amount of power. If each receiver input impedance is Z_o, then no power will be lost in the Z_o termination connected to port 3 of the hybrid.

In Fig. 5B, the hybrid is used to obtain an *unequal* split in generator power. The generator frequency is at one-third the hybrid 3-dB frequency, f_o. Therefore, as indicated by Fig. 3, the power arriving at the load connected to port 4 of the hybrid will be attenuated by 0.5 dB, while the power emerging from port 2 will be 10 dB down. In this case, the hybrid is functioning as a directional coupler. If the detector and load impedances are near the value of Z_o, no power will be dissipated in the Z_o termination connected to port 3; also, the impedance looking into port 1 will be Z_o.

Fig. 5C shows the parallel operation of two amplifiers, a particularly useful application first mentioned in Ref. 1. This connection provides excellent amplifier isolation and virtually eliminates interaction between them, thus "taming" most tuned transistor amplifiers. The circuit is unique in that, if the amplifiers are identical, then the impedance seen looking into port 1 of the first hybrid and port 2 of the second hybrid will always have the value Z_o regardless of the amplifiers' input and output impedances.

Fig. 5D shows how an impedance-matched spdt switch can be constructed from two hybrids and two spst switches. When the spst switches (which can be semiconductor diodes) are open, all of the power from the generator will flow into load no. 2. When the switches are closed, all of the generator power will be diverted to load no. 1. In either case, the generator and both loads will always see an impedance of Z_o.

In Fig. 5E, the switches have been replaced by two identical band-pass filters. For frequencies that fall in the passband of the filters, all power from the generator will flow into load no. 2. However, for frequencies outside the filter passband the generator power will be diverted into load no. 1. As before, the generator and both loads always see impedance Z_o.

Hybrid Limitations

Fig. 3 implies that the twisted-wire hybrid is principally a one-band device since the coupling remains near 3 dB over a relatively narrow frequency region. A

*[Editor's Note: The toroid was part no. CF-101 Q2 made by Indiana General Corporation, Keasby, NJ. Outside diameter of toroid was 0.230 inch, thickness was 0.60 inch, and permeability approximately 100.]

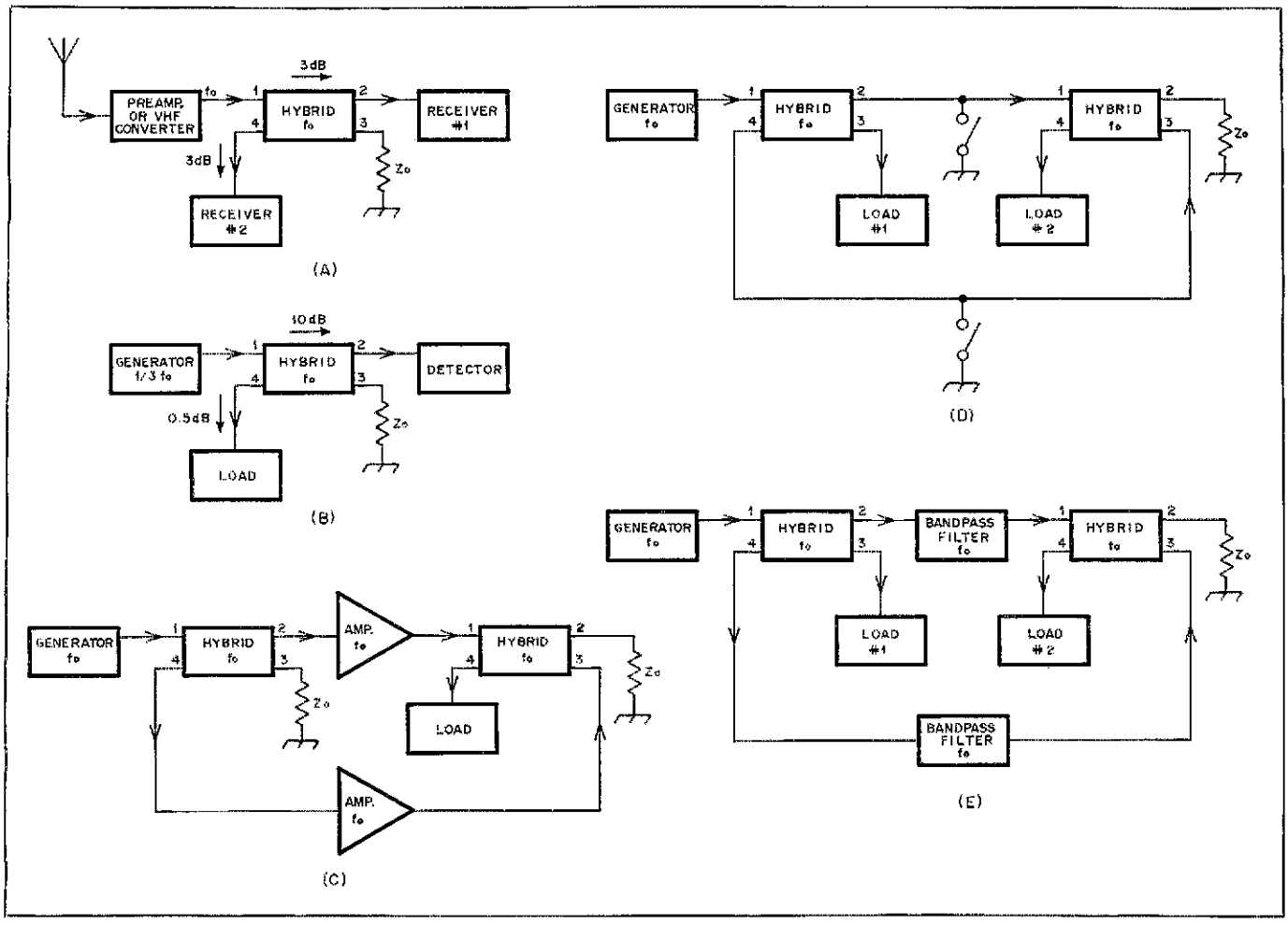


Fig. 5 — Various hybrid applications.

method of cascading two couplers to obtain wider bandwidth has been described in the literature.[4]

The upper frequency of operation is limited by the minimum value of capacitance C (Fig. 4B), which is the capacitance between turns of the bifilar winding. These hybrids have been made to operate successfully at 900 MHz.

Power-handling capability is limited by ferrite-core saturation and/or insulation breakdown in the bifilar section. The hybrid shown in Fig. 2 should be able to handle at least 10 watts. Higher power hybrids can be constructed by employing not only wire with thicker insulation, but also larger ferrite cores. It may be profitable to experiment with an air-core transformer by simply winding the bifilar pair into a solenoid. However, the design equations hold only for a "lumped network"; therefore, the length of the bifilar pair should not exceed perhaps one-tenth wavelength.

References

[1]Fisher and Turrin, "UHF Directional Couplers," *QST*, September, 1970.
[2]*The Radio Amateur's Handbook*, 1971 edition, p. 541.
[3]*The Radio Amateur's Handbook*, 1971 edition, p. 35.
[4]Fisher, "Broadband Twisted-Wire Quadrature Hybrids," *IEEE Transactions on Microwave Theory and Techniques*, Vol. MTT-21, No. 5, May, 1973, pp. 355-357.

Strays

I would like to get in touch with . . .

☐ teenage hams who would like to play chess, checkers, battleship, etc. on 80-, 40- or 15-meter cw or ssb. Please send an s.a.s.e. Dave Bullard, WB3CBG, 202 S. 4th St., Hamburg, PA 19526.

☐ anyone who knows where I can reach the daughter of Russell H. Tighe, W2ALH, a recent Silent Key. Jorge Perich, WA4GPC, 821 Barnett St. N.E., Atlanta, GA 30306.

☐ industrial electricians or members of large- to medium-size industrial maintenance organizations. Florentino Gonzalez, WA1LYS, 26 Lincoln Ct., Meriden, CT 06450.

☐ teenagers who would like to start a 15-meter ssb net for ragchewing and traffic. John Purnell, WD9CYV, 405 Miller Ave., Madison, WI 53704.

☐ other university-affiliated clubs concerning functions and services during the academic year. Rick Lewis, WBØUZI, University of Iowa ARC, Room 4900, Engineering Bldg., Iowa City, IA 52240.

☐ an amateur rose grower to share knowledge with a new rose enthusiast. Lyle Bickley, WB4VKW, 901 N. Washington, Tuscumbia, AL 35674.

An Inexpensive Morse Keyboard

Put that hand key, bug or electronic keyer on the shelf! Update your operating with this fine-performing Morse keyboard that sends perfect cw, yet requires little skill to use. Build it for under $30 and you'll have a ball!

By Al Helfrick,* K2BLA

Many radio amateurs who have used a keyboard for transmitting Morse code find the device most satisfying and delightful for communication. The near-perfect code sent by keyers of this type does much to reduce operator fatigue and increase accuracy of copy. Oddly enough, and over the objections of some purists, machine-sent code does tend to improve one's fist. Any device that improves the quality of radio communication deserves attention and use.

Until recently, the price of commercially available keyboards and the cost of many homebuilt units have made the keyboard keyer an expensive station accessory. But, with the explosive growth of home computers, large supplies of surplus keyboards and digital-logic material have been made available at reasonable prices. By careful shopping and acquisition of a used keyboard, the keyer described in this article costs less than $30.

After designing and building two previous keyboard keyers, I decided upon a few guidelines for any future construction. First, diode matrices for keyswitch encoding are to be avoided. With all sorts of LSI chips and dynamic systems for encoding switch closures, there is no justification for using literally hundreds of diodes. Secondly, CMOS logic is used. CMOS devices are widely available at reasonable cost. They have excellent noise immunity and allow the use of simple power supplies. Finally, any unnecessary frills will be avoided such as buffer memories, baudot operation, and canned messages.

*RD 1 Box 87, Boonton, NJ 07005

These extras, although often useful, are not worth the added cost and complexity to me. What evolved is an inexpensive, easy-to-build, keyboard keyer constructed from readily available parts. It includes a completely interlocked keyboard with two-key rollover. The unit has the capability to transmit all letters, numbers, punctuation and special symbols including AR, SK, DN, AS and BT.

The secret to the diodeless encoding scheme is the use of a scanned keyboard. The heart of the scanning circuitry is composed of three CMOS analog multiplexers. An analog multiplexer is comparable to eight electronic switches as shown in Fig. 1, arranged so that only one of the eight switches is closed at any time. The switch that is closed depends on the binary number presented to the decoder. For example, if binary 010 appears at the decoder, switch number two will be closed. If 000 appears, then switch number zero will be closed. If the input to the decoder is connected to the output of a binary counter, then the switches will close in succession (zero through seven and back to zero.)

If the analog inputs and outputs are reversed the device becomes a demultiplexer, allowing one common input to be applied to any one of eight outputs. The same monolithic integrated circuit is used in the keyboard keyer as a multiplexer and demultiplexer.

The Scanned Keyboard

Fig. 2 shows a simplified schematic diagram of a scanned keyboard. It may be viewed as an electronic maze or puzzle. If one of the keyboard switches is closed, the

The author operating his keyboard in its intended environment. For field operation, the Gonset twins have been "solid-stated," and run eight watts to an FET power amplifier.

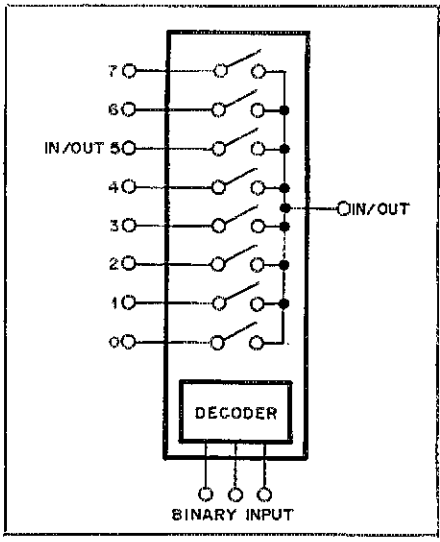


Fig. 1 — An analog multiplexer with an internal decoder. The decoder allows only one of the eight switches to be closed at a time.

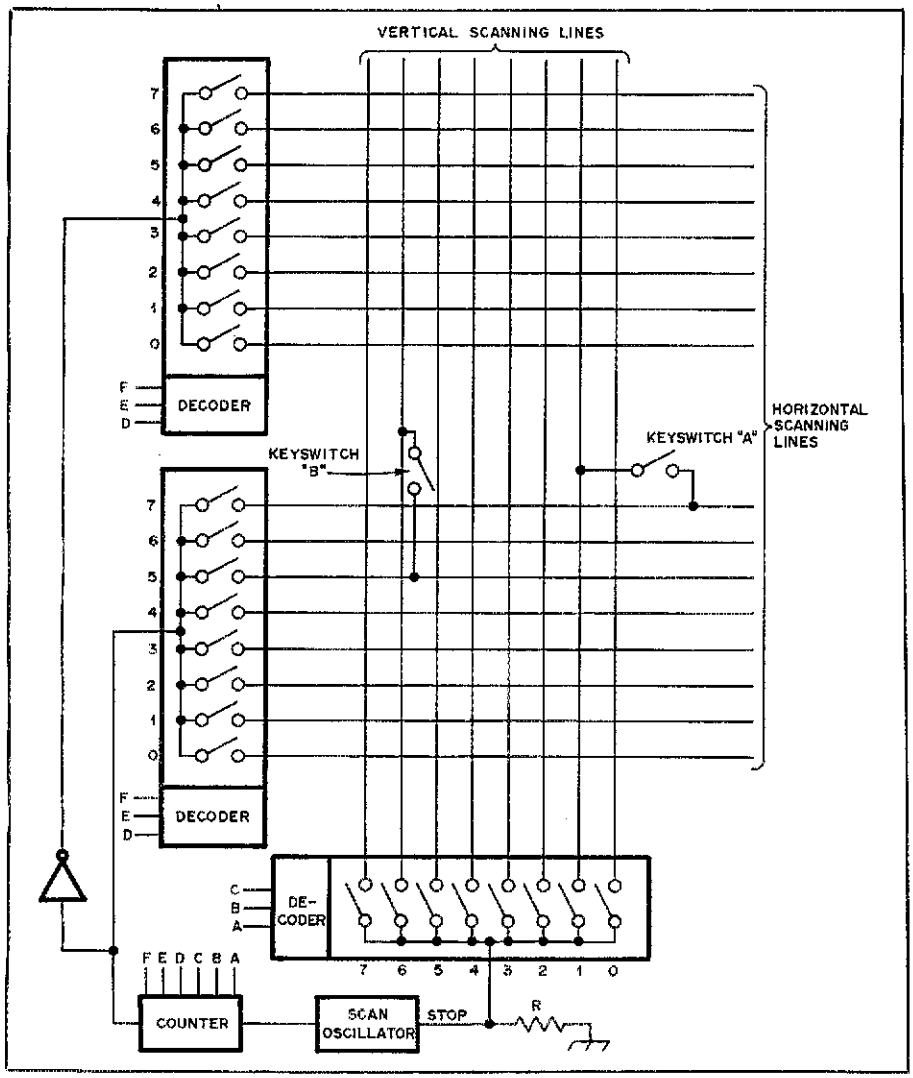


Fig. 2 — A scanned keyboard. Switches are connected between any horizontal wire to any vertical wire as desired. An intersection without a switch implies that these binary codes are unnecessary or invalid for the system.

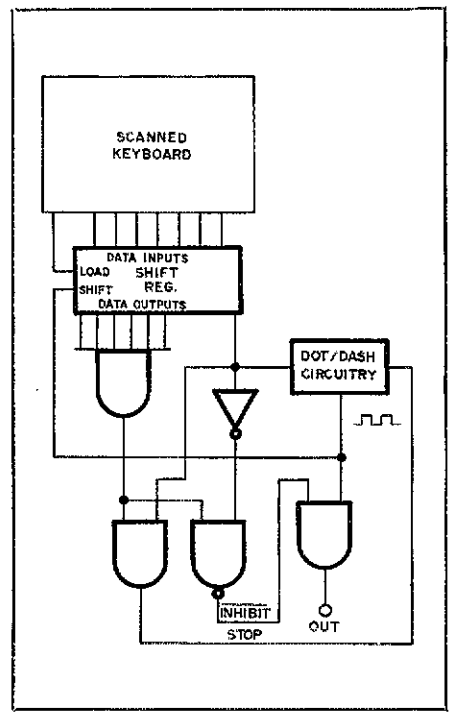


Fig. 3 — A simplified diagram of the Morse keyboard. Each Morse code character has a unique seven-bit binary number. The binary number encoded by a keyboard switch is determined by which horizontal and vertical scanning lines the switch is connected to.

Table 1

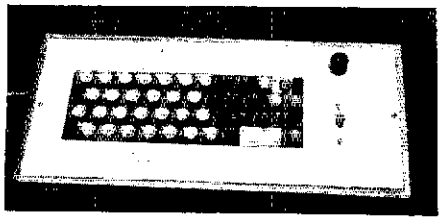
Keyswitch Connections

Connect keyswitches as indicated. Connecting wires are kept short to minimize rf susceptibility. The longest wire in the author's keyboard is about 200 mm (7-7/8 inches). It causes no difficulties.

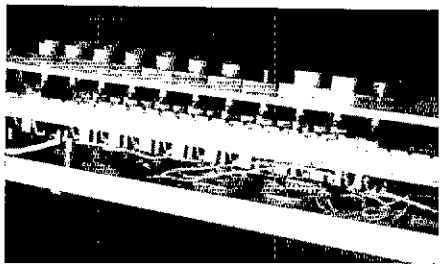
	Connect			Connect	
Character	*From*	*To*	*Character*	*From*	*To*
A	A7	B1	X	A4	B6
B	A5	B6	Y	A4	B2
C	A5	B2	Z	A5	B4
D	A6	B6	1	A0	B1
E	A5	B5	2	A0	B3
F	A3	B3	3	A0	B7
G	A6	B4	4	A1	B7
H	A5	B7	5	A3	B7
I	A7	B3	6	A3	B6
J	A4	B1	7	A3	B4
K	A6	B2	8	A3	B0
L	A5	B5	9	A2	B0
M	A7	B0	0	A0	B0
N	A7	B2	$\overline{AS}$	A3	B5
O	A6	B0	$\overline{AR}$	A2	B5
P	A5	B1	$\overline{BT}$	A1	B6
Q	A4	B4	$\overline{DN}$	A2	B6
R	A6	B5	$\overline{SK}$	A9	B7
S	A6	B7	comma	A8	B5
T	A7	B4	period	A9	B1
U	A6	B3	?	A10	B3
V	A4	B7			
W	A6	B1			

scanning system must find it and generate the proper code assigned to that switch without being fooled by switch bounce or multiple switch closures. When a keyboard switch closes, there will be a current path from the demultiplexer to the multiplexers. The scanning circuitry attempts to find this current path by closing one electronic switch after another, going through all possible combinations until the circuit is completed.

The current flowing through the demultiplexer, the keyboard switch, the multiplexer and finally resistance R, in that order, causes a voltage drop across R and stops the scanning oscillator. The binary number contained in the seven-bit counter when the oscillator stops is the binary code assigned to the keyswitch. Since the counter is seven bits long, there is the possibility of encoding any binary number from 0000000 to 1111111 and producing 128 different combination possibilities. For example, if switch A in Fig. 2 is closed, the counter will stop at 1111001. If switch B is closed, then the counter stops at 1101110. If no switches are closed, then the circuit will continue to scan all 128 different possibilities until a closed switch is found. When this happens the counter will stop until the detected switch is released, whether or not any other keyboard switches are closed. This produces interlocking so that if more than one keyboard switch is closed, only the first will be decoded.



Operator's view of the Morse keyboard. The enclosure is home constructed. The top panel is made with 1/8-inch aluminum while the sides are wood. Some keys are relabeled to include noncomputer symbols such as AR, BT or SK.



The electronics are contained on a single 4- × 6-inch prototype board attached to a shallow aluminum channel. The keyboard frame, the panel and the electronic channel are secured with long machine screws and spacers.

The scanning oscillator in this keyboard keyer operates at about 64 kHz. At this frequency the operator has a feeling of instantaneous operation. This frequency provides a worst-case decoding time of about 2 ms. Although possible, operating the oscillator at a higher frequency is not desirable. The 2-ms time is fast enough for practically any keyboard action. Higher scanning frequencies tend to place stronger, low-order harmonics of the scanning oscillator in the hf radio spectrum, causing possible interference problems.

Because the keyboard scanner can only encode seven-bit binary numbers, some scheme is required to convert these binary numbers into valid Morse code characters. In this keyer, binary one represents the dot and binary zero the dash. An extra zero is added as an "end" bit and the characters are sent from right to left. All of the letters, numbers or special characters must be represented by seven-bit binary numbers where all of the unused bits to the left of the "end" bit are binary 1s. For example, the letter A is represented by 1111001. The right-hand digit, a one, represents a dot. The next digit is zero, representing a dash. The following zero represents the end bit and is not sent, but signifies the end of the Morse character. The remaining digits are ignored. To illustrate further, the letter B is thus encoded 1101110, and the number seven as 1011100.

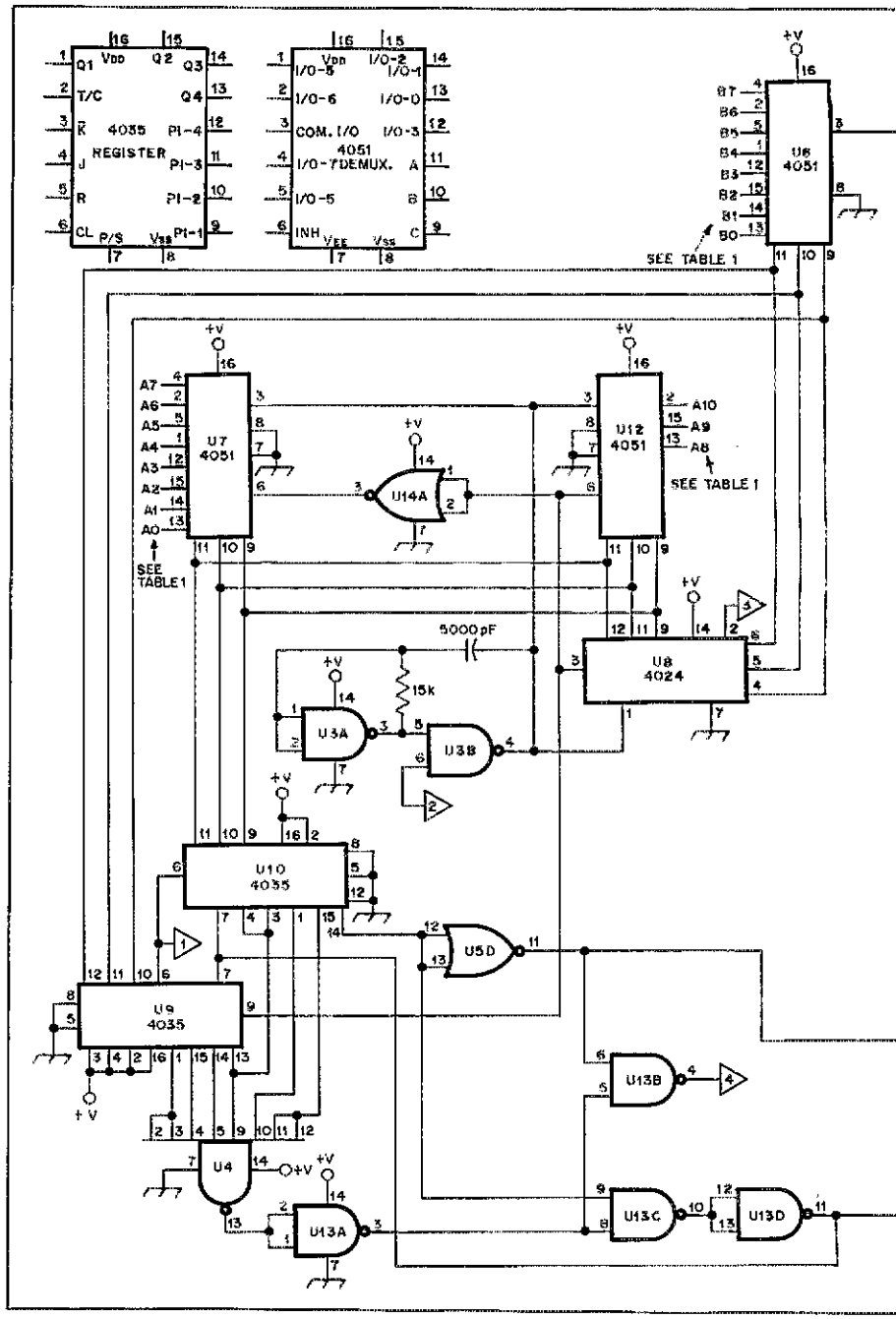


Fig. 4 — The inexpensive Morse keyboard using a diode-less encoding scheme. All capacitors

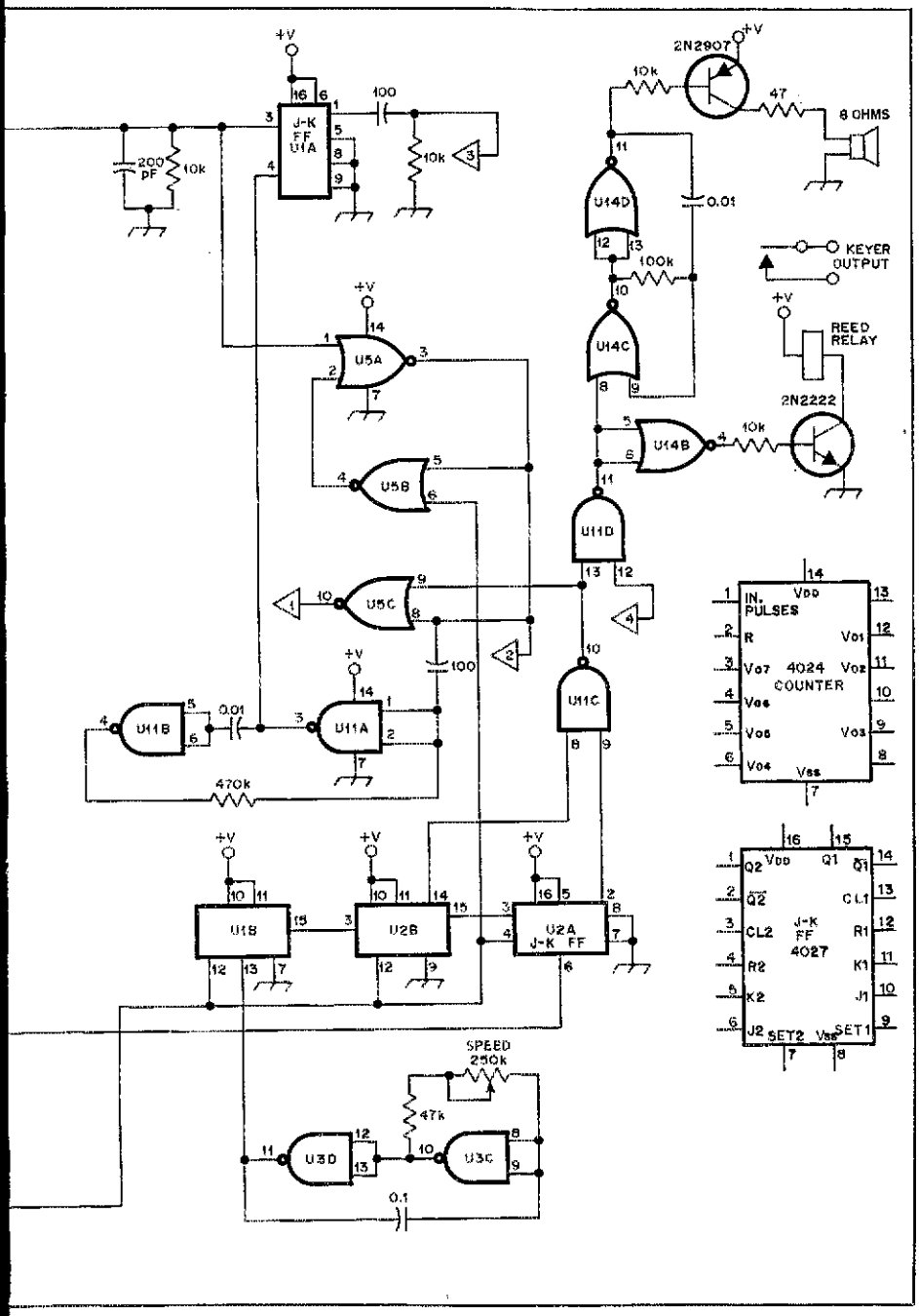
U1, U2 — Monolithic silicon digital MOS IC, dual J-K flip-flop type 4027.
U3, U11, U13, U14 — Monolithic silicon digital MOS IC, quad 2-input NAND gate, type 4011.
U4 — Monolithic silicon digital MOS IC, 8-input NAND gate, type 4068.
U5 — Monolithic silicon digital MOS IC, quad 2-input NOR gate, type 4001.
U6, U7, U12 — Monolithic silicon digital MOS IC, multiplexer/demultiplexer, type 4051.

The Shift Register

A shift register is used to temporarily store the decoded binary number and to shift the number to the right one digit at a time (see Fig. 3). The binary output from the keyboard scanning encoder is parallel-loaded into the seven-bit shift register. The state of the right-hand stage of the shift register will determine whether a dot or dash is to be sent by the dot/dash circuitry.

Presume that 1111010 has been parallel-loaded into the shift register from the keyboard encoder. Because the right-hand stage of the shift register contains a zero, the dot/dash circuitry will send a dash. The falling edge of the dash shifts the register one step to the right, and places a 1 in the left-hand stage. The number now in the register is 1111101, with the right-hand stage containing a one, the dot/dash circuitry sends a dot.

When the falling edge of the dot shifts the register again, the digital content is 1111110. The dot/dash circuitry generates a dash because the last digit is zero.



are Mylar or polystyrene, 20 V.

U8 — Monolithic silicon digital MOS IC, 7-stage binary counter, type 4024.
U9, U10 — Monolithic silicon digital MOS IC, 4-stage parallel-in/parallel-out shift register, type 4035.

However, the dash will not be sent because the inhibit line will go low and not allow the dash to appear on the output line. After shifting, the register now contains all ones. This causes the "stop" line to go high, indicating the end of the Morse character. In this example, the letter N has been sent and a space of one dash duration was generated. The shift register is now free to be parallel-loaded with the next encoded Morse character. Notice that the space of one dash duration, included between any two Morse characters, is required for letter spacing and is thus automatically generated.

About the Electronic Package

In the keyboard keyer constructed by the writer, these simplified circuits took on a somewhat different form in order to contend with problems of real hardware. See Fig. 4. Extra gating was required to suppress false decoding which resulted from switching glitches in the scanning circuitry. A flip-flop was added to allow automatic spacing of repeated letters.

If the reader wishes to understand thoroughly how the circuit functions, a careful study should be made of the data sheets for each device, especially the complex functions. By doing so, one may gain an in-depth understanding of the keyboard keyer from the moment a switch closure has been detected until the unit is ready for another key closure.

The entire electronics package is assembled on a universal DIP pc board. Wire-wrap techniques could be used, but would require the board to be deeper. Because of the noise immunity of CMOS devices, layout is not critical.

The scanned keyboard circuits are inherently debounced and interlocked. Therefore, almost any type of key contact or keyboard will work. No electronics are required for the keyboard. Consequently, the builder can save considerably by shopping around for a keyboard with nonstandard encoding, or no encoding at all.[1] These keyboards are the least desirable for the computer enthusiast, but are ideal for a Morse keyboard. If the keyboard has any circuit connected to it, the circuitry must be removed.

A Sidetone Oscillator and Key Switches

A sidetone oscillator was added and a switch was provided for turning off the sidetone to save power drain. A power drain problem exists for the keying stage. The use of a reed relay is the most foolproof keying method, but costs the most in terms of power drain. If an ac supply is used, power drain is no problem, allowing the use of pilot lamps, monitors and relays. The power supply voltage may range from 5 to 15 volts dc. A regulated supply is not essential. The writer's keyboard keyer is powered by six penlight cells. There is no keying stage because the keyboard is used with a portable transmitter having a CMOS-compatible key input.

In Conclusion

The keyboard is easy to use and requires very little skill to send perfect code. Being familiar with a typewriter keyboard is helpful.

Because the keyboard keyer automatically spaces each letter, the operator may press one letter and before the letter has been completed press another letter and still have both letters sent with correct spacing. For example to send CQ, press the C key and then immediately press the Q key. Hold the Q until the keyer starts sending Q. A perfectly spaced CQ will be transmitted.

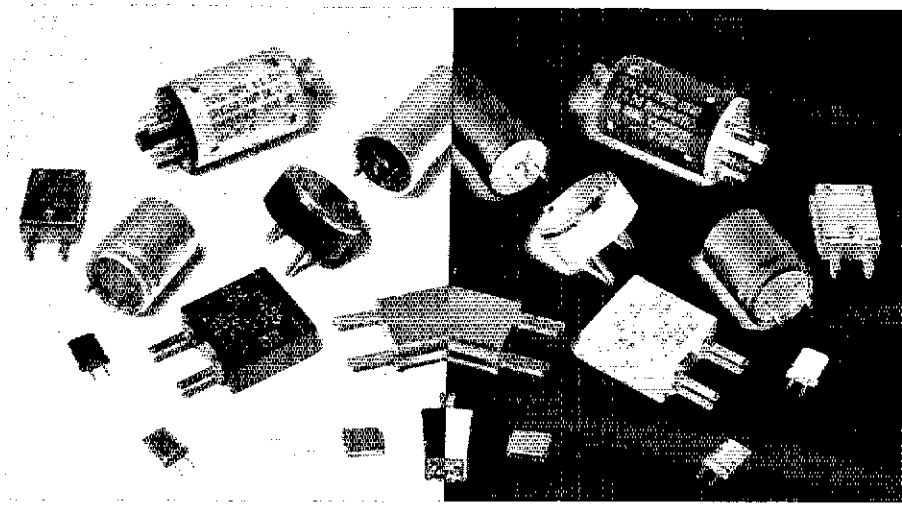
One word of caution is in order. Sitting in front of a keyboard is like sitting at the wheel of a Ferrari — one is tempted to go very fast. Remember that copying the keyboard with a pencil is like racing a Model A against the Ferrari! QST

[1]To purchase a keyboard, the builder should refer to Ham Ads in *QST* and advertisements for surplus equipment.

Crystals Inside Out

So you know what frequency to order . . . but what about load capacitance or tolerances? There's a lot more to crystals than what's stamped on the outside. Take a peek at the guts and learn what makes them tick — here's a dissection!

By Jim Bartlett,* WB9VAV



Without crystals, we'd be drifting like snow in a December storm, making communication much more difficult than it presently is. Piezoelectric crystals are very important to us as ham radio operators, because they maintain frequency stability in oscillator circuits. Since crystals play such a significant part in our hobby, it only seems fair that we should be interested in their history, design and theory of operation.

In 1880 the Curie brothers discovered the direct piezoelectric effect. They found that pressing a large piece of Rochelle salt on its surfaces produced a voltage between the surfaces, and that the charge produced was directly proportional to the pressure exerted. The converse piezoelectric effect was discovered a year later. In this effect, when submitted to a voltage at its faces, a crystal would be strained and bend due to the expansion and contraction inside the crystal.

The piezoelectric effect remained a scientific curiosity until the early 1900s, when Nicholson constructed and demonstrated speakers, microphones and phonograph pickups using Rochelle salt crystals. He was also the first to use crystal control in an oscillator, and obtained the primary crystal oscillator patent. G.W. Pierce also published an early oscillator circuit using crystal control, and the Pierce oscillator bears his name.

Today, quartz is the most widely used radio crystal material because it is less brittle than Rochelle salt and some of the other early crystal materials.[1] A crystal behaves much like an inductor-capacitor (LC) tuned circuit, and in fact simulates or looks like the tuned circuit shown in Fig. 1 when in the vicinity of its resonant frequency. Depending on the thickness and "cut" of a crystal, one frequency will exist at which the crystal will vibrate when a particular frequency of ac voltage is applied to its plates. This frequency at which the crystal oscillates is similar to the resonant frequency of an inductor-capacitor tuned circuit. One difference is that the crystal has a much higher Q than an LC tuned circuit does. When we speak of the "Q" of a circuit we are actually talking about *quality*, because that is what the Q stands for. But quality in electronic circuits means a combination of efficiency and selectivity. A tuned circuit with a high Q has very little dc resistance, and therefore very little energy is wasted or used up (dissipated) by the pure resistance. Result? High efficiency. This also means that almost all of the current is flowing through the capacitive and inductive elements of the tuned circuit. Consequently, they are more effective in their tuning and more selective! So the high Q helps make crystal-controlled oscillators more accurate and stable than the LC type.

Let's look at the crystal in an oscillator circuit. If we can apply an ac voltage to the crystal plates momentarily, the crystal will begin to vibrate. This physical vibration will, in turn, *generate* an ac voltage (identical in frequency to the original) which causes the crystal to continue vibrating. This circular process continues until the energy that was initially applied to the crystal plates is dissipated. This action is similar to that in an LC tank circuit.

Two schematic diagrams of a triode oscillator are shown in Fig. 2. Both forms of the circuit are of the tuned-plate, tuned-grid variety, but one contains an LC tuned-grid circuit, and in the other a crystal is substituted for the coil-capacitor combination. In both of these circuits the energy that is fed back from the tuned-plate circuit through C keeps the grid circuit oscillating. We said before that a crystal displays a greater Q than an LC circuit. Because of this high Q, the grid circuit of the *crystal* oscillator is much more selective, responding only to those frequencies very close to its resonance. The crystal tuned grid also requires less feedback energy (drive) from the plate circuit than an LC tuned-grid circuit does, because the crystal's higher Q means it dissipates the energy more slowly. This is important, because the strength of the crystal's vibration depends on the voltage being fed back to the grid circuit from the plate. If the feedback becomes too large (too large C), the vibrations may increase in magnitude until the crystal fractures.

Crystal Types

The resonant frequency of a quartz crystal is dependent mainly upon the

*Basic Radio Editor, *QST*
[1]Footnotes appear on page 32.

crystal thickness, its electrode configuration, and the angle of cut. The angle of cut is determined by the orientation of the crystal faces with respect to the X, Y and Z axes present in the natural crystal formation. Fig. 3 shows X-, Y- and AT-crystal cuts and their orientation in the quartz formation.

An X-cut crystal is cut perpendicular to the X axis. This type of crystal is usually thicker than Y or AT crystals all cut for the same fundamental frequency. The X also has a tendency to oscillate at many frequencies that are all fairly close together, making it difficult to pick out the desired mode. For this and other reasons, it was abandoned in favor of the Y-cut crystal which vibrates in shear rather than longitudinal mode (see Fig. 4). Unfortunately, the Y-cut crystal had problems too, the largest being that its resonant frequency would increase about 86 parts per million for every degree Celsius increase in the temperature. (A 5-MHz crystal would shift about 430 hertz per degree Celsius.) This highly positive temperature coefficient required close regulation of the Y crystal temperature in order to achieve good stability.

In order to improve the performance of quartz crystals, investigations were made that led to the development of the AT-cut crystal. The AT cut displays a low temperature coefficient, which means that its resonant frequency varies only a little with temperature change. Because of its large frequency range and its superior frequency stability, the AT-cut crystal is probably the most widely used at this time. These crystals are available from many sources and can be designed for operation on any frequency from approximately 500 kHz to 25 MHz in the fundamental mode, or from 10 to 200 MHz in overtone modes.

Overtone Crystals

So what is the difference between a fundamental and an overtone crystal both designed for 15 MHz? The difference is that the fundamental crystal is cut for 15 MHz and the overtone crystal is cut for some frequency lower than 15 MHz. If it were a third overtone rock, its fundamental frequency would be 5 MHz, and if it were a fifth overtone, 3 MHz. Thus, both 15-MHz crystals can operate at the same frequency, but are cut at different fundamentals. Fundamental mode is the operation of a crystal at the frequency for which it is cut. In an overtone mode, the crystal actually vibrates at a frequency that is harmonically related to its fundamental cut. This is called its *working* frequency. An overtone frequency is always an *odd* multiple of the fundamental.[2] *Even* multiples of the fundamental cannot be excited in a crystal, because the charge displacement inside the crystal does not result in a voltage potential at the electrodes when the crystal is stressed. In other words, the piezoelectric effects discussed earlier do not occur when a crystal is vibrating at an even multiple of its fundamental frequency. Consequently, oscillation cannot be sustained at the even harmonics. A crystal also cannot oscillate in its fundamental and overtone modes simultaneously. See Fig. 5. When a crystal oscillates on an overtone, it breaks down into separate layers. The number of layers depends on the specific overtone in use. There are three layers for a third overtone oscillation, five for a fifth, and so on. The layers are separated by nodes as shown in Fig. 5. Extreme care is used in the grinding and mounting of overtone crystals because the overtone layers are only a fraction as thick as the fundamental layer. Take a 7-MHz crystal about 0.014 inch thick, for example. The overtone layers for third mode operation would each be less than 0.005 inch thick. For fifth mode they would be less than 0.003, and for seventh, 0.002 inch thick! This doesn't leave much room for error in the grinding process. A small imperfection or scratch on the crystal surface could impair crystal efficiency or prevent operation in the overtone mode completely. The method used to mount the crystal, and the capacitance of the holder used, may also have considerable bearing on the perfor-

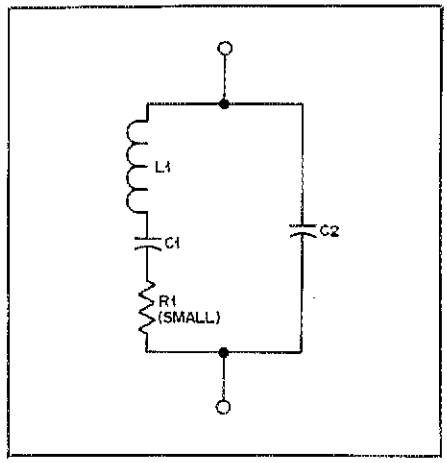


Fig. 1 — An electrical equivalent to the crystal in a circuit. The inductance of the crystal is symbolized by L1 and the capacitance by C1. The resistance of R1 is shown to signify that although the crystal has a very high Q, the value is not infinite. The capacitance of C2 is called shunt capacitance. This is added in parallel to the crystal (across the electrodes). This shunt capacitance is a combination of crystal holder and socket capacitances.

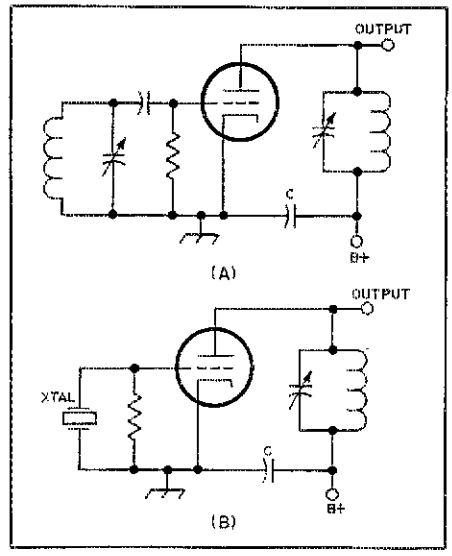


Fig. 2 — Shown in A is a tuned-plate, tuned-grid oscillator using an LC tuning combination in both the plate and grid circuits. Both circuits are tuned to the same resonant frequency. In B, the LC combination at the grid has been replaced with a crystal. In this circuit, if a fundamental crystal is used (one which is cut at the working frequency) then the plate circuit is tuned to the crystal frequency just as in A. But if an overtone crystal is used, then the plate circuit is tuned to the working frequency or overtone.

Fig. 3 — X, Y and AT cuts of quartz crystal in relation to the raw quartz formation. Notice the angle at which the AT cut is made. Other cuts are made from quartz using different angles of cut from perpendicular. For instance, a BT cut, is made at an angle of about 49 degrees to the opposite side of perpendicular from that of the AT cut.

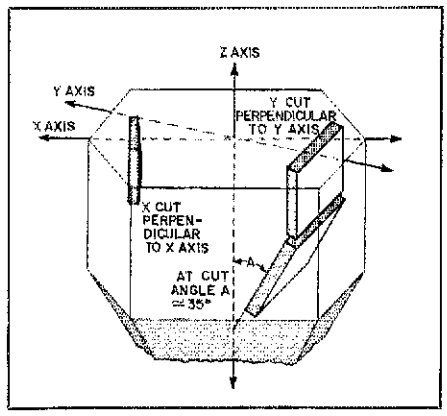
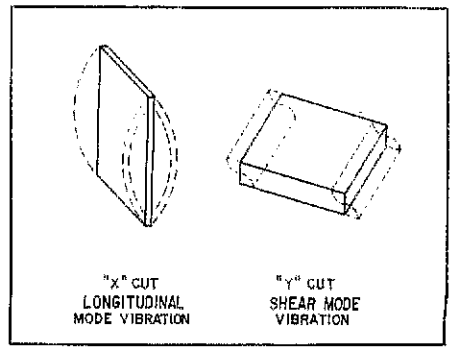


Fig. 4 — Longitudinal and shear modes of vibration are shown greatly exaggerated in this drawing. These both show fundamental operation of a crystal.



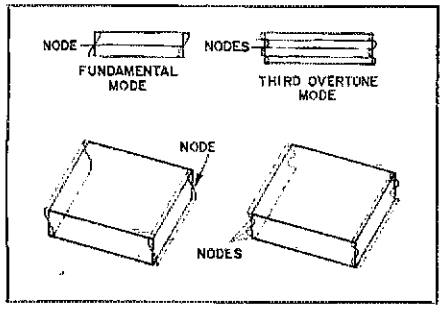


Fig. 5 — At the left is a fundamental-mode crystal oscillating at its "cut" frequency. At the right is an overtone crystal oscillating at an odd multiple of its fundamental or cut frequency. Note that there is a *node* for each multiple of the fundamental. Basically, each node is a point on the crystal where there is no movement when the crystal is vibrating. In a fundamental crystal or an overtone crystal operating at its cut frequency, there is only one node. But if an overtone rock is operating at its overtone or working frequency, there are nodes equal in number to the overtone number. Thus, the third-overtone crystal has three nodes.

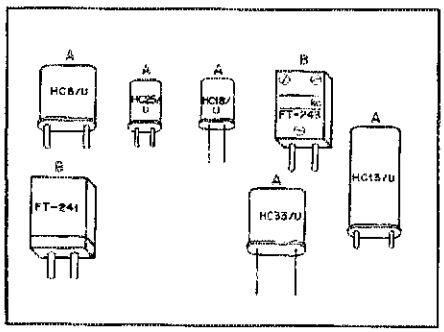


Fig. 6 — Some of the more common types of crystal holders found in amateur radio equipment. Those marked with an A are typical plated-electrode types. Those marked with a B are typical pressure-mounting types.

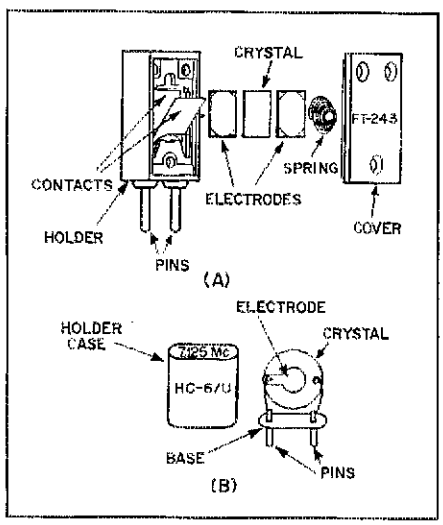


Fig. 7 — One type of pressure-mount crystal holder is shown in A. The crystal blank is sandwiched between two electrodes and then held in place between the contact plates by spring pressure after the case is screwed together. An electrode-plated crystal and holder are shown in B. This type of holder is usually evacuated or filled with dry air before being sealed.

mance of the crystal in the overtone mode.

One more thing that makes an overtone crystal different from a fundamental crystal is the circuit in which it is used. As we said earlier (see Fig. 2), an overtone crystal oscillator must return energy to the crystal at the overtone frequency. This encourages the crystal to oscillate at the overtone rather than the fundamental. Note that because of the need for feedback from a tuned circuit, an overtone crystal will not work in many crystal oscillator circuits. Common circuits such as the Pierce and crystal Colpitts cannot be used with a crystal that is to be operated in the overtone mode. The overtone crystal must be used in a tuned-plate, tuned-grid, or similar circuit as shown in Fig. 2B.

Holders

Because crystals are so delicate, they must be mounted in containers that protect them from the environment. These containers or holders come in various shapes and sizes, each designed to hold a specific type of crystal or one used in a certain application. The crystal holders most common in amateur gear at present are shown in Fig. 6. These holders can be broken down into two basic groups: those using pressure to hold the crystal between the electrodes, and those in which the electrodes are actually plated to the crystal and attached to the holder by wires. These are shown in Fig. 7. The plated type of crystal begins with a quartz blank that has already been ground to a frequency just above the one to be achieved. Then a plating of silver (or sometimes other metals) is applied to the crystal surfaces. This plating thickens the crystal and brings the blank closer to its final operating frequency (fundamental). After plating, the blank is mounted on a base and the plated-on electrodes are attached to the base pins. The mounted blank is then calibrated to its final frequency, after which the base and cover are joined and sealed together. The plated crystal has the advantage over the pressure mounted type of being more mechanically stable, permitting the crystal to have closer calibration and temperature tolerances. In general, plated crystals also tend to work better in overtone modes than the pressure mount types, and therefore they are more widely used than the older pressure-mounted ones.

The plated crystal has one disadvantage: its inability to dissipate as much internal heat as the pressure-mounted crystal. Consequently, plated crystals must be operated at lower drive levels than the pressure-mounted ones.

How to Order Your Rocks

Some of you are probably saying, "But how do I order the crystal for a specific application?" First of all, in order to know what type of crystal to order, you must know what kind of equipment or circuit it is going to be used in. For most crystals that might be ordered, you would include some of the following information: (1) holder type (as per Fig. 6), (2) load capacitance, (3) intended use (type of equipment), (4) fundamental frequency (cut frequency), (5) working frequency (if other than fundamental), (6) the overtone to be used (if it is an overtone crystal), (7) calibration tolerance required, (8) temperature coefficient required, (9) temperature range over which crystal will be used (room temp. — nonoven or oven), (10) final transmit or receive frequency of rig, and (11) any other information that may be helpful to the crystal manufacturer, such as the transmitter or receiver strip numbers on old commmercial gear.

For old Motorola gear, give the Motorola crystal type number if possible (RN-1 for transmit and RM-10 for receiver, for example). The *most important* items to include when ordering are frequency, holder type, and load capacitance.

Finding the Frequency

First, let's discuss the procedure for obtaining the crystal frequency. This depends somewhat on the type of equipment, because of the numerous transmitter and receiver designs. Dozens of conversion schemes and intermediate frequencies (i-fs) exist for receivers, and there are probably as many ways to multiply or heterodyne signals to the final frequency in transmitters. All of these designs require different crystal frequencies to fit into the various circuits being employed.

Let's take a 2-meter transmitter, for example. Pretend we have a circuit diagram which shows that the output of our transmitter should be 144 MHz. But the crystal isn't going to be at 144 is it? No, the three doubler circuits on the schematic tell us that the crystal oscillator must be putting out a frequency only 1/8 of 144 MHz, or 18 MHz.

$$\text{Three doublers} = 2 \times 2 \times 2 = 8$$

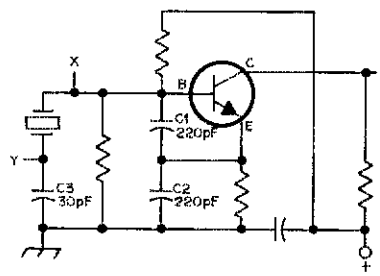
$$\frac{144}{8} = 18 \text{ MHz}$$

Now we know that the crystal is oscillating at 18 MHz. But to find out whether it is a fundamental or overtone crystal, we must look at the transistor oscillator circuit. The crystal in the base circuit is labeled 6 MHz but the collector tuned circuit is labeled 18 MHz. This indicates that the crystal is a third overtone cut for 6 MHz and designed to oscillate at 18 MHz — its working frequency![3] Now we know the frequency that the crystal must be cut for and that it is a third over-

tone, but we've also found out something else that is important: the number of multiplications between the crystal working frequency and the transmitter output frequency. Knowing this can help us determine the calibration tolerance needed for our crystal.

Calibration: How Exact Is the Frequency?

To begin with, we must agree that no crystal is going to be *exactly* on the frequency that you want it to be, even if you had it cut specifically for that frequency. For instance, a 7.125-MHz crystal might actually be 7.12529 or 7.12472. This would mean it was plus or minus 0.004 percent correct, or had a calibration tolerance of 0.004 percent. "Well, that's close enough for anybody on 40 meters" you might say, and you'd be right! That's where knowing the equipment comes in. What if you had a 6-MHz third overtone rock that had the same tolerance but was used in the 2-meter transmitter we discussed earlier? Would you be on 144 MHz? Let's find out. The third overtone crystal is designed to oscillate at 18 MHz, so the 0.004 percent calibration is at that frequency. A plus or minus 0.004 percent gives us 18.00072 and 17.99928 MHz respectively. That's not too far off, but we haven't multiplied the error yet: 18 × 8 = 144 but 18.00072 × 8 = 144.00576 and 17.99928 × 8 = 143.99424 so at 2 meters, you are off by plus or minus 5.76 kHz. Not so good, huh? Actually, you would be able to adjust the frequency some amount by using the trimmer that is in parallel with the crystal, but can you adjust it that far? This would depend on the circuitry in the rig, and the value of the trimmer capacitor. So we're back to *knowing the equipment* in which the crystal is to be used. It can get pretty complicated, that's for sure! The best way to guarantee that any crystal you order will be close enough for your purposes is to specify the rig that it will go in. Then the crystal manufacturer will make the crystal "to specs" for the rig, and you should have no problems. If you are converting an old commercial rig to amateur frequencies, then you should specify whether the equipment originally had oven or nonoven crystals, and what type you want as a replacement. As a rule, nonoven crystals are plenty accurate for amateur use, and they're energy efficient too!



$$C = \frac{1}{\frac{1}{C1} + \frac{1}{C2} + \frac{1}{C3}} \qquad \text{Eq. 1}$$

$$C = \frac{1}{\frac{1}{220} + \frac{1}{220} + \frac{1}{30}} = \frac{1}{0.0045 + 0.0045 + 0.0333} = \frac{1}{0.0423} = 23.6 \text{ pF} \qquad \text{Eq. 2}$$

Fig. 8 — A typical crystal-oscillator circuit using an npn transistor. The load capacitance can be figured by determining the amount of capacitance that is placed across the crystal by the rest of the circuit. The direct capacitance of C1, C2 and C3 is figured by the formula shown in Eq. 1, because the three capacitors are in series. The values shown in the diagram are plugged into the formula as shown in Eq. 2. The 23.6 pF is directly between points X and Y, and therefore across the crystal. But to obtain an accurate load capacitance figure, we must also take into account the stray capacitances present in the circuit wiring and pc board, and the emitter-base junction capacitance of the transistor. For the moment, we will assume the stray capacitance value to be about 7 pF. Actually, in a small-signal transistor such as this one, the junction capacitance is almost impossible to determine, because it depends upon operating frequency, signal amplitude, and operating voltage. However, for our purposes it can be anything up to 150 pF without changing the load capacitance value more than a fraction of a picofarad! This is because the junction capacitance of the transistor is in parallel with C1, and consequently is going to be almost negligible in the final analysis. With junction capacitance out of the way, we can obtain the load capacitance by simply adding 23.6 pF of straight capacitance and 7 pF of stray capacitance arriving at 30.6 pF. This would be rounded off to 31 pF.

Temperature Tolerances

The next item on our list of crystal-ordering parameters is temperature. Although a crystal is cut for a certain frequency and is calibrated to within a fraction of a percent, it can still deviate from this frequency when the ambient temperature changes. The best way to determine how much deviation might occur in a particular crystal, and how much temperature change would be required to cause the frequency drift, is to check the crystal's temperature coefficient or tolerance. Two methods are used by crystal manufacturers to denote a crystal's temperature tolerance. One method is to list the tolerance as a percentage of the crystal frequency (0.002 percent) as the calibration tolerance is. The second method gives the tolerance of the crystal as a parts-per-million (ppm) figure accompanied by a temperature range over which the figure is accurate (±30 ppm from —30 to +60 degrees Celsius). The relationship between these two methods is not always direct or constant, but depends on complex curves drawn by plotting frequency drift and temperature change against time. Therefore, it is desirable for the amateur to be familiar with both methods and their use in ordering crystals.

Let's revive the 2-meter transmitter example used earlier and discuss frequency tolerance with respect to the 18-MHz transmit crystal. The crystal is a third overtone type, cut for 6 MHz but operated at 18 MHz. The temperature-tolerance information is referenced to the working or operating frequency, so we can disregard the 6-MHz figure and concentrate on the working frequency of 18 MHz. Pretend that we have two crystals both cut to operate at exactly 18 MHz. While we are pretending, let's also say that for the purpose of this example the calibration tolerance on both crystals is zero. Now the only *variable* that is left is the temperature coefficient. If crystal A has a temperature tolerance of ±0.002 percent, and crystal B has a tolerance of ±30 ppm from —30 to +60 degrees Celsius, which is the better crystal? Here are the figures for crystal A: 0.002 percent of 18 MHz is 360 Hz, multiplied by 8, to get a figure at 144 MHz, gives us 2880 Hz (360 × 8 = 2880). So crystal A will vary a maximum of 5.76 kHz, or more specifically 2.88 kHz above or below the 144-MHz transmitter operating frequency. For crystal B, ±30 ppm from —30 to +60 degrees Celsius means that for every million hertz (and we have 18) there will be up to 30 hertz of deviation above or below the crystal working frequency: 30 × 18 = 540, and 540 × 8 = 4320 Hz. So at 144 MHz the frequency could vary by as much as 8.64 kHz, or 4.32 kHz above or below the "ideal" 144-MHz transmit frequency, depending on the temperature. Which is better? Crystal A? Not necessarily, because comparing these two crystals with different temperature tolerance notations is like comparing apples with oranges! Crystal A *could* be better, but you can't be certain without more information. For instance, there was no

Table 1 — Sample Crystal Order

One (1) crystal HC-25/U holder, load capacitance: 32 pF nonoven type.
Frequency: Third overtone — 18.2925-MHz crystal working frequency. Transmit freq. — 46.34MHz.
To be used as a transmit crystal in a Schmaltzberg 144Q 2-meter transceiver, serial no. 0123456A.
Calibration tolerance: ±0.002 percent*.
Temperature tolerance: ±30 ppm from —30°C to +60°C.

A sample crystal order for a 2-meter transmitter. Note that both calibration and temperature tolerances are given. Keep in mind that these tolerances are additive. This means that when variations in both tolerances occur simultaneously, they can combine making a larger change in crystal frequency than either could create individually. Realizing that this can happen, some crystal manufacturers combine their tolerance figures to arrive at a more practical figure, and one that will more accurately predict the crystal's behavior in the circuit. In these cases, the calibration tolerance *only* will be listed, but will contain a qualifying temperature statement (from —30 to +60 degrees C).

*Unless the crystal is to be used in an oven, this calibration tolerance will be measured at room temperature, or 26°C.

temperature range given for crystal A's figures. Actually, both crystals would probably be fine for use in the 2-meter transmitter we used as an example provided crystal A was rated from —10 to +60 degrees Celsius. "But those things would be off frequency by a mile," you're probably saying. Yes, left as they are they would be off by as much as 4.32 kHz except that we haven't taken into consideration the temperature-compensating components that may be inside the rig! These devices are placed in the oscillator circuit to compensate for frequency drift which occurs when the temperature changes. If the frequency of the crystal goes up when it gets colder, a component is used which has the opposite effect. Thus, when the circuit gets colder, the crystal wants to oscillate faster, but the value of the compensation component changes also so as to make the oscillator run slower. The two effects tend to cancel each other and the change in frequency is held to a minimum. But each piece of equipment is designed differently, so you must know the equipment in order to take temperature compensation components into account. As mentioned earlier, this can become quite complicated, consequently the best way for a beginner to assure himself of getting the proper temperature tolerance for his crystal is to specify the rig or circuit in which it will be used.

Finding Load Capacitance

One of the most important items to include when ordering a crystal is the load capacitance. The load capacitance is just what its name implies: a load in the form of capacitance that is presented to the crystal by its associated circuitry. When a crystal is manufactured, its frequency and tolerance figures are all calculated for a specific load capacitance. In other words, each crystal is designed to operate properly with a predetermined amount of external capacitance across its terminals. This value is usually somewhere between 20 and 50 pF, the most common figure being 32 pF. To determine the load capacitance for a particular circuit, look at the components surrounding the crystal (see Fig. 8). The load capacitance value will consist of all direct capacitances across the crystal terminals, the transistor junction capacitance (or tube interelectrode capacitance), and any stray capacitance in the circuit wiring or pc board. All this figuring can be somewhat difficult for the beginner. Therefore, it may be easier when ordering crystals for commercially manufactured gear to simply state the rig (make, model and serial number) rather than chance a mistake in the calculations. Let the manufacturer send the proper crystal for that piece of equipment. If you are ordering a crystal for a homemade rig, then you might want to send a copy of the schematic diagram to the crystal manufacturer along with your measurements of load capacitance.

Now that we've covered all the design parameters that should be included when ordering amateur crystals, let's look at an example of a typical crystal order. See Table 1. In this crystal order, we have listed the number of crystals we want, the frequency, holder type, load capacitance, type of equipment, and calibration and temperature tolerances. We also have specified a nonoven or room-temperature type of crystal.

With the advent of VFOs, digital synthesizers, and PLL,. crystals are slowly consuming a smaller and smaller chunk of the amateur's budget . . . but even synthesizers need crystal oscillators or "clocks" to make them tick. Therefore, the quartz crystal may still be the most important item in our radios for years to come — until someone finds something better.

Assistance in the compilation of data used in this article was given by ARRL Technical Advisor Paul Freeland, W5ZVB, vice president of International Crystal Co.

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McCoy, "Crystals Where You Want Them," *QST*, June, 1958.
Tilton, "Overtone Crystals — How and Where to Use Them," *QST*, March, 1955.
The Radio Amateur's Handbook, ARRL.

Footnotes

[1]Tourmaline, another crystal material, is sometimes used instead of quartz in very-high-frequency applications due to its superior strength, which allows it to be sliced extremely thin.
[2]An overtone frequency is not an exact multiple of the fundamental, but is always higher than the true multiple frequency. For example, a 6-MHz crystal operating on its third overtone would not be exactly at 18 MHz, but could be 3 to 10 kHz higher depending on the frequency.
[3]Although we are using an overtone crystal for our transmitter in the example, most transmitters use fundamental modes because the circuits include trimmers to zero the crystals. Receivers use both fundamental and overtone crystals. The use of the fundamental is prevalent in equipment utilizing temperature-compensated crystal oscillators (TXCO), because compensation is easier and there is trim range. When overtones are used, it is almost impossible to trim more than a few hundred hertz.

Strays

TRANSATLANTIC CROSSING A BUST

☐ When two balloonists prepared to attempt a transatlantic crossing from the Boston, MA, area last September, radio amateurs were among those providing support. For three hours K1FB and WA1LJB used WR1ACO, 19-79 Repeater Association and WR1ABV, Waltham Repeater Association, to relay weather updates from the tracking center in Bedford, MA, to the launch site in Marshfield, MA. The *Double Eagle* reached as far as the west coast of Iceland before deteriorating weather forced it down. — *WB1CTZ*

It's never too late: K4AI, of Morganton, NC, displays his new ARRL life member plaque along with a 50-year membership award. — *W4WXZ*

Technical Correspondence

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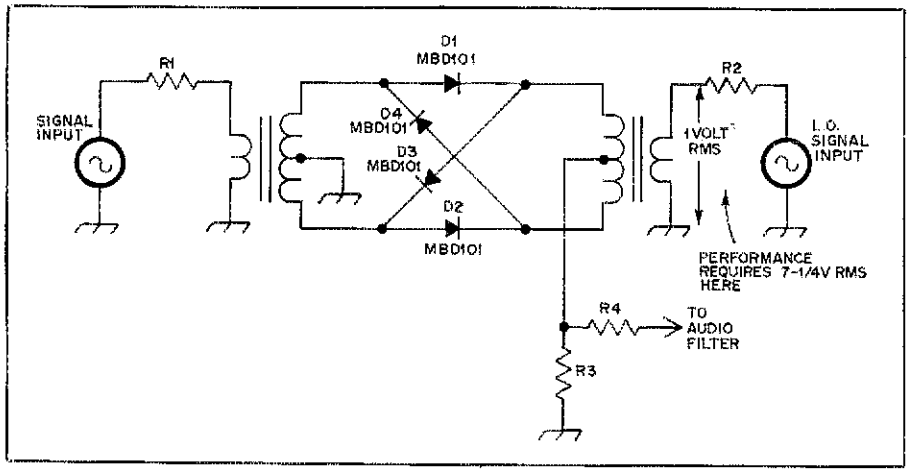


Fig. 1 — W9NZB's direct-conversion product detector scheme.

DIRECT-CONVERSION RECEIVING NOTES

☐ W1FB's article, "Understanding Linear ICs" (*QST*, January, 1977), was received with interest here. Direct conversion is one way we can put the "amateur" back in ham radio.

An important shortcoming of direct conversion is the poor ability of the product detector to reject strong a-m or ssb signals. It is very useful to give this quality a quantitative value so that product detector designs may be compared. This quality could be called a-m rejection ratio, or AMRR. This is the ratio, stated in dB, of the a-m signal required to cause the same audio output as a reference cw signal. The a-m signal would be a few kHz away from the receiver's tuned frequency (I use 100 kHz). The a-m signal gives an audio output proportional to the power in its sidebands. I am currently using this formula

$$\text{AMRR} = 20 \log (0.707)(0.01)(\%\ \text{modulation}) \frac{V_{\text{carrier}^{a\text{-}m}}}{V_{\text{carrier}^{cw}}}$$

As a-m detection is often a threshold effect I always use 1 μV as the cw carrier reference level. The same audio frequency should be used on cw and a-m because of the receiver's audio passband. With a frequency-selective voltmeter I have measured peak carrier voltages in the range of 5 to 10 μV for Radio Moscow in the 40-meter band and WWV at 15 MHz. Others have reported similar problems. This means that the practical direct-conversion receiver would have an AMRR in the range of 70 to 80 dB.

The best product detector for direct coversion that I have built so far is the double-balanced, hot-carrier diode type as first described by Hayward and Bingham in *QST* for November, 1968. The real tricks to getting performance out of this configuration are to terminate all ports in a resistance of 50 to 150 ohms and drive it hard. Fig. 1 illustrates what I mean.

The hot-carrier diodes used in the mixer respond very fast and during the design I had problems with a periodic "clicking" in the audio output at about one-second intervals. I first suspected it to be some sort of relaxation oscillation in the audio amplifier. However, DeVry Tech is just down the block from me and they have an old (WW II) pulsed radar they use for educational purposes. The pulsing came from that direction, so I managed to cut it off with a piece of aluminum sheet!

All this makes me think that direct conversion is practical for vhf/uhf, using the same mixer but changing the broadband transformers. A 2-meter transceiver would be quite possible, and dsb might be more welcome on 2 meters than it is at hf. If I do anything along those lines I'll let you know. — *Wayne R. Openlander, W9NZB, Direct Conversion Technique, 3132 North Lowell Avenue, Chicago, IL 60641*

A HIGH-PERFORMANCE RTTY BAND-PASS FILTER

☐ The filter described here is designed to be used ahead of the limiter in any good-quality 170-Hz-shift RTTY receiving converter. All of the filters I have seen for this purpose are of the capacitive-coupled, tank-circuit kind, using Butterworth design. While these circuits have the advantages of simplicity and ease of tuning, they exhibit very sharp lower skirts at the expense of poor high-frequency skirts. The high impedance dictated by the 88-mH toroids generally used in this application can be easily transformed to the desired 600-ohm level, but since this will do nothing to even out the skirts an entirely different circuit is indicated.

The circuit described here is the "mesh" configuration and uses a 0.1-dB-ripple Chebyshev design (Fig. 2). This circuit allows much lower impedance (73 ohms in this case) and the freedom to choose the couplings at will. An inductor to ground sharpens the lower skirt while a capacitor coupling sharpens the upper skirt. The one-inductor, two-capacitor scheme shown yields good symmetry. The two 0.33-μF capacitors (C1 and C6) are not couplings but rather are part of an L network that matches the filter to the desired 500-600 ohms.

Tuning of this type of filter can be very involved if the parts used have poor tolerance. Only one prototype of this filter was built and 10-percent tolerance capacitors were used. Measurements beforehand, however, revealed that the four 0.1-μF capacitors (C2 through C5) were all very nearly matched. When the filter was built the passband was smooth with no signs of "hanging sections," but it was centered about 40 Hz low in frequency. Pulling 12 turns off each inductance section (L1 through L4) moved the passband to the right frequency, indicating about 3.5 Hz per turn is a good rule of thumb.

High-Q capacitors should be used for best results; Sprague 715P is a good choice but they are difficult to obtain. If you are forced to use standard Mylar capacitors as I was, try to get five-percent tolerance or at least buy a large quantity and pick out four closely matched ones for C2, C3, C4 and C5.

Performance of the filter is excellent, as may be seen from Fig. 3. Insertion loss is a bit high at 6.6 dB but the 3-dB/60-dB shape factor of 5.1 as compared to the theoretical 4.5 is impressive. The 3-dB bandwidth is 225 Hz, putting the mark and space tones only 1.5 dB down. — *Albert J. Klappenberger, K3KWX, Rte. 1, Box 227, Westover, MD 21871*

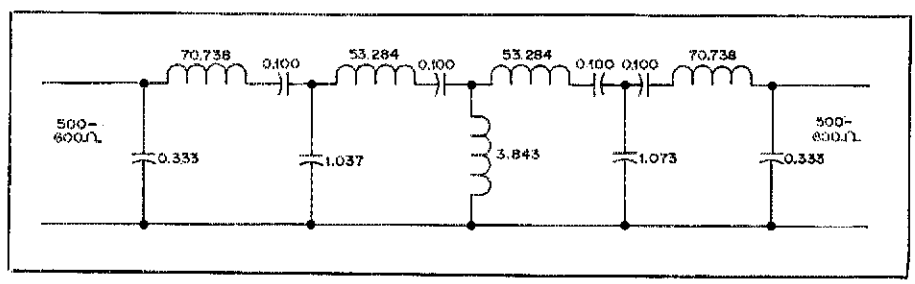


Fig. 2 — Schematic of the Klappenberger RTTY band-pass filter.

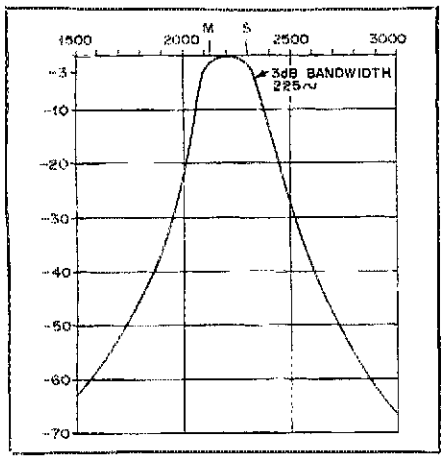


Fig. 3 — RTTY filter response curve (2100-Hz center frequency).

STANDARDS FOR FM AUDIO

☐ Edward Avilla's article about repeater audio in the June, 1977, issue of *QST* was a much-needed contribution to the amateur art. Many repeaters *do* sound bad for precisely the reasons given in the article — a lack of understanding of the technical standards for amateur fm audio. In the interest of completeness and accuracy, I would like to make a correction to the article, and then argue that standards for fm audio do exist, and should be published in the ARRL *Handbook* and recognized as such.

First, the correction. The 75-microsecond preemphasis mentioned and described in WB6DSW's article is the standard for commercial fm broadcasting, not amateur fm. Amateurs on vhf fm use the same standards as the Land-Mobile Service: phase modulation. In equipment where a frequency modulator is used, it is preceded by a preemphasis circuit consisting of a series capacitor and a shunt resistance with a time constant of RC = 53 microseconds. The de-emphasis circuit following the receiver discriminator consists of a series R and a shunt C with a time constant of 530 microseconds.

There is an important distinction to be noted between the commercial broadcasting standard of 75 microseconds and the land-mobile standard. In commercial broadcasting, starting at the lowest modulating frequency, the response is flat until the turnover frequency of 2100 Hz is reached. From there, the response rises at 6 dB per octave up to the highest modulating frequency. In the land-mobile standard, the one we amateurs follow (whether we realize it or not), the response rises at a rate of 6 dB per octave, *starting at the lowest modulating frequency*, all the way up to the highest modulating frequency. Further clarification of this point may be found in "Modulation Standards for VHF FM" by Les Cobb, W6TEE, in the June, 1970, issue of *Ham Radio*.

My second point about standards is that there aren't any in the *Handbook;* amateurs building gear according to the 75-microsecond standards used by commercial fm broadcasters would find their homemade gear incompatible with the majority of hams operating on vhf fm. The *Handbook* should clearly spell out the phase modulation standards in use by hams today and show how to design receiver and transmitter audio circuits to meet those standards. — *Mark Wharton, KØLO, 1344 Scrub Oak Circle, Boulder, CO 80303*

GROUND-FAULT-INDICATOR PRECAUTIONS

☐ Reference K4AAL's comments on possibly bypassing ground-fault indicators (*QST*, August, 1977, page 42): I strongly suggest that any amateur having problems with GFI devices contact the vendor of the unit for information concerning EMI problems. The use of bypass capacitors introduces leakage paths which may, under certain conditions, defeat the whole purpose of ground-fault detection — especially around swimming pools.

Unless one is totally familiar with safety and leakage standards, and GFI systems, it is wiser to ask the product engineering division of the manufacturer for advice than to attempt home remedies. — *John Czap, WB2LGS, 938 E. 5th St., Brooklyn, NY 11230.*

☐ K4AAL's suggestion that RFI may cause GFI systems to operate is probably true; however, bypassing the GFI can be dangerous. Most amateurs assume that a neutral connection on power tools represents a zero-impedance path to dc ground. My experience, in three years in the electric distribution trouble area, shows otherwise. Power company employees find several cases daily where the jumper connection from the electric service panel (the main fuse panel) to the cold water pipe (as required by the electric code) has become disconnected or has developed a high-resistance connection. This factor, combined with a significant amount of resistance in the electric extension cord, and the amount of fault current that can exist when a device such as a power tool fails, can cause a significant amount of current to flow in a person's body if he is holding the faulted device and is standing on a good ground such as damp soil.

The hand-to-foot path is very dangerous in that the heart is frequently in series with this circuit. Heart stoppage or fibrillation is likely. Death often occurs as the individual cannot release the faulted device yet the current produced is not detected by the circuit breaker for some time. Because 0.07 ampere can produce a heart stoppage, there is no room for error. The GFI will operate on as little as 0.005 amps of ground current, thus offering considerable protection.

At present, GFI is required only on outlets above 300 volts to ground and on all outside receptacles. Because of the danger involved, the GFI portion of the house circuit breaker must *not* be bypassed. Frozen water pipes are not as serious as Fried Ham. — *Tom Kulas, KØTK, 221-17th Ave. N.W., New Brighton, MN 55112*

CIRCUIT BOARD MOUNTING TIPS

☐ Since June, 1976, there has been an alert published by the U.S. government to all their vendors about high failure rates of 1N914 and 1N4148 type diodes. It seems they will open when subjected to a six-pound axial pull and cycled in temperature. The use of 1N914 and 1N4148 diodes is now forbidden in government equipment.

The failures seem to stem from a method of construction called thermal compression bonding. This is where the diode chip is placed between two metal plugs and held there by compression forces caused by the glass outer case. The metal plugs and glass case have similar thermal expansion coefficients; if an axial pull is applied and the device is subjected to temperature cycles of 100°F, the diode is likely to open due to loss of compression on the chip.

This mode of failure has been reduced greatly by using a construction technique called metallurgical bonding. Here the chip is bonded or "welded" to the end plugs. Otherwise, construction is the same.

Lower failures were also obtained by using a heavier glass case for thermal compression bonding, while some manufacturers are successfully using a small "C" spring to take care of any mechanical movement. Diodes now approved for military and/or government use are designated 1N914-1 and 1N4148-1. These use a metallurgical bond and exhibit acceptable failure rates.

Before you throw away all your diodes I should say that the reliability of ordinary diodes for amateur use is good except for high-vibration or high-temperature-variation applications. Keep in mind also that the failures usually occur when the diodes are pulled down tight against a circuit board. Since the pc board has a different coefficient of thermal expansion than the diodes, an axial pull is exerted on the diodes under conditions of changing temperature. Vibration causes the pc board to bend, causing the same forces. The accompanying drawings illustrate better ways to mount diodes.

Failures in electronic assemblies have also been traced to potting techniques. If a potting compound is allowed to cure unevenly, as in an oven, the outer surface of the epoxy will harden before the middle, creating a hard, inelastic shell. Then, as the middle hardens, it expands slightly (or tries to), putting a tremendous force on components. Some can be crushed. No cheap fix has been found for this problem except to keep the epoxy coating thin.

One more thing a home constructor can do to increase the reliability of his projects involves soldering of components to boards. Usually, component leads are stuck straight through the hole, soldered, and the excess lead clipped off. This results in a very small soldered surface area, leading to bad solder joints, oxide formation and solder land failure. The preferred method is to bend the component lead over the solder land, clip it off about 1/8 inch from the hole and then solder. This results in a much more reliable solder joint.

The foregoing are a few of the things I have run across where I work; the last idea is probably the most useful to amateurs but the others are certainly interesting food for thought. — *Lee Sumner, WB3BCF, 75 E. King St., Dallastown, PA 17313*

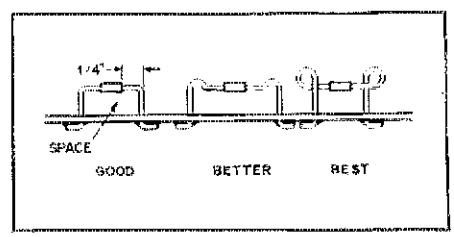


Fig. 4 — Suggested circuit board mounting techniques.

Product Review

ETO Alpha 76 Linear Amplifier

With the introduction of the Alpha 76 linear amplifier, Ehrhorn Technological Operations now offers a "full line" of hf power amplifiers for the amateur service. Several years ago the Alpha 374 set new standards for small, full kilowatt linears (*QST*, April, 1975) and the 76 is a logical spinoff from that unit.

The main differences between the 76 and the 374 are manual tuning only (no band-pass operation) and two 8874 tubes in the 76 instead of three. Actually, we are speaking now of the standard model 76: Also available is the Alpha 76P which includes three final tubes and the 76C which boasts three tubes plus a special 2.4-kVA Hypersil transformer. Both provide for greater power input than the Alpha 76. Options available in the standard model 76 include the Hypersil transformer (about 20 pounds lighter than the standard transformer) and a relay arrangement, front panel switched, for either high or low plate voltage.

Typically excellent ETO construction techniques are evident in the 76; the cabinet is natural finish aluminum. The top cover and right-hand panel are easily removable for installation of the transformer, which is shipped separately. Mating of two pairs of multi-pin connectors, which hook up the control circuitry with the "business end" of the amplifier, completes assembly.

Physical layout of the 76 is similar to the 374: bandswitch, tuning and loading controls are on the left of the front panel while all control and metering switches are on the right. Metering functions include HIGH VOLTAGE, GRID CURRENT, PLATE CURRENT, FORWARD POWER and REFLECTED POWER. Two small lamps, mounted behind the meter on the control circuit board, illuminate the meter: amber during warm-up time and while transmitting, and green for "ready."

The ETO Alpha 76 Amplifier

Power input: 2000 watts PEP for ssb, 1000 watts for cw (amateur service).
Amplifier tubes: Two 8874 triodes.
Plate dissipation: 800 watts for the two tubes.
Frequency range: Amateur bands, 1.8-30 MHz.
Metering: Plate current, grid current, plate voltage, reflected and forward power (in watts).
Power requirements: 240 V at 10 A or 120 V at 20 A.
Rear-panel terminations: Relay, rf output, rf in and alc adjust.
Dimensions: 7-1/2 × 17 × 14-3/4 inches (191 × 432 × 375 mm) (HWD). Weight: 75 pounds (34 kg).
Price class: $995; $1045 with high-/low-plate voltage relay.
Manufacturer: Ehrhorn Technological Operations, Industrial Park, P. O. Box 708, Canon City, CO 81212.

The Alpha 76 cabinet is divided into two rectangular compartments, one for the rf section and one for power supply and control circuitry. One small bare corner indicates where the third 8874 is placed in the 76C and 76P models. All control circuitry is on one board, approximately four by eight inches, mounted above the six filter capacitors. They are, incidentally, computer-grade, factory-matched electrolytics, totalling 30 μF at 2.7 kV.

RF Circuits

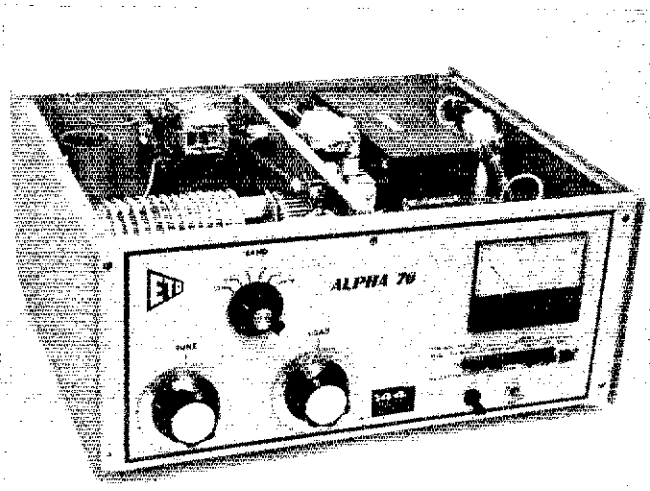
The 8874 tubes are parallel-connected in a grounded-grid configuration. They require forced-air cooling, which is accomplished by a squirrel-cage blower, pressurized anode compartment and rubber chimneys which direct the air through an outlet on the top of the cabinet. ETO recommends four to six inches of clearance for both the back and top panels. During normal operating with the 76, the exhaust air was observed to be no more than lukewarm.

A built-in timing circuit precludes operation of the amplifier (i.e., application of drive power) until the 8874's indirectly heated cathodes have reached operating temperature. When the meter light switches from amber to green the unit is ready to run. Warm-up takes about 30-45 seconds. Switching functions are the normal "straight-through" in standby and external shorting at the RELAY connector on the back panel to enable the amplifier during transmit.

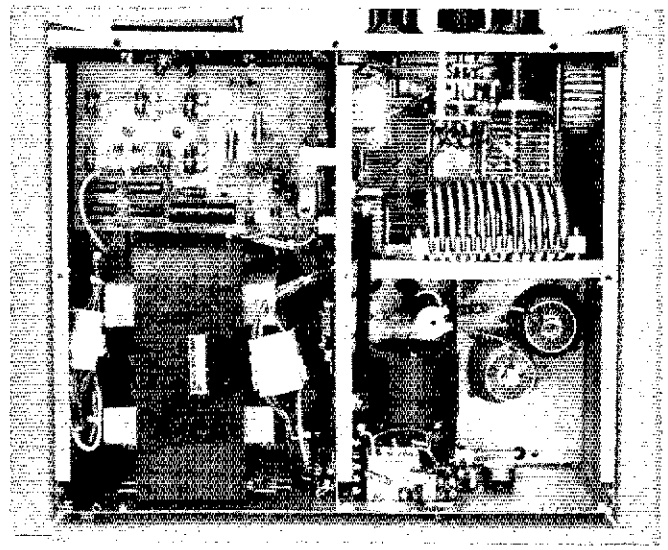
Drive is applied to the cathodes of the 8874s via a broadband, toroidal, matching transformer; the output circuit is of the pi-L variety. ETO recommends use of antenna systems providing a VSWR of 2:1 or less (50 ohms). One hundred watts PEP or 60 watts carrier are required to drive the Alpha 76 to the legal amateur limit.

Power Supply and Control Circuitry

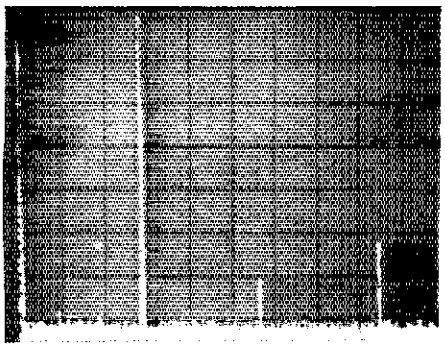
The transformer in the 76 is a 1.5-kVA continuous-service unit; high voltage may be reduced from the normal ssb level of 2.4 kV to about 1.5 kV by changing the transformer tap. The optional high/low-voltage relay does this via a front-panel switch. The design feature of reducing the plate voltage when going to the 1-kW cw input provides excellent efficiency at the lower power level. Output efficiency as measured in the ARRL laboratory, was better than 60 percent for both the 2000-watts PEP



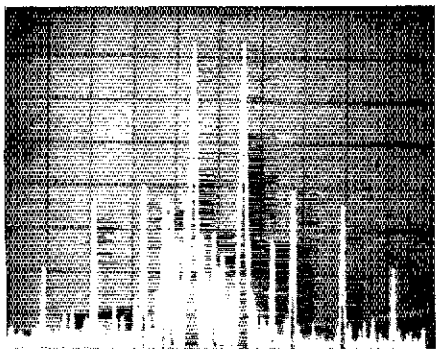
This shows the neat front-panel arrangement of the Alpha 76.



Peering down into the amplifier shows the clean appearance of the unit.



This spectral analysis photograph shows the 14-MHz signal and the second and third harmonics. The tall pip at the far left is generated in the analyzer. Each horizontal division is 5 MHz and each vertical 10 dB. The Alpha 76 more than exceeds harmonic attenuation for spurious signals.



This photograph shows the two-tone IMD test. Third-order products are approximately 40 dB down from the PEP output level. The driver unit used to test the Alpha 76 was a TS-820 exciter.

and 1000-watts cw inputs on all bands.

Approximately 95 volts are applied to the blower, reducing its noise level with only a slight reduction in blower speed. As in other ETO amplifiers, a cover-interlock switch prevents the main power from being applied to the unit with the top cover off. A safety "crowbar" discharges the filter capacitors when the top cover is removed. A plate overcurrent relay disables the amplifier by removing ac power in the event of a high-voltage problem or excessive drive. Main-power switching and metering are both similar to those functions in the model 374; a self-latching relay controls application of power to the unit, and a time-delay relay takes care of amplifier tube warm-up.

General and Operating Notes

The very extensive operating manual provides installation and operating instructions, including detailed tune-up procedures for maximum efficiency. In actual use the Alpha 76 tunes "smoothly" and tuning is not particularly critical, so long as the operator always adjusts the load control first, then the tune.

The unit runs cool and quiet, fits on the operating desk rather than having to take up an entire corner of the room, and most parts are easily accessible for service despite the small size of the amplifier. "Dial-a-number" tuning is possible for quick band changing during contests. — *K1TN*

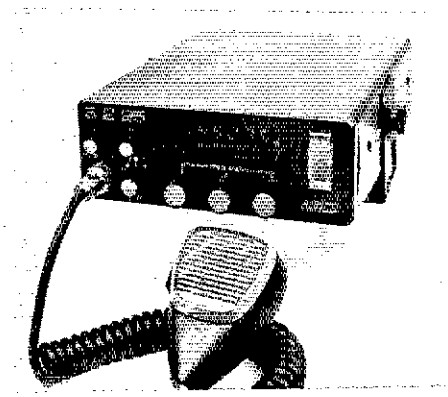
THE AMCOMM S225 SYNTHESIZED TWO-METER FM TRANSCEIVER

It seems unlikely that any active ham has not been exposed to the burgeoning phenomenon we call "2-meter fm." From scanning the parking lot at a hamfest, it appears that everyone has a mobile whip on his car. Fm is truly the most universal amateur operating mode. Most fmers find that four or five sets of crystals will fulfill their needs when they're close to home. But when traveling, it always seems that the one repeater you want to use is one you're not "crystalled-up" for. Sticking to 600-kHz offsets, there are 78 standard repeater channels, including 15-kHz "splits," and 12 standard simplex channels. Assuming your rig needs two crystals for each repeater or simplex channel, you'd need 180 crystals to cover all of them. This hefty investment still wouldn't permit operation on the die-hard repeaters using 1-MHz offsets, nor could you operate on a nonstandard simplex channel.

Military communicators ran into similar problems in the past. Operation on one particular military vhf band required equipment that could cover a whopping 1750 channels! Early synthesized gear designed for this application used intricate mixing schemes and mechanical switching drives that gave the repairman nightmares. The gross inefficiency of these radios and their high cost made them unsuitable for amateur use. Thanks to the development of digital integrated circuits, synthesized vhf radios may be constructed that are comparable in size and efficiency to crystal-controlled radios. Amateurs now have the convenience of multichannel communications equipment that fits beneath the dashboard of a compact car and doesn't require the electrical system of a tank to power it.

Rather than use a rack full of crystals, most synthesized rigs (the S225 included) require only one crystal oscillator, called the reference. Miniscule integrated circuits slice up the ouptut of the reference oscillator. The divided frequencies are mixed with harmonics of the reference in combinations selected by the front-panel-mounted frequency controls. When transmitting, nominal synthesizer output at 124 MHz is mixed with the 22-MHz reference to yield an output at 146 MHz. In receive, the 124-MHz signal is shifted by 600 kHz when simplex operation is desired, and mixed with the incoming signal to produce the first i-f of 21.4 MHz. With all this frequency dividing, multiplying and mixing going on in an 187-cubic-inch (3064-cc) enclosure, the designer must take great pains to prevent harmonics and spurious mixing products from appearing at the output port. In the past, harmonics of the oscillator in a vhf transmitter were the only concern. These could be located with a sensitive wavemeter, an accurate communications receiver and patience. This simple approach is no longer permissible. In order to properly evaluate a modern amateur transmitter, a spectrum analyzer is absolutely essential. While scanning the rf spectrum from bottom to well into the microwave region, spurious outputs are readily observed. A spectrum analyzer also permits the reviewer to study the transmitter output close to the desired transmit signal. Properly used, the spectrum analyzer tells no lies and keeps no secrets.

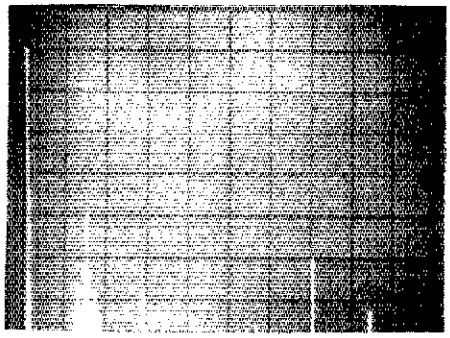
The spectral-response photograph shows the displayed spectrum of the AMCOMM transceiver at 25-watts output. To prevent the fundamental output of the transmitter from



The AMCOMM S225 cabinet is finished in black, presenting a sleek appearance.

overloading the spectrum analyzer mixer stage, a two-cavity notch filter is connected between the transmitter and the analyzer. The horizontal lines on the graticule correspond to 10-dB steps of decreasing amplitude, with the top line calibrated at 0 dB. Spectral response from nearly 0 to 1000 MHz is displayed, with each vertical line on the graticule a 100-MHz increment. The tallest "pip," at the far left edge of the screen, is a marker signal generated inside the spectrum analyzer. It represents 0 MHz. The fundamental output of the transceiver at 146.52 MHz may be seen attenuated 49 dB by the notch filter. FCC requires that the out-of-band spurious emissions of an amateur transmiter in the 25-watt-output class be suppressed 60 dB. The most powerful spurious output of the S225 is at 700 MHz and is suppressed over 60 dB. Second-harmonic energy is suppressed 68 dB. Other spurious outputs resulting from the 22- plus 124-MHz mix are suppressed more than 66 dB. In-band spurious emissions are all suppressed more than 62 dB.

The transceiver tested did not initially comply with FCC specifications regarding spurious outputs. An image caused by mixing the synthesizer output with the reference oscillator was suppressed only 56 dB, 4 dB less than what FCC requires. Inability to resolve this problem would have required ARRL to refuse AMCOMM advertisements. The presence of this spur was puzzling because the transceiver tested for advertising approval last year did not show any spurs suppressed less than 60 dB. AMCOMM was contacted and two representatives of the company flew up to Hartford from Florida the next day, bringing with them another transceiver. After comparing the two units, the review model was subjected to a minimum of tweaking, which knocked the spur down to 66 dB below the fundamental output. A discussion ensued on ways of insuring against a recurrence of the problem and it appears AMCOMM has the situation well in hand. It was apparent that a synthesized radio could not be aligned by looking at a field-strength meter and tuning for maximum output; the complexity of the procedure requires the aid of a spectrum analyzer. The user should keep this fact in mind, though it may go across the grain of some old-timers: *Unless you know what you're doing and have the proper test equipment, don't fiddle with a synthesized transceiver.* Modern rigs are sturdily built and should remain properly aligned for long periods of time if not physically abused. Just as our modern automobiles require periodic trips



Spectral display of the AMCOMM S225 transmitted signal. Transmitter output was 25 watts at 146.52 MHz. The vertical axis is calibrated in steps of 10 dB per division; the horizontal axis is 100 MHz per division. The fundamental is attenuated 49 dB using a two-cavity notch filter. The most significant spurious output, at 700 MHz, is down 61 dB from the unnotched fundamental, which exceeds FCC specifications. Other spurious outputs are the second harmonic, attenuated 68 dB, and unwanted mixing products down 66 and 69 dB. The S225 complies with FCC specifications regarding spurious emissions.

to the shop for renewal, it is not unreasonable to expect that occasionally our modern radios will need touching up.

AMCOMM has included several features in the S225 which are worthy of mention. Instead of discrete transistors, the transmitter power-amplifier stage is a hybrid power module. PA output is passed through a multistage low-pass filter. The power module is immune to damage from open or short circuits in the antenna system. This feature was confirmed by the reviewer, at one time inadvertently! Power output is continuously adjustable from 1-25 watts* with a front-panel-mounted control concentric with the volume control. This feature allows reduced input for local work or selection of the proper drive level for an external power amplifier. A potentiometer concentrically mounted with the squelch control may be used to adjust the brightness of the LED digital display and the meter-illuminating lamp. The digital display is recessed from the panel and this, in combination with the dimming feature, allows the display to be read in all but the brightest incident light.

While most synthesized rigs display received frequency, AMCOMM has chosen to display transmitted frequency. This feature will help prevent the operator from accidentally transmitting outside the amateur band. Another front-panel control selects either simplex, plus or minus 600 kHz, or plus or minus 1-MHz receiver offset. The offset feature allows the receiver to tune from 143 to 147.995 MHz, while the transmitter covers 144 to 147.995 MHz. Tuning is in 5-kHz steps.

Audio quality is an all-but-forgotten area in communications equipment. Many mobile rigs have receiver audio outputs barely capable of being heard when the vehicle is in motion. Not so with the AMCOMM. Audio output is rated at 4 watts. Not only was the audio level more than adequate, but the *quality* of the output was startling. For the first time, stations worked sounded like humans were operating, rather than tinny-sounding computers. The hefty microphone shown in the photograph comes as standard equipment with the unit. In combination with some audio filtering in the transmitter, this mic accounted for several unsolicited comments on the fine audio quality of the rig.

This reviewer could go on and on telling the virtues of the S225, but in the interest of space will just touch briefly on a few more features. A search for spurious responses in the receiver failed to turn up any, nor was image response a problem. Two LEDs are mounted next to the frequency display. One indicates the synthesizer is "locked" and the other is illuminated while the unit is transmitting. The panel meter is calibrated in S units and power output. The power meter calibration could have been better; it reads slightly high. When the meter read 25 watts out the measured output was 19 watts.* Full output was obtained with the power-level control fully advanced while the unit operated from a stable 13.5-volt supply. When the supply voltage was reduced to 12 volts, power output was 20 watts maximum. At the 13.5-volt level, with the display at full brightness and power output at maximum, the unit drew 6.7 amperes. Frequency display was compared with that indicated on a frequency counter and maximum error was measured at 60 Hz. This leads one to believe that the owner of an S225 would be very popular whenever a crystal-controlled rig needed "netting." Because of its accuracy, a discriminator meter is not required in the receiver, but one would be useful when helping other stations get on frequency.

An accessory Touch-Tone encoder pad plugs into a jack mounted on the rear panel. A delay circuit in the pad keeps the rig transmitting for one second after a key is pressed to prevent the transmitter from turning off between digits. The transmitter is automatically keyed when an encoder button is depressed. Also mounted on the rear panel is an external speaker jack. Transmitter deviation adjustment, the only one which should be attempted without a spectrum analyzer, is easily accomplished by removing the top cover of the all-aluminum cabinet. A gimbal bracket for the transceiver and slip-in brackets for the mic and optional tone encoder are provided. The transceiver measures 7-1/8 × 2-5/8 × 10 inches (181 × 67 × 254 mm) and weighs 4-1/2 pounds (2 kg). The S225 is available from AMCOMM, 730 West McNab, Ft. Lauderdale, FL 33309. Price class is $400. — *W1XZ*

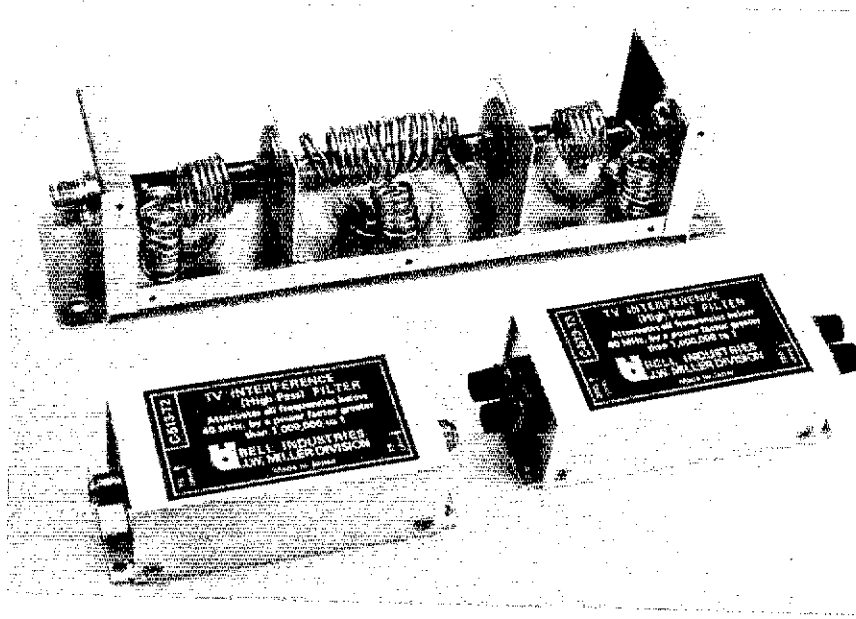
*Measured in the ARRL lab.

TVI FILTERS FROM J.W. MILLER

There's hope that the time will come when *all* home-installed, RFI-suppression devices will be a thing of the past. And it's doubtful if any hams will grieve over their absence. But until the day arrives when newcomers ask, "What's that?" when they see a high-pass filter on a flea-market table, supplemental suppression techniques will be required.

In the meantime, J. W. Miller has offered some assistance with their filters for audio and rf home-entertainment equipment. For those not familiar with the company, J. W. Miller has a very excellent line of components such as capacitors and coils. The review items are of similar quality. Of particular interest to amateurs are the high-pass (for receiving) and low-pass (for transmitting) filters. A frequency-response curve for the C-514-T low-pass filter is shown in Fig. 1. Field tests confirmed that this filter was effective in rejecting transmitter harmonic energy that would otherwise be conducted to the antenna and radiated. A noticeable decrease in interference level was observed with the filter installed in the transmitter transmission line. Response of the high-pass filter models was checked in a 50-ohm system, even though a 75-ohm measurement setup is required. Rejection appeared to meet the manufacturer's specification in spite of the mismatch.

Many TV sets derive their operating voltages



Interior view of the C-514-T low-pass filter. Also shown are the C-513-T2 high-pass filter (75-ohm type F connectors) and the C-513-T3 high-pass filter (300 ohm). The C-514-T is designed to handle 1000 W (2000 W PEP) at 50 ohms impedance.

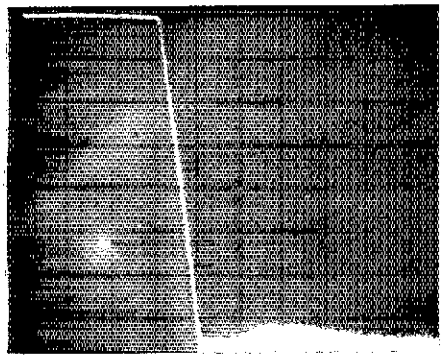


Fig. 1 — Frequency response of the C-514-T low-pass filter. The vertical scale represents 10 db/division while the horizontal scale is 10 MHz/division. Rejection is better than 70 dB above 40 MHz.

directly from the ac line. While this is an "el cheapo" way of doing things, it represents poor design procedure, particularly from a safety point of view. *Consequently, never attempt to connect a grounded device* (such as a high-pass filter) *directly to the chassis of a TV set!* Sparks may fly if you do! (To compound the confusion, some sets have a filament transformer but still get the other voltages directly from the line. The filament transformer can easily be mistaken for a power transformer.)

The obvious question is, "But what about the antenna: Is there a 75-ohm coaxial input for CATV in newer sets which would have 117 V ac on the outer sheath?" In order to get around this problem, the outer shield of the coaxial cable is broken inside the TV set between the 75-ohm input and the tuner, then a capacitor is inserted. Since the capacitance is small (on the order of 0.001 μF), it presents a high impedance at 60 Hz while permitting rf energy to pass. However, the ability of the outer conductor to shield the system from unwanted rf energy is also decreased by the break. Consequently, high-pass filters connected at the antenna input are not as effective as a filter built into the tuner itself.

One happy note in this regard: A few manufacturers are beginning to get their act together and have improved the immunity of their tuners to unwanted rf energy. Faced with the reality that RFI is not just a problem in a "few isolated cases" perhaps the rest will do the same. The manufacturer of these filters is Bell Industries, J. W. Miller Div., 19070 Reyes Ave., P. O. Box 5825, Compton, CA 90224. Price class of the C-514-T is $27 and all high-pass units are $10. — *KIFM*

GEM QUAD ANTENNA

The Gem Quad three-band antenna has been around for about 10 years, but it is not well known in the U.S. Patented by the late VE4RA, the quad originally used gamma-match feed. Subsequently redesigned to provide greater matcing convenience, the antenna is now fed directly with a single 50-ohm coax line.

The Gem Quad antenna is unusually complete. The shipping package, a very tough cardboard tube with wooden end-inserts, contains eight fiberglass arms (more about them later), four 80-inch tie rods, six spools of wire (three each for the directors and reflectors), 16 stainless-steel clamps, 24 tension tubes (attach wire to each arm), a toroid balun kit, an all-aluminum welded spider, a packet containing 64 self-locking nylon straps, a packet containing a spool of wire for the stubs, a length of nylon cord, and seven spacers (insulators) for the stubs (two spacers for each band) and one for the common driven-element tie point.

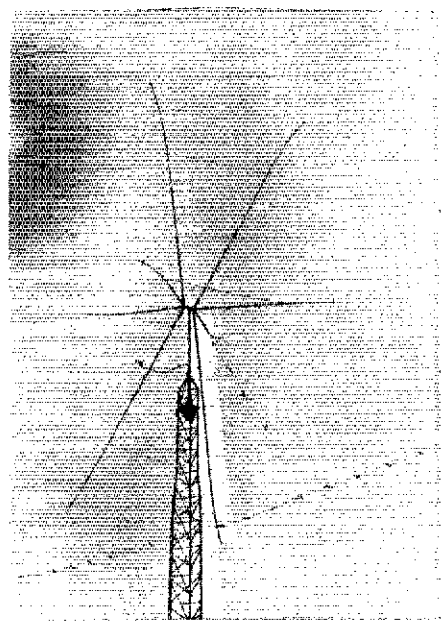
The fiberglass arms are perhaps the most significant feature which sets the Gem Quad apart from other quads. Each arm is an assembly; an assembly not unlike a tower. Gem Quad calls them "tridetic" arms. Each arm consists of three fiberglass rods conically spaced, and wound with fiberglass material to form what appears to be a very strong structure. Since it has been known to survive winters even worse than those commonly found in New England, there is every expectation that these arms will make it through this one.

The assembly of the antenna is straightforward, despite some ambiguities in the instructions. One would think that in 10 years these would have been eliminated. As a result, one must know at least what a quad looks like to be able to successfully complete the installation and assembly. If not, there could be some trying moments.

In an otherwise excellent design, there is one weak point that may be avoided in the assembly of this antenna. The stub spreaders (the insulator at the common tie point of the driven element is made of the same material) are made of a low-temperature plastic that melts just as soon as heat is applied to the connection to be soldered. As a result, the wires melt through the plastic immediately. To avoid this anguish, in advance it is suggested that just about any material be substituted. It's a simple matter to make up the seven insulators needed. Masonite would be better from a structural standpoint, and should have little effect upon the performance of the antenna as the insulators appear at low-voltage points.

The information in the instructions about pruning the feed-line length perpetuates some fallacies that were supposedly laid to rest more than 20 years ago by W1DX ("My Feedline Tunes My Antenna," *QST*, March, 1956 or April, 1977) and the information about the antenna "link coil" is certainly dated in this era of pi-network finals and Transmatches. However, the physical construction of this antenna has much to recommend if you have ever suffered having your quad fold up like so much straw in a wind or ice storm.

The antenna is available from Gem Quad Products, Transcona, MB R2C 2Z5, Canada. Price class, including U.S. duty, but FOB Transcona, is $129. — *WISE*



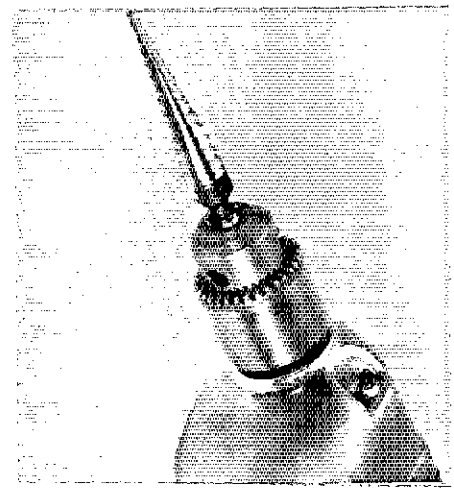
The design of the Gem Quad antenna provides for optimum element spacing.

A close-up view of a section of the fiberglass tridetic arms. Exceptional strength is achieved using this method of construction.

UNIBIT

The sum of $7.95 will buy quite a few individual drill bits, so there must be more to the Unibit than price alone. And there is. Unibit is a drill bit capable of drilling 13 different hole sizes, from 1/8- to 1/2-inch diameter. As the card it comes on says, it cuts metal, wood, plastic, doesn't need a centerpunch start, and automatically deburrs its own holes. That pretty well sums it up, and it's convenient, especially when you don't know exactly what size hole you need to make. The Unibit will handle just about any kind of drilling requirement amateurs have, short of quarter-inch plate for antennas. And it really does work! The patented Unibit is made by Unibit Corporation, Wyoming, NY 14591, and is distributed by Amidon Associates, 12033 Otsego Street, North Hollywood, CA 91607. — *KITN*

Thirteen bits in the drill simultaneously.



Hints and Kinks

A SIMPLE COIL-WINDING TOOL

Winding a coil with a large number of turns is a chore few experimenters look forward to with anticipation. And if a fixed spacing is required, the task is all but impossible. A few turns may go on the form successfully only to have them loosen as more are put on. Special equipment such as a lathe or a coil-winding machine is necessary if a professional appearance is desired. But the cost of such gear can hardly be justified if it is to be used only occasionally.

The tool shown in Fig. 1 and the accompanying photograph is the answer for those one-of-a-kind projects. It is made from a piece of 0.058-inch aluminum stock, 1-1/4 × 15 inches (32 × 381 mm). This model is suitable for coils of approximately 3-1/2 inches (89 mm) in

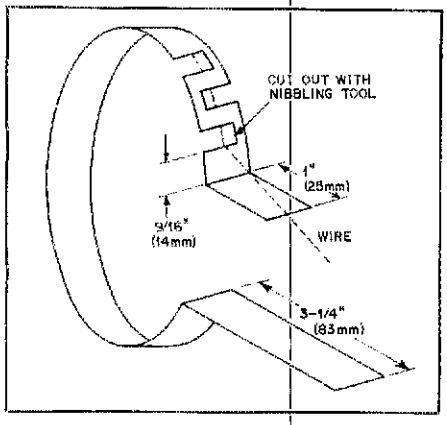
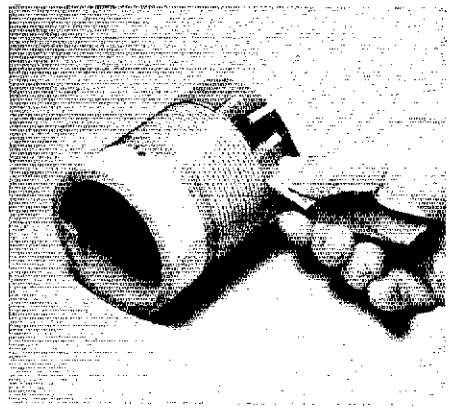


Fig. 1 — Construction details of the coil-winding tool.

diameter. Versions can be made for other coil sizes by bending the metal strip on a suitable form such as a can or bottle. Leave a slight spacing between the upper lip and the lower handle so that pressure can be applied on the coil form during the winding process. Slots are cut into the sides with a nibbling tool in order to guide the wire and examine the winding as it is being made. This winding tool is best suited for wire sizes up to about No. 22 or so. Larger wire sizes don't bend as easily. Also, a larger wire tends to retain its shape once it is formed, so different methods can be used.

To use the tool, first mark a line around the winding form where the winding is to begin. This can be accomplished by placing the form on a flat surface next to a pencil positioned at the proper elevation. Rotate the form and mark the line. It is also advisable to make other lines at different locations in order to assure that the windings are going on uniformly. Then attach the wire to the form securely since considerable tension is applied during the winding process. Inserting the wire through a hole drilled in the form should suffice. Next, position the winding tool over the wire as illustrated in the photo. Rotate the form while guiding the wire so that it follows the line made previously. With a little practice, it is possible to get uniform spacing or even a variable-pitch coil as shown in the photo.



Winding evenly spaced coils or variable-pitched ones is simplified considerably with the method illustrated.

By applying pressure to the winding as it is being formed, even minor kinks or bends in the wire are straightened out. After the coil is completed, the windings are tight enough so that they won't unravel before a coat of coil dope is applied. — *K1FM*

MOUNTING BRACKET FOR SMALL CIRCUIT BOARDS

A handy mounting bracket for small circuit boards can be fabricated from terminal strips such as H. H. Smith nos. 3002-3013. These are available in various sizes and are the type where a piece of phenolic containing the terminals is pressed into a U-shaped channel. Merely remove the phenolic strip and replace it with the circuit board. This method has been used at K1THP to mount crystal calibrators and other circuits such as preamps. For commercial gear where a minimum of drilled holes is desirable, this way is convenient. — *Dave Karpiej, K1THP*

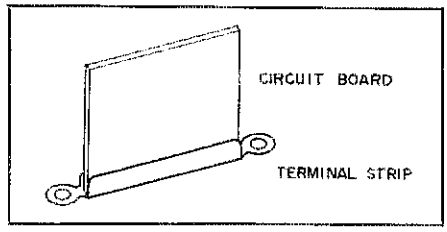


Fig. 2 — A terminal-strip mounting bracket is used to hold a small circuit board.

ALTERNATE RECEIVING ANTENNA MODIFICATION

Often the use of a low-noise receiving antenna for the 160- and 80-meter bands will reduce atmospheric-noise levels sometimes associated with vertical, sloper and inverted-V antennas. Popular low-noise receiving antennas include the Beverage, loop or random-length wires mounted close to the ground. To switch such an antenna to and from a transceiver may require an expensive coaxial relay, a not-so-handy manual switch or a simple modification that requires 30 minutes and an expenditure of 45 cents. Credit for the idea goes to K1PBW, a well-known, 16-meter DXer.

I modified my FT-101EE according to the illustration shown here. The idea can be used for similar transceivers. In the FT-101 series, RL-2 is the transmit-receive relay. A normally closed, miniature phone jack is installed between the receive side of the transmit-receive relay and the protective bulb fuse. I installed the phone jack on the rear of the FT-101EE using a hole vacated by removing the AF IN jack (RCA type). Many miniature phone jacks will fit directly into the hole without drilling. At trade-in time restoration is quick and easy.

Feeding the alternate receiving antenna input to this jack through the matching plug removes the main antenna from the receive circuit. Simply pull the plug for normal reception through the transmit-receive relay. — *Bill Smith, W5USM*

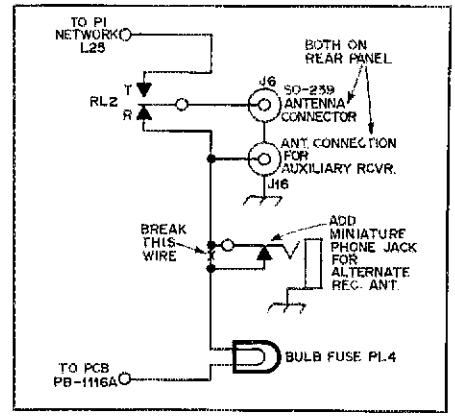


Fig. 3 — An arrangement for using a separate low-noise receiving antenna with the FT-101E/EE transceivers.

A MOD FOR THE MICODER

Do you like the convenience of an encoder at your fingertips but find that the local 2-meter repeater at times fails to decode the tones from your Micoder? I overcame such a difficulty by installing a Data Signal encoder, available for about $16 from Data Signal, 2403 Commerce La., Albany, GA 31707.

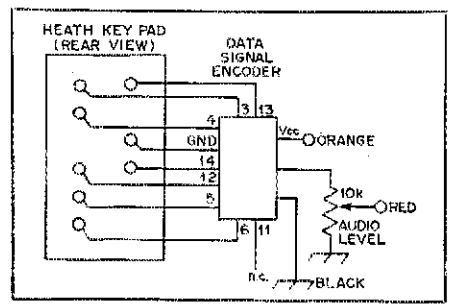


Fig. 4 — Dialing capability of the Micoder may be improved with the use of this encoder.

To install, remove the old pc board from the microphone housing. Epoxy the keyboard on the back corners to secure in place. Connect the new encoder as in the drawing. Wrap the pc board in foam to hold in place. Adjustment of the tone level can be made externally if a small hole is made through the housing and the 10-kΩ potentiometer is epoxied in such a way as to be accessible through the hole. — *Bill Atkins, WD4ASB*

COIL IMPROVEMENT FOR OFF-CENTER-LOADED ANTENNA

I followed a suggestion about using epoxy to beef up the insulating strips on the coils for my off-center-loaded dipole antenna (*QST* for September, 1974). I also changed the configuration of mounting the coils in order to take the strain off the first turn on each end of the coils. The result is shown in the drawing.

I made these changes on my old coils and was able to salvage them very well in spite of one loose coil end and considerable crazing of the insulating strips. Repairs turned out well and the old coils have been in use for several months with no appreciable effect from weathering. — *Fred Oldendorf, W6RPO*

SLIDING FERRITE BEADS

While assembling the Heath IO-4510 oscilloscope one may have some difficulty in sliding ferrite beads over the insulated green wire depicted on page 89 of the instruction manual. I found that the wire diameter is too large to fit into the ferrite bead hole. My solution: With a pair of pliers, grasp the end of the uncut green wire (both conductor and insulator) and then slowly heat the wire over the kitchen stove until the wire is reasonably hot to touch. Next, while holding the end with the pliers, squeeze the hot insulation with your fingers, moving the insulation toward the free end. The insulation is slowly stretched and moved over the free end, thus reducing the diameter. The heating and stretching may have to be done more than once to reach a diameter compatible with the hole in the ferrite beads. — *H. C. Patterson, WA1ZMV*

A LIGHTWEIGHT FIELD DAY ANTENNA

A Field Day, fun-day antenna that performs well on 10 and 15 meters can be made for under $10. With a Transmatch we have used a 15-meter version for contacts on 10, 15 and 20 meters. The drawings illustrate the construction of this lightweight antenna which may be constructed as an inverted or horizontal V. The assembly can be folded flat for easy transportation atop a car or in a van.

The boom pivots at the plywood plate. When the antenna is removed from the mast, the insulators are easily detached and the boom can be folded parallel with the crossarm. When assembled the antenna wires act as guys for the crossarm. It will bow slightly under tension. For the 10-meter band, the boom is approximately 5-3/4 ft (1.75 m) long as is each of the two pieces which form the crossarm. For 15-meter operation, the boom is approximately 7-3/4 ft (2.36 m) long as is each member of the crossarm. While the design is mainly for portable use, we have one version permanently mounted on the roof of our shack that is doing very well for itself. — *Terry and Mark Sinclair, WB1AJD and WB1AJE*

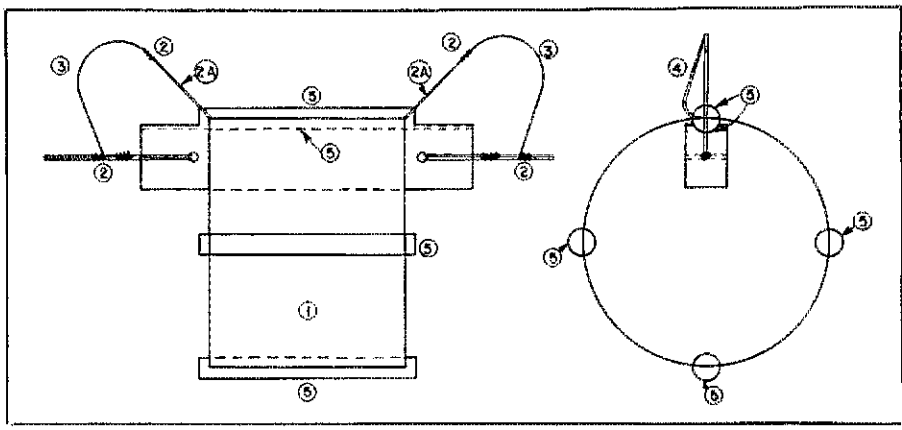


Fig. 5 — Coil modifications for the off-center-loaded dipole (*QST*, Sept., 1974). Coil parts and instructions: (1) Coil body. (2) Wrap and solder wire. Use pliers at points 2A on wire for heat sink when soldering ends of coil. (3) Flexible stranded wire. (4) Only one end view is shown — other end has opposite take-off from coil. (5) Epoxy applied at these areas.

ABOUT RIT FOR THE HW-8

In regard to "Full Break-In and RIT for the HW-8 QRP Transceiver," *QST* for July, 1977, readers should note that the ability to copy ssb is lost if the wide-selectivity switch is removed.

While using my HW-8, I have enjoyed several QSOs with Canadian hams who were on ssb, a pleasure that would have been denied me by removal of the switch. — *Andy Thall, WD8EOI*

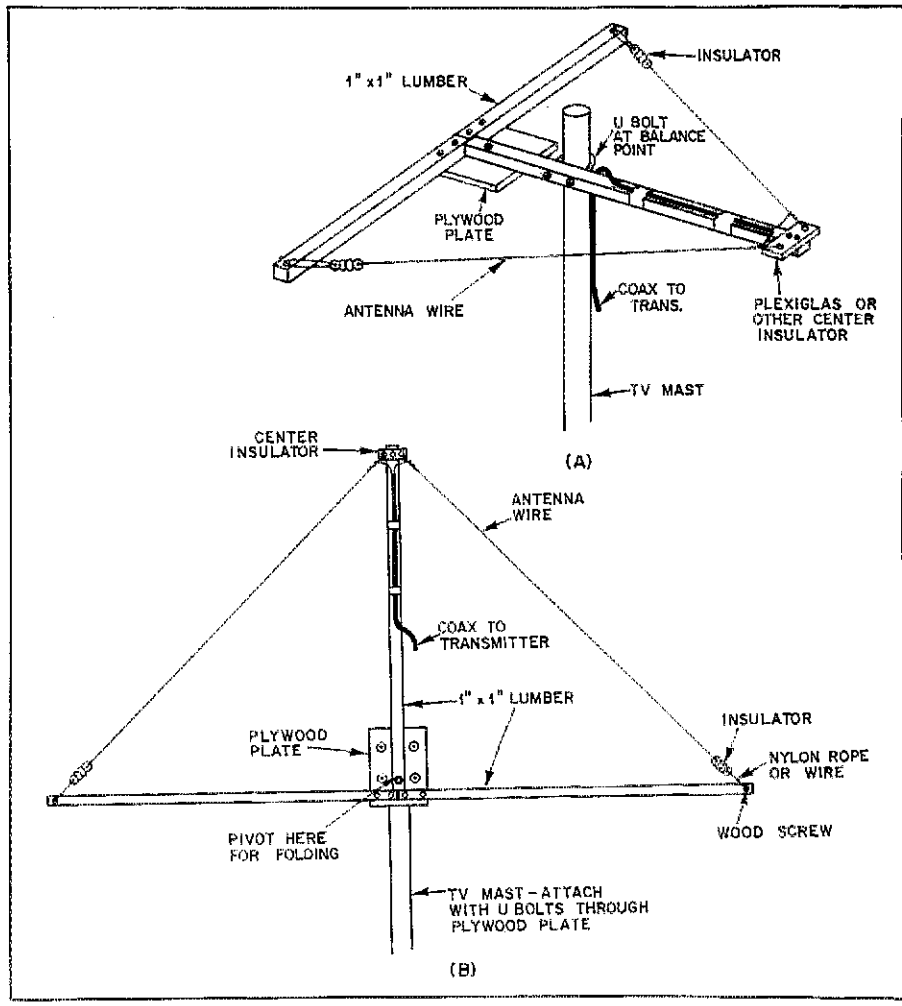


Fig. 6 — Simple construction of these horizontal (at A) and inverted (at B) V antennas make them useful for Field Day activities.

The Women Among Us

Once a rarity, still a minority, women radio amateurs voice their concerns in a special QST report.

By Judith C. Gorski*

To put a finger on the concerns of the female ham, QST asked a random group of women radio amateurs to respond to a questionnaire probing their thoughts and feelings about their hobby.

While no statistical conclusions can be drawn, these representatives gave some surprising insights into how the woman radio amateur views herself and the amateur community.

Reflecting the great social changes of recent years, the keynote to the concerns of women amateurs, as revealed in a special *QST* survey, is *equality*.

At the Toronto convention, one gal fumed when she was handed a yellow i-d tag, a color designating her as the wife of a ham. As a radio amateur herself, she felt entitled to the tag that would distinguish her not as a wife but as a radio amateur.

Women view themselves as equal in operating skills, in technical ability, as a public-relations emissary. They see themselves in the context of amateur radio, not as women but as hams.

Most women recognize, however, that amateur radio is masculine-oriented.

Another female ham became incensed when her award certificate came through noting "his work" and "his performance." She could understand — if not like — the "Dear OM" greeting on mass mailings. But she considered this indiscriminate reference a travesty on a tribute to her personal accomplishment.

It helps to have a sense of humor in these matters, says W3WRE. "One Russian OM addresses all his mail to me as 'The YL Editor of *QST*, Mr. Louis Moreau.' So I sent him my feminine QSL, but he still does it."

What's in a Name?

As a whole, the women understand the problems inherent in mass mailings. While they may not totally endorse the use of OM, the gals say under these circumstances they don't find it too objectionable. But others who did oppose the OM greeting from soliciting manufacturers and such, note that there is a short, alternate expression available — "Dear Ham."

It's in another related area that the strong trends of opposition crop up. Answers to the question "Do you think the term *XYL* should be continued or is it outdated?" were sharply divided.

Those who voted for continuance view the term *XYL* as part of tradition. Others hint that it's a problem of definition. All women, they contend, are YLs whether five or 500 in age. XYL means simply a married woman and not an elderly one.

Feelings on the flip side of the question are equally strong. "If there's a committee to ban the term *XYL*," quipped one gal, "I'll volunteer for chairwoman." Their reasoning? If an OM is an OM all his life, married or not, why then XYL?

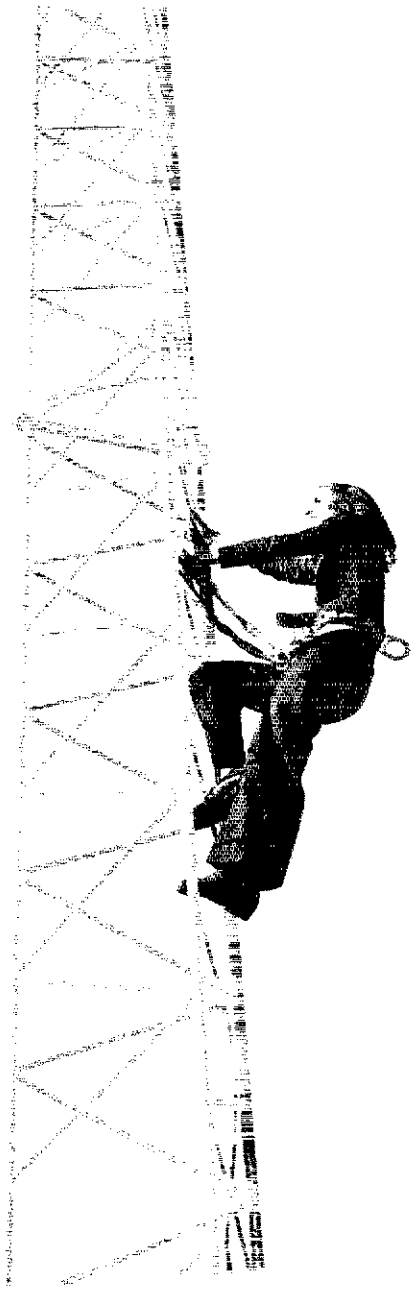
What's the Alternative?

One disgruntled woman suggested she didn't mind being called XYL as long as all husbands were referred to as XOMs. Others suggested skirting the problem completely by using such unisex references as FRO (Fellow Radio Operators). This, they pointed out, would also avoid the Dear OM greeting problem. "Even OL (Old Lady) is okay," emphasized K7RRS. "But not XYL. It robs you of your own personal identity and tags you as somebody's wife." Other frequently suggested substitutes for XYL were YF and simply YL.

The Tide Is Turning

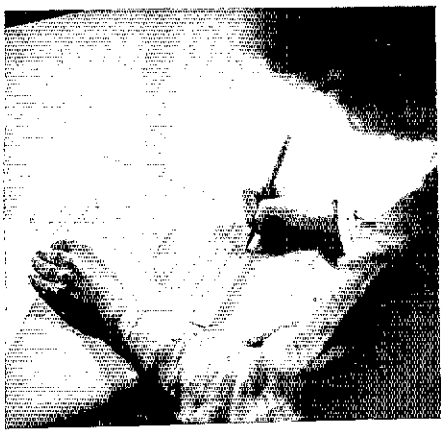
In the gals' appraisal of their on-the-bands treatment by the opposite sex, the men emerge with generally high marks. That's not surprising considering the overwhelming majority of women attribute their interest in amateur radio to some of the male sex — either husband, father, brother or other male Elmer. They find the men courteous and helpful.

Even those who do detect some difference in their on-the-air reception by male operators point out that it's simply a



Whatever the task at hand, today's woman is not content to sit on the sidelines. Yet for those not inclined to scale towers, there are plenty of hands available, say the women who praise the hams' willingness to help each other out.

*Editorial Supervisor, *QST*



A chance to speak out: Accompanying the returned forms came a bevy of handwritten comments and typed letters, some as long as three pages. Women took the opportunity to focus in on issues of concern to all amateurs.

matter of pure numbers. And the women feel that too is changing. As WB5MEU noted, "We are in the minority at present. However, our local group grows more each six months."

But the gals were quick to underscore the changing role of women in today's society as another factor influencing their status within the amateur fraternity. Today, a woman using a soldering iron is no oddity. And although some found reluctance on the part of the male ham to accept such invasion into supposedly man's territory, the women acknowledged such prejudice as to be less in amateur radio than in other fields. Women, they say, have always been encouraged to do anything the male op does — participate in Field Day, climb towers, dig into gear.

Still, many women see an overall need to strengthen their position in technical fields. More testing, more troubleshooting, more willingness to participate in technical discussions were a repeated theme to questionnaire comments. One woman explained that she got into amateur radio as a relief from everyday family routine. The last thing she wants is to become involved in ragchewing about kids, house and cooking.

Help Us Out, *QST*

The women observed that one way to bring about a better awareness of the technical and operating aspects of amateur radio is through greater emphasis on easily understood articles. In WB7DKN's words, "more articles that don't assume the reader is an electronics engineer." Such articles on an elementary level would do double duty suggests Advance class licensee WA4FTJ. Novices,

From a Female Viewpoint

What can amateur radio add to your life? Six top female hams offer these suggestions.

By Judith C. Gorski*

How does amateur radio fit into the many roles of today's lifestyles? *QST* went to six top women hams for their size-up of the contributions amateur radio has made to their lives. They discuss here how they team up their lives and careers with their hobby.

A Good Release from Pressures

Lenore Kingston Jensen, W6NAZ, Advanced, Sherman Oaks, CA: "Amateur radio can widen your horizons. It did for me and it can for anyone. If your own personal life is restricted in any way, ham radio can open new worlds to a fuller life."

As a young radio actress in Chicago away from home, Lenore Jensen was somewhat lonesome with lots of free time between show rehearsals when her interest in amateur radio was piqued. At the time she was working in radio and many of the network engineers were hams.

"Out of curiosity, I joined a code class near the studio. When I got my license in 1939, I met new friends and became very much involved. Simultaneously, my career also began to improve. I think it was because through amateur radio I adopted a more relaxed attitude. It helped me alleviate tenseness and get outside myself. Like exercise, it's a good release from pressures."

In her unqualified praise for amateur radio's beneficial influence on her life, Lenore adds, "I've learned so much — about communication between people. I've had opportunity to observe, to participate in the giving and getting process which communication is all about. People need to know a lot more about how to communicate in person, with friends, lovers and relatives."

There's little doubt as to the conclusions W6NAZ has drawn from those prac-

Lenore Jensen, W6NAZ

*Editorial Supervisor, *QST*

too, need material they can understand, she emphasizes, if their interest in ham radio is to continue and, most important, grow.

The gals would like to see some of these articles authored by women. Yet they realistically sized up the situation: few women submit such articles.

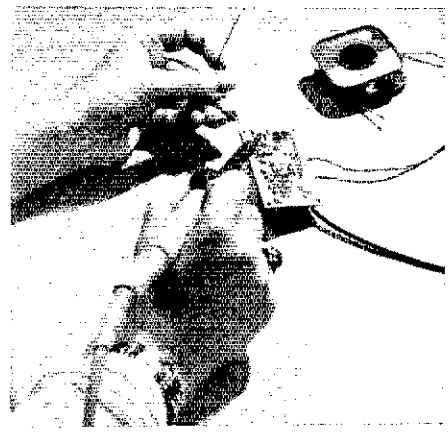
How else could *QST* better respond to the needs of women hams? With human-interest features, giving equal coverage to the distaff side and their accomplishments, responded the majority of those answering the questionnaire.

Vital Issues

WARC-79 and the entire question of frequency preservation won hands down as *the* vital issue before all radio amateurs today. But other concerns were many and varied: expanding training programs, especially in the youth areas; increasing public awareness of what amateur radio is all about; CB's impact on amateur radio, maintenance of high standards despite the explosive growth of newcomers to the hobby; RFI, increasing pressure on manufacturers to accept their share of the responsibility and the encroachment of illegal operators into the ham bands.

A Great Place to Be

While there was no uniform agreement on all issues, the gals left little doubt of the high value they placed on amateur radio as an integral part of their lives. What may have started for many as a curiosity or a way to share a part of their husband's life has metamorphosed into an exciting, personal opportunity to learn new skills, meet new friends and be of service to their community. And, after all, isn't that what ham radio is all about for all ham operators, regardless of gender?



Digging elbow-deep into the interior of her gear doesn't frighten the female ham. According to comments received in the survey, many gals view such pursuits as the natural extension of the more traditionally accepted female handcrafts of needlepoint, knitting and such.

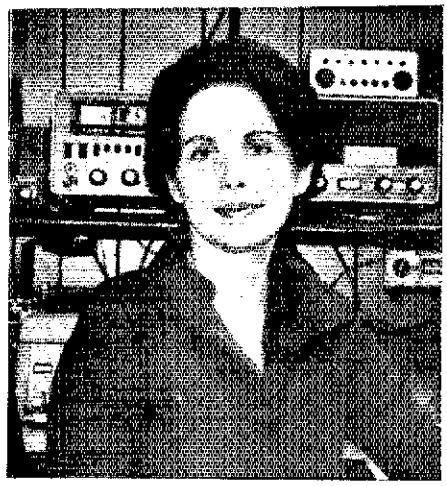
tical lessons: It's the giving in life that's important. And that Lenore does amply — through amateur radio and the some 43,000 phone patches she's handled for armed forces personnel overseas through Army MARS. "It's been a tremendous emotional experience . . . and my life has been extremely rich in contacts. Best of all, it's wonderful to be able to share a hobby with my husband."

Perfect for Women

Jan Shillington, N9YL, Amateur Extra, Glendale Heights, IL: "An absolutely great hobby for women! It fits in perfectly with a career of housewife and mother. It hurts to think of how many great antennas, linears and top-notch transceivers stay sitting on the shelf all day while the 'OM' is at work. The YL of the house could be having a ball!"

Jan Shillington, mother and housewife, is having just such a time of her life letting others in on her enthusiasm for ham radio. She's gone out to TV talk shows, her daughter's school classroom, "anywhere I can get someone to listen" to explain what amateur radio can offer people.

"Amateur radio is so varied you don't have to be an engineer. I am not a technical person, but I am an enthusiastic ham. I enjoy the code and people. Ham radio is an outlet, an escape from the everyday world of children and muddy dogs. You turn the switch and you are no longer the harried housewife, but a ham competing on an equal level of competition with every other person — man, woman or child."



Jan Shillington, N9YL

Alicia Moore, WB9LAD

Ham radio is fun, but it's also work too, acknowledges Jan. But that's one of its charms she maintains.

"If you stop growing, expanding your mind, you might as well be buried. I know it's hard to learn and grow and be a housewife. That's why amateur radio is so great. You can watch the kids, stir the dinner and operate all at the same time." To that thought she adds humorously that using code is preferable since any yelling and screaming won't be heard by your contact.

Opened Career Opportunities

Alicia Moore, WB9LAD, General, Rensselaer, IN: "Outside of my parents, ham radio has been the strongest influence in my life: It helped me decide the direction of my education. It's opened career opportunities."

Electrical engineering student Alicia Moore is a second-semester junior at Purdue University. She's there, she says, thanks to the encouragement from the engineers she has met on the air.

"As part of a work-study program, I've assisted in design research in solid-state microelectronics. Someday, I hope to design amateur radio equipment."

But even as the technical aspects of amateur radio become more important as she furthers her studies, WB9LAD underscores what all amateurs get around to when discussing their hobby: friendship and people.

"There's still nothing like the friendliness and friendship! There were

evenings in high school when I would be studying at my desk and the temptation to turn on my radio would overcome me. I knew that a whole world of communication was at my fingertips with the flick of a switch. Isn't that indeed a temptation? It's still just as exciting today. To me friendship is the big thing in amateur radio. People grow by sharing ideas. Even if you are just reaching out to shake a hand with a ham from across the ocean, you are gaining and so is he or she. It's a way to have more sunshine in your life and a very good way to pass some on too!"

A Great Equalizer

Dr. Christine Haycock, WB2YBA, General, Newark, NJ: "If a young girl is physically large or awkward on the dance floor, over the airwaves she's the same as anyone else. Amateur radio offers her a chance to compensate. If she's shy or introverted, she can make hundreds of new friends, easily."

Chris Haycock knows the value of such activities from experience. She admits readily to being an "unabashed, unashamed, out and out tomboy" from an early age, more comfortable on a baseball diamond than on a dance floor. So she turned her energies and intellect to

pursuits where she could use her natural abilities to advantage — fencing, baseball, bowling, amateur radio and surgery — even though as a woman she was treading into supposedly man's territory long before it was fashionable.

"And the welcome mat is out everywhere. No matter where I travel, I'm never alone. One time, while attending a medical conference in another country, I found two lovely floral bouquets as I walked into my hotel room. Local amateurs had sent them. Nowhere is there so much friendship as in amateur radio. If I'm in a strange city traveling late at night, I can always find someone to chat with on 2 meters.

"It's not really all that technical. Today, women are doers. I built a lot of my own stuff. And I put every one of these damned antennas up myself, including the towers." But then traditional role reversal has never interfered with WB2YBA's doing her own thing and doing it well: While the majority of women amateurs marry into ham radio, Chris is still trying to get her husband interested.

A Natural for the Electronics Buff

Sue Heller, K3YL, Amateur Extra, Philadelphia, PA: Sue Heller is a young woman in a hurry. Just 18, she qualified for the call sign K3YL only a few months after she stepped into her college amateur radio station for the first time.

A sophomore majoring in electrical engineering at Drexel University in Philadelphia, Sue took to the airwaves like there was no tomorrow. Amateur radio was a natural progression for her deep-seated interest in electronics.

As she tells it, "It gave me the chance to build my own circuits and I can go all the way around the world with them. My first DX contact was with a DJ (West German) station and I've enjoyed talking to hams in other countries. It's taught me geography and some things about their customs."

She's fascinated by computers and their potential for changing things for the better. As part of a cooperative work-study program, Sue works at the Naval Air Development Center, where she's involved with command control and communications. She credits amateur radio with helping her brief career.

"I think it was my hobby that got me the job in the first place," she says. "They saw I was familiar with antennas and basic circuits."

Although she's had a TVI problem at home, she's almost got it licked, having devised a system of filters.

Sue is the only ham in her family, and she's proud of her success on the amateur bands. "I didn't have any outside influence. When I saw what amateur radio was all about, it was love at first sight. Here was a hobby in which I could use electronics and talk around the world at the same time. The combination is fantastic."

Making Friends Overseas — That's a Real Thrill

Flo Majerus, W7QYA, Lewiston, MT: "What do I like most about amateur radio? The contacts it gives you are great; you have a friend every place you go. I got off the plane in Russia once and someone was right there waving my QSL."

Flo Majerus doesn't need much encouragement to talk about why she's a ham. "It's the feeling that you've accomplished something. And helping out in emergencies; that's most rewarding.

One time I helped a Panamanian family get in touch with their son who was in a hospital here.

"Selfishly, I suppose it's making friends overseas. To talk to someone in, say, Sydney, Australia, and then meet them in person, that's a real thrill!"

Mrs. Majerus became licensed when she worked with the Federal Aviation Administration in Alaska following World War II. She's a pilot, teacher, world traveler — and dyed-in-the-wool cw op. Being a woman in Montana has some on-the-air advantages, as she doesn't have to go after long-distance QSOs. But it can interfere with her favorite type of operating, ragchewing. "I enjoy DXing quite a bit, but most people I talk to aren't too interested in ragchewing. I'm a YL in Montana and that's a dodo!"

Her years of cw operating have resulted in a cw proficiency that few can match. She's qualified for the Five-Star Club, a group of people who communicate at 80 words per minute. Flo, the Club's only woman, didn't expect the unsolicited honor. "Imagine my surprise when the certificate arrived in the mail."

Public Service Begins with You

Looking for a way to get involved? Try your hand at any one of a host of public service activities.

By Joel P. Kleinman,* WA1ZUY

It could never happen to me, you think. Many other hams feel the same way. But it does happen; you could suddenly find yourself a key to handling emergency communications when no one else can do the job.

That's the way it happened for a Lexington, MA, teenager, Roger Strauch, WA1KZE. While browsing around the 20-meter band, he happened on the tail end of an animated conversation concerning an earthquake in Nicaragua. Another panic-filled voice came on frequency, Roger responded, and he and his brother Hans suddenly found themselves the nationwide focus of an intensive eight-day effort to provide emergency assistance to the ravaged country.

*Features Editor, *QST*

Public service by volunteer amateurs is nothing new; the first recorded emergency message was passed over the amateur airwaves in 1913! Is public service an important aspect of the Amateur Service? "Without it there would be no amateur radio," says Bob Halprin, K1XA, ARRL assistant communications manager for public service and emergency activities. "According to the FCC rules and regulations governing the Amateur Service, public service is the number one reason for its existence," he continues. "It makes possible all the hobby-oriented things hams do, such as DXing, contests and playing chess over the air. If there were no public service, people would ask, 'Why do we have amateur radio?' There's no other service that could arrange to have medicine flown to Ecuador or help a ship at sea as well as we can."

Simply stated, when regular communications are knocked out, whether because of an earthquake in Nicaragua or a flood in Colorado, only amateurs have the capability to provide communications links that could mean the difference between life and death for thousands of persons. Whether it is assisting with handhelds at a March of Dimes Walk-a-thon or in a week-long, nonstop effort to help a remote Appalachian hamlet recover from a disastrous flood (see related story), public service is the major justification for the bands we now enjoy.

Where You Fit In

Tens of thousands of U.S. and Canadian amateurs are involved with public service. Where do you fit in? Just about

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Amateurs Come Through Again During WV Flood

The unexpected happened to an unwary group of amateurs last spring as torrential rains combined with normal runoff to destroy tiny hamlets in remote parts of three states — Kentucky, Virginia and West Virginia. As they have so often in the past, volunteer amateurs came through when they were most needed in and around the Appalachian hamlet of Williamson, WV.

The West Virginia Phone Net provided the first clue that a flood was imminent when several stations checked in to report heavy rains and rising waters in the southern part of the state. A few hours later, W8DL had activated the amateur station at the Emergency Operations Center (EOC) in the state capitol building in Charleston. It was to be manned continuously for the next six days.

In Williamson, a hamlet of 6000, WB8TEE, K4IFD/8 and WD8IGN provided the only link with the outside world until other amateurs arrived. Residents awoke to a horrifying scene — the entire business district was underwater. Homes, trailers and vehicles were lifted, moved and smashed by the rising currents. Hundreds of people huddled on mountainsides, watching as their work of a lifetime disappeared before their eyes.

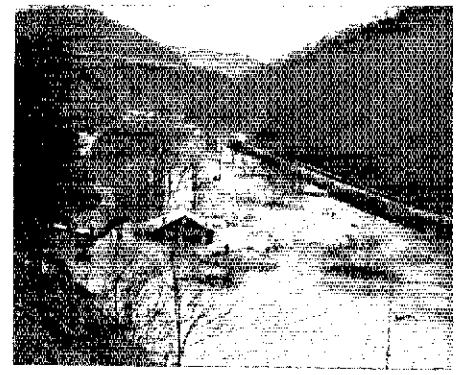
Needless to say, telephone lines and poles were down; even the exchanges and switching stations had been washed away. No communications were possible between the disaster area and the EOC in Charleston — except for amateur radio.

The following day, military helicopters airlifted several hams into the inundated town to strengthen communications. They set up a 75-meter station at the Williamson Memorial Hospital, one of the few buildings with standby power, and a 2-meter link with state police and National Guard command posts at the airport. W8NR, also a licensed pilot, was asked by the Governor's office to fly supplemental communications equipment to Williamson. Bad weather forced cancellation of that plan, but he set out with his family and several fellow hams in a three-vehicle convoy the following day. Upon arrival, they joined other amateurs already working on communications problems.

The National Guard established roadblocks in the disaster area early. The key to getting through for the hams who assisted was their amateur radio license.

When emergency telephone service was finally restored, the National Guard informed W8NR that amateur communications were no longer needed. After 144 consecutive hours of emergency operations, amateurs in Williamson and in parts of three states began to return to a normal way of life.

Once again, a group of public service-minded volunteer amateurs came through when no one else could. As in all such cases, no financial compensation was made. But those who helped their neighbors during the flood have the special kind of satisfaction that comes with assisting hard-pressed government and volunteer agencies when assistance is most needed. — *Donald Morris, W8JM, SCM of West Virginia*



The valleys of Appalachia filled rapidly in the rush of the Holy Week flood. In this view, the Clinch Valley loses its struggle to hold the river. More than 20,000 homes in four states suffered damage.

A typical Emergency Operating Center. Receiving operators (foreground) copy messages as they come in, while local emergency officials plot them on maps. This EOC is run by the city of Milwaukee, WI. *(WB9ODO photo)*

Phone Patching: It Shows Its Worth In Emergencies

Although it never fails to impress nonhams during demonstrations, phone patching — tieing in a ham conversation over regular telephone lines — shows its real worth during emergencies.

If a physician at the scene of a disaster has to confer with colleagues at a distant hospital, there's no better way to do it. Phone patch equipment can also be attached to handheld units, making them even more useful and convenient.

When an amateur wants to complete a phone patch, he first dials the desired party from his own telephone just like any other call. After the connection is established, he interconnects his receiver and transmitter to the line through a telephone company coupler, transformers and other parts. The distant station being received goes into the telephone line so the called party can hear it. To reply, the local ham turns on his transmitter and the called party talks back over the airwaves to be heard at the distant end.

A phone patch is a *simplex* circuit; only one side of the conversation can take place at once since they are usually on the same frequency. — *KH6HQG*

wherever you want to.

The basic field organization for emergency communications is the Amateur Radio Emergency Service (ARES). ARES and the National Traffic System (NTS) compose the Amateur Radio Public Serice Corps (ARPSC).

As a member of the 40,000-strong ARES, you'll train to provide emergency communications on the city or county level. Each local group is headed by an Emergency Coordinator (EC).

Although it's advantageous to have your own emergency-powered 2-meter fm gear, you don't need equipment of any type to join; it's the training and practice that are most important. All you really need is an interest in serving your community through amateur radio. Full members pledge to participate actively in periodic tests of readiness capability, while limited members participate only as time permits.

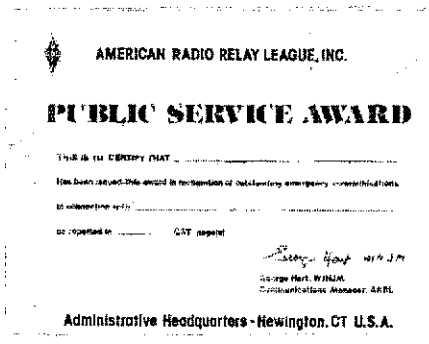
Becoming involved is as simple as requesting a registration card (form CD-98) from the ARRL Communications Department. The name of your local EC will be provided upon request. Other sources of information about ARES are the *ARRL Ham Radio Operating Guide* ($3), the *Public Service Communications* manual (CD-235) and *Operating an Amateur Radio Station.*

Should your community not have an EC, why not volunteer yourself? You qualify if you have a sincere interest in public service and a willingness to put in the time and effort to fulfill the appointment. Just write to your Section Communications Manager (listed on page 8 of any *QST*) or Section Emergency Coordinator.

The other leg of the public service corps is the National Traffic System (NTS). A U.S. and Canadian message-handling system that operates 365 days a year, it has dual purposes: rapid movement of long-haul traffic from origin to destination, and training of amateur operators in handling written traffic and participating in directed nets. It could be called the "Pony Express of the Airwaves." During emergency situations its activities are stepped up as necessary.

NTS message handling is concentrated on the low frequencies, while ARES operates mainly on vhf, especially 2 meters. For ease and accuracy in handling, NTS messages follow a standard format.

Awarded to all amateurs who are listed in the "Public Service" column of *QST*, the Public Service Award is one tangible benefit of volunteer community service.



AMERICAN RADIO RELAY LEAGUE, INC.

PUBLIC SERVICE AWARD

Administrative Headquarters · Newington, CT U.S.A.

For amateurs with a bent toward public service, helping out runs the gamut from following marathon runners to relaying health-and-welfare messages from a remote earthquake-ravaged village high in the Andes.

How to Find an ARES Net

Local nets serving a town or county for the prime purpose of emergency preparedness often operate on vhf or 10 meters and meet once a week or more. They may have a liaison with NTS.

Section nets covering a wide area can usually be found on 75 or 80 meters. Some are ssb, others cw. You can find the NTS nets that serve your area with a copy of the *ARRL Net Directory* (free upon request for an s.a.s.e. at least 6 X 9 inches with 35 cents postage). The latest edition has a special section for beginners.

While you're requesting the *Directory*, also ask for a copy of Operating Aid 9 (CD-218) and CD-3. They'll give you the standard format for ARRL numbered radiograms. If your message fits one listed on the form, you can use it to save time. Instructions are included.

You've pinpointed a net through the *Directory* and have written up a radiogram. All that's left to do is check into the net. At this point many people get weak knees because net operation may seem strange at first. It won't be once

you've checked in once or twice, though.

If you are checking into a phone net, wait until the control station calls for check-ins. Then call in. List your traffic when asked to do so: Give the number of messages (radiograms) you have and their destinations. Don't hesitate to say this is your first time in a traffic net; you'll get plenty of help.

Cw nets operate basically the same as phone nets, but for brevity rely on Q signals (listed on Op Aid 9). If your code speed is slow, check the *Net Directory* for a slow-speed net. They usually operate on the Novice bands, but all comers are welcome. If your check-in speed is slow, usually the control operator will slow down to your sending speed. If he doesn't, ask him to QRS. Most will make an extra effort to accommodate a new station. Listening to the net before checking in will help you get acquainted with the system.

A Stitch in Time

The bulk of recent emergency communications has been handled at vhf. Much has involved repeater operation. The reason is simple: Repeaters can be accessed with low-cost and lightweight equipment, handheld or mobile. Best of all, they provide clear, reliable communications up to 100 miles or so. Many repeaters provide alternate sources of power in case of power failure, making them the mainstay of any widespread emergency.

What You Should Do

Before an emergency occurs, prepare for it by keeping your station and emergency power supply (if you have one) in good working order. Participate in SET (the annual nationwide Simulated Emergency Test during the last weekend in January), annual contests and Field Day in June.

Register your station with your local EC. During an emergency, report to him at once and follow his suggestions.

Monitor your local emergency net frequency, but don't get on the air unless you are certain you can be of assistance.

Copy special W1AW bulletins[1] for latest developments.

Use your receiver more, your transmitter less. Interference can be intense during an emergency.

After the emergency, tell your EC of your activities so he can compile a list of amateurs who participated and send it to ARRL hq. Amateurs mentioned in the Public Service Diary in *QST* receive a handsome certificate.

The Amateur Radio Service has been a vital part of emergency communications for more than 50 years. Why not become a part of it! QST

[1]Phone on the hour, RTTY at 15 minutes past the hour, cw on the half hour. See the W1AW schedule, p. 90, for frequencies.

Successful Museum Exhibit Boosts Plans for Permanent Amateur Station

If all goes according to plan, visitors to Boston's impressive Museum of Science soon will be able to see — and operate — an amateur station. Last spring, a consortium of Boston-area clubs gave the project a large boost by sponsoring a four-day exhibit that museum officials called one of the most successful ever held there.

"Judging by the reaction and response we've had, I'd say it really worked very well," commented Exhibits Director John Drabek.

The exhibit was planned and executed by 110 amateurs representing six clubs — the 19/79 Repeater Association, Middlesex ARC, Wellesley ARC, Dorchester ARC, Sharon ARC and Chelmsford ARC. League hq. supplied educational material and beginners' handouts. Volunteers manned 10 separate exhibit areas and chatted with the several thousand visitors who stopped by.

Highlights included a functioning repeater, message center, first code lesson (400 people signed up), and functioning OSCAR, RTTY, slow-scan and hf stations.

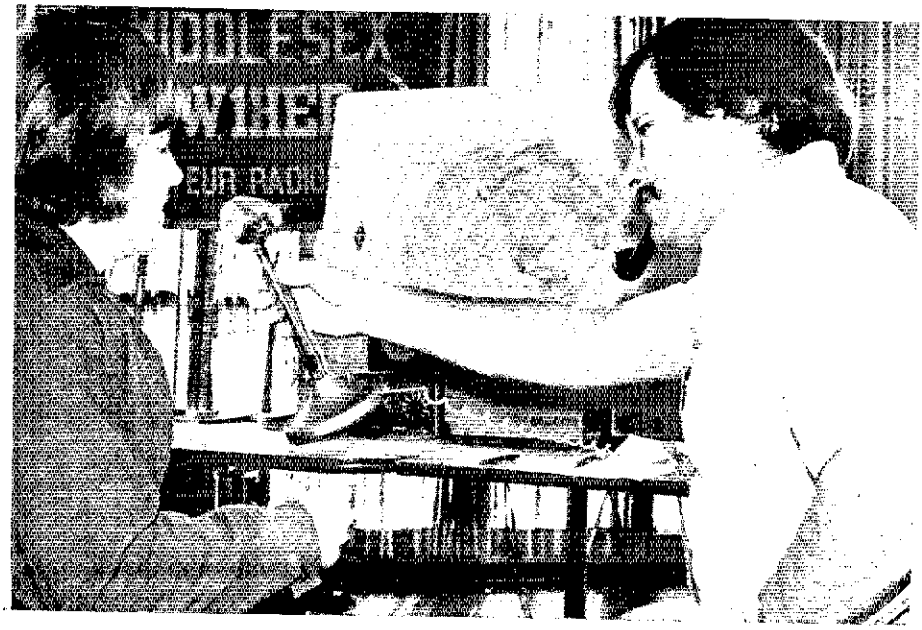
When completed, the museum station will be part of a wide-ranging display covering the history of radio communications. Not content to rest on their laurels after the highly successful exhibit, the clubs that participated are actively helping to plan the permanent exhibit that will include active hf and OSCAR (Modes A and B) stations as well as RTTY gear and a microprocessor.

Well-known vhfer Joe Reisert, W1JR, points out a few of the finer points of moonbounce. His attractive display was a highlight of the exhibit.

Persons wishing to donate or loan antique equipment, or good-quality modern gear, should contact John Drabek, Director of Exhibits, Boston Museum of Science, Science Park, Boston, MA 02114.

Once in operation, the station will join other museum stations in a number of cities: Miami, Toronto and New York among them. — *Joel P. Kleinman, WA1ZUY*

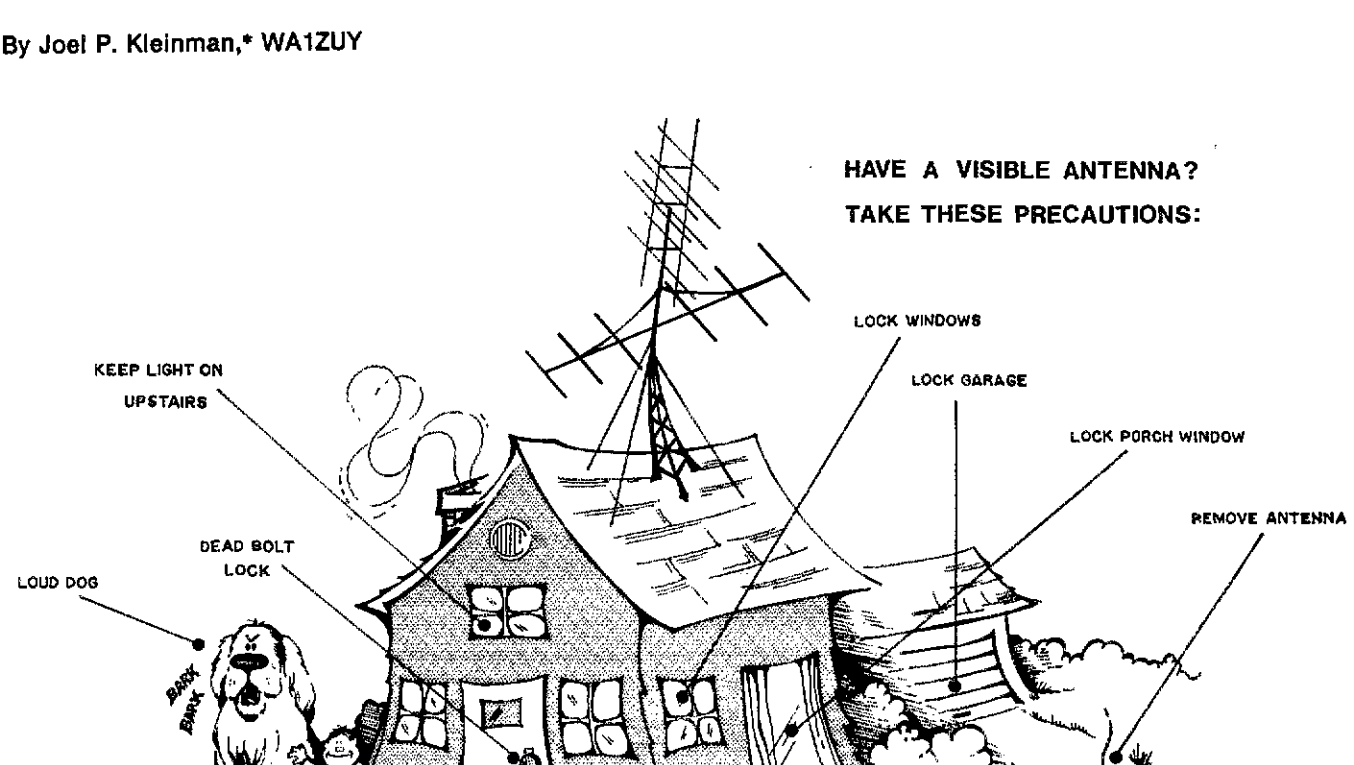
Marty Green, WA1WHU, gives a visitor a chance to send her voice over the airwaves at the well-appointed hf station, the handiwork of the Middlesex ARC.



How to Avoid Rip-Off

It pays to prevent the theft of your precious amateur gear. But if you should become a theft victim, two new League membership services will help you get it back.

By Joel P. Kleinman,* WA1ZUY



"If I'm walking up and down a street and I see you have a huge antenna, I'd rather get into your house than the other one across the street. It's logical."

The person talking isn't a burglar, but he's a crime expert just the same. Officer Richard Ivey is a crime-prevention specialist with the Hartford, CT, police department. "Burglary isn't a planned crime; it's a crime of opportunity," he's fond of telling community groups.

Even if your insurance is adequate, there's no excuse to give burglars the invitation they're looking for to pilfer your amateur gear or other valuable property. A house, an apartment or a car is broken into once every 17 seconds, according to latest figures. To determine the best ways amateurs can protect their property, *QST* asked Officer Ivey and property insurance expert Al Abend how burglars can be discouraged from targeting your property.

In Your House

"Householders provide the best opportunities for thieves," says Abend, of Aetna Life and Casualty Co. "Most houses are easy to break into," he adds. While no house or apartment can be made totally theft-proof, he recommends several ways to minimize the risk.

Since "a house is only as secure as i weakest lock," be sure to install dea bolts on all doors, he tells homeowner Pay special attention to cellar and garag doors.

Lock all windows that can be reache from the street, a porch, terrace or roo Cellar windows are a favorite means entry; secure them with a strong bolt loc

One of the most common ways we he a burglar help himself to our possessio is with the key. Abend says it's "just pla dumb" to leave a spare key lying arou under a mat or in a flower pot. He ca tions against putting your name and a

*Features Editor, *QST*

dress on your key chain. If you lose it, you may get your keys back but lose just about everything else.

Burglar alarms are often worthwhile, but a loud dog is usually just as good, he says.

A Few More Deterrents

To deceive a would-be burglar into thinking you're at home when you're not, make sure all deliveries are stopped and that your lawn is mowed in summer and the driveway shoveled in winter. If you're out during the day, leave a radio on at normal volume. At night, leave an upstairs light on. For extended absences, use an automatic timer.

Another deterrent is Operation Identification, the nationwide registry of valuable appliances such as amateur gear. Both Officer Ivey and Aetna's Al Abend stressed its value. The first step is to borrow a vibrating, engraving pen from a local police department. By writing your name, call sign, and driver's license number (preceded by your state's two-letter abbreviation) on the underside of all your gear, you make it extremely difficult to sell on the street or anywhere else. Window stickers warning potential burglars that you've taken this precaution are extremely effective in persuading them to try their luck elsewhere.

If the police should recover your engraved gear anywhere in your state, it can be traced immediately. "It'll take 15 to 18 seconds for a policeman to access a computer to trace your driver's license number," according to Officer Ivey. He estimates that the Hartford PD auctions off between $200,000 and $250,000 worth of untraceable merchandise each year.

It will also help the police if they have good photos of your gear, along with a list of all serial numbers.

In Your Car

If you're sure you're going to keep your mobile rig a while, you can "permanently mount" (i.e., weld) it in your car. If that isn't feasible, you're up against the same problems you faced in your house or apartment. Not surprisingly, the solutions are similar.

The best way of preventing a thief from picking your vehicle out of a crowd is to conceal the fact that it contains something he wants. If you've got a rig in full view of a passerby, he's likely to be interested. To keep it out of sight, mount it on a slide and put it in the trunk when you leave the car, even if it's only for a few minutes.

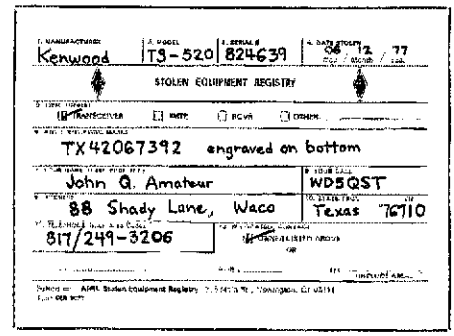
Another way to go, especially if your vehicle lacks a trunk, is to run your rig off the cigarette lighter and keep it in a small briefcase on the seat next to you. When you leave the car, just close it. This system requires a special, quick-disconnect, PL-259 connector, as well.

Or your mobile rig can be mounted in the trunk or under a seat.

ARRL Stolen Equipment Registry

If you and your gear should part company prematurely, there's a new way to get it back — Hq. publishes and distributes free of charge a monthly list of all stolen gear, the *ARRL Stolen Equipment Registry*. All amateurs contemplating purchase of used equipment are encouraged to send for the list. It's available now from the ARRL for an s.a.s.e.

Persons who want to have their stolen gear listed should send for a *Registry* card. When it is returned, the information it contains will be placed on the next monthly list. It will continue to appear on updated lists until Hq. is informed that the gear has been recovered.



As many vhfers are painfully aware, a mobile antenna is a sure sign to a potential thief that something of value lurks within. Simply stated, hiding or disguising your mobile antenna is about the smartest thing you can do. How to go about it? There are quite a few choices.

Magnetic antennas detach easily and can be stashed in a trunk. A fold-down bracket mounted at the trunk lip allows the antenna to disappear neatly when you don't need it. These are sold commmercially for about $10, but you can devise your own for almost nothing using scrap metal, as did WA1QHZ, of Terryville, CT. Then there are spring-loaded, gutterclip, quarter-wave antennas which remove and store easily.

Another choice is to use your existing car radio antenna with the addition of a matchbox specially designed for vhf operation. There is likely to be some signal degradation, though. Or you can use a 2-meter antenna that looks like a regular car radio antenna.

Many Will Look Elsewhere

Officer Ivey recommends use of a car alarm with a toggle switch mounted inside. If you warn potential burglars that the car is wired, many will look for greener pastures.

Again, make use of Operation Identification for your mobile rig. Engraving your state's abbreviation and driver's license number takes but minutes and may save you a great deal of money later.

Whether in your home, apartment or vehicle, amateur gear is always susceptible to theft. The means to lessen the risk are available; using them is up to each of us.

"I can make all the recommendations in the world," Officer Ivey says, "but it's up to each individual to follow them."

New Insurance Program for ARRL Members

Want an inexpensive way to protect your gear — whether portable, mobile or fixed — against loss? A new League membership service is available to persons living in the U.S. or Canada that will provide coverage for all amateur gear except antennas.

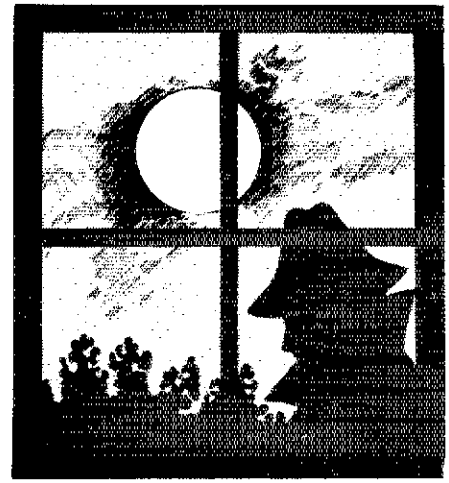
The policy covers named risks of fire, theft, lightning, overturn and collision perils. Exclusions are loss of use, inherent vice (using equipment illegally), intentional damage, damage caused by repairing or mistuning, electrical charge other than lightning, and loss or damage to antennas.

Claims will be settled on a replacement cost basis, minus a 10-percent deductible ($50 minimum per loss).

The basic rate will be $1 of annual premium per $100 of equipment listed, with a minimum premium of $10.

Bonn A. Gilbert, Jr., of G & H Insurance Administrators, Inc., of Charlotte, NC, has been named group administrator by the ARRL Board of Directors, who will oversee the new policies and approve offering them to the membership as they are developed.

One other policy, covering accidental death, dismemberment and accident medical costs for affiliated clubs, is available now. Gilbert is working toward policies to reimburse amateurs who may have to go to court because of amateur activities, policies to protect club officers if they should be sued by outsiders because of club activities and policies offering prepaid legal coverage for individual amateurs.



Rain of Terror

For the third time in 88 years, rampaging water devastated Johnstown, Pennsylvania. The amateur radio communications effort proved to be as intense as the unceasing rain.

By Donald J. Myslewski,* K3CHD and Robert Halprin,** K1XA

"The message seemed a bit cryptic — Helen Small from the Red Cross called — something about a flood." — *K3RBH*

"Upon my first attempt to drive into Johnstown, particularly the area where I was raised as a boy, I was astounded by what my eyes beheld. It was more devastating than I anticipated, seeing the streets, homes, property and businesses of people I had known, as a boy and a man, utterly wiped out. It was too much — the tears began swelling in my eyes." — *N8AC*

"On the fifth day after the flood, a bulldozer was clearing a street. The driver found a bassinet high in a tree. The baby is fine." — *WA3GAL*

Johnstown, PA, was destroyed by an avalanche of water — in 1889. It happened again in 1936. With a series of earthen dams built to control the water flow in the hilly terrain surrounding Johnstown, the local populace felt certain that another flood would be unlikely.

On Tuesday, July 19, 1977, the National Weather Service issued a weather warning that a severe thunderstorm line was moving southward through Western Pennsylvania. Flash-flood warnings were issued at 7:30 P.M. for Butler, Clarion, Cambria, Jefferson, Clearfield, Armstrong and Indiana Counties.

"It began that evening, around 9 P.M. The rain started. The lightning built in intensity, a bolt here, a bolt there. Lightning was all over, fusing into a single bolt, causing tremendous damage. Red brick homes and buildings were seared white by the intense heat.

"The rains continued, the rivers and creek beds slowly started rising and the velocity of the flow increased. The water began running in torrential rivers from the hillsides, merging with water from the rivers. The velocity increased, so did the destruction.

"Trees were uprooted, so were telephone poles. Finally, as the velocity of the water approached 70 mph, automobiles were swept away, piling into each other, into homes, telephone poles. The force of the water began undercutting streets, sidewalks, homes and highways, dropping off into 15- to 20-foot chasms. Homes crashed into each other and the automobiles continued to pile up. Nearly a foot of rain had fallen in an eight-hour period. A state of emergency was declared, the National Guard moved in and the city was placed under martial law.

"A call went out for amateurs with 2-meter equipment." — *N8AC*

At 12:30 A.M., July 20, assistant E WB3COR activated the ARES net o WR3ACS, Johnstown 34/94. RACES sta tion WC3AAO was activated from th Cambria County Courthouse.

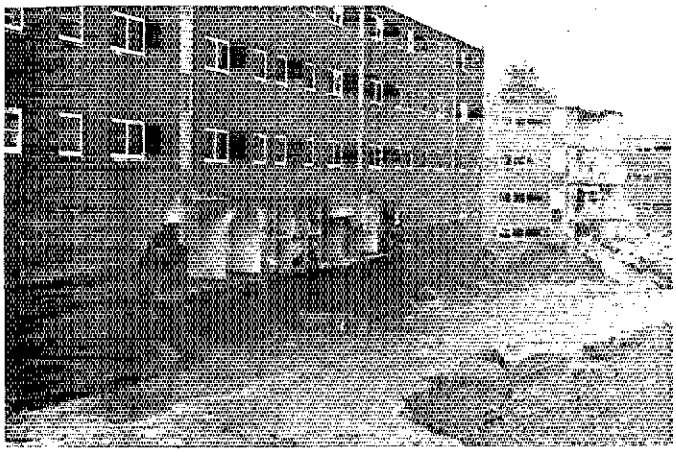
In the early hours of the morning, th Laurel Ruth Dam in Tanneryville, PA burst. The town was virtually carrie away down the Conemaugh River. Su vivors were found in trees and on top o houses. Some were found still alive, cling ing to debris many miles downstream. Th dead were found later, buried along th banks of many streams.

At 11:30 A.M., the mayor o Johnstown issued the first press release t the general public, concerning the exten of known damage and lives lost.

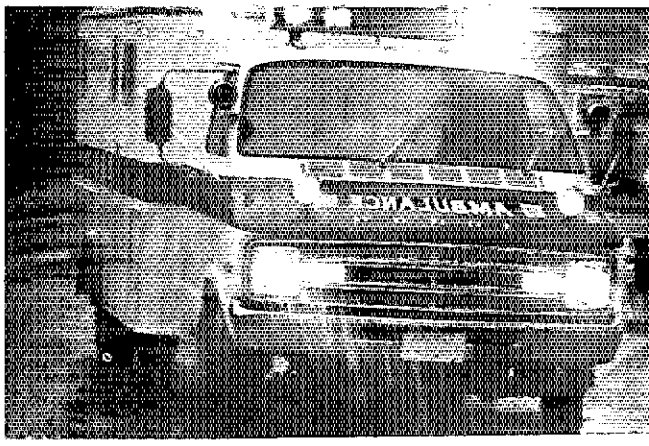
"We were standing in all kinds of mu and muck and everything else, right in th center of town. There was a man with bullhorn, giving orders to National Guar personnel and police. We found out late he was Mayor Pfuel of Johnstown. . . The mayor had us set up our radio equip ment on the hood of W8UIH's vehicl and started to make a list of the items tha were needed in the area. We set up ou

*SCM WPa, 359 McMahon Rd., N. Huntingdon, PA 15642
**Asst. Communications Mgr., ARRL

This devastated apartment complex in the city of Johnstown exemplifies the damage caused by flooding water throughout western Pennsylvania in July, 1977. (Johnstown Tribune-Democrat *photo*)



An ambulance, answering the emergency dispatches of amateur radio operators, fights its way through the maelstrom of the first night to rescue victims of nature's wrath.



communications with the mayor's command post, requesting such things as bulldozers, backhoes, water buffaloes (to provide drinking water), axes and chain saws. As the day progressed, we changed frequencies several times. I found that I had the unique advantage of having a handheld with a synthesizer on it. When we had interference problems, we could switch to another frequency. Thanks to ham radio, I was able to coordinate what the mayor's and the National Guard's needs were." — *K8HGY*

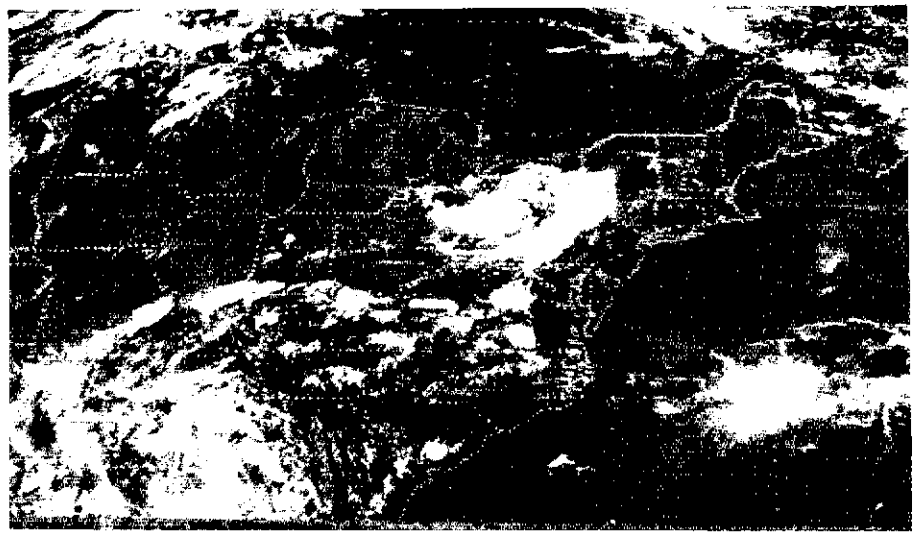
Operations

"The 34/94 Johnstown machine, WR3ACS, carried only emergency and disaster traffic to specific points in the city. Net control WC3AAO, at the Cambria County Courthouse, coordinated relief efforts with all services including National Guard, state government, police, fire, Red Cross, etc.

"WR3AIZ, 75/15, on Blue Knob Mountain, was a wide-coverage repeater which was used to coordinate relief efforts directly to stations in the Harrisburg, Pittsburgh and Washington, DC, areas. Through the efforts of K3RBH, the repeater was linked with WR3AEN, 25/85, for better coverage into Wilkes-Barre and Harrisburg. It also permitted the Central PA c.d. hq. to directly contact the lieutenant governor at Cambria County Airport. Back-up links to the Johnstown area for local usage were WR3ACM (01/61) and 52 direct.

"On the hf bands, 3993.5 was used exclusively for emergency traffic. Health-and-welfare traffic was handled on 3988 and 3972 kHz." — *W3TEF*

When WR3AIZ malfunctioned, Western PA Section Emergency Coordinator WA3VUP and his wife, WB3BOB, left for the repeater site hoping to make repairs. They determined that a lightning-induced power surge took out the low-voltage supply. WA3VUP notified W3BTX and K3IML via WR3ACM. They in turn journeyed to Blue Knob Mountain with the needed parts. And in the early hours of the emergency, the 34/94 repeater also went down. WA3CPH and WB3BUV fought their way to the site with gasoline for the emergency generator. WR3ACS returned to the air.



This satellite photo shows the storm entering northwestern Pennsylvania around noontime Tuesday, July 19. By 1700, the storm had completely covered the state. For some reason, its movement easterly ceased — with disastrous results.

All emergency supplies were arranged primarily through the RACES nets to transport the many essential pieces of equipment, medical supplies and personnel to the Johnstown area. WC3AAB at the Blair County Emergency Operations Center was active on three repeaters in addition to 3993. WC3AAO became the focal point of all incoming radio traffic and amateur operators.

W3TEF, Blair Co. EC, and his group set up communications with c.d. and National Guard, and obtained medical supplies and emergency power for several flooded hospitals. They even provided the governor with a monitor to listen to the traffic on the air via a link to WR3AIZ and WR3AEN. Cambria Co. EC N3WR and others got a station going from Johnstown's Memorial Hospital. By 9 P.M., July 20, the local operators were being ably assisted by hams arriving from the neighboring counties and states. Numerous command posts were established and manned by amateurs. These included survivor shelters, police/fire stations and surrounding towns that also suffered severe flood damage.

On the local traffic nets, only the priority and emergency messages were passed. Health-and-welfare messages from everywhere arrived via the National Traffic System through the WPa CW Net, the Pa Phone Net and the WPa RACES Net. EPa Phone Activities Manager WA3PZO organized a health-and-welfare net on 3988 kHz which handled over 3000 messages.

"Heavy and massive relief efforts were coordinated entirely by amateur nets on 2 and 75. The national and local news media singled out amateur radio as the key link to this whole effort of relief and cleanup." — *W3TEF*

Walt Disney's "The Rescuers" was the feature at a downtown Johnstown theater, while outside, real-life rescuers worked around-the-clock to bring relief to the stricken city. *(WA3RKM photo)*

Amateurs manned numerous command posts such as this at Conemaugh Valley Memorial Hospital. Over 400 amateurs assisted the community during and following the rampaging flood.

It would be impossible to calculate the number of lives and human suffering alleviated by the vital communications supplied by hams. What kinds of traffic did they handle? They made it possible for doctors, nurses, paramedics and medicine to be sent where they were needed. They arranged for food and clothing to reach flood victims. Cleanup supplies and volunteer workers were dispatched to the proper locations. The hams themselves arrived in the area as volunteers to assist in any way possible. No single individual can be commended since so many hundreds sacrificed time from their families and jobs to help. Many operators spent long hours at their rigs with no sleep. Truly the amateur operators were the eyes, ears and mouthpiece for the area during the first days after the flood.

"Teenagers from the neighborhood made a colorful, bedsheet sign — HAM RADIO. This was erected to mark the location of the emergency communications center available to flood victims. It didn't take long for people to catch on . . . Hams found themselves so busy that they often forgot (or were unable) to eat or sleep. A shower was rare and a word back home a real treat. Elvis Presley agreed to give a concert in order to boost morale. Unfortunately, he was unable to visi Johnstown, Pennsylvania due to hi death." — *K3SEW*

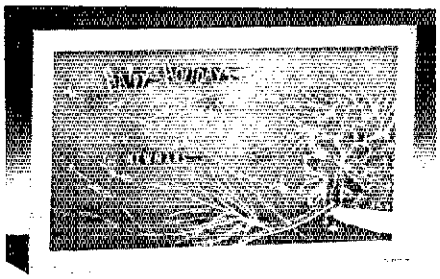
The extent of the devastation on July 2 left 73 confirmed dead, 15 missing, 50,00 displaced, 2000 dwellings destroyed, 330 automobiles lost and over $250 million i damaged dreams.

More than 400 amateurs assisted th community during and after the chaos. I is impossible to recognize all those wh took part, but the flood and its aftermat exemplified the amateur spirit; that is, t serve in the public interest under the mos adverse conditions.

Strays

MAKE YOUR OWN GREETING CARDS

☐ An unusual idea for greeting cards, awards, plaques and nameplates has been worked up by WBØEPB, LeRoy Newman. Using a photographic process, he transfers India-ink drawings from posterboard to pc boards. He developed the process to fill the need for a distinctive "Senior Award" for the Centennial (CO) 10/10 Chapter. A retired electronics teacher, LeRoy now gives demonstrations on his technique to interested students and amateurs.



Just one of a wide variety of distinctive designs from the creative mind of LeRoy Newman.

A special pc-board design he worked up for the 1976 ARRL National Convention in Denver.

KM1CC TO MARK MARCONI ANNIVERSARY

☐ This month marks the 75th anniversary of the first two-way radio telegraph transmission between the United States and Europe by Guglielmo Marconi. To celebrate Marconi's achievement, special-events station KM1CC will be operating from the original Marconi station location on the shores of South Wellfleet, MA, during the week of January 14-22. The FCC has granted special approval for the use of A2 emission on all amateur bands and the distinctive sound of the 240-Hz Marconi Rotary Spark Gap 1903 station "CC" will be reproduced for cw contacts.

Operation will be on 160-10 meters on cw, ssb, RTTY and SSTV; 2-meter fm and 6-meter ssb are also planned by the sponsoring organization, the Town of Barnstable Radio Club. The Cornish Radio Club will operate station GB3MSA (Marconi's 75th Anniversary) from Poldhu, England, and the Irish Radio Transmitters Society will operate from Clifden, Ireland, under an EIØ call. Stateside stations should QSL via W1 Bureau or W1GAY.

All you old-time brasspounders, here's the chance to relive the spark gap days, and work one of the last U.S. special-event calls. And all of you newcomers to the hobby, catch a glimpse back to the way it was for our pioneering radio forefathers.

For further information, write c/o K1VV, RFD No. 1, 14 Pine St., Sandwich, MA 02563.

ICC WATCH ON SHIPPERS

☐ Are you planning to ship an exciter, linear or other "boat anchors" hither and yon? Be aware of recent good news from the Interstate Commerce Commission concerning delivery charges that some companies were assessing in addition to the shipping fee. The September 19, 1977 issue of *Consumer News* reports:

"Trucking companies are prohibite from charging higher rates to consume than to businesses, the result of new rule recently enacted by the Interstate Com merce Commission.

"A two-year, industry-wide investiga tion has found that nearly all carriers wer assessing charges for pickup and deliver to private homes, churches, schools an other nonbusiness locations. In some in stances such charges were found to b higher than the transportation charge themselves.

"The new rules also require carriers t make arrangements with nonbusines receivers for a mutually agreeable delivery time." — *W4API*

More than 100 messages were originated as part of an amateur radio demonstration for delegates attending the recent National Association of Counties' annual conference in Detroit, MI. Using equipment furnished by Heath, members of the Wayne County Amateu Radio Public Service Corps operated W8MRM (Motor City Radio Club) from the exhibit hall during the three-day event. W8SS is at the mic

It's Been Quite a Year

The League moved full-speed ahead on WARC preparations, increased services to its members and answered FCC proposals that would adversely affect the Amateur Radio Service. By any standard, 1977 was a year to remember!

By W. Dale Clift,* WA3NLO

Like toppling dominoes, FCC budget problems in 1977 set off a number of actions striking in turn the Amateur Radio Service.

Underbudgeted in the face of the phenomenal growth in citizens band use, the FCC shouldered its first crisis January 1st: no income from license fees. The U.S. Court of Appeals for the District of Columbia ordered suspension of all fees until the Commission could justify each fee assessment on the basis of the cost in processing each license. An overworked FCC began to look for ways to relieve its workload, and started a long, hard look at the Amateur Radio Service. Some of these economy moves benefited amateur radio; some did not.

Effective March 3, the FCC stopped issuing licenses for special-event and secondary stations. Then it drafted a Notice of Proposed Rule Making which, if adopted, would wipe out these licenses. The moratorium continued into 1978.

The Big News Was Deregulation

Looking at the Amateur Radio Service's record of self-policing, the FCC proposed relaxed licensing requirements for repeaters, control stations and auxiliary links. It also suggested easing logging requirements. The ARRL agreed with the Commission's desire to eliminate separate licensing for auxiliary and control stations, but opposed cutting out separate licenses and distinctive "WR" call signs for repeaters. The League agreed with the proposal to allow portable and mobile auxiliary-link operation.

The *Federal Register* published a major deregulation order September 30. This Report and Order (Docket 21033) relaxed some of the rules, but it contained several unpleasant surprises. The League objected strenuously to the creation of a new repeater subband (144.5-145.5 MHz) because interested parties had no time to study and comment on the ramifications of such action. It also asked the Commission to reconsider its Order eliminating separate repeater licenses, and distinctive "WR" prefixes, and making the 420- to 450-MHz band, except for 435-438 MHz, available for repeater operation. The League expressed special concern that vhf/uhf weak-signal work, particularly satellite work, be better protected.

The League's comments struck a sensitive nerve, as the FCC rescinded its Order only hours after it went into effect. WIAW carried the news that the Commission delayed implementation of *all* new repeater regulations to reconsider parts of its Order. It continued to freeze applications for new repeater, auxiliary-link and control stations, but processed modifications and renewals of these stations.

"Interim BF"

In other action during 1977, the FCC instituted "Instant Upgrading." Effective March 1, licensed amateurs passing higher class exams could immediately use their new privileges. Happiness radiated from radio amateurs signing "interim BF" or "interim LB," and so on, after their calls to signify their newly earned privileges. "BF," incidentally, indicates that the FCC's *Buffalo* office authorized the new privileges. "LB" designates the FCC's *Long Beach* office.

Also in March, the FCC changed the name of the Amateur and Citizens Division to the Personal Radio Division. Many radio amateurs growled at being lumped together with citizens band, but the change was in name only. The Division's duties remained the same.

On August 18, the FCC eliminated the sending test in international Morse code from Commission-administered amateur examinations. This step was a further attempt by the Commission to lessen its workload. According to the Commission, experience shows that a person able to receive code at the required speed can also send at that speed. However, it continued to require separate sending and receiving tests for Novice applicants.

Class E CB Falls on Its Face

Amateur radio breathed a sigh of relief on October 13. That day, the FCC dropped the proposal for Class E CB on 220 MHz. For over four years, the League battled this proposal to take at least 1 MHz of amateur frequencies. Many amateurs doubted the League could stop this juggernaut. But after the FCC considered the evidence, it dismissed the largest threat to 220 MHz.

Will There Be Amateur Radio in the Year 2000?

The future of amateur radio depends on favorable treatment at the 1979 World Administrative Radio Conference (WARC-79). Because the FCC will represent all U.S. interests at the conference, the year began with a flurry of activity in response to the Commission's "Third Notice of Inquiry (NOI) of Docket 20271." The docket began to sort out conflicts among U.S. radio spectrum users to serve as a guide toward the FCC's position at WARC-79. The League also replied to the fourth and fifth NOI's with comprehensive arguments justifying amateur radio and its need for further band expansion.

Regular travel to IARU member-societies around the world is a vital part of our concerted effort to prepare for the 1979 World Administrative Radio Conference. Shown here are ARRL Vice President/IARU Vice President Victor C. Clark, W4KFC (extreme left), and ARRL Vice President/IARU President Noel B. Eaton, VE3CJ (third from left) with officers of the Central Radio Club in Moscow. The CRC is the national amateur radio society representing the amateurs of the USSR.

*Membership Services Assistant, ARRL

At every opportunity the League represented amateur radio in WARC-79 preparation. This included full participation in the Advisory Committee for Amateur Radio (ACAR), one of the Commission's own Service Working Groups. Any U.S. citizen could attend and express his viewpoint at ACAR. Up to nine League representatives attended ACAR meetings. Though ACAR and ARRL worked in close cooperation, separate filings of comments provided greater impact on the FCC's preparation for WARC-79.

Like every nation, the United States and Canada will have only one vote each at WARC-79. The League's job of safeguarding amateur radio did not end with convincing the FCC and DOC of the value and necessity of amateur radio. Many countries which will influence the future of amateur radio by their votes at WARC are unaware of the value of amateur radio, especially in time of emergency. Many countries have either no amateur radio or only a few radio amateur pioneers.

Nations with organized amateur radio societies recognize two needs: coordination of efforts between societies, and fostering amateur radio in lesser-developed countries. The League and the amateur radio societies of other nations say the International Amateur Radio Union (IARU) is the best means of formulating an internationally coordinated effort at WARC. The ARRL Board of Directors called for maximum assistance by ARRL to the WARC preparatory efforts of the IARU and its regional organizations.

Representatives from amateur radio societies in France, England, Sri Lanka, Hungary and Italy visited Newington for workshops on WARC. League personnel traveled to Europe, Asia, Africa, and Central and South America. Radio amateur leaders around the world continued to work toward an important goal: a strong, unified amateur radio voice coming from all corners of the globe.

Our Image — Setting the Record Straight

On April 4, syndicated columnist Jack Anderson reported that amateur radio operators were receiving special treatment by the FCC. He also reported that the ARRL was behind an effort to thwart the radio spectrum needs of over 10 million citizens band operators. Letters and phone calls began to flood the offices of the ARRL's Public Information Office.

At first it looked as if amateur radio was going to get a black eye simply because hams were defending their frequencies; but hundreds of amateurs responded to the Anderson column in their local newspapers. The Public Information Office supplied materials to help them present accurately the amateur radio picture. Approximately 300 people earned special Certificates of Merit for responding to the Anderson column.

Bobbie Chamalian, WB1ADL, ARRL's public information specialist, explained amateur radio to the famed TV news anchorman Walter Cronkite during a recent trip to CBS headquarters in New York.

The Anderson column episode drove home a point to many amateurs: How the public perceives amateur radio *is important*. More members had contact with the Public Information Office. For example, Field Day participants getting publicity shot up from 250 in 1976 to over 1200 in 1977.

The Public Information Office also began compiling a list of hams in the media. These leads and contacts resulted in numerous printed articles and radio and TV appearances by League personnel. By year-end, Hollywood stars Dick Van Dyke and Bob Hope had promoted the amateur radio cause on over 700 U.S. and Canadian radio stations. TV public service announcements pictured the key role amateur radio played by saving lives and property during last summer's California fires. Over 200 television stations ran these spots, filmed during the actual disaster. These projects began a concerted effort by the League to present a clear picture of amateur radio to the public.

Services

The League compiled new, free *Repeater Directories* and *Net Directories* for the membership. It also unveiled several new publications: *Learning to Work with Integrated Circuits, OSCAR from the Ground Up, Solid-State Design,* and new editions of *Understanding Amateur Radio* and *The Radio Amateur's License Manual.* Technical information requests skyrocketed, and more members made use of free Operating Aids. The mailroom rushed message forms, W1AW schedules, Countries Lists, and dozens of other items to thousands of League members.

New Novices benefited from the work of ARRL's newest department: Club and Training. C & T expanded its vigorous educational programs to help all prospective amateurs and present amateurs. A new instructor resource manual helped teachers with courses for the General class. C & T supplied nearly 2700 instructors with educational materials and six issues of the "Instructor Newsletter," while greeting new licensees at their mailboxes with "New Ham News." "Radio Club News" went to nearly 1900 ARRL-affiliated clubs in addition to all registered instructors.

C & T's "OSCAR in the Classroom" helped educators mesmerize kindergartners and graduate students alike. This newsletter introduced over 1600 educators to amateur radio satellites. Many teachers and professors discovered OSCAR a help in teaching physics, geometry and other subjects used for orbital calculations.

OSCAR 6 died near the end of the year after more than four years of faithful service, but OSCAR 7 surpassed its own three-year design lifetime in November. Problems with the launch vehicle for the new A-O D caused a delay in lift-off, but preparations continued for a launch in early 1978. Plans called for the League to take over the administrative and licensing duties for OSCAR 8, as it will be called once in orbit, to allow AMSAT to concentrate on development of the new Phase III satellite.

To better serve individuals and dealers who order publications and supplies, the Circulation Department computerized certificate processing and other operations. It added additional staff to handle the shipping of over one-half million League publications, other than *QST*, during the first nine months of 1977.

W1AW barreled in on code practice and bulletin listeners thanks to a bequeathment by Ralph P. Thetreau, W8FX, to the League. The money bought two Telrex 20-meter four-element Yagis installed at 60 and 120 feet with a 3-element, 40-meter Yagi in the middle at 90 feet, complete with a Rohn 65 tower, two sets of guy wires and tons of concrete.

Not all amateurs were able to put up antenna towers, however, as many ran into legal obstacles to antenna construction. Zoning restrictions and restrictive covenants caused an increase in the number of requests for the ARRL Legal Kit. The ARRL Board of Directors also donated $5000 to the Personal Communications Foundation (PCF), which will provide information and research tips to lawyers defending radio amateurs.

The Future

December *QST* heralded a breakthrough in voice communications. Called narrow-band voice modulation (NBVM), it compresses voice transmissions radically without sacrificing intelligibility. It is cheap, efficient and effective. Radio amateurs have again pioneered a scientific breakthrough affecting history.

1977 brought new rules and regulations, technological advances and improved world preparation for WARC-79. We now look to 1978.

A Brand-New OSCAR

Part 1: The eighth OSCAR is on its way. If you've used previous amateur satellites, you're ready for OSCAR 8. If you haven't, this series of articles will get you there.

By Joel P. Kleinman,* WA1ZUY

When the latest in the OSCAR series of amateur spacecraft is thrust into earth orbit in March, amateur radio operators across the globe will have a new means of communicating. AMSAT-OSCAR D (to be called A-O 8 after launch) will be a relay station for vhf and uhf signals with a maximum range of 2000 miles (3200 km).

But it will do far more. Like its predecessors, OSCAR 8 will be the focus of a wide range of experiments that will expand the practical uses of amateur spacecraft. It will also serve the educational program that introduces thousands of persons to the fascination of space communication via amateur spacecraft.

Why launch a new OSCAR now? A brief look at the past will put A-O D into perspective.

A-O 6: A Smashing Success

Like a larger-than-life sports hero or movie star, AMSAT-OSCAR 6 could seemingly do no wrong during its 56-month lifespan. It astonished even its builders by remaining active for more than three-and-a-half years beyond its design lifetime, far outshining the commercial satellite it was launched with in October, 1972.

By doing just about everything its users asked of it, OSCAR 6 established standards that future amateur satellites will be measured against. For example, the relay of medical data, just one of a wide range of successful experiments run through OSCAR 6, proved conclusively that amateur satellites can play a major role in disaster relief.

Now silent, the tiny bird will be remembered as perhaps the most successful amateur satellite to date. Although AMSAT-OSCAR 7 remains very much alive and well, its 2-to-10-meter (Mode A) transponder never matched the performance of its predecessor.

A-O D: Between Past and Future

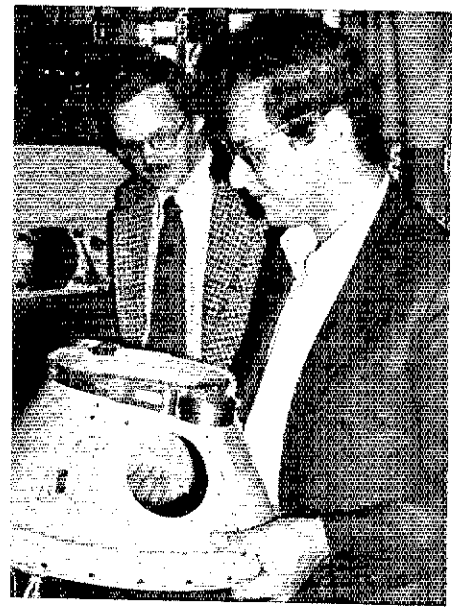
Enter a new amateur spacecraft, which will serve the worldwide amateur community as an interim satellite until the first Phase III elliptical-orbit satellite flies late next year. Now scheduled for launch in early March from the NASA Western Test Range at Lompoc, CA, A-O D will be a secondary payload with two other satellites. It will be injected into a sun-synchronous, polar orbit that will bring it over the same place on earth at the same time each day. The new amateur satellite will orbit the earth at an altitude of approximately 560 statute miles (versus 910 miles for A-O 6 and A-O 7). Thus, tracking A-O D will differ somewhat from past OSCARs.

AMSAT-OSCAR 8 will contain two linear transponders as does A-O 7. Passband frequencies and telemetry frequencies can be found in Table 1.

The 2-to-10 transponder (Mode A) will be almost identical to the one aboard OSCAR 7. A brand new Mode J transponder, developed in Tokyo by the Japan Amateur Satellite Association (JAMSAT), will translate 145-MHz uplink signals onto a 435 MHz downlink.

Six-channel telemetry beacons will transmit coded data on vital spacecraft functions such as battery voltage and temperature. Each transponder will have a beacon.

Although final details have not been worked out, the operating schedule of the two transponders will favor Mode A, since it is expected to operate with a positive power budget (it will generate more power than it uses). This transponder will also be used for live demonstrations during the week as part of the ARRL OSCAR Educational Program. The Mode J transponder is expected to be



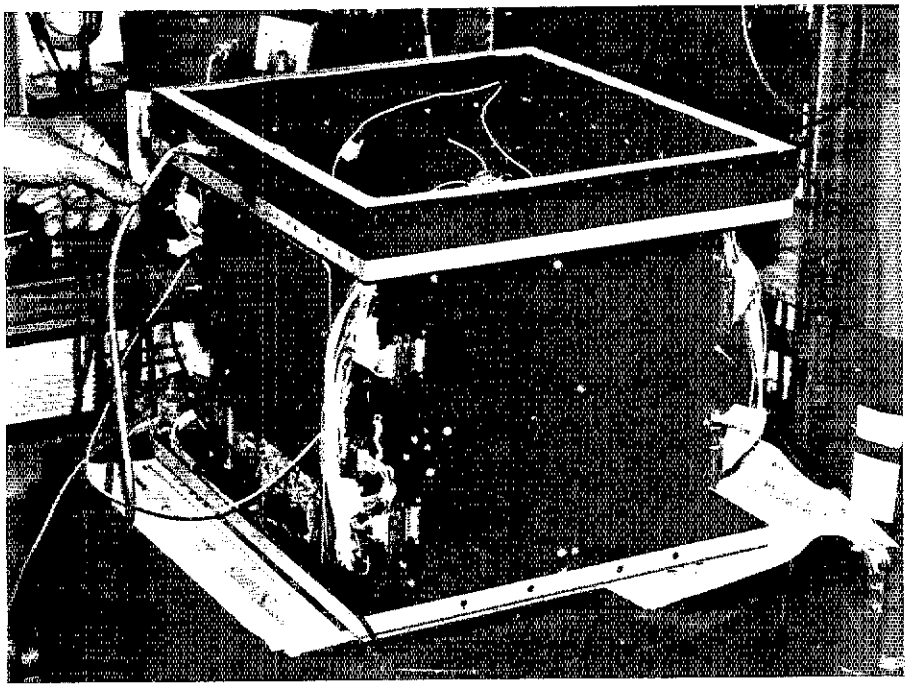
With AMSAT Vice President for Operations Rich Zwirko, K1HTV, in the background, AMSAT President Perry Klein, W3PK inspects one of the most vital of the thousands of parts that go into an OSCAR — the connecting collar. The cone-shaped collar will connect the tiny satellite to its launch vehicle. *(WB2CHO photo)*

What If I'm a Beginner?

Although the amateur satellites are available to all who want to tune them in, many people have resisted the temptation to get involved with space communications.

If you'd like to learn just how easy it is to set up your own OSCAR ground station, get your hands on a copy of the ARRL's new satellite booklet, *Getting to Know OSCAR — from the Ground Up.* It covers everything the beginner needs to know about equipment, tracking and operating through AMSAT-OSCAR 7, A-O D and the Soviet RS amateur spacecraft expected to be launched soon. It's available from ARRL hq. for $3 postpaid in the U.S. ($3.50 elsewhere) or from your favorite amateur supply outlet.

*Features Editor, *QST*



Resting comfortably atop *The Washington Post* sports section, the newest OSCAR undergoes final tests. In this photo, taken in the basement workshop of veteran satellite builder Dick Daniels, WA4DGU, the output from the new Mode J transponder is being checked. Lacking the sophisticated facilities and equipment enjoyed by those who build commercial satellites, AMSAT volunteers provide much of the labor and facilities that bring an amateur satellite into existence. Much of the testing of OSCAR 8, for example, was done in the crowded apartment office of AMSAT President Perry Klein, W3PK. To work on a new OSCAR, you must be a talented builder — and have a spare room in which to do your building! (*WB2CHO photo*)

Table 1
OSCAR 8's Vital Statistics

Size: 15-inch cube
Weight: approximately 60 lbs.
Orbit: 560-mile, circular, polar orbit. Period: 103 minutes; inclination, 99 degrees [These are design specifications. Precise information available from ARRL and on AMSAT nets after launch — Ed.]
Transponders: Mode A — 145.85 to 145.95 MHz uplink passband; 29.4- to 29.5-MHz downlink; power output, 1 to 2 watts PEP, telemetry beacon, 29.402 MHz. Mode J — 145.9 to 146 MHz uplink; 435.1 to 435.2 MHz downlink (inverted); power output, 1 to 2 watts PEP; telemetry beacon, 435.095 MHz.
Antennas: Modes A and J uplink — circularly polarized. Mode A downlink — dipole, linearly polarized; Mode J downlink — monopole, linearly polarized.
Power system: solar cells and rechargeable, 12-cell, 6 ampere-hour, NiCad battery.
Telemetry: 6 channels, transmitted sequentially in Morse code at 20 wpm. Parameters include total solar array current, battery charge/discharge, battery voltage and temperature, and rf power output for Mode J.
Mission: To provide an instructional tool by using A-O D to illustrate physical concepts in classrooms; various communications experiments to show feasibility of amateur spacecraft for emergency and public service communications; reliable and predictable access to remote areas regardless of propagation.

operational during weekends, although not continuously. UTC Wednesdays will be reserved for experiments.

The new satellite's major task will be to replace OSCAR 6 for the Educational Program that brings live demonstrations of amateur communication via satellite to classrooms across the U.S. and Canada. Under this program, the ARRL distributes free curriculum material to teachers and brings together interested educators and volunteer amateurs who can demonstrate use of the spacecraft. For more information, see "OSCAR Goes to Schools," *QST* for December, 1976, or write the ARRL OSCAR Educational Program Manager.

Aside from the Educational Program, the newest OSCAR will be the subject of experiments that will enhance the potential of low-orbit satellites for emergency communications and other practical applications. Among those planned for A-O D are (1) using small-terminal, vhf equipment to communicate up to 2000 miles (3200 km) through a low-altitude satellite, regardless of propagation conditions; (2) providing back-up emergency communications; (3) relaying medical data such as electrocardiograms from the scene of a disaster to a hospital; (4) providing data on satellite signal propagation to mobile terminals in aircraft, ships, automobiles, and even motorcycles and bicycles; (5) continuing to test the feasibility of direct satellite-to-home voice broadcasts using simple antennas and receiving equipment; and (6) testing the operation of the new 145- to 435-MHz Mode J Japanese transponder and a new version of the command encoder that allows the satellite to be controlled from ground stations.

Future issues of *QST* and the AMSAT Newsletter will contain further information about these experiments. Have an idea for an experiment? AMSAT, Box 27, Washington, DC 20044, would like to know about it.

Tuning in OSCAR 8

How do you hear or transmit through the latest amateur spacecraft? Pretty much the same way you heard or transmitted through A-O 7.

If you'd like to eavesdrop on the 10-meter downlink, all you'll need is a receiver covering the upper part of that band and a simple half-wave dipole antenna. Each arm should be about eight feet long. Even a simple longwire hung outside your window will probably do the trick. If your receiver lacks sensitivity on the upper part of the 28-MHz band, use a preamp such as that manufactured by Janel Laboratories or Hamtronics, Inc.[1]

Transmitting on 2 meters to access the Mode A transponder is accomplished with equipment ranging from the inexpensive Ameco TX-62 cw/a-m transmitter (no longer manufactured, but available used) to any of the multi-mode, 2-mete transceivers that have recently becom popular.

Another possibility is the Heath SB-50 2-meter transverter. In general, just abou any rig that puts out a signal on th 2-meter band can be used for satellit work. Two good possibilities for 2-mete uplink antennas are a turnstile or a slightl tilted vertical.

Remember: Aside from special uses, th only modes of transmission through th OSCARs are ssb and cw. Erp (effectiv radiated power) should be kept below 10 watts.

The new Mode J transponder can b used with a 2-meter transmitter/uhf con verter combination. Although much uh equipment is available for 432 MHz, may be a bit more difficult to find th 435-MHz receive converters required fo

New Bandplan Announced by AMSAT

A new bandplan applicable to all amateur satellites, present and future, has been announced by AMSAT. Based on the downlink passband, it will standardize the modes of operating through all the satellites.

The lower third of the downlink passband is to be reserved for cw operation, while the upper third should be used for ssb. The center third of the passband is reserved for mixed-mode and experimental emissions (cleared beforehand with AMSAT). Please stay off the beacon frequencies, which must be monitored continuously.

[1]Footnotes appear on page 57.

Mode J. But more vhf equipment is sure to become available as the new satellite gains popularity.

A good-quality uhf receive converter covering 435-437 MHz is available from Hamtronics, Inc., either as a kit or wired and tested. It is best used with a preamp, also available in kit or wired form. A similar converter and preamp are sold by Janel Laboratories in wired and tested form. Other receive converters are manufactured by England's Microwave Modules. Its products are imported to the U.S. by Texas RF Distributors.[2]

Several manufacturers produce beam antennas suitable for receiving 435 MHz. KLM, for example, offers a 14-element beam that covers frequencies between 420 and 470 MHz, and a 27-element antenna for 420 to 450 MHz. The narrow beamwidth of these antennas makes it necessary to use an aiming device for both altitude and elevation, however. An omnidirectional turnstile can be used instead.

A word about antenna polarization. As shown in Table 1, the satellite's uplink (receive) antennas are circularly polarized so that Mode A users in the Northern Hemisphere should transmit left-hand circular polarization, and Mode J users should use right-hand circular polarization on their uplink antennas. The polarization is reversed for Southern Hemisphere users.

Part 2 of this series will cover all you need to know about tracking the new OSCAR — and the Soviet RS spacecraft expected to be launched soon. QST

Footnotes

[1]Janel Laboratories, 3312 S. E. VanBuren Blvd., Corvallis, OR 97330; Hamtronics, Inc., 182 Belmont Rd., Rochester, NY 14612.
[2]Texas RF Distributors, 4800 West 34th St., Suite D12A, Houston, TX 77092.

Strays

ENTER THE FIRST ANNUAL ARRL PHOTO CONTEST

☐ There's no doubt about it — lots of hams are also amateur photographers. And lots of hams are contesters. We've come up with a way to combine the two pursuits — the First Annual ARRL Photo Contest. It's a way to compete for prizes and perhaps gain notoriety on the hallowed pages of *QST* or other League publications. Here's how it works:

1) Categories — Photos should fall into one of six subject areas: (a) *Operating events,* including special displays at malls and museums, contests and Field Day; (b) *Portraits* of amateurs, preferably with an amateur radio theme; we're especially looking for portraits of boys and girls who are hams and women amateurs; (c) *Equipment,* including towers, gear, accessories and antennas; (d) *Public service and emergency activities,* including SET, walk-a-thons, and so on; (e) *Overseas amateur activity,* including WARC preparation, IARU activities and pertinent activities of foreign amateur societies; and (f) *Unusual modes of operating* an amateur radio station. (We'll leave that one up to your imagination.)

Note: The contest will be split into "amateur" and "professional," since it wouldn't be fair to pit one type of photographer against the other.

2) Prizes — The top three photographs in each category will be awarded ribbons. In addition, Blue Ribbon (first place) winners will receive a hardbound copy of the 1978 *ARRL Radio Amateur's Handbook.*

3) Publication — Unfortunately, there can be no guarantee that any of the photos sent to us will find their way into *QST* or another ARRL publication. Which ones eventually are published depends entirely on their suitability for the particular space we need to fill.

4) Type of photos — Black-and-white prints, as well as color prints and slides will be acceptable. Since color can be used only on the cover of *QST,* there is less chance that these entries will be published, however.

5) Conditions — All photographs and slides submitted must be the property of the entrant. In addition, the entrant must agree to assign exclusive copyright privileges to the ARRL. The photographs or slides should not have been submitted or published elsewhere.

6) All prints must be accompanied by their negatives. Those that are submitted without negatives cannot be considered for the contest.

7) There is no limit to the number of entries or the number of categories entered. Each entry requires a separate official entry form (or clear photocopy) — see below.

8) How to enter — Just send for your official entry form. Address your request for forms to ARRL Photo Contest, 225 Main St., Newington, CT 06111. Please enclose a self-addressed, stamped envelope.

9) Complete instructions and rules are included on the entry form. Remember: Each entry requires a separate entry form, so be sure to indicate the number you'll need. Clear photocopies are acceptable, should you decide to enter more photographs later. You must include the negative to be considered for the contest.

10) Photographs and slides will be judged by a panel of Hq. staff members. Winning photographs will be unusual without being over-artistic. Keep in mind that many people see published photographs; they should have a wide appeal to the amateur radio community. For prints, use glossy paper. Try to combine photographic excellence with artistic merit. Photos should be at least 4 × 6 inches, but any size up to and including 8 × 10 inches is acceptable.

Oh, yes. The deadline for submitting entries in the 1978 ARRL Photo Contest is March 15, 1978.

HELP A KID USE OSCAR

☐ Your local schools, AMSAT and the OSCAR Education Program need your help! If you are interested in assisting a local reacher to bring the excitement of OSCAR into the classroom — weather it's a two-way or receive-only demonstration, a brief explanatory talk or a showing of the videotape "OSCAR and the Ham" — let us know. In return for your invaluable service the ARRL will send you a complimentary copy of the 1977 *Radio Amateur's Handbook.* It's much easier than you think — and you can be sure that the ARRL will support you in every way possible. For details, contact Steve Place, WB1EYI, OSCAR Educational Program Manager, ARRL, Newington, CT 06111.

ARTHUR C. CLARKE BECOMES AMSAT NO. 2001

☐ Long before the design and launch of communication satellites became technically feasible, their potential was pointed out by Arthur C. Clarke. In a letter published in the February, 1945, issue of *Wireless World,* he even predicted geosynchronous satellites, although he saw them as "a possibility of the more remote future — perhaps half a century ahead." In recognition of his far-thinking, creative contribution, Clarke recently was made honorary Life Member no. 2001 in AMSAT. — *WA3LND*

Feedback

☐ The photo caption on page 48, *QST* for November, incorrectly identified WR2AHU as the repeater of the Broadcast Employees Amateur Radio Club. WR2AHU is in fact operated by MAARC, Manhattan Avenue of the Americas Radio Club.

☐ No connection exists between the National Company, of Malden, MA, and the Japanese company of the same name, as was implied in *QST* for December, 1977, page 13.

My Amateur Radio Demonstration

Though of different generations, Dave Vitkus and Jan Shillington came up with the same idea recently — to show youngsters what amateur radio is all about. Their experiences provide lessons all amateurs can learn.

By David Vitkus*, WB9RXV

It was Tuesday, the 14th of December, and we found ourselves on the Knox Junior High School roof during lunch break. Leonard Maryons (an eighth-grade friend) and I were assembling an end-fed hertz. We had permission from the principal to be on the roof, but the principal hadn't told the teacher who was patrolling the school grounds.

When he saw us, he didn't seem too happy about having two students several feet above the ground, one on the TV tower and the other on the roof. He was proceeding to give us 10 "whacks" each when we met Mr. Slavens, the teacher who had asked us to give the amateur radio demonstration in his seventh-grade classroom the next day. We were excused — this time.

When I got home that day, I disassembled my station (Hammarlund HX-50, Heath HR-10B and Transmatch). Not too practical for a demonstration, but it was all I had.

No CBers Today

The next morning, with all our equipment loaded in the car, we got to the classroom and began to set up. There were about 20 spectators expecting me to turn it on and talk to the local CBers. At noon I tested it out and had an SWR of 12:1. What could be wrong? I normally have a maximum SWR of 1.1:1. Those of you who think it was not grounded are wrong!

We tested the transmitter again the following day — and didn't make a single contact before school. I still didn't make a contact after the first class arrived, although the SWR did improve to 7:1. The students were sitting there yawning, listening to me saying "Hello CQ CQ CQ 40," over and over. Finally, I gave up and played a recording of a couple of my old contacts. One special tape was the conversation I had with a young YL, WA1YJF, in New England. This proved there are younger — and female — hams. I also played a recording of a contact with WA5SWT in Texas because he came in so clearly — better than most CBers a mile away!

The second hour was not the least bit better. I did discover that when I gave the SWR meter a good "whap" the meter would indicate 1:1, so I started investigating. The third hour of the disaster, I mean demonstration, arrived. I took the cables apart and found that the coaxial cable from the SWR meter to the transmatch was shorted, so I removed the SWR meter completely. I fired her up, tuned for dip and started: "Hello, CQ — CQ." Everybody stared and listened.

Like Music to His Ears

Then I heard it! "WB9RXV/9 Whiskey Bravo . . ." It was like music to my ears! I QSO'd and let a couple of students say hello. They seemed quite excited, and so was I!

Fourth hour was terrible. I had planned for weeks, made lists, received supplies. But there was one thing I had overlooked — the nearly 500 fluorescent lights in the school. They put a nice 20-dB S9 signal into my rig with the automatic noise limiter on. (Anyone who contacted WB9RXV on December 16, 1976, and was told that you were difficult to copy, it wasn't your signal that was failing. For me to even have heard you, you would have needed a nice S9 signal!)

Having recently upgraded to General, Dave enjoys operating Schwinn mobile.

Fifth hour was not bad at all, because there wasn't any class.

The next hour was about the best. The students didn't stop asking questions long enough for me to make a contact until I finally did break in and made one. I asked someone to say hello to the OM I was

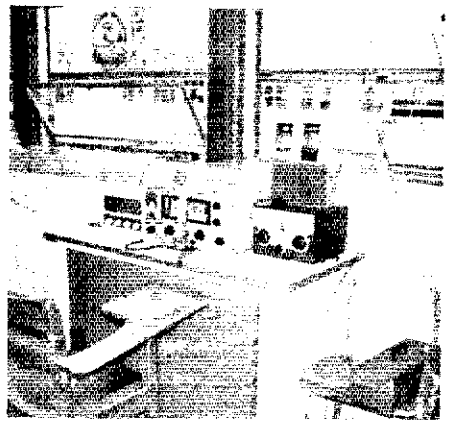
*8066 Wicker, St. John, IN 46373

QSOing with, and 90 percent of the class got up. There were at least 25 "hellos." Seventh hour was the last class; everybody was waiting to go home and I was waiting to fall into bed and go to sleep! The bell rang and the school day was over.

Mr. Slavens Gave a Test

It was quite tiring putting on a demonstration for 200 students in the seventh grade at Knox Junior High, but quite a challenge too. The science teacher, Mr. Slavens, really helped out. The day before the demonstration he had each class read through PR material on amateur radio and even gave a test on the difference between amateur radio and CB. The demonstration was presented as a portion of their study of electronics.

It was very rewarding, for both amateur radio and myself. Each student now knows there is a difference between amateur radio and CB, and that there is a form of radiocommunication that can operate through satellites, use TV, Morse code and teleprinter — and bring conversations from all over the world to their doorstep.



The station I brought to Knox Junior High. It's not fancy, but then again you don't want to give the impression that amateur radio is for millionaires only! *(WB9RXV photo)*

One of the eighth graders in Mr. Slavens' science class tries his hand at the mic. That's Mr. Slavens at the rear. *(WB9RXV photo)*

Want to Do What They Did?

It doesn't take much to bring your hobby to a group of appreciative school children (or scouts, Y groups, or whatever). A little advanced planning will go a long way toward making your demonstration a memorable one.

1) If you're in school yourself, make sure you're caught up or even ahead in your homework.

2) Let the ARRL Club and Training Department know about your demonstration a few weeks in advance. They'll be glad to send you posters, lists of nearby Novice classes, address pads to be used to send for further information and introductory material. It's free for the asking.

3) Beforehand, help the teacher learn something about amateur radio.

4) Bring along tools and extra cable.

5) Invite the local newspaper reporter to stop by.

6) Set up the station the day before so you can test it and make sure you have the bugs out of it for portable operation.

7) Try to find a youngster in the school who is an experienced ham (or bring along a photo of one) to show the students that we all aren't, literally, Old Men!

8) Fluorescent lights and venetian blinds will often play havoc with incoming ham signals in a classroom. Avoid metal buildings, too, unless you can somehow get your antenna above it.

9) Bring along a key and oscillator. The kids will remember pounding out their names in code for a long time.

10) Invite the ones who show the most interest to your shack.

11) Odds are the teacher will be as impressed as the kids. Try to set up a follow-up demonstration, perhaps using OSCAR. Write the ARRL for details. — *WB9RXV and WA1STO*

The Great Idea

By Janice Shillington,* N9YL

Giving a ham radio demonstration at your child's or grandchild's grammar school class (or that of your nephew or niece or neighbor) isn't only a good idea — it's a fun way to spend an afternoon.

"That's not for me," you say? "They're too young to understand amateur radio." Perhaps they are, but they are certainly not too young to be exposed to the wonders of ham radio. I have written proof (see illustration). You see, I have done it myself, two years in a row, for my daughter's second- and third-grade classes.

Like their students, many teachers do not know much about amateur radio; they seem, as most people do, to group it with CB, thinking of "radio as radio." The kids (seven years old and up) in Karen's classes really enjoyed having a guest speaker and getting out of regular school work — but they were also fascinated! Amateur radio has all sorts of educational applications (science and geography are two of the most obvious). The best way to learn is often when knowledge kind of

Pictured in the shack she shares with husband Tom, WB9OKL, Janice Shillington is an Extra Class ham with a penchant for spreading word about her hobby. She recently demonstrated amateur gear on a Chicago children's program, "The Ray Rayner Show." *(WB9OKL photo)*

*49 Jacobsen Ave., Glendale Heights, IL 60137

sneaks up on you before you realize that you are learning!

As I briefly explained how signals bounce off the ionosphere and how you can talk around the world, my QSL cards were circulated with much interest. I also brought a code-practice oscillator and key to demonstrate the Morse code (boy, did they love that!). At the end of the demonstration I let each child dit-dah his own name. They even voluntarily stayed after school to try their names on my key.

The children went home and lost little time in educating their parents about amateur radio. Many of them still come up to me and say, "Hi, Mrs. Shillington, do you remember that talk you gave? I do."

So don't hide the "light" of amateur radio under a basket or in a ham shack. Volunteer your services — to neighborhood schools, Boy Scout and Girl Scout troops, the local Y — or any place that kids congregate. I'm sure you all know of a place where you as an amateur radio operator could educate little (or big) ones. You'll plant a seed in a mind and who knows what benefits all of us will reap from it.

Get up, go out, and talk. They'll love it! And you will too.

Thank You for Coming

What kind of reception can you expect from a group of fidgety seven year olds hooked on television? If Janice Shillington's daughter's class is at all typical, it will be a day to remember for all concerned. A few of the comments she received on large pieces of lined paper:

"Thanks for for coming I Enjoyed it was cool. I like it very much."

"Thank you for comeing in our class I like the radio it was neato"

"You can rilly communicate."

"I realy liked it. I thought that amateur radio can only go to Indiana no farther."

"I liked the radio. And I like to push the thing that go bep bep bep bep."

"I bet that all the boys and girls plus me liked the radio."

"Thank you for showing your hobby and what a Morse Code is."

"Thank you for sowing ous the radio. I lick the morse Cods."

And finally: "Dear Mom: I really like the morsecode. It was so fun. Thank you for comming. Love Karen."

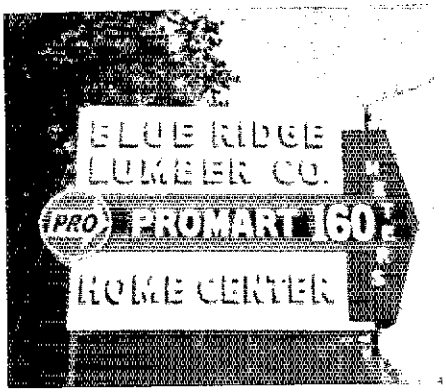
Dear Mrs. Shillington
Thank you for comeing
to are class.
I like the pickchers.
And I like you.
From
Eddie D.

Strays

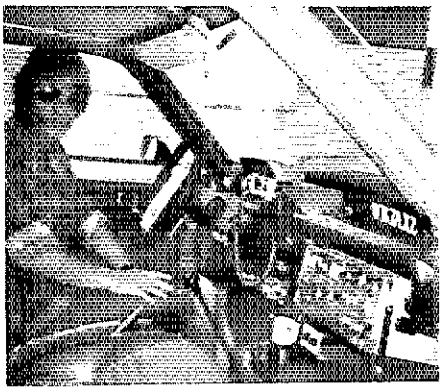
I would like to get in touch with . . .

☐ science fiction readers for on-air discussions. Try around 7253 kHz evenings or 14,310 kHz weekends. Neil Preston, WBØDQW, 7024 Bales, Kansas City, MO 64132.

☐ another SWL or ham, OM or YL, also in twenties, to exchange correspondence in English. Vladimer Radev, P. O. Box 18, 1504 Sofia-4, Bulgaria.



This sign on Rte. 94 in Blairstown, NJ, seems to give a clue about the activity of the company's manager, WB2PSK. — *W2CHI*



Brian, WB7AXZ, of Heyburn, ID, carries two vhf as well as one hf transceiver in his Japanese subcompact auto.

The John Wells family of Rochester, NY, has a rather unique QSL card. John, WA2BAF, wife Sue, WA2EKQ and daughter Kelley, WB2LRY, color in the appropriate squares with a felt-tip marker and list vital statistics on the back.

7 ACROSS _____

28 ACROSS _____

1 DOWN _____

72 DOWN _____

ARS: _____

OPER: _____

ADR: _____

Moved and Seconded...

MINUTES OF EXECUTIVE COMMITTEE MEETING
No. 366
November 20, 1977

Pursuant to due notice, the Executive Committee of the American Radio Relay League, Inc., met at 2:08 P.M. on November 20, 1977, at the Headquarters offices of the League in Newington, Connecticut. Present: President Harry J. Dannals, W2HD, in the Chair; First Vice President Victor C. Clark, W4KFC; Directors Max Arnold, W4WHN, Richard A. Egbert, W8ETU, Ron Hesler, VE1SH, and Robert B. Thurston, W7PGY; and General Manager Richard L. Baldwin, W1RU. Also present were General Counsel Robert M. Booth, Jr., W3PS; Directors Charles M. Cotterell, WØSIN, J. A. Gmelin, W6ZRJ, Harry A. McConaghy, W3SW, L. Phil Wicker, W4ACY and Stan Zak, K2SJO; Vice Director Edmond A. Metzger, W9PRN; and Assistant General Managers David Sumner, K1ZZ and Robert M. Myers, W1XT.

On motion of Mr. Hesler, the Committee recognized the names of 135 individuals who had recently been elected to Life Membership, and instructed the General Manager to list their names in *QST*.

On motion of Mr. Thurston, the following convention dates were approved: Alabama State, May 13-14, 1978; Wisconsin State, May 20, 1978; and West Virginia State, July 1-2, 1978; and changes of date were approved for the Great Lakes Division, to April 8, 1978; and Midwest Division, to October 19-21, 1979.

On motion of Mr. Thurston, the Committee approved the affiliation with the League of the following amateur radio societies: Ashland Area Amateur Radio Club, Ashland, OH; Briarpatch Mt. Amateur Radio Club, Woodlawn, VA; Brush Country Amateur Radio Society, Pleasanton, TX; Capitol Hill Amateur Radio Society, Washington, DC; Central Illinois DX and Contest Club, Trivoli, IL; Clinch Valley Amateur Radio Club, St. Paul, VA; Don Bosco Tech. High School Radio Club, Boston, MA; Federal Brass Pounders ARC, Warren, MI; Flagstaff Jr. High School, ARC, Flagstaff, AZ; George S. Ladd Pioneer Radio Club, San Francisco, CA; Grande Ronde Radio Amateurs, La Grande, OR; Greers Ferry Lake Amateur Radio Society, Heber Springs, AR; Grundy Ground Waves, Big Rock, VA; I.M.A. Radio Club, Bloomfield, IA; Keowee-Toxaway Amateur Radio Club, Seneca, SC; Lake Erie Amateur Radio Association, Inc., Lakewood, OH; Lakeview High School Amateur Radio Club, Battle Creek, MI; Lincoln-Way High School Amateur Radio Club, New Lenox, IL; "MARC" Morongo Basin Amateur Radio Club, Twentynine Palms, CA; Marcos de Niza High School Amateur Radio Club, Tempe, AZ; Oneonta Amateur Radio Club, Oneonta, NY; Opelousas Area Amateur Radio Club, Opelousas, LA; Orange County Communicators Club, Orange, CA; Orillia Amateur Radio Club, ON; Ozark Mountain Amateur Radio Club, Springfield, MO; Parsons Area Amateur Radio Club, Parsons, KS; Polk County Civil Defense Amateur Communications Society, Bartow, FL; Queens County Amateur Radio Club, Mill Village, NS; River City Amateur Radio Communications Society, Sacramento, CA; Siouxland Amateur Radio Club, Sioux City, IA; Society of Physics Students at Wittenbert Univ., Springfield, OH; Student Electrical Engineers Amateur Radio Club, Columbus, OH; Telephone Employees Amateur Radio Assoc. of NJ, Newark, NJ; Thatuna Amateur Radio Club, Moscow, ID; Valley Stream Amateur Radio Club, Valley Stream, NY; Walker County Amateur Radio Club, Jasper, AL; West Alabama Amateur Radio Society, Demopolis, AL; West Louisiana Amateur Radio Society, DeRidder, LA.

After a discussion by the General Manager on the requirements of the Employees Retirement Income Security Act of 1974, and the work that has been done in modifying the staff pension plan to meet those legal requirements, on motion of Mr. Arnold the following enabling motion was VOTED unanimously:

1) That the Amendment to the American Radio Relay League, Incorporated Pension Plan and the Amendment to the American Radio Relay League Pension Trust Agreement, heretofore considered and discussed be, and the same hereby are, adopted with such changes as may be required by the Treasury Department in order to meet the requirements of Section 401 of the Internal Revenue Code, such Amendments to be effective as of the first day of June, 1976, and that the President of the Corporation be, and he hereby is, authorized and instructed to execute said Amendments for and on behalf of the Corporation.

2) That the Corporation be, and it hereby is, designated as the Plan Administrator in accordance with the provisions of Article XIII of said Pension Plan.

3)To authorize an officer of the Corporation, on behalf of the Corporation, to execute a Power of Attorney to John H. Riege, Raymond J. Payne, William R. Judy, James C. Ervin, Jr. and/or Andrew J. Howat, permitting any of them to deal with the Treasury Department in connection with the obtaining of approval of said Plan and Trust.

The General Manager presented the Communications Manager's plan for changes in the Communications Department appointment structure and, after extensive discussion, approval was VOTED unanimously. (Full details on the restructuring will be published separately in *QST*.)

After a report by General Counsel Booth on the status of court cases involving interference and zoning problems of radio amateurs, it was moved by Mr. Thurston and VOTED unanimously that the General Manager, with the advice and recommendation of the General Counsel, is authorized to use the unallocated funds which were the subject of Minute 60 of the Board of Directors meeting held in Denver, CO, in July, 1976, to assist in defraying the expenses of such cases.

On motion of Mr. Baldwin, VOTED unanimously to appropriate an additional $1000 for the expenses of the Management & Finance Committee for 1977.

After discussion, on motion of Mr. Arnold, VOTED unanimously that the General Counsel request the Federal Communications Commission to modify the stay of the effective date of the new or amended rules concerning repeaters adopted by the Report and Order in Docket 21033, published in the Federal Register of September 30, 1977, to make the stay applicable only to (a) the elimination of WR prefix call signs for repeaters, (b) the elimination of separate licenses for repeaters, and (c) the expansion of the frequency bands available for repeater operation, as originally intended.

After discussion, on motion of Mr. Clark, VOTED unanimously that the Federal Communications Commission be requested to hear oral argument in Dockets 21033 and 21135.

Mr. Hesler presented a check for $1150 from the 1977 National Convention Committee, to be used for WARC-79 preparation. (Applause) The Secretary was directed to address an appropriate letter of appreciation to the Scarborough Amateur Radio Club.

During the course of the meeting the Committee discussed, without formal action, the following matters: the League's third-quarter financial position, the ARRL Code of Ethics, the use of the League name by tour organizers, appointments of acting SCMs, the conviction of two amateurs in Louisiana for obscenity and interference to a repeater, the suit by K6AU against certain West Coast amateurs, the Marconi 75th anniversary operation by KM1CC in January and League support thereof, and the application of the autopatch guidelines to certain situations.

President Dannals announced that the next meeting of the Executive Committee would be held at 2:00 P.M. on Wednesday, January 18, 1978, at the Headquarters offices of the League.

There being no further business, the Committee adjourned at 6:05 P.M.

Respectfully submitted,
Richard L. Baldwin, W1RU
Secretary

The Executive Committee acknowledges the following Life Members who have been elected between June 5, 1977 and November 17, 1977.

List No. 1

Charles E. Adams, W4WMZ; Emmet P. Algiers, W9HR; John P. Anderson, W9TRC; Robert G. Arndt, WA9IAT; John Arquero, W9TTI; Paul James Azar, Jr., K5UYL; Claude S. Baker, K9PGW; Don O. Barber, WBØLPK; Martin K. Barrack, WB4JUK; Paul O. Behrends, W4OLS; David Bennett, WB8YZE; Wilfred J. Bertelt, W6SAL; Marvin M. Boetcher, WA9UXP; John W. Booker, K4DOH; Richard A. Borchilo, WA3MCH; Emil Borovac, Jr., WBØEVT; David G. Boyd, WA9GBW; Frank L. Bretz, Jr., K7EBE; Edward R. Briner, WA3TVG; James M. Bruton, W4CHU; Roy C. Buser, WB8KQI; Jonathan F. Bushnell, Jr., K2RN; Percival C. Buzza, VE1AOS; John Mike Campbell, WA1YDJ; Richard L. Cariello; Thomas E. Carr, WB5KXT; Garry Dean Cartwright, WAØHNW; Robert Caudill, WA8GPB; William R. Chandler, WB8BMU; Frank Charlton; Alan M. Christman, WD8CBJ; Dale F. Clausen, WBØOTE; Jim R. Cochran, WB5JCV; David W. Cogar, WA8QZO; Daniel W. Colburn, WB6BJT; Joseph W. Connery, Jr., WA1ZVA; Stanley O. Coutant, WB6WFI; Frederick L. Covell, WA1ZIC; Anthony R. Curtis, K3RXK/W8TIZ; David H. Curtis, WB4KTQ; Robert C. Cutter, WAØYED; Paul H. Danish, WB2BLD; C. Conrad Darby III, WA3SSB/WB4DSI; Donald M. Dasher, W4PVW; John S. Davis, WB4KOH; William T. Davis, VE7ACJ;James R. Dea; Kenneth L. Dean, WA4APE; William A. Duncan, Jr.; Joe D. Edge, WA4KYI; Edward C. Eichler, WBØBCB; Andrew R. Ellis, WB6QVW;William H. Ellis, WØNXY; Stewart Emery, WA7VOT; Donald Erickson; Felix L. Ferranto, N6IE; Julian Frank Fields, Jr., WA4CKY; Todd A. Fonstad, K9LWV; William C. Frost, WA4UFT; Keith H. Gilbertson, WBØLXM; John F. Gillen, Jr., WA2CWT; Palmer K. Glunt, WB3AFL; Walter M. Goddard, Jr., W2FPN; Maurice L. Goldberg, WA1TMN; Maxwell B. Goslen, W4RWL; Leo J. Graham, K4KFM; Chrispus D. Grant, W8JTR; Gary L. Grebus, K8LT; Ronald Greene, WA2PCY; Charles M. Guschke, WB5SKE; B. Juanita Harris, K9VIP; Lance S. Haserot, K6LWS; Frederick G. Hawley, WAØVSS; Glenn L. Hayes, WB6LZK; M. M. Hemphill, WA4KEM; Dan H. Howard, VE3BIR; Virgil Alden Howard, W4HVT; Willis J. Howard, WA4HDU; William B. Hutchinson, W7EX; Larry S. Jacobs, WA7ZBO; Charles B. Johnson, Jr., WA4ECG; Norman D. Johnson, WØAMJ; Eugene F. Jolly, WA2ISH; Ole Jorgensen, WA5IPS; Stephen A. Karkos, K1VUE/WA1IUP; Michael D. Kersenbrock, WB4IOJ; Stanley M. Kimel, WB6BIS; Dennis A. King, W6ROL; Nick G. Lash, K9KLR; Robert L. Lhota, WØPTI; Harmon P. Ligon, K5SJA; Fred Linxweiler, WD8BAE; Herman N. Lofdahl, W7PTO; Kenneth A. Machtley, W3CGA; George F. Mancini, WA1UBD; George T. Martin, Jr., KV4FR/WB8OEZ; John S. Mason, Jr., WB2UPA/TG9ML; Rodney D. McCabe, WB2SXH; Danny O. McCarty, WA5KRP; Asa C. McCollum, WA3RCL; James L. McCoy, K5GCE; James McFadden, WB3CZJ; Richard L. McKenna, WA9FUD; Rudolf Messerer, DK9SZ; Leonard W. Molberg, WAØDFW; Robert J. Morefield, WA6FTN; Robert Dean Morrison, WØTT; Mario Muollo, WA2WII; William Myerson, WA1QON; Carl E. Nay, K8VQG; Gene A. Nurkka, WØIHW; J. M. Oesterreich, WA4BMW; Richard N. Olson, K9BWI; Edward R. Paris, Jr., WA4AAV; Edgar Howard Parsley, W8ICO; Mary B. Patton, WB3BOB; Roger H. Pearson, WB5SIT; Edwin F. Pollok, WB5UOG; David Pomfret, K1DLM; James M. Price, Jr., WB6KXT; Jean A. Price, WA5JCQ; Wendell E. Pugh, WA3BKG; Bruno D. Puglia, W1ETF; Benjamin G. Raskob, W5PLK; David W. Reed, WA7QGI; Jack Reed, VE3GMT; Paul Reed, VE3BZO; Byron D. Richards, K7AII; George E. Richardson, WA7DXV; Claire Rosenbaum, W2KQL; Charles C. Rupp, W4HIY; Alexander H. Rydlewicz, WA1VUA; Peter L. Sajdak, WB8SEU; Stephen L. Sala, K7AWB; Werner Sandmayer, HE9HRS; Robert G. Schafer, WA7IHN; Elmer G. Schalles, K5YQX; Worthington Schenk, Jr., W2MSV; Wayne Schupbach, WAØUNE; Miles L. Shepherd, W7GYX; Wilbert W. Sidney, WB8IZN; Ron Sieloff; Kenneth W. Simpson, WB7DRD; Joseph T. Skopek, WA9UHA; Kenneth E. Smith, Jr., K5OAF; Paul A. Smith, VE3FAA; Wolcott M. Smith, WB4CGI; Mark Edward Speck, KØEJ; Randall A. Stegemeyer, W7HR; William Stidham; Leighton W. Stumpe, K6AZW; Takao Suzuki, JA3XXE; Richmond A. Sweet; Arthur J. Tanaka, WA6TKO; Johnny B. Thurmond, K4AKP; J. C. Tipton, W4FUB; Vincent W. Trotnick, Jr., WA3LBG; Lyle Dean Turner, WØMFV; Jim Vamplew, VE3CRV; B. H. Vejrosta, WA4FPK; Wayne O. Wallace, WØVPY; Richard S. Ward, N6BF; Elwood H. Weston, WA8YYL; Frank W. Widmann, WA2YSW; Douglas R. Wilson; Marvin J. Woodruff, WB6RAD; Carl H. Zimmerman, W3EEK; Linda A. Zimmerman, WB3BSV; Donald A. Zupon, W3MIF.

List No. 2

Ronald G. Adams, WB9EBR; John D. Adamson, W6RNU; J. C. Richard Alban, WB8QWR; Rolf Andersson, K8SL; Michael G. Ash, K1LHO; Loren F. Ashwood, W9DH; Paul Asplin, WA5HTL; Arthur A. Barbeau, WØIHO; Richard T. Behrendt, WØLJA; Kenneth Blanton, W5CBT; Conrad J. Boilard, WA1VCU; Joseph T. Bonfante, Sr., WA6MVW; Raymond F. Borelli, W9RKF; Bruce Y. Bouvier, W2RHE; Jack S. Brindle, WA4FIB; Thomas J.

Brion, WA1MHJ; William F. Bulchis, KL7IQM; Luke A. Burnham, WB1AJL; Steven F. Butler, WB4PFV; Michael D. Callaghan, WA6KPD; Robert W. Cambreleng, Jr., WA2USW; Ray Caringer, WAØIIK; William S. Carley, W3PCB; Richard A. Cassada, K1IAX; Harold M. Cassidy, K3OMX; John J. Champa, K8OCL; John C. Clark, Jr., WA1QWW; Charles R. Connors, K3FDJ; Marion W. Cornett, Jr., K4TYU; Robert C. Crews, K6JN; William F. Curtis, K3HAD; Michael John Cyran, WD6ALM; Leigh A. Damren, WB1EAE; Steve Daniel, WA4CTA; Patrick J. Dayshaw, WA7VNI; Albert G. Dick, W5HWP; Andrew S. Dlinn, WA2FFY; Martha S. Dray, WBØERI; Jerrold W. Drewett, K5MT; Marshall M. Dues; George C. Dunlap, K5MRT; R. G. E. Earl, VE7BQF; W. C. Eckenrode, W5SG; Eugene K. Eggebraten, W7GVF; S. David Eisenberg, WB2LQQ; Gordon R. Elliott, W6CIT; R. Kenneth Elliott, WAØOHR; George M. Erickson, W5POG; Paul G. Fargusson, WB9GBF; Michael Farrow, WA4IVP; A. Irving Fineberg, WB5MHE; Bernard J. Fineberg, WB5UGJ; Florence P. Fineberg, WB5MHF; Sheldon Fisher; Barry Fluxe, WB8LSV; Robert B. Foster, Jr., K5CQH; Richard E. Franklin, W2EUF; John J. Freeman, K3CBE; Bill Fullam, WB2KIM; James Anthony Galeski, WAØYFS; Arthur Philip Ganezer, WA6SQD; Evelyn D. Gauzens, W4WYR; Alan E. Gearing, WB2CJQ; George L. Geller, WB2GTC; Elwood O. Gilchrist, WA5SNL; Ralph Graf, WD4ACY; Joseph P. Grefer, WB8WWB; Joseph E. Griffis, WB5KRK; James R. Hain, WB2BXM; John D. Haller, WB6BEN; Keith B. Handyside, WA1UKF; James T. Hanlon, W8KGI; Richard A. Hann, WA4FDC; James C. Hansen, K5VVV; Kenneth A. Hanson, W6MRN; Jane E. Hardin, WB5JYN; Clement L. Harris, WB5VDL; Keith D. Harris, WB8OBR; Frederick R. Hartman, WA2PAD; Michael E. Hayes; Ramon L. Headstrom, W4RUJ; M. Lynwood Heighes, Jr., WA3RRK; Ronald A. Heisler, WB2OVT; Lee H. Hilborne, WB6EPS; Ralph A. Hileman, K6HD; Ralph G. Holberg III, N4RX; John H. Holman, Jr., W3INV; William Holt, W1BV; Phillip M. Horan, WA2IKO; Warren Howard Jr., WB7BNP; Edwin H. Howe, WA6TJW; Mark D. Huge, WBØPDI; Richard A. Hughes, W6CCD; F. Ross Hunt, Jr., WB5NEO; James E. Inacker, WB2BTX; Wayne K. Irwin, WA1RRZ; F. Bernard Jakab, VE6HE; Thomas G. James, WA2SPX; Anthony F. Japha, W2EUO; Samuel Jenkins, WB8UES; John Jensen, VE2BBK; Charles T. Johnson, N4TJ; Robert A. Johnson, W4CQJ; John D. Jones, WB8DEX; Morris Jones, N6DE; Cheryl R. Justice, WA7UMM; Charles M. Kahn, W2PR; James E. Kearman III, W1XZ; Lonnie J. Keller, WA2AOG; Robert E. Kelly; Robert W. Kembel, WBØKDQ; Darrel J. Kempf, WBØIIP; W. B. Kent, VE3HSK; John Kline, K9GN; James R. Koerner, K5DU; Drew W. Koontz, K8YFM; Robert L. Kuch, WA3TTN; John Byron Landress, W5IBE; John S. Larson, K6AUC; E. S. W. Leach, WA6WGZ; Michael G. Lee, K7GSG; Joel E. Lichtenstein, W8CQP; Ronald K. Long, W8GUS; Norris N. Loyd, WAØUCZ; Michael H. Mahlbacher, WA4UQA; Wallace S. Mansz, VE7HQ; Benjamin J. Martin, WB4YPZ; Robert J. Mattson, WB2AMI; Wilton M. McAllister, WB4PCS; Raymond C. McClimans, Jr., WB8AXM; Raymond H. McClure, W8CNL; Jess V. McCowin, WA7MLO; George H. McCright, Jr., KØLNQ; Norman H. McNew, WB9PCQ; Stephen Mendelsohn, WA2HDF; Charles R. Miller, WB7CLF; David H. Miller, WBØPIO; Keith Mobarry, WAØTXJ; Edwin M. Monsell, W2FAG; Charles W. Morgan, WB2TDH; Leon M. Morgan, N4LM; Ray L. Mote, Jr., W6RIC; Michael H. Mount, WA4UJE; Joe Muscanere, WA5HNK; Frank Mynahan, WA1DLW; Charles H. New, WBØPSM; William H. Nicholson, W4WZV; Douglas G. Noderer, W3FYV; Donald J. O'Connor, Jr., WA2VOM; Theodore O'Neal, WA7SXS; A. Lee Ott, Jr., WA4CNL; Hobart J. Paine, K7CC; Wayne R. Pauley, WBØRLN; John D. Pavao, WA1LPM; Michael Pawlowski, WA6DBA; Edward Pect, WB5RIX; Paul A. Philip, WB9AJV; James S. Piker, K5DIS; John E. Platt, W4QX; Larry Plummer, WA6HCH; Joe R. Poerschke, WB4HIS; Richard R. Pooley, W7HUY; James D. Pope, WB2QMP; Matthew J. Popecki, WA1SMG; Timothy R. Povlick, WA3INX; Robert B. Price, WA3BNF; Carlos H. Purtee, WB4JZF; John Radcliffe, WB5QHH; Herbert W. Raemsch, WAJHGT; Albert Lee Ray, W9SFY; Leon E. Rediske, K9CGF; James L. Reese, WB9YIL; John N. Reichert, Jr., N4RV; Mike Reininga, N9EA; John F. Rekus, WA3KBN; Robert L. Richardson, K4AMN; John L. Ricks, WØPKO; Jordan L. Ring, WA1HBP; Alfred B. Robson, Jr., KV4GR; I. David Rosenthal, WD4FIH; Donald A. Sabella, WA4WKZ; Ira J. Saber, N2IS; E. Joseph Sabo, WA7VSD; John F. Salony, WA3SRE; Donald E. Samek; Robert W. Schober, K2CRR; John Michael Scott, K2EM; John L. Shaffer, KØZUN; Gordon B. Short, W5UCJ; Wilbur L. Shriner, WB2NUK; Richard D. Simpson, W6NAL; Arthur J. Smith III, WB5AFH; Thomas Young Smith, WB4RGQ; William Phil Smith, WD4JMZ; Thomas L. Snowden, WA7OIJ; Jerry Sokolowski, W8MR; Sharon A. Stegemeyer, WB7DBP; Columbus Walton Stroud, WA4QOF; Melvyn Sulzburgh, W2NM; David F. Taylor, WB5PIO; William J. Taylor, W3VW; Kirk Lee Thomas, WBØIDY; James E. Thompson, Jr., W4THU; Robert W. Turner, WA5RPC; John J. Udvari, WB8VPA; John H. Vinson, WA4WLD; Peter A. Voelker, W3EGJ; James A. Walker, K3AFY; Carol Walsh; Richard H. Warren, Jr., N7RH; George R. Webster, W2CPT; R. L. Wentworth, WA6DCW; Darrell Wesley, WB4YPN; George B. West, WA2YWK; Carroll W. Westphall, KØHSC; John R. Whitaker, Jr., W5HEZ; Herschel L. Whiting, WA7IMC; Ying P. Williams, WB2MOR; Clarence E. Yockey, WB4CUQ; Bill L. Young, W7RVY; William Yushevich, Jr., WA1VMA; Dennis R. Zachary; Laurence D. Zimmer; Warren D. Zimmer, WA2DJM.

List No. 3

William D. Adams, WA4IAZ; Morgan W. Anderson; Benjamin C. Antanaitis, Jr., WB2RHM; Gerard M. Aubuchon, K1BBV; Jerry L. Bailey, WB8FBJ; W. Frazier Baldwin, Jr., W5UWU; John E. Banes, WA7YIG; George E. Bartges, W3ATJ; Alan J. Bateman, K9AYB; Leola Mae Beatty, K7GAT; Ned L. Beckstead, WA6UWW; Leonard Beecroft, VE6BFF; Scott Behnke, KL7IVQ; Laurel Bertolozzi, WB9VYY; Michael Best, WD4DUG; Laura F. Bingham, K9BZY; Melvin Bitterman, WA6WFM; Roy E. Blair, K4HGX; Robert B. Bose; Steven Brichta, WB9ZNL; Woodrow K. Brown, WB4DDR; Richard D. Burger, WB2SLZ; Norman W. Campbell, VE1AWR; Robert C. Cannon, W4IGO/W8MPR; Donald W. Carlson, WAØONK; Bruce E. Cinader, WB8UFH; Allen F. Collver, WA8LRC; Charles S. Compton, K4BQP; Richard P. Cook, WA4OUF; Barbara L. Cooke, WB5NVH; Ralph F. Covington, Sr., W7SK; Dennis J. Correia; Ronald F. Daniels, N6RR; William Davis, WB6UWB; C. Gordon Davison, W6SGI; James Day, WA3QED; Tillo Deforce, ON5KD; David J. Delonnay, WD8BHZ; Daniel M. Dibble, WBØSQT; Saul Dorin, WB4PFZ; Carmen C. Drogo, K1LKP; Robert England, W1VS; Robert W. Euler, WAØHUJ; Joe M. Fairlie, VE2DFJ; John C. Fandl, WA2FUZ; Gary L. Farley, WA6WBF; William A. Farman, WB9QBU; Linda Ferdinand, N2YL; Bruce L. Ferris, K4AWR; Arthur L. Flanner, WBØWRG; Ronald R. Freeman, WØLPZ; Alan Galin, N1AF; Robin F. Gallagher, WA4MJH; David W. Gent, W5QZ; E. Joan Gentry, WA6DXG; Roger E. Gentry, WB6DXH; Leone Goldberg, WB6AVP; Robert Gorman, WA1SCH; Erwin H. Grossman, KØLVO; Scott K. Hamilton, WA6MMB; Timothy M. Haniford, Jr., WB5PQP; Lloyd Harris; Mary Claire Harris, KL7IBC; Norman M. Hauk, VE8CS; Richard D. Henry, N7OA; Baxter W. Hogan, WA5AOB; James M. Homan, Jr., W4DPH; Fannie C. Huddleston, K4RXO; Edward M. Hurtack, Jr., WA2VWT; Clarence F. Klamm, Jr., W6PNK; Cyril Knudson, VE7CDL; Andrew A. Kuchis, Jr., WB5WJM; Perry R. Koenig, WB9JEI; Philip W. Krise, WA6WRS; Carlos C. Lane, WA4TNV; Charles Lariviere, VE6BEF; Victor Lee, WA6CBY; Gerald Licht, N2YY; Paul D. Lieb, KH6HME; Lionel O. Lincoln, WA4DBL; Donald M. MacDonald, VE7AKW; Robert S. McCaffrey, KØEJZ; Donna L. Menart, WB9ZBE; Moshe Michel, K2UB; James R. Miller, KZ5JM; Lawrence O. Montgomery, W9HWP; Martin A. Moran, WB8HGN; Ronald G. Morford, WBØBMC; John Morrice, WB6ITM; Jimmy D. Murray, WA4RQK; Edwin J. Narwid, WA2OAF; Richard C. Niemtzow, W5VQN; Fortunato Pellicano, WB2SUH; Marilyn Peterson, WB7EPR; Rae E. Petley, VE3RP; Kenneth W. Pineo, VE1BAK; John V. Pinkerton, K7ZSK; David E. Power, Jr., K9PHP; Barbara Race, WB8UWX; John J. Radigan III, WB8MMF; Edward J. Ramming, WB2IMU; Ronald Reynolds, WA6AEY; John L. Ricks, Jr., WB5VDE; Richard P. Rogers, WD8CXO; Donna K. Roop, WB9QIU; Arnauld F. Scafidi, WB3FGH; Edward H. Seeliger, Jr., WA5PWW; John M. Shea, VE5JS; James L. Skinner, WB6NVO; Diana Slabinski, WD8IYU; Frank E. C. Smith, VE7ALU; Kenneth Smolik, WA9APW; Jimmy R. Sorrells, WA9ABB; Mary B. Stanley, WAØKRB; Sonny Stires, WA6NLF; Donna M. Stock, WB6IDK; Daniel R. Streicher, WB2JXI; Thomas H. Strothman, W7LTM; Frances K. Sullivan; John L. Swartz, WA9AQN; Haruo Takahashi, JA1CG; Robert F. Taylor, W1DSG; William Taylor; Harry D. Thomas, WB2DCJ; Robert H. Todd, W8CN; David J. Tomaszek, WD4CBZ; Raymond J. Tompkins, WB6KIN; Edwin J. Walker, WB7OUG; Walter G. Walker, Jr., W4NRO; William Ward, KL7IFJ; John R. Weeks, Jr., WB8RTY; Daniel W. Welker, WB4SSP; Lloyd P. Williams, WA5PPA; Elsie C. Woodson, WD4IDU; Charles L. Xerri, WD8PBB.

Strays

CORNHUSKER DEFENSE — WAØZGY

"Tech's quarterback goes back to pass, readies . . . he's hit by a Cornhusker and fumbles! WAØZGY recovers for Nebraska!"

Well, the call sign may not have been in the sportscaster's play-by-play account, but during the 1976 Astro-Bluebonnet Bowl between the University of Nebraska and Texas Tech University, defensive end Reg Gast was right in there. And he is WAØZGY from Lincoln, NE. Now a senior in business administration, Reg has found the away games ideal for operation with his portable, 2-meter rig. For example, when the team played the University of Hawaii Rainbow Warriors in Aloha Stadium, he turned a few ears when he checked in on the Islands' linked, triple-repeater system.

When Reg was a 12 year old delivering papers, he heard some curious-sounding noises coming from the basement of one of his customers. That whetted his interest in amateur radio and within two years he had his Novice license. The General class ticket was earned at the age of 16. Ever since he has been active on the hf bands as well as 2 meters. More recently, WAØZGY has been a competitor in the Lincoln Amateur Radio Club's monthly transmitter hunts. For these, Reg has designed his own direction-finding antennas based on techniques he picks up as a part-time technician at the Hy-Gain electronics plant in Lincoln.

For yet more diversion, he is also a licensed pilot. That enabled him to work in the Simulated Emergency Test as an air-based, communications center to direct mobiles on the ground.

So if you've heard Reg Gast identified as part of a hot Cornhusker defense, you know who he really is. — *C. K. Walter, WØOYW*

A new way to string a longwire antenna? Perhaps not, but University of Nebraska defensive end Reg Gast is WAØZGY. *(photo courtesy of* Lincoln *(NE)* Journal*)*

Happenings

Conducted By Peter O'Dell,* WB8NAS

Radio Jammer Closed Down

The system does work! Two hams have pleaded guilty to broadcasting obscene, indecent and profane language, and to interfering with amateur radio communications. John R. Souvestre, K5NY and Keith M. Schexnayder, WB5AWN, were released on $2,000 personal appearance bonds pending sentencing after pleading guilty on November 2 in the U.S. District Court in New Orleans, LA.

Area amateurs were somewhat shocked because Souvestre and Schexnayder have been active on the local scene for years and up to this point appeared to be "pillars of the community." Souvestre holds an Amateur Extra Class and formerly served as SEC and Assistant SCM. He also holds a master's in EE from LSU and a "First 'Phone." Schnexnayder holds an Advanced class license and Second 'Phone commercial ticket. The FCC indicated that both the commercial and amateur licenses held by the men will be reviewed by the FCC in Washington for possible suspension or revocation.

Over a year ago the repeater users in the New Orleans area began to experience deliberate interference. The unidentified transmissions contained obscenities and the sound of a "laughing box." Initially, local efforts failed to locate the offenders; however, the local group (New Orleans VHF Club) documented the case as thoroughly as possible. The information was then presented to the local FCC office; Wes Staudch, W5VBX, past president of the New Orleans VHF Club, and Philip Spencer, W5LDH (an attorney at law), visited the U.S. Attorney for Eastern District of Louisiana and brought him up to date on the situation.

Behind a cloak of "bureaucratic indifference" the FCC quietly took measures to bring the situation to a halt. In late June the FCC brought one of its most sophisticated direction-finding units to the New Orleans area. Less than an hour after arriving in town and setting up operations, the jammers had been pinpointed and positively identified — and they weren't sitting still, either. Bob Bradley, K5EDV, of the FCC Office in New Orleans, indicated that the culprits were driving at a high rate of speed and in a manner apparently designed to avoid location by conventional direction-finding techniques. In other words, the FCC nabbed two individuals, technically competent beyond a shadow of doubt, who were using all their skills to avoid detection.

By the time that the FCC agents had finished their investigations, they had conclusive evidence of violations on eight different occasions. At this point the evidence was turned over to the U.S. Attorney to prepare the case against the two. Bradley indicated that this was the hardest part — knowing the identity of the culprits and knowing that the case was being prepared against them, yet pretending ignorance and indifference when discussing the situation with local amateurs. Months later, when an airtight case had been put together, legal action was taken. When confronted with the overwhelming evidence against them, both of the violators "caved in." Plea bargaining resulted in the two pleading guilty to three of the counts and the U.S. Attorney dropping the other five.

Even as we go to press, this same thing is happening in several other locations around the country. Obviously, until the legal matters are brought to head, we will not comment on them.

The message is clear: If you are suffering from deliberate interference, document your case as thoroughly as possible. Take your documented case to the authorities, both the FCC and the U.S. Attorney in your area. Then wait patiently. The FCC will pretend to be ignorant of and indifferent to the situation up until the minute that legal action is taken against the culprits. If you are one of the culprits, mend your ways and then pray that a well-dressed stranger does not come knocking at your door.

ELECTION RESULTS

The ballots are counted — the voters have chosen their divisional leaders for a two-year term commencing January 1, 1978, in the six ARRL divisions where balloting for director and vice director posts was held this past fall — Canadian, Atlantic, Delta, Great Lakes, Pacific and Southeastern. Ballot opening on November 21 took longer than in any previous election — a pleasant sort of problem brought on by ARRL's rapid growth and high interest by the membership!

There will be only one new face at the table when the Board of Directors meets this month; that of William J. Stevens, W6ZM, of San Jose, CA. The newly elected director from the Pacific Division gleaned 1446 votes to 1207 for Charles R. Breeding, K6UWR and 947 for Frederic N. Barry, K6RTU. Bill was first licensed in 1934 as W6LCF and has held the call W6ZM since 1968. He retired from classroom teaching last June after 35 years in secondary schools teaching electronics as well as serving as chairman of the Industrial Education Department. He is currently an independent educational consultant. At age 62, he is the holder of the Extra Class license; has held various offices in the SCCARA over the years and is a member of the QCWA.

Running mate Robert C. Smithwick, W6JZU, of Sunnyvale, CA, won election as the new vice director in the Pacific Division with 2092 votes to 1499 for J. Patrick Corrigan, KH6GQW. "Smitty," as he is known over the air, has been a practicing dentist for 34 years, specializing in dentistry for children and adolescents. He is 56, holds an Advanced class license and was first licensed in 1940. He is a director of MARCO, the Medical Amateur Radio Council and is a member of NCDX and SCCARA.

Jesse Bieberman, W3KT, of Malvern, PA, was reelected vice director in the Atlantic Division with 2790 votes to 1298 for Harold C. Smith, WA2KND, 1142 for L. Lynn Lamb, W3BWZ and 951 for Alan M. Maslin, W3DZI.

The Canadian Division picked Ron J. Hesler, VE1SH, for a second term as director, with 2050 votes over William R. Savage, VE6EO with 1034 votes.

Incumbent director Max Arnold, W4WHN, returns for another two-year term in the Delta Division, where he garnered 2490 votes to 773 for Malcolm P. Keown, W5RUB, the present vice director.

Replacing Mal in the second spot is Robert H. Dilworth, III, W4LQE, of Concord, TN. Bob is one of three new vice directors joining the "official family." He has been licensed since 1947, holds the Extra Class license and is a Life Member of ARRL as well as the QCWA. Bob's career has been in electronic engineering and engineering management. He presently is employed as Head, Management Services Section, Fusion Energy Division, Oak Ridge National Laboratory in Tennessee. He sits on the Board of The Nucleus, Inc., Oak Ridge, TN and Testline Instruments, Inc., Titusville, FL. Bob is a former radio officer with the Knox County Civil Defense, holds an FCC First Class Commercial license and is a member of the Tennessee Repeater Advisory Committee. To win election he rang up 1733 votes against 796 for William E. Mixon, K5SYD and 714 for Robert P. Schmidt, W5GHP.

Richard A. Egbert, W8ETU, was successful in his bid for re-election as director of the Great Lakes Division. Dick received 3322 votes to 2001 for Leonard M. Nathanson, W8RC.

George H. Goldstone, W8AP, is the new vice director from the Great Lakes Diviston; he received 2782 votes to 1392 for Joseph E. Miller, K4DZM and 1154 for Paul P. Kluwe, W8SOP/KP6BD. (The incumbent, Bill Clauson, W8IMI, withdrew as a candidate.) George is 60; lives in Bloomfield Hills, Michigan; is an attorney-at-law and senior partner in the law firm of Goldstone & Ott. He has been an assistant director in the division continuously since his first appointment in 1955. On the amateur scene, these accomplishments: director, past president, past vice-president, past secretary, past treasurer and trustee, W8ZZ, Detroit Amateur Radio Association; past editor, D.A.R.A. *Bulletin*; past president, Detroit Area Amateur Radio Council; member, Detroit Area Repeater Team, Great Lakes Repeater Association, and Amateur Radio News Service. He is a member of QCWA, a Life Member of ARRL and was first licensed in 1934 as W8MGQ. His wife, Bea, is W8MMB.

*Public Information Officer, ARRL

Larry E. Price, W4RA/W4DQD, will again lead the Southeastern Division. He received 3786 votes to 1014 for Ted R. Wayne, WB4CBP, in his bid for re-election in that division.

Bev B. Cavender, W4ZD, who tallied 2160 votes to 1996 for Evelyn D. Gauzens, W4WYR and 621 for David Novoa, KP4AM, will carry on as vice director of the division for another two-year term.

This column, in the November issue of *QST*, reported the re-election (without membership balloting as they were the only candidates nominated by the members of the respective divisions) of the following: directors — Harry A. McConaghy, W3SW, of Atlantic; Garfield A. Anderson, KØGA, of Dakota; Paul Grauer, WØFIR, of Midwest; and vice directors — William W. Loucks, VE3AR, of Canadian; Tod A. Olson, WØIYP, of Dakota; and Claire Richard Dyas, WØJCP of Midwest.

Do you have any suggestions for programs and policies that as members you would like to see discussed and enacted by the Board of Directors? Now is the time to write to your division director (names and addresses are on page 8 of this issue), as they will assemble for their first 1978 meeting in Hartford on January 20 to hear reports and take actions necessary for the continued good of amateur radio and the League. — *WB1FSN*

NEW REPEATER RULES POSTPONED

In this column for November, 1977, and in "Washington Mailbox" for December, 1977, we discussed new repeater rules which were scheduled to go into effect at midnight, November 4, 1977. Those rules would have

1) Eliminated separate licenses for repeater, auxiliary-link and control stations.

2) Permitted operations now conducted by such stations to be carried on by other amateur radio stations.

3) Made 144.5-145.5 MHz available for repeater operation.

4) Made all amateur frequencies above 220 MHz (except 435-438 MHz) available for repeater and auxiliary operation.

5) Authorized auxiliary operation from control points in portable and mobile operation.

6) Deleted the monitoring/recording requirements for open, automatically controlled repeaters.

7) Revised slightly the logging requirements for remotely controlled stations.

In response to a petition for stay filed by the ARRL, the FCC has delayed implementation of the new rules pending action on petitions of reconsideration filed by the League and several other parties. The League pointed out in its petition for reconsideration that the FCC did not give "adequate notice" of its intentions to eliminate completely the "WR" prefix for repeater stations, or to open up new subbands for use by repeater stations. Specifically, in the original Notice of Proposed Rulemaking, the FCC said, "Stations presently assigned such call signs ('WR') would be permitted to retain them indefinitely. A licensee wishing to engage in repeater operation and wishing to obtain a 'WR' call sign would be required to request that prefix." In the Report and Order, the FCC eliminated the "WR" prefix entirely.

In addition, the NPRM invited comments on the proposal to make "all frequencies allocated to the Amateur Radio Service, except 435-438 MHz," available for repeater and auxiliary operation. Alternatives, such as additional subbands, were not mentioned. The League, in its original comments, did *not* oppose additional repeater subbands per se, but asked that the subject be incorporated in a separate rulemaking proceeding so that all parties concerned would be given adequate notice and opportunity for participation.

To prevent a deluge of applications for repeater stations, the FCC is continuing its "freeze" on accepting applications for *new* repeater, control and auxiliary stations. However, existing repeater, control and auxiliary station licenses may be modified and renewed.

A final note: It is true that the FCC's action in response to the League's request for stay in Docket 21033 postpones the adoption of the entire docket, including the less controversial matters not addressed in the ARRL's petition for reconsideration. However, on November 20, 1977, the League's Executive Committee voted to request the FCC to modify the stay so as to make it applicable only to (1) the elimination of WR prefix call signs for repeaters, (2) the elimination of separate licenses for repeaters, and (3) the expansion of the frequency bands available for repeater operation, as originally intended. — *K1FHN*

FCC ISSUES TVI HANDBOOK

The FCC has finally announced the long-awaited arrival of *How to Identify and Resolve Radio-TV Interference*, a 30-page booklet which describes causes and cures of TVI. In addition to being written in very basic English, the booklet provides color pictures which dramatically illustrate the different symptoms of several sources of poor video display, including radio transmitter interference. Home remedies are then provided for the layman.

Another section presents more detailed technical information for use by qualified service technicians, including possible cures for solid-state audio devices. The final section is a set of guidelines for the operators of CB and amateur stations. It is interesting to note that the FCC says "You are not, however, required to service or add filtering to the complainant's television, and should not take any such action without the full cooperation of your neighbor." Finally, there is an appendix listing the names and addresses of many of the major manufacturers. Individuals registering a complaint with the FCC will receive a free copy of the booklet. Noncomplainants can obtain a copy of it from Consumer Information Center, Dept. 051F, Pueblo, CO 81009. The cost is $1.50.

NEW RECIPROCAL AGREEMENT

The FCC reports that the United States and Liberia have established a reciprocal agreement for operation of amateur radio stations effective November 2, 1977. Liberian amateur radio operators may now apply to the FCC for a permit to operate in the United States. A U.S. amateur may now apply for a reciprocal license for operation in Liberia. For details on the procedure, contact International Services Office, ARRL. — *WA6IDN*

PAST DIRECTOR DIES

Sanford D. de Hart, W4RRV, of Oak Ridge, TN, died August 14, 1977 after a prolonged illness. He was 68.

A past Director of the Delta Division (1960-61), Dee had been inactive in amateur radio since losing his eyesight seven years ago. A former employee of the Oak Ridge National Laboratory, he is survived by his wife, Gladys, one son, Roy de Hart, and two grandchildren.

CANADIAN CHANGES

A minor, though perhaps significant, change has been made in the General Radio Regulations of the Department of Communications (DOC). In March, 1977, we reported that the DOC had "clarified" the meaning of "remote point" in the part of the rules which authorize the Minister of Communications to issue a provisional license. A remote point was stipulated to mean anything 300 miles or more from the nearest examination center. To be eligible for a provisional license now, one must reside "at a place from which an examination centre is not readily accessible," instead of the rather inflexible "300 miles."

The Canadian government has also announced a plan to move the Telecommunica-

Hudson Division Director Stan Zak (right), K2SJO, presents the *QST* cover plaque award to Vince Biancomano, WB2EZG, for his January, 1977, article on "A Prototype Pulse-Code Modulation System."

Cleveland Mayor Ralph J. Perk (center) presents Kenneth H. Simon (left), WA8QFK, with an award for "two decades of volunteer public service as an important part of the 'Greatest Parade Team' this city has ever known." Eunice G. Bernon, K8ONA, ARRL Public Relations Assistant, looks on.

tion Regulatory Service from the National Capital Region and to relocate it in Quebec City. Since the move will not be completed until 1981 or 1982, it is not readily ascertainable as to what impact, if any, this will have. There is, however, some concern that removing the office to a point such a distance from the remainder of the capital will place a hardship on those having business with more than one agency of the government. There is also some danger of professional employees resigning rather than moving to another province.

BEHIND THE DIAMOND

Caribbean DXpeditioner, QSL manager, DXCCer and the only native-born Iowan to have the misfortune of being c.d. director of the town of Winceburg, AR, John Nelson, W1GNC, has weathered many a storm. (We're not sure that Winceburg has been so lucky.)

Working as Assistant Circulation Manager since November, 1970, Nelson was responsible for the implementation of the computerized record-keeping system used in his department. Beginning in October, 1972, all of the membership records formerly kept on 3 × 5 cards were turned over to the computer service bureau for taping. Solving the glitches usually associated with computer operation became Nelson's "baby." Later, he enlightened the membership about the trials and tribulations faced by the Circulation Department during the transition period in "Woes of Babysitting a Computer" (*QST* for March, 1974). The difficulties encountered in organizing such a system included getting the address label information correct and overcoming the innate ability of the Postal Service to lose second-class mail, e.g., *QST*.

Born in Des Moines, IA, but raised in Newton, IA, Nelson attended local schools, including Iowa State University, for two years. He transferred to the University of South Dakota where he graduated with a B.S. in Business Administration in 1970.

Presently holding an Advanced class license, John began his ham career in 1961 as a Technician with the call WØDRE. Six meters was his favorite band as evidenced by a total of 46 states worked and confirmed on that band. In 1971, shortly after he moved to Connecticut, Nelson rented a house in Farmington with Morgan Godwin, W4WFL and Rick Niswander, K7GM (ex-WA1PID), who have both moved on to earn an air of distinction. Because this house was a fireball of amateur activity, it soon earned the name of "The Home for Wayward Hams." This spontaneous eruption of hamming resulted in the formation of a club which Nelson describes as a real gas.

"The Home" became a center of DXing and contesting, both of which John pursued avidly. When not in Farmington or at work, he usually can be found in Curacao (PJ9MM) or Bermuda (W1GNC/VP9). He has also acted as QSL manager for several efforts.

DXpeditions usually lead to working other DXpeditions and rare countries while at home. Nelson is no exception. He presently has 180 countries confirmed and over 200 worked. Although he works all bands, 80-10 meters, 20 is his favorite. His antenna farm at The Home consists of two elements on 40, three elements on 20 through 10 meters, and a sloping dipole for 80. All of the aforementioned are either clamped or attached somehow to an 85-foot tower. John has also been known to hang out on 220-MHz fm with occasional forays to 2-meter repeaters. Field Days are spent with either Murphy's Marauders or the Connecticut Wireless Association, setting new contest records.

John Nelson, W1GNC

His friends both at The Home and around the League have made many comments about his sterling qualities. For example, Bob Halprin, K1XA, a longtime associate, said, "He's terrific at antenna parties. There are few things he does not know about antennas." Jim Parise, WA1VGP, remarked, "He can fix anything." Other acquaintences spoke of his affinity for beer and, surprisingly, Pop Tarts (although no mention was made of whether the two were mixed together).

Does he have any other hobbies? "Snorkeling since my trips to Curacao," John said. Stamp and coin collecting along with fishing have also kept him occupied in the past. Despite denials, we are sure John has some kind of a big, big DXpedition planned for the near future. Say, has anyone ever been to Outer Slobovia? — *WA1TZK*

Strays

As any member of the Quarter Century Wireless Association knows, the recent election of officers was hotly contested. Well, here are the winners. From the left: Art Miligan, W8KW, director; Art Monsees, W4BK, treasurer; Leo Meyerson, WØGFQ, director; Ethel Smith, K4LMB, secretary; Harry Gartsman, W6ATC, president; A. Gironda, W2JE, director; Henry Harley, VE3BR, director. Not shown are two more directors: Clarence Seid, W2KW and Hal Sears, W5NC. Good luck to the QCWA officers!

MY FIRST CONTACT

This is going to be easy, I say to myself. After all, I've listened to my husband make several contacts. And besides he will be right by my side to tell me what to do. What could be so complicated anyway? Look out hams — here I come!

"Sit here," my husband says, pointing to the big chair directly in front of the new radio with all the knobs. Why is it that I am beginning to sweat a little? Now that dreaded command comes, "Tune up!" Trying to think which knobs go up and which go down, I begin to fumble. "Remember — only 10 seconds," my husband, the WD4CMH, shouts. I'm beginning to wonder if I really want to go through with this after all.

Now that I'm tuned up, what next? Oh yes, I'm supposed to find a clear spot before calling CQ. "Slowly now, not too fast," shouts my husband because I now have on those distinguished-looking headphones. (It sure is *hot* in here!)

With trembling hand, here goes the C (oh no, *quick*, tell me what a C is). And now the Q. How many times to I send CQ? "Now send your call," says WD4CMH. Thinking how easy this is, I send it twice and am ready to stop. "REMEMBER THE K," says the know-it-all.

Now what do I do? I'm sitting in my big chair, squeezing my pen, and wondering if anyone in the world has heard me or even understood me.

All of a sudden I hear something familiar — *my call sign!* Next comes DE and then and then WB3CIJ! I'm ready to run and laugh at the same time. "You're supposed to send him something back," says Bill.

"What do I say to him?" I quickly ask. After one or two short sentences (and a lot of mistakes) I give WB3CIJ the signal for him to come back to me. I could do this all night!

After about an hour, I urge Bill to help me sign off. That done, I grab my log with zest and write down all the information about my first contact. I am a *real* ham, I think to myself. Unfortunately, WD4CMH has already moved into the big chair himself. — *Jan Moore, WD4CMG*

Canadian NewsFronts

Conducted By Ron Hessler,* VE1SH

Strength in Numbers

Ties between the U.S. and Canadian amateur that reach back to the pioneer days of wireless communication endure still today.

Those amateurs at the 1977 National Convention were part of them. Even the convention theme "communication between nations" addressed the long-standing objective: two nations working together for the advancement of the Amateur Radio Service.

Continuing in this tradition, this issue introduces a monthly Canadian news column chronicling the happenings in the Canadian Division, alternately known as the Canadian Radio Relay League (CRRL). And just as those earliest joint Canadian/American efforts worked to establish effective point-to-point delivery of messages, effective communication is what this new venture is all about too. Its purpose is to keep you (including some 6600 Canadian members) fully acquainted with Canadian events of concern to you.

Reader support will be needed to make this page newsworthy. Please send any special-event reports and copies of all club bulletins to your editor. No attempt will be made to cover items of personal opinion, unless in the national interest.

At the outset a brief overview sketch of the organization of the Canadian Division seems in order especially since its setup differs somewhat from the U.S. divisional structure. Unlike his 15 stateside counterparts, the Canadian director is responsible for maintaining government liaison and representing the membership to its regulatory body, the Department of Communications (DOC). As the CRRL is the official Canadian member of the International Amateur Radio Union, he also represents all Canadian amateurs before that Union.

Support Framework

But the director doesn't formulate policy and make decisions in a vacuum. Assisting him in these functions is an Advisory Committee, a kind of informal board of directors. This group includes, besides Director Hesler, immediate past director George Spencer, VE4IM; League Vice President Noel Eaton, VE3CJ Vice Director William Loucks, VE3AR Associate Counsel B. Robert Benson, VE2VW and all 10 assistant directors. There is, in addition, a smaller Executive Committee which limits the assistant director participation to two. Currently filling these posts are Noreen Nimmons, VE3GOL and Holland Shepherd VE3DV.

Each of the Division's six sections is entitled to one assistant director. One exception is Ontario which, because of sheer membership numbers, has additional representation. Likewise, Newfoundland, because of its physical distance from the mainland, is represented by an assistant director. Appointees presently serving are Sid Jones VE6MH, Alberta; Al Venning, VE7LL, British Columbia; Mike Pura, VE4MP, Manitoba; Noreen Nimmons, VE3GOL, Banner Edwards, VE3SU, Holland Shepherd, VE3DV and Randy Smith, VE3SAT, Ontario; Bill Parker, VE5CU, Saskatchewan and C. L. Engelbrecht, VO1BL, Newfoundland.

CRRL AMATEUR OF THE YEAR

At the Toronto National Convention last June, Brit Fader, VE1FQ, accepted the CRRL Amateur of the Year award, the *first* such presentation. In his long-time career in amateur radio, VE1FQ has amassed an impressive list of contributions, including duty as EC, SEC, OPS and NCS. Most senior in time of all the ARRL QSL bureau managers, he is active in the Halifax (NS) ARC.

Send your nominations for the 1977 award to your assistant director or SCM by April 30, 1978. Recipients of the Division Certificate of Merit become eligible for ballot listing automatically. The division vice director and all assistant directors select the final candidate.

ARRL TRAINING COURSES — CANADIAN STYLE

Production has been initiated on the Canadian edition of the Novice and amateur grade license training courses with completion date targeted for early spring. Working closely with the ARRL Club and Training Department, Bill Parker, VE5CU, has tailored these study courses specifically to the Canadian licensing requirements. In the meantime, all class instructors can write to Bill for a copy of his interim CRRL Instructors' Guide.

WARC

DOC released its first draft proposals for the World Administrative Radio Conference just about a year ago. (See *QST* for June, 1977, page 64.) In its subsequently filed comments on the proposal, CRRL (a) re-entered its request for an allocation at 160-190 kHz. If not an exclusive basis, a secondary basis would be acceptable. Failing this, a notification basis would also be acceptable. (b) Agreed to the proposed allocation of 1800-2000 kHz on a shared basis. (c) Objected firmly to the deletion of 3.8-4.0 MHz to the Amateur Service. (d) Agreed to the proposed changes to the 40-meter band, on the basis that the proposed 30-meter band would become a reality. (e) Re-entered request for an amateur allocation at 902-928 MHz. Other Canadian amateur organizations and many individual amateurs also filed similar comments. Complete documentation of WARC proceedings is available from all DOC Regional Offices: Moncton, NB; Montreal, PQ; Toronto, ON; Winnipeg, MB; and Vancouver, BC.

DOC SYMPOSIUMS

The latter half of 1977 saw DOC host a series of symposiums, coast to coast, related to the general radio service and its problems. The widely attended forums will guide future DOC policy and regulation changes. At each regional meeting CRRL represented the Amateur Radio Service. Watch this column for details of the final session scheduled soon.

POTPOURRI

☐Canadian editions of the Bob Hope and Edgar Bergen public-service announcement tapes for broadcast station use are now available from CRRL headquarters. They're offered free of charge to any radio amateur who can get them aired. You just gotta hear Mortimer Snerd promoting ham radio! Headquarters address is P. O. Box 418, Sackville, NB E0A 3C0.

☐As of September, 1977, Canadian life memberships totaled 286 with an additional 110 Life Quarterly Plan members. As of the same date, Canadian full membership came to 5274 with an additional 1333 associate members (unlicensed).

☐Over 15,000 copies of "Talk to the World," the pamphlet created and produced by the Radio Society of Ontario (RSO), have been distributed to date in Canada and the U.S. Recognizing this effective effort in publicizing amateur radio, the League has awarded the society its National Certificate of Merit.

☐CARF (Canadian Amateur Radio Federation), CGRSA (Canadian General Radio Service Alliance) and CRRL have jointly formed a "troika" committee to deal with municipal and local zoning regulations concerning towers and such. Chairman Al Law VE3ACZ, welcomes comment from any Canadian amateur or organization. He is especially interested in obtaining copies of any local or municipal regulations dealing with tower restrictions. Write to him at P. O. Box 515 Kanata, ON, K0A 2C0. Bob Benson, VE2VW is the CRRL member of the committee.

☐In accordance with the decentralization plans of the government, the Telecommunications Regulatory Service of DOC is slated to move from Ottawa to Quebec City. No definite timing for the move has been announced.

☐The Canadian DX Association's "new baby," the CAN-AM Championship Contest, was a bouncing success. Participation was heavy with some top QSO members exceeding 1300. Look for complete results in an upcoming *QST*. Inasmuch as CANADX wishes to "shape up" its infant while still in diapers, send appropriate comments and suggestions to VE3BMV, Box 292, Don Mills, ON, M3C 2S2.

*Director, Canadian Division

Washington Mailbox

Conducted By Harold M. Steinman,* K1FHN

More on Control Operators and Third Parties

The rules concerning control operators and third parties haven't changed much since they were last treated in this column back in August, 1976, but questions on the subjects are abound. So . . . here we go again. . . .

Q. Can I let my friend, who does not have an amateur radio license, operate my station?

A. Your friend may not "operate" your station. However, he may "participate" in radio communication from your station as a third party. You and the station you are in contact with are parties one and two. (97.79d)

Q. The distinction escapes me. What is the difference between "operating" and "participating"?

A. You must have an amateur radio license to be the control operator of an amateur radio station, but you need not have one to participate in amateur radio communication as a third party. A control operator who is properly licensed must be physically present to assure compliance with the rules in either case. The third-party privileges are there to allow a control operator to pass messages to others. The control operator may allow the third party to state his message directly into the microphone or whatever, but this must not be stretched to the point where the third party actually becomes the control operator. That privilege is reserved for the licensed amateur who has properly demonstrated his qualifications.

What does this mean in terms of my friend who wants to get on the air using my amateur radio station?

A. It means he should obtain an amateur radio license of his own. If, however, you wish to pass a message from him to the station you're in contact with, then you can let him participate directly as a third party. You are the control operator and you must be present at all times to supervise the traffic. If something goes wrong you are the one responsible, not your third-party friend.

Q. What can my friend do, and what can he not do, with my station?

A. Generally, a participant can do just about anything the control operator will allow him to do (under the control operator's supervision), but there are two big exceptions. A participant cannot make adjustments which affect the proper operation of the station (such as tuning up the rig); however, depending on the capabilities of your station and your willingness to accept responsibility for him, a participant may use the microphone (even with VOX), keyboard, key or camera depending on the mode in use.

The second exception is that since the participant is a third party, he must comply with all third-party regulations. In particular, he is prohibited from communicating with stations in countries that have not entered into a third-party agreement with the U.S.

This prohibition is more extensive than may appear at first glance. For example, there are no third-party agreements between the U.S. and *any* European countries. This means that it is illegal for your friend to communicate with *any* amateur stations in Europe. The lone exception is 4U1ITU, located at the headquarters of the International Telecommunication Union in Geneva, Switzerland.

Q. What countries does the U.S. have third-party agreements with?

A. The U.S. currently has third-party agreements with Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Israel, Jamaica, Jordan, Liberia, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay and Venezuela. There is also the 4U1ITU exception noted above. In addition, W7JXE/SU is authorized to conduct third-party communications between Egypt and the U.S.

Q. So, to sum it up, my friend may participate in amateur radiocommunication from my station, subject to certain restrictions, only if I am present to keep an eye on him?

A. It goes further than that. *You* can be present, of course, or you may also designate another amateur to be the control operator to supervise your friend.

Q. Huh? What exactly is a control operator?

A. A control operator is an amateur radio operator designated by the licensee of an amateur radio station to also be responsible for the emissions from that station. (97.3p)

Q. What do you mean by ". . . also be responsible . . ."?

A. Many amateurs believe that if they allow another licensed amateur to be the control operator of their station, the control operator, not the station licensee, is then responsible for the proper operation of the station. That is not the case. If a violation occurs, both the station licensee *and* the control operator are equally responsible for that violation, and both can be cited.

The license privileges of the control operator can be less than, match or exceed the license privileges of the station licensee. Different procedures apply in each case. (97.79c)

Q. What happens if the license privileges of the control operator are less than those of the station licensee?

A. Let's say that Michele, the holder of WB1FAU, Novice class, visits Peter, the holder of WB1AUD, Extra Class. Michele can be the control operator of WB1AUD provided that she restricts her operation to the Novice subbands and Novice power. She need not be supervised so long as Peter has designated her to be control operator in the log. She must identify the station as WB1AUD.

Should she wish to utilize frequencies outside of the privileges of her Novice license, she becomes a third party, and a control operator with the appropriate privileges greater than hers must be present to supervise her. (97.79d)

Q. If I correctly interpret what you're saying, it looks like a licensed amateur can at one moment be a control operator, and at another moment be a third party. Is that correct?

A. That's correct. If Michele is operating Peter's station under the privileges of her Novice class license, she is a control operator. However, if she exceeds her Novice class privileges, she becomes a third party. Hence she is bound by all third-party regulations.

As a control operator, using Novice privileges, Michele can communicate with amateur stations in non-third-party countries. But as a third party, using privileges not authorized to Novices, she cannot.

Q. What if the license privileges of the control operator are the same as the privileges of the station licensee?

A. This is the simplest case. The control operator may operate the station on all frequencies on which the station licensee is authorized to operate. (97.79d)

Q. What about the last case, where the license privileges of the control operator exceed those of the station licensee?

A. For this case, let's say that Peter visits Michele, the reverse of the above example. Peter may be the control operator on all frequencies authorized under *his* Extra Class license. However, if he restricts his operation to Michele's Novice class privileges, he must identify the station as WB1FAU. If he operates the station on frequencies authorized to *him*, but not to Michele, he must identify as WB1FAU/WB1AUD. On phone this would sound something like "WB1FAU with WB1AUD, control operator," or "WB1FAU with WB1AUD controlling." (97.87b)

Q. When a third party is participating in amateur radio communication from my station, must a control operator be continuously present, or can the control operator be in the next room and just check in from time to time?

A. The rules state that when a third party is participating in amateur radio communication, a control operator must be *continuously* present to monitor the operation. This is quite explicit. (97.79d)

[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.]

*Deputy Manager, Membership Services, ARRL

Correspondence

The publishers of QST assume no responsibility for statements made herein by correspondents.

ETHICS REVISITED

☐The editorial by W1SE (September *QST*) brings out in print what many of us have felt for some time. Ownership and operation of amateur equipment by law-breakers represents a danger to all amateurs. I'm sure that every amateur made aware of this situation will subscribe to and support the Code of Ethics. Positive statements by prominent *QST* advertisers to the effect that they do not and will not engage in such practices could send legitimate business their way to the detriment of those not willing to go on record against such operations. The League must pursue this matter for our protection and survival. — *Horace Goss, W1AB, Essex, CT*

☐I consider it a must. — *Raul Lopez, KP4EQN* . . . It's time someone took a stand. — *Harry McConaghy, W3SW* . . . I'd like to express my support. Over the years I've come to trust the ads found in *QST*. — *Robert Backer, N3FM* . . . In the past this has not been necessary, but times are changing. — *Edwin Hollis, K4CN* . . . The idea has merit. Sight unseen, I'm in favor. — *Ed Jones, WB2DVL* . . . It's the first article that lays it on the line. — *Charles Cox, W5SQW* . . . Amen brother. You hit the nail on the head. It's long overdue. — *Bob Efrein, N2EF* . . . I'm pleased to see that someone finally had the courage to do it. I've spoken to other publishers; none of them ever put it into print. — *Bryant Hozempa, WB2LVW* . . . Please jump on this with both feet. — *Peter Schrieber, W1HXB* . . . Thank you for having the courage, even at the risk of certain criticism. — *F. Sonnek, KØJM/WAØJUM*

PROSE ABOUT PROS

☐I just happened to be riding along in the car and I heard something interesting on the car radio. I was listening to Newsradio WCBS about 2 P.M. To my astonishment, I heard Bob Hope come on and give a public service announcement about amateur radio. It was very well produced and it was obviously done by ARRL. I wish to commend you on this feat. It is something I've been waiting to hear for a long time. Use the media to recruit amateurs! Now *that's progress!* — *Andrew Robertson, WB1AFX, Wilton, CT*

☐I heard a public service announcement in which Mr. Bob Hope promoted amateur radio very highly. I'm not against that because amateur radio doesn't get enough "thanks" for the things it accomplishes, but ARE YOU PEOPLE CRAZY! When you start promoting nationally you are going to get hundreds of thousands of people becoming hams. I will guarantee that because of the promotions the whole meaning and everything it stands for will be like CB is today. — *Robert Marten, Garfield, NJ*

☐I, like many other amateurs, would like to thank you for the fine PR spots being aired over commercial radio stations. I have heard many fine comments about the way Bob Hope informs the public of the many facets of our hobby. — *Tommy Grier, WA4AYA, Mobile, AL*

[Editor's Note: Over 700 stations plus the CBS Network have donated air time for our public service announcements.]

WANDERED IN

☐I'm forwarding this letter to you to share a story that should warm the heart of any avid amateur radio buff since it exemplifies the fine tradition of amateur radio. Being a neophyte General class amateur (had a license in 1948 but it lapsed) my interest was reactivated this year through the help of the Rochester Amateur Radio Association. I decided to set up a portable operation in a mobile travel trailer we have. Being a little short on antenna theory (the more I read, the more confused I got), I wandered into a small radio-TV repair store in Old Forge, NY, and cited my plight. I was greeted by two amateurs, Fred Liddle, W2TN and his son, Bob, WA2NDK. In short order we had the components for a half-wave, inverted V with SWR bridge. That afternoon Fred showed up at my QTH and spent three hours directing the construction of the antenna. After two hours of snipping copper wire and measuring the SWR, he decided we were ready to give it a shot. The first station worked was an American serviceman operating from Germany who gave us a 5/7 signal report. How's that for help, know-how and a piece of wire? — *Duane Molyneaux, WA2QKL, Pittsford, NY*

WHAT PRICE PLEASURE

☐From the comments that I have heard over the air, a lot of hams seem to have the impression that the ARRL is out to "rip off" the poor amateur radio operators in this country. Some claim they are being soaked for $12 a year for a service that is most highly overrated. Others claim they are paying a premium for a magazine that is going downhill in quality. Others have even further claims that are all directed toward that "worthless organization" in Newington, CT. It is my opinion that these claims are completely unjustified and could hardly be any further from the truth! I've been a radio amateur for eight years and a member of ARRL for three years. I can say without a doubt, that I would not be as far along in this great hobby had it not been for the many great publications and other services that I've received from ARRL. I would like to stress that many publications and services are available upon request to anyone who wants them, League member or not, and at little if any cost. This can hardly be classified as a "rip-off." It's about time some people got down off their thrones and took a good hard look at the many things the ARRL does to support amateur radio and its many activities. Without the League, I would hate to see where the direction of amateur radio might be headed. — *Paul H. Sherman, WB8ETB, Houghton, MI*

☐I eagerly look forward to the arrival of *QST* each month but must read it with a bit of irony. While the first third of the magazine promotes the craft and economy of the homebrew artist and tickles the dreams of those who would like to be but aren't yet, the remainder negates what was just promoted. The message is clear: If you want to be somebody in ham radio, you've got to have money, get a picture of yourself looking nonchalant while sitting next to all this equipment put into *QST*, and win contests. Show me a picture of a station put together for less than $500 and I'll show you a dozen that took at least two grand! I'm not against any of these in particular (money, expensive equipment, pictures, contests) but why bother pushing the homebrew art while suggesting through pictures, contests and ads that the real action is in bigness. My suggestion is simply that you show us some real homebrew stations, and encourage activity with homebrew and/or QRP equipment through awards, certificates and contests. — *Don Hekman, VE2DUN, Sept-Iles, PQ*

☐Dick Tlapa's (K9DNR) articles on "QSLs" (October/November 1977 *QST*) were most informative and an excellent guide for getting needed confirmation of those DX QSOs. Dick didn't mention cost involved but at my last overseas station, the computed cost per new country needed was between $1.50 and $2 per confirmation. I am again working toward DXCC from a new stateside QTH (20-meter phone with 100 watts; expected time period, six months.) The estimated cost: transceiver, $950; tower, $600; antenna, $400; cost of cards, mailing, etc., $200; new house overlooking Atlantic Ocean, $110,000. Total cost: $112,150. So you see, it can be expensive. Good luck to all and have patience, the cards will arrive. — *John Parrott, W4FRU, Virginia Beach, VA*

FCC THANKS

☐Thank you for the printout furnished in response to the Commission's appeal to amateurs for volunteer examiners. In an effort to establish a comprehensive register of such volunteers for the area under jurisdiction of the Dallas field office, we had made some limited individual appeals and the responses have been overwhelming. The information provided in your listing will certainly assist us in developing a register of volunteers to cover the geographical area in this district. We appreciate the cooperation of the American Radio Relay League in this most worthwhile program. Thank you for your interest. — *Carl E. Pyron, Engineer-In-Charge, Field Operations Bureau, Dallas, TX*

NAMES OF THE GAME

☐During the Johnstown flood I was the operator of station N3KZ, the main net control for the Health and-Welfare Net. I would first like to express my gratitude to all the individuals who helped me move health-and-welfare traffic. However, there is one problem that disturbs me. Many stations were completely unfamiliar with net discipline and traffic handling procedures. Many times when I asked a station what its traffic was, the operator would start asking me if I could obtain information on a certain person. When I would ask the net to stand by, others would continue to call. I would strongly urge that every amateur familiarize himself with traffic handling and net procedures. Checking into one of the nets once a week would familiarize one with correct procedures. Nets are on every frequency band, and most are listed in the ARRL *Net Directory*. — *David Dodel WB7TPY, Scottsdale, AZ*

☐I have been a reader of *QST* for over 40 years, and know of no other publication that has had such consistently high standards of editing for so long. I'm anything but a purist, but I have to admire your use of the term "doubly balanced mixer" (page 35, October 1977 *QST*). A double-balanced mixer could be merely two balanced mixers, but doubly balanced is exact. I wondered if you were consistent, so I turned to my 1976 *Handbook*. There it was, page 248. Out of curiousity, I checked a number of manufacturers' catalogs: all call them "double-balanced." Since the language the majority ultimately rules, eventually you will probably say "double-balanced," too, but I'm glad you're holding out for the better term. — *Harry R. Hyder, W7IV, Scottsdale, AZ*

NEITHER RAIN, NOR SNOW, NOR SLEET, BUT MURPHY . . .

☐The February, 1968, *QST* had a concise formulation of Edsel Murphy's Law(s). Despite the advance since then, the elements of this basic and powerful la are just as valid today as ever. The novitiates shoul be given some idea of the forces against which the must cope. "If anything can go wrong, it will." — *William Blazer, K4WGP, Summerville, SC*

☐As of October 18 I hadn't received October *QS* — *Richard Bush, W4KQK, Louisville, KY*

☐As of November 6 I hadn't received Novemb *QST*. — *Myron Bennett, WB5PSL, Roswell, NM*

☐As of November 6 I hadn't received November *QS* — perhaps the Postal Service found it so interestin they decided to keep it. — *Len Weber, WA2KR Monroe, NY**

*[Editor's Note: Except for late renewals and ne members, *QST* is mailed from the printer in Gla gow, KY, around the 20th of the month pr ceding the cover date. Members in *Glasgow* r port receiving their copies two weeks late. T Postal Service offers no explanation.]

FM Repeater News

Conducted By Lew McCoy,* W1ICP/WR1ABH

Two-Meter Crowding — Let's Be Careful

Because of the preponderance of fm on 2 meters, sometimes we forget that the 144- to 148-MHz band was already the most popular ham band before fm became widespread. In the early 1960s, tens of thousands of hams were active on two, mostly on a-m. And today, though a-m activity is at a much lower level, there are plenty of stations around using ssb, cw, RTTY, and even SSTV.

Non-fm activity has always been highest below 146 MHz, so as long as fm developments involved the 146- to 148-MHz band there was little conflict between the modes. In fact, recently it would have been quite accurate to say that there were *four* 2-meter bands: one for cw and ssb at the low end, another for ssb and a-m beginning at 145 MHz (where Technicians were permitted), the OSCAR band at 145.8-146.0 MHz, and the fm-repeater band at 146-148 MHz.

With all the synthesized fm rigs now on the market, there is a tendency for hams interested in quiet or lengthy simplex contacts to shift below 146 MHz and get away from the QRM on the standard simplex frequencies. There's nothing wrong with that; in fact, in makes especially good sense to keep the popular frequencies such as 146.52 MHz clear for brief calls by selecting some other frequency for the QSO once contact is established. In picking that frequency, however, keep in mind that there is lots of activity below 146 MHz, and that if you inadvertently interfere with, say, an OSCAR pass, the hams you're interfering with may not be able to call you on that frequency on fm, and may not even be able to demodulate your signal, to ask you to move. This is a problem especially with respect to OSCAR because the satellite passband is adjacent to the low end of the repeater subband.

So, we ask all fm operators, if you're inclined and equipped to operate below 146 MHz, please keep 145.8-146.0 MHz clear for the OSCAR satellites. Once the satellite is in orbit, it's mighty difficult to put it on another frequency!

NEW SUBBAND

As you may have heard, there is a hold on the new repeater subband for 2 meters. While ARRL acted quickly in providing a band plan for this new, projected band, we now have had some time for additional input to filter in concerning the usage of the band.

In some areas of the country, such as the Northern New Jersey and New York City-Long Island Sections, the proposed channels were quickly allocated to amateurs wishing to put repeaters on. In other areas, such as Texas, the Texas VHF Society made some preliminary ground rules. They accepted the band plan but decided that they would reserve the bottom channels — not for fm — but primarily for other modes such as ssb, RTTY, computer and other amateur techniques. We would be less than honest if we didn't say "good idea and good thinking."

Don't misunderstand — fm-repeater operation has truly opened up vhf/uhf to vast numbers of amateurs. However, there are other modes besides fm that can be used to great advantage on repeaters and translators, so let us never be accused of stifling development in amateur radio.

Should the new subband be allocated strictly to translators? Should the channels be reserved for modes other than fm? Should part of the subband be saved for modes other than fm? Let us hear from you, or better yet, let your VRAC representative know. You can find his address in back of the *Repeater Directory*. If you don't have a directory, write to us and we'll forward your letter.

NEW REPEATER DIRECTORY

It is approaching that time of year again when we start thinking about the next edition of the *Repeater Directory*. If your repeater isn't listed in the current directory, or listed wrong, how about writing us and getting a registration card. Our policy has been that we only carry a repeater listing for two years without an update. If the current directory shows your last listing as 1976, better let us have a new registration.

While we are talking about it, the following figures taken from the current directory, may be of interest to you: Total number of repeaters, 2876 (adding Canada; 3080). Total on 2 meters is 2283. In 1976 we had 404 repeaters with autopatch and 853 in 1977. Emergency-powered machines went from 43 in '76 to 379 in '77! RTTY operation, 22 in '76 and 50 in '77.

Repeater growth is still very heavy and it will be very interesting to see what the new year brings.

RDFING AND JAMMING

Be sure to read the column "Happenings" in this issue of *QST*. Details are given about the arrest and conviction of two amateurs in New Orleans, LA, who deliberately and maliciously interfered with a repeater.

This column conductor has attended many fm and repeater forums at conventions and hamfests over the last few years where we pointed out that the FCC was aware and was looking for jammers. When asked what repeater operators could do about malicious interference, our stock answer has been to try and locate the jammer, and learn the use of RDF (radio direction finding) equipment. Be sure to make tape recordings. Keep accurate records and when sufficient material has been accumulated, let the local FCC office know, and offer to work with them. This FCC action in New Orleans is not so much a case of "we told you so" as an affirmation in our faith that FCC is aware of the problem and will take action.

This should be a stern warning to some of the characters who think it is their right to deliberately interfere with the operation of others. We keep getting reports from various parts of the country about bad cases of deliberate interference to repeater groups. And hopefully, FCC will be cracking down with additional actions soon.

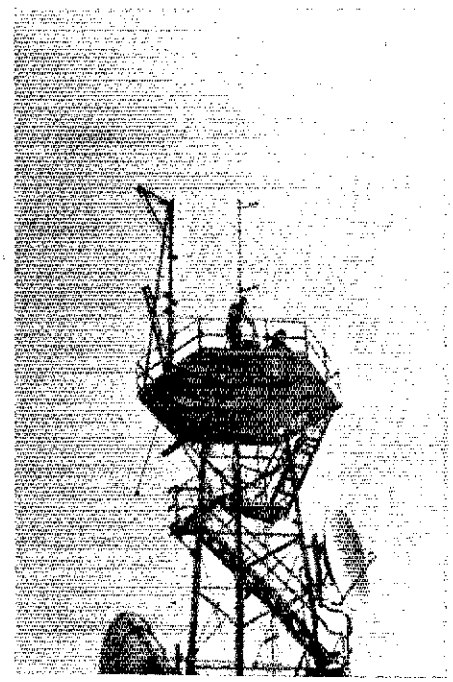
Meanwhile, what can you as a repeater club do? We have mentioned some ground rules in previous columns about this subject, but now would be a good time to go over them again.

It is generally accepted that you should never, under any circumstances, recognize that there is a jammer on the frequency. People who maliciously interfere cannot get any pleasure out of what they are doing if they are not recognized. They get their jollies by having an audience and when you admit they are interfering with you, you are playing into their hands — so ignore them. However, this doesn't take care of the stubborn cases.

Many repeater clubs have formed technical committees, and one of their functions is tracking down "undesired" signals. It is suggested that if your club or repeater doesn't have such a group that you form one. The "search" committee of one of the local repeaters here in Connecticut has nailed about 10 jammers plus recovered several stolen transceivers.

If you have a serious jammer problem, contact the local FCC office and ask their advice. They can tell you what sort of information they need in order to take action. Don't be discouraged if the whole process takes time. It may be a cliche, but while the wheels grind slowly, they *are* grinding.

Ed Gribi, WB6IZF, wrote an excellent piece in November *QST* called "A Baptism of Fire." One of the pictures that we didn't get to use is this one showing the tower at the Williams Hill site. This was the location of WR6AWM, sponsored by the Williams Hill Amateur Radio Society.



*VRAC Liaison, ARRL hq.

YL News and Views

Conducted By Louise Moreau,* W3WRE

1978 — Plan Ahead

Our plans for activities throughout the year include the local club meetings and our net schedules as well as the many contests and QSO parties. The year ahead has so many YL-sponsored affairs that a calendar of events might assist our plans.

*YL Editor, *QST*. Please send all news notes to W3WRE's home address: 305 N. Llanwellyn Ave., Glenolden, PA 19036.

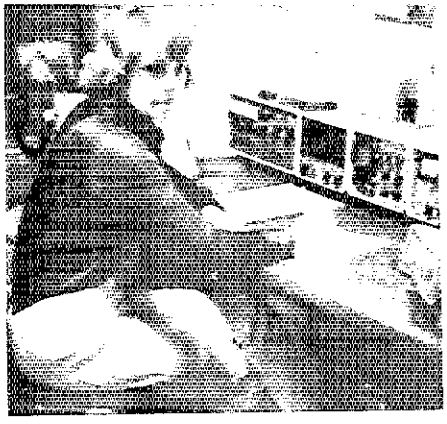
The German YLs will be continuing their monthly YL Day all year looking for us. The month of February will open the calendar with the YL Valentine banquets in many clubs throughout the country. Then February 18-19 is the cw section of the YL-OM contest that culminates on March 4th and 5th with the phone portion. Novices are always welcome in the cw portion with a special award for the high Novice score.

The DX-YL to North American-YL contest is the major event in April for the gals hunting contacts for CLARA and YLRL awards as well as the possibility of winning the cw portion April 11-12, or phone April 25-26. And of course April is Buckeye Belle month for the Ohio club.

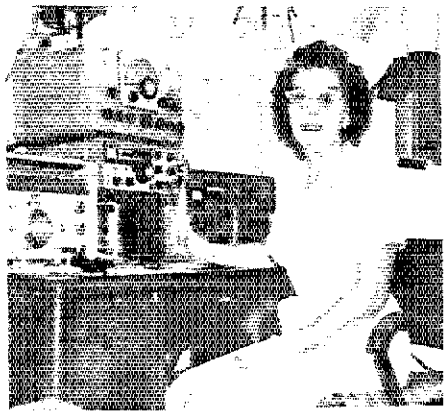
May is the month of YLISSB's annual QSO Party, while in June many YL clubs are setting up and operating their own Field Day.

Fall activity begins in September with CLARA's AC-DC contest, as well as YLRL's Howdy Days, that very informal YL QSO party that gets us in condition for the cw end of the YL Anniversary Party in October. October is also Floridora Month for the Florida YLs.

The Ontario Trilliums sponsor their annual Trillium Weekend the first weekend of November, and the month also marks the phone section of the YLAP. December has no contests but it might be a good idea this year to plan well ahead for the YLRL International Convention in 1979.

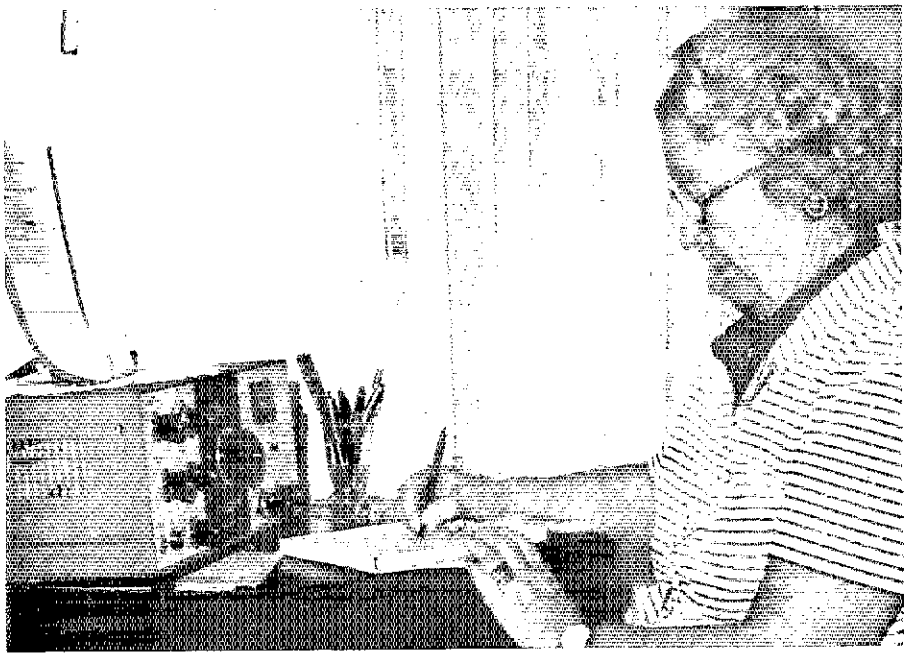


Patti O'Steen, WB4FAJ, calls herself a victim of computers after having gone through four calls. She is an ardent certificate hunter and is very active on 40 meters.



Sue Kinney, WB5MWO, holds the distinction of being the only General class YL in Norman, OK. The OM is Walt, WB5MWP. *(WD5CQE photo)*

Evelyn Fox, WB9QZA, passed her Novice at age 78, and recently progressed, at the age of 80, to pass Technician and is going right on to upgrade to General with the help of the Yellow Thunder Amateur Radio Club. *(K9ZZ photo)*



1977 HOWDY DAYS RESULTS

The winners: YLRL member, DJ1TE 103. Non-YLRL member, WD5FOX 90. YLRL member scores: WA1JYO 61; W1ZEN 51; WA2DMK 22; W2GLB 52; WA2NFY 69; WA2VIE 37; K4AOH 53; WB4PRM 72; K6KCI 71; K6RLR 74; WA6WZN 62; WA7TLL 19; WA8AHU 86; WB9TDR 46; WBØJFF 49; WØZWL 44; DF2SL 61; DJ5UAC 34; DJØEK 33; DK5TT 71; DL3US 25; EI7CW 75; I5RC 28; HB9ARC 44; LA3RN 31; OZ1AVV 20; VE7DTO 32. Non-YLRL member scores: DJ1EIC 53; DF2KG 85; DF3RJ 17; DF3TE 40; EA3ARI 63; HB9BIR 23.

Congratulations to the winners of one of the largest YLRL Howdy Days contests.

YL CALL IN ALL U.S. CALL AREAS

1977 was the year that the YL suffix completely covered this country's call areas with the addition of Janice Shillington, N9YL. Guantanamo Bay, Cuba, added Edna Skinner, KG4YL.

Thanks to that N prefix, several call areas boast of more than one gal with that special call, and YL News and Views thanks Ken Spittler, NØJP, for the information that Edna Thorson holds NØYL.

XYL OR YF?

There have been requests from many women in this country and Canada that we change that designation *XYL*. Since we are all YLs, whether we are six or 600, the gals request that XYL be dropped and that the alternate abbreviation YF be adopted to designate a married YL. The majority of the comments in the mail is that all men operators are OM; so why, they ask, can't we be YL? Or, if the marital status must be given, then use YF as suggested in the ARRL *Radio Amateur's Handbook*.

NEW JLRS AWARD

Japan's national YL club, JLRS, is now offering their latest award: the Alphabet Certificate. To qualify an amateur radio operator must show proof of contact with 26 YL operators to spell the alphabet through the last letter of the call signs. The certificate is awarded in two different classes: (a) Work all JA YLs, and (b) for stations outside Japan work YLs from any country including at least five JA YLs. Send log info plus seven IRCs to the custodian, Tsuneko Watanabe, JE1IWR, 15-2 5 Chome Asaki-machi, Atsugi, Kanagawa 243 Japan. Tsuneko adds that this certificate could be a real challenge to equal the YLRL's WAS-YL Award.

International News

Conducted By Bruce A. Johnson,* WA6IDN/WA1ZQP

Operation by Alien Amateurs in the United States

As the Amateur Radio Service grows around the world, more and more amateurs from other countries apply for permission to operate an amateur station in the United States. We present below some of the most-often-asked questions sent to Headquarters by both U.S. and foreign amateurs.

May I operate in the U.S.?

Aliens who hold a valid amateur license may apply to the FCC for a permit to operate in the U.S. only if a reciprocal agreement exists between the U.S. and the alien's government. Reciprocal agreements are currently held with these 50 countries: Argentina, Australia, Austria, Barbados, Belgium, Bermuda, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Denmark, Dominican Republic, Ecuador, El Salvador, Fiji, Finland, France, Germany (West), Guatemala, Guyana, Honduras, India, Indonesia, Ireland, Israel, Jamaica, Kuwait, Liberia, Luxembourg, Monaco, Netherlands, Netherlands Antilles, New Zealand, Nicaragua, Norway, Panama, Paraguay, Peru, Philippines, Portugal, Sierra Leone, Surinam, Sweden, Switzerland, Trinidad and Tobago, United Kingdom, Uruguay and Venezuela.

For how long a period will my permit be valid? May I renew it?

The permit is valid for one year, unless your native license expires sooner. It is renewable.

How do I apply?

Send a copy of FCC form 610A to the FCC, Box 1020, Gettysburg, PA 17325, USA. These forms are available free from the International Services desk at ARRL Hq., Newington, CT 06111, USA. Canadians should file FCC form 410 instead, available from the same desk. Be sure to include a photocopy of your current amateur license when sending the form to the FCC. You should apply at least 60 days in advance of your need to allow for processing time.

I am a U.S. citizen living overseas, but have only an alien license. Can I obtain a reciprocal permit for operating in the U.S.?

No. Only noncitizens may obtain permits. If an alien becomes a U.S. citizen, the reciprocal permit becomes invalid, and the amateur must then take the U.S. amateur exams and apply for a regular U.S. license and call sign.

How will I identify on the air?

You will sign your own (native) call, plus the Morse "/" or on phone, "portable," followed by W1, W2, and so on, depending on the call district you are operating from. If you decide you would like to hold a regular U.S. call sign, the FCC has said that all aliens who are not official representatives of a foreign government, and who can provide the FCC with a U.S. mailing address, can take the U.S. amateur examinations. Upon successful completion of the exams, an alien's amateur radio station will be assigned a regular U.S. call sign.

What if this hasn't answered all my questions?

The International Services desk at ARRL hq. will be happy to answer any questions you might have regarding operation in the U.S.

BUT WHAT ABOUT U.S. AMATEURS GOING OVERSEAS?

We're here to help! We'll provide you with the latest available information on the possibilities of operating in almost any country, but we do ask that you send a self-addressed, stamped envelope with your request. For openers, we would like to point out that in almost every country, a General class or higher license is required of the applicant. And you must allow 30 to 90 days for processing.

Going overseas? We'll send you a "Recip Kit" to help you in applying for permission to operate outside the U.S. Just tell us where you're going!

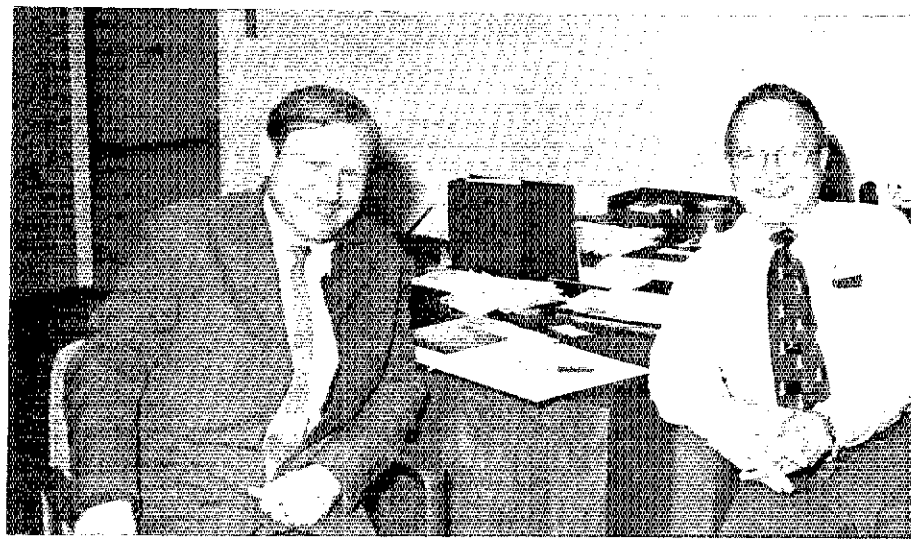
Can I operate only in those 50 countries with whom the U.S. holds reciprocal treaties?

No. There are quite a few countries who choose not to hold specific reciprocal treaties, but which do allow visiting amateurs to operate. These countries usually prefer to retain the privilege of deciding on each application individually — rather than to grant permission automatically. Once again, the ARRL has the answers, and is here to serve its members. Write us.

INTERNATIONAL 2-METER DX RECORD SHATTERED

YV5ZZ and LU1DAU have set a new DX record on the 2-meter band. On October 29, 1977, Ed and Antonio made contact on 145.9 MHz after observing intense *transequatorial-mode* propagation on 6 meters. YV5ZZ ran 200-watts input from a portable location in Boca de Uchire, Venezuela. LU1DAU, located in La Plata, Argentina, was running 100-watts input. Antennas at both ends were 10-element, cross-polarized Yagis. The two stations were 3135 miles (5044 km) apart at the time of their QSO. Initial contact was made on cw; both stations then switched to ssb. Shortly after working LU1DAU, YV5ZZ contacted LU7DJZ, 50 miles (30 km) north of Buenos Aires.

After two years of scheduling, Ed and Antonio surpassed the 2540-mile (4200-km) record held by the late John Chambers, W6NLZ and Ralph Thomas, KH6UK (now W2UK), since 1957. For their successful transpacific contacts on 144, 220 and 432 MHz, Thomas and Chambers jointly received the Edison Award for 1960. Both the current and 1957 records were set without the aid of artificial satellites or EME (moonbounce).



We've mentioned from time to time that Headquarters sponsors something called the WARC Fellowship Program, offering a week of intensive study of the Amateur Radio Service, the IARU, and preparations for the vital World Administrative Radio Conference. Shown here (left) with ARRL General Manager Baldwin, W1RU, is Dr. Andras Gschwindt, HA5WH, the President of the Hungarian Amateur Radio Society. Bandi is the latest visitor to arrive in Newington on the Fellowship Program, and departed for Budapest in late November with considerable information to pass along to his compatriots in Hungary. As a microwave and OSCAR expert, he was in turn able to assist Headquarters staff in these areas. *(W1YL photo)*

*International Services Officer, ARRL

Hamfest Calendar

Kentucky: The Mammoth Cave Amateur Radio Club's annual Mid-Winter Swapfest is Saturday, January 21, from 9 A.M. to 6 P.M. at the Flea Market Building in Glasgow. Take Highway 31-E. Admission $2. Door prizes and auction. Talk-in on 34/94. Contact Gary Hext, WB4FLB, 101 Community Dr., Glasgow, KY 42141.

Ohio: A Mid-Winter Hamfest Auction is February 5 at the Richland County Fairgrounds in Mansfield. Prizes, flea market, auction. Large, heated buildings. Doors open 8 A.M. Talk-in 34/94. Advance tickets $1.50, $2 at the door. Contact Harry Frietchen, K8HF, 120 Homewood, Mansfield, OH 44906. Tel. 419-529-2801 or 419-524-1441.

Virginia: The Richmond Winterfest-78, sponsored by the Richmond Amateur Telecommunications Society, is January 15 at the Bon-Air Community Center. Technical symposium, drawing and homebrewers contest: two divisions (over 18, and under) with certificates to most original idea, best mechanical and best electrical construction. FCC exams, starting at 10 A.M. Mail form 610 (available for s.a.s.e.) at least five days prior to fest to address below. Commercial exhibits, indoor flea market, $2 ftable included); outdoor Frostbite Tail Gate Flea Market, $1. Admission $2, children under 12 free. Talk-in 28/88 and 52 simplex. Write to Richmond Amateur Telecommunications Society, P. O. Box 1070, Richmond, VA 23208.

Wisconsin: The sixth annual Mid-Winter Swapfest of the West Allis Radio Amateur Club is Saturday, January 21, 8 A.M., at the Waukesha County Expo Center. Tickets are $1.50 advance, $2 at the door. Reserved tables, $1.50; nonreserved tables are first come, first served. Go on I-94 to Waukesha Co. F, south to FT, west to Expo. Write to WARAC, P. O. Box 1072, Milwaukee, WI 53201.

Coming Conventions

January 21-22, 1978
Southeastern Division, Miami, FL

February 17-19
Florida State, Orlando, FL

March 18-19
South Carolina State, Greenville, SC

April 8*
Great Lakes Division, Muskegon, MI

May 5-7
Delta Division, Baton Rouge, LA

May 13-14
Alabama State, Birmingham, AL

May 19-21
New York State, Rochester, NY

May 20
Wisconsin State, Lake Delton, WI

May 27-28
Tennessee State, Knoxville, TN

July 1-2
West Virginia State, Jackson's Mill, WV

September 1-3
West Gulf Division, El Paso, TX

September 22-24
ARRL National, San Diego, CA

October 13-15
Midwest Division, Kansas City, MO

October 14-15
New England Division, Boxboro, MA

November 11-12
Hudson Division, McAfee, NJ

November 18-19
South Florida Section, Clearwater, FL

***Date Change**

NOTE: Sponsors of large ham gatherings should check with League headquarters for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL hq. for up to two years in advance.

SOUTHEASTERN DIVISION CONVENTION

January 21-22, 1978, Miami, FL

The 1978 Southeastern Division Convention and 18th annual Tropical Hamboree moves to a new and bigger location this year. With free parking for 6000 cars, the Flagler Racing Theater is close to both airport and downtown motels and hotels. Dade Radio Club continues its tradition of presenting the best of "old-fashioned" hamfest/conventions along with the latest concept in equipment shows. The giant flea market, all under cover, is a gold mine for the new ham, the builder, and the experimenter. While the OM browses, the YLs and XYLs can enjoy their own special programs and exhibits. Some lucky one will take home a beautiful diamond ring.

The convention program will offer sessions to intrigue everyone from the newest and greenest to the old-timer and expert. At least one talk, "WARC-79," will be conducted entirely in Spanish for the benefit of the many visitors from Central and South America. For those with a little extra time, this is an excellent opportunity to combine the event with a vacation in the most Latin of all U.S. cities. "Little Havana" is only a few blocks away — perfect for trying out that high-school Spanish! The multitude of shops, complete bilingualism, no passport, no "exchange" problems and no vaccinations can make this trip to "Latin America" an exciting visit. No formal banquet is scheduled since most visitors will want to try the many exotic restaurants for which Miami is famous. Lists of these will be available at the information booth.

Bus service will be provided between hotels and the convention site. Specify *Tropical Hamboree* and make reservations, to the attention of person named, directly to hotel of your choice: *Ramada Inn (Airport)*, 3941 N.W. 22 St., Miami, FL 33142, Attn: Marian Geletka, $30 single, $34 double; *Holiday Inn (Airport Lakes)*, 1101 N.W. 57 Ave., Miami, FL 33126, Attn: Harriet-Reservations, $28 single, $35 double, triple, quad (one-night deposit required); *Holiday Inn (Civic Center)*, 1170 N.W. 11 St., Miami, FL 33136, Attn: Elena Rodriquez, $23 single, $31 double (one-night deposit required).

The $2.50 early registration covers all activities. Junior ops under 12 are free if accompanied by an adult registrant. Get the bikinis and summer clothes out of mothballs, turn down the thermostat, and join us in tropical Miami in January! Tickets and even more information from Dade Radio Club, P. O. Box 350045, Riverside Station, Miami FL 33135. Do it soon!

Club Notes

Controversial and thought-provoking. You know all those club auctions and flea markets you sponsor? How do you keep nonhams, who aren't interested in getting a license, from buying gear? Playing policeman isn't fun. But the issue is of great enough concern that something has to be done. Do you make exhibitors and salespersons sign on the line that they will only sell transmitters, transceivers and amplifiers to licensed hams? And how do the exhibitors and salespersons know who is licensed and who isn't? Or who soon will be? Not everyone carries his license with him. One solution is to ask sellers to require buyers to sign a form stating that they are licensed, giving their call sign. If it is a transceiver, sign if they are in a class, giving their instructor's call sign. It seems like an agreeable solution. Any other good ideas? We would be glad to share them in a future issue of *Radio Club News*.

Your club secretary should receive annual report forms for 1978, this month. These forms are short and easy to fill out except for one item: How many of the voting members are ARRL members? A simple way to get this information is to have the treasurer ask each person as he pays his dues. Or if the club has a membership application form, add a box for League members to check. These annual reports are important for us to have. We need a good address for our mailings to get to your officers in a timely fashion. The sooner you send them back, the sooner we will get you "good" on the computer mailing labels. We want you! — *WA1STO*

Strays

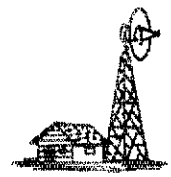
LONGWAVE CLUB SEEKS MEMBERS

☐ Interested in operating (and reading) "Lowdown"? Dedicated to promoting DXing and experimentation on frequencies below 550 kHz, the Longwave Club of America publishes a monthly bulletin with that name. With close to 450 members, the club is especially interested in encouraging experimentation on the 1750-meter band. Information and a simple bulletin will be sent in return for a legal-size s.a.s.e. Write Longwave Club of America, P. O. Box 33188, Granada Hills, CA 91344. Beginning in February, 1978, annual dues are $6. — *KH6JOV*

I would like to get in touch with . . .

☐ an owner of a B & W 5100 transmitter with manual addenda sheets 2 and beyond. Have serial no. 720. Gary Payne, WD6BJK, 4812 E. Grant, Fresno, CA 93727.

The World Above 50 MHz



Conducted By
William A. Tynan,* W3XO

Another Chance for 220!

In its October 13, 1977, Public Notice dismissing Docket 19759, FCC gave us another opportunity to demonstrate that we need and will utilize our 1-1/4-meter band. The docket, put forth in 1973 in response to an EIA petition proposed to delete from the Amateur Service the frequencies 224 to 225 MHz and reallocate them to the Citizens Radio Service. The Commission said, in disposing of the docket, that since its issuance four years ago, "significant events have occurred which render the original comments and reply comments obsolete." FCC emphasized that it is continuing to seek alternate frequencies for CB so the threat to our 1-1/4-meter band and possibly other bands may not be completely gone but it is certainly out of the way for a while at least.

This breathing space provides us the perfect opportunity to fully develop the valuable resource that the 220- to 225-MHz band represents. Here is a band very much like 2 meters but with more space. Antennas are just enough smaller than their 144-MHz counterparts to make a significant difference in ease of construction and mounting. Transmission-line losses are somewhat higher than on the lower band, so good quality, low-loss line is particularly important. Propagation is very much like 2 meters especially for local and tropo work. Aurora and m.s. can and have been worked on 220 but not as easily as on 144. Contacts via Es have never been reported but that doesn't mean they can't happen. EME is one mode which should work as well, if not better than on 2 meters. A number of stations including K5FF, WB2BYP; W5HN and WB6NMT have indicated that they are ready to go with skeds via that mode.

The 1-1/4-meter band makes an ideal place in which to expand 2-meter fm and repeater activities and indeed many groups are already so doing. The 220-MHz band plan published in the current *ARRL Repeater Directory* lists 27 repeater pairs available with the lowest channel being 222.34 in/223.94 out and each channel being 40 kHz in width. The directory does list some repeaters operating below 222.34 but so far they are few in number. Increased use of 1-1/4 for fm repeaters is certain to lead to some kind of expansion in the number of channels designated for such application. Whether this increase comes from the use of additional frequencies between 222.0 and 222.34, or between 220.0 and 222.0 as would be permitted under FCC Docket 21033, or whether space can come from splitting the 40-kHz channels into 20-kHz slots is difficult to guess at this time but its almost certain that there will be more fm channels on 220.

The weak-signal operators are fragmented with most of the country using a small band just above 220.0 while the West Coast contingent insists that the low end of the band is unusable in their part of the country because of radar and TV interference. They congregate around 222.0 MHz. Another user of the amateur spectrum may some day enter the picture. AMSAT has considered the possibility of using the 1-1/4-meter band in connection with a transponder package riding on a synchronous satellite positioned such that only North and South America would be within range. The band is not allocated to amateurs in the rest of the world. Of course, such use as an amateur satellite band would have to be blessed by the ITU at the 1979 WARC before it could be implemented.

What all this boils down to is that like our other bands above 50 MHz, there are many potential users for 1-1/4 meters and they can be expected to be competing for pieces of the band. The fmers, being very numerous, will want and probably will get the lion's share. The weak-signal gang are not very numerous and are split over which part of the band they wish to use. On 2 meters the split has been imposed on us by FCC, but such is not the case on 1-1/4 meters. Here, it is of our own making. If we are to develop the band to its fullest capability, we must get together and decide how to divide the pie. We have the organizations to accomplish this task in the form of two advisory committees, the VHF-UHF Advisory Committee (VUAC) and the VHF-Repeater Advisory Committee (VRAC). The former is the spokesman for the weak-signal interests, including satellites, while the latter handles fm and repeater matters. Together, they can help us get moving in the right direction but they must have inputs from you. Contact your VUAC or VRAC representative or drop a line to the respective headquarters liaison: Jim Kearman, W1XZ or Lew McCoy, W1ICP, with your views. They will be relayed to all of the members of the two committees. Let's get started right away on an orderly plan for the optimum use of the entire 220- to 225-MHz band. In the meantime, don't delay taking advantage of all that the band has to offer while awaiting new word from Hq. or anywhere else. Get going on 1-1/4 right away. Use the band plans we already have for a start, e.g., repeaters from 222.34 up, fm simplex on 13 channels between the repeater inputs and outputs with 223.5 as the national calling frequency (see *ARRL Repeater Directory*), ssb, a-m and cw employ the slots just above 220.0 or 222.0 MHz depending on the part of the country.

Let's get going! Remember the old saying "USE IT OR LOSE IT." We have a reprieve — let's make the most of it.

ON THE BANDS

6 Meters — One would almost think it was May rather than October from the looks of the Es reports. A prime example is WA5UUD's log for the 28th. Jack told this conductor over the air in an Es QSO the following day that he contacted some 35 stations from his New Orleans QTH ranging from the East Coast to CA. Two weeks before, on October 13 between 0000 and 0140 UTC, WA2NZO near Rochester, NY, reports an opening which began in zero-land and worked around to central FL before the band went out. At about the same time, WB7PMP near Portland, OR, worked stations in AZ, NV and southern CA over a 2-1/4 hour period. Ron, who may be remembered as WB5PSQ and WA8FCB, says that the strongest signals came from the San Diego-Riverside, CA, area. Another report from WA8OGS, Cincinnati, OH, notes a contact on the 17th with WA8GUB/Ø, CO. Just prior to that Joe heard WB8IGY working W7XF, WY. He also reports a good aurora the following evening.

Things have been exciting out in the Pacific, also, according to KG6JIH on Guam. Jerry writes that for the five weeks preceding October 10 the band was open about 90 percent of the days. Almost every afternoon about 1700 local (0700 UTC), TV sync signals from mainland China have been heard with strengths running to S9 plus 30 dB. He says that the whole band from 50 to 54 MHz is covered with buzz when the opening is in that direction. On some occasions, Japan would come in producing numerous JA contacts. The evening of October 8 was one of the most interesting, bringing contacts with VK8ZCJ and VK8VV, Darwin, Australia, on 52 MHz. Signals were very strong both ways. Heard weakly the same evening was P29HV. Two weeks before, on September 30, KG6JIH worked KH6EQI on cw. The KH6 and VK contacts make countries 10 and 11.

K5ZMS of SMIRK calls attention to the new award now available from that organization. It's the DXDC (DX Decade Club) for 6-meter operators who have worked at least 10 countries since January 1, 1976. Send an s.a.s.e. to Ray at 7158 Stone Fence Dr., San Antonio, TX 78227, for details. Speaking of SMIRK, Ray reluctantly announces that dues are going up to a one-time charge of $4. Everything else is heading in that direction, why should SMIRK be different?

Several nets have come to my attention. One is a new ssb gathering in the Washington, DC, area termed the "Free State SSB Net." It meets Sunday evenings at 2000 local time on 50.125 MHz. WA3PGA is net control. This complements the popular 50.4 a-m net conducted every Sunday morning at 1000 by WA3FVB. From east central PA, WA3NDQ reminds us of a net which meets Monday evenings at 2330 local time on 50.113 MHz. From the Pacific Northwest, K7ZCB's OVS report lists the SMIRK net serving that area. It meets at 1900 Thursdays on 50.120 MHz.

2 Meters — By now everyone should be aware of the hold put on implementation of the new repeater rules by FCC. The news came after last month's lead material was set in type so it was not possible to change that. The best thing to do for the time being is to sit tight with our present operating patterns and await developments.

Besides the exciting news of YV5ZZ's contacts with three Argentine stations, the 2-meter story this month mainly concerns aurora. WØRLI, Minneapolis, MN, is one of those reporting the big buzz session of October 27-28. Hank put in his log W7JF and W7RZY, MT; W7VEW and WA7KYM, WY; WAØNRE and KØAGI, SD; as well as CO stations WØPW, WØHHF and WØOQI. After completing with W7VEW, he heard that station work W7FN, Seattle, WA. To his surprise, he was able to hear W7FN, albeit weakly. The best beam heading was on the true bearing (290 degrees) rather than the traditional northerly direction usually associated with aurora. Although no contact resulted, Hank was excited just to have heard 2-meter aurora signal from 1400 miles away. WØRLI suggests that we look on the direct path in cases of really long-haul aurora. From IA, WAØDXZ submits a list of buzz contacts for the same opening much too long to publish. QSOs ran all the way from NY to ND. Bob characterizes this as one of the best auroras he has caught in two years.

A well-known 70-cm EMEer has joined the ranks of 2-meter moonbouncers. He's W1JR, who, as of the end of September, had completed contacts with W7FN and K5CM. Joe's four 21-element F9FTs seem to be working.

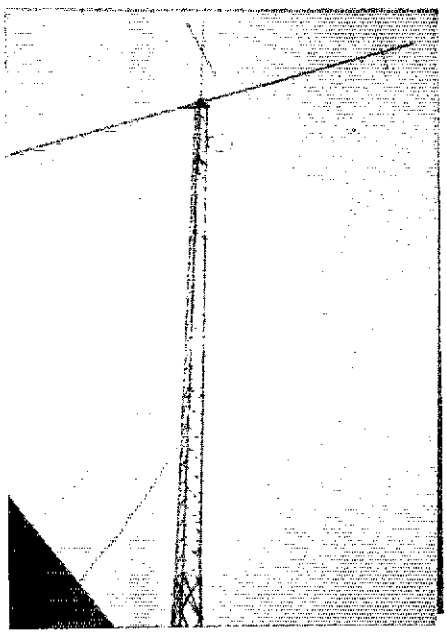
K5BXG had almost climbed to the top of the 2-meter state ladder from OK. Now Charlie has

*Send reports to Bill Tynan, W3XO, P. O. Box 117, Burtonsville, MD 20730 or call 301-384-6736 and record your message.

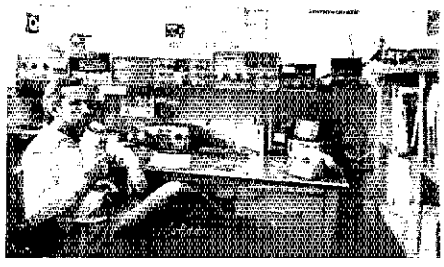
23-Cm Standings

Figures are states, call areas and best DX in miles.

K1PXE	13	5	448
W1XP	7	3	300
K1FO	4	2	149
W1JR	4	1	—
WA2LTM	17	6	770
K2UYH	14	4	520
W2VC	13	5	537
K2JNG	10	4	305
W2DWJ	10	4	200
WA2VTR	6	4	320
K2YCO	6	4	570
WA2EUS	4	5	320
K2OVS	3	2	135
W3HMU	11	5	300
K3IUV	7	4	320
WA3JUF	5	4	250
K4QIF	12	5	551
K4SUM	5	3	220
K4NTD	3	2	647
K1FJM/4	2	2	300
W4VHH	2	1	350
W4LDV	1	1	290
K5LLL	2	2	847
W5LDV	2	2	838
K5PUF	1	1	290
W5HN	1	1	235
W5HPT	1	1	235
K6ZMW	1	1	250
N6NB/6	1	1	250
N6TX	1	1	112
K8UQA	6	4	448
W8YIO	5	4	551
W9HUV	5	3	525
W9JIY	5	3	300
W9WCD	3	3	770
W9JTP	3	2	165
VE3HW	1	1	260



This explains the 6-meter signal from WA8OGS, Cincinnati, OH. Joe's 13 elements with trigonal reflector are on a 60-ft boom up 100 ft. Yes, that white dot is the moon.



The Caracas, Venezuela, shack of YV5ZZ, the northern end of the record-breaking, 2-meter, TE contacts with three LU stations. Edgar is also well known for his 70-cm EME work.

moved to Cedar Rapids, IA. But you can't keep a good 2-meter man down. In just one month of operating, K5BXG/Ø is already up to 26 states. For those who would like schedules, Charlie's phone numer is 319-393-6943.

Almost everyone on 2 meters except KØMQS and a few in southern CA needs HI. What looks to be the best chance in years to salt away a KH6 contact appears to be the January 18 to 25 EME DXpedition to our 50th state by K5MB (ex-WA5UNL). It is understood that Marshall will take along 16 nine-element F9FTs and a kW rig. For skeds, contact him at his *callbook* address or via the Central States VHF Net, 0230 UTC Mondays (2030 CST Sundays), 3818 kHz, or the 2-Meter Moonbounce Net, 1700 UTC, Saturdays and Sundays, 14300 kHz.

70 Cm — A new station on the 70-cm EME scene is KP4RF (formerly KP4AST). Pedro uses one of the 100-foot dishes set up in the vicinity of Arecibo. First contacts were on October 2 with K2UYH (Al's 17th country), K3PGP, K3NSS, F9FT (on ssb), YV5ZZ and WB5LUA. After several months absence due to moving, the old 70-cm EME pro himself, VE7BBG, is back in business. Cor's new QTH appears to be working out well. First contacts were with K8UQA. Dave came back to a TEST as if it were 80 meters! VE7BBG also exchanged with K3NSS and JA1VDV. AZ is represented by W7GBI. During October, Charlie worked K3NSS and W1JR. His presence is welcome especially since WA7BBM has been off due to a move. New stations in Japan are JA9BOH and JA6CZD. JA9BOH was able to QSO K2UYH despite the fact that he was running just 250 watts output to eight RIW Yagis. JA6CZD made the grade with K3NSS. Both of these fellows are welcome additions to 70-cm EME. Other new stations on, or in the process of getting on, are XE1RY, VE1QD, G8FUF, G4DGU, I8CVS, PAØMSH, W6ABN, N4KT/7 and K6ODV. Interested in becoming operational are the likes of LA3WU, UK5EDB, YU2CBM, CT1WW, DC1XC, LA1K, UT5DL, YU2UV and OK3CDI. Who said that the world above 50 MHz was a local proposition?

Slow-scan TV via moonbounce? Yes, it has been done when on October 10 KP4RS received several pictures from K3NSS. K3PGP was also able to copy some of K3NSS's SSTV transmissions.

Thanks to K2UYH's *432 EME News* for the foregoing material. Speaking of that fine publication, the October issue carries a biasing circuit applicable to the V-244 GasFET. I'll send copies to anyone furnishing an s.a.s.e.

In the terrestrial department, WØOHU, Rochester, MN, says that tropo conditions were better than usual during the fall of 1977. Ed doesn't know whether to attribute this to Mother Nature or increased activity. The Midwest gang concentrate their activities between 2130 and 2230 local time around 432.110 MHz.

W5QPX says that he has some surplus gear that he would like to find a good home for. Gil has several of the T-282/GR, 225- to 400-MHz transmitter units along with associated modulator/power supplies, and R-361/GR receivers. Interested parties should contact him at 101 Rita Blanca Trail, Amarillo, TX 79108.

Microwaves — Activity on 23 and 13 cm is on the increase in eastern PA and NJ according to W2EIF writing in his regular column in *Cheese Bits*, the monthly publication of the Pack Rats. Jo says that WA3JUF and WA2LTM are running skeds with western NY stations on 1296. Other active 23-cm stations include W3HMU, W3HQT, K3GAS, K3IUV, WA2ZZF, W2VC and W3HFF as well as W2EIF. The Pack Rats 1296-MHz net meets on Monday evenings at 2115 local time. Four to five stations are usually on band. This activity is paying off as it is reported that on October 24-25, WA3JUF worked K2YCO, western NY; K4QIF, VA; K1FO and K1PXE, CT; as well as more local stations W2VC and W3HQT on 1296. This brings K1FO's 23-cm total to four states despite a 7-dB noise figure receiver, 6 dB of feed line loss and 2-1/2 watts at the antenna which consists of a single Yagi with about 13 dB gain. Farther to the north, W1JR also reports a total of four states with only 3 watts in the shack. Joe's contacts include K1MNS, NH; W1JOT, MA; and K1WHS, ME.

K4MSG, who has recently moved from the Petersburg, VA, area to the Washington, DC, suburbs plans some Gunnplexer tests on 10.25 GHz from the Blue Ridge Mountains as soon as the weather becomes more conducive.

2-METER TRANSEQUATORIAL CONTACTS MADE

What most certainly must be regarded as one of the significant amateur findings in the field of radio propagation is the recent discovery that 2-meter signals can be propagated over great distances via the ionosphere in equatorial regions. As reported one year ago in this column, YV5ZZ, on November 8, 1976, heard the 145.9 MHz OSCAR-uplink signal of LU7DJZ. At about the same time, the New Zealand beacon, ZL1VHF, operating on 145.1 MHz, was reported heard by K6QJS/KH6. Following his reception of the Argentine station, YV5ZZ established schedules with a group of stations 3000 miles to the south. This effort finally paid off at 0220 UTC, October 28, 1977, when, using 6 meters for liaison, Ed worked both LU1DAU and LU7DJZ first on cw and then on ssb. Attempts to QSO LU3AAT and LU3EMH were not successful at that time despite the fact that these two were also hearing YV5ZZ's signal. LU3EMH's carrier could be heard but the a-m modulation was not readable on the Venezuelan coast. Unfortunately LU3AAT was running only 10 watts at the time. Signals on 2 meters were considerably weaker than on 6, S3 to 7 versus S9 plus, but YV5ZZ reported that they did not appear to have as much of the characteristic TE flutter as on the lower band. The distance from YV5ZZ's beach QTH to LU1DAU is about 3150 miles; well in excess of the existing terrestrial 2-meter record of somewhat over 2600 miles between CA and HI.

One week later, at 0006 UTC November 7, YV5ZZ, this time operating from his Caracas QTH, established contact with LU3AAT. The fact that by then the LU had his amplifier going apparently made the difference. He was S5 on ssb at Ed's while YV5ZZ's 100 watts was only S2 in Argentina. On this occasion, YV5ZZ was using his OSCAR 7 receiving antenna consisting of two vertical, 9-element F9FTs. Ed made the interesting observation that signals were best when the array was elevated about 10 degrees above the horizon.

Now that the ice has been broken by these persevering vhfers, and long-distance, 2-meter transmission via what appears to be transequatorial propagation has been demonstrated, will the mode be exploited further by additional stations in other parts of the world? Only time will tell. With so many now equipped for satellite operation around the globe, the chances would appear to be good. One tip-off the LUs had that conditions might be favorable was reception of OSCAR 7's 2-meter-downlink signals well beyond the normal horizon. That piece of information might give the rest of us something to think about in our quest of long-haul, 2-meter contacts via TE, if indeed TE is what it is.

TWO NEW CONTESTS

Watch for announcements, soon, of two new contests which are certain to make life in the world above 50 MHz even more interesting. The first is the EME Test to be held over two 48-hour periods in April and May while the other is a uhf operating event (220 MHz and above) slated for early August. The latter contest will employ a very interesting multiplier concept. Instead of ARRL sections, multipliers will consist of squares derived from one degree increments of latitude and longitude.

Let's all get behind these two new contests and show that world below 29.7 MHz what we can do.

THE STANDING BOXES

Keeping the standing boxes up to date is, without doubt, one of the more tedious jobs associated with editing "The World Above 50 MHz." Nevertheless, many feel that accurate up-to-date listings of their accomplishments are very important. On the other hand, others, whose totals should be recorded, have, for one reason or another, never submitted the necessary information. Tedious and time-consuming or not, this conductor feels that the boxes are important both as chronicles of progress on our vhf/uhf bands and as examples to others who may be considering whether to make the plunge into the interesting and challenging waters represented by the bands above 50 MHz.

In an attempt to reduce errors and provide a straightforward format for the submission of information, I have developed a new reporting form. It is not mandatory that everyone use it and I will continue to process all information received. Nevertheless, it would be helpful if everyone uses the form. It is requested that a separate sheet be used for each band and that no other information be included on the form. One potential source of error is my not remembering to put letters or cards in the standing box file after extracting other information from them.

I will be happy to provide forms to anyone sending an s.a.s.e. Please state how many sheets you need for states boxes among the various bands as well as the EME annals.

How's DX?

Conducted By Rod Newkirk,* W9BRD

DX Is Great in Seventy-Eight!

This one should be more like it. The new DX year, we mean. And about time. In our memory no sunspot minimum has seemed such a drag. But now even 10 meters begins to sound like old times. And old-timers, when the solar climate changes, hearken back to other cycles and other DX days. They've seen 'em come and go, and come again. . . .

There was ancient 1948, another fine year, our first inside *QST*'s DX mailbag. Just 10 guys on the Century Club Honor Roll led by W1FH with 173 countries. . . . Factory receivers were in, but home-brew transmitters were commonplace. . . . Cumbersome equipment and travel obstacles made DXpeditions practically unknown. . . . A-m hash and heterodynes jammed our voice subbands. Consistent radiotelephone DX was nearly impossible. . . . Remember hf narrow-band fm? That mode minimized BCI and worked lots of DX on 10 and 20. . . . There were rumors of a harrowing menace just around the corner, TVI.

By 1958 the 21-MHz band and Novice class were living it up in the DX world. . . . Single-sideband was just beginning to get its clear message through the a-m mess. . . . Electronic keyers were captivating the cw crowd. . . . The Honor Roll listed 26 stations, Ws 1FH and 6AM tied for the lead at 274 countries. . . . Many DX hounds still built their own rigs but TVI was such a threat that factory-sealed transmitters had increasing appeal. . . . DXpeditions were more popular but vacuum-tube outfits were terribly clumsy to lug around.

Then came 1968 which seems like only yesterday. A-m had been relegated to the airlines, shortwave broadcasters, jukebox radio and CB hordes while hf hams went ssb. . . . TVI, RFI and miniaturized complexity made homespun stations rarities among DXers. . . . But midget, solid-state transceivers boomed the DXpeditionary front. . . . The DXCC Honor Roll had swelled to 243. W1FH had retired but W6AM still shared top spot. . . . Vhf nets, repeaters and publications of clubs and groups permeated the DX scene.

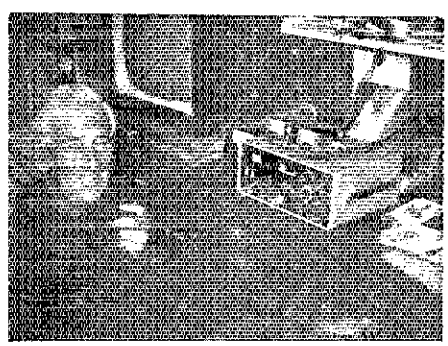
So here's 1978, right on schedule. Anything happen in the past decade? For real sure, good buddies. The biggest DX development has got to be OSCAR, hamdom's entry into the space age. . . . Slow-scan TV DX is a fresh attraction to amateurs in more than a hundred countries. . . . Lightweight minitransceivers and easy travel turn routine vacations and business trips into lively DXpeditions. . . . The Honor Roll fills entire *QST* pages, dozens tied for top billing with indefatigable W6AM. . . . Proliferating newsletters, repeaters and nets feed fast-spreading appetites for DX liaison and information.

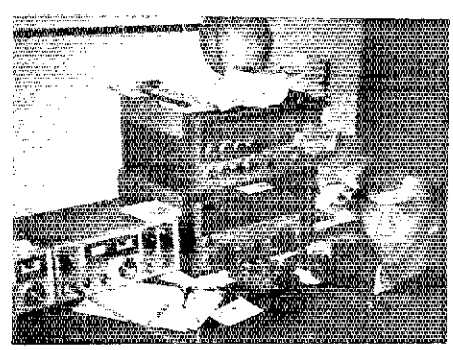
Ah, mere kaleidoscopic fragments of a vast and intricate DX tapestry, but those trends and highlights do stand out. A most fascinating 30 years behind this DX-oriented mill. We wouldn't have missed 'em for the world. Onward to '88!

GETTING 'EM ON THE WALL

Three cheers and a tiger or two for "QSLers of the Month" A4XGX, CP6HE, CTs 3BQ 9BK, EAs 3AEA 6DF, EL2R, FK8KAA, FO0RS, HC2TI, HIs 3XEA 8EJH, JA8AA, JR1UTH, KA1S, KM6FC, KP4s DGT EAS, KX6DC, KZ5DG, OA4AO, OX3s AB OA, P29CC, P19XX, UA9YE, UB5RAZ, UKs 4WAB 0KAA, UR2QD, UW0LX, VPs 1PG 2DD 8PL, W5ONL/HB, WB5LBJ/DU6, XE2MX, YV2ACH, ZF2AK, 3A2HB, 3D2DM, 8P6s GG JM, 9G1JN and 9J2ES, plus QSL tenders Ks 5YMY 6NA, Ns 2BA 6HR, Ws 3HNK 4UL 6VG, WAs 4HHG 6EAE and WB9TOU, all commended in recent "How's" correspondence for rapid pasteboard response by K1NG, Ws 1WA 4LVP 7HPI 9HR 9WI, WBs 4WHE and 8ZRL. Any other reliables who rate recognition? . . . Along with QSLers of the Month we should applaud DX stations who quickly supply logs to their QSL managers. (WB8ZRL) . . . FM7AQ is long overdue with his logs, and I may soon have to return all the many requests on hand for his QSLs. (W1YY/8, ex-K4KQB) . . . I handle VR4BT's QSLing for the Americas and Pacific contacts. Others go via G4CRY. (W0VU) . . . No bureau or manager out here in the bush. I've been QSLing direct but that won't be for long at 15 cents a shot. (KC6JJ) . . . I serve as SV0W7's QSL aide for Stateside contacts only. (WA9MZS) . . . KG6IF logs for September 16, 1965, through January 14, 1968, are now in my possession. They had been gathering dust at the Marcus MARS facility. (WA2IFK) . . . I manage QSLing for TU2GO and, when he moves to TJ-land, will take care of his Cameroon cards as well. (WA4OUF) . . . My managerial duties for CT2BS date from August 31, 1977. (K1NG) . . . All QSLs for WA7OTT's 1976 Caribbean tour may be obtained through me. Calls include VP2s MT LDU and WA7OTT/VP2D, also VP2M contest contacts, cw only, for the autumn of '76. Most USA stations should have received theirs via the bureau by now. (JA1KSO) . . . C4, 5B1-2-3-5, 5BA2, etc., are prefixes unauthorized for use on Cyprus and QSLs for such stations are not handled by our bureau. ZC4s are stations at British bases on the island. (5B4AZ) . . . Note that I can confirm TJ1BF QSOs only for the year 1972. (WA4WTG) . . . The various QSL reps specified by "3V8P" know nothing about him. Save your stamps. . . . I handle cards for op Ken of 9L1SL and will QSL for his own personal 9L1 call sign when it comes through. (WB4WHE) . . . As must be widely known by now, the former Angola QSL bureau of LARA is no longer operative. (D2ASW) . . . I still have QSLs available for 1970-71 Yap operation by KC6s WS and YL. (W3FDP) . . . YA1OS logs for May, 1971, to August of '73 are on hand here. I can also confirm Bo's 9K2EP contacts. He currently signs SM0OS. (SM0DJZ) . . . I2YAE assures me he does not QSL for HH and TL8 stations despite erroneous contrary indications. (N2NN) . . . Past QSOs with EP2OD, EQ2ITU and 9D5B can be confirmed through my present QTH. Likewise, contacts with HP1XOD, OA4DX and PY1ZAL, 1968 through '74. (K4OD) . . . DXpedition-of-the-Month QSLing is in process for recently active A9XCA, K4RT/HR1/8R1 and WB2IEC/H18/S21 from our facility address, 2417 Newton St., Vienna, VA 22180. (W2GHK) . . . I do QSL chores for W8OLC's two-year EP2MS sojourn. Bill says the club in Tehran acts as QSL bureau for any EPs at P. O. Box 907, Tehran, Iran. (W8CXS) . . . Cards for XF4JJ may be sent via the UMRE bureau, attention XE1VW, as well as via my home address. (WB4KPZ) . . . CR9AJ QSOs in last fall's phone contest action may go via W6AQ. (WA6AUD) . . . AA4GM, formerly WB4SIJ, was an early displayer of Uncle Sam's newest ham prefix. AA4AA is ex-WA4FIX. . . . Forwarding arrangements for K5CO's previous address expired, K5CO/5A QSL delays resulting. Try Tom's present QTH. (LIDXA) . . . JK1BKE, 21,315 kHz at 1030 UTC, offers the latest Japanese label. CT5Ø/1AL and CT5Ø/1DW were CT1s AL and DW hamming commemoratively. (VERON) . . . W4SPX's big backlog of TT8AC, 5V7DB and 5ZVWT QSL requests is being tackled by brave WA4WTG who will work via bureaus. HQ is a Honduras special, J3 now goes for Grenada, and KP4 calls already represent the Virgin Islands courtesy FCC. U1USP, U2USP, etc., are Russian specials QSLable via CRC, Moscow. (DXNS) . . . 'Alp! Parenthesized colleagues plead for pushes toward confirmations from holdouts specified: (W1CDC) HK3ADO, HL9TS, ZS6QU/3; (W1GDQ) VQ9TC/d '66, XW8BA '65; (W2LZX) 7Q7BC;

*c/o ARRL, 225 Main St., Newington, CT 06111

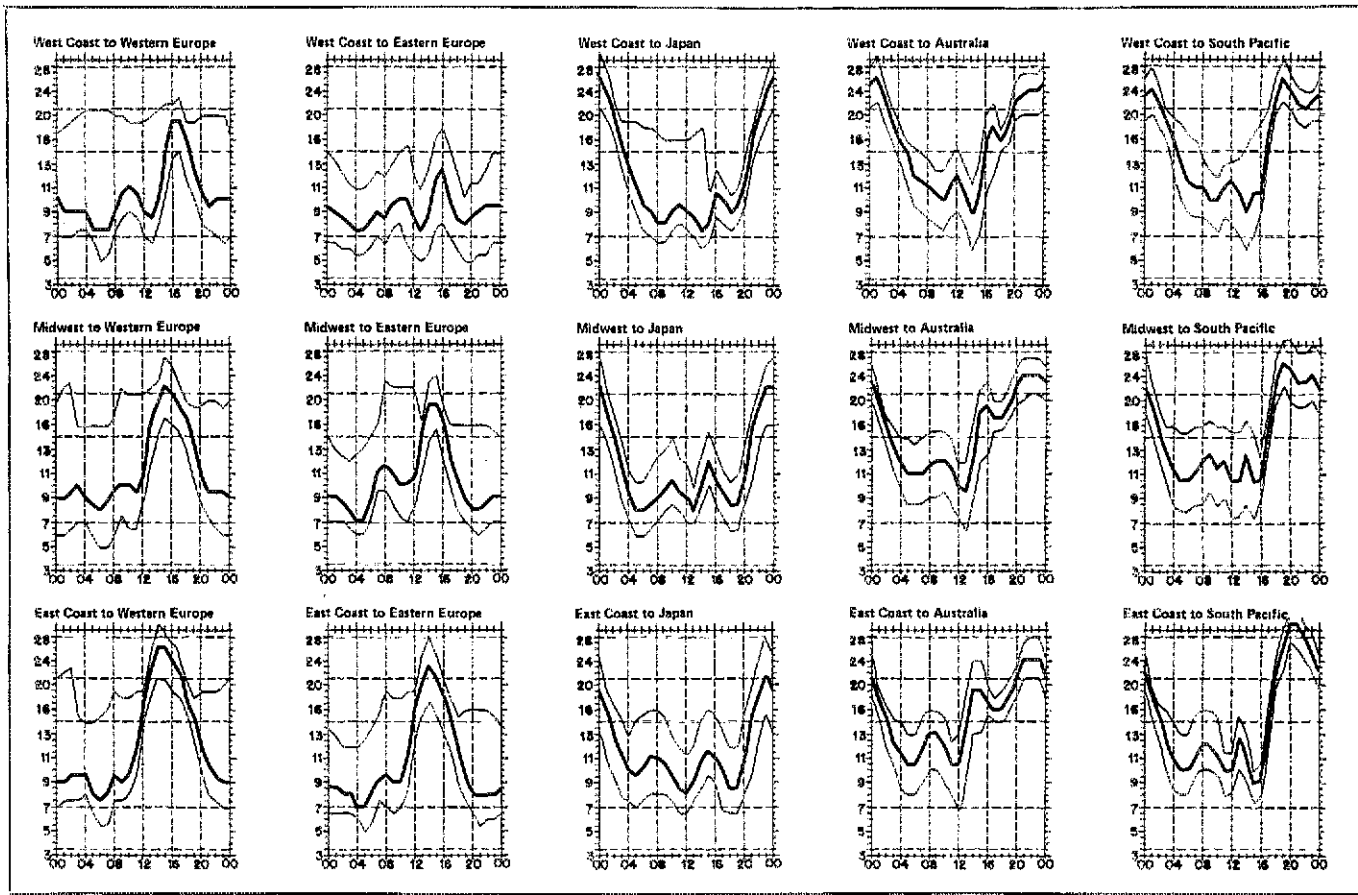




ZLs 2LH, 2KG and 3GG, left to right, radiate familiar signals our way when the bands open to New Zealand. Roy, Ken and Jack posed for the camera of VE3AUI during the latter's recent global tour.

(WØULU) 6W8DY; (K6UGS) CR7LE, GC2TR, 7Z3AB, 8R1W, 9Y4PA, all '72; (K8GWU) W9GST/ZS3F; and (WBØMNW) CO2FRC. Any aid? WBØMNW also offers to serve as Stateside QSL agent for overseas QMs or YLs, the rarer the better. . . . These rovers may be reached through their home addresses for QSL purposes: DF2MQ/HBØ, DL7RV/OHØ, HB9AGC/1A5, I2s PFY/ID9 VGM/TI2, JA1TES/5A, KH6JJD/VQ9, N6WW/4X4, OE2WSL/YK, Ws ICDC/VP2A 8TIX/KM6 ØUO/6Y, WAs 4NFF/C6A 6YOU/DU and 9FXJ/6Y. Now let's hit specifics, but remember that each suggestion is not necessarily accurate, complete or "official." . .

AP2s AM AU, P. O. Box 8925, Karachi, Pakistan
C2ITA, T. Arai, P. O. Box 246, Nauru
C5AAC, P. O. Box 227, Banjul, Gambia
C5AAP, A. Pomfret, c/o BHC, P. O. Box 507, Banjul, Gambia
C5ABK, MRC, Box 273, Banjul, Gambia
CE7AQK, P. O. Box 206, Ancud, Chile
CE7BDJ, P. O. Box 35, Puerto Montt, Chile
CO7UPC, Pioneer Palace, P. O. Box 52, Camaguey, Cuba
CP6HE, W. Bustamante, P. O. Box 1652, Santa Ana, CA 92702
CT6FSM, P. O. Box 58, Viseu, Portugal
D2ASW, Rua Projectada L, Lote 20-4 ESQ, Quinta do Marques, Oeiras, Portugal
DK6UI/5N2, B. Hinze, P. O. Box 1543, Ontisha, Nigeria
EA1URE, P. O. Box 1087, Logrona, Spain
EL2AH, P. O. Box 380, Monrovia, Liberia
EP2LI, Box 1555, Tehran, Iran
EP2s PI PY, P. O. Box 14-1684, Tehran, Iran
FMØDOS, P. O. Box 686, Fort-de-France, Martinique, F.W.I.
HC2AG, P. O. Box 9473, Guayaquil, Ecuador
HC2EY, P. O. Box 5503, Guayaquil, Ecuador
HH5RB (via W4ORT for cw, K4UTE ssb)
HI8XBA, P. O. Box 2071, Santo Domingo, Dominican Republic
HKØBDK, Box 842, San Andres Island, Colombia
HM5JW, P. O. Box 586, Pusan, South Korea
HP1XWA, F. Rayborn, P. O. Box 2919, Balboa, C.Z.
HP1XYA, P. O. Box 9668, Panama 4, R.P.
HP2LT, J. Levia, P. O. Box 1988, Colon, R.P.
HP5FI, P. O. Box 1568, Chitre, Herrera, R.P.
HUØYS, P. O. Box 32, San Salvador, El Salvador
I9LHQ, C. Liistro, via Marconi 46, Canicattini, Bagni, Siracusa, Sicily, Italy
J28BD, P. O. Box 1465, Djibouti, Djibouti
J3s AH AJ (to VP2s GAH GAJ)
JA8s AQN/JD1 IEV/JD1 (via JA8JL)
JY5US, P. O. Box 2285, Amman, Jordan
JY9DH, P. O. Box 2788, Amman, Jordan
K4VWI/KH6, J. Martin, 910 Murray Dr., Honolulu, HI 96818
K5CO/5A, T. Meadows, 3417 Statler Dr., Mesquite, TX 75150
KØADY/DU2, R. Williams, MSD, Box 33, FPO San Francisco, CA 96555
KL7RW, P. O. Box 94, Cold Bay, AK 99571
KP4ERR, P. O. Box 9318, St. Thomas, VI 00801
KX6LA, D. Snowden, Box 494, APO San Francisco, CA 96555
KZØDX, P. O. Box 407, Balboa, C.Z.
LU7KAT, Box 131, Tucuman, Argentina
N4SN/DU2, c/o NCDXA, P. O. Box DX, Boyce, VA 22620
N7HR/KH6, c/o WVDXC, Box 555, Portland, OR 97207
OD5AQ, P. O. Box 2, Beirut, Lebanon
ON7FF, Box 32, Ieper, Belgium
S79S, J. Browning, 25 Parsons Ln., Los Altos, CA 94022
S79WHW, P. O. Box 491, Mahe, Seychelles
S8JAM, P. O. Box 45, Umtata, Transkei, South Africa
TI2DBJ, P. O. Box 2357, San Jose, C.R.
TI2EPG, P. O. Box 175, Guadalupe, C.R.
TI2FF, P. O. Box 1105, San Jose, C.R.
TI2VVR, P. O. Box 2412, San Jose, C.R.
TR8MFB, P. O. Box 2182, Libreville, Gabon (or via WB4IWW)
VE3s HY/SU JQA/SU (via VE1RU)
VK9NI, A. McCullagh, P. O. Box 27, Norfolk Island 2899, Australia
VP2LDB, P. Searle, P. O. Box 181, Castries, St. Lucia, W.I.
VP2LDF, Miriam Searle, P. O. Box 181, Castries, St. Lucia, W.I.
VP8PT, P. O. Box 224, Port Stanley, Falkland Islands
VR4BC, P. O. Box 225, Honiara, Guadalcanal, Solomon Islands
VR4CF, P. O. Box 498, Honiara, Guadalcanal, Solomon Islands
VS5CW, C. Whiteley (G3NYX), Box 1746, Bandar Seri Begawan, Brunei
WA1HCK/TG4, E. Read, Box 20, Chimaltenango, Guatemala
WA1RFM/VP9, W. Birtcher, Tudor Hill Lab, FPO New York, NY 09560
WA6OXZ/VQ9, R. Luney, NAVCOM, Box 13, Diego Garcia, APO, San Francisco, CA 96685
WA6QFO/3D6, J. Cooper, Box 295, Secunda, Transvaal, South Africa
WB2KPA/TI2, T. Kunkel, Apto. 10240, San Jose, C.R.
WB4MYN/TG4, J. Miller, c/o Canadian Embassy, Guatemala City, Guatemala
WB4ZNW/DU2, G. Bankston, PSC 1, Box 3076, APO San Francisco, CA 96286
WB5TON/HR1, A. Jones, Box 2636, Laurel, MS 39440
WB7QJY/8R1, R. Neufeld, P. O. Box 596, Georgetown, Guyana
XE2PL, P. O. Box 1154, Monterrey, NL, Mexico
YB1BF/7, S. Muchsin, Box 76, Balikpapan, Borneo Indonesia
YV5ACM/4, P. Siblesz, P. O. Box 2169, Aragua, Venezuela
ZD8H-ZD8HAL-9Y4KK, H. Horn, 1609 E. Lake Parker Dr., Lakeland, FL 33801
ZL1s AA YL (via ZL1BKL or W6ORD)
ZP5XU, Harlet Novins, USAID, APO New York, NY 09881
ZS3BOY, P. O. Box 794, Tsumeb 9260, Southwest Africa
3D2MD, P. O. Box 55, Lautoka, Fiji Islands
3D6AC, P. O. Box 1159, Mbabana, Swaziland
4J6A, L. Agabekov, P. O. Box 41, Essentuki 357600, U.S.S.R.
5B4EI, P. O. Box 5009, Nicosia, Cyprus
5N2NPB, P. O. Box 52, Sokoto, Nigeria
8P6s AH BN CP (via WA4WTG)

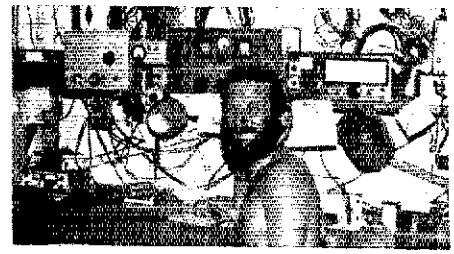


When are the bands open? These charts predict this month's average propagation conditions for high-frequency circuits between the U.S. and various overseas points. One chart for East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be 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

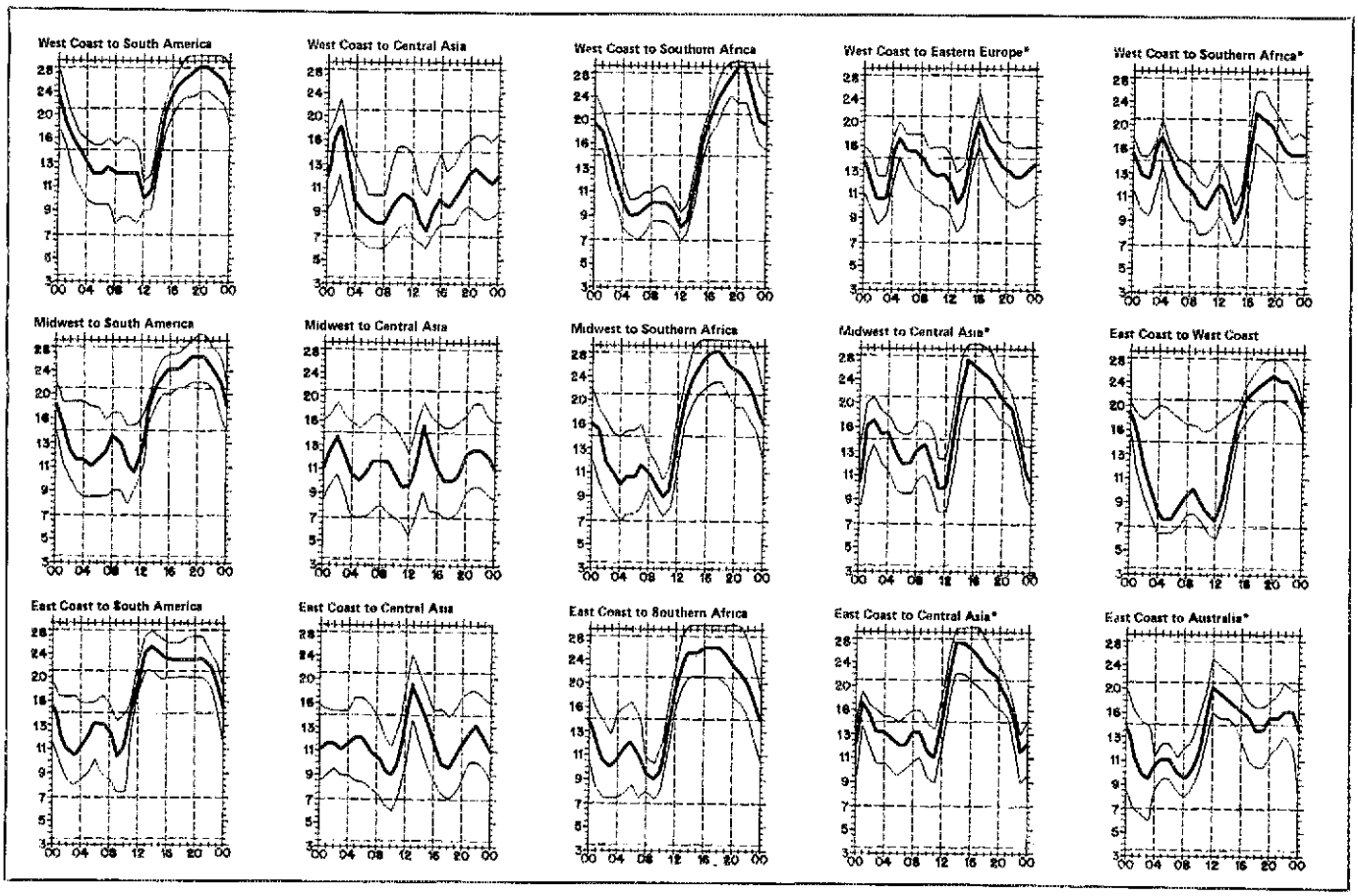
9J1JG, E. Poulsen, P. O. Box 75, Mpraeso, Ghana
9G1MM, Marianne McGillivary, P. O. Box 1277, Kumasi, Ghana
9K2FO, P. O. Box 177, Kuwait
9V1TF, 332-Q Gilstead St., Singapore 11 Singapore
9Y4FS, P. O. Box 1157, Port of Spain, Trinidad
9Y4R, P. O. Box 25, San Fernando, Trinidad

A2CBW (DK3KD)
A2CCY (VE4ACY)
A7YXX (DC9NV)
A9XCA (W2GHK)
AP5HQ (NØRR)
C31ME (W1JFL)
C31MR (EA3XO)
C31OG (DF1KT)
C31OH (DK8EV)
C31OJ (DK4AP)
C31OZ (DC6RJ)
C31PE (DB1VB)
C31PF (DK5VP)
C31PI (OH2NP)
C5AR (G3LQP)
C5AT (OH2BFJ)
C6AEY (WB9HAK)
CF1ISH (VE1FQ)
CK1HH (VO1HH)
CM2HB (ON5YL)
CT2BS (K1NG)
CT2BSA (WA8SVU)
CT3AF (W3HNK)
CT7AL (CT1AL)
CWØA (W3HNK)
CX5RV (G5RV)
CY1NN (VE1NN)
DM25FA (DM2BTO)
EA7VU/9 (W6UOU)
EA8OR (DJ6JI)
EL1F (WB4IUX)
EL2BS (K9KXY)
EL2R (WA4HHG)
EL0AP (JA1VE)
EP2DT (OZ6DT)
EP2IA (W4YE)
EP2LA (WB8DKQ)
EP2MO (WB8DKQ)
EP2MS (W8CXS)
EP2NC (I2YAE)
EP2VH (W4MYL)
FØAOZ (DK1DY)
FØCUW (I1ANP)
FØCYA (HB9BFS)
FØDOT (VE2ACW)
FCØAPA (DL6WC)
FCØDWN (DK2WV)
FG7AV (REF)
FGØDWT (F6BLK)
FHØFX (W2PPG)
FHØYL (I8JN)
FHØYO (W6BVM)
FK8BB (DJ9ZB)
FM7AU (I2YAE)
FMØBZK (FM7AS)
FMØCOO (VE7DGO)
FOØBG (K6AHV)
FR7AD (F6ASK)
FR7ZS (F5DB)
G5BZF (W4YE)
GJ5AGA (K4II)
GJ5CCX (DK6AS)
GJ5CEE (DJ6AJ)
GU4DAA (G3FXB)
HBØBLC (HBØMRR)
HC2YL (WD5FQX)
HD8GZ (HC1GZ)
HH2MC (WA4AKU)
HH5HR (K4UTE)
HH5TW (W4ORT)
HI3JEI (W2KF)
HI8MOG (W3HNK)
HI8XDJ (K3SWZ)
HL9KW (WA7DIG)
HS1ALD (HB9AZW)
HS9FK (9M2FK)
HUØYS (YS1YS)
IA5PQW (I2BWW)
IC8HGZ (SMØFXA)
IH9LCK (I4LCK)
IH9XIX (IT9XIX)
IK5ØARI (ARI)
IY4FGM (I4BFY)
IZ4ARI (I1WZ)
JD1IAA (JE1HKX)
JT1AN (W7PHO)
JY4MB (DJ3HJ)
JY9DP (DL1OU)
K4IIF/C6 (W4KA)
KØAX/DU (W4FLA)
KA2DX (K5RW)
KG4DX (WBØQWW)
KG4OO (KØPMZ)
KG6IF (see text)
KG6JED (K8BZ)
KG6SL (WA6AHF)
KG6SW (W7OM)
KM6EA (I2YAE)
KM6FC (K5YMY)
KX6DC (W6VG)
N4JJ/HC (WA4QMQ)
OF6NU (OH6NU)
OK3KII (OK3CHK)
PA9AZX (K2SVO)
PJ8AR (W3HNK)
PJ9CQ (WB4EHX)
PJ9XX (W1XX)
PJ9YN (W1YNT)
PY2PE (F6BFA)
SQ7SPU (SP7KTE)
SU1JA (JAØFLI)
SVØWZ (see text)
TJ1BF (see text)
TK7GAS (FG7XA)
TT8AC (WA4WTG)
TT8HV (WB9YHA)
TU2GO (WA4OUF)
TU4AM (I8JN)
UKØFAJ (WA6FIT)
UVØEX (W7PHO)
VG3BA (VE3BA)
VKØCC (VK2BCC)
VP1AJ (N5UR)
VP1PG (WB9TOU)
VP1UR (N5UR)
VP2ABB (9Y4SF)
VP2GWM (W8JWY)
VP2LJ (WA4WTG)
VP2MIZ (W5TIZ)
VP2MJD (W5SJD)
VP2MSA (OE3GSA)
VP2SZ (WB8RPIJ)
VP2VDH (K6SDR)
VP5GS (W4OO)
VP5ZZ (WA2CPX)
VP8OA (G4FIY)
VP8PL (G3LIK)
VP9IR (G4FIY)
VQ8CB (F6BHY)
VR4BT (see text)
VS5MM (VS6BY)
VU2KMK (W7ISY)
VU2LE (WA6OET)
VU2UH (SP9AJT)
VYØC (VE3GMT)
WB8NTK/KP4 (W8TO)
XF4JJ (WB4KPZ)
XP1AB (WA2UUK)
XU1DX (W1JFL)
YA1OS (SMØDJZ)
YJ8KC (ZL1BAB)
YS1SC (I2YAE)
YTØIARU (YU1PCF)
YTØM (YU1SRS)
ZB2CN (DJ9WH)
ZB2DM (W1JFL)
ZB2DN (G4FIY)
ZB2GF (G8LUV)
ZD8RR (G4FIY)
ZF1MA (VE3GCO)
ZF1MT (WA9UEK)
ZL5AC (ZK1DR)
ZS4PB (W7VRO)
3C1X (SM6PF)
3D2AN (K6ZIF)
3D2CC (VE6AKV)
4A1U (XE1U)
4S7TE (SM7TE)
4X4UF (WA4WTG)
4Z1ØTD (NØRR)
5V7JC (F6CBC)
5W1AK (WA6AHF)
5W1BD (K1AGB)
5Z4QQ (K7DVK)
5Z4RT (I8JN)
6W8MM (WA1SQB)
7Q7LB (I2YAE)
7X2FL (K1VSK)
8J1HAM (JARL)
8P6FD (VE2QO)
8P6GN (WB4RRK)
8P6HV (W5EN)
8PØA (WA4WTG)
8Q6AS (G4CIR)
8Q7AD (JA1UMN)
8R1X (VE3IXE)
9G1JD (WB8WBZ)
9G1KP (K1MAR)
9G1RP (W7FLE)
9G1SM (W3HNK)
9GØARS (GARS)
9K2EP (SMØDJZ)
9K2EX (SMØBYD)
9L1JB (WB8LDH)
9L1JM (W4BAA)
9L1SL/b (WB4WHE)
9M2DW (DJ3HJ)

These were gathered with prime assistance from the mail of Ws 1CDC 2GHK 3AZD 4LVP 5SJD 7HPI 8UOQ 9LNQ 9PIO ØUO, Ks 3SWZ 8BZ, N2NN, WAs 4WTG 6ARP 9MZS, WBs 4RRK 4WHE 6NLH 8ZRL 9TZM ØONN, WD8CUU, VO1KE, HB9NL, JH1HWN and DX literature to be gratefully accredited next month. A piece of cake!



KC6JJ finds Western Carolines cw QSOs in wide demand on 80 through 10 meters. An old HQ-140 receiver, homebuilt 50-watt transmitter from scrapped TV set parts, and a horizontal V beam do the job for John on Yap. His home base is Hawaii where he signs KH6GPC.



lowest curve (optimum traffic frequency, or fot). See January 1977 *QST*, page 58, and September 1977 *QST*, page 35, for a complete explanation. The horizontal axis shows Universal Coordinated 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 January, 1978, assume a sunspot number of 58, which corresponds to a 2800-MHz solar flux of 109.

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, 1977. 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

ZL1TY/299	DKØBZ/122	WA6EKH/107	JA2DGD/104	W7TIZ/102
JA3GM/223	I2MQP/121	YU1NWO/107	DF2RG/102	K7GGY/102
OH7RF/211	JA4CTL/118	W2LRU/106	JH4LEL/102	VP2SQ/101
A3CSZ/165	WB2ALX/112	WB9OXV/106	K4JEX/102	W5ZNN/101
JA2BJC/155	W3UJ/112	CT1DF/105	KG6JIH/102	KC4AAC/100
DL8JL/142	JA4MH/111	K4IBI/105	WA2EDV/102	W3KWH/100
S79DF/135	JA1EL/107	K5LUW/105	WA4YDK/102	WB4SQA/100
KL7HR/134	K3VXV/107	DJ7OL/104		

Radiotelephone

K4PDV/300	K6QHC/123	WB5PGF/114	WA6EKH/107	WD8DIV/102
ZL1TY/299	N6JV/123	K8UNV/110	EL3A/106	G4AUT/101
JA3GM/189	ZP5VO/123	ZL2ARX/110	W6FQF/106	WA2EDV/101
K6BWD/166	I2MQP/121	EA3OD/109	JA3CSZ/104	VP2SQ/100
WB6KIL/145	TU2EP/121	JA1KJW/108	ZP5WU/103	WA1SQB/100
EA3KW/143	WB6WCW/121	WA7VMC/108	JH4LEL/102	ZF1AK/100
F6DHD/125	KØRPH/114	W3AX/107		

CW

JA8ZO/161	DK7SU/116	JA3CSZ/110	W9QLD/104	W4DZZ/101
JA1KJW/149	JA4CTL/113	JA3GM/105	PY2ELV/103	WA5YMW/101
AC6MUR/140	WB2ALX/112	K4AIZ/105	N1RW/102	K1GMW/100
DF4GV/124	JA2GJC/110	K8UQA/105	W3AX/102	WB8ZRV/100
W3API/123				

5BDXCC

SP9AI	HI8LC	SP5PWK	W8DA	W2TO
YU3APR	OH7RF			

Radioteletype

K3SWZ	OK1MP

Endorsements

Mixed

W1JNV/350	N3ED/302	W3DPA/250	WA1EOT/206	JA5PUL/160
KH6CD/347	W6ZYC/298	WB4RUA/250	N7MW/203	K4ZVS/160
F9RM/340	W4VJH/297	YU3TDX/250	WB8KNZ/202	W5RBB/158
W1HH/340	W4KNW/294	DK5WS//249	KØSVW/201	JA7YOJ/154
W6MUR/337	K1ZSI/291	WB5HVY/244	N6VF/201	WA1QNF/144
WA2RAU/336	W1ESN/291	WB6KIL/242	DL7RT/200	HB9SO/141
K4AIM/336	N6GG/289	WA3NGS/241	N4HU/200	YU3TKT/140
HB9PL/333	W5MN//286	W8ZR/241	SVØWTT/200	N9TN/139
I2SM/328	JA3BQE/283	W1JR/240	VE3DKE/200	K2YGM/138
YU2DX/328	PY8JO/280	K3RT/239	JA8KSF/195	K1XA/137
K7ABV/325	K5OR/276	WØLR/232	WB9REB/183	DJ9UN/135
W6BVM/325	ZS4MG/274	K9UIY/231	W3YY/180	WB9EIW/127
JA8ZO/322	JF1PJK/271	JA6RIL/227	W4BTZ/180	K9JS/125
K4CEB/321	WA4DCP/271	W7LR/225	K2WS/179	K2OQJ/124
W3ZN/315	IT9PUG/270	WA22BEX/223	SK5AA/179	OH2KP/121
W2FG/315	IT9WGI/260	N4GE/220	K1ALP/176	WB8SBH/121
K2BT/314	W7QS/258	W4TYE/220	N9GT/176	WAØIDK/121
W8ILC/312	W3AX/257	WB6JQP/220	DL9PR/171	K2DEB/3/120
YU3EY/312	W5TWI/252	WA9MOE/220	JA8HQI/166	K4KBL/120
W4WG/310	W2RS/251	JA1KJW/212	AA4US/161	WA4OUF/120
JA2KLT/306	N8BM/250	W4MWT/207	DJ2MH/160	N1II/116
WAØDUB/305				

Radiotelephone

ON4DH/349	W2FG/302	DK5WS/249	WØEVE/200	W2MPI/160
F9RM/340	OE3WWB/293	W1ESN/248	WØWAM/200	I8YZP/159
WA2RAU/336	W6ZYC/293	W1PCD/243	W8ZR/191	W2HXF/158
K4AIM/336	K1ZSI/273	WB2NIC/237	W8GG/185	IØCHF/144
I2SM/328	K4MEZ/272	JA3BQE/230	K2GAT/180	N9GT/143
I8AA/328	W6BJB/272	K3RT/229	W3YY/180	PJ3DO/141
I8YRK/324	K5OR/270	W3FZE/219	W6ZUM/179	K2BWQ/140
W4EEO/317	W3ZN/266	JA6RIL/217	DA2KD/177	ZP5EF/140
HB9AAA/315	N3ED/262	W5SAA/206	K1ALP/175	WB4QVZ/120
JA8ZO/310	W3IF/261	JA1QER/205	WB9REB/175	WB5UKI/120
VE3UX/309	W8SET/260	K5HWO/200	JA8HQI/166	W9TEI/120
G3ZBA/308	JF1PJK/252	W4MWT/200	JA5PUL/160	
W1JNV/304	W5TWI/251			

CW

K6GA/261	DL1PM/175	WB8JEY/160	N7MW/152	K9UIY/150
JF1PJK/193	W2MD/165	WA9MOE/156	SVØWTT/151	N1AC/120
W4TYE/180				

Corrections

The following Honor Roll corrections should be noted: K4YFQ should have appeared as 325/311 Mixed; W6RJ should be corrected to 338/314 Mixed. The following endorsement totals should have read: Phone W9VWV/148, CW W9GM/176.

DXAC NOTES

The following recommendation from the DX Advisory Committee was submitted to Headquarters by DXAC chairman K5LM in October, 1977: Geyser Reef should be deleted from the ARRL DXCC list.

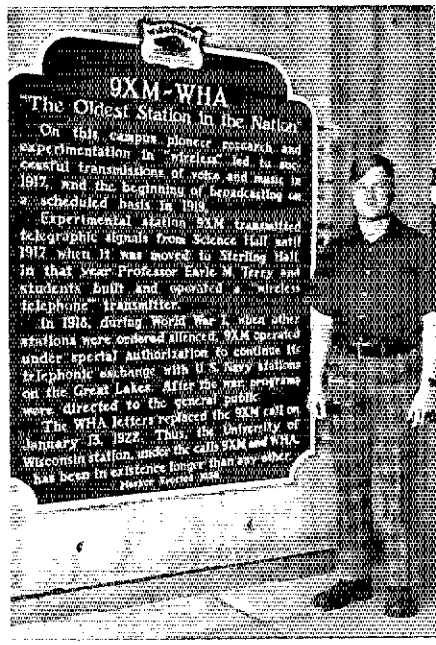
The recommendation was accepted by the Communications Manager. For more information on the function of the DXAC, see page 90 of *QST* for December, 1974.

DXCC NOTES

A deletion to the ARRL DXCC list is Geyser Reef, deleted as of March 1, 1978, by reason of Rule 4 of the Countries List Criteria (unadministered area).

This action brings the grand total on the ARRL DXCC list to 363; 318 current and 45 deleted.

Strays



When Extra Class licensee Ken Dixon became eligible for a two-letter call he had a natural choice in mind. WHA-TV, the public broadcasting station he works for now, began more than 60 years ago as an experimental station airing telegraphy, voice and music from the University of Wisconsin campus in Verona. The plaque next to W9XM tells the rest of the story.
— *K9ZZ (W9LA photo)*

VENUSBOUNCE, ANYONE?

☐ It may look tough, but the feat may not be so impossible. Dick Simpson, W6JTH, believes that Earth-Venus-Earth communication is technically feasible. In fact, he is looking for someone to either help him coauthor an article on the possibility of such an experiment, or write a companion piece emphasizing amateur radio state-of-the-art. Contact him at 2339 Santa Catalina, Palo Alto, CA 94303.

50 Years Ago

January, 1928

☐ The radio(telegraph) conference is over; amateur radio has been officially recognized internationally, and bands are now pretty much common throughout the world, though smaller than the U.S. delegation argued for.

☐ Amateur phone is not rated very high quality, and the 5AJ-5JU description of a pair of UX-210s modulating another pair of 210s in an *oscillator* doesn't seem destined to help much.

☐ Some towns have been trying to prohibit amateur operation by local ordinance; or to license amateurs; the League took a Kentucky case to court and won the argument that radiocommunication is basically interstate and thus subject only to federal control.

☐ If you want the advantages of crystal control but find the quartz pieces too expensive, 4FM's article will show you how to cut and grind a slab to meet your requirements.

☐ 9BQY doesn't like vibrators or choppers to convert d.c. to a.c., and has built a commutator system for current reversal which gives equal output on both halves of the cycle.

☐ MIT's Chinn has a nice design for a portable, general-purpose receiver covering 15 to 2500 meters.

☐ The importance of r.f. chokes is being more fully recognized, and Glenn Browning points out some design considerations, particularly to stay away from the natural resonances.

☐ Lou Hatry says we sometimes worry too much about short leads in wiring, which on occasion can be detrimental.

☐ RCA's Roberts finds that even though your transmission line may be quite long, the losses are minimal *if* it is properly matched to the antenna.

☐ nu3CAB in Washington is an outstanding station with a full description in this issue.

25 Years Ago

January, 1953

☐ Good news flash — FCC has dropped its proposal for mandatory calling and answering frequencies, which had us all pretty much up in arms.

☐ We now have technical solutions to every TVI problem except the freakish ones of non-linear harmonic generation, such as a rusty metal eave trough. W2RYI recounts dozens of such potential sources, and how the interference might be located and alleviated.

☐ Double conversion has lots of advantages and is not as complicated as most of us think, as W1DX shows us in his description of a simple receiver design and layout.

☐ Ever watchful of Novice needs, W1ICP this month presents a nifty 35-watt rig, simple to construct yet TVI-proofed.

☐ Amateurs of six counties around Detroit cooperated to design and mass-produce a basic, hand-held, 10-meter unit for civil defense emergency communication.

☐ W1PH has now added an amplifier to the coffee-can rig he described some issues ago.

☐ If your big rig is not easily reached from the operating position, use a Clapp oscillator in a remote v.f.o. unit at your fingertips, following W1TS' design.

☐ W2PAT finds another way to simplify getting on RTTY with a converter useful for both receiving and transmitting.

☐ Busy months ahead — the V.H.F. SS in January, and the big DX competition in February and March.

☐ Building a better receiver than you can buy is a principle applying especially to the world above 50 Mc., W1HDQ points out, in a series of tips on improving sensitivity and signal-to-noise ratios. — *W1RW*

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1FWA, Carl G. Grindle, Ellsworth, ME
W1HXL, Frederick E. Horner, Mystic, CT
W2II, Webster E. Fisher, Rochester, NY
WB2IDU, John H. Wenzel, Navesink, NJ
W2KEG, Emil L. Ploenes, Point Pleasant, NJ
WA2MKG, Eric K. McLean, Rochester, NY
WB2MWH, John Calton, Rockaway, NJ
W2RA, Robert K. Anders, Toms River, NJ
W2WYM, Joseph Leeb, Paramus, NJ
W3AIR, Francis C. South, Wheaton, MD
WB3AJN, Edward J. Klassen, Clinton, MD
K3EDH, L. Richard Andrews, Chambersburg, PA
W3KBT, James F. Groman, Nazareth, PA
W3RFH, Alfred D. Muldoon, Pittsburgh, PA
K3SCL, Ebo Picchetti, Wilkes-Barre, PA
W3VYY, George W. Kindt, Bryn Mawr, PA
W3YF, Charles H. Hodges, Baltimore, MD
W3YG, Paul H. Singewald, Drexel Hill, PA
W4ABF, Gordon C. Edwards, Springfield, VA
W4CEH, Frederick I. Jackson, Belleair, FL
K4CPC, Samuel D. Letsinger, Concord, TN
K4ELH, Herbert W. Yeager, New Port Richey, FL
WB4HJZ, Charles B. Simpson, Knoxville, TN
K4KIQ, Paul Geiselmann, Vero Beach, FL
W4MK, Marion M. Causey, Richmond, VA
WB4PWT, Albert Werner, Royal Palm Beach, FL
W4RRV, Sanford B. DeHart, Oak Ridge, TN
W4SB, John M. Webb, Henderson, TN
W4VJQ, Charles D. Norris, Alpine, TN
WB4VLX, Paul B. Grove, Sarasota, FL
W5JIC, Marshall B. Riggs, Fort Smith, AK
W5LTA, Hiram W. Holland, Mountain Home, AR
W5LUX, Fred E. Ward, Albuquerque, NM
WB5OCT, Seymour H. Cronk, Mountain Home, AR
W5TS, John S. Lewis, Fort Worth, TX
K5UGP, Ernest D. Sweenhart, Tijeras, NM
K5UYU, Paul H. Dugan, Lake Jackson, TX
W6BSN, Dr. Omar U. Need, Jr., Campbell, CA
W6CCX, John H. Miller, Fresno, CA
W6JEH, Robert E. Cakebread, Redondo Beach, CA
K6KRA, Charles E. Gray, Los Angeles, CA
K6KV, Maurice E. McCreery, Santa Barbara, CA
W6MWQ, Walter L. Scott, San Luis Obispo, CA
KH6OT, Henry Pataray, Kaneohe, HI
WA6PDQ, John M. Bostain, Lancaster, PA
Ex-W6UCB, Carlyle R. Smith, Lompoc, CA
W6YT, Alfred K. Robinson, Porterville, CA
WA6ZOM, Lloyd J. Hagaman, Belmont, CA
WA7AGO, Kenneth L. Alton, Salt Lake City, UT
WB7AHV, Francis L. Noffsinger, Scottsdale, AZ
K7CTC, Vergil R. Chambers, Portland, OR
KL7IAO, Paul O. Lonneke, Homer, AK
WA7ISM, Glenn E. Long, Eugene, OR
W7ONZ, Elmer S. Kedl, Buffalo, WY
K7QFW, Charles "Chuck" R. Walbridge, Mountlake Terrace, WA
WA7TGX, Edward T. Frates, Prosser, WA
W8ABH, Virgil K. Linke, Hart, MI
WD8CFW, Jack Finnie, Lansing, MI
K8DTF, Donald E. Irish, Westerville, OH
K8EYH, Raymond V. Spohn, Toledo, OH
W8EZA, Frank M. Hilbert, Toledo, OH
WA8GGC, John A. Breece, McComb, OH
WB8GKU, Thomas B. Keller, Cleveland, OH
K8LGB, Spencer Warren, Cadiz, OH
W8LGG, Nicholas J. Goretti, Kent, OH
W8LQ, Ash O. P. Medici, Detroit, MI
K8NLS, Arnold C. Smith, Columbia Station, OH
W8THZ, Francis E. Oberlin, Lansing, MI
W8VKK, Ellis C. Miller, Sr., Akron, OH
W8WUV, Charles M. Rhoads, St. Albans, WV
K8YWO, Norman E. Parker, Bellaire, MI
K9CJO, Sister Mary Lumena, Mequon, WI
W9EAU, Anton J. Rank, Appleton, WI
W9FED, Valdemar C. Carlson, Geneva, IL
W9FKJ, Henning A. Jansson, Morton Grove, IL
W9FMI, Lloyd J. Lewis, Baraboo, WI
W9JFS, Russell G. Michael, Frankfort, IN
W9NUN, Willis R. Barber, Glen Ellyn, IL
WA9QWP, John Padgett, Des Moines, IA
W9SMS, H. Robert Elder, Sr., Indianapolis, IN
K9SPH, William C. Parr, Monticello, IN
K9TAV, Michael J. Gall, Evergreen Park, IL
W9WUK, Franklin R. Belott, Chicago, IL
WA9YCA, Ben H. Gaither, Indianapolis, IN
WØCNC, John C. Evans, Elkland, MO
WØCRY, James W. Fowley, Sioux Falls, SD
WBØFSI, William A. Ridley, Estherville, IA
WØHQE, John A. Hamblen, Kansas City, MO
WØKIX, Kenneth W. Dixon, Manitou Springs, CO
KØPOF, Mina Oster, Clarion, IA
WØZFJ, William J. Smith, Boulder, CO
KØZQE, Ormal L. Green, Humboldt, IA
Ex-VE1ASP, Joan Clahane, Halifax, NS
VE1ATY, J. J. Oliver, Yarmouth, NS
VE3AVD, Bernard L. "Bunny" Utronki, Renfrew, ON
VE3BEB, Harry W. Hayes, Ottawa, ON
VE3CEZ, James L. Ward, Ottawa, ON
VE3DR, Jin Ide, Oakville, ON
VE3HTE, Johann Hribal, Kitchener, ON
VE4AAC, Cecil H. Plunkett, Pinawa, MB
VE4DR, Harold E. Mansell, Beausejour, MB
VE6AZE, John W. Helwig, Edmonton, AB
VE7AFA, Henry T. Wright, Chilliwack, BC
VE7SC, Rolfe Mathie, Kelowna, BC
DL2WB, Wolfgang P. Bauer, Muenchen, Germany
OH2RY, Fjalar "Ed" Lindstrom, Lohja, Finland
UP2PAO, Jonas L. Tumatis, Siauliai, Lithuania
VK5AZ, Barry T. Parker, Adelaide, S. Australia
XE1CF, Alberto, Saltiel, Mexico, Mexico

Strays

PIONEERING MISSIONARY DIES AT 80

☐ A radio pioneer who spent a quarter century isolated in Labrador, where he used amateur radio to communicate with trappers and other residents, died recently at age 80. The Rev. Dr. Lester Burry, VO1EN, served for 26 years at North West River, where he and his mission boat, *Glad Tidings*, were a familiar and welcome sight.

QST Congratulates . . .

☐ Larry Field, WA9YZR, president of the Circle ARC, who recently received the Circle Student Service Award for his club's free radiogram service at the University of Illinois Chicago Circle campus.

☐ Lucas J. Bazin, WB2SQP, Cydney A. Johnson, WB2WNL, Mark R. Nelson, K8ZHD and Dennis M. Schneider, WA2RSQ, who were among a 10-member team of RCA technicians who won the David Sarnoff Award for Outstanding Technical Achievement. In just one year they designed, developed and produced RCA's TK-76 color camera, a 20-pound unit used in electronic news gathering.

I would like to get in touch with . . .

☐ aviation veterans of World War I, any country, or others who are interested. Bill Pearce, WØMWO, Eagles Rest, 9 Knightsbridge Pl., Pueblo, CO 81001.

☐ KIM-1 digital computer users. E. Adams, K2YEF, 718 Graisbury Ave., Haddonfield, NJ 08033.

☐ students, ages 8-80, interested in joining a net on 7245 kHz, Tuesday-Thursday, 2250 UTC. Maria L. Evans, WBØSPT, Coates St. Rd., Macon, MO 63552.

☐ chess players for an on-the-air sked. S.a.s.e. to Dave and Dan Laske, WBØYUU and WBØYUV, 419 4th St. N.E., Stewartville, MN 55976.

☐ anyone with information on the Avro Arrow (CF-105) built in Malton, ON, during 1957 and 1958. E. R. T. Park, VE1NU, 622 Acadia Ave., Dieppe, NB E1A 1J3.

Public Service

Conducted By Robert J. Halprin,* K1XA

A Year Ago This Month

What SET? Amateurs in northeast Indiana did not participate in last year's Simulated Emergency Test. Instead, they were involved in the real thing.

Four inches of snow fell peacefully on Allen County during the early morning hours of January 28. Within two hours, as many motorists were heading for work, 54-mile-per-hour wind gusts swept the area, rearranging the snow into drifts and piles seven to 10 feet high. Roads quickly closed from the drifts and many cars were buried. As daylight broke, the wind persisted and the temperature dropped to 12 degrees below zero, resulting in a wind-chill factor of 70 below.

Noting the gravity of the situation, the possibility of instantaneous frostbite and stranded motorists, Allen County Sheriff Bud Meeks declared a snow emergency. Coordinator K9SPD announced over Ft. Wayne's 28/88 machine (WR9ABN) that the sheriff's emergency operating center was going to be activated. Assistant EOC Coordinator WB9PXT quickly reported to the sheriff's communications department and within a half-hour, the Allen County EOC was on the air. WB9PXT closed the 'ABN machine to all but emergency traffic.

Hams monitoring that machine and WR9ADI (31/91) immediately began checking into the emergency net. Some reported to the EOC to provide relief while others began rounding up four-wheel vehicles. Within two hours after the storm had hit, Allen County amateurs found themselves not only providing emergency radio communications from isolated parts of the country, but also providing actual rescue and relief assistance to Allen County police.

A list of available four-wheel vehicles and snowmobiles was quickly compiled after two local radio stations asked for such assistance from the public. Both stations remained in direct contact with the EOC via ham radio.

At least 139 times during the emergency, the Sheriff's Department called on hams to assist in emergencies, including reconaissance missions to two communities which were snowed in and quickly running low on food and fuel supplies. Amateur-equipped, four-wheel drive vehicles transported stranded families from their homes to Red Cross emergency shelters and took groceries to others. Nurses, doctors, police and firemen found their way to work in these vehicles. Victims in need of medical care, including heart and diabetic patients, were transported to local hospitals.

Hams themselves even encountered problems. WB9NIE and others found themselves stranded in a rural section of the country for over five hours in a snow drift one-half mile long and five to seven feet deep. They were in the process of trying to pass an abandoned vehicle in the roadway when they became bogged down with two elderly passengers they were transporting. Battery power for his handheld and gasoline in his vehicle ran dangerously low before he and the others were dug out by two snowmobiles, a fire department rescue squad, and a fire truck.

Hams transported medicine, special milk formula and even fed stranded farm livestock throughout the 58-hour period. It lasted from Friday morning, January 28, through Sunday evening, January 30. When it was over, the SET was long forgotten and the repeaters fel almost silent, except for the few hams com menting on the just-completed feat.

By the next day, the statistics were in. The storm had claimed two lives in Allen County Over 1500 families had been housed in emergency shelters and 8000 meals were served by the Northern Indiana Red Cross. Forty per cent of Allen County's roads remained closed Even though the EOC had secured, amateur still stood ready to take over again if needed.

Sheriff Meeks credited the approximately 5(hams who operated during the emergency with preventing what "could have been utter chao in the county." Northern Indiana Division Red Cross Director Robert Vessey had praise fo the amateurs, saying that he had never seen hams so willing to provide not only emergency radio communications, but rescue and merc mission relief as well. Television and radio sta tions gave the amateur effort extensiv coverage. The Associated Press ran a statewid story on the ham activity which later wa picked up by AP's national wire service.

There is irony to this story. Not only did th storm strike the same weekend as the SET, bu Sheriff Meeks had been planning for months t stage a mock disaster to test emergency preparedness, including that of the amateu populus. He was, needless to say, extremel pleased with the turnout in the actual emergen cy.

For the time being, northeast Indian amateurs have proven that the Allen Count emergency operating center, WB9YER, was in deed Your Emergency Radio. — *Victor M Locke, WA9YOS*

PUBLIC SERVICE DIARY

☐ Atlantic Ocean — July 23. WB2QHE and his wife (along with WA2OOM and his wife) were returning from Bermuda on their 30-foot yacht when their main sail was wrecked and their gas supply ran out, 60 miles off Montauk Pt. WA2OOM transmitted a distress call; WB4QWM answered and notified the Coast Guard. (WA2HSQ)

☐ West Caicos Island — July 28. When the yacht *Madame Butterfly* ran aground and began taking on water, VP1LC put out a MAYDAY. He was immediately answered by VP5EE and help was dispatched. (VP5EE)

☐ Dayton, OH — August 10-12. When the Dayton Fire Department went on strike, area amateurs went into action, assisting Red Cross relief efforts, and spotting and checking fires for the municipal government. (W8ILC, EC Montgomery/Greene Cos.)

☐ St. Croix, V.I. — September 3. KV4FZ spotted an SOS being sent by flashlight from a yacht and notified c.d. via 2 meters. The passengers were successfully rescued. (KV4FZ)

☐ Reno, NV — September 4. Nineteen amateurs responded to a call for assistance in the search for a missing young woman. The operation was coordinated by WA7UEK. (K7VYT)

☐ Louisiana — September 4-5. As Hurricane Babe began moving toward the Louisiana coast, the Central Gulf Coast Hurricane Net activated at 0400Z and remained in session until 1800Z. Luckily, Babe turned out to be a minimal hurricane. (K5OWK)

☐ Kansas City, MO — September 11-13. Six area repeaters operated continuously, providing police, fire, Red Cross and other relief agencies with communications after 12 inches of rain (in a 48-hour period) flooded most of the city. WBØOAY, Lee's Summit, was on the air from an underground emergency operations center and supplied liaison between hams and the municipal government. (WBØFKY, SEC MO)

☐ Atlantic Ocean — September 12-October 12. Canadian and American amateurs combined efforts on 80, 40 and 2 meters to provide invaluable service to the transatlantic-bound *Eagle* balloon. (W1ZB)

☐ Jacksonville, FL — September 22. At 3:30 P.M., all the generators of the Jacksonville Electric Authority failed. Acting on the spur of the moment, Jacksonville hams established both high-frequency and 2-meter communications. (N4UF)

☐ Lake Minchumina, AK — September 24. An incredible amateur radio response occurred instantaneously when a small plane carrying six people ditched in an isolated lake in the interior of the state. Ham radio was the only form of communications to the crash scene. The pilot and passengers were successfully airlifted by paramedics. (KL7CUK, SCM AK)

☐ Anchorage, AK — September 30. Five amateur provided communications in the search for a missin hunter in a remote area, 125 miles north of the city (KL7CUK, SCM AK)

☐ Cumberland, MD — October 8. While bike hikin along the C & O Canal, the group leader of an Ex plorer Scouts group was seriously injured during a to rential rainstorm. One of the scouts, WB3EOU, calle for help on 52 and was answered by WB8OOC (W3DKX, SCM DE)

☐ Atlanta, GA — October 13. When a water mai exploded, causing a telephone outage at two loc hospitals, local amateurs made sure that the hospita weren't cut off. All incoming emergency and priori calls were routed through the home telephone K4SWJ and then patched to the hospitals via 2 meter (K4SWJ, EC Fulton Co.)

☐ Pierce Co., WA — October 15-17. The Pierce C ARES provided communications for authorities du ing three separate searches over the weeken (WB7AJR, EC Pierce Co.)

☐ *Repeater Log.* According to reports received date, repeaters were used to report 41 automobile a cidents and related occurrences, two fires, two distu bances and one plane crash. Repeaters involved we WR2AIX, WR4s ACO AXL, WR5s ABA ABY AD AIB AJG, WR7s AGK AHD, WR8AFZ, WR9AJ WRØAPH.

*Asst. Communications Mgr., ARRL

☐ For the month of October, 33 SEC reports were received, showing a total ARES membership of 12,500. Last year at this time, 33 reports were submitted, with a total membership of 13,192. Sections reporting were Alta, Ariz, Ark, Colo, Conn, Del, ENY, EMass, Ga, Ind, Iowa, Kans, Me, Man, Mich, Miss, NC, NFla, NNJ, Ohio, Okla, Ont, Org, Oreg, SV, SDgo, SJV, Sask, SFla, SNJ, Va, WVa, WMass.

NATIONAL TRAFFIC SYSTEM

"Traffic handlers must be very careful with those messages. Did you hear about the businessman attending a convention? He sent a radiogram back to his wife which read: 'Having a wonderful time, wish you were her.' . . . only a dit missing!" Please note the new format for NTS statistics below — this is the first month of composite region net reports. WB2IDP is now assistant manager, 2RN-D. N5YL became a CAS member-at-large. TWN-D is well on the road to recovery, spearheaded by WØHXB. RN7-D now meets at 1900Z and 2030Z on 7268 kHz (3895 alternate). Certificates: WA4CNU WB5OYU WB5RLR (RN5-D); K7CWV WB7AAK WA4HRG/7 VE7COA (RN7-E); WA7IHS W7VSE VE6AAT VE7BKK (RN7-D); W8WEG WB8WTS (8RN-E).

October Reports

Area Nets

(evening sessions)
(daytime sessions)

	1	2	3	4	5	6	7
EAN		31	1564	50.4	1 403	98.9	
EAN		62	859	13.8	.710	87.1	
CAN		31	1282	40.7	1.039	100.0	
CAN		62	403	6.5	.279	96.8	
PAN		31	983	31.7	.974	98.3	
PAN		31	384	12.4	.331	97 8	
Region Nets							
1RN		90	766	8 5	.540	90.4	91.9
2RN		119	763	6 4	.485	92.1	95.9
3RN		92	429	4.5	566	100.0	99.2
4RN		124	1407	11.3	.483	71.4	100.0
RN5		93	1244	13.5	459	90.7	99.1
RN6		94	699	6.6	.346	93.7	100.0
RN7		124	538	4.3	.359	79.6	96.7
8RN		83	366	4.2	.664	79.8	100.0
9RN		90	497	5 5	.356	83.3	96.7
TEN		93	545	5.1	.271	64.6	99.1
ECN							70.9
TWN		89	562	6.3	.336	89.0	97.5
TCC							
TCC Eastern		113'	656				
TCC Central		86'	597				
TCC Pacific		109'	625				
Sections²		5012	18928	3.7			
Summary		6351	34077	5.3			
Record		5476	31117	16.4			

'TCC functions not counted as net sessions.
²Section and local nets reporting (141): BCEN (BC), MTN (MB), APN (Mar/NFld), CMN GBN GBSSN LN ODN OPN OSN (ON), WQV/UHF (PQ), SATN (SK), AENB AEND AENJ AENM SENS (AL), ASN (AK), ATEN HARC (AZ), AMBN APN ARN OZK (AR), NEN SCN (CA), CWN (CO, WY), CN CPN NVTN (CT), DEPN DTN (DE), FAST FMTN GN NFPN PBTN QFN SPARC TPTN (FL), CVEN GARES GCN GSN GSSBN WGARES (GA), IMN MTN (ID, MT), ILN (IL), INTN ITN QIN (IN), ICN I75MN TLCN (IA), KPN KSBN KWN QKS QKS-SS (KS),KNTN (KY), LAN LRN LSN LTN (LA), MSN PTN SGN (ME), MDCTN MDD (MDC-DE), EMRI EMRISS NENN WMN WMPN (MA), HEN MACS MI6m MWN QMN (MI), MSN MSPN MSSN MWX PAW (MN), MTN (MS), WNN (NE), NHVTN (NH,VT), BARTEN NJN NJPN NJSN (NJ), SWN (NM), NLI NLIPN NLS NLIV WDN (NY), CNN NCSSBN SCSSBN THEN (NC, SC), BN BNR BRTN ONN 06mN OSN OSSBN (OH), OAN OFON OLZ OPEN OTWN STN (OK), EPA EPAEP&TN PTTN WPA WPAP&TN WPA2MP&TN (PA), SDN (SD), TN TNN TPN (TN), TEX TTN (TX), UCN (UT), VFN VN VSBN VSN (VA), WSN (WA), WVN WVNN WVPN (WV), BEN BWN WIN WSBN WSSN (WI).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVG.
5 — RATE
6 — %REP.
7 — %REP. TO AREA NET

Public Service Honor Roll October 1977

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.

66
WB5NKD

65
W6AUC

64
WA1ZAZ
K4ZN
W5KLV
N5YL
W8SOP

63
WBØHOX

62
W4OGG

61
W1DVW
WA1UWF
WA2ERT/1
N2YL
N3HR
K4BKX
WA4CNY
WB4DBK
WA5YEA
W7VSE
WB8JGW
WBØLFY
VE7DKY

59
WA4JDH
N4PQ
WB4OBB
WB5NKC
WA9QCF
VE3GT

58
N2MW
K6JT

57
WB5RLR
W8DIL

56
W1KX
N2GM
WA2HTP
W2MLC

WA4UUX
N4WA
N5ES
N5TC
WØHXB

55
WB2LCC
KØDJ
WØOYH

52
K3YL
W4MEE
K5DG
WA6UAZ
W7GHT
WA7MEL
WB8VLR
WB8YDZ

51
WA3PZO
AA4CK
WBØOFQ

50
WA2BMI
W2YJR
WA4PSL
WB8WTS
KØTER

49
WA1POJ
W1RWG
W2MTA
K3ORW
WA3PRW
WB4ALH
WB4GHU
WB4NJU
W5GHP
K5MAT
WB5NEZ
WB5OOM
WB6PVH
K9LGU
WØFT
WAØTNM

VE1ACU
VE5AAE

48
WA1MJE
WB5OSN
WB5OYU

47
WA3WPY
WD9AUD
VE4QU

46
K4YFC
WB6FTY
W8YIQ

45
WB5KKT
K5OWK
WA5VBM
WØOTF

44
W1BVR
WA1HYN
K1OOG
K2AV
W2CS

44
WA2YYM
WA3NAZ/4
W3PQ
WB4DJU
WB4EKJ
K4EV
W4LXB
WB4TEK
W4ZJY
N5DP
K5MC
N5TS
K5TTC
W5UYH
K7GXZ
WA7JRC
N8CW
W9MR
W9NXG
W9UW

WØIX
KØPVJ
WØRFF
WBØUIP
WBØZAL
VE1AMR
VO1GW
VE1HJ
VE1RO
VE3GOL
VE4PG
VE4YE

43
WA2AIV
W2JI
WB4OXT
WB7DMI
KØEVH

42
W1DMS
WB2HIQ
WA5JWD
WA7YCM

41
WB1CPF
WB3AQB
W4FMN
WA6VBS
WBØMCL

40
WA1TBY
WA2JKG
K2SE
WB5FHA
WB6VJW
K9MX
WBØVHN

39
WA7ZAP/T

27
WA4RND/N

23
WA1TAK/N
W1TKZ/N

22
WA4QGV/T
WB7TAZ/N

Independent Nets (October)

	1	2	3	4
Amateur Radio Telegraph Society	31	679		509
Central Gulf Coast Hurricane	31	150		3029
Hit & Bounce	55	965		419
Hit & Bounce Slow	19	34		103
IMRA	26	400		995
North American SSB	26	230		249
North American Traffic and Awards	31	63		1209
Southwest Traffic	31	117		1320
Washington Region PON	18	19		328
West Coast Slow Speed	31	202		514
20 Meter ISSB	26	375		486
75 Meter ISSB	31	533		1209
7290 Traffic	42	474		2447

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Ferd Thiede, W2EC, former manager and secretary of the Hit & Bounce Net, who regularly sent in reports you see above, passed away at the age of 80 on October 22, at his home in East Setauket, Long Island, after 65 years as an amateur radio operator. Ferd received the call 2EC in 1912, a commercial license in 1913 and served as a radioman aboard a ship during World War I. In the 20s and 30s, he was involved in the emergence of radio broadcasting as an entertainment medium and many patents for recording mechanisms were in his name at the time. Ferd was a charter member of QCWA, DOTC, active in RACES since 1953, Navy MARS, and a member of ARRL continuously since its founding in 1914.

"Ferd was loved and respected in both phone and cw nets all over the eastern area. He was one of the founders of the Hit & Bounce Net and was very active in the old trunk lines before that. Ferd spent so much time for so long, helping people get into traffic handling and in keeping the nets going, that it's so sad that soon people just starting will never have known him. *We* who knew him can remember in our hearts, but let's do something to keep his spirit and dedication alive as an example for others." — *N2YL*

Transcontinental Corps

	1	2	3	4	5
Eastern		124	91.1	1778	656
Central		93	92.4	1162	597
Pacific		124	87.9	1257	626
Summary		341	90.4	4197	1878

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (October): Eastern Area (VE3SB, Dir.) — W1s KX NJM QYY, K1s BA EIR GN NIA PAD SSH XA, WA1ZAZ, W2s CS FR GKZ MTA RQ, WA2ICB, N2GM, W3s PQ YQ, K3s KW PA, N3HR, W4UQ, K4s BKX KNP, N4KB, W8s LTA PMJ, K8KMQ, VE1AAO, VE3s GOL SB. Central Area (W5GHP, Dir.) — N4MD, W4ZJY, WB4SKI, W5s GHP RB, K5s GM MC TTC, N5s TS YL YXØ, WA5s HNN IQU, W9s CXY DND FC NXG, N9TN, WØs AM HI, KØEVH, WAØTNM. Pacific Area (K5MAT, Dir.) — W5KH, K5MAT, N6GW, W6s EOT MLF OA VZT, K6HW, KH6IQU, N7RC, W7s DZX EP GHT KZ, K7IWD, WØs ETT FG FV IW LQ, KØs BN DJ TER, WBØTAQ, VE7ZK.

Brass Pounders League October 1977

BPL Medallions (see December 1973 *QST*, p. 59) have been awarded to the following amateurs since last month's listings: WB2IDP, N2YL, WA4CRI, WB4DBK.

The BPL is open to all amateurs in the United States, Canada and U S possessions who report to their SCM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL form.

	1	2	3	4	5	6
W3CUL		649	1696	1945	62	4352
WØWYX		51	926	370	556	1903
W4MEE		5	564	496	24	1089
KØYFK			543		543	1086
WA4JDH			506	477	8	991
WB4QBB		235	254	461	16	966
K9CPM			528	38	297	863
W3VR		331	186	326	19	862
WA3ZRY		59	280	304	20	663
K4TH		25	294	190	129	638
WAØAUX		5	258	349	6	618
W5KLV		2	366	238	11	617
WB4JMM		57	225	305	21	608
KØONK		1	482	114	11	608
K1BCS		94	192	295	14	595
N4PQ			275	298	2	575
N3HR		5	290	251	20	566
WA1MJE		19	318	206	13	556
K4ZN		11	277	234	1	523
W2YJR		31	229	219	35	514
WB5NKD		19	229	242	22	512
WB5NKC		4	170	325	5	504
Multioperator Stations						
W4IZ		1036	30	658	3	1727

BPL for 100 or more originations-plus-deliveries

WA3ATQ	275	WA4OEM	130
WØFQB	194	WA4CRI	121
WØHXB	187	WB5LBR	106
K7VWA	179	WB5NEZ (Sept.)	132
W7SQT	171	WØFQB (Sept.)	129
W7TZK	159	WØFQB (Aug.)	159
WA5VBM	134		

1 — CALL
2 — ORIG.
3 — RECD.
4 — SENT
5 — DEL.
6 — TOTAL

What's Your Serial Number?

Your rig is as valuable as any other durable good. A service manager points out how serial numbers can help.

By William A. Frost,* WD8DFP

"And the serial number?" When you report a stolen rig, this phrase usually follows the manufacturer-and-model question asked by the police department and insurance company.

If you are among those who don't send in warranty cards, perhaps you can find the serial number in the packing carton. That is, if you didn't throw it away thinking that the rig would never need service at a distant point, or if the XYL hasn't used it to pack grandma's Christmas present. If your dealer did list it on the bill of sale, you're in luck. Better yet, your log book is the ideal place.

But, if you didn't log your rig's serial number anywhere, you're in trouble! You might say "The factory will know; they have my warranty card." Well, I'm sorry, OM, but this isn't necessarily so. The R. L. Drake Company, for one, files all warranty cards by product, then by serial number — not by the owner's last name. Why? Because, rigs change hands often. So, if you bought a used rig and forgot or lost the original owner's name, we would never find the warranty card. Returning it not only establishes the warranty, but allows us to advise you of any updating changes in the rig. Return those cards!

Another reason for recording your serial number, and the best, is that every rig passing through our service department gets checked for being stolen. How? Those who report stolen rigs to me have a three- by five-inch card stapled to their warranty card. It gives the date stolen, whom to contact and any accessories or peculiar identification such as a hidden serial number. Therefore, each rig's serial number is checked against the warranty card file regardless of its age. If the rig's serial number was removed, we can't do much. But, you as hams can do something.

If the rig's serial number was removed, we can't do much. But, you as hams can do something.

Don't buy a rig without a serial number regardless of price or antique value. If a stolen rig does appear, we contact our local authorities, who in turn contact the owner's local authorities and eventually the person who sent the rig in for service. By the way, that person could be liable for receiving stolen merchandise.

Make a list of all your equipment. Note the serial numbers and any peculiar markings like a hidden serial number behind the front panel or main tuning knob or another spot out of sight. An engraved serial number on the inside of the cabinet or chassis will help, but what if the thief looks inside? If he files off the serial number on back, I'm sure he won't mind doing one more that a prospective buyer might see. Put it where it can't be seen and only you know where it is. Be sure to use the same number as the manufacturer.

Now that you have your identification list (including the XYL's hair dryer; mighty useful in tracking down a heat-sensitive transistor), place it in your safety-deposit box or in the milk can along with your other valuables such as old spark-gap rigs. Don't send it to me. I file by serial number, remember?

If, and I hope not, your rig is stolen, you'll be able to give the required information to your insurance company, local authorities and the manufacturer. QST

*R. L. Drake Co., 540 Richard St., Miamisburg, OH 45342

Strays

Two-Letter Codes for FCC Field Offices

Code	Office	Code	Office
AR	Anchorage, AK	MA	Miami, FL
AT	Atlanta, GA	OR	New Orleans, LA
BF	Buffalo, NY	NF	Norfolk, VA
BM	Baltimore, MD	NY	New York, NY
BS	Boston, MA	PA	Philadelphia, PA
BT	Beaumont, TX	PL	St. Paul, MN
CG	Chicago, IL	PO	Portland, OR
DL	Dallas, TX	SD	San Diego, CA
DT	Detroit, MI	SF	San Francisco, CA
DV	Denver, CO	SJ	San Juan, PR
HL	Honolulu, HI	ST	Seattle, WA
HU	Houston, TX	SV	Savannah, GA
KC	Kansas City, MO	TP	Tampa, FL
LB	Long Beach, CA	WN	Washington, DC

As you tune across the low end of 20 meters a faint transmission from the west ends with "/HL" — Korea! Well, more than likely it's the interim designator being used by a U.S. amateur who has just upgraded at FCC's Honolulu district office. The complete list is shown here.

With bold black and small green lettering on bright yellow, Jim Wilson, K4BAV, spreads a positive image of amateur radio. The Alexandria, VA, EC had the shirt made for Field Day and other public service activities. *(Becky Wilson photo)*

1978 Novice Roundup Announcement

Another big crop of new Novices and an expanded awards structure highlight this year's Novice Roundup.

The 27th annual Novice Roundup should be the biggest one yet! Beginning with this year's NR, additional achievement awards will be available. Each and every Novice or Technician who submits a *valid* entry of 200 or more QSOs during the NR will receive a handsome certificate heralding his or her achievement. The award for 200 or more QSOs is, of course, in addition to the certificates normally given to both section and division leaders.

Two hundred QSOs may at first seem like a lot, but considering the 30-hour operating period available, the average comes out to about seven QSOs per hour. Take into account the expected increase in NR participation and the 200 QSO award should be "easy pickings." We hope to be able to award a certificate to each entrant.

Since Novices are now issued permanent type call signs, how do you tell the Novices from the others? This is handled rather easily by requiring that Novices sign with a slant bar (dahdididahdit) followed by the letter "N" after their call sign.

If a Novice operates portable from a call area other than that indicated by the number in his call sign, the general rule which now applies to all ARRL contestants also applies to Novices. The Novice will sign his call, slant bar, the number of the call area he is operating in, and "N." Example: A Novice, WA1XYZ, is portable within the first call area, so he signs WA1XYZ/N in the Novice Roundup. Another Novice, WA1XXX, is operating portable in New York (second call area); he signs WA1XXX/2N.

Technician class licensees may participate in the Novice Roundup on the same terms as Novices, but they will be competing against other Technicians and *not* against Novices in their ARRL section. Techs will sign /T, for purposes of identification, and they may work Novices, other Technicians, and General, Advanced and Extra licensees, all for points. Technicians will be eligible for awards, same as Novices.

All licensees other than Novices and Technicians will be working *only* those stations signing /N or /T.

Now that we've decided who can be in the NR (everybody) and who is competing against whom (Novices vs. Novices, and Techs vs. Techs) and competing for what (ARRL section winner awards), the big question is, How to do it?

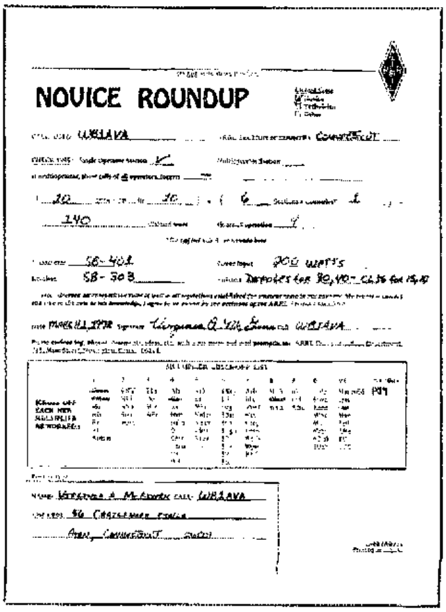
How to Participate

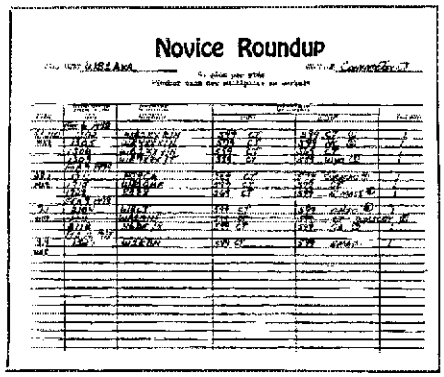
The 1978 Novice Roundup starts at 0001 UTC on February 4 and ends at 2359 UTC on February 12; that means local time the NR starts on Friday evening, February 3. You may operate 30 hours out of the nine days. Rule no. 2 further details the timekeeping. Entry forms are available from ARRL headquarters; log sheets, summary sheets (one needed) and Operating Aid 6 forms (one needed) to keep track of whom you have worked in matrix form. The log sheets have room for 100 contacts each. Send your self-addressed, stamped envelope to Headquarters now and be sure to indicate how many of each form you want. You'll have them in time to start the Roundup.

The idea in the contest is to work as many stations as possible, in as many different ARRL sections and foreign countries as possible. ARRL sections are listed on page 8 of every *QST*. You may work each station *only once*. Keep your contacts as short as possible; send your exchange (RST report and ARRL section) only once and repeat it only if requested. Keep your CQs short, too! Here's a sample:

CQ NR CQ NR DE WA1XYZ/N
WA1XYZ/N NR K
WA1XYZ/N DE WA1XXX/T AR
WA1XXX/T DE WA1XYZ/N 579 VT K
WA1XYZ DE WA1XXX R 569 EM K
WA1XXX R 73 DE WA1XYZ/N NR K

Note that once you have established





each other's license class you can drop the /N and /T for the duration of the QSO; brevity is the name of the game!

Scoring and Rules

Count one point for each contact (you may work a station only once, regardless of band); add your ARRL Code Proficiency credit, then multiply by the total number of multipliers (sections + countries) worked. And remember, KH6 KL7 KP4/KV4 KZ5 and VE districts are sections and *cannot* be counted a second time as a foreign country. If you work 100 stations in 31 sections + 3 foreign countries and have an ARRL (not FCC) Code Proficiency credit of 10 wpm from W1AW or W6OWP, then your score is 100-plus-10 × total multipliers (31 + 3) or 34, for a total of 3740 points. For details on the Code Proficiency program, see "Operating Events" on page 91 of this issue. You may work DX stations for contest credit; a multiplier of one is earned for each separate foreign country worked.

Read the rules carefully. Keep a check sheet of stations worked (we have Operating Aid 6 available free) so that you don't have duplicate QSOs. Log sheets, Op Aid 6, and a summary sheet are now available from your ARRL headquarters. *Unless first-class postage is included with your request, log sheets will be sent by third-class mail.* To aid us in getting these forms to you as quickly as possible, please be sure to include with each request a self-addressed, stamped envelope containing: your full name, call and mailing address complete with ZIP code. We suggest a minimum of 13-cents postage attached. This will assure your receiving three log sheets (enough for 300 QSOs), one Op Aid 6, and a summary sheet. Using this as a guideline, you can adjust the postage according to the number of logs you anticipate needing.

B C N U in the NR!

Rules

1) *Eligibility:* The contest is open to all radio amateurs in the ARRL sections listed on page 8 of *QST*.

2) *Time:* All contacts must be made during the contest period starting at 0001 Coordinated Universal Time (UTC) on the 4th of February and continuing until 2359 UTC on the 12th of February. Time may be divided as desired but *must not* exceed 30 hours total. Off periods *may not be less than* 15 minutes at a time. Times on and off *must* be entered in your log.

3) *QSOs:* Contacts must include certain information sent in the form as shown in the example. QSOs may take place on the 80-, 40-, 15- and 10-meter bands. Crossband contacts are not permitted. Novices and Technicians work any amateur stations; others work Novices and Technicians only. Valid points can be scored by contacting stations not working in the contest, upon acceptance of your RST and section, and receipt of an RST and section/country. A station may be worked only once, regardless of band.

4) *Scoring:* Each exchange counts one point. Only one point may be earned by contacting any one station, regardless of the frequency band. The number of ARRL sections (see page 8 of any *QST*) plus foreign countries worked during the contest is the "total multiplier." Yukon-N.W.T. (VE8) also counts as a multiplier. A fixed scoring credit may be earned by entrants who hold the ARRL Code Proficiency certificates. FCC code credit *cannot* be used in lieu of the above. If an entrant does not hold an ARRL CP Award, he can apply for credit by attaching to his Novice Roundup report a copy of the qualifying run from W1AW or W6OWP for January or February. CP credit equals the wpm speed indicated on the latest ARRL certificate or sticker held by the entrant. The final score equals the "total points" plus "ARRL Code Proficiency credit" multiplied by the "total multiplier."

5) *Reporting:* Contest work must be reported on forms from the ARRL, or reasonable facsimile. Make sure to include the time, call, RST and section received for *each* QSO. Reporting forms will be sent free upon request. Indicate starting and ending times for each period on the air. All NR reports become the property of ARRL and none can be returned. Entries must be mailed to ARRL, 225 Main St., Newington, CT 06111, no later than March 13, 1978.

6) *Awards:* A certificate will be given to the highest-scoring Novice and Technician in each ARRL section and each single operator Novice or Technician who submits a *valid* entry with 200 or more QSOs. Multioperator or General class licensees and above are not eligible for awards. However, a box containing the Top-Ten W/VE higher-class licensees will be incorporated in the results. And should participation warrant, a similar box will show Top-Ten DX Entrants.

Strays

BITING BUG AWARD OFFERED

☐ Competition for the 1978 Amateur Radio Biting Bug Award has begun. Designed to attract nonamateurs to amateur radio, it is awarded to the author of the best amateur radio article published in a U.S. nonham publication.

The award will be issued in two categories: A plaque and a $200 prize will be awarded to the writer of the best article about amateur radio in a nationally circulated publication, while a plaque and $100 will be given to the author of the best article in a regional or local publication. Articles will be judged on how well they attract nonhams to amateur radio. Authors do not have to be amateur radio operators to qualify.

The 1976 winner was Anthony R. Curtis, K3RXK/1, for his February, 1976, *Popular Mechanics* article entitled "New Satellites Make Ham Listening More Fun." There was no 1977 award.

Photocopies of articles with the name and date of publication should be sent to Ray Collins, WA2GBC, Harter Road, Morristown, NJ 07960. Please enclose a self-addressed, stamped envelope. All entries must be submitted by January 31, 1979.

I would like to get in touch with . . .

☐ broadcast-band DXers. Ronald Yurman, P. O. Box 112, Merrick, NY 11566.

Right down to the wire, W4PEI and N4EE competed in the Ted McElroy Memorial CW Competition at the Western Carolina ARS hamfest in Asheville, NC. In 1939 McElroy set the world's record of 75 words per minute in Asheville! Copying at 65 wpm, N4EE took a beautiful trophy. — *W1YL*

Results, 1977 September VHF QSO Party

Like gold and happiness, multipliers are where you find them.

By Bill Jennings,* K1WJ

The conditions of the vhf bands for the 29th September VHF QSO Party, held September 10-12, came as no surprise. It was a September contest and September conditions prevailed. Six meters did not open up, "June Style," for 50 or more multipliers. In fact, only one station, WA8OGS, had the required 30 multipliers on 6 to make the minimum of 30 for the multiplier listings. Two meters supplied enough action to make numbers of multipliers, from the teens and low twenties to the contest-high total of 27 by K1WHS, an attainable goal.

Okay, so the band conditions won't cooperate and competition is the name of the game in vhf contesting. No one, at least not serious competitors, likes to stagnate, if you will, or even worse, regress, with respect to total score from year to year, regardless of fluctuating band conditions. An increased score should be the end result of improved operating techniques and improved station capabilities. True, participation in the latest running of the September VHF QSO Party was up to 343 entries from the 223 reported in 1976, an increase of about 54 percent. This increase in participation, although helpful, does not in itself account for the average score increases noted among stations in the Top Ten. A participant making the single-operator, Top-Ten listings had to post an average score increase of 5162 points or 25 percent over the scores of the Top Ten in 1976. The scores of multioperator stations rose an average of 4383 points or 14 percent over those in the same category a year ago.

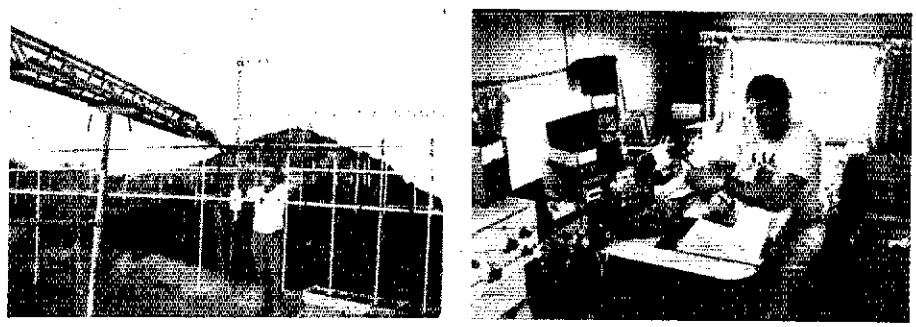
Propagation variations aside and assuming that average score increases are not due solely to an increased number of participants, how then do we account for the steadily increasing scores?

A look at the multipliers-per-band statistics for the 220-MHz-and-above portion sheds some light on the question (increased activity on 220 MHz and above). The number of stations making the multiplier box with at least the 220-MHz minimums rose 51 percent over the 1976 tally. Even though the minimum required to make the 432 listing was raised from three to five multipliers, 24 percent more participants were able to make the minimum number in 1977 than in 1976. These totals indicate that there were plenty of multipliers to be had on 432. And they were not just in the areas of greater population and sectional density such as the East and West Coasts although W2SZ/1 and W3HQT led the field with 22 sections apiece on 432, but also in the Midwest and Southwest as evidenced by stations KØDAS, W9OII and K5SW. They had seven, nine and five sections, respectively, on 432 MHz.

Working even one or two sections on 1296 MHz also paid off handsomely with extra multipliers and a corresponding increase in total score. Twenty-nine stations managed to at least make the minimum of one QSO on 1296. This is an increase of 13 stations or 81 percent over the 1976 number. While the W2SZ/1 multiplier total of eight on 1296 took top honors in the contest, 20 of the 29 stations meeting the band minimum for the multiplier listing were able to exceed the one-multiplier plateau. Operating 1296 exclusively, K6ZMW, who managed a record 250-mile, 1296 QSO with N6NB during the contest, comments on the superb 1296 conditions on the West Coast and offers a list of three deficiencies that he considers the greatest hindrance to successful 1296 contest QSOs: "low output power (less than five watts), inability to direct (steer) antennas, and insufficient receiver sensitivity."

When 6 and 2 meters have yielded the last possible multiplier, more and more vhf contesters are looking to 220 MHz and above to augment their multiplier totals and are enjoying the bonus of an increased point per QSO ratio as well.

The 1977 September VHF QSO Party, Top-Ten, single-operator list shows five stations that held similar positions in 1976. N6NB (K6YNB) for the third year in a row, heads the single-operator listing. Wayne's arsenal of aerials includes a five-element Yagi on 6 meters, an eight-element quagi on 2 meters, an eight-element quagi on 220 MHz, a 15-element quagi on 432, and a 16T helix for 1296. Steve, K1FO (WA1FFO), the number two single operator, gave N6NB a run for the top spot as is indicated in the less-than-900-point spread between the two scores. K1FO's antennas are all of the Yagi configuration: four elements on 50 MHz, 48 elements on 144 MHz, 11 elements on 220 MHz, and 52 elements on 432. Other "repeaters" to the Top Ten, single-operator leaders are K1MNS, who nearly



WA6JUD/6 checks the hardware. At the operating position, Carl came up with 586 QSOs and 35 sections to become the top-scoring, single operator in the East Bay Section, place number three nationally, and set a new single-operator record in the Pacific Division.

*Communications Assistant, ARRL

Division Leaders

Single Op	*Division*	*Multi-Op*
W3HUM	Atlantic	K3LZ
N9SS/9	Central	W9CSF/9
KØOK	Dakota	WØRGU
WB4JGG	Delta	W4BFB/4
WB8IGY	Great Lakes	W8VP
WB2BUR	Hudson	WA2SNA
KØTLM	Midwest	WØQOA/Ø
K1FO	New England	W2SZ/1
WA7TDU	Northwestern	W7LYE/7
WA6JUD/6	Pacific	W6YKM
WA4GPM	Roanoke	K3LNZ/8
WBØVGC	Rocky Mtn.	
WA4NJP	Southeastern	W4VO
N6NB/6	Southwestern	K6MEP/6
WB5FCR	West Gulf	K5SW
VE3QN	Canadian	VE3FHK

All-Time Division Leaders

Single Operator			*Division*	*Multi-Operator*		
Call	*Score*	*Year*		*Call*	*Score*	*Year*
K3IPM	24,596	69	Atlantic	W3IZY/3	43,080	62
N9SS/9	11,220	77	Central	K9HMB	29,820	72
KØOK	1365	77	Dakota	WØRGU	1700	77
WB4JGG	5070	77	Delta	W4BFB/4	33,436	77
K8III	13,900	76	Great Lakes	WA8PLZ	44,019	73
K2OWR	32,720	73	Hudson	WA2SNA	66,447	76
KØMST	4216	72	Midwest	WØLB	1290	66
K1FO	31,688	77	New England	WA1MUG	132,396	74
WA6JUD/7	4056	76	Northwestern	WA7NAN	8759	75
WA6JUD/6	24,640	77	Pacific	K6GSS/6	25,080	76
K4PCL/4	12,838	72	Roanoke	WA8PLZ/8	65,700	70
WØEVZ	546	64	Rocky Mtn.	WØDK/Ø	1080	64
WA4NJP	5508	77	Southeastern	W4VO	10,440	77
K6YNB/6	34,013	76	Southwestern	K6MEP/6	13,748	77
K5WVX	4900	72	West Gulf	K5WVX	5181	73
VE3ASO	18,816	73	Canadian	VE3ONT	43,413	74

doubled his 1976 score to move from eighth to fourth place; W3HMU, who bettered his own 1976 score by almost 2k points, and K6KLY, who posted an almost 3000-point increase.

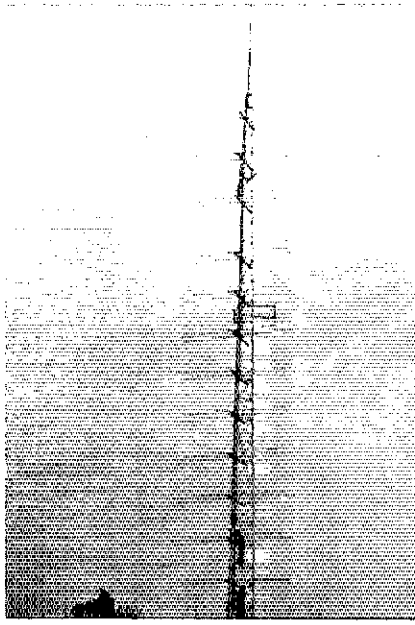
The multioperator standings in the Top Ten also took a little rearranging. The W2SZ/1 group added almost 36k points to their 1976 effort and moved to the number one spot from a third-place finish in 1976. W1XM (the W1MX operation with a new call) doubled their 1976 point total and made an upward jump of four positions in moving from 10th to sixth place. The operators at W4BFB/4 tallied a 7k-point gain over their 1976 outing to retain fourth position. WA2SNA, in second place, rounds out the list of stations that retained Top-Ten honors from a year ago.

No fewer than 10 new all-time division records, six single operator and four of the multioperator variety, were set. Three divisions (Dakota, Delta and Southeastern) all boast new records in both the single-operator and multioperator categories. Single operators setting new marks were led by N9SS/9, who added 400 points to the eight-year-old record in the Central Division. KØOK now has the score to beat in the Dakota Division. WB4JGG increased his own five-year-old record in the Delta Division by 2k points. K1FO bettered the WA1NGR 1974 record by 9000 points to take command of the New England Division. WA6JUD/6 topped the one-year-old previous best in the Pacific Division by over 11k points. Carl is the only operator who now holds two single-operator division records simultaneously, thanks to his portable operation in the Northwestern Division's Oregon Section in 1976. WA4NJP added nearly 1000 points to his own five-year-old record the Southeastern Division.

Multioperator records were set in fo divisions. WØRGU bettered the o record in the Dakota Division by near 600 percent. W4BFB/4 increased the 1976 score by almost 7k points to reta possession of the Delta Division recor W4VO came up with a 73 percent score i crease to best their 1976 record in t Southeastern Division. The K6MEP group now holds the Southwestern Di sion multiop record by posting a 4k-p point increase over the previous thre year-old division record.

VHF Sweepstakes time is almost up us. A new scoring structure which rewar operation in the 220-MHz-and-abo bands, (outlined in December, 1977, *QS* should make the contest a bit more i teresting.

Be sure to watch upcoming issues



On the left is Steve, WA3RKM, and on the right is Vince, K2NE, operators of the W3AD multiop entry from Eastern Pennsylvania. The antenna in the photo on the right is a 48-element, horizontally polarized, collinear curtain for 6 meters, built by Steve and Vince. It was used to full advantage as evidenced by the 27 multipliers that they were able to work on 6 meters.

Multipliers Per Band

Min. Sections / *MHz*	*30* / *50*	*15* / *144*	*4* / *220*	*5* / *432*	*1* / *1215*
K1FO	20	22	11	15	
WB1DNM		19	4		
K1ZZ	12			11	
W1FB		18			
W1FAJ		12	6		
W1XX	13	15	3	2	
K1KG	11	16	6	6	
WA5IOD/1	12	10	5	4	
N1HR		16			
K1GVM		16			
W1GXT		12	7		
N1CW	10		5		
W1JOT		1		2	2
W1XM	23	20	10	13	
WA1UHA	13	18	6	15	3
K1WHS		27	5	14	1
K1MNS	21	20	5	12	4
W1EJ	24	16	5	9	3
WA1OUB	24	21		5	
W1FMF	14	13	4	5	
WA1FSZ	16	11		8	
WA1TZV		16	2	13	
W1SL		21			
W1JSM		17			
W1UHE	12	2		10	
W2SZ/1	28	21	14	22	8
K2SHB	15	12		11	
K2CBA	22	14	8	18	2
WB2TCC		18		14	
K2OVS	12	15			
K2RIW				19	
K2LIO		21			
W2HI		16			
WA2SLY		15			
WA2MJK		4	4		
WB2BUR	6	18		6	
W2VC				20	5
WB2CUT		18			
WA2ZZF				15	3
W2AQT		17			
WA2SNA	22	17	9	18	6
K2XR	27	23	15	18	
W2EIF	11	15	8	13	3
WA2KOK	19	11	2	8	
W2BLV		16		6	
W3CXU/2		18			
K2BWR	20	17	8	10	
WB2CUD	4	12	4		
K2YCO	13	20	6	7	3
K2LZF	9	14	4	7	
K2NV	4	16		3	
K2GK		23			
W2WGL		15			
W2GV				6	
W2CNS/2	21	22		7	
K2LWR	19	24		11	
WA2ZJF	17	9		5	
K2LDU	11	9	1	6	1
W3BDP		15			
W3HMU	17	18	7	17	6
WA3AXV	18	22		13	
WA3JUF		21	10	13	6
W4MIL/3	20	13		12	
K3MWV	19	14	2	6	
WA3YUE	11	11		8	
W3HQT				22	4
WB2RBG/3	3	22			
K3IWK	10	15		1	
W3ARW		16	3		
K3LZ	21	18	4	14	
W3AD	27	21	3		
W3TMZ		22		20	
K3HKK	18	18			
W3GNR/3	10	22			
WB4NMA		15			
W4WDH		9		5	
W4ISS	4	4		7	
W4VO	24	10		6	
WA4IPI		8		7	
K4EJQ	9	9		12	
WB4IXU	10	6		5	
WA4ZIA		7	2	6	
W4CO/4	7	9		7	
WA4WZQ/4	11	10	2	6	
K1FJM/4		8		8	3
WA4LDU	11	9		5	1
W4BFB/4	25	16	3	8	
WA4GPM	16	20		10	
WA4SBC		9		9	
W4FS		1		8	
K4LHB			7		
K5SW	17	11		5	
WA6JUD/6	13	10	6	6	
K6IBY			7		
N6NB	11	13	9	9	3
W6OAL	4	3	1	2	1
K6MEP/6	8	10	5	5	
K6TZ/6	7	7	5	1	
K6KLY	12	9	6	7	3
WA6HCI	9	9	5	6	1
WA6GYD	7	9	8	6	1
K6FV	8	7	2	5	
K7CAD/6		9		6	
WB6NMJ	9	10	6	4	
W6NWE	4	6	5		
N6HZ	7	5		5	3
WB6NUX		6	4		
K6JKQ	3	7	9		1
K6ZMW					5
W6YKM	14	11	6	6	2
W8IDU		23	3	5	
WB8IGY	27	17		5	
K8UQA				17	
WA8OGS	30	11			
W8VP	16	16		1	
N8II		17		6	
W8AEC	4	11		10	
K3LNZ/8	14	16	3	5	
K9ZGT		17	10		
WB9SNR/9		9		8	
W9OII		12		7	
WA9LZM	11	3			1
KØDAS		12		7	
WBØSBG	2	9		6	
KØTLM	9	7	2	5	
VE2DFO	19	21			
VE3BQN	10	16	3	8	1
VE3DJE		22			
VE3FGU		15			
VE3FN		20			
VE3DSS	2	17			

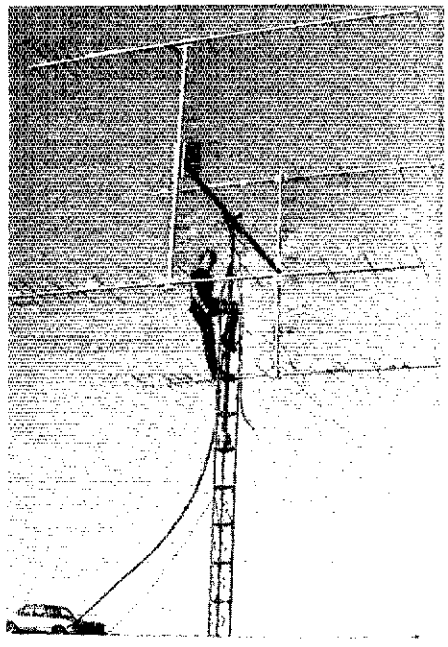
QST for announcements of the new UHF and EME Contests.

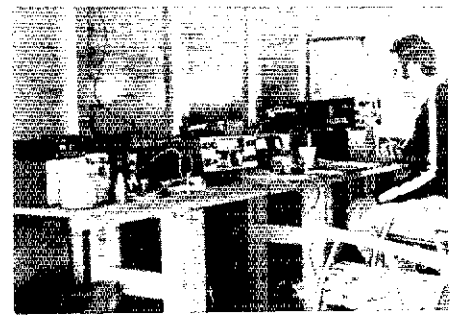
Feedback

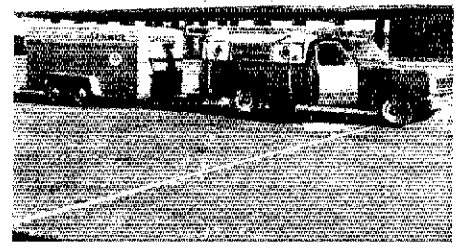
In the results of the 1976 September VHF QSO Party, January, 1977, *QST* (pages 81-84), the following corrections should be noted: In the Los Angeles Section, the call W6GVV should be W6GGV. In the All-Time Division Leaders Box, WA1NGR should be listed as the single-operator record-holder for the New England Division with a score of 22,176 in 1974.

Top Ten

Single Op		*Multi-Op*	
N6NB/6	32,535	W2SZ/1	85,932
K1FO	31,688	WA2SNA	62,424
WA6JUD/6	24,640	K2XR	60,922
K1MNS	21,700	W4BFB/4	33,436
W3HMU	19,500	K3LZ	25,194
K6KLY	16,095	W1XM	24,288
W1EJ	15,732	K2CBA	18,752
WA3AXV	15,317	W2CNS/2	18,700
WA1OUB	14,100	W3AD	18,360
WA3JUF	11,900	W6YKM	15,756







The WB2SIH/VE1 expedition to Yarmouth NS. The photos show: entering customs at Yarmouth, WA2OMT operating the 6-meter station, and WB2SIH on the 2-meter tower.

Scores are listed in order, single-operator stations first within each section. From left to right: call, score, number of QSOs, number of multipliers, bands operated (A-50 MHz B-144 MHz, C-220 MHz, D-420 MHz, E-1215 MHz, F-2304 MHz, G-3300 MHz, H-5 GHz, I-10 GHz).

U.S.A.

1

Connecticut

K1FO 31,688-392-68-ABCD
WB1DNM 3082-129-23-BC
K1ZZ 1932- 58-23-AD
W1FB 1530- 85-18-B
W1FAJ 1242- 60-18-BC
K1DBA 1106- 79-14-AB
K1ZKR 975- 75-13-A
WA1LQU 938- 67-14-B
W1WHL 689- 93-15-A
K1VMI 682- 62-11-B
WA1ZNT 671- 61-11-B
W1JA 570- 57-10-B
WA1GTP 336- 24-14-AB
K1TN 105- 15- 7-A
K1ENO 65- 13- 5-AB
W1BL 65- 11- 5-B
W1XX(+K1s HTV RT,W1s GNC
IA JKS OD RM,WA1VGP,WB1ALW)
9306-272-33-ABCD
K1FKW(+WA1s KXH YHZ)
4617-171-27-AB
K1MUJ(WA1s GBA HYN,oprs.)
3003-143-21-AB

Eastern Massachusetts

K1KG 7527-166-49-ABCD
WA9IDD/1 4309-119-31-ABCD
N1HR 2704-169-16-B
K1QVM 1616-101-16-B
W1CRL 1449- 64-21-ABD
W1GXT 1444- 62-19-BC
N1CW/1 1020- 57-15-AC
W1JOT 140- 13- 5-BDE
W1XM(W1XG,K1JH,WA1RJX,
WA4TTG,oprs.)
24,288-312-66-ABCD
WA1UHA(+W1JR)
13,475-183-55-ABCDE

Maine

K1WHS 11,468-186-47-BCDE

New Hampshire

K1MNS 21,700-297-62-ABCDE
W1EJ 15,732-234-57-ABCDE
WA1OUB
14,100-273-50-ABD
W1FMF 7776-195-36-ABCD
WA1FSZ 6345-165-35-ABD
WA1TZV 4557-110-31-BCD
W1HDC 2394-114-21-AB
W1SL 2247-107-21-B
WA1NPZ 1558- 82-19-AB
W1JSM 1173- 69-17-B
WA1MGC 1050- 75-14-A

Rhode Island

K1COW/1 2852-113-23-ABD
W1UHE 1752- 91-24-ABD
K1ICM 1680-105-16-AB
W1BAT(K8BGZ,opr.)
1008- 72-14-B

Vermont

W1AIM 1220- 61-20-AB
K1LPS/1 1152- 72-16-A
WB1BZR/1 1- 1- 1-B
WB1CNE(+WB1BZR)
111- 37- 3-B

Western Massachusetts

WA1UOL 451- 41-11-AB
WA1YJN 270- 30- 9-AB
W2SZ/1(K1DH,WA1UGE,WB1CBH,
K2TR,WA2s DTH FKS GFP SPI UJK
WB2s BXP CJS DCH GSW PKO
QCJ,WA3YLE,N4CD,WA8USA,
oprs.) 85,932-777-93-ABCDE
W1YK(K1IR,WA1s TUH UXA
VUK,oprs.)
671- 61-11-B
WA1WRM(+WA1WRK)
280- 28-10-AB
WA1PQY/1(+WA1s TAK YOJI
150- 30- 5-B

2

Eastern New York

K2SHB 7144-160-38-ABD
WA2FUZ/2
5049-149-33-ABD
W2AWX 1216- 59-19-ABCD
K2CBA(+W2KHQ,WA2s BAH PVV,
WB2HYP,WB4BMZ)
18,752-227-64-ABCDE
WA2FPG(+WA2s FPI OQN,WB2s
FPC FPL MCO)
1615- 85-19-AB

New York City-Long Island

WB2TCC 6048-153-32-BD
K2QVS 3402-126-27-AB
K2RIW 2432- 64-19-D
K2LIO 1680- 80-21-B
W2HI 1008- 63-16-B
WB2GVD 938- 57-14-AB
WB2IMX 798- 57-14-AB
WA2SLY 750- 50-15-B
WA2MJK 648- 60- 8-BC
W2LEJ 280- 35- 8-B
WA2DZD 240- 48- 5-B
W2FVS 198- 33- 6-B
WB2IBE 88- 19- 4-BC
WB2LWJ 64- 13- 4-BC

Northern New Jersey

WB2BUR 8460-264-30-ABD
W2VC 3350- 63-25-DE
WB2CUT 2970-165-18-B
WA2ZZE 1980- 57-18-DE
W2AQT 986- 58-17-B
WA2CWA 960- 60-16-AB
WB2NCF 592- 74- 8-B
WB2MXZ 585- 45-13-AB
WA2UDT 264- 20-11-BD

WA2SNA(K2BJG W2IHM,WA2s
DTJ HLE PJV UPK,WB2s ARS
JCP LHG LPX QOQ UXA,oprs.)
62,424-704-72-ABCDE
K2XR(+K2OWH,WB2WIK)
60,922-631-83-ABCD

SouthernNew Jersey

W2EIF 11,550-167-60-ABCDE
WA2KOK 6680-142-40-ABCD
WB2YEH 3094-103-26-ABC
W2BLV 1518- 61-22-BD
W3CXU/2 1206- 67-18-B
W2HXF 168- 16- 8-BD
K2BWR(+K2ZRJ)
9185-137-55-ABCD

WB2CUD(+WB2HWF)
3480-155-20-ABC

Western New York

K2YCO 7546-126-49-ABCDE
K2LZF 3400- 78-34-ABCD
K2NV 2553-106-23-ABD
K2GK 2208- 96-23-B
WB2ELB 848- 49-16-ABD
W2WGL 420- 28-15-B
W2GV 156- 13- 6-D
W2CNS/2(+W2AV,WA2s VCM
ZKD,WB2s HNL KAO KYQ)
18,700-356-50-ABD
K2LWR(+K2LGJ)
15,714-266-54-ABD
W2OW(WA2s IKO RBJ SGS WYQ
oprs.) 6578-188-36-AB
WA2ZJF(K2s IJ JJI RSM,
WA2s MYU RQC,WB2s FBP MYZ,
oprs.) 6941-202-31-ABD
WB2BGI(+WA2 CJT,WB2s KLD
ORX) 2553-111-23-AB
WB2YIK(+WA2s IVD YFB,WB2s
GPR RRK)
2369-103-23-AB
K2LDU(+WA2YRL)
2352- 69-28-ABCDE
W2DUC/2(+WB2DPT)
576- 48-12-AB

3

Delaware

W3BOP 1110- 74-15-B
W3CGV 753- 21-11-ABD

Eastern Pennsylvania

W3HMU 19,500-221-65-ABCDE
WA3AXV
15,317-249-53-ABD
WA3JUF 11,900-172-50-BCDE
W4MIL/3 9090-172-45-ABD
K3MWV 6109-131-41-ABCD
W3IIT 5278-182-29-AB
WA3YUF 4410-124-30-ABD
W3HQT 3562- 64-26-DE
WB2RBG/3
3550-142-25-AB
K3IWK 3172-120-26-ABD
W3SMK 1311- 64-19-ABC
WB3ABH 1140- 85-14-B
W3AJF 784- 48-14-ABC
W3ARW 665- 32-19-BC
WH JF TD 138- 46- 3-B
WA3KFT 115- 23- 5-AB
K3LZ(WA3s KPP LBI TUL WAK,
WB3 BND,oprs.)
25,194-371-57-ABCD
W3AD(12 oprs.)
18,360-347-51-ABC
WA3NRU(+K3s OX PA YL,
WA3YNO,WB3s AZE BLE DJB
DJF) 9252-245-36-ABC
K3ARR/3(+K3TRM)
1392- 87-16-AB

Maryland-D.C.

W3TMZ 10,332-190-42-BD
K3HCE 5049-181-29-AB
WB3AZH 1744-109-16-AB
W3HQX 1012- 92-11-B
W3TK 902- 82-11-B
WA3NNZ 780- 60-13-B
W3JPT 759- 69-11-AB
W4NVW/3 549- 54- 9-ABC
WB3CHS 488- 61- 8-B
W3PGA(K3s FRX PHH ROJ YZY,
WA3RD, WA3s FHV HZJ LAW
OTZ TUN,WB3s BGS BIT DUU,
oprs.) 6086-170-34-ABCD
W3EAX(N1QQ,WA3s WDO WHE
YTP,WB3s DOF EIJ EMQ HUP,
oprs.) 1377- 72-17-ABC

Western Pennsylvania

W3ZR 1641- 89-19-AB
W3KJM 120- 20- 6-A
K3HKK(K3s CM RBH TRV,
W3PD WA3s IFC LMW,WB3s AEI
HKL HKU,oprs.)
7236-201-36-AB
W3GNR/3(+K3s TFL ZDR,WA3s
BUX DDA,WB3DVR)
4800-190-32-AB
WB8RDY/3(+WB8YDP)
684- 57-12-AB

4

Alabama

WA4CQG 548- 39-13-BD
WA8KLH/4 468- 39-12-AB
WB4WXE/4(+WA4YMZ,WB4YRL)
1134- 63-18-AB
WD4ILV/4+WD4s BXT HIB,
WA5WUX) 390- 39-10-AB

Georgia

WA4NJP 5508-153-36-AB
WB4NMA 1500-100-15-B
W4WDH 1036- 64-14-BD
W4IS5 780- 36-15-ABD
WA4SJI 15- 5- 3-A
W4VG(K4CKS,WA4s IBI KPU,
WB4AEG,oprs.)
10,440-249-40-ABD
WD4ALA(+WA4ODB,WD4s ACZ
IIS IMH) 765- 85- 9-AB

Kentucky

WA4IPI 1035- 58-15-BD
W4WYX 130- 65- 2-B
W4SMU 1- 1- 1-B
K4EJQ(+WA4s CBX JKK OEM
GYK,WD4AGO)
4080-105-30-ABD

North Carolina

N4SM 2553-111-23-AB
WB4IXU 1785- 78-21-ABD
WA4ZIA 1395- 74-19-BCD
WB4LDP 408- 34-12-AB
WB4HFL 92- 23- 4-AB
K4JYS 48- 16- 3-A
W4CQ/4(G8NF,WA4s JDN TIJ
UNZ WBV ZBZ,WB4s BSG BUK
ETF MCI QYC,WD4s BEC CFX,
oprs.) 7682-334-23-ABD
WA4WZO/4(+WA4s AYS WZP,
WB4UOS,WD4HBU)
5887-185-29-ABCD
W4MOE(WA4WAW,WB4YSL,WD4s
AAM AQH,oprs.)
3151-129-23-ABD
K1FJM/4(+K2UYH,WB2HHH)
1843- 66-19-BDE
N4VD(+WA4GBE)
1365- 62-21-ABD
WB4CCL(+WA4FKI,WB4WOR,
WD4JRS) 651- 85- 7-ABC

Northern Florida

W4CSS 200- 25- 8-AB

South Carolina

K4GMJ 1200- 67-18-AB
K4GL 992- 52-16-ABC
N4JK/4(+K4LQO,WB4s NRK
TMT WJQ,WD4s BUH BUK)
2032-127-16-AB

Southern Florida

W4MNZ 56- 14- 4-A

Tennessee

WB4JGG 5070-130-J9-AB
WA4DLU 2574- 88-26-ABDE
W4BFB/4(K4s BF BWS CEB LVV
PDY SLC,WA4s VCC ICM,WB4s
BQC JXG LTA NDB PCS YFC
FLX,WD4ABZ,oprs.)
34,436-608-52-ABCD

Virginia

WA4QPM 7913-151-46-ABD
WA4SBC 1782- 80-18-BD
WB4FQR 1360- 80-17-AB
K4FTO 533- 41-13-AB
K4EVH 490- 65- 7-BC
WB4YRB/M4
480- 32-12-BD
W4FS 351- 26- 9-BD
K4LHB 204- 16- 7-C
WA4QYP 190- 38- 5-AB
K4AF(WA4RCS,opr.)
185- 37- 5-B
WA4NXM(+WB4ROT)
4327-160-27-ABD

5

Arkansas

WB5JAR 54- 9- 6-A

Louisiana

WA5UUD 418- 38-11-A
WB5LBT 224- 31- 7-BD
K4CHE/5 98- 12- 7-ABD
WA5UFH 72- 18- 4-A

Mississippi

W5UCY 120- 24- 5-B

Northern Texas

WB5FCR 210- 30- 7-A
W5SZ(+WB5NGB,WD5BYE)
3375-129-25-ABD
WB5ROR/5(+WB5s TNC TZM)
252- 42- 6-B

Oklahoma

K5SW(+K5CM)
4656-136-33-ABD

Southern Texas

N5AF 26- 13- 2-B
K5LZO(+WD5s CZF GNP)
1694-118-14-ABD

6

East Bay

WA6JUD/6
24,640-586-35-ABCD
N6OX 864- 72-12-AB
WA6VEF 368- 92- 4-B

Los Angeles

W6PAJ 1017-112- 9-ABC
W6BPC(WA6HXD,WB6YVP,
oprs.) 5060-253-20-AB

Orange

WB6MHW 426- 71- 6-B
K6IBY 182- 13- 7-C

Santa Barbara

N6NB/6 32,535-600-45-ABCDE
W6OAL 468- 32-12-ABCDE
K6MEP/6(K6s VMN XO,WA6s
CJS IJZ PBB TWP,WB6EOA,
N6MA,oprs.)
13,748-419-28-ABCD

K6TZ/6(W6EMS,WA6s ATE MBZ
OQZ RGJ SHC ZYG,WB6s CWE
HOZ IBO OUZ TUD WZU,
WB9KMO,oprs.)
9340-358-20-ABCD

Santa Clara Valley

K6KLY 16,095-447-37-ABCDE
WA6HCL 10,050-284-30-ABCDE
WA6GYD 7347-177-31-ABCDE
K6FV 3454-131-22-ABCD
K7CAD/6 2640-139-15-BD
K6QAX 1920- 91-20-ABC
N6RZ 981-109- 9-B
K6BJI(K6BDK,WA6SVW,WB6SQO
oprs.) 528- 66- 8-AB

San Diego

WB6NMJ 5481-167-29-ABCD
WB6FTW/6 130- 26- 5-B
WA4MMP/6 126- 18- 7-AB
WA6COE 84- 21- 4-B
W6NWE(+WA6s DNI KGR PNY
TAW WB6 BVS)
5820-336-15-ABC

San Francisco

N6HZ 2940-116-20-ABDF
WB6NUX 1270-114-19-BC

San Joaquin Valley

K6JKQ 1120- 57-20-ABCE
K6ZMW 325- 19- 9-E
W6YKM(+K6LXO)
15,756-324-39-ABCDE

7

Arizona

WB7QYG/7 24- 24- 1-B

Idaho

WH7SDA/7 32- 23- 4-B
K7MM(+WA7YLZ,WB7CSP)
648- 81- 8-AB
WA7FSI(+WB7DZD)
600- 59-10-ABD
WA7UBC/7(+WA7YEW)
52- 26- 2-B

Montana

WA7PDC/7 60- 10- 6-AB

Nevada

K7ICW 481- 37-13-AB
K7NV 49- 7- 7-A

Oregon

WA7TDU 798- 56-14-ABD
K7HSJ 684- 19- 7-ABCD
W7TYR 125- 25- 5-AB
K7ZCB 12- 6- 2-A
WA7LCY/7(+K7ZCB)
368- 39- 8-ABCD

Utah

WB7QNP 62- 30- 2-BD

Washington

K7VNU 714- 97- 7-ABD
W7IDZ 65- 13- 5-AB
W7ERH 13- 13- 1-B
W7LVE/7(K7s KOI ND WTG,
N7NW,WA7NAN,oprs.)
7011-326-19-ABCD

Alaska

KL7IFD 168- 52- 3-ABD

8

Michigan

WB8BGY 5562-201-27-ABD
WB8DU 3224-104-31-BCD
WD8BDW 744- 62-12-AB
WB8TEX 684- 57-12-B
WB8AAX 200- 25- 8-B
WB8UWX 41- 13- 7-AB
WA8EUY 68- 34- 2-B
WB8YDK/8(WA8s WOQ YUZ,
WD8s JPX KMU,oprs.)
1008- 68-14-ABD

Ohio

WB8IGY 11,319-222-49-ABD
WA8OGS 7913-193-41-AB
K8UQA 1836- 84-17-D
K8DIO 885- 85-15-BD
WB8GGX 495- 99- 9-A
WA8TLZ 468- 45- 9-BD
WD8ODD 320- 40- 8-A
W8JRN 140- 35- 4-AB
WD8NMY 54- 18- 3-B
W8VPK(K8AL,W8IBH,WB8s
ERB ONY SXT TSI,WD8s
AHV AKI KTK LVI,oprs.)
7755-233-33-ABD
WB8HUC(WB8s GEU GEW GEX GEY
GFA,oprs.) 6752-211-32-AB

West Virginia

N8II 3588-145-23-BD
W8AEC 2325- 85-25-ABD
K3LNZ/8(WA3s EOQ NZL OYW W4
PSJ WA4 LJQ,oprs.)
8664-214-38-ABCD
W8GK(W8s MEJ,K8s BS MBH SR WMX
WA8 NXO WH8 OQV,oprs.)
1520- 76-20-AB

9

Illinois

N9SS/9 11,220-247-44-ABD
K9ZGT 5130-161-27-BC
W9SE 2416-151-16-AB
WB9GBU 1806-122-14-ABD
WB9SNR/9 1785- 85-17-BD

WA9AHZ 1738-158-11-AB
WB9WYA 235- 47- 5-B
WB9NBA 204- 51- 4-B
K9KQR 180- 26- 6-BD
W9IVI 156- 26- 6-B
W9IFA 24- 7- 3-ABD
WA9CWY(+K9CHZ,WB9OPT)
3025-121-25-AB

Indiana

WB9CEP 3486-166-21-AB
WB9PXW 2414-142-17-AB
WA9PKL 988- 52-19-AB
WB9YAI 924- 82-12-AB
WB9NTL 803- 76-11-AB
K9RSF 504- 42-12-AB
WB9LLQ 351- 39- 9-B
W9CGI 256- 32- 8-AB
W9CSF/9(K9s DZE FT TTX URA
Y9BRF WA9 MSW,WB9s COD
WNU WD9 BDR,oprs.)
5271-238-21-ABC

Wisconsin

W9QII 2109- 94-19-BD
WA9SUJ 1615- 79-19-ABD
WA9QVK 1026-104- 9-AB
WB9RUE 1020- 60-17-AB
WA9IZM 990- 58-16-ABEF
W9NHE 864- 79-11-B
K9DID 630- 62-10-BD
WA9JFM 609- 87- 7-B
WD9ACY 420- 70- 6-B
WB9IDU(+W9WI,WB9YHB)
1236-103-12-AB

0

Colorado

WB0VGC 99- 33- 3-AB
WD9BJP 10- 10- 1-A

Iowa

K0DAS 1311- 56-19-BD
WB0SBG 1258- 64-17-ABD
WB9NZA 1092- 76-14-ABD
W0SI 300- 50- 6-A
W0RAP 270- 45- 6-B
WB0CQO 184- 23- 8-AB

Kansas

WB0WAO 1003- 55-17-ABD
N0LL 288- 24-12-AB
WB0RET 207- 23- 9-AB
W0QOA/0(+K0OBY,WB0QDK)
600- 60-10-B

Minnesota

K0OK 1365- 91-15-AB
W0RGU(+WD0AHA,WA0QWY,
WB0s RSS RSW HVQ (UP)
1700- 85-20-ABD

Missouri

K0TLM 2346- 84-23-ABCD
W0JRP 160- 20- 8-AB

Nebraska

WA0MRH 512- 26-12-A
WB0DGF 70- 14- 4-BD
K0JBL(+WA0F PB)
30- 15- 2-B

North Dakota

WA0CSL 144- 16- 9-AB
W0RIB(+WB0s GPW UOR)
240- 30- 8-AB

CANADA

Maritime-Newfoundland

WB2SIH/VE1(+K2YRZ,
WA2OMT,WB2DST)
990- 52-18-ABD

Quebec

VE2DFO 5720-143-40-AB
VE2KW 203- 29- 7-AB
VE2BBK 100- 17- 5-BD

Ontario

VE3BQN(VE3CRU,opr.)
8018-189-38-ABCDE
VE3DJE 4576-208-22-B
VE3FGU 2700-180-15-B
VE3FN 1640- 82-20-B
VE3DSS 1235- 65-19-AB
VE3EVW 462- 33-14-AB
W3XO/VE3 208- 26- 8-B
VE3FHK(+VE3FHU)
4320-140-30-ABD
VE3CGE(+VE3HRU)
618-103- 6-B

British Columbia

G3PPE/VE7 8- 4- 2-A

DX

Federal Republic of Germany

DK1FGA 1- 1- 1-B

Check Logs

W1AY, W2PAU

Disqualifications: The following have been disqualified from the 1977 September VHF QSO Party per the criteria described on page 85 of *QST* for January, 1977. WA1JGK, WA1WEH, WA2IDS, WA2SRI, WA2BLM,WA2LOA, WA2UXW (operators of WA1IWK)

Operating News

Conducted By George Hart,* W1NJM

Schedule for Restructuring

The response to the CD appointment-restructuring proposals (June and July, 1977, *QST*) has been so varied and detailed that it has been impossible to arrive at a consensus. It seems quite apparent that hardly any of the changes proposed will meet with majority approval, but also that proposed alternatives will score an even lower popularity vote. Of course we can't keep on going 'round and 'round on each new proposal offered. At some point, we have to take the bull by the horns and hope we don't get thrown.

Proposals for improvement can be and should be a continuous procedure. We want to assure one and all who have made such proposals that they have not been ignored. On the contrary, some have elicited a response of "Hey, now *that* sounds like a good idea." But when such proposals are one-of-a-kind, they are immediately suspect. If they are good ideas, why don't they arise spontaneously from a number of different sources? Thus, we cannot respond with action to lone individual ideas, even if we (personally) think they have merit.

And so we come back to the basic proposals made last July and consider what disposition shall be made of each of them, and on what schedule. All at once? This might get the agony over with quickly, but it would be pretty shocking — both for the Headquarters staff and the field. Although making the changes in steps might be considered prolonging the agony, it would have two advantages: It would avoid shock, and it would make possible gradual assessment of results. The latter is especially important because of the wide divergence of opinion on how restructuring should be accomplished. It would permit us to change course in midstream if this seemed advisable.

So here's a tentative schedule for restructuring. We'll use the same order listed in July *QST* (see pages 61-63).

1) Combine ORS and OPS into Official Traffic Station. July 1, 1978.

2) Three new basic appointments: (a) Official Emergency Station.[1] Enough general acceptance to put into effect immediately. January 1, 1978. (b) Official Contest Station. Very little acceptance, postponed indefinitely. (c) Official DX Station. Also little acceptance, also indefinitely postponed.

3) Phase out Official Bulletin Station. Very little acceptance, postponed indefinitely; however, discontinue Official Bulletin *mailing* by April 1, 1978.

4) Reduce Official Observer classifications from five to three, tighten tolerances for frequency measurement. January 1, 1978.

5) Revise standards for OVS appointees to emphasize repeater and OSCAR operation and vhf/uhf on-air experimentation. January 1, 1978.

Now, as to the leadership appointments:

6) Section Traffic Manager (STM).[1] This is a high-level official and SCMs will need some time to think about it. October 1, 1978.

7) Net Manager (NM), combining RM and PAM.[1] This would have to go into effect at the same time as foregoing no. 1. July 1, 1978.

Note that this schedule is *tentative*. This means that we may or may not adhere to it, depending on a lot of factors, many of them unforeseeable, others beyond our control. Also, it does not take into account many possibilities for other appointments and operating incentives which you ladies and gentlemen have proposed, and which we can take up at another time. The above is aimed at *change for improvement* (the only kind of change worth making), not at expansion of the appointment structure. This can come later, if deemed desirable.

Well, there it is — the schedule for restructuring. On January 1, if all goes well, SCMs may start issuing OES appointments, reclassifying OOs, canceling some OVS and reappointing them appropriately as OTS or OES.

Perhaps, again if all goes well, the schedule can be speeded up. If we run into clinkers, it may have to be slowed down. But, let us begin.

[1]Subject to approval by the ARRL Executive Committee.

W1AW Operating Schedule (October 30, 1977-April 30, 1978)

PST	CST	EST	UTC	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
8 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	2400	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.

Normal W1AW visiting hours are Monday through Friday, 8 A.M. to 5 P.M. and Saturday and Sunday 3:30 P.M. to 1 A.M. (all local Eastern Time). The station address is 225 Main St., Newington, CT 06111 (about 7 miles south of Hartford). Maps with local street detail are available upon request. Please note that all footnoted frequencies are approximate. If you wish to operate when visiting, you must have your original operator's license with you. (Schedules can also be arranged to work W1AW.) The station will be closed Dec. 25-26, 1977; Jan. 1-2, Feb. 20, Mar. 24, 1978. *Staff:* Chief operator/Asst. Communications Mgr. C. R. Bender, W1WPR; Chris Schenck, W1EH; Stan Gibilisco, W1GV.

In a communications emergency monitor W1AW for special bulletins as follows (times in UTC): *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: Jan. 6, *It Seems to Us*; Jan. 10, World Above; Jan. 16, League Lines; Jan. 19, Public Service; Jan. 25, Happenings; Jan. 30, Operating News.

SCM ELECTION NOTICE

To all ARRL members in the Wisconsin, Illinois, Northern Florida, Manitoba, Santa Clara Valley, Indiana, Vermont, Maine and Oregon 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 or 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 10, 1978.

Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on April 3, 1978, returns counted May 23, 1978, and SCMs elected as a result of the above procedures will take office July 1, 1978.

If only one valid petition is received for a section, that nominee shall be declared elected without opposition, for a two-year term beginning July 1, 1978.

If no petitions are received for a section by the specified closing date, such section will be resolicited in July *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.

George Hart, W1NJM
Communications Manager

APPOINTMENTS

Since the inception of the new procedures, the following were appointed: In the Quebec Section, Edward Sieb, VE2BAQ, was appointed to complete the term (until June 1, 1978) of Larry Dobby, VE2YU (resigned). In the Minnesota Section, Helen Haynes, WBØHOX, was appointed to complete the term (until April 10, 1978) of Gordon Olson, KØEC (resigned). In the Idaho Section, Ed Hamlin, W7KDB, was appointed to complete the term (until April 23, 1978) of Dale Brock, WA7EWV (resigned). In the Nebraska Section, Ed O'Donnell, WBØGWR was appointed to complete the term (until July 1, 1978) of Claire Dyas, WØJCP (resigned). QST

AMSAT-OSCAR 7

Ref. Orbit	Date	Time (UTC)	Long. W	Ref. Orbit	Date	Time (UTC)	Long. W
14311B	1 Jan.	0039	65.2	14512B	17 Jan.	0143	81.4
14324B	2 Jan.	0133	78.8	14524X	18 Jan.	0042	66.3
14336A	3 Jan.	0032	63.7	14537B	19 Jan.	0136	79.9
14349X	4 Jan.	0126	77.3	14549B	20 Jan.	0035	64.7
14361B	5 Jan.	0026	62.1	14562A	21 Jan.	0130	78.3
14374A	6 Jan.	0120	75.7	14574B	22 Jan.	0029	63.2
14386B	7 Jan.	0019	60.5	14587B	23 Jan.	0123	76.7
14399B	8 Jan.	0114	74.1	14599A	24 Jan.	0023	61.6
14411A	9 Jan.	0013	59.0	14612X	25 Jan.	0117	75.2
14424B	10 Jan.	0107	72.6	14624B	26 Jan.	0016	60.0
14436X	11 Jan.	0007	57.4	14637A	27 Jan.	0111	73.6
14449A	12 Jan.	0101	71.0	14649B	28 Jan.	0010	58.4
14461B	13 Jan.	0000	55.8	14662B	29 Jan.	0104	72.0
14474B	14 Jan.	0055	69.4	14674A	30 Jan.	0004	56.9
14487A	15 Jan.	0149	83.0	14687B	31 Jan.	0058	70.5
14499B	16 Jan.	0048	67.9				

NOTES

1) All time and date references are in UTC.
2) The times and longitudes are for OSCAR's first equator crossing each day which is called the reference orbit.
3) A-O 7 will operate Mode A only on days of the *year* fully divisible by three (February 2 is day 33, for example) and the other two days in between will be Mode B.
4) All Monday orbits are reserved for QRP use only. Use a maximum of 10 watts erp. Wednesdays are reserved for special experiments: authorized users only. This includes *Tuesday evenings* for the Western Hemisphere.
5) The Mode B transponder inverts signals. Upper sideband on 432 MHz becomes lower sideband on 145 MHz.
6) A-O 7 progresses an average of 28.73728 degrees west per orbit in a period of 114.94515 minutes for the month of January.
7) A-O 6 has been permanently removed from active service.

Haven't listened to OSCAR yet? Try this: If you live in the eastern half of Canada or the U.S., listen to the reference orbit given in the chart (don't forget times are in UTC). If you live in western North America, listen about one hour and 55 minutes later. Give OSCAR plenty of time to cross your QTH's horizon — a pass lasts a maximum of 25 minutes. There are several other passes each day that you'll be able to hear or talk through, both in the morning and in the evening. Consult your OSCARLOCATOR to determine their times and directions. (Note: A complete A-O 7 reference orbit schedule for 1978 is available from ARRL headquarters for an s.a.s.e.)

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 on A-O 7 reference orbits, and AMSAT nets (East Coast at 0100 UTC Wednesdays on 3850 kHz lsb; Mid States at 0200 UTC; West Coast 0300 UTC).

SPACECRAFT FREQUENCIES

Spacecraft	*Uplink*	*Downlink*	*Beacon*
A-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

This schedule of orbits for AMSAT-OSCAR 7 is a regular feature of *QST*. Further information on the radio amateur satellite program can be obtained free of charge from ARRL hq. Also, the popular and informative series of *QST* articles for the beginner has been reprinted in book form. *Getting to Know OSCAR — from the Ground Up* covers OSCAR 6, OSCAR 7, the newest satellite, A-O D, to be launched during the beginning of March, 1978, and the exciting Phase III program scheduled for late 1979. It includes the OSCARLOCATOR, a tracking device that lets you know which passes you can access and where the satellite is in the Northern Hemisphere at any given moment. The book is available for $3 ppd. ($3.50 outside the U.S.) from the ARRL.

Strays

NEW AMSAT QSL MANAGER

Attention all OSCAR users: AMSAT has a new QSL Bureau Manager. U.S. satellite-users should send several no. 10 s.a.s.e.'s to Ross Forbes, WB6GFJ, P. O. Box 1, Los Altos, CA 94022. They will be returned when filled with incoming cards. Only one call sign per envelope, please.

Outgoing DX OSCAR QSL cards will be forwarded at the rate of 6 cents per card, or 20 cards for a dollar, subject to change. Domestic QSLs (U.S., Canada and Mexico) can be sent in bulk; they will be sorted and placed in the self-addressed, stamped envelopes.

SCHEDULE CHANGE FOR A-O 7

OSCAR 7 will change schedule beginning January 1, 1978. Starting with orbit number 14361 (a Mode B orbit), A-O 7 will be in Mode A on any Julian date (day of the year) that is completely divisible by 3. It will be in Mode B on all other days. For example, February 2, the 33rd day of the year, will be a Mode A day (33/3 = 11), while February 9, the 40th day of the year, will be Mode B (40/3 = 13 with a remainder of 1). Mondays will still be QRP days and Wednesdays experiment days. Remember: All times and dates are UTC.

USE YOUR SATELLITE WISELY — A REMINDER

AMSAT asks that you follow the satellite operations program to make OSCAR work enjoyable for all. Keep your maximum erp (effective radiated power) to 100 watts. Erp is the output power of your transmitter, minus transmission line losses, times the antenna gain.

Mondays, UTC (Sunday night local time in the Western Hemisphere), are QRP days. Use a maximum of 10 watts erp. Wednesdays, UTC, are reserved for experiments and activities sanctioned by AMSAT. If you have a project that you would like to submit for consideration, contact Rich Zwirko, K1HTV, AMSAT vice president of operations, 30 Sweet Birch Dr., Meriden, CT 06450. If all users cooperate we can ensure equal opportunity for all and the continued health of OSCAR. — *WB1EYI*

QST Congratulates . . .

four contributors to amateur radio who have been extended honorary life memberships in the San Antonio Repeater Organization. The group includes: Roy Albright, W5EYB, active since 1922 and West Gulf Division director, 1968-1976; George Munsch, W5VPQ, operator of the first 34/94 repeater in the U.S. in May, 1962, founder and first president of SARO and cofounder of the Texas VHF/FM Society; Larry Higgins, W5QMU, three-time president and now on Board of Directors of SARO, and Jack Gant, W5GM, West Gulf Division director.

Operating Events

JANUARY

1: Straight-Key Night*
4: West Coast Qualifying Run**
7-8: CD Party phone*
14: Hunting Lions on the Air*, SARC VHF Contest**
14-15: YU 80-Meter DX Contest*
14-22: KM1CC Operation**
17: W1AW Qualifying Run**
21-22: VHF SS,* CD Party cw,* QSO Party of the Americas**
28-29: Simulated Emergency Test,* French Contest cw, CQ 160-Meter Contest****

FEBRUARY

2: West Coast Qualifying Run***
4-5: DX Competition phone*
4-12: Novice Roundup**
11-12: NH QSO Party, QCWA QSO Party,** Ten-Ten QSO Party****
12: Frequency Measuring Test**
15: W1AW Qualifying Run***
18-19: DX Competition cw,* YL/OM Contest phone**
22: W1AW Qualifying Run***
25-26: French Contest phone**

MARCH

4-5: DX Competition phone,* YL/OM Contest cw**
11-12: Commonwealth Contest cw***
18-19: DX Competition cw*
25-26: WPX SSB, BARTG Spring RTTY Contest***

***Detailed last month**
****Details this issue**
*****Details next issue**

JANUARY

4: West Coast Qualifying Run (W6OWP prime, W6ZRJ alternate) 10-35 wpm at 0500Z (Universal Coordinated Time, abbreviated UTC, with Z shown as a time designator). The run will take place at 9 P.M. PST the night of January 3. 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 name, call (if any) and complete mailing address. A large, stamped, addressed envelope will help to expedite your award/endorsements.

14: VHF Contest sponsored by the Schaumburg (IL) ARC, between 6 P.M. and midnight, CST on Jan. 14. All area amateurs are invited to participate. Send an s.a.s.e. to Schaumburg ARC, Box 612, Hoffman Estates, IL 60195, for rules and logs.

14-22: KM1CC Marconi 75th Anniversary special-event station, sponsored by the Town of Barnstable Radio Club of Cape Cod, MA. Celebrating the first two-way radio transmission between the United States and Europe by Guglielmo Marconi in 1903. 160 through 2 meters; cw, ssb, RTTY and slow-scan TV. Special FCC approval for use of A2, the 240-Hz sound of the Marconi 1903 station "CC" rotary spark gap will be reproduced for cw QSOs. "G-land" station GB3MSA and "EI-land," special-event, EIØ station to be operating during this same period. W/K stations QSL with an s.a.s.e. via Duncan Kreamer, W1GAY, Main St., Vineyard Haven, MA 02568. KM1CC mail address is R. J. Doherty, K1VV, Congrel Op., KM1CC, RFD 1, 14 Pine St., Sandwich, MA 02563.

17: W1AW Qualifying Run at 0300Z, 10-35 wpm, transmitted simultaneously on 1.835 3.58 7.08 14.08 21.08 28.08 50.08 and 147.555 MHz. This is 2200 EST (10 P.M. local Eastern time) the night of January 16. Underline one minute of the highest speed copied. Certify that the copy was made without aid and send it to ARRL per the instructions under the January 4 listing.

21-22: QSO Party of the Americas, sponsored by the Guantanamo Amateur Radio Club. Phone will take place 0001-2359 January 21, cw 0001-2359 January 22. Each is a separate contest. Any station entering both will automatically be also considered for a mixed-mode award. This will not hinder either phone or cw submissions, but is a bonus to those entering both modes. Eligibility: CQ zones 6, 7, 8, 9 (including HC8 VP9 KHØ PYØ XF4 TI9) versus the rest of the world. Exchange RS(T) plus sequential serial starting with 001, plus the ARRL country that one is in at the time. Multipliers are one per each ARRL DXCC listing per band (per contest). Those inside the above zones and accompanying areas count 2 points per completed contacts in own country, 3 points for contacts outside their own country but in the contest zone, or 5 points for all completed contacts outside the contest zone. The rest of the world scores 5 points for all completed contacts. All bands permitted. The U.S. General class portion of the bands is recommended for use on both phone and cw. The above zones and accompanying areas may work all stations. The rest of the world works zones 6/7/8/9 and accompanying areas. No cross-band or cross-mode contacts allowed except via OSCAR satellite. Entries should be postmarked by March 1 and sent to Guantanamo ARC, Box 73, FPO, NY 09593. All entries become the property of the club and none can be returned. An s.a.s.e. accompanying the entry will bring a copy of the results. Check sheets would be appreciated for any logs claiming 100 or more contacts. Special awards to be issued including working through OSCAR, working six or more KG4s, working at least six or more of the countries that are inside the contest zone, plus others yet to be announced. In your summary please include a band-by-band breakdown of your score to include the number of contacts, points and multipliers. Indicate if single or multi, transmitter and bands. Log in UTC and note each new multiplier the first time worked on a band. Check for dupes, etc. Do *not* use separate logs for each band. Include usual signed declaration.

28-29: French Contest cw, Sponsored by the French society, Reseau des Emetteurs Francais (REF), the full 48-hour period UTC (phone Feb. 25-26). Single operators work only 36 hours (160 meters is used for cw only, F stations on 1.826 MHz). Exchange RS(T) and QSO number. Score 3 points with F and DOM stations (overseas French departments) and TOM (overseas French territories) in the same continent; 10 points with F and DOM-TOM on other continents. Multipliers: for each F department (95) and FFA (DA); each DOM (FG FM FY FR); each TOM: FB8W FB8X FB8Y FB8Z FK FO FP FU FW FH (Mayotte); each other country on the DXCC list. Identification for F: The F station will transmit the number of the department after the call (F6ZZZ/67), the FFA transmits DA.../FFA. The final score is the sum of QSO points on all bands multiplied by the sum of multipliers on all bands. Send logs to the REF Traffic Manager, 2 Square Trudaine, 75009 Paris, France. **CQ WW 160 Meter CW DX Contest,** starts 2200Z Jan. 27 and ends 1600Z Jan. 29. Rules same as in previous years (see p. 99, Dec., 1976, *QST*), however, there will be more emphasis on penalties and disqualification criteria this year. This is a cw-only contest (no cw to phone). Exchange RST plus a three-figure QSO number starting with 001, and your state or province. It is not necessary for DX stations to send their QTH, their call will identify them. Scoring: For W/K/VE/VO, 2 points per QSO with other W/K/VE/VO stations. All DX contacts are worth 10 points. (DXCC list less W/K and VE/VO.) For all other countries, 2 points per QSO with stations in the same country, 5 points with stations in other countries; except for QSOs with W/K/VE/VO, which count 10 points. Multipliers: For all stations; one for each state, VE province and DX country worked. (KH6 and KL7 are considered DX; The District of Columbia is the same as Maryland. VE1 is divided into three provinces: New Brunswick, Nova Scotia and Prince Edward Island.) The final score: total QSO points multiplied by the sum of multipliers. Three additional contacts will be deleted for each QSO shown to be a duplicate (or false or unverifiable). A second multiplier will be deleted for each one lost by the above action. Disqualification can result if in the opinion of the Committee the penalty total is considered excessive. Disqualified stations and operators may also be barred from competition in all **CQ** contests for a period of up to three years. Awards. Logs and summary sheets and U.S. rules for 160 may be obtained from **CQ** by sending a large s.a.s.e. with sufficient postage. Mailing deadline for the contest entries is February 28. Send to **CQ** 160 Contest, 14 Vanderventer Ave., Port Washington, LI, NY 11050.

FEBRUARY

2: West Coast Qualifying Run (see Jan. 4 listing); Feb. 1, 9 P.M. local PST.

11-12: New Hampshire QSO Party, sponsored by the Concord Brasspounders Inc., W1OC, to promote the Worked New Hampshire Award. Operating periods are 2000Z Feb. 11 to 0500Z Feb. 12, and 1400Z Feb. 12 to 0200Z Feb. 13. Stations may be worked once per band per mode. NH stations may work each other. NH stations send RS(T) and county. Out-of-state stations send RS(T), ARRL section or country. NH stations score 1 point per QSO, multiplied by the number of ARRL sections plus countries plus NH counties. Others score 5 points per NH QSO, times the no. of NH counties. Suggested frequencies are cw 1810 3555 7055 14055 21055 28130, phone 1820 3935 3975 7235 14280 21380 28575, Novice 3730 7130 21130 28130, vhf 50.115 145.015 fm simplex (no repeaters). Awards. Mailing deadline is March 13, send your entry with a large s.a.s.e. for results and/or award to Concord Brasspounders Inc., C. Halloway, 9 Via Tranquilla, Concord, NH 03301. **Ten-Ten International Net Winter QSO Party,** full 48-hour period UTC. Open to all amateurs (nonmembers ineligible for awards). Exchange name, QTH and 10-10 number if a member. Members score 1 point per QSO, add a point if with a member. Give the name of your chapter for chapter credit. Send logs to Grace Dunlap, K5MRU, Box 445, La Feria, TX 78559. Entries must be postmarked no later than March 31. **QCWA QSO Party,** 21st annual, starts 2300Z Feb. 10 and ends 2300Z Feb. 12. A contact with another QCWA member counts 1 point. Contacts with the QCWA memorial station W2MM/6 count 2 points. (Contacts made with captive lists of stations, such as local nets, are invalid.) A multiplier of one for each state, province, U.S. possession, country or political subdivision designated by a call sign prefix, i.e. VK2 VK3 KP4 KV4, (JA1 and JH1, being the same, would only count as a single multiplier.) Each state counts as an additional multiplier. All contacts must be with QCWA members. Suggested frequencies: phone 1805-1825 3940-3960 7240-7260 14240-14260 14280-14300 21340-21360 28640-28660, cw 1805-1825 3540-3560 7040-7060 14040-14060 21040-21060 28040-28060. Exchange QSO number, QTH, name and QCWA-membership number. Logs should be mailed no later than Feb. 19 to Ralph Cabanillas, Jr., W6IL, 2359 Creston Dr., Hollywood, CA 90068.

12: Frequency Measuring Test, open to all, begins with a callup at 0300Z and 0600Z, Feb. 12. Remember, this is the evening before, Feb. 11, by local time. The periods for measurement start at 0307 (20 meters), 0315 (40 meters) and 0323 (80 meters); for the late run, 0607, 0615 and 0623, respectively. Each measuring period lasts five minutes. Submit your averages for each five-minute period which will be compared with the umpire's averages for each five-minute period. (The umpire is a professional measuring laboratory.) Tell how many readings you took to form your averages. Approximate frequencies for the early run are 14128, 7040 and 3552 kHz. Late-run frequencies are 14082, 7030 and 3561 kHz. Your report must be received by February 23 to qualify for the May *QST* report of the competition. W1AW will start transmitting the official results in a special bulletin on February 24.

18-19: YL/OM Contest, Young Ladies Radio League, starts 1800Z Feb. 18, ends 1800Z Feb. 19 (cw session March 4-5). Open to all licensed OMs and YLs throughout the world. All bands, crossband not permitted nor do net contacts count. Exchange QSO no., RS(T), section or country. Entries in your log must show band worked at the time of contact, time/date. Each mode a separate contest. One point for each station (stations may be worked just once regardless of band). Multiply total contacts by the number of different sections and countries worked. Contestants running 150-watts input or less on cw and 300-watts ssb PEP or less on phone, multiply results by 1.25. Copies of logs, showing claimed scores, must be signed by the operator and postmarked on or before March 23. They must be received by the contest manager (YLRL v.p.) no later than April 9, 1978. Send to Phyllis Shanks, W2GLB, 3 Honey Ln., Miller Place, NY 11764.

25-26: French Contest phone, see January 28-29 listing.

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, S.T. Jones, VE6MJ — SEC: VE6XC. PAM: VE6AFO. My sincere thanks to VE6EO and his XYL for their hospitality during my recent trip to Lethbridge. VE6AHH have a very interesting talk and demonstration on the construction of printed circuit boards at the Southern Alberta Radio Club meting. The Lakeland Radio Club members were active during the Oct. DX contest and are recruiting new members for the club. K7MAT/VE6 is interested in weather observing as well as ham radio. VE6AAT is now back living in Grande Prairie. VE6AK is back at old QTH and has erected antenna for OSCAR work this winter. VE6FF has moved to Victoria and is now operating as VE7DVR. VE6MJ and VE6HO attended DOC symposium in Ottawa on Nov. 26. Traffic: VE6HO 27, VE6AVV 6, VE6AKY 4, VE6AMM 3, VE6AAT 2, VE6COJ 2, VE6CE 2, VE6EC 2, VE6YW 1.

BRITISH COLUMBIA: SCM, H. E. Savage, VE7FB. We missed one months report this summer and was chastised by many. Well why not help and write me. VE8RR is our newest OO at Contwoyto Lake, NWT. British Columbia Phone Net on 3755 kHz, Net Manager, VE7DKY, and Asst. VE7QC report net activities are remaining high. We attended the Vancouver Island Senior Citizens Repeater Assn.'s Annual Meeting in Qualicum, good steak dinner, they reelected VE7WA, pres. also VE7DAR VE7AWC. Their repeater is battery operated and has good coverage. Traffic: VE7DKY 149, VE7ZK 106, VE7FB 81, VE7OM 48, VE7BLQ 47, VE7GY 46, VE7COA 16, VE7MW 10, VE7CDF 8, VE7BLS 6.

MANITOBA: SCM, Asst. SCM, VE4PG — RM: VE4UL. PAM: VE4JP. MTTN, the new RTTY net is now on at 3635 kHz on a trial basis, at 0130Z daily. Welcome to VE4IZ, Winnipeg. He is active on the cw as well as the phone net. New ECs, VE4TR VE4LB. VE4IX had heart surgery and doing well. VE4FK visited his homeland the UK, and tried to find out if a souvenir "807" would break if dropped on Canadian soil. MEPN 31 sessions, QNI 1115, QTC 64. MTN 30 sessions, QNI 166, QTC 83. Traffic: VE4PG 129, VE4QU 77, VE4UL 61, VE4HR 17, VE4IX 17, VE4JP 16, VE4ABB 7, VE4AAD 6, VE4ED 4, VE4LN 4, VE4ADX 2, VE4EJ 2, VE4HA 2, VE4IF 2, VE4NE 2, VE4AAF 1, VE4LB 1, VE4MG 1, VE4NM 1, K3ZVH/VE4 1.

MARITIME-NFLD.: SCM, Aaron D. Solomon, VE1OC — Asst. SCM: VO1FG. SEC: VE1DI. PAM: VO1JN. RM and APN Mgr.: VE1ACU. RM and NTN Mgr.: VO1GW. Silent Key: VE1EK. Recent Hosp. VE1BGL. VE1s AI OU YT operated Port. during Boy Scout Jamb. Bull. Eds. VE1s AKT AUT FQ IG recd. Cert. of Merit for efforts in keeping Club Members informed. Woodstock AREC ran successful SET VE1RO & VE1AUF recd publicity in Hfx. press. VE1LCR new club call being used by VE1RO. VE1KX & VE1NN gave talk on FM to MAARC. VE1JS covered most of Europe on recent trip. Recent visitors to Hfx. incl. VE3IT, VE4DF, W2CO, IA5PF VE1ASW & VE1UW have new three-element beams up. VE1s ASW AMC BBO attended E.M.O. (N.S.) seminar. VO2AG gave 200 Zone 2 contacts on 6M. VHF contest. XO1C6G had 1000 contacts during Can. Summer Games. APN, sess. 28, QNI 71/14, QTC 68/47. NTN, sess. 24, QNI 47, QTC 3. (Aug.) NTN sess. 10, QNI 15, QTC 4. Traffic: (Oct.) VE1ACU 119, VE1RO 38, VE1AMR 28, VE1HJ 25, VE1ASW 16, VE1AMB 8, VE1ABG 6, VO1GW 5. (Aug.) VO1GW 4.

ONTARIO: SCM, Larry Thivierge, VE3GT — Asst. SCM, Noreen Nimmmons, VE3GOL. Happy New Year. For the ninth time in 16 years the Scarborough ARC has won the Keith Russell Memorial Trophy for their 1st place Field Day finish. VE3FON, new pres. of RSO made the presentation. Scarboro ARC has made a donation to ARRL for WARC '79. VE3TM has become a Silent Key. Kiwanis International are organizing a net composed of members who are amateurs, contact VE7KC. New RSO Directors for '77/'78 are VE3s DHW BLZ XE FPF OR FON and BNV. London area amateurs VE3s BTZ CL GRO GYQ IBV and OT attended the International Ham-O-Rama in Hamburg, NY. VE3GOL addressed the Metro and Nortown ARCs and was well received. New CARTG members are VE3s FQD IVD and BNB. Best wishes and speedy recoveries to VE3s HSK ATO AXR GKJ and GTY. VE3s IIF CVH and HME have their Advanced. Ex-VE3CMR now VE3IJH. New Calls around the Section are VE3s JTO JTE JOZ JIR and JIP. VE3HYI has picked up the WAS award. Recent additions to CLARA are VE3s IIS and IIY. VE3DV explained the NTS to the OVMRC at a recent meeting. Repeater VE3TDO now on using 146;43/147.03 MHz. The annual KWARC -vs- Guelph ARC golf tournament was won by the Guelph club, again! You are invited to participate in SET '78, Jan. 28 and 29. Monitor your local repeater, NTS HF nets and Ontars. Valuable experience can be gained by handling traffic under emergency conditions. Watch for special event station, KM1CC during the week of Jan. 14 to 22nd. This station will be active on all modes and bands to commemorate the 75th anniversary of the first two way radio transmission between the US and Europe, by Marconi in 1903. VE3AJN is the new net mgr. of the CMN. Congrats to the Peterborough ARC on winning the Presidents Award for best club bulletin in 1977. VE3DV chatted with VE3AYZ who was returning home after holidays in the east. VE3CDM would like to complete a register of Ont. amateurs who are also members of the Canadian Power Squadron. Traffic: (Oct.) VE3GOL 307, VE3SB 276, VE3DPO 154, VE3HGJ 136, VE3ISW 128, VE3CDK 119, VE3GFN 111, VE3GT 78, VE3DV 67, VE3EWD 56, VE3GJG 53, VE3BDM 46, VE3DVE 27, VE3GNW 24, VE3ATR 17, VE3VX 17, VE3IFP 15, VE3FHQ 5, VE3FGV 4, VE3GCC 4. (Sept.) VE3AWE 16, VE3FHQ 13, VE3APK 9, VE3GCC 6.

QUEBEC: SCM, Ed Sieb, VE2BAQ — VE2ERA reports local Ten-Ten net active Sun. at 1330 UTC. 29,650 kHz. New check-ins are welcome. A hearty congrats to VE2PY and his very capable cabinet of newly elected officers of Montreal Amateur Radio Club. We know they will do a superlative job this season. MARC holds weekly nets on 147.06, VE2BG repeater, Wed. eves. at 0100 UTC. VE2BHP very active with 220 MHz repeater VE2HH, and welcomes users. Frequencies are 222.9/224.5. VE2AED very busy with scanner kits, this project has him burning the midnite oil, and has kept him off the air. I welcome yhour news, traffic and other reports of activities. Send them to met at P. O. Box 296, Cote St Luc, Quebec. H4V 2Y4. Tel, 489-7974. Traffic: VE2UN 68.

SASKATCHEWAN: SCM, Percy A. Crosthwaite, VE5RP — Saskatchewan had two simulated air crashes, one in Regina, the other in Saskatoon. Our amateurs played an important role in both crashes. Last Mountain Radio Club will be offering Ham classes to their rural people. I wish them all the success. I have spoken to all of the affiliated clubs this fall on the developments that took place at the GRS Symposium in Winnipeg, Sept. 9, 1977. Traffic: VE5AAE 40, VE5DF 16, VE5NJ 15, VE5RP 15, VE5EK 11, VE5OL 9, VE5ABK 8, VE5QL 7, VE5WM 6, VE5QI 4, VE5QY 3, VE5YP 3, VE5ABN 2.

ATLANTIC DIVISION

DELAWARE: SCM, Roger E. Cole, W3DKX. — SEC. W3PQ. PAM: W3WD. RM. W3QQ. PSHR: K3YHR 49, WA3WPY 47, W3PQ 44, W3EGN. Del. State MARS Dir. (Army) scheduled a Dec. exercise using a 2-meter repeater airborne in a National Guard "Chopper." New Del. Repeater Assn. officers are WA3QLS, pres.; WA3QPX, vice-pres.; W3KET, treas.; WB3FOE, corr. secy.; WB3ENF, rec. secy; WB3ERC, Del. Dir.; N2RE, NJ Dir.; WA3UMA, PA Dir. WB3ENF upgraded to Extra and WB3DUG to General. DEPN QNI 75, QTC 18. DTN, QNI 355, QTC 60. Traffic: W3PQ 241, WA3WPY 49, W3QQ 42, WA3WIY 36, W3DKX 30, K3JL 26, W3WD 16, K3TVV 10, WB3ENF 5, WB3FUQ 4.

EASTERN PENNSYLVANIA: SCM, Geo. S. Van Dyke, Jr., W3HK — SEC: W3FBF. RMs: K3NGN K3KW. PAMs: WA3PZO W3AVJ. Net reports: EPAEP&TN QNI 337, QTC 90; PTTN QTC 144; EPA QNI 499, QTC 214; PFN QNI 347, QTC 545; AREC (2) QNI 6; CMSMN QNI 41; QTC 4. OO repts WA3TMP W3KEK K3SD. OVS rpts W3GOA N3EG W3CL WA3BJQ WA3NDQ. OBS rpts W3ATJ K3SD W3ID W3AVJ W3CL. PSHR: N3HR K3YL WA3PZO K3SD; BPL: W3CUL W3VR N3HR WA3ZRY WA3ATQ. Holiday tfc keeping W3CUL and W3VR busy. Our new EPA RM K3KW is now Asst. Dir. on TCC! Our lady Marine is back in full swing! WA3ATQ of course. WA3PZO back after illness.-W3ID says where is the SEC reports? Get after W3FBF! W3ADE an ole CW man says he is having fun on 2M FM! W3BUR had local Scouts at his shack. W3EU thinks he can duck Murphy by moving into big house! W3GMK reports no problems, must be doing something right. Looks like the Pack Rats did it again with their Hamarama! The club papers are getting better all the time, shows we have some real dedicated editors out there. K3UCJ now K3UC WB3EXV now N3EX. K3PFX got his big A now working on the big E. W3BBS will soon be working moon bounce thanks to K3AI K3RYL WA3BRW & WB3ESS. EPA has updated its active member net certificates. PTTN welcomes following new stations: WB3CPZ WB3EML WA3OPN WA3YHR & WA3YJZ. I hope you all exercised your right to vote in the SCM election. Keep the reports coming and don't forget the dead line! Traffic: (Oct.) W3CUL 4352, W3VR 862, WA3ZRY 663, N3HR 566, K3KW 419, WA3ATQ 389, WA3WQP 342, WA3THT 292, K3NGN 209, K3YL 158, W3IPX 114, W3ATJ 73, K3SD 67, WA3PZO 34, WA3YHR 28, W3ID 27, WA3WAC 27, WB3BKV 23, K3RC 19, W3AVJ 15, W3ADE 15, W3GL 14, WA3CKA 13, WA3NDQ 12, K3HXS 9, W3BUR 5, W3HK 3, WA3YDC 3, N3AI 2, W3KEK 1, W3EU 1, WA3VDQ 1, WA3TMP 1, W3GMK 1, W3GOA 1. (Sept.) WA3NDQ 31, WA3ZRE 4, WA3VDQ 1. (Aug.) WA3WAC 35.

MARYLAND — DISTRICT OF COLUMBIA: SCM, Karl R. Medrow, W3FA — Sad to report W3QW became a Silent Key. He was a good ham to the end. Gaithersburg was a big bash with people getting lost in tailgaters alley. The BARC supplies the Modulator. It is a big club with membership in the hundreds. The AARC is comparatively small. It is interesting to see them grow. AARC has the Ham Arundel news, and plans for repeater WR3AJP 705/105. WB3FTX WB3FPB and N3DE teamed up to explain their set-up in detail and a good show. WB3CLO is the AARC busy computer man. N3IC does the honors for BARC. OO reports from WA3RSK W3WBY and WA3JSZ. WA3RSK had 6 IW reports plus passing his mid terms at U of Md. W3WBY keeps watch on UHF and notes interesting band openings as well. W3IKA will spend the next half year in or near Antartica — perhaps a little hamming from the ice breaker. K3HPG is mastering a memory keyer for contesting. N3HC moved from the 2nd to the 8th floor for a better QTH! W3ZNW is happy it is EST again. N3AL still has K3KMO, 25 years a ham last Jan. W3ECN is busy with the nets. W3CDQ was among

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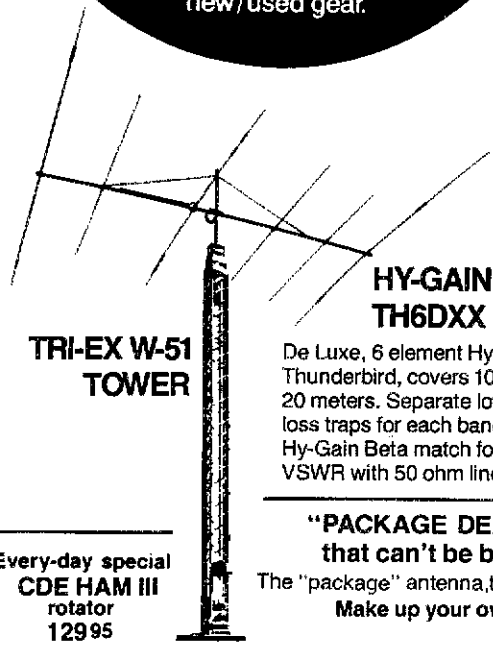

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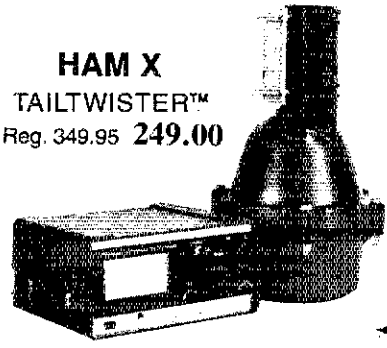

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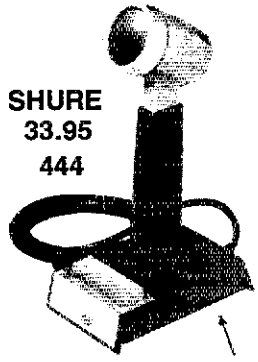

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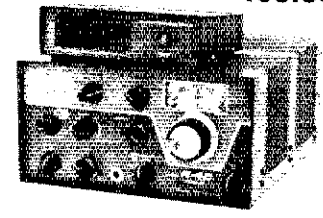

DRAKE R-4C RECEIVER
A limited number at old price of **599.00**

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Does Your Unit Cover The New Sub-band 144.5 - 145.5 MHz? The FM2015R Does, PLUS MARS-CAP!*

All Solid State-CMOS PLL digital synthesized - No Crystals to Buy! 5KHz steps - 144 - 149 MHz-LED digital readout PLUS MARS-CAP.*

• 5 MHz Band Coverage - 1000 Channels (instead of the usual 2MHz to 4MHz-400 to 800 Channels) • 4 CHANNEL RAM IC MEMORY WITH SCANNING • MULTIPLE FREQUENCY OFFSETS • ELECTRONIC AUTO TUNING - TRANSMIT AND RECEIVE • INTERNAL MULTIPURPOSE TONE OSCILLATOR • RIT • DISCRIMINATOR METER - 15 Watts Output - Unequaled Receiver Sensitivity and Selectivity - 15 POLE FILTER, MONOLITHIC CRYSTAL FILTER AND AUTOMATIC TUNED RECEIVER FRONT END, COMPARE! • Superb Engineering and Superior Commercial Avionics Grade Quality and Construction Second to None at ANY PRICE.

INTRODUCTORY PRICE

$399.00

Regulated AC/PS Model FMPS-4R . . . $49.00

FMMC-1 Microphone with Built-in Touch Tone Pad.
- New! Auto Key-up
- LED indicator
- Adj. level and tone balance
- only 3-3/4" x 2"

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- **FREQUENCY RANGE:** Receive and Transmit: 144.00 to 148.995 MHz, 5Khz steps (1000 channels) INCLUDING NEW BAND 144.5-145.5MHz + MARS-CAP.*
- **LED DIGITAL READOUT.**
- **4 CHANNEL RAM SCANNER WITH IC MEMORY:** Program any 4 frequencies and reprogram at any time using the front panel controls-scan all or part of the memory-search for occupied (closed) channel or vacant (open) channels. Internal Ni-Cad included to retain memory (no diode matrix to wire or change).
- **MULTIPLE FREQUENCY OFFSETS:** Three positions A,B,C, provided for installation of optional crystals: EXAMPLE - 1 MHz offset. Duplex Frequency Offset Built in - 600 Khz PLUS or MINUS 5 KHz steps, plus simplex, any frequency.
- **INTERNAL MULTIPURPOSE TONE OSCILLATOR BUILT IN:** 1750Hz tone burst for "whistle on operation" and sub-audible tone operation possible by simply adding a capacitor across the terminals provided. Internal 2 position switch for automatic and manual operation, tone burst or sub audible tone PL - adjustable 60-203Hz (100 Hz provided).
- **AIRCRAFT TYPE FREQUENCY SELECTOR:** Large and small coaxially mounted knobs select 100KHz and 10KHz steps respectively. Switches click-stopped with a home position facilitate frequency changing without need to view LED's while driving and provides the sightless amateur with full Braille dial as standard equipment.
- **FULL AUTOMATIC TUNING OF RECEIVER FRONT END AND TRANSMITTER CIRCUITS:** DC output of PLL fed to varactor diodes in all front end RF tuned circuits provides full sensitivity and optimum intermodulation rejection over the entire band. APC (AUTO POWER CONTROL) - Keeps RF output constant from band edge to band edge. NO OTHER AMATEUR UNIT AT ANY PRICE has these features which are found in only the most sophisticated and expensive aircraft and commercial transceivers.
- **TRUE FM:** Not phase modulation - for superb emphasized hi-fi audio quality second to none.
- **RIT CONTROL:** Used to improve clarity when contacting stations with off frequency carrier.
- **MONITOR LAMPS:** 2 LED's on front panel indicate (1) incoming signal-channel busy, and (2) Transmit.
- **FULLY REGULATED INTEGRAL POWER SUPPLY:** Operating voltage for all 9v circuits independently regulated. Massive Commercial Hash Filter.
- **MODULAR COMMERCIAL GRADE CONSTRUCTION:** 6 Unitized modules eliminate stray coupling and facilitate ease of maintenance.
- **ACCESSORY SOCKET:** Fully wired for touch tone, phone patch, and other accessories. Internal switch connects receiver output to internal speaker when connector is not in use.
- **MULTI-PURPOSE METER:** Triple Function Meter Provides Discriminator Meter, "S" Reading on receive and Power Out on Transmit.
- **RECEIVE:** Better than .25uv sensitivity, 15 POLE FILTER as well as monolithic crystal filter and AUTOMATIC TUNED LC circuits provide superior skirt selectivity - COMPARE!
- **HIGH/LOW POWER OUTPUT:** 15 watts and 1 watt, switch selected. Low power may be adjusted anywhere between 1 and 15 watts. Fully protected-short or open SWR.
- **OTHER FEATURES:** Dynamic Microphone built in speaker, mobile mount, external 5 pin accessory jack, speaker jack, and much, much more. Size 2½ x 7 x 7½. All cords, plugs, fuses, microphone hanger, etc. included. Weight 5 lbs.

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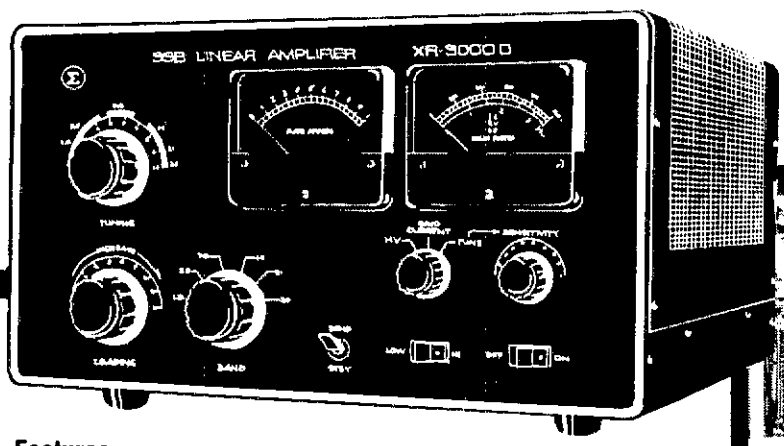
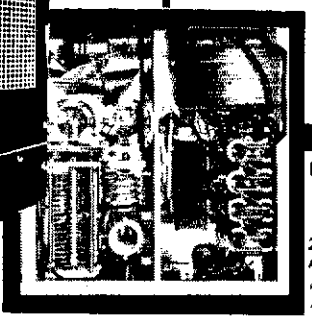
The New Sigma XR3000D Linear Amplifier Compare!





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Airport to Airport $35
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Features:

Custom computer grade commercial components, capacitors, and tube sockets manufactured especially for high power use—heavy duty 10Kw silver plated ceramic band switches • Silver plated copper tubing tank coil • Huge 4" easy to read meters—measure plate current, high voltage, grid current, and relative RF output • Continuous duty power supply built in • State of the art zener diode standby and operating bias provides reduced idling current and greater output efficiency • Built in hum free DC heavy duty antenna change-over relays • AC input 110V or 220V AC, 50-60Hz • Tuned input circuits • ALC-rear panel connections for ALC output to exciter and for relay control • Double internal shielding of all RF enclosures • Heavy duty chassis and cabinet construction and much, much more.

- Full band coverage 160-10 meters including mars.
- 2000 watts P.E.P. SSB input. 1000 watts input continuous duty, CW, RTTY & SSTV.
- Two Eimac 3-500Z conservatively rated finals.
- All major HV and other circuit components mounted on single G-10 glass plug in board. Have a service problem? (Very unlikely) Just unplug board and send to us.
- Heavy duty commercial grade quality and construction second to no other unit at any price!
- Weight: 90 lbs. Size: 9½" (h) x 16" (w) x 15¾" (d).

HOLIDAY INTRODUCTORY SPECIAL!

New! Sigma Model AF250L Deviation/Modulation Meter

Fully Certifiable for Commercial Use

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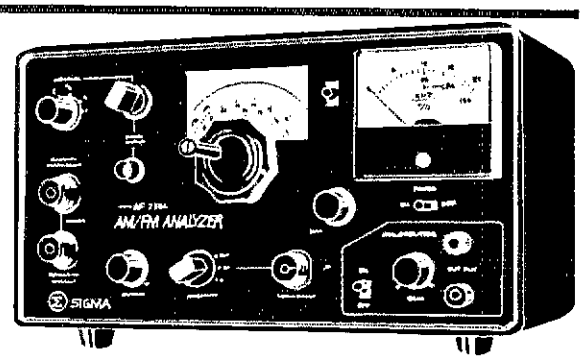
$169



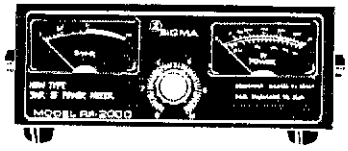
Features:

Extremely stable local oscillator for easy measurement of HF, VHF, and UHF bands employing negative feedback to insure extremely high stability ● Easy to read, accurate linear scale ● Direct off the air signal measurement capability.

Specifications:

Frequency: 1.8MHZ-520MHZ/3 range select (A, B, C, EXT), A range: 26.5 MHZ-40MHZ, B range: 48MHZ-60MHZ, C range: 140MHZ-156MHZ, EXT. range: 1.8MHZ-520MHZ (Need Signal Generator) • Generous overranges • Input level: (1) Through type input level: 1W-200W (RF Input Terminal) (2) Direct input level: More than 80db/50ohm impedance • Amplitude modulation degree: 0-100% • Frequency deviation: 0-20KHZ • Accuracy: +/-3% of full scale • Intermediate frequency: 10.7MHZ • Local input frequency (EXT Range) • Measuring frequency +/-10.7MHZ • RF Attenuator: 0-60db variable • Audio signal oscillator: (1) Audio Frequency—1,000HZ (1 KHZ), (2) Output level—More than 1V RMS • Power Source: AC117V • Dimensions: H-5½" (140mm), W-10¼" (260mm), D-7¼" (184mm) • Weight: 7 lbs.

SIGMA RF-2000 SWR & POWER METER



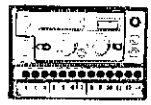
$29

Introductory Price

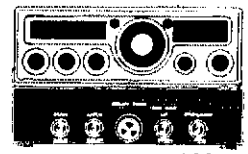
Cal PWR Scales 200W-2000W Freq Range 3.5-150 MHz. Please do not confuse the RF2000 with similar appearing lower priced units. RF2000 is an individually calibrated professional quality instrument. Unequaled at many times the price. Size 7" (w) x 2 1/3" (d).

SPECIAL SCANNER SALE

FOR KENWOOD TR-7400A



14 Channel Programmable
reg $109 — **$65**



FMSC-1 reg $169 — **$99**
7400 Scanner II Reg $189-$119

FMSC-1 Scanner for KDK FM 144 and 7400 Scanner II for Trio-Kenwood TR-7400A. ● Full scan 146 and 147 MHz consecutively or 1 MHz, or any MHz range ● Scan rate: 1 MHz/2 seconds (adjustable) ● Controls: Scan/Hold, Latch/Delay, 600 KHz offset (off, up, down), program 1 MHz ● Simple installation.

KDK SPECIAL SALE FM 144 Accessories

FMTP-1	Touch Tone Pad	$59
FMTP-2	Touch Tone Pad with 10 Number Programmable Memory	$99
FMTD-1	Private Call Decoder for use with and Programmed by Any Touch Tone Pad	$75
SC-12A	Audible Tone Encoder Decoder	$65
FMSC-1	Scanner-Random Any Range.	$99
MARS-CAP	Option Kit - Any Frequency, Any Split	$12
FMOF-1	Offset Option Kit - 2 Extra Positions, Crystals Required	$10
FMOF-2	+1 MHz Offset Option Kit (No Crystals to Buy)	$10
FMTE-1	Sub Audible Tone (100 Hz-Adjustable 67-203 Hz)	$15
	Owners Manual (Extra)	$5

FM 2015R Accessories:

FMPS-4R	Regulated AC PS	$49
FMMC-1	Microphone with Built-in Touch Tone Pad	$49
MARS-CAP*	Option Kit - Any Frequency, Any Split	$6
FMAT-1	½ Wave Portable Antenna for Hotel, Motel or Apartment	$7.95
	Extra DC Cord & Plug	$3.50
	Service Manual	$4.00
	Mounting Bracket (Extra)	$6.00

Standard-New 2 Meter FM Transceivers Model SRC 146A Special Sale

SRC 146A	$314
4 Xtals:34/94 and 94/94	NC
USA 2 Deluxe Base Charger	$47
PT3644 Leather Case	$12
AT 19 Rubber Ant and Whip	$10
N1-cads	$30
Reg.	$413

NEW!!! Touch Tone pad completely wired and ready to plug in-$69.00

Our Price **$289**

NEW! 6 METER FM50-10SXRII

51.00-53.995 MHz. 600 channels
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the many at Gaithersburg. WB3AUK got his old call back. WA3YFM, and a regular on the MD nets. N3IT picked up 10 new ones in the CQ WW test. WB3CGG was NCS of the VA fone net 5 times and haunts 75 meters at night. WB3AOB is back at the school grind, but manages liaison and NCS jobs. K3ORW is settled for the winter operations, and it looks like a busy one. K3KU is getting psyched up for the contest season! W3FZV had fun in the CD party. WA3UYF reports little ham activity, with 100% school. WA3PRW reports the ARES set up at the Hospital Center in Frederick. N3QA is an Eastern Shore regular. W3DFW and W3OYY find a big difference between EST and EDST. With the nets: Mgr, Sessions/QTC/QNI Avg. MDD, W3QO, 60/181/7.5. Top Brass WA3UYF WA3WPY and W3POI. MEPN, WA3PPRW 21/76/23.7. Toppers W3ADQ W3HWZ W3LDD WA3PRW K3RIJ and WA3ZRY. Others WA2YFM MDCTN, K3ORW, 16/68/17.7. Top Honors to K3ORW WB3AOB WA3ZRY and WA3PRW. WR PON, W3DFW. 18/19/18.2. MDC PON, W3OYY, 4/13/25.5. Late sad news from W3BHE who reports WB3DSI became a Silent Key. Traffic: (Oct.) WB3AOB 126, K3ORW 51, WA3UYF 48, K3KU 45, W3FA 41, N3QA 36, WA3PRW 32, W3ECN 31, N3IT 29, W3FZV 19, K3HPG 13, W3ZNW 2. (Sept.) W3IKA 34.

SOUTHERN NEW JERSEY: SCM, Raymond F. Clancy, WB2GTE — SEC: W2HOB. WB2LOC PAM-RM reorganizes the New Jersey Slow Net which meets daily at 8:15 P.M. on 3.730 MHz. Revived Pennsauken High School ARC meets Tue. nite sez WB2RMZ. Del. Valley ARC's WB2FIZ conducts Microprocessor meetings at his home. K2HG has new computer terminal. WA2HWZ has PTR with his M-Processor. SPARC started new Novice class Oct. 19. Also has White Elephant sale and plans bus trip to ARRL. WA2ASB and WB2IBM add new jr. op. WB2JRF new Tech. Generals: WB2IWB WB2LCH WB2FRG WB2MXX WA2LRN. WB2RIY new ham. WB2KNY is Advanced. Extras: K2ODG W2FYS WA2AWO. WJRA reports Novice classes began Oct. 5 at JFK High School. SEC W2HOB reports WA2YAV new EC for Atlantic Co., WA2SEA EC Gloucester Co. K2HG sez Old Barney ARC and SCARA members operated K2BR during Miss America Contest from convention hall had 750 contacts with 49 states, and many msgs. Miss America was on SCARA's Repeater. WA2ONG graduate of class of 52 sez new Novice Class of 72 under way. Willingboro Repeater Group (WR2AJY) elect W2XQ, pres.; WA2VQX, treas. WB2KKS, secy. NJ Assemblyman introduces Bill A3417 to permit amateurs to have police and fire freq. recvrs. in their cars. W2KF writes a technical article for SJRA's Harmonics while in Tehran, Iran. W2JI lost mast and quad in wind storm. Net NJTN WB2LCC sess. 31, QNI 610, QTC 223. Net Sun. AM sess. 5, QNI 84, QTC 24. Traffic: W2ZQ 202, WB2LCC 125, WA2AWU 75, K2BR 60, W2JI 38, K2UL 23.

WESTERN NEW YORK: SCM, Joseph M. Hood, K2YA — Asst. SCM: W2MTA. SEC: N2JC. The RAGS Hamfest drew over 1,000 despite poor weather. Oct. brings more licensing classes as follows: ARATS at North Tonawanda F.D., WB2KGE and WB2JQK instructing, K2GJC Novice Class, and GRAM Novice/General Class at G.C.C., W2EFA coordinating. RARA had a very successful Auction with more than 1200 dollars worth of goodies changing hands thanks to an FB job of auctioneering by K2MP. More two letter calls: K2KNV is now K2NV and WB2FJC is now N2DM and is on 52.525 MHz FM looking for other experimenters in the Auburn and Syracuse areas. W2FR is taking a leave of absense as EAN NCS until next spring. W2RQF has a new tribander at 55-ft. Amateurs wishing to help financially support the WR2AFF, 16/76 repeater formerly in Groveland should contact WA2CBU. The Rochester VHF group Oct. meeting featured K7QWR from Motorola who gave an excellent talk on transistor RF Power Amplifiers. Stations are reminded to mail reports for this column by the fourth of the month and local stations delivering reports by telephone are requested to hold delivery until the eighth of the month. Finally, an ARATS member tells me he recently received his new rig via parcel post marked fragile — throw underhanded. Traffic: WA2ELD 354, W2OE 191, W2MTA 100, W2PZL 90, W2RUF 86, W2FR 47, WA2AIV 45, WB2EXH 34, W2RQF 30, W2TZ 30, WB2KHT 23, W2UYE 20, WB2VND 18, WA2UAR 13, K3GJC 9, WB2WCE 7, K2VR 2.

WESTERN PENNSYLVANIA: SCM, Donald J. Myslewski, K3CHD — SEC: WA3VUP. Asst. SECs: K3SMB WA3LJW. PAM: K3SMB. VHF PAM: W3GOJ. RMs: K3AT W3NEM W3KUN. Net, kHz, Time/Days; WPA CW Traffic, 3585.0, 7:00 PM Dy; WPA Phone Traffic, 3983.0, 6:30 PM Dy; Pa Traffic & Training, 3610.0, 6:30 PM Dy; WPA RACES 3990.5, 9:00 AM Su. New appointments: W3GQJ as VHF PAM, WA3WIK as EC for Mercer County. Get well wishes to W3SN and W3ELZ. K3HWL received the DXCC Award. WA3TOB is using a talking calculator for use by the blind. The North Hills ARC is conducting Novice classes with 22 in attendance. The Nittany ARC is putting a repeater on 449.9/444.9 MHz. WB3BQU and WA3SKC have erected new beams. The Crawford ARS received the National Certificate of Merit from the ARRL for the donation of League publications to the Meadville library. New Novices in the Section: WB3JUY WB3JMU WB3JFI WB3JDJ WB3JDK WB3JGI WB3JIO WB3JGH. K3ZFI has upgraded to Extra Class. Remember that Jan. 28 & 29, 1978 is the National Simulated Emergency Test. Last year the WPA Section was confronted with actual emergencies with many lives and property at stake. Make a special effort to participate in this important test. For further details contact WA3VUP, WPA SEC or myself. The WPA (Pgh) 2 Meter Traffic Net had 29 sessions with 433 check-ins and handled 64 messges. The WPA CW Traffic Net had 31 sessions with 335 check-ins and handled 72 messages. Traffic: K3AT 219, N3FM 143, W3YQ 120, W3EGJ 116, K3MIY 86, W3KUN 54, K3CHI 52, K3SMB 40, W3GQJ 38, WB3DKT 36, WB3EYY 32, WA3QNT 31, K3HI 27, WA3YEQ 24, WB3HGL 20, W3RU 17, K3HCT 11, WA3YXJ 10, WB3GZR 9, W3AS 8

CHOOSE ONE OF THESE TWO GREAT 2-METER FM TRANSCEIVERS.

BOTH SYNTHESIZED FOR STANDARD AND "ODD-BALL" REPEATER SPLITS!

Model FM-28. Check these outstanding features. Fully-synthesized from 144 to 148 MHz in 5 KHz steps. Bright six-digit frequency display. Supplied with simplex, plus 600 and minus 600 KHz offsets. Up to two additional "non-standard" offsets available. Clean 25 watt transmitter. 0.25 UV receiver with helical front end. Modular construction. All solid state. Complete with base station and mobile mounts, hardware, DC cable, microphone and manual. **Introductory priced at only $359.95.**

Model FM-DX. Compare the specifications of this unchallenged performer: 40 watt transmitter output. Extended frequency coverage from 143.5 to 148.5 MHz to facilitate MARS and CAP. Supplied with simplex, plus 600 and minus 600 KHz offsets. Up to three additional "non-standard" offsets available. LED frequency display. Selective, single conversion receiver. Rugged extruded chassis and modular construction will withstand the most severe environment. Engineered and built in USA. Shipped with mobile mounting hardware, power cables, microphone and manual. **Limited time pricing only $499.00.**

Optional accessories: include base station, power supplies, tone encoders, antennas and solid state power amplifiers. Write or telephone today for detailed specifications.

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$669.95 Kit

The New SB-104A: The Advanced Concept In Ham Technology—Now Updated and Improved!

From front panel to rear apron this solid-state 80 through 10 meter transceiver is packed with the superior features and performance that set Heath's SB series apart. Featuring digital frequency display, all new front end board, sensitivity less than 0.5 μV, broadband design, and a solid 100 watts out, you'll agree the SB-104A is the ultimate experience in Amateur Radio. **Only $669.95 Kit**

Shown with optional Micoder™ II installed

$269.95 Kit

HW-2036A: The New Industry Leader

The HW-2036 is the transceiver that made 2-meter history; no we've improved it with full 4 MHz frequency coverage! Also fea tures 15 dB quieting with 0.5 μV in; a solid 10 watts ou simplex or ± 600 kHz offsets; full frequency synthesis, ex cellent audio, built in sub-audible tone encoding . . . the lis keeps going and at this price the HW-2036 is a super value

Only $269.95 Kit

$199.95 Kit

HR-1680: The Perfect Choice for your first Receiver

One look and you'll know . . . this is one outstanding receiver! The HR-1680 covers 80, 40, 20, 15, and the lower 1 MHz of 10 meters and features solid state design, preselector tuned dual-conversion MOSFET front end, excellent sensitivity, 4-pole crystal IF filter for razor sharp selectivity, active audio filtering, and a price that's unbeatable. **Only $199.95 Kit**

$339.95 Kit

HW-101: Amateur Radio's unbeatable value

If you're looking, search no further, because there isn't a be ter performance value than the Heathkit HW-101. This 8 through 10 meter transceiver features LSB, USB and CW o eration, 180 watts PEP in on phone, sensitivity less than 0.3 microvolts, open chassis layout, easy circuit board assembl incredible performance and a price that's rock bottom!

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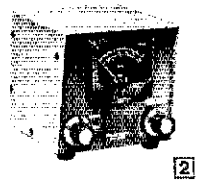
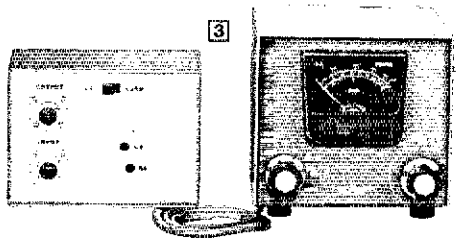


2

1 Fully assembled desk mike
Hi-Z dynamic, grip-to-talk, VOX and PTT with cables. **HDP-121A** **39.95**

2 VHF wattmeter
1-25 and 10-250 W ranges. Built-in SWR bridge.
Kit HM-2102 ..... **37.95**

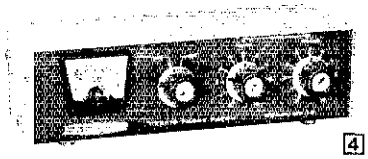
3 HF wattmeter/SWR bridge
1.8-30 MHz range, handles up to 2000 watts.
Kit HM-102 ..... **37.95**



3

4 Hybrid phone patch
Has VU meter, 30 dB isolation, matches 3-16Ω speakers & hi-Z or 600 ohm inputs.
Kit HD-15 ..... **37.95**

5 Multiple antenna coax switch
SWR 1.1:1 max, 2 kW PEP rating.
Kit HD-1234 ..... **10.95**



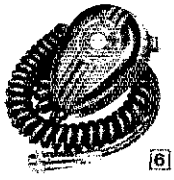
4

6 Hi-Z ceramic mobile mike
PTT or PTT and VOX operation. Fully assembled. **GH-12A** **12.95**

7 "Cantenna" dummy load
1 kW max. input; 1.5-300 MHz range with SWR 1.5:1 or less. Oil not included.
Kit HN-31 ..... **14.95**

5

8 Solid-state dip meter
Covers 1.6 through 250 MHz. Battery powered. Bat. not included.
Kit HD-1250 ..... **59.95**



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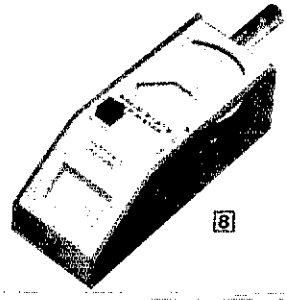

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Prices are mail order net F.O.B., Benton Harbor, Michigan.
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WB3AGB 6, K3CR 6, W3UE 5, W3TTN 5, W3IDO 4, K3UA 2.

CENTRAL DIVISION

ILLINOIS: SCM, Edmond A. Metzger, W9PRN — Asst SCM: Harry Studer, W9RYU. SEC: W9AES. PAM WA9KFK. RM: W9NJP. Cook County EC: W9HPG. Net Freq., Time(Z)Days, Tfc. Sess. ILN, 3690, 2330/0300 Dy 327, 62; Ill Phone, 3915, 2245 Dy, 226, 31; NCPN, 3915 1200/1700 M-S, 158, 26; IEN, 3940, 1400 Su, 9, 4. The Oct meeting of the Central Ill. QCWA was held in Peoria a the Klaus Radio Co. with a demonstration of RCA's new video recorder. The new officers of the Six Meter Club o Chicago are: K9ENZ WA9RIJ WA9TWW K9ZWV WD9GDA WA9MJJ W9RVG and WA9RER. K9MFY has received his 5BWAS certificate. WB9OBP now N9JF and WB9KZP is K9LM. WA9TWW now a General. W9NXC was appointed Director of the Central Area Transcon tinental Corps (daytime) and W9JIJ was appointed mgr of the Ninth Region Net (daytime). Both appointments are positions of the ARRL National Traffic System. Kno County ARC formed a repeater Association, WR9AKI with frequencies of 146.01/61. New Novices in Kno County are WD9GPZ and WD9GPP. WB9FWO is nov K9BY and WB9DED is K9AR. K9DAC is building a SB200 and a keyboard. The CAND report for Oct. wa 403 messages in 62 sessions. The Ninth Regio representation was 93.6 percent. Our sympathy is ex tended to W9ZUI on the loss of his wife who passe away recently. WB9TMJ of Sterling won 1st prize at th Energy Fair sponsored by Sauk Valley College. WA9QB and his wife were injured in a plane accident at th Pekin airport. The Gypsy Amateur Radio Society o Joliet has new officers — K9EIH W9EGO W9YIG an W9OKM. W9NQO was the featured speaker at the Oc Northwest Amateur Radio Club. WB9PEQ has le Motorola and has joined Rockwell — Collins Co. i Cedar Rapids, Iowa. W9JTO and WB9TPQ were marrie on Oct. 29th. This column's sympathy to the family an friends of W9CZZ who recently passed away. The Com monwealth Edison of Chicago presented a program tit ed Energy 2000 at the last Hamfesters Radio Clu meeting. New officers of the Rockford Amateur Radi Assn. are: WB9PBR WB9SGF WB9SFT WA9APA W9BA WB9PCA W9COX WB9VLN and associate editors WB9PBY and WB9LEF. Upgrades this month include WB9THG to General, WB9YWT to Advanced, WB9UR to General and WB9URB to General. One of the mos loyal members of JARS (Joliet ARC) for a quarter of century became a Silent Key at the age of 54. Traffi (Oct.) W9NXG 285, K9DAC 188, K9MX 143, WA9KFK 12 N9TN 112, W9NJP 103, WB9JSR 84, W9KR 72, W9OK 7 W9JIJ 64, W9OBS 63, W9FLF 36, WA9EBT 33, N9MX 3 K9EEA 32, W9OYL 31, K9SW 30, WB9YAS 26, W9LNQ 2 W9PRN 20, N9NA 10, WB9RFC 9, K9KHI 9, W9LZA WB9PHM 4, WB9ZFJ 4, K9AR 3, K9BY 2. (Sept.) K9S 69, WB9LZA 14.

INDIANA: SCM, M.P. Hunter, W9LF — SEC: W9UM The contest season has now officially begun with th CQWW phone. Some very good scores were produce from Ind. despite marginal conditions on several bands W9LTU finally broke down and bought a tower an beam. NTS regulars are now changing their sleepin habits with the change in time. W9HUF has been issu ing Net Certs. in massive numbers. If you have had longing for 28 MHz and haven't listened recently, yo should! WA9BAI has now returned to the air after pu chasing a new home. Richmond ARA is listing som very good programs for their upcoming meetings. The were reports of a local aurora display as well as signa of divine origin from Johnson Co. during the CQW phone on 21 MHz. QIN is rapidly coming alive with QT and might surpass ITN in the coming months (and the say cw is a lost art!). WB9QPN now has a new tw element 40-Mtr beam and WB9LTY is back with all ne antennas following his early spring disaster. Net Tf ICN 11, QIN 236, ITN 281, INTN 42, IPON 2, Hoos. Vhf 2 Traffic: W9FC 303, W9QLW 197, WB9YXN 182, W9M 136, W9LTU 130, K9DC 121, K9TKE 101, W9EI 90, WA QCF 82, WB9IHR 59, WB9PIR 52, W9ZW 50, W9PMT 3 WB9DIX 26, K9FG 26, K9YBM 25, W9UEM 20, WA9OH 18, K9RPZ 18, K9CGS 11, K9EQT 11, K9FZX 10, K9WV 10, WA9TJS 9, WB9VKO 8, W9RTH 7, W9DLF 6, W9SD 1, WB9OTX 1.

WISCONSIN: SCM, Roy A. Pedersen, K9FHI — SE K9ZZ. PAMs: W9AYK W9IEM K9UTQ. RMs: WB9IC K9KSA K9LGU K9EN W9SFL. Nets. Freq., Time, QN QTC, Mgr. BWN, 3985, 1145Z M-S, 634, 568, W9AY BEN, 3985, 1700Z Dy, 717, 108, W9IEM. WSBN, 398 2230Z Dy, 1306, 235, K9UTQ. WNN, 3725, 2215Z Dy, 40, WB9ICH. WIN-E, 3662, 0000Z Dy, 257, 61, W9SFL. WIN- 3662, 0300 Dy, 208, 104, K9LGU. WSSN, 3662, 223 M-W-F, 40, 7, K9KSA. WRN, 3662, 0300Z S., K9EN. WI PO, 3925, 1701Z M-F, 580, 26, WA9NIX. East High ARC Madison now affiliated with ARRL. ORS renew W9SFL. WSBN certificates to WD9DTM WB9MF WB9FTC WB9YUH. New Novice family in Menas WD9GTO WD9GTP WD9GTQ WD9GTS WD9GT WA9PDU now K9IS. WSBN certificate to WD9DHF. Ne hams in Lodi (WD9GUP W9XM's father) and WD9GU WB9QZA passed Tech., she is 80 years young! K9YH K9ZZ K9EN teaching radio classes in Portage-Barab area, Novice and General classes going well. K9ZZ w give examinations to any handicappead persons with 100 miles of Baraboo. WB9QZB now General. OO Cla 4 to K9TR. Mark your calendar 2nd Sun. in July for WN picnic at Oshkosh. Are you ready for SET 1978? ARE conference at Wisconsin Rapids was very successf watch for it again next year. YTARC will again spons WI ARRL convention on Sat. May 20, 1978. Hope you w try to attend these fine doings. WD9DHF has Advance Regret to report WA9ZWI a Silent Key. WD9CQC ma General. K9CPM made BPL. WB9SHK has Extra. N Novice in Pound area WB9ZKW. Traffic: K9CPM 8

TEN-TEC 540/544—the transceivers that almost seem like an extension of yourself. Following your every command, easily, simply — because we did our homework. They are designed with the same out-front thinking that characterizes all Ten-Tec equipment — super-sophisticated to make things simple for you.

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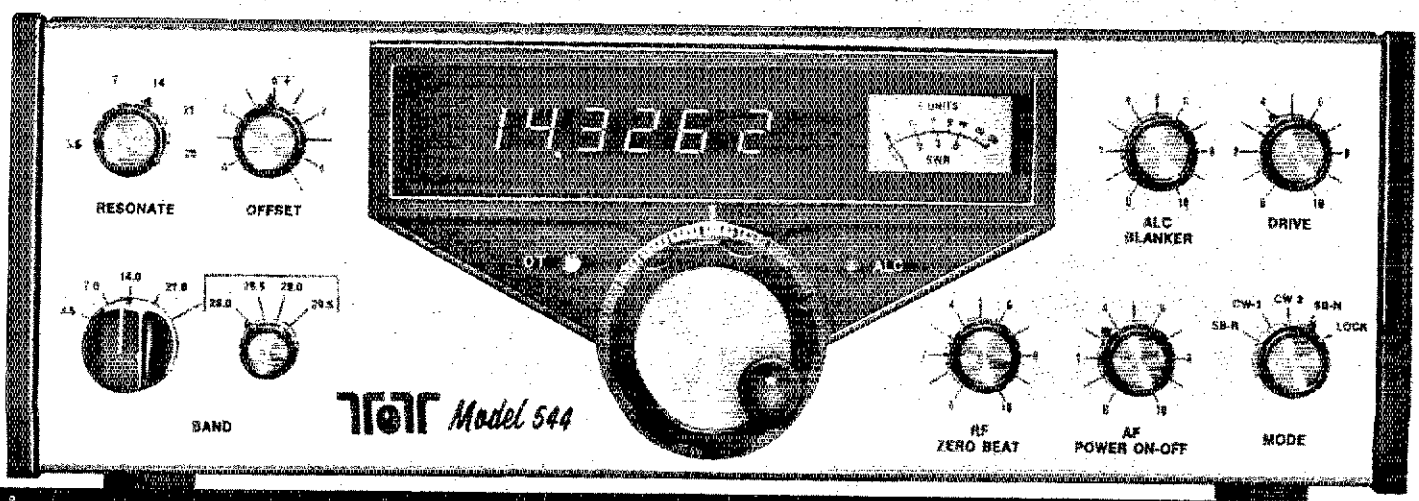
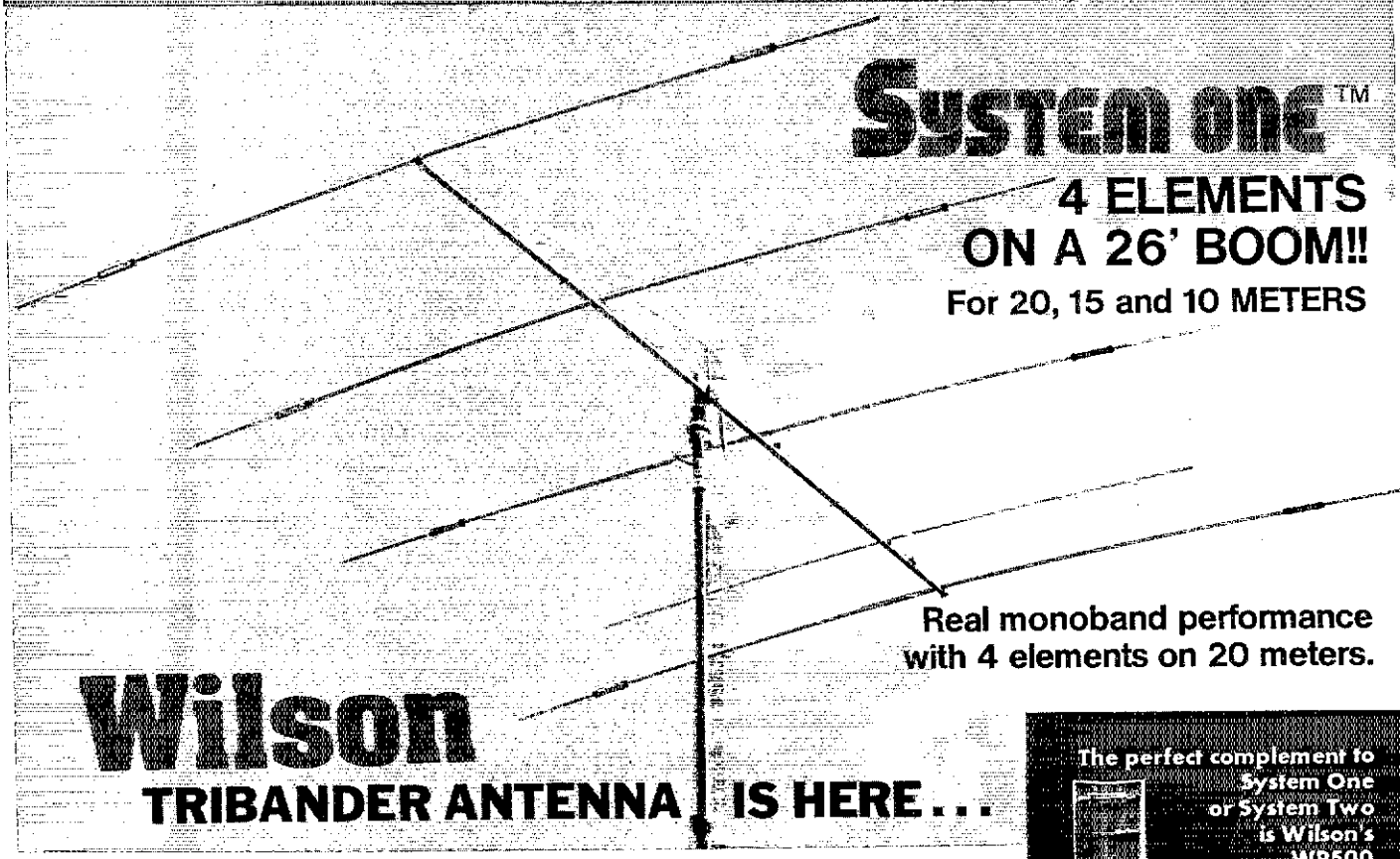
SIMPLICITY OF OPERATION, SOPHISTICATION OF DESIGN



System One™ TRI-



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4 ELEMENTS ON A 26' BOOM!!

For 20, 15 and 10 METERS

Real monoband performance with 4 elements on 20 meters.

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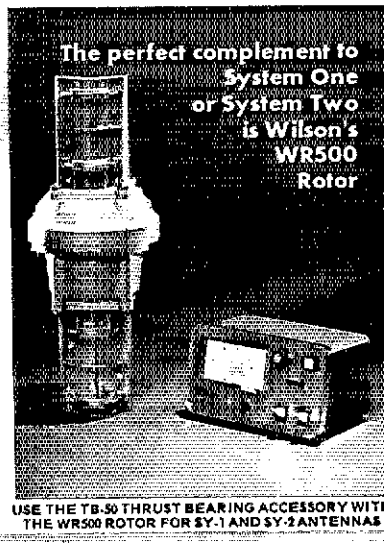
TRIBANDER ANTENNA IS HERE . . .

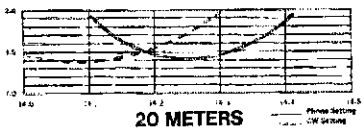
The new standard of performance for Tribanders is the Wilson System One!!! A DX'ers delight, operating 20 meters on a full 26' boom with 4 elements, 4 operational elements on 20-15-10, plus separate reflector element on 10 meters for correct monoband spacing. Featured are the large diameter High-Q traps, Beta matching system, heavy duty taper swaged elements, rugged boom to element mounting. Additional feature: SWR less than 1.5 to 1 on all bands. Value priced at $259.95!



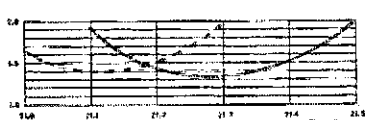
USE THE TB-50 THRUST BEARING ACCESSORY WITH THE WR500 ROTOR FOR SY-1 AND SY-2 ANTENNAS

SY-1 SPECIFICATIONS

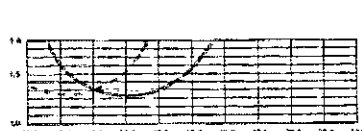
Matching Method	Beta	**Boom Length**	26' (2" O.D.	**Boom Diameter**	2" O.D.
Band MHz	14-21-28	**No of Elements**	5	**Surface Area**	8.6 sq. ft.
Maximum Power Input	Legal Limit	**Longest Element**	26'7"	**Windload**	215 lbs.
VSWR (at Resonance)	1.5 to 1	**Turning Radius**	18'6"	**Shipping Weight**	65 lbs.
Impedance	50 ohms	**Mast Diameter**	2" O.D.	**(UPS Shipment in 2 Cartons)**	



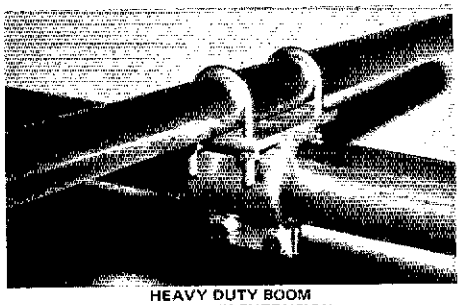
20 METERS



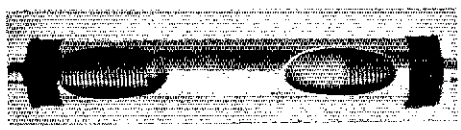
15 METERS



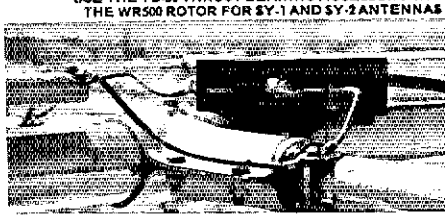
10 METERS



HEAVY DUTY BOOM TO ELEMENT EXTRUSION



ADVANCED DESIGN LARGE DIAMETER HIGH-Q TRAPS FOR MINIMUM LOSS AND MAXIMUM POWER CAPACITY



INSULATED DRIVEN ELEMENT WITH PRECISION BETA MATCH AND HEAVY DUTY ELEMENT MOUNTS

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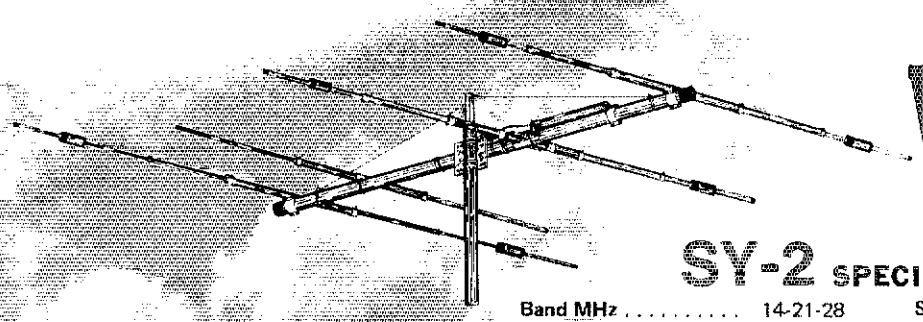
BANDER FOR 20, 15 and 10 METERS System Two™



Wilson SY-2 SPECIFICATIONS

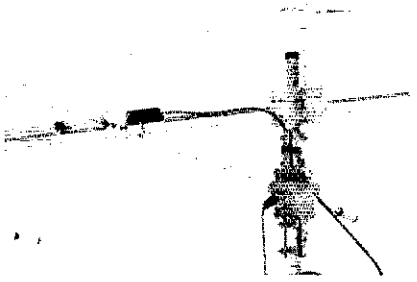
Band MHz	14-21-28	Surface Area (Sq. Ft.)	6.15
Maximum Power Input	4 Kw	Wind Loading at 80 mph	153
VSWR (at Resonance)	1.5:1	Assembled Weight (Lbs. - Approx.)	47
Impedance	50 Ohms	Shipping Weight (Lbs. - Approx.)	50
Boom (O.D. x Length)	2" x 18'6"	Matching Method	Beta
No. Elements	4	Only One Feed Line Required	
Longest Element (Ft.)	26'7"		
Turning Radius (Ft.)	16'4"		
Mast Diameter	2" O.D.		
Boom Diameter	2" O.D.		

SHIPS BY U.P.S.!!!

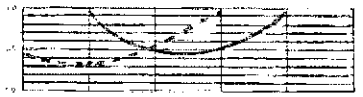
Delivers outstanding performance on 20, 15 and 10 meters. Features Wilson's large diameter High-Q Traps, feeds with 52 ohms coax, a beta match method presents tapered impedance which provides most efficient 3 band matching and DC ground to eliminate precipitation static. The result is SWR less than 1.5 to 1 at resonance on all bands and maximum front-to-back. An added feature is the separate 10 meter reflector for correct monoband spacing. Add to this the rugged boom to element mounting, heavy duty taper swaged elements, and you have

System Two™

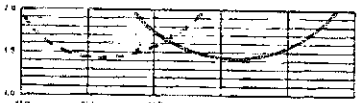
. . . a space efficient, high performing, cost effective new tribander . . . value priced at $199.95!



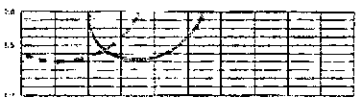
Wilson's WR-500 Rotor and SST-64 Crank-Up Tower used with System Two



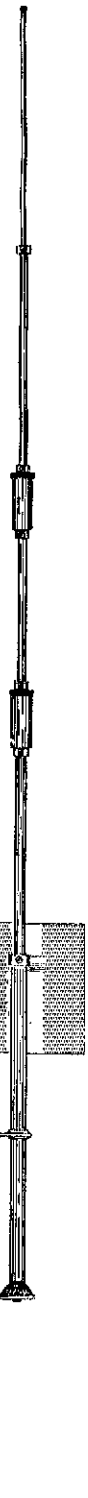
20 METERS - MODEL SY-2



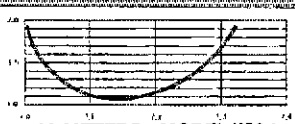
15 METERS - MODEL SY-2



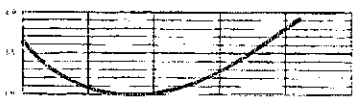
10 METERS - MODEL SY-2



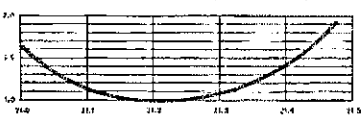
40 THRU 10 METERS VERTICAL TRAP



40 METERS - MODEL WV-1



20 METERS - MODEL WV-1



15 METERS - MODEL WV-1

10 METERS - MODEL WV-1

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 priced at $65.00 . . . 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: 1.5:1 on all Bands • 1½" O.D. Heavy wall aluminum tubing • Does not require guying • Overall length: 25' 1½".

MODEL WV-1

Wilson Electronics Corp.

4288 SO. POLARIS AVENUE • P. O. Box 19000 • LAS VEGAS, NEVADA 89119

TELEPHONE (702) 739-1931 • TELEX 684-522

W9CXY 194, W9DND 161, W9SFL 118, WD9AUD 98, K9FHI 87, K9MZO 79, W9IEM 77, K9LGU 64, K9UTQ 60, W9AYK 59, W9KU 59, W9IHW 59, WB9JSW 43, WB9FTC 40, WB9YPY 37, WB9ICH 34, W9UW 30, N9CP 29, K9KSA 29, WD9CQC 28, K9JPS 28, WB9BRE 27, WB9MPF 25, WB9YSH 23, N9JW 22, WB9ESM 17, WB9RRU 13, K9RTB 13, K9ANV 10, WB9UIJ 10, WB9SHK 8, WA9WYI 5, K9ASC 4, W9NQ 2.

DAKOTA DIVISION

MINNESOTA: SCM, Helen Haynes, WBØHOX — SEC: WØSA.

Net	Freq.	Time/Day	QNI	QTC	Manager
MSN 1	3685	6:30 PM	317	127	WBØOFQ
MSN 2	3689	10:15 PM	153	21	NØHY
MSPN N	3945	12:05 PM	844	99	WBØJYT
MSPN E	3925	5:45 PM	642	140	WØDUW
PAW	3925	9-2/1-5 PM	3731	220	WAØYVT
MSSN	3710	5:30 PM	129	48	KØQW
MWX	3925	8:15 PM	286	185	WBØPKG
ARES	2282	7:30 PM Su	69	4	WØVB
ARES	3912	8:00 PM T	21	3	WØVB
ARES	28 657	7:00 PM W	32	2	WØVB

Congratulations to the recent upgraded licensees WBØDXD, Tech to General. WBØVFW, Novice to General. WBØOHN WBØRUD WBØVEH WDØBIE, Novice to General. WDØEKH, General to Advance. WBØLSI WBØOFQ and WBØHKU, Advanced to Extra. Congrats to WBØZAL on being selected Sept. Operator of The Month by Army MARS. Thanks to WBØOHN WBØZQH and WBØZUR for their excellent public service work by providing an amateur station and exhibits at the Blue Earth County Scout Jamboree and a church group campout. Some people have all the fuck. WBØLJH is now KØTG and it was his first choice. Olmsted County civil defense headquarters had all of their amateur gear and antennas checked compliments of the Rochester ARC. Traffic: WBØHOX 287, WBØZAL 160, WBØJYT 143, WAØVAS 109, WAØYWA 100, WBØLDO 99, WØDUW 95, WAØTFC 96, WBØOFQ 89, WBØUIP 79, NØHY 68, WBØPKG 61, KØQW 56, WBØWJE 52, WAØYBT 50, KØPIZ 47, WØFJ 32, WBØNZB 29, WØPET 27, WØHZU 25, KØZBI 24, KØZRD 17, KØCSE 16, WBØZUR 14, KØRMX 14, WØRQJ 14, NØJP 11, WØPNE 11, WAØCCA 10, WAØEPX 10, WBØCPC 10, WDØETM 10, WØOPX 9, KØFLT 7, NØVB 7, KØBR 5, WAØTGM 5, KØSXQ 3, WAØEZQ 3.

NORTH DAKOTA: SCM, Mark J. Worcester, WAØWLP — The second Annual FARC Ham Auction and dinner was held Nov. 5 with Gar Anderson, Dak. Div. Dir. as guest speaker. WDØDUI got first QSO on 40 mtrs. WBØAUI on with TR-4. WØOUX has new Quad up. WØHNV has 24 states cleaned up for co. hunting. Minot Annual Christmas Party to be held Jan. 13, 1978, if interested in attending, contact WBØKWY. 10 mtr. net in Minot Mon., Wed., and Fri. at about 28150 kHz at 9 P.M. CST. Stations that have upgraded: WDØs CHE CHD CHF BMG; WØTUP WØHVA WØJUL all of Minot. Others WDØCPZ WBØYIB WBØSWY KØYST WBØWSQ and WBØYJG. Dickinson reports WBØAUM has put an antenna at 103 ft. A rpt. on 22-82 in the future. WBØTYR now on two mtrs. KØAAJ on two from Wimbeldon and WAØCRH working all over on two. WAØSUF announced his retirement as Data net Mgr., WBØWSQ has volunteered as new mgr. I wish to thank Lyle from all the ND hams for a job very well done! WØRIB SEC moving to TN. Nets, kHz, CST/Days, Sess., QNI, QTC, Mgr. DATa, 3996.5, 1700 S-S, 1800 M-F, 32, 340, 73, WAØSUF. Goose River, 1990, 0900 Su, 5, 43, 0, WØCDO. Traffic: WAØSUF 58, WØDM 5, WØCDO 3.

SOUTH DAKOTA: SCM, Ed Gray, WØSD — The Watertown Repeater now has auto patch facilities. Officers of the Lake Area ARC are WBØVAR, pres.; WBØYCM, vice-pres.; WBØMWJ, secy-treas.; WBØZYR, prog. dir. WBØMWJ becomes the second amateur in SD to complete 5-band WAS. SEC WAØTNM reports that WBØTUJ WBØGPY WØSD WØTI WAØLLG WAØBZD WØWH WBØDWH WBØOMF and WAØTNM and possibly others participated in a surprise Civil Defense communications test in Oct. sending messages to state headquarters at Pierre. WBØSMV of Pierre did a superb job of getting messages to state headquarters where they did not have enough manpower to receive them. Net reports: Morning Net-666 QNI and 56 QTC; NJQ-798 QNI and 38 QTC; Evening Net-1488 QNI and 62 QTC; SDN CW-137 QNI and 65 QTC. Traffic: KØFRE 258, WAØVRE 212, WAØTNM 151, WØHOJ 59, WAØFUZ 16.

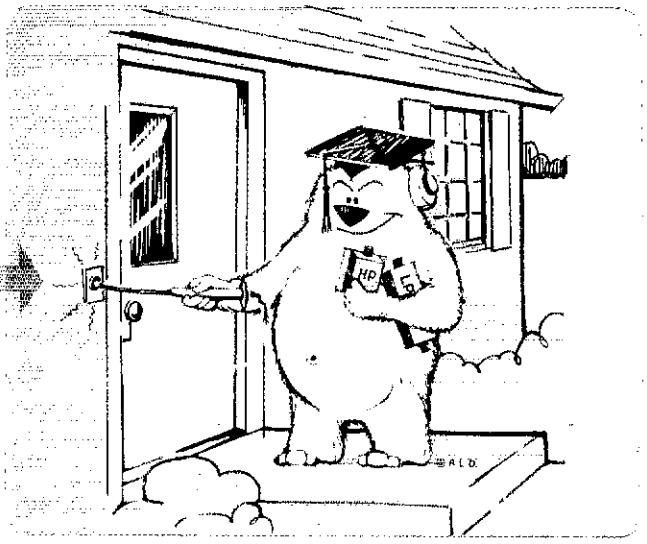
DELTA DIVISION

ARKANSAS: SCM, S. M. Pokorny, W5UAU — SEC: WA5VNV. PAMs: W5POH WA5ZWZ K5MEA. RM: W5MYZ. Nets, kHz Times/day, QNI, QTC, Mgr.: ARN, 3995, 0030/dy, 805, 71, K5MEA. OZK, 3760, 0100/dy, 190, 31, W5MYZ. APN, 3937, 1200/M-S, 784, 34, W5POH. M-Bird, 3928, 2230/M-F, 581, 12, WA5ZWZ. First rpt from Craighead Co Emer. WX Net, 146.28/88, 0100 M-F, 169, 16, WB5QOR. WA5BDP now N5AS. Cancel appt, OBS of K5GKN. Issued OBS appt. to K5DW and WB5RCS. W5YDP new EC for Jefferson Co. OBs K5MEA 14, W5UAU 9. Traffic: K5MEA 53, W5POH 31, W5UAU 17, W5BED 14, K5DW 14, WB5GWU 13, W5EIJ 4, W5KL 4, W5ASD 2, WB5GQH 1.

LOUISIANA: SCM, Robert P. Schmidt W5GHP — Asst. SCM: N5JM. SEC: WB5CIQ. RM: N5YL. PAM: WB5NEZ. VHF PAM: W5VBX. Congrats to N5YL and WB5CDX on their appt. to the Central Area Staff of NTS. LA now has four members on this Staff. K5BLV making good recovery from cardiovascular surgery. W5HGT of the Ruston Tech Club in process of putting a 34/94 repeater on the air; the regular Ruston repeater has been moved to 72/12. The New Orleans VHF club has their 01/61 machine on the air. BRARC has 42 members in Novice

If you're having a TVI problem...

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:

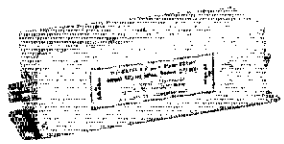
"Low Pass" Filters will reduce or eliminate TVI caused by harmonics from amateur transmitters. All transmitters generate some harmonics which might be just strong enough to cause TVI. We believe every station should be equipped with a Low Pass Filter, designed to cut off at 41 MHz, the TV i-f frequency. 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.

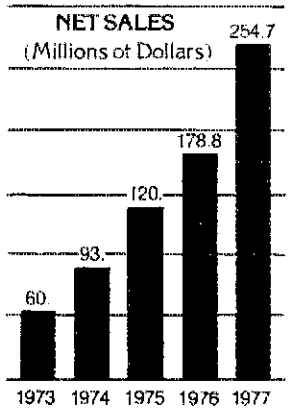
Known 'round the world for world-wide radio communications.

R. L. DRAKE COMPANY DRAKE®

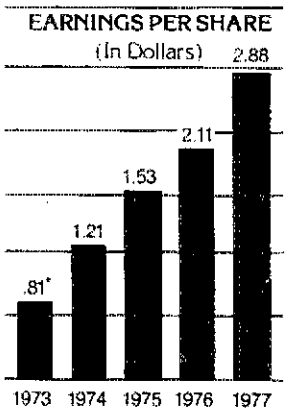
540 Richard St., Miamisburg, Ohio 45342
Phone: (513) 866-2421 • Telex: 288-017

Western Sales and Service Center, 2020 Western Street, Las Vegas, Nevada 89102 • 702/382-9470

Is your career growing as fast as ours?



(1977 Fiscal Year)



*Adjusted to reflect a 3-for-1 stock split effected in the form of a 200% stock dividend declared in February 1973.

New Products Engineers (Analog and Digital)

Your responsibilities will include new product introduction of state-of-the-art processors, peripherals and controllers to our Systems Integration Division. A BSEE degree or the equivalent is required with a minimum of 3 or more years of related experience.

Diagnostic Programmers

You will design, code and debug assembler language programs for fault isolation, to the chip level, in digital systems. You will also write functional level system exercisers for stand-alone and disc-based real-time operating systems. A technical degree or the equivalent experience is needed, together with a thorough understanding of digital system hardware. Hardware troubleshooting experience and 3 or more years' programming experience, preferably in diagnostics is very desirable, especially with strong assembly language skills.

To apply for one of the above positions mail your resume to Tom Aldrich.

Test Engineers

You will be responsible for PCB test engineering support for digital products such as CPU's, memories and options. Experience is required in solving engineering problems as they relate to test equipment, diagnostics, test philosophy and component fault isolation. You will also initiate and implement improvements to the testing process and equipment, and provide coordination for the introduction of new products into production. A BSEE degree and two or more years' experience in PCB test or Test Equipment Design.

Manufacturing Engineers

You will be responsible for providing floor support in the PCB assembly area. A BSME, BSIE or the equivalent with 3 years' experience in Manufacturing Engineering is required. A knowledge of auto-insertion equipment assembly technique and soldering equipment is helpful.

To apply for one of the above positions mail your resume to Rene Santini.

Senior Systems Technicians

This position requires at least 3 years' experience, minimum, and an ASEE degree or its equivalent. Your background should include familiarity with CPU memory, moving head disks and related peripherals.

Special Systems Technicians

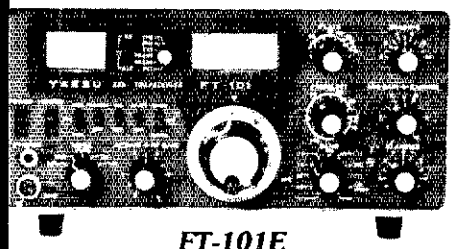
You will be working closely with the Special Systems Engineering Department in the design of non-standard computer products. A minimum of 3 years' experience and an ASEE degree or its equivalent is necessary.

To apply for one of the above positions mail your resume to John Prendergast.

Data General Corporation, Route 9, Southboro, MA 01772. Data General is an equal opportunity employer, M/F.

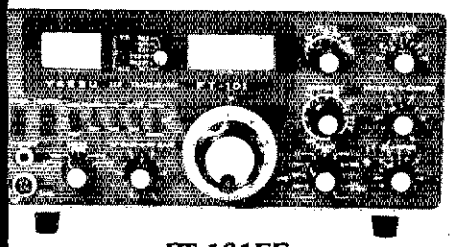
Data General

WITH COMPETITIVE PRICES GOING SKY-HIGH THE YAESU FT-101 SERIES IS STILL YOUR BEST BUY!



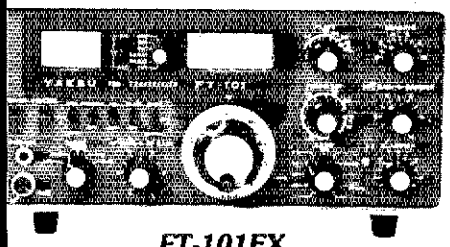
FT-101E
$729.00

Top of the series, the FT-101E has everything—RF speech processor, AC and DC operation, plug-in PC boards for easy servicing—nothing has been omitted for excellent 160-10 meter performance.



FT-101EE
$649.00

Just one step down is the FT-101EE identical in every respect—but less the RF speech processor—an item many hams can live without, thus saving a few dollars.



FT-101EX
$589.00

The FT-101EX is the same basic unit, less DC/DC converter, 160M, WWV, and three of four 10 meter crystals and the RF speech processor. Many hams do not need these features and would just as soon save the money. All accessories may be added later and the "EX" can then become an "E".

Amateur radio's first all plug-in PC board transceiver, the FT-101 series has a long pedigree of success dating back to the FT-101 and FT-101B. More than a quarter million are in use all over the world! Refinements have been added over the years to update the equipment and we believe it is the most thoroughly satisfactory and trouble-free transceiver money can buy. Compare price and features with any "Brand X" and you'll choose Yaesu!

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277

YAESU ELECTRONICS CORP., 15954 Downey Ave., Paramount, CA 90723 (213) 633-4007
YAESU ELECTRONICS CORP., Eastern Service Ctr., 613 Redna Ter., Cincinnati, OH 45215

class. N5NA a G5 in London. Lafayette 22/82 repeate
taken off the air for repairs and new 81/21 machine in
stalled until their new duplexer arrives. The Twin City
Club hamfest in Monroe a great success. WB5TPG had
good attendance at the Amateur Radio Booth at the
Zwolle Tamale Fiesta. He also reports formation of
new club — the Sabine Parish ARC, "SPARC."
Remember SET this month. Congrats to WB5LBR and
WB5NEZ on making BPL. New officers of SELARC in
Hammond are WD5FQG, pres.; K5MUI, vice-pres
W5BAV, secy-treas.

Net	Freq.	Time/Days	QTC	QNI	Manage
LAN	3615	7&10 PM	313	469	N5Y
LTN	3910	6:30 PM Dy	113	263	WB5NE
LSN	3703	8:30PM MF	30	74	WB5 OOM
LRN	3587.5	6:30PM SW	8	12	N5RE

Traffic: N5YL 303, W5GHP 284, WB5LBR 242, K5TTC 192
N5ES 168, K5MC 164, WA5IQU 150, N5TS 150, N5DP 86
WB5OOM 81, WB5NEZ 75, N5RB 18, W5HGT 17, W5YN
12, K5BLV 6, WB5IKT 2.

MISSISSIPPI: SCM, E. Ed. Robinson, W5YTN — SEC
WB5FXA. The Miss. Coast ARA (Gulfport-Biloxi
Hamfest Sun., Oct. 23, was enjoyed by many. Eyeballin
and trading were very active and all reported a fine time
Dir. Arnoldi, W4WHN, Vice Dir. Keown, W5RUB and
yours truly SCM, drew the main prizes for the lucky win
ners. All nets reporting improved check-ins — keep up
the good work. Net attendance and traffic handling is
must to be ready for emergencies. K5UJ working as
/HL9. Check-ins on DRN5 up (see below) but still need
help, 7290 kHz at 2030Z daily, please! DRN5, W5KLV, 3
Sess., QTC 432. Ms. Rep. 80% by WB5NGF K5MI
W5RUB W5EDT W5QDC W5GOT K5QNE WB5SXK
CGCHN, K5OWK, 31 sess., QNI 3029, QTC 150. MSBN
WB5SNB, 31 sess., QNI 1565, QTC 63. MTN, WB5FHA, 3
sess., QNI 210, QTC 88. Traffic: WB5FHA 115, N5RN 98
W5EDT 94, K4OAF 55, W5LSG 49, W5WZ 41, K5MK 33
W5YTN 23, WB5SNB 19, W5RUB 15, WA5JWD 13
WA5OK1 12, N5XA 9, WD5BVY 8, WB4FXA 6, W5LL 4
K5UJ 4, WB5VFS 3.

TENNESSEE: SCM, O. D. Keaton, WA4GLS — SEC
WB4DYJ. PAM: WB4PRF; RM: WB4DJU. Net, Freq., Tim
(Z) Days, Sess. QNI, QTC Mgr. TPN, 3.980, 1140 M-F, 124
M-F, 0030 M-S, 1400 SSuH, 0300 M, 81, 4015, 365
WA4EWW. W4PFP, WB4YPO, WB4WHE TN, 3.635, 010
Dy, 25, 218, 86, K4YFC. TNN, 3.710, 0030 Th, 9, 45, 29
W A 4 C N Y
ETVHFN, 50.4, 0200 MWF, 13, 108, 2, WA4WZJ. ETVHFN
145.2, 0200 TTh, 9, 38, 0, WB4DZG. MTTMN, 28.8, 020
TTh, 9, 85, 0, W4EAY. ETTMN 28.7 0200 WF, 9, 108,
WB4NFI. WTVHFN 146.37, 146.97, 0030 Dy, 30, 978, 522
WA4VVX. WMARCN, 146.07, 146.67, 2200 TThSu, 13, 10
0, W4TZG. Everyone get ready for SET on Jan. 28 & 29
let's make this one the best yet. Glad that K4XU has hi
move complete and back on the air. Walnut Mountai
ARC working hard to get their repeater improved befor
winter, look for them on .07-.67. Tennessee Nets observ
the following holidays: Jan. 1, last Mon. in May, July
first Mon. in Sept., fourth Thur. in Nov. and Dec. 25
Please refer all repeater matters to David Wolfe
WA4VVX, Chmn. Repeater Frequency Advisory Commi
tee. Traffic: K4CNY 359, WA4CNY 199, WB4PRF 182
W4OGG 134, W4ZJY 107, WA4GLS 88, K4WWQ 79
WB4BKF 76, WA4DKC 75, WB4GZF 61, WB4ZSZ 60
WB4DJU 56, K4YFC 47, W4RUW 41, WA4WHQ 36, K4X
E36, WA4VVX 28, K4JSF 23, WB4BXG 22, K4VM 2
WA4KSO 21, W4TZG 14, K4FSK 12, WB4HOI 1
WB4DYJ 11, W4PSN 9, WB4YPO 8, WA4TYN 7, WA4BD
6, WA4MCC 6, N4UC 6, WB4WHE 6, W4EWR 5, W4SGI
WA4IDN 3, WA4WVW 3, WA4IAX 2, WB4BGV 2.

GREAT LAKES DIVISION

KENTUCKY: SCM, Ted Huddle, W4CID — SEC
WB4ZML. RMs: W4BAZ WA4IGS. PAMs: WA4JTI
WA4AVV W4BEJ.

NET	QNI	QTC	NET	QNI	QT
KRN	304	31	KYN	239	11
			KSN	90	1
KTN	1242	117	SEKN	35	
6DAREC	82	7	CARN	234	1

The new net in the listing above is the Cave Area
Repeater Net in the Mammoth Cave Area. McLean Coun
ty now has a ham club with WB4PSP, pres.; WB4QJJ
vice pres.; WB4ZTO, secy-treas. The club is boring righ
in by setting up a booth at a CB Convention. If you can'
lick 'em, convert 'em! Frankfort has a new repeater o
147.84/24. Traffic: WA4IGS 82, N4GD 76, WA4JAV 53
K4HRF 49, W4CID 45, WB4NPD 37, W4RHZ 35, WA4AV
34, K4TXJ 36, WA4RCD 26, WB4AUN 18, WA4FAF 18
WA4EFG 17, WD4CQL 15, WD4ANY 14, K4HOE 13
WA4AGH 11, K4AVX 5, W4CDA 4, K4IFD 1, WA4SAC 1

MICHIGAN: SCM, A. L. Baker, W8TZZ — Asst. SCM
W8MPD. SEC: WA8EFK. RMs: W8JYA WB8NCD. PAMs
K8LNE W8SOP. VHF PAM: WA8WVV.

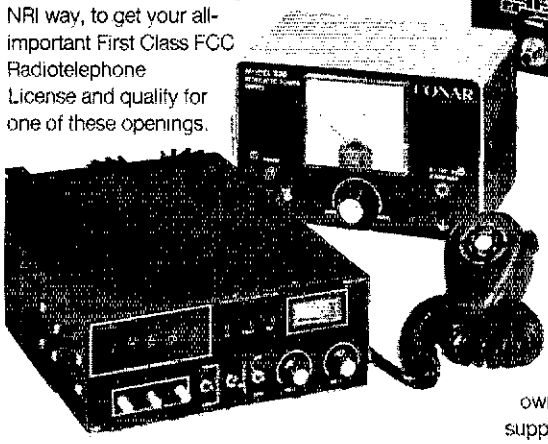
Net	Freq.	Time/Days	QNI	QTC	Sess
MACS	3953	1600 Dy	885	349	3
QMN	3663	2300/0200 Dy	897	231	9
WSSBN	3935	0001 Dy	1132	203	3
GLETN	3930	0130 Dy	811	94	3
BRMEN	3930	2230 Dy	572	72	3
UPEN	3922	2230 Dy	638	60	3
MI6M	50.7	0001 Dy	154	24	2
VHF	PAM	report	388	18	2

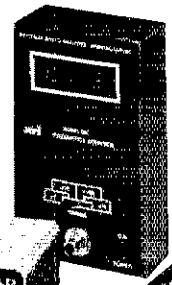
Election results. Cherryland ARC: W8JUY, pres.; K8YVL
vice-pres.; W8TVT, treas.; WD8CGA & WD8EKN, secy
Who's Who dept. WA8WWM-K8TE, W8BUB-N8H
WA8FMU-K8DO, WB8IOT-K8OT, K8LUU-W8LU. Ne
licensees. Techs: WD8JEL WD8CBU WD8JES, Generals
WD8CEG WD8NLS WD8NRZ WB8EYL, Advanced WD8
JET WB8TPR K8CJF K8EMQ WD8CGP. Congratulations

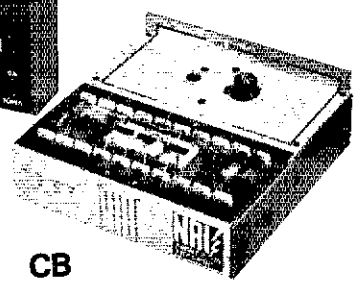
You can turn the CB boom into income...with NRI's complete communications course.

NRI can train you at home for a part-time job or a full time career in communications.

The field of communications is bursting out all over. Millions of CB sets are in operation with millions more being sold annually. That means countless careers in design, installation and maintenance. Start training at home now, the NRI way, to get your all-important First Class FCC Radiotelephone License and qualify for one of these openings.







CB Specialist's Course also available.

NRI now offers a special 37-lesson course in CB Servicing. You get your own 40-channel CB Transceiver, AC power supply, and multimeter for hands-on training.

Learn on your own 400-channel, digitally-synthesized VHF Transceiver.

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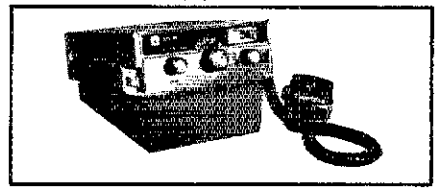

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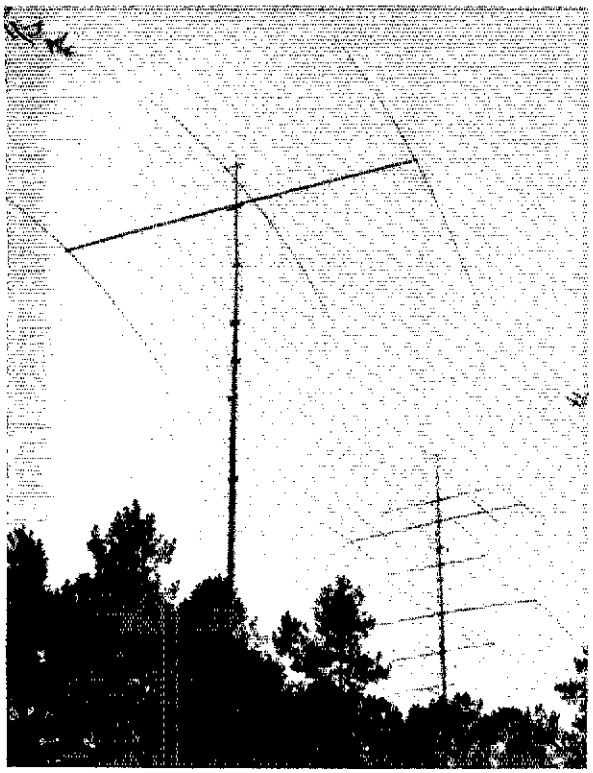

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THE ARRL ANTENNA BOOK contains a wealth of practical ideas for your antenna farm whether it is located in an apartment house in the city or a ranch in the country. Some of the topics covered:

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- Use of Smith Charts

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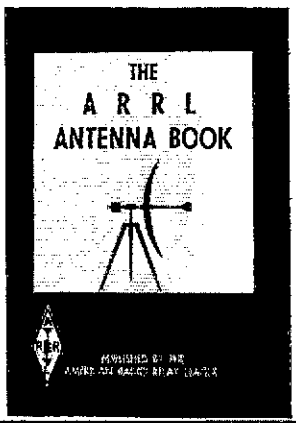


The AMERICAN RADIO RELAY LEAGUE, INC.

NEWINGTON, CONN. 06111

Compare the Atlas 350-XL with other transceivers . . .

TYPE	ALL SOLID STATE			HYBRID (VACUUM TUBE P.A.)			
MODEL	ATLAS 350-XL	TEN TEC	YAESU FT-301	DRAKE TR4-CW	HY-GAIN 3750	KENWOOD TS-820	TEMPO 2020
INPUT POWER	350 WATTS	200	200	300	200	200	180
BANDS	10-160M	10-80M 160M OPT	10-160M	10-80M	10-160M	10-160M	10-80M

. . . and see why it's your best buy!

Above is a chart comparing leading HF Transceivers that fall in approximately the same price range as the Atlas 350-XL. The Drake TR4-CW is least expensive, while the HY-Gain 3750 is the highest. Rated power input (SSB) and bands covered are listed in the chart, but below is a discussion on a number of other interesting comparisons which will help you choose the right transceiver for your station.

1. STATE-OF-THE-ART, ALL SOLID STATE

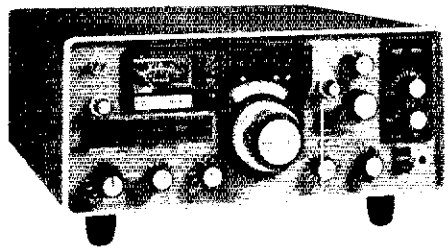
The first 3 transceivers listed above are all solid state. The real designs of the future! Having manufactured and sold over 12,000 of our little 210x/215x's, we can attest to the high performance and reliability of all solid state design. Tubes for the driver and P.A., with their tuning circuits and high voltage power supplies are rapidly becoming obsolete. As a result their resale value will be declining.

2.POWER RATING.

The higher power rating on the 350-XL provides you with a comfortable edge over the others. Running barefoot you can easily ride over the competition. If you're driving a linear you don't have to strain for every bit of drive from the transceiver. It can loaf along with ease. The 350 watt input rating is really very conservative. Typical input power runs upwards of 400 to 450 watts without flat-topping. Considerably more than the others.

3. BAND COVERAGE

Not only does the 350-XL cover the 10 through 160 meter bands (including all of 10 meters in four 500 kHz segments), but one of its exclusive features is that you can install up to 10 auxiliary 500 kHz ranges anywhere from 2 to 5 MHz, and from 6 to 23 MHz. This gives you great flexibility for MARS operation and possible future amateur bands. Crystals for Auxiliary Ranges are installed internally. In addition, the 350-XL provides reception of WWV at 5, 10, and 15 MHz, without having to add any auxiliary range crystals.



4. DIGITAL FREQUENCY READOUT

On the 350-XL, the optional Digital Dial can be installed, and you still retain the conventional analog dial, with the option of switching the digital dial off if you wish. With the Ten-Tec or Yaesu 301, you lose the analog dial if you purchase the digital dial model, making you totally dependent on the digital dial.

5. FULL BREAK-IN CW

Only two rigs offer this feature; the Atlas 350-XL and the Ten-Tec ! The others are all "semi-break-in". And the Atlas includes CW sidetone with pitch and volume adjustments.

6. NARROW BAND CW FILTER

This is another standard feature in the Atlas, optional on the Ten-Tec , Yaesu, and Kenwood. Ours is an I.F. filter with 500 Hz bandwidth, and shape factor of better than 3 to 1.

7. A.F. NOTCH FILTER

This 350-XL standard feature permits nulling out heterodynes and other interference. The Yaesu, Hy-Gain and Kenwood include a similar feature.

8.SPEECH COMPRESSION

The standard Atlas ALC system provides up to 20 dB of R.F. compression which increases your talk power and at the same time reduces "flat-topping" and splatter. An optional speech processor to provide up to 20 dB additional A.F. compression will be available soon for installation in the AC supply. The Hy-Gain, Kenwood, and Yaesu also provide some form of speech processing.

9. AUXILIARY VFO

All of the rigs listed offer an optional second VFO for split frequency operation. But Atlas is the only one with an Auxiliary VFO that is not an add-on box. The Atlas Auxiliary VFO plugs right into a space provided in the upper right hand corner of the front panel. Although miniature in size it tunes the same 500 kHz as the primary VFO, and does it smoothly with coarse and fine controls that have 10:1 planetary drives. Green, yellow, and red LED's let you know which VFO you have set up for receiving and transmitting. Very neat, and all self-contained.

An option to the Model 305 Auxiliary VFO is the Model 311 crystal oscillator that provides up to 12 crystal controlled channels. It also plugs into the front panel just like the 305. Vernier controls provide fine tuning of the crystal frequency.

10. MOBILE/PORTABLE OPERATION

The Atlas, Ten-Tec , and Yaesu, being solid state, are unique in that they will operate mobile or portable directly from a 12-14 volt DC battery. Also, the solid state rigs are considerably smaller and lighter weight than the hybrid rigs. The Atlas is unique in having a very handy plug-in mobile bracket for the 350-XL that makes it a simple matter to plug-in and go mobile.

11. OTHER 350-XL STANDARD FEATURES

include R.I.T., VOX, Crystal Calibration, ANL, and Noise Blanker.

Compare the Atlas 350-XL SSB-CW Transceiver with the others, and we think you'll agrea the Atlas has everything you'll ever need in a transceiver. And it's made in America.

And let us not forget to mention Our Customer Service which is second to none. Just ask the ham who owns one.

Model 350-XL (less options) . . . $995.
Model DD6-XL Digital Dial . . . . $229.
Model 305 Auxiliary VFO . . . . . $155.

MADE IN AMERICA

We're very proud that every Atlas transceiver is made right here in America, (as are the Ten-Tec and Drake). We think the American worker, and our employees in particular, are the most talented, industrious people in the world. The quality and versatility of our transceivers are proof of this.

And by using this American quality workmanship, advanced value engineering in design and manufacture, and rigid quality control, the Atlas transceiver is not only competitively priced with the imports, but is actually a better value!

Merry Christmas and Holiday Greetings from all the gang at Atlas!

ATLAS RADIO INC.

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New equipment. WB8TTA WB8NDP & WB8TLV are sporting new Kenwoods. K8JED has Dentron Matchbox. K8GXV has inverted V on 80M. W8UOQ received 5BWAS No. 292. 88 stations submitted logs for the 1977 QSO Pty. Trophy winners: WA8MOA, Calhoun Cty, WA8WWM, Leelanau Cty, WA4KKP, Virginia, Club Trophy to L'Anse Creuse. ARC as usual. We even had an entry from ZL2AH. MACS amateurs of the month are: July, WB8TTA, Aug., K8CIP, Sept., WB8UFS. WB8DKQ pulled up stakes and headed for the sunny south. Phone net liaison to NTS continues. Contact W8SOP for details. Traffic (Oct.) W8SOP 518, K8LNE 202, WB8YDZ 123, K8DYI 112, W8YIQ 111, K8DD 101, W8VPW 101, W8JYA 82, WB8POL 75, W8CUP 70, WB8ITT 70, W8NOH 68, WA8DHB 67, W7KQU/8 67, W8TZZ 55, WA8OIE 52, W8IHX 41, K8CN 36, WA8TBL 36, WA8QAF 32, K8ZJU 27, W8MPD 26, K8FE 24, W8LOU 24, WB8DJS 21, WB8YIG 21, K8DTG 20, W8SCW 20, W8PDP 18, W8UOQ 17, WA8MAM 15, W8VIZ 15, K8BZL 14, W8SDB 14, WB8VAI 14, WB8ZYC 14, WD8LSV 12, WB8VOM 11, WB8UUT 10, WA8WVV 10, WD8JYT 10, W8DCN 9, K8GXV 9, W8JUP 9, WB8SYA 8, WD8NYN 7, WB8JIX 7, W8IUC 6, WA8FXR 5, W8WVL 4, W8RNQ 3, W8JLD 2, W8KJ 2, K8JED 1. (Sept.) WA8AXF 9.

OHIO: SCM, Hank Greeb, W8CHT/N8XX — Asst. SCM: WB8JGW. SEC: K8AN. PAMs: W8DIL W8FU WA8SSI. RMs: WB8JGW WB8KKI W8TP WB8VLR. Net reports:

Net	Freq.	Time(Z)	Sess	QNI	QTC
OSSBN	3.9725	1530/2100/2345	93	2622	536
BNR	3.605	2300	31	118	133
06mN	50.16	0200	31	303	47
OSN	3.577	2310	29	183	65
ONN	3.708	2330	27	97	20
BN	3.577	2345/0300	62	513	283
BRTN	146.46	0200	31	208	35

Best wishes to RM W8LTA who leaves for 3-land. W8TP is new RM without portfolio. New ECs include W8HXR, Fayette County and WB8ZTX, Harrison County. New ORS, WD8KDR. BN certificates issued to W8IQ and W8ISU. Logan County ARES provided communications for "Walk for Crop" in Bellefontaine on Oct. 2. Apricot Net received certificate from Cleveland's Mayor for years of public service activities. WB8WTS will take over ONN Manager and RM on Jan. 1, 1978. Thanks to WB8VLR for FB job as ONN Manager during the past year. K8AN reports good participation in two code/theory classes at Belmont County JVS. OVS K8TUT reports working Washington on 50 MHz. EC W8ILC reports assistance to City of Dayton by Montgomery County ARES during a fireman's strike. Central Ohio ARES communicated for Columbus Day footrace. Oct. 9. Traffic: WA8MCR 409, W8DIL 293, WB8KKI 254, W8PMJ 231, WB8KWD 134, WB8WTS 128, WB8JGW 121, N8TM 107 WA8HGH 100, K8BYR 92, WB8CJU 81, W8QZK 71, N8CW 69, W8GGX 63, WB8PIY 61, W8TP 57, WB8VLR 57, WA8SSI 53, WB8OMQ 52, W8CXM 48, W8WEG 47, WB8QHV 45, WB8SIQ 41, W8TH 37, WB8MRL 35, WD8KDR 32, W8OUU 31, WA8VWH 31, WA8SED 30, WD8BZD 25, WA8MHO 25, WB8TRK 23, N8XX 23, WB8OXN 22, WA8RQQ 22, W8FN 21, K8AN 20, WB8UJM 20, K8DL 19, K8DMU 18, N8NR 18, WD8LIU 18, WA8TSX 17, WD8BBQ 16, W8QCU 16, WB8GGR, 14, W8LZE 13, WB8AJC 12, WB8LWY 12, W8FU 11, W8IM 11, WB8VZX 11, WB8LNF 10, W8RG 9. WD8DQX 8, WA4RIJ/8 8, WD8DMD 7, K8ONA 7, K8CKY 6, WD8DIP 6, WB8CTX 4, K8HF 4, K8LT 4, WD8MGP/N 3, WA8VEC 1.

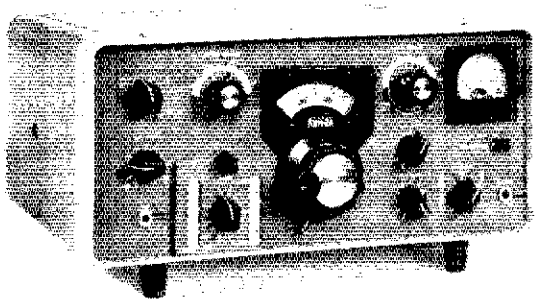
HUDSON DIVISION

EASTERN NEW YORK: SCM, Guy L. Olinger, K2AV — SEC: WB2VUK. Asst. SEC: K2AYQ. RMs: W2CS K2OYG WB2IXW. PAMs: N2YL WB2QEI. Congrats to new Novice WA2STX who sends a nice note thanking N2EF for help. (A word to those who wonder about how to keep frequencies, staff nets, ARES, etc. — the fledgling amateur helped in by a public-service-minded ham won't forget. All these classes and individual effort will have their effect). Along that line WB2ZCM WA2JBO WB2SWA WB2QCJ report running a Novice class at Cohoes Firehouse with about 30 students. Comm. Club of New Rochelle is holding a periodic equipment clinic to keep things running down there. WA2OTC has a new antenna on 80 and a new signal on NYS. W2YJR made BPL using 5 watt rig two weeks out of the month (WA2OTC take note). WA2UYL has moved to AZ and was heard /7 in CW SS. All Appointees: Certificates are due in for endorsement this month to continue appointments, CD bulletins, etc. Oct. PSHR: N2YL W2YJR K2AV WA2YYM W2CS. Traffic: (Oct.) W2YJR 514, N2YL 194, WA2YYM 160, K2AV 120, W2CS 102, WA2SPL 58, W2BIW 42, N2JK 38, WA2EQW 30, WA2CJY 28, N2EF 27, WA2PAU 14, K2HNW 8, WB2GOJ 5. (Sept.) WB2ZCM 7, WB2GOJ 6.

NEW YORK CITY-LONG ISLAND: John H. Smale, WB2CHY — SEC: K2HTX. PAM: WA2ECO. The following are major AREC/RACES nets, join one. Bronx — 28.64 MHz 50.35 MHz 146.88 fm. Kings — 28.64 MHz 50.35 MHz 146.88 fm. Richmond — 146.88 fm. New York — 29.5 MHz 146.88 fm. Queens — 29.5 MHz 50.52 MHz 145.62 am/fm. Nassau — 28.72 MHz 145.68 am. W. Suffolk 28.73 MHz (Hunt.) 145.59 am. 28.65 MHz (Smith.) 147.21 fm. 28.6 MHz (Babylon) 146.085/685 fm, 28.65 MHz (Islip). E. Suffolk — 146.82 fm. Brookhaven — 16/76 fm. Riverhead — 3730 kHz cw. Note: Net times between 2000 and 2100 local on Mon. And since this is the first of the year, that means SET time again, why not make one of your resolutions to be to join your local AREC and help out, the SEC is listed at the top of the column, why not call and see how you can help. It's nice to write your own column because you can blow your own horn the loudest, which means that I finally passed my Extra, along with WA2HWD, and at this time of writing I am awaiting my two letter call and so is HWD. As of 11/1/77, the NLS net

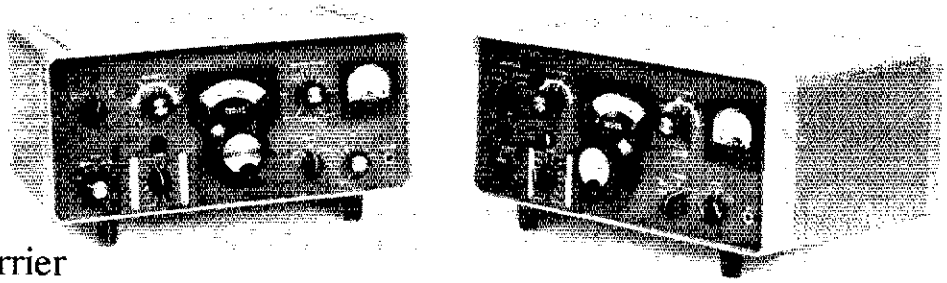
Which Collins should you choose now that you've chosen Collins?

If you work mainly voice, and just dabble in CW, RTTY, or SSTV, build your station around our KWM-2A Transceiver. The unit is compact and lightweight, designed for portable as well as fixed operations.



You're not limited to SSB voice communication, though. The KWM-2A's CW features include break-in and sidetone monitoring circuits. And with the optional Collins 516F-2 Power Supply and external cooling air, you can operate RTTY communications as well.

But if your communications interest is varied and you want maximum voice, CW, RTTY or SSTV capability, we recommend Collins 75S-3C Receiver and 32S-3A Transmitter.



Optional filters, rejection tuning and variable BFO on the receiver, plus features like carrier reinsertion on our transmitter, give you as much control of your equipment as possible. And Collins S/Line is famous as the cleanest sound around.

Give your local Collins dealer a call. Or contact Amateur Radio Marketing, Collins Telecommunications Products Division, Rockwell International, Cedar Rapids, Iowa 52406. Phone: 319/395-4493.

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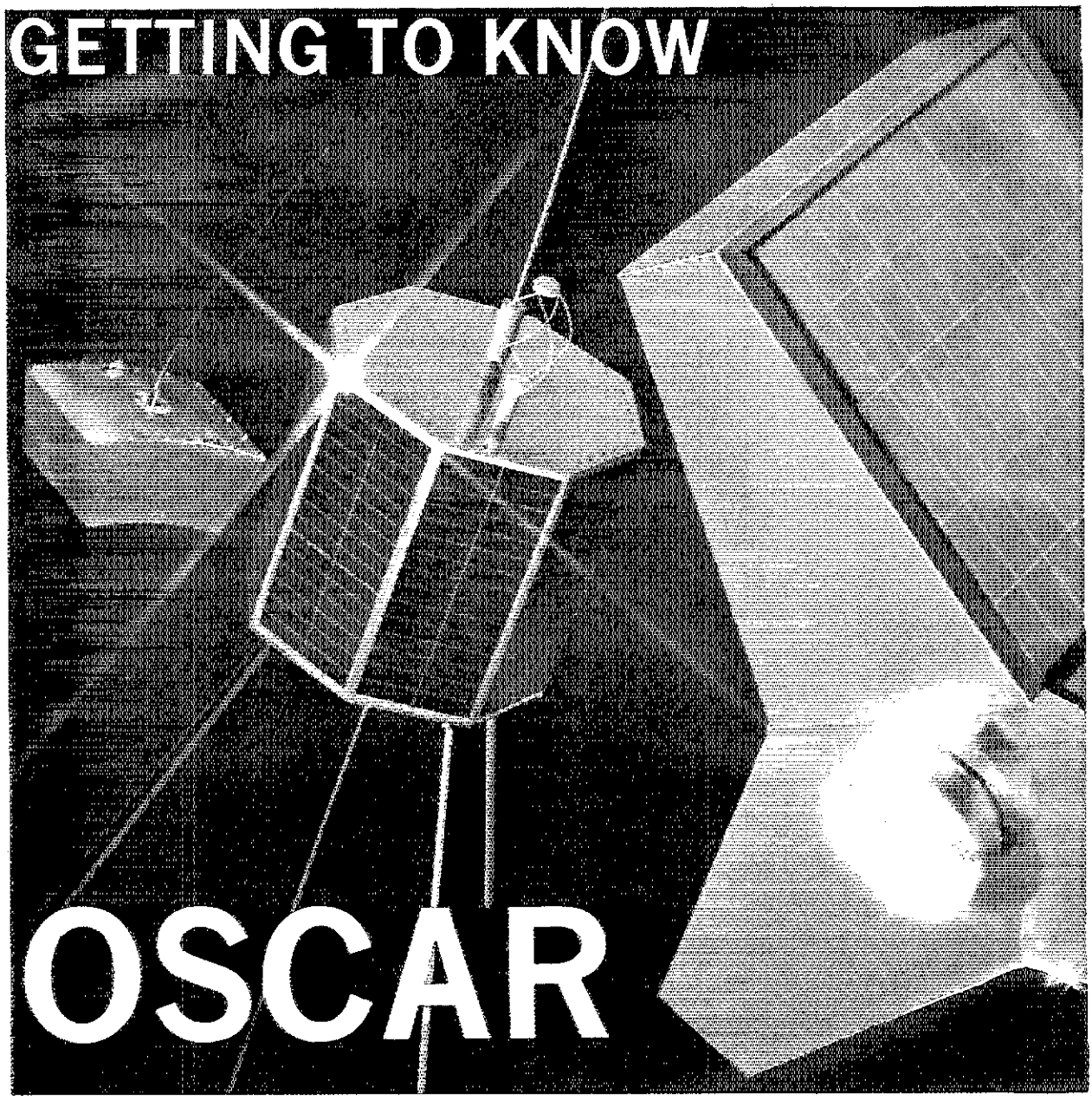
...where science gets down to business



Never has there been a better time for you to share in the space-age adventure of satellite communications, GETTING TO KNOW OSCAR FROM THE GROUND UP, a reprint of the popular QST series, *tells* you *how* to get started, how to find, and use OSCAR, describes the newest OSCAR, the ultimate amateur satellite, use of OSCAR in the classroom, and how satellites can save lives. Also included is an OSCARLOCATOR and a section on how to use it. Join the space communicators who have already discovered OSCAR. $3.00 U.S. and possessions, $3.50 elsewhere.

THE AMERICAN RADIO RELAY LEAGUE, INC.

225 MAIN STREET

NEWINGTON, CONNECTICUT 06111

meets at 1745 local on 3725 kHz, WB2KIH is the new mgr. Congrats to WA2RAH and WA2KES who upgraded to Tech., and WB2PNQ who passed to General. K2XJ is now sailing as asst. radio officer aboard U.S. ships and will hopefully get his sea time in so he can become an RO. K2TV now has an HW 7 for QRP work. WA2BMI now has 2-mtr mobile rig in his dad's new car. W2GKZ now has new ant. set up. It is with deep regret that we list W2EC as a Silent Key, Ferd was one of the very active traffic stations around. WA2YEI reports a net on approx. 145.050 MHz at 1900 local and it's a.m., this net is to get activity going on the low end of two. LIMARC had their flea market on Nov. 13, it never rains for their flea markets, cold and snowy yes, but never rain. The traffic nets are still looking for new stations to check in, this goes for all parts of the section, why not try it once, you might like it. Traffic: WA2BMI 252, WA2JKG 102, WA2HTP 77, W2MLC 76, WB2KIH 74, W2GKZ 72, W2DBQ 58, WB2HIO 54, W2HXT 52, K2CRT 51, WB2FKZ 30, WB2CHY 26, WB2JAY 26, W2HXT 14, K2GCE 8, WA2YEI 8, K2JFE 6, W2XY 4.

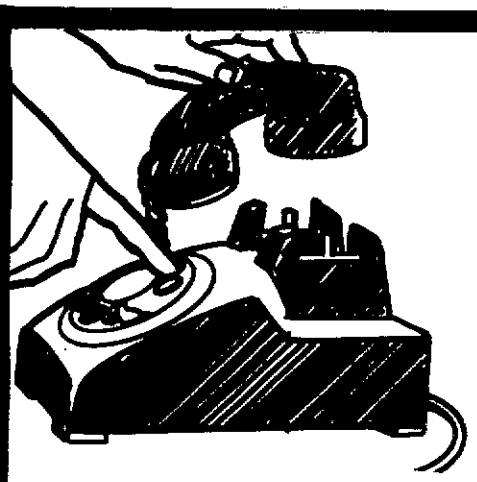
NORTHERN NEW JERSEY: SCM, Bob Neukomm, WA2MVQ. Net, Freq., Time(PM)Days, Sess. QNI, QSP, Manager. NJN, 3695, 7:00 Dy, 31, 307, 102, W2ZEP. NJN, 3695, 10:00 Dy, 31, 138, 38, W2ZEP. NJSN, 3730, 8:15 Dy, 18, 71, 9, N2MW. NJPN, 3950, 6:00 Dy, 31, 601, 223, WB2LCC. NJPN, 3950, 9:00 A Su, 5, 84, 24, WB2LCC. NNJ RTTY, 147.51, 7:00 Dy, W2PSU. PVTN, 147.7, 8:00 Dy, WA2OPY. K2BJG now Extra along with WA2FBP. K2BJG now on RTTY. N2GJ now QRP and added VFO for his TS520, also 40 new countries on 10. WA2VFT finished 5Band WAS. WA2QJU now W2XD. WB2FHB now N2ZM. WA2UDT received WAS and WAC also attended AMSAT meeting in Washington, DC. WA2JUQ completed WAC and WAS. WA2LNL has a new quad and has his Advanced. WB2JYQ and WB2LOJ now Advanced. WB2PKX now a General along with WB2LNQ and WA2LNM. WA2LNQ now Advanced. WB2JYQ and WA2JYR have a new tower and beam. K2RRV is conducting a Novice class as is K2ETN. Club station WA2NPP now has a new TS820S. OO reports received from WB2CST and WB2JJW. Traffic: (Oct.) N2GM 341, W2RQ 208, W2SWE 94, N2MW 82, W2WHB 65, WA2NPP 63, W2ZEP 62, WA2EPK 42, N2GJ 42, W2CC 34, K2SE 29, W2LTP 28, WA2MVQ 28, WB2HSG 25, WB2KAK 16, W2CVW 13, WA2VFT 10, WA2DLZ 9, WA2KFE 6, W2XD 5, W2UH 2. (Sept.) WB2HSG 27, W2CVW 8, W2GD 8, W2UH 8. (Aug.) W2CVW 12.

MIDWEST DIVISION

IOWA: SCM, Max R. Otto, WØLFF — Congrats to WAØDHU for "Midwest Ham of the Year" award at ARRL convention at Wichita, and thanks to Wichita Club for tour of Beech plant. WRØAJF at Ft. Dodge back on with AP. WBØVKN a new General. Election results: Clinton ARC, KØBAX, pres.; WBØSEL, veep.; WBØUQD, secy-treas. Humbolt/Algona ARC, WBØUPF, pres., WBØBBA, veep.; WDØBBB, secy.; WDØBPO, treas. Iowa Repeater Council, WAØDOY, vice-pres.; WAØYGJ, secy.; WAØKWK, treas. New equipment: NØEL new quad working UL7s and UM8s. WØHUP new 60-ft. tower. WØAYH new IC-22S. WØEIT new Mosley CL-33. WBØSEL new Tribander at 51 feet. WDØBRD new FT-221. WAØCLM new TS-700A. WBØQFR plugging amateur radio on KTIV-TV, KMNS, KBCM and KWSL radio. Cedar Valley ARC presented a plaque to CD Director. Busy month for WØEOE. Took delivery of new FT-101E and his first grandchild, and resumed hamming after a 7 year layoff, and had a 50-yr. party for his license. WBØLKW now with Montgomery Ward in Chicago. Muscatine had good witch watch. It's time for antenna work. Happy New Year. Nets: Tall Corn (TLCN) 3560, 0030/0400 Dy, WØYLS, Mgr., QNI 475, QTC 149, sess. 60. Iowa Code (ICN) 3713, 0045 T-T-S, WBØNRN/WBØYRH, Mgrs., QNI 31, QTC 4, sess. 8. Ia. 75M 3970, 1830 M-S, KØJVO, Mgr., QNI 1718, QTC 96, sess. 26; 2330Z, KØRN, Mgr. QNI 1144, QTC 55, sess. 26. Traffic: WAØAUX 618, KØEVH 213, WØSS 198, N5YX/Ø 148, WØYLS 118, WBØKHO 67, WØUPX 42, WØLFF 24, WBØGXA 20, WBØYRH 19, WBØNSS 17, WBØAVW 13, WBØPYD 13, WBØJYF 10, WØBW 4.

KANSAS: SCM, Robert M. Summers, KØBXF — SEC: WØKL. RM: WØFT. PAMs: WØOYH WBØBCL. All the hams in KS, I know, join me in expressing sympathy to the family of KØDVN who joined the ranks of Silent Keys on Nov. 1. Ken has been a long time standy-by on 3920 kHz and on the VHF band in the Wichita area. He will be missed by us all. SEC WØKL has the EC net functioning again on Sun. 2 PM on 3920 kHz. All ECs and or the designated asst. should be on hand. If your club has an EC for the club, why not have him join the net. Several clubs and AREC zones now organizing slow-speed net activity on the Novice frequency 3735, consult your local club officers to see if you quality to check into same. Net activity for Oct. KWN QNI 744, QTC 258; QKS QNI 441, QTC 183; KSBN QNI 1116, QTC 137; KPN QNI 282, QTC 22; CSTN QNI 945, QTC 65. Sept. CSTN QNI 799, QTC 72. Hiawatha ARC participated in the annual Halloween parade by providing communications for parade officials. Still receiving compliments on the fine Division convention in Wichita in Oct. Is Your Club Represented In The KS Network System? Check 3920 kHz, 3610 kHz, 3735 kHz. QKS-SS report QNI 107, QTC 56. Traffic: WØOYH 124, WØFIR 113, KØBXF 103, WØRFF 101, WØFT 73, WØCHJ 71, WØHI 65, WØAM 63, KØFPC 63, WAØLBE 56, WØIX 51, WBØLKA 47, WBØKDE 30, WØPB 25, WØNYC 23, WØFDJ 17, NØIN 14, WAØKVP 14, WAØWXY 9, WBØHGG 9, WBØBIY 9, WØKL 8, WØRBO 7, WØOWH 5, WØLL 1.

MISSOURI: SCM, L. G. Wilson, KØRWL — Asst. SCM: Joe Flowers, WØOTF. SEC: WBØFKY. Congratulations to the following new licensees: WDØs AJB CCZ ESH ESN through ESO; ESW EUG through EUJ; EUN EUR EV/



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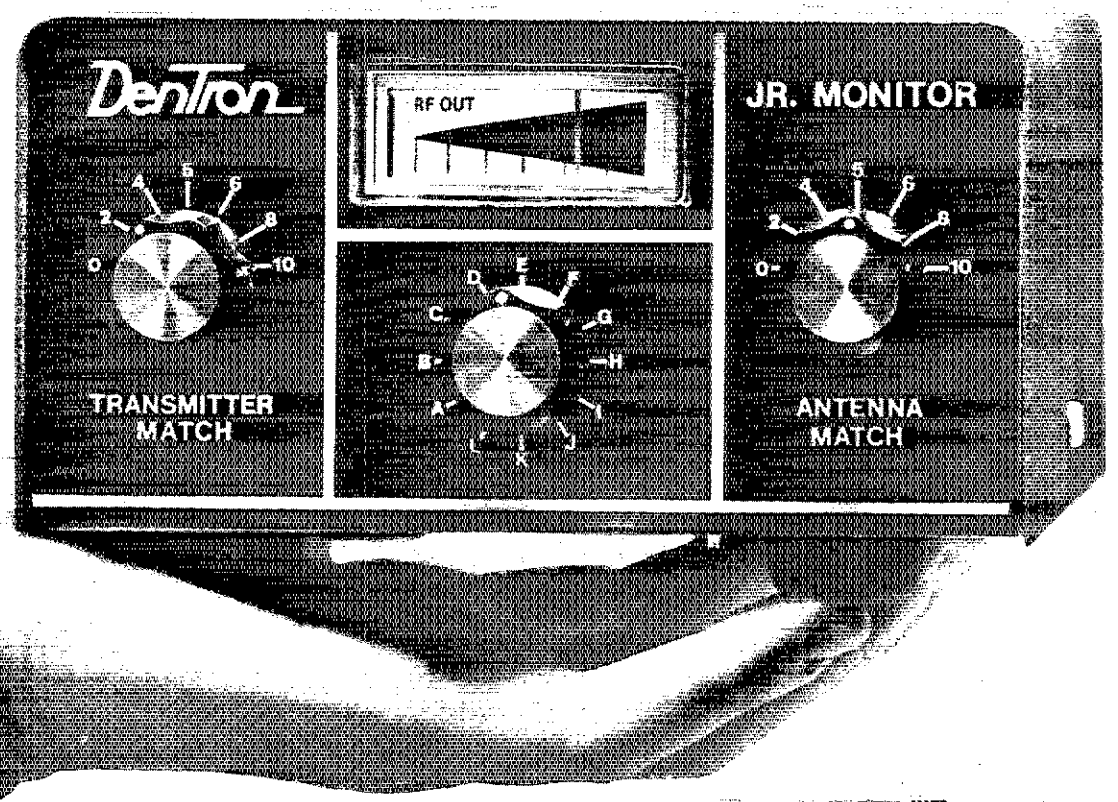

EVH EVJ EVL EVM EVS EVT EVW EWF EWG EXG EXW through EXY; EYB EYO EYP EYW EYX EYZ EZA EZL EZU FAV FAW FAY FAZ and FBB. Please note a new address for your SCM — 5415 E. 97th Street, Kansas City, MO., 64138, phone 816-966-8953 and a new address for your SEC — 1406 Peggy Circle, Lee's Summit, MO. 64063. Phone remains the same. Best wishes for a speedy recovery to WBØMUU who is at home now after undergoing back surgery. Congratulations to WAØYEF on receiving DXCC and WØKC on receiving 5BWAS Award. WBØCJB has a new HW-100.

Net	QNI	QTC	Net	QNI	QTC
MSN	57	14	HBN	281	30
NEMOE	76	1	MON	248	129
MON2	153	50	PHD	31	9
MOSSBN					

The Barton County Amateur Radio Klub (BARK) is promoting amateur radio by taking part in "Operation Checkerboard," a Civil Defense exercise designed mainly for Law Enforcement Agencies. The Carthage Amateur Radio Club took part in the annual Maple Leaf Festival with a display on the lawn of the Jasper County Courthouse. Springfield, MO now has a National Weather Service Radio transmitting on 162.40. Joplin should have one of it's own by Jan. 1978. The PHD ARC is getting amateur radio publicity through a CB article in the Kansas City Star newspaper. Recent appointments are: OPS, KØSSN; PAM, WBØLFY; ECs: WBØOSV WØHH WBØKUW WBØFND; ORSs; WØQAU KØSSN. Traffic: KØONK 608, KØSSN 134, WBØLFY 92, WBØSND 92, WØOTF 88, WBØVHN 80, WBØSSB 62, WØBV 49, WØBMA 47, WØHH 46, KØSI 43, WØBVL 34, NØWM 29, WØOUD 27, WAØLCV 22, WBØVDO 17, WØGBJ 16, WBØFKY 14, KØRWL 10, NØJL 8, WAØMOF 3, WBØCJB 2.

NEBRASKA: SCM, Claire R Dyas, WØJCP — Congrats to WAØDHU on being selected the Midwest Div. "Amateur of the Year." Congrats to all who recently upgraded. Effective Jan. 1, 1978, WBØGWR will become the SCM. Due to increased duties as Div. Vice Director and other activities in volunteer work, I have resigned. I wish to thank all Neb. Hams for their fine cooperation, it has been a pleasure to have served as SCM. I know you will give WBØGWR the same fine support. Net reports: Nebr. Morn Net, QNI 1104, QTC 45, AREC Net, QNI 174, QTC 1; Western Neb. Net, QNI 479, QTC 30; Cornhusker Net, QNI 1105, QTC 92; PM Net, QNI 292, QTC 26; Sandhills Wx Net, QNI 197, QTC 4; Nebr. Storm Net, QNI 1089, QTC 33; QCWA Net, QNI 69. Traffic: WØFQB 194, WØVEA 164, WØEUT 57, WAØCBJ 32, WØSGA 32, WØHOP 26, WAØPCC 25, KØHNT 22, WØVYX 17, WØHTA 15, WAØJIH 14, WØUFZ 14, WØZNI 12, KØSFA 10, WAØQEX 8, WBØSYV 8, WØRJA 5, WBØGWR 4, WØLJO 4, WAØLOY 4, KØODF 4, WØNIK 3, WBØJTM 2, WBØJWQ 2, WØYFR 2, WØIXB 1, WØZTE 1.

NEW ENGLAND DIVISION

CONNECTICUT: SCM, John Mc Nassor, W1GVT — SEC: W1XX. RM: K1EIR. PAM: K1EIC. VHF PAM: WA1ELA.

Net	Freq.	Time/Days	Sess	QNI	QTC
CN	3640	1900/2200D Dy	61	260	168
CPN	3965	1800 M-S 1000 Su	31	501	171
VHF-2	28/88	2130 Dy	31	360	109
CORN	147.75/.15	RTTY 24 Hrs.	1	3	17

SEC W1XX expects ECs participation in '78 SET — Clubs can promote the fine image of Amateur Radio. Director W1HHR suggests clubs obtain an increase in ARRL Membership equal to 10 percent of the club total during '78. New England total now over 10,000 members! Please note addition of Conn. RTTY Net (CORN) active 24 Hrs Autostart 147.75/.15 — an NTS local Net & may become Section Net — RTTY stations encouraged to join! Manchester RC "Short Skip" Club Quarters set up at old Nike Site. Shoreline ARC presented W1BDN with Life Membership. Tri-City ARC provided Ham Radio Demonstration at Groton Library. Contact K1IKE for copy of "Conn. Ham Trader." Contact WB2CHO for Danbury CARA CQ Ham Radio Video Tape Novice lessons now on Cable TV. K1XA & WA1SQB operated 6W8MM during CQ Worldwide Phone Test. Congratulations to: WA1UXA & WA1TUH Extra Class; WB1CPF Gen. Class; N1GL CT winner '77 ARRL DX Phone contest; W1WY winner '77 CQ 160 M. Contest! Suggested New Year Resolutions: Learn more and improve Amateur Radio; do NOT abuse Auto-Patch; support Repeater Clubs. Sincere thanks for your help during '77. Happy New Year to All! Traffic: K1GF 111, K1DFS 104, WA1HYN 90, K1OQG 84, W1AW 63, WB1CPF 58, WA1ZVS 57, W1BDN 41, K1XA 41, W1GVT 33, K1SRF 32, W1KV 30, W1TR 21, W1JA 15, W1QV 9, WA1TUH 8, WA1UXA 8, W1CUH 5, K1RT 4, W1WEE 1.

EASTERN MASSACHUSETTS: SCM, Frank Baker, W1ALP — Asst. SCM: WA1OWQ. SEC: W1AOG received reports from ECs: W1s BK III BHD; K1s PAD CCW NFW FMM; WA1s RTR HPSZLO AMG. We all wish W1BVR W. MA SCM the best of luck, he is retiring the 1st of Jan. and a welcome to our new W. MA SCM W1TM. K1RL was K1RNZ Silent Keys: W1ELP WA1YPB W1BAB W1LRD WA1WJN who just came back after 25 yrs. The 4 P.M.ers had their 7th birthday Nov. 2nd. WA1YXM now General. WA1FCZ in hospital. EMRI had 308 QTC, 383 QNI. W1ZU was W1ZUH. K1AFF/VE1 back here for his 50th anniversary. W1QYY retired from 1RNE a swell job done. K1BA new 1RN E Mgr. WA1ZAZ new EMRI mgr. W1JVZ in Silver Lake, NH. WB1FKB's last name is "HAM." South Shore RC had meeting. WA1YOJ on several nets. K1RAW has MLA2500 linear. WB1AJY now Advance. N1CQ was WB1BXC. K1MTH has TS520. K1ZSI has FT3010. W1HZU has RFI problem ironed out. NEEPN had 89 QNI, 11 QTC. W1FJI will be operating from KM1CC along with K1VV WA1VEI K1BA N1DM WA1ZAZ

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2SC1018	1.50	CX121A	6.20	STK011	10.50	UHIC006	6.50
2SC1096	1.20	HA1151	2.90	STK015	6.50	UPC16C	2.50
2SC1306	4.75	HA1202	3.10	STK032	14.20	UPC20C	5.00
2SC1307	5.75	HA1306W	5.20	STK050	24.50	UPC30C	3.95
2SC1678	5.50	HA1308	4.50	STK056	11.35	UPC41C	3.95
2SC1760	2.15	HA1322	5.20	STK415	8.50	UPC563H2	8.00
2SC2028	1.10	HA1339A	5.20	TA7045M	3.50	UPC566H	2.25
2SC2029	4.75	LA1201	4.25	TA7055P	5.50	UPC575C	4.10
2SC2074	3.00	LA4031P	3.50	TA7060P	1.85	UPC595C	3.60
AN203	3.75	LA4032P	4.50	TA7061P	2.25	UPC1001H2	5.15
AN208	4.75	LA4051P	4.65	TA7063P	2.25	UPC1008C	6.00
AN210	3.10	LA4400FR	3.80	TA7075P	4.90	UPC1020H	5.50
AN214	4.90	LA4400FS	3.80	TA7089P	2.90	UPC1025H	5.50
AN241	3.20	LD3120	3.10	TA7120P	2.20	UPC1152H	3.95
AN315	3.50	M5115PR	4.80	TA7150P	4.55	UPC1156H	6.50
BA511	3.50	MN3001	19.50	TA7153P	6.90	UPD277C	4.50
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CX075B	2.50	MN3003	9.45	TA7204P	6.50	UPD858C	13.00
CX100D	7.50	MPS8000	1.25	TA7205P	6.50	UPD861C	22.00

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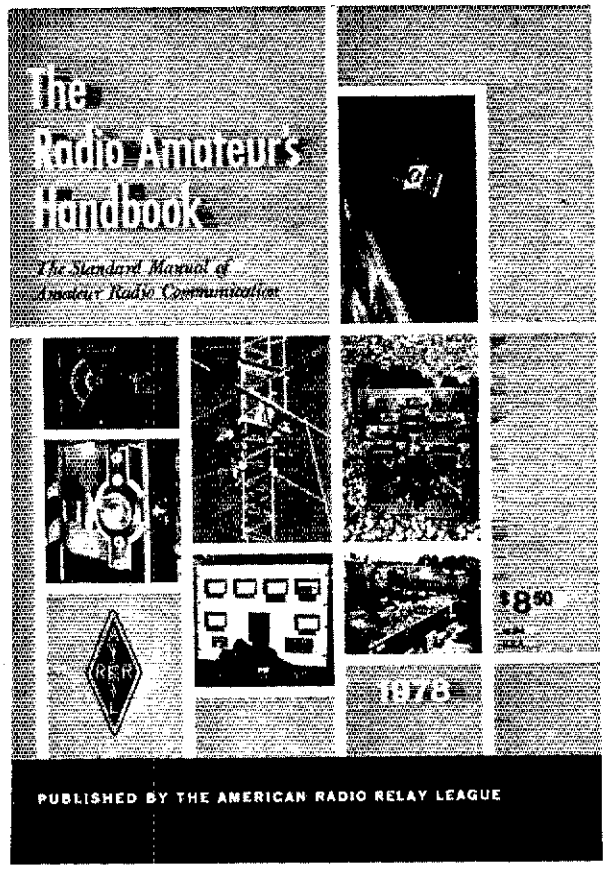

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WA1UUC. W1DMS helped out in the Brockton Walk-a-Thon. Chelmsford ARA had program on the U.S. Experimental over the horizon back scatter, HF Radar. Sector ID MA CD on the air with test Reading CD NCS. N1GB was WA1NUQ. WA1YMD now Advance. W1NF has sked with W1MZ/MM on 140.0. Minuteman Ten Tenners had luncheon. WB1DGG mobile on 10. WA1ZXB new OBS, WA1ZGX OPS ORS. WA1HPS new EC-RO for Malden. WB1FGD OVS. WA1ZAZ new RM for 80. W1TC endorsed as EC OBS. W1SR/W1MTQ OO. WA1QMZ ORS. Wellesley ARS W1TKZ Novice Net had 20 QNI, 4 QTC. A new club Concordian ARC had its first meeting reports WA1YGJ, who again is on 2. HHTN had QNI 345, 56 QTC. W1XA & K1TKI started 2nd Novice Class at Foxboro Co. ARC, WA1EMT. A welcome to WB1BUP who just started to join in our nets. W1MJ was WA1MYK, has new QTH, job, etc. W1AQE still County Hunting. WA1TGX writes from Germany. WA1ZLO has new baby girl. WA1VKB at school QTH in Madison, WI. WA1UYR now General, has T4X & R4A. W1DJH has 30-L1 linear. WA1WFY moving to Alaska. WA1OUU has KDK 2M rig. WB1DFV has NCX-5 and his General. Generals: WB1sDFI DFH DFU DPU. Massasoit ARA held its 16th banquet at the Halifax Country Club, and W1HIQ spoke about "Scopes" at meeting. Quannapowitt RA had talk on "Coax" by WA4ATM. N1CW is ex-WA1MRJ. From W1BB, the Winthrop Emergency Radio Net has been going since 1932. WA1ZAZ put out nice copy of "Zero Beat" for the EMRI. Whitman Club had a "Flea Market." Framingham RC a talk by WA1JQH on "Integrated Circuits." Wellesley ARS holding the Natick Mall Message Fair. W1JMA on the air, on cw. Middlesex ARC has a General Class, with WA1LJB, instructor. EMRI had 450 QNI, 293 QTC. Traffic: (Oct.) WA1ZAZ 568, WA1UWF 356, WA1TBY 256, K1GN 145, W1FJI 134, WA1EYY 126, W1DMS 112, K1BT 80, WA9NEWI 72, W1EMG 57. W1DMH 56, WB1BUP 33, W1SR 20, WA1QAJ 13, K1BSO 12, W1AOG 10, WA1ZGX 10, WA1YMD 9, W1MJ 8, W1NF 8, K1ES 6, WA1PQY 4, WA1TAK 4, WA1ZXB 4, W1TKZ 3, WA1QMZ 2. (Sept.) WA1YGJ 11, WA1ZXB 6, WA1PQY 4.

MAINE: SCM, Bill Mann, W1KX — SEC: K1EF. ECs: WA1YUW WB1BSS WA1QIK WA2ERT/1 KL7IEP/1 N1RP W1HDC K1OJN K1GDI WA1MUX N2KC/1 K1ZIT. SET Jan. 28-29. All ME nets and some rptrs. will be active in SET. Join in so you won't be in the dark when needed for real thing. Any clubs or individuals needing copy of ME Ama. Radio Comm. Plan contact K1EF or W1KX. New Yankee ARC rptr. 28/88 installed Streaked Mtn. Oct. 15 and working great. YARC officers: W1BYK, pres.; K1VFG, vice-pres.; N1RP, secy-treas. Club spkrs: W1WX-C, Aroostock ARA; W1KX, Ellsworth AWA. Look for KM1CC Jan. 14-22. Appointees try CD Parties Jan. 7-8, 21-22. New Sea Gull Net certs issued to net regulars. Oct. Reports:

Net	Freq.	Time/Days	Sess	Tfc.	Ck-in
PTN	3596	7 PM Dy	29	194	225
SGN	3940	5 PM M-S	25	92	1173
MSN	3596	6:30 PM MWF	13	20	74
BYN	3960	8 AM M-S	26	39	920

Traffic: W1KX 334, WA2ERT/1 166, K1EF 117, W1RWG 98, W1ERW 66, N1RP 52, K1MZB 44, N2KC/1 37, W1HDC 31, WB1AOD 26, K1TZH 24, W1AHM 20, WA1JCN 20, WA1QFX 8, W1CTR 6, WA1YJY 5, K1MFT 3, K1RQG 3.

NEW HAMPSHIRE: SCM, Robert C. Mitchell, W1NH/W1SWX — SEC: K1RSC. RM: N1NH. Don't forget the NH QSO Party sponsored by the Concord Brass pounders scheduled for Feb. 11 & 12. The Keene ARS new officers: WA1SOZ, pres.; WB2QLL/1, vice-pres.; WB1BSX, secy., WA1YSM, treas. W1TN has a new Murch Transmatch. W1HWB now K1HI. The GSPN had 406 check-ins & 84 trffic. K1SHR worked 78 countries on 15 during Oct. WA1DUO moved from CT to NH. W1TTX has new Advanced ticket. W1BYS & WA1WVD are back in FL. K1VBL now K1OX. Recent NH visitors were W1LID/7 & WA2DEW. K1ACL trying OSCAR 7 with a TX 62TX. WA1PSI now on 40 & 75. K1NH teaching a general class. K1FUD was featured in recent NH newspaper. W1EJ keeps sked with VE2SH at 7 AM on his 145.025. K1ACL received KH6 QSL and has 5BWAS. K1HI WB1BRE & WA1MZV installed a new tri-band beam at the Nashua Red Cross Center. The NHVT Net had 199 check-ins, 111 traffic. A K1BCS radiogram addressed to Dartmouth College was acknowledged by reciplent via postcard from Bourges, France. W1VBX has a new Kenwood TS820S. The Horsetraders Swaptest is scheduled for May 13 at the Deerfield Fairgrounds. Merry Christmas and Happy New Year. Traffic K1BCS 595, N1NH 119, W1TN 67, K1NH 42, K1PQV 28, K1ACL 23, WA1PEL 8, W1BYS 6, WA1HOB 1.

RHODE ISLAND: SCM, J. Titterington, W1EOF — New officers at Fidelity ARC, WA1SEJ, pres.; K1KT, vice-pres.; WA1LET, 2nd vice-pres.; WB1CFT, secy. WA1UHT, treas. Fidelity has technical lecture & demo at every meeting. New calls: W1MB (W1QLD), W1GS (K1HZN), K1KT (WA1GGL), K1GK (WA1QKJ), K1LA (WA1TRA), K1KX (WA7VCE), K1JF (WA8BZD), N1DM (WA1RFT), K1DT (WA1QOG), K1AO (K1GMW), W1X. (K1ABR). Congrats! PRA held DX night and annual OT night. Fidelity held annual dinner. Hope Valley Rptr Assn. had dinner dance. Visited W1AQ and will continue visits to all clubs. Hope you had a Happy Holiday Season. EMRI SS Net (WA1POJ, mgr.) 12-62-19, RIEM 2 mtr. Tfc Net (WA1SCO) 26-154-32. Traffic: WA1POJ 113, W1EOF 21, N1OO 4, WA1RXI 4, WA1TFF 2.

VERMONT: SCM, Bob Scott, W1RNA — SEC: W1VSA. W1QQ visited CN, I, & YU countries this summer. While in Yugoslavia he was met by head of Rijeka RC who gave him tour of city and club station where he met several of its members. W1AIM has added Del. & Md. to his 6 mtr list, making 46 states. He also reports he is active on HF teletype. VT SSB had get-together Oct. 8 at Vernon recreation area. BARC has 30 taking Novice and Genera

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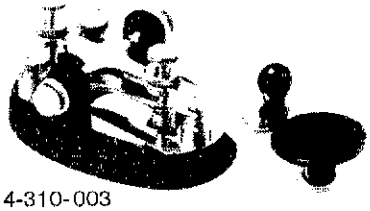

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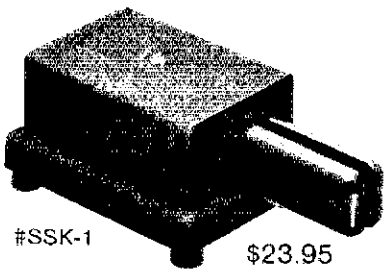

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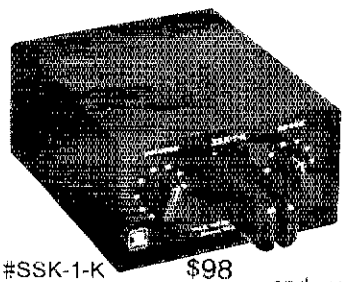

#SSK-1-K $98
(w/AC power supply)

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Dear Sirs:

Enclosed are my warranty cards for Triton IV SN 1629, the 262G power supply, the 249 noise blanker, and the 245 CW filter. I installed the filter and noise blanker and the set is operating satisfactorily. It is a sensitive receiver, and I get good reports when transmitting. I particularly like the CW operation. I also own two Yaesu FT101E receivers, one Yaesu FTdx 570, a Hallicrafters HT-37 and SX101A, several linears (FL2100B, SB 220, etc.) and a home brew Class C KW AM-CW rig. The Triton does not take a back seat to any one of them.

Your warranty cards ask why I bought the Triton. I have two basic reasons.

1. I was very impressed with the factory response to a complaint I had with my KR-50 keyer. A replacement board was sent to me by air mail and it cured my rfi problem in the keyer.
2. I gave a lot of thought to the purchase. I compared Triton IV specs to others (Atlas, Heath, Yeasu 301, etc.) and came to the conclusion that Triton had the best specs. Checks with Triton owners, one of whom brought his Triton IV over to my house for me to test into a dummy load and on the air, convinced me that the Triton specs were honestly presented.

I congratulate you on your good American made products which help this nation compete with Japan, and provide top quality communication gear to the Amateur.

73,

Osborne Milton, W5NZV

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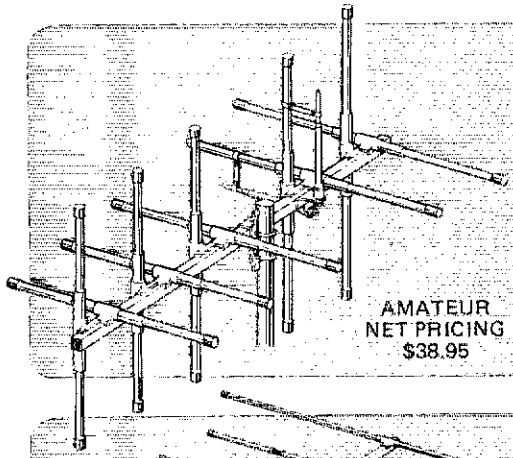
LOOK OUT The FINCO Stingers are here!

FINCO Is introducing its new Stinger Series Amateur Antennas.



AMATEUR NET PRICING $38.95

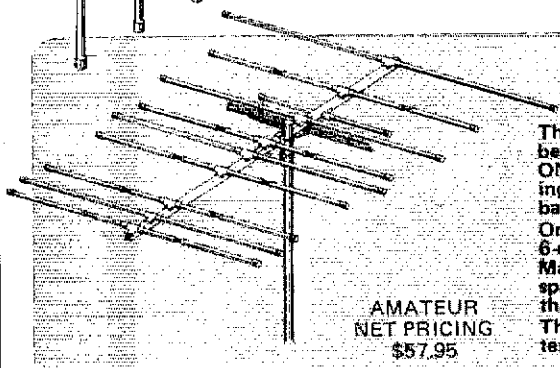
FINCO STINGER A 2+2

2 Meter

The model Stinger A 2+2 is a ten-element, dual polarization 2-meter antenna designed for OSCAR communications or where switching from horizontal to vertical polarization is required. The A 2+2 can even be phased to operate on both horizontal and vertical polarization at the same time (circular polarization). This is not only ideal for OSCAR work but gives your station versatility for ground communications.

Wide, non-linear element spacing gives the A 2+2 superior gain. However, since it is a five element beam in one given plane, the half power beam width does not make satellite tracking difficult because of sharp directivity. The dual gamma match assemblies provide for a very low V.S.W.R. and will withstand 2,000 watts P.E.P.

The Stinger construction features make the A 2+2 extremely heavy duty. Provisions are made for mounting the antenna at the end of the boom – for azimuth control – or at the middle of the boom for normal applications.



AMATEUR NET PRICING $57.95

FINCO STINGER A62

6 & 2 Meter

The model Stinger A 62 is a truly remarkable combination 6 and 2-meter beam designed for optimum performance on both bands yet only requiring ONE transmission line. This is accomplished through the use of exclusive phasing elements to accomplish dual band operation with no sacrifice to either band – NO SWITCHING REQUIRED!

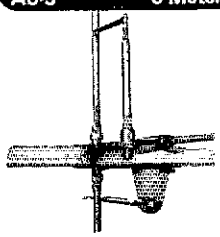
On 2-meters, the A 62 has 6 colinear elements – equivalent to three 1/2 λ 6-element yagis stacked side by side – thus giving outstanding performance. Maximum forward gain is assured on 6-meters through the use of four wide spaced elements. The heavy duty Stinger construction is used throughout so that the antenna will withstand 100 mph plus wind loads.

The A 62 is ideal for mounting on the same mast as your tri-bander or other antenna thus easily opening up the world of 6 and 2-meter VHF communication.

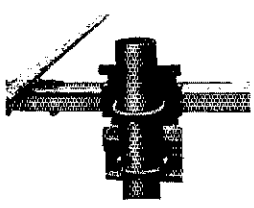
OTHER FINCO STINGER AMATEUR BEAMS AVAILABLE:

MODEL	AMATEUR BAND	ELEMENTS	BOOM LENGTH	AMATEUR NET PRICING	MODEL	AMATEUR BAND	ELEMENTS	BOOM LENGTH	AMATEUR NET PRICING
A10-4	10 Meter	4	16'	46.95	A2-5	2 Meter	5	5½'	21.95
A6-3	6 Meter	3	6'	23.95	A2-10	2 Meter	10	10'	34.95
A6-5	6 Meter	5	13'	35.95	A1¼-10	1¼ Meter	10	8'	24.95

ENGINEERING FEATURES:

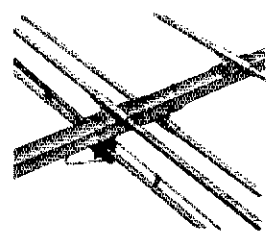


All Stinger Series Amateur Antennas incorporate heavy duty fully adjustable gamma matching systems to allow for maximum power transfer. The design provides for minimum V.S.W.R. and a wide bandwidth. A built in SO-239 type connector assembly is utilized plus the matching systems are power rated at 2,000 watts P.E.P.



A 4"x 6" x full 1/8" thick heavy duty plated steel mast to boom mounting assembly is used on all Stinger Series of Amateur antennas. The bracket assembly locks permanently on the square boom and thus withstands high wind loads and torque without twisting or becoming misaligned. The assembly accepts mast diameters of up to 2" O.D. Provisions for mounting either in a vertical or horizontal plane is incorporated in several models.

Exclusive Stinger square boom construction is used on all amateur antennas. The 1½" square booms are of .064 wall high tensile strength aluminum which is many times stronger than its round counterpart. Also, special bracket assemblies have been developed to allow instant element to boom alignment – plus they stay aligned in the highest wind and ice loads. All elements are of thick wall high tensile strength aircraft quality aluminum.



Antenna design engineering is a specialty at FINCO. Top quality lab standard test equipment is used throughout the development and design of all antennas. The FINCO antenna test range has been carefully checked for erroneous reflection characteristics that could cause errors in antenna designs. Shown is the sophisticated stub and matching system that has been developed for the Stinger A62, 6 and 2-meter dual band beam. No traps or coils to burn out or detune, thus assuring you of the highest possible performance on both 6 and 2-meters.

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There are many features common to both MLA's, like forced air cooling, and a plug-in PC board containing ALC and metering circuitry. The MLA-1200 covers 10-80 and MARS frequencies. Be assured that all DenTron amplifiers far exceed the FCC harmonic emissions standards.

It's a different kind of luxury. The MLA-1200 is a compact dynamo only 10"W x 5½"H x 10"D and weighs only 30 pounds! Two outboard power supplies are available for AC or DC mobile operation. Picture that in your home, boat or car.

MLA-1200 $399.50 AC-1200 $149.50 DC-1200 $199.50

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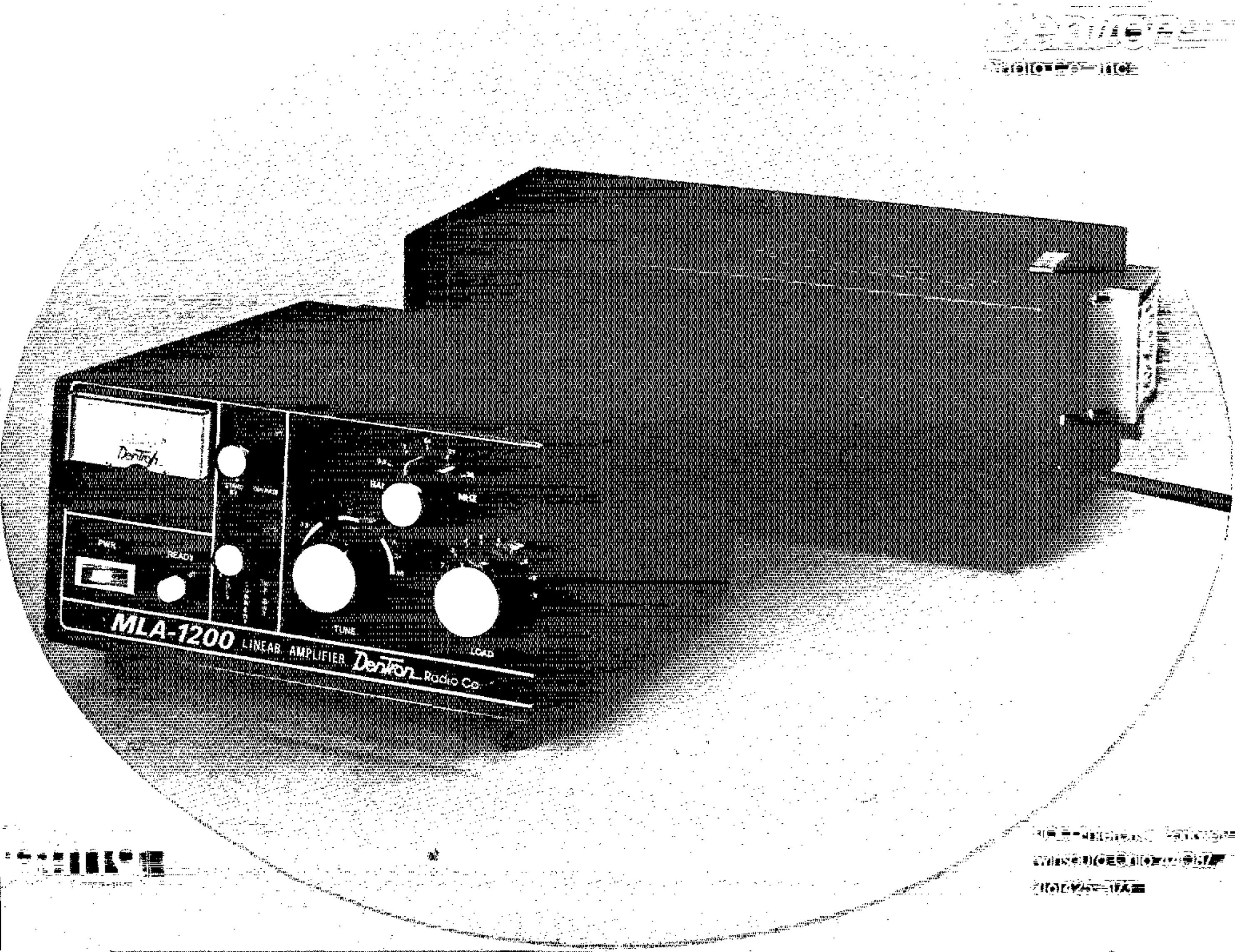

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12 transmit and 12 receive channels, independently switchable, 25 watts output power, 144-148 MHz.

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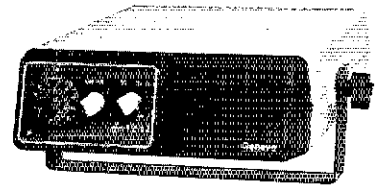

GTX-800

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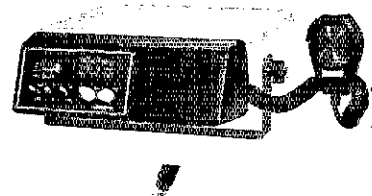

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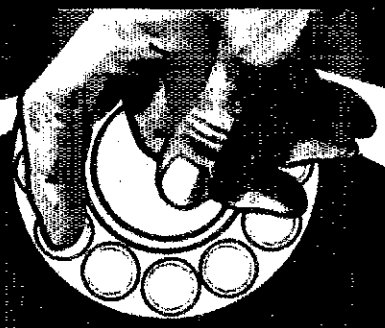
Add $4 per radio for Shipping, Handling & Crystal Netting



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code classes. WB1BZR reports Grand Isle County ARC (GICARC) has club license WB1FPT, looking for Novices at present. VTSSB 29/630/85; GMN 26/521/73; Carrier 26/495/73; VT Fone 5/97/15; VT RFD 5/82/22; NHVT (cw) 31/199/111. Traffic: K1BQB 118, WB1BZR 11, WB1AFY 7, W1RNA 4.

WESTERN MASSACHUSETTS: SCM, Percy C. Noble, W1BVR — Beginning with your Dec. activity reports, mail them to our new SCM, W1TM, William T. Lowe, Commonwealth Ave., Great Barrington, MA 01230. Also, clubs sending bulletins to me, should readdress to him. W1GAJ new EC for Hampshire Co., W1ZPB new EC Franklin Co. W1DVW resigning as CW RM, WA1MJE for WMPN sess. 21, QNI 291, different stations 81, traffic 81. W1DVW for WMN: sess. 31, 24 different stations, traffic 115. WA1DNB for WMEN: 5 sess., QNI 242 (including 144 from 2-meter repeaters). West. Mass. now has a total of 127 AREC members. W1YK at Worcester Tech. now doing a thriving business with campus message service. Much activity on 15 and 10 during recent openings. New OBS K1IU. K1RQF now K1RQ. Our sympathy to the family of W1VC/W4GS on his passing. Best wishes to all for the Holiday Season! Traffic: WA1MJE 556, W1BVR 86, W1DVW 85, W1YK 50, W1TM 49, W1DOY 43, W1ZPB 34, K1IJV 31, WA1OPN 24, WB1CWH 11, WA1TYY 11, W1NLE 5.

NORTHWESTERN DIVISION

ALASKA: SCM, Roy Davie, KL7CUK — SEC: KL7ISB. ECs: KL7HFM KL7IJG KL7ISA KL7IRT KL7FSE KL7RU KL7HNQ WB0BAY/KL7 KL7IBG KL7IEW KL7HIX and KL7HMK. PAM KL7HOV reports that the ASN had 1108 CKins for this month. KL7IVQ writes that he is demonstrating amateur radio to a group of native children in the interior who has never seen radio before. The Anchorage Club informs me that they will have over 60 graduates in their Novice class. KL7FKO is home from the hospital. KL7IKX is in the hospital with an injured ankle. Please listen for a beacon on 28.057 MHz with call KL7IKA, if you hear this beacon please advise the licensee with full details. The new emergency plan for the greater Anchorage area is out to all ARES members. If you have not received yours advise KL7FSE EC for Anchorage. Conditions are sounding much better these days and this winter promises to be a very good one for DX. Let's have some news items for the column.

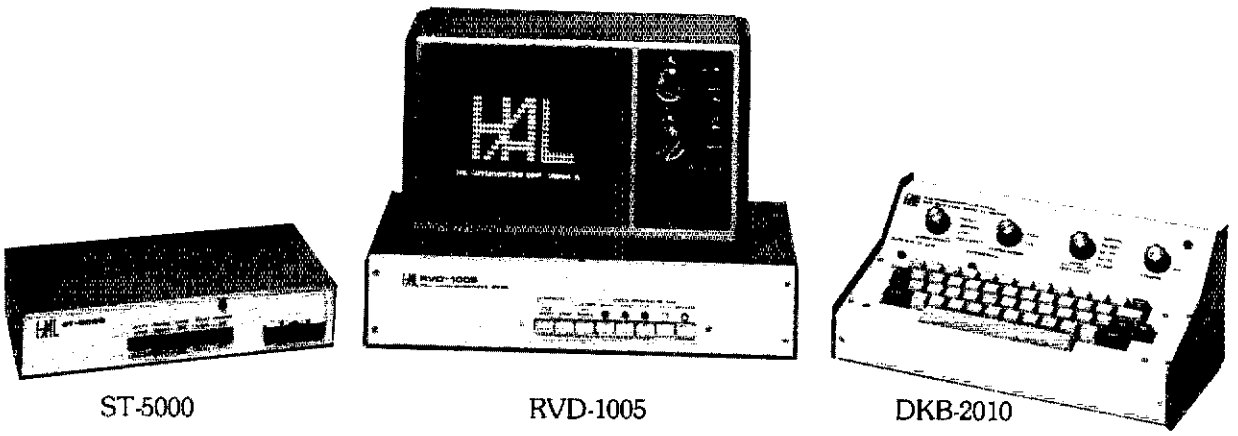
IDAHO: SCM, Ed Hamlin, W7KDB — SEC: W7JMH. PAM: WA7HOS. RM: N7DH. Net times still the same as before. WA7BDD is new Net Manager for IMN. W7GHT made PSHR. WB7PFT & WB7PDP are new hams in Caldwell area. Pocatello Club has new repeater on 147.06/147.66 the Twin Falls repeater has upped power on 16/76. W7CJC is new manager of FARM Net. Your new SCM would like news of happenings from anywhere in the Idaho section. Traffic: W7GHT 181, W7ASA 22, WA7WXI 3, W7GGV 1, W7KDB 1, K7UBC 1.

MONTANA: SCM, Robert Leo, W7LR — WA7PZO has the DX bug. Butte ARC annual installation dinner dance Jan 21st. W7FO has tribander at 60 feet, plus dipoles. W7AVD now Advanced Class, & active 2-60. Eaglehead repeater now active. VHF committee now active with executive committee, plus ballots for decision making. The committee is: W7LR chmn., W7TYN secy., W7CT WA7MUU W7WYG & acting K7CHY & WA7RMV. Contact them or club VHF reps. for inputs, such as new 144.5-145.5 band plan. K7ABV reports 20 at Gt. Falls ARC. N7AD busy on newsletter & Novice class. Gt. Falls ARC mtgs 1st Mon. 7:30 PM Mont Pwr room. Capital City ARC issued Helena Ham list. WA7ZRA busy with 24 hour digital clock. W7DB continues ARRL bulletins on MTN. IMN had QTC 48, QNI 132, & meets at 0230Z now, 3635. MTN 0030Z 3910. RACES 3947 1600Z 1st & 3rd Sun. Traffic: W7NEG 6, WA7KMP 4, W7LR 2, WA7PZO 2.

OREGON: SCM, Dwight J. Albright, W7HLF — Asst. SCM, WA7UJU. Chief PAM: WA7SSO. PAM: WA7GFE. RM: K7OUF. OSN, 3585 kHz, QNI 250, QTC 100, N7NO. WCN 3702 kHz, QNI 324, QTC 122, K7UJY. BSN, 3908 kHz, WA7GFE. ARES, 1993.5 WA7RWM. OEN 1980 kHz, QNI 4467 (Sept), QTC 43, W7VIF. It should be noted that a station in Mont. has worked Portland on tailgate 146.19/79 rptr. WB7FBH & WB7FDB have special recognition for their efforts of code practice during past year. W7KVV and WA7VKK have largest class to date in La Grande, Ore. for Novices. One vote of appreciation from W7HLF for all the messages and cards while in hospital. OK, now. Congratulations to WB7UFF a new Novice in Grants Pass. WB7DSK rpts he is operating a 6800 SWTPC computer system with 8k Basic & machine language, having fun running programs & writing them. Times have changed and so has QRM. SS contest wiped out some nets (cw). Local nets 146.19/79 Linn-Benton Co, 574 QNI, 33 msgs., K7UGF EC mgr. ARES. 146.49/49 Baker Co. ARES, W7EMX EC rpts. 147.06/.06 Jackson Co. 109 QNI, QTC 2, WA7RVE, mgr. The 13th anniversary held in Eugene for EARS. Traffic: (Oct.) W7VSE 290, K7NTS 151, K7UJY 117, K7OUF 115, K7VM 106, WA7IHS 71, K7IFG 68, W7HLF 28, WA7TXV 28, WB7AAK 26, W7EMX 9, W7LT 9, WA7ZAP 8, WB7TAZ 5, WB7CBA 2. (Sept.) K7OUF 81.

WASHINGTON: SCM, Bob Klepper, W7IEU — SEC: WA7RWK. RM: K7OZA. PAM: K7YR. VHF PAM: W7HR. Season's Greetings to all. Contact me if you are interested in an appointment. I regret that one of my first duties is to report W7SFM as a Silent Key. WB7AJR is the new EC for Pierce Cty. PSCARC net meets Sat 9 AM to discuss projects; followed by W7CKZ (NW PRA) and PR net on 3930. K7UL Code practice 9 PM MW, 3710; W7JWJ practice 7:30-8 PM MWF, 3590 kHz, 5-15 wpm. Island City ARES forming club and plan to affiliate. Everett 31-91 Repeater moved to 3065 ft. level of Mt.

A Component System for RTTY



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Active amateur, short wave listener, beginner, or old-timer—you'll enjoy RTTY with the HAL component system. Shown above are our ST-5000 Demodulator, RVD-1005 Visual Display Unit, and DKB-2010 Dual-mode Keyboard. The RVD-1005 is a time-proven display generator that converts BAUDOT coded RTTY pulses into a video display. It receives the 4 standard RTTY speeds (60,66,75, and 100 words per minute) and generates a 25 line, 40 characters per line display. The low-bandwidth video output can drive either a TV monitor or a modified TV Set (power transformer and video connection required). The DKB-2010 will transmit these same four RTTY speeds as well as MORSE code at 8 to 60 wpm. The DKB also features N-key rollover, adjustable CW weight, HERE IS message, and internal CW side-tone oscillator. The 3-key standard buffer can be extended to 128 keys with the EMO-128 buffer option. The ST-5000 is the newest of HAL's line of RTTY equipment, offering 2-shift operation with high-performance active filter circuitry. It also has built-in AFSK oscillator and loop supply and can be factory tuned for either the "High" or "Low" frequency tone pairs. Autostart and printer control circuitry make the ST-5000 ideal for both electronic and mechanical RTTY terminals. For a high-performance and cost-effective RTTY station, the RVD-1005/DKB-2010/ST-5000 combination is hard to beat!

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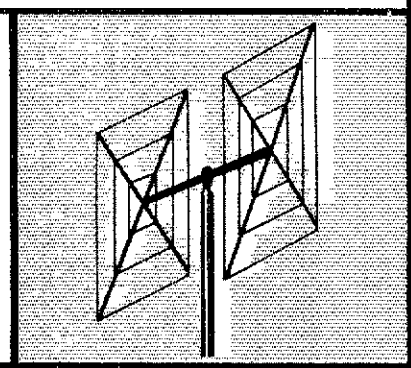

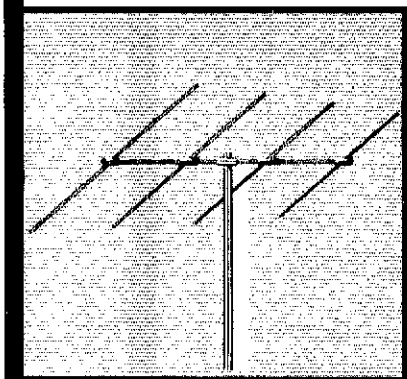

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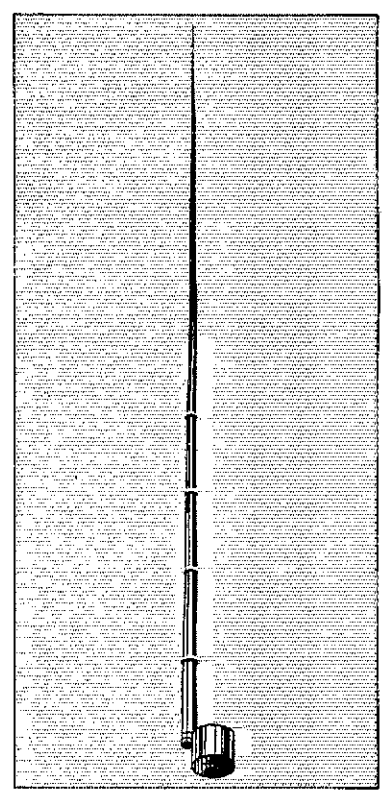

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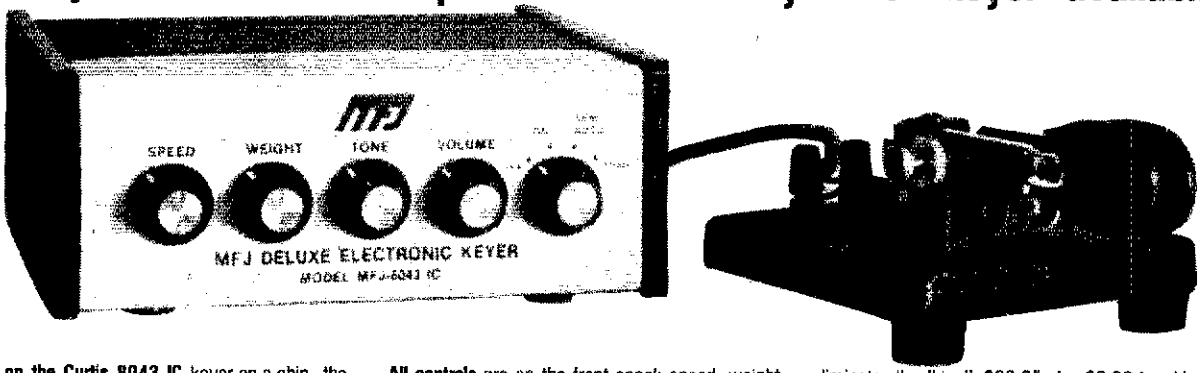

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Pilchuck, primary purpose for ARES and was used fo Punkin patrol in Everett. Patrols in Marysville an Snohomish covered on .58 simplex. K7GXZ new Mg WSN. NCS too fast on WSN? Try WCN, 3702, 7 PM d N7CTI (Ex-W7BCS) busy as Chairman NW Chapte QCWA. W7LG is new ORS. WA7OJI back on cw nel with FT101E. WB7CFH has Synthesized 2-meter ri WA7LQV has 2 on motorcycle. WA7BDD now on 2 FM K7MF (Ex-K7GGD) added 220 MHz to station. WA7LP has moved to Idaho. WA7YXX now WDØBGP. WA7YC now Sun. liaison WSN to RN7. WB7ETD has Thurstc City ARES bunny hunting. Clark Cty ARC play sink th Bismark on 146.49 Thur. the usual hidden transmitt hunts in Vancouver area still on for Sun. K7VNI W7IL WA7YOK WA7QQN are Novice Counselors for Mou. Baker ARC. Wash. nets are: NTN, 3970, 1930Z D W7PFD ESN, 3920, 0100Z Dy, K7RN: WARTS, 397 0200Z Dy, W7QGP; N.WSSB, 3945, 0230Z Dy, W7IEI WSN, 3590, 0245Z Dy, K7GXZ; CBN, 3960, 0300, WA7JX ARES/EC 3930, 1700Z Sun, WA7RWK/SEC. All evenir nets are subject to time changes due to band condition during the winter. NAMS (Northwest Amateur Monito ing Service) on from 1700-0145Z, 3970 Dy. We need yo help so mark Apr. 30 on your calendar for the Was State Diabetes Bikathon. Statewide coverage will b needed to link us all together. SEC WA7RWK will coo dinate the ARES for 75-meter coverage. Traffic: W7DZ 467, K7GXZ 133, N7AJ 60, WA7YCM 59, W7LG 5 W7APS 54, WA7BDD 38, W7BUN 34, W7EBU 33, WA7 OV 32, W7IEU 20, N7CT 13, WA7RCR 10, WB7CFH WA7KGT 4, W7RXH 4, WA7OJI 3.

PACIFIC DIVISION

EAST BAY: SCM, Charles R. Breeding, K6UWR — I a most sorry for having missed the last two reports. Due an illness in the family, time just ran out. This is my la report as SCM. On Jan. 1st, Bob Vallio, W6RGG/N6K will take over the duties of SCM, for the next two year Please send your reports by the 5th of the month to Bo Vallio, 18655 Sheffield Rd., Castro Valley, CA 94546. Bo comes to the office of SCM with much experience local and League activities. He is currently Radio Offic tor Alameda Co. RACES and has served on the ARRL D Advisory Committee. Bob also is a member of the No thern Calif. Contest Club, Northern Calif. DX Club and on the ARRL DX Honor Rolls. I would like to express m thanks to each and every one of you for helping in ma ing this Section a leader in the Pacific Division. The la four years have been the most pleasant years of m amateur radio life and this is because of you. Each ar every county of this Section has contributed much making amateur radio better. I would like to give a ve special thanks to W6ZF, for his assistance, council ar friendship, without which my job would have been ne impossible. My thanks to all the appointees for their e terest in the ARRL and the East Bay Section. Last ar most important, my thanks to you for allowing me serve as the East Bay Section, SCM.

NEVADA: SCM, Leonard M. Norman, W7PBV — SE K7ZAU. W7BES WB7DSP and K7WS were in conta with WB7DAA on the RACES repeater securing medic information and aid for a Boy Scout Troop. WA7LRU h new Dissel mobile unit. W7OK vacationing in W4-lan N7YL is a YL. W7PBV and WA7RPZ mobiling with ne Airstream Trailers. K7ICW has new ham shack. K7ZC is pres. of Las Vegas Chapter QCWA. With the help W7CYC W7MWF and WA7RPZ, W7CTK has his ne tower and beam set up and working at his new QT Reno Amateur Radio Clubs are planning a joi Christmas party. W7BIF and XYL are on a sea cruise South America and operating mobile from aboard sh K7EC is chief engineer of Las Vegas FM station, work ZL2GG both operators same age, name and identic rigs and antennas. W7PBV and WB7PWL attended t convention at Santa Maria. Z51JH was a guest WA7RPZ.

PACIFIC: SCM, Pat Corrigan, KH6DD — SEC: KH6CK Please contact KH6CKJ to offer your help in SE Typhoon Kim caused only slight damage at Guam a Saipan, fortunately. Hams were ready once agai SAROC-Hawaii had about 250 attendees this year Kuilima, many from W including W9JUV editor of H Report. KH6JF has QRQ net on 7030 Sun. morns 9A Hawaii time. Pac Inter-Island Net meets daily 14315 pl or minus 0800 UTC. Don't forget ARRL SET this mon and ARRL Int'l DX Contest in Feb./Mar. Congratulatio to our new Division Director. Let us all lend support him and keep him posted on membership desires. He our representative to the ARRL Board. Kauai will so have a 146.25/85 repeater. KH6HOU/KH6JNK will ha ultimate QSO this month when they tie nuptial knot.

SACRAMENTO VALLEY: SCM, Norman Wilson, N6JV SEC: W6SMU. WB6GFJ is new EC for Sutter and Yu Counties. Ross is also the new QSL Mgr. for AMSA W86DQP new trustee of the Mt. Vaca RC and WB6PH now serves on the MVRC Board of Directors. W6RI now is the Fri. night NCS on the Northern Calif. N which meets each night at 7:00 and 8:30 PM local ti on 3630 kHz. K6VT picked up a new Viking Ranger kit a local flea market. The Calif. QSO Party produced a of activity from most of our counties. K6SG and N6 made over 100K points in the CW SS contest wh W6NKR had over 60K. WB6FAA now on the Beryes ARC Board. Congratulations to N6KB/W6RGG the n SCM EBay. The Golden Empire ARS held their annu Steak Bake at Parkview School because of "rare" dar condx at Bidwell Park. Traffic: W6DEF 39, K6RPN W6RSP 17. WB6KUT 2.

SAN JOAQUIN VALLEY: SCM, Charles McConn W6DPD — Asst. SCMS: WA6YAK W6TRP WA6HIN. SE WA6YAB. Renewals: W6AJH, EC. W6DPD, OO, OF WB6RZI, OO. Appointments: WA6YAB is SEC, WA6C

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SX-99 Receiver	99
SX-117 Receiver	189
SR-150 Xcvr	259
SR-160 Xcvr	159
SX-146 Receiver	175
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FV-101 VFO	79
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Tektronix 5140	249
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Hickok 695 Generator	69
Bendix BC221 Freq Meter	39
Polarad Spectrum Analyzers A84T	1695
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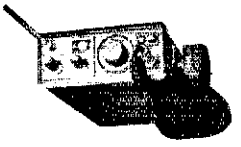

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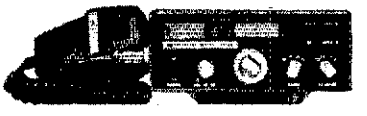

MIDLAND 13-510
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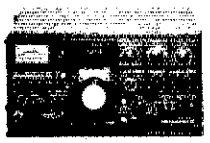

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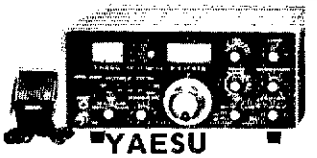

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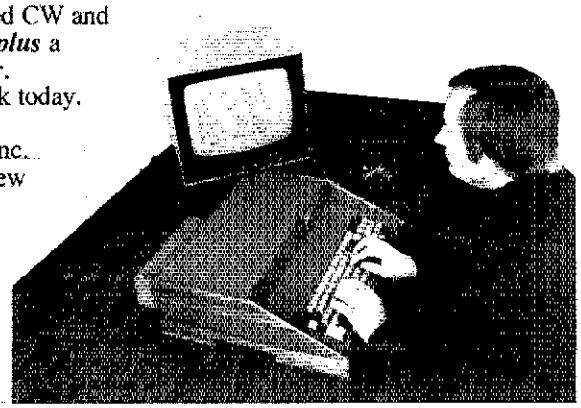

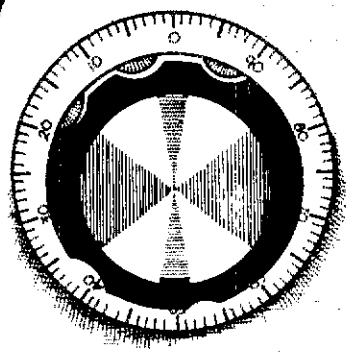

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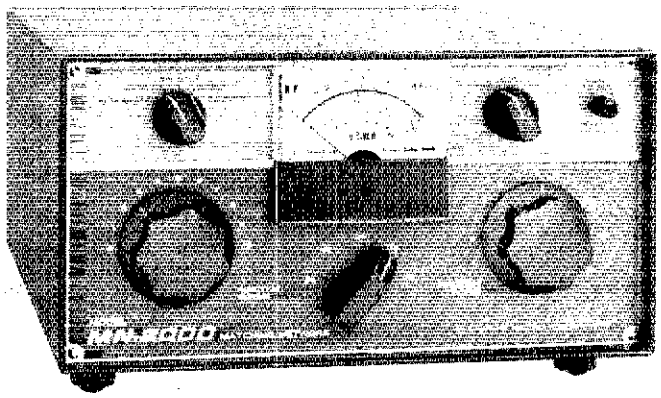
Antenna Matching Network



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EC for Fresno Co. WA6HIN Asst. SCM for the north section. Officers of the Central Valley RC are W6UBA, pres., WA6CYN, vice-pres.; W6BYH, secy-treas.; K6IUX, PR dir. The Sierra Amateur RC of the High Mojave is a new club in Ridgecrest with WA8KZV, pres. Officers of the QCWA Central Valley Chapter are W6OV, pres.; W6FHC, first VP; W6UZ, 2nd VP; W6BYH, secy.; W6TRP, treas. Stockton ARC 2m net meetas on Wed. at 8 PM on WR6ALK 147.765/147.165. WA6FWS a Silent Key. WA6COG is N6IO. WB6KHW is N6WC. WA6PJN and WA6SSG are General. WA6PRE has a TS700A. N6AM has an Atlas 350XL. WA6FQM a new tower and beam. WB6VJW made PSHR and operates from Ojai while at college. WA6IQZ returned to the air. Plan now for the Fresno Hamfest on May 5-7, 1978. Don't forget the SET. W6PJU won a prize at the Pacific Division Convention in San Mateo, attended by 15 from the SJV. I wish everyone a Happy New Year. Traffic: (Oct.) WB6VJW 55, WA6JDB 11, WA6KMW 11, WA6GJV 6, WA6CPP 5, WA6IQZ 5, W6DPD 1. (Sept.) WB6VJW 44, N6AM 10, K6YK 5.

SANTA CLARA VALLEY: SCM, Jim Maxwell, W6CF — This report prepared by SEC WB6IZF. RM:W6RFF. Nets: SCV ARES, Sun., 1000 LT, 3955 a.. At month end two high level repeaters serving the Section were poised and waiting to go into operation on the new subbands: WR6AZO on 145.47/144.47 and WR6ADC on 145.41/144.81 (and home of NCN-VHF at 1930 LT). QCWA will hold its annual luncheon at 1200 at the Seawolf, Jack London Square, Oakland, Feb 5, 1978. Walkathons: Palo Alto-Sunnyvale area, Oct. 16, 16 hams under EC W6ASH; King City, Oct. 1, 8 hams under EC WA6PLE; Salinas to Monterey, several hams under N6YR. Diabetes Bike Ride, San Jose, group from WR6ABD. Drills: San Benito County, Oct. 28, about 14 hams under EC K6LFZ. WR6AWM, 28/88, near King City, grew a new phased vertical array that vastly improved coverage to the more populous portions of its range — we're calling it the W6LIO vulture roost. SCV hams were everywhere at the Santa Maria SW Division Convention and then again at the Pacific Division Meet in San Mateo a week later. SCM W6CF checked in by Luft post card from Bayrichzell, Bavaria — can he really be there on business? Traffic: W6YBV 158, W6AUC 97, W6NW 13, W6KZJ 9, WA6HAD 3.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Bill Parris, K4GHR — SEC: W4EHF. PAM: W4OFO. RM: K4MC. VHF PAM: WB4VIM. All state nets have been filled with Christmas traffic with W4OFO & WB4MXG running up totals by handling messages from several eastern cities via 2 meters. Officers of Brightleaf ARC (Greenville) WA4MOK, pres.; K4NBH, vice-pres.; WD4JAD, secy.; WA4DAN, editor. W4OMW missed NC QSO Party due to spending a month in Ecuador. WB4KCS has large ARES group now active in Forsyth Co. WD4ABZ & WA4VMZ raecently got Novice WAS. Many Novice classes ended up before Christmas with 20 in Greenville, 50 in Raleigh, 20 in Charlotte, and 15 in Winston. Fine efforts were made in Oct. in completing the first trans NC 2-meter test from Manteo to Murphy. Thanks to N4UE for coming up with such an interesting test. K4JEX is working on a repeater for Elizabethtown. WB4ZQB is planning a repeater for Robinsville on 915/315. Cape Fear ARS ran their annual Ghost Patrol during Halloween with good results as usual. WA4WRQ now Advanced, WA4OOS is chasing WAS on 75, & WA4PSL is actively pursuing 5BWAS. Stanly CO ARC was active during recent Boy Scout pilgrimage at Camp Barnhardt. Coastal Carolina Emerg. Net had annual Xmas Party & Flea Market at Williamston. Watch for W4BFB in VHF contest this month and everyone be sure to be ready for the Simulated Emergency Test (SET) Jan. 28-29. Let's all keep North Carolina at the top of the national listing in the SET. Get your plans polished up now. See you in the SET. Traffic: (Oct.) WB4ZIQ 388, WA4PSL 361, W4EAT 345, WA4UTC 140, W4OFO 105, W4FMN 101, K4FTB 89, WB4MXG 88, N4ZH 64, K4VHT 56, WA4OQS 48, W4PCN 46, K4MC 41, WB4OXT 38, K4OGB 34, W4ACY 33, K4GHR 30, WB4VIM 23, WB4ULP 22, WA4SRD 22, WB4WII 16, WD4HCY 15, WB4TOP 6, W4EHF 6, WB4CES 6, WD4CNS 5. (Sept.) N4UE 60, K4AIH 3, K4JEX 2.

SOUTH CAROLINA: SCM, Tom Lufkin, WA4DAX — Asst. SCM: WA4MDP. SEC: WB4TNS. Chief PAM: W4MTK. PAM: WA4DZG. RM: WB4CAK. Don't know what heppened to last month's report, but my apologies to the members. XYL and I enjoyed a veary nice visit to the N. Augusta Belvedere ARC. W4OAQ new OO. SEC WB4TNS reports many new counties have ECs. If your co. is not represented contact Bill. Let's see if we can't get 100 percent representation. Also SET is this month and I hope to see your report of participation. K4ZN reports new location of hamshack helped him to make BPL. N4PQ also made BPL again. Anderson Club reports lots of fun with two meter transmitter hunt last month. May you and your families be blessed with a very Merry Christmas and the best of the New Year. Nets: SC SSBN QNI 1370, QTC 160. PX QNI 239, QTC 77. Anderson 2 Mtr net QNI 592, QTC 28. Traffic: N4PQ 575, K4ZN 523, WA4KXZ 167, W4NTO 106, W4MTK 55, W4FMZ 52, K4FRX 41, WA4DAX 35, WA4DZG 35, W4FVV 35, K4ULT 34, W4OCX 33, WB4CAK 23, WB4UDK 21, WB4JNE 8, WD4EDM 3, N4EE 3.

VIRGINIA: SCM, Robert L. Follmar, N4RF — SEC: WB4ZNB. PAM: WB4DBK. RMs: VN K4BKX; VSN AA4CK; 4RN W4SHJ. WB4DBK's beam still not wrking; college taking much time. HI. W4LXB has 2 new masts up 40-ft but no dipole tied in yet. WA4EPJ nw AA4CK. WA4UUX saving moola to buy new Ten-Tec, also wrking on Extra. K4GR's SB-104 has "stomach" prblms so restricted to TR4C. Director Wicker put out an FB Division Ltr. WA4STO misses everyone while wrking on new HW101. W4KX says VN like Halloween with all those new calls! W4TMN rpts that Williamsburg Club doing

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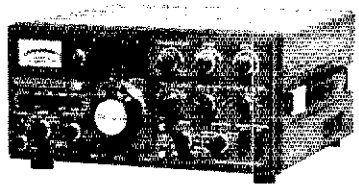

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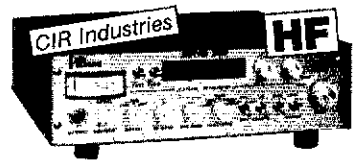

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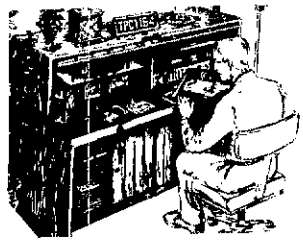

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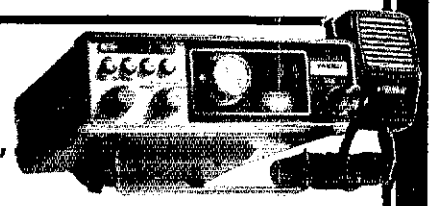

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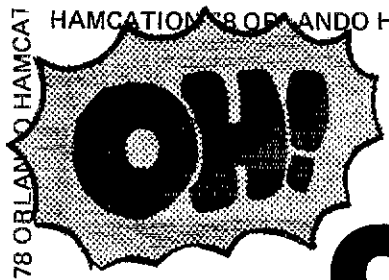

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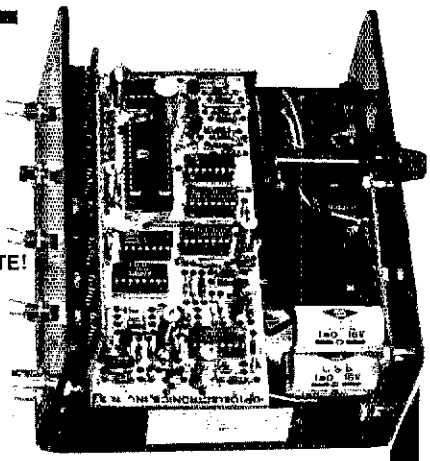

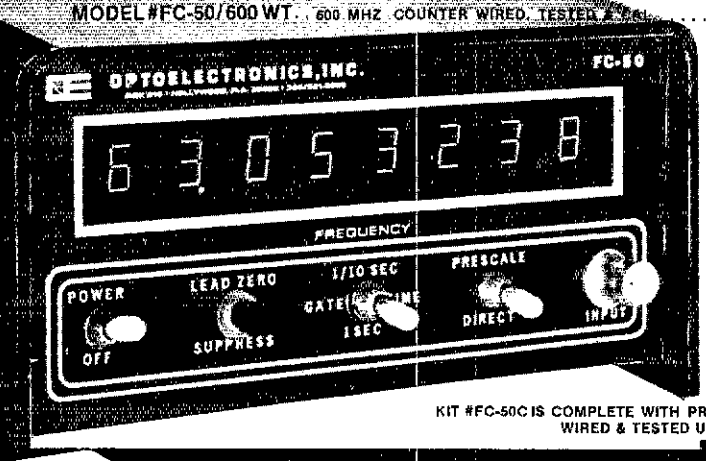

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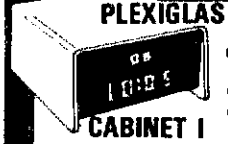

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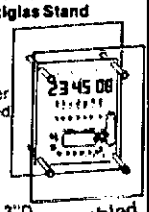
- Plug transformer
- all parts included



Plexiglas is Pre-cut & drilled
Kit #850-4 CP
Size: 6"H, 4½"W, 3"D
Assembled
$23.50 ea. **2/$45.** **$29.95**

60 HZ.

XTAL TIME BASE
Will enable Digital Clock Kits or Clock-Calendar Kits to operate from 12V DC. 1"x2" PC Board Power Req: 5-15V (2.5 MA TYP.) Easy 3 wire hookup Accuracy: ± 2PPM
#TB-1 (Adjustable)
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Wir & Cal **$9.95**

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PRIME - HIGH SPEED RAM
21L02-3 400 NS
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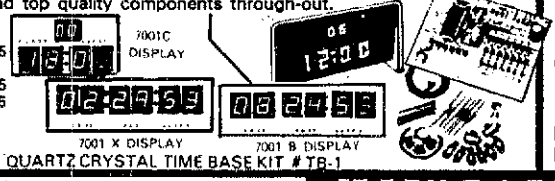
1-24	$1.75 ea.	100-199	$1.45 ea.
25-99	1.60 ea.	200-999	1.39 ea.
1000 AND OVER			**$1.29** ea.

6-DIGIT LED CLOCK CALENDAR KIT

DATE-TIME-SNOOZE ALARM & MORE... KIT 7001

FOR THE BUILDER THAT WANTS THE BEST. FEATURING 12 OR 24 HOUR TIME — 29-30-31 DAY CALENDAR. ALARM, SNOOZE AND AUX. TIMER CIRCUITS

Will alternate time (8 seconds) and date (2 seconds) or may be wired for time or date display only, with other functions on demand. Has built-in oscillator for battery back-up. A loud 24 hour alarm with a repeatable 10 minute snooze alarm, alarm set & timer set indicators. Includes 110 VAC/60Hz power pack with cord and top quality components through-out.



KIT - 7001B WITH 6 - .5" DIGITS $39.95
KIT - 7001C WITH 4 - .6" DIGITS & 2 - .3" DIGITS FOR SECONDS $42.95
KIT - 7001X WITH 6 - .6" DIGITS $45.95

KITS ARE COMPLETE (LESS CABINET)
ALL 7001 KITS FIT CABINET I AND ACCEPT QUARTZ CRYSTAL TIME BASE KIT # TB-1

PRINTED CIRCUIT BOARDS for CT-7001 Kits sold separately with assembly info. PC Boards are drilled Fiberglass, solder plated and screened with component layout.
Specify for 7001 **B, C or X - $7.95**

JUMBO DIGIT CLOCK

A complete Kit (less Cabinet) featuring: six .5" digits, MM5314 IC 12/24 Hr. time, PC Boards, Transformer, Line Cord, Switches and all Parts. Ideal Fit in Cabinet II
Kit #5314-5 **$19.95** **2/$38.**

JUMBO DIGIT CONVERSTION KIT **$9.95** ea.
Convert small digit LED clock to large .5" displays. Kit includes 6 - LED's, Multiplex PC Board & Hook up info.
Kit #JD-1CC For Common Cathode
Kit #JD-1CA For Common Anode

AUTO BURGLAR ALARM KIT

AN EASY TO ASSEMBLE AND EASY TO INSTALL ALARM PROVIDING MANY FEATURES NOT NORMALLY FOUND. KEYLESS ALARM HAS PROVISION FOR POS & GROUNDING SWITCHES OR SENSORS. WILL PULSE HORN RELAY AT 1HZ RATE OR DRIVE SIREN. KIT PROVIDES PROGRAMMABLE TIME DELAYS FOR EXIT, ENTRY & ALARM PERIOD. UNIT MOUNTS UNDER DASH - REMOTE SWITCH CAN BE MOUNTED WHERE DESIRED. CMOS RELIABILITY RESISTS FALSE ALARMS & PROVIDES FOR ULTRA DEPENDABLE ALARM. DO NOT BE FOOLED BY LOW PRICES - THIS IS A TOP QUALITY COMPLETE KIT WITH ALL PARTS INCLUDING DETAILED DRAWINGS AND INSTRUCTIONS OR AVAILABLE WIRED AND TESTED

KIT #ALR-1 **$9.95**
#ALR-1WT WIRED & TESTED **$19.95**

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- VARIABLE FROM 4 to 14V
- SHORT CIRCUIT PROOF
- 723 IC REGULATOR
- 2N3055 PASS TRANSISTOR
- CURRENT LIMITING AT 1 Amp

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TRANSFORMER 24V CT will provide 300MA at 12V and 1 Amp at 5V. $3.50

MOBILE LED CLOCK

12/24 HR .4" DIGITS!

MODEL #2001
12 VOLT AC or DC POWERED

- 6 JUMBO .4" RED LED'S BEHIND RED FILTER LENS WITH CHROME RIM
- SET TIME FROM FRONT VIA HIDDEN SWITCHES • 12/24-Hr. TIME FORMAT
- STYLISH CHARCOAL GRAY CASE OF MOLDED HIGH TEMP. PLASTIC
- BRIDGE POWER INPUT CIRCUITRY — TWO WIRE NO POLARITY HOOK-UP
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- TOP QUALITY PC BOARDS & COMPONENTS - INSTRUCTIONS.
- MOUNTING BRACKET INCLUDED

KIT #2001
COMPLETE KIT **$27.95** EA. 3 OR MORE **$25.95** ea. 115 VAC Power Pack #AC-1 **$2.50** EA.

ASSEMBLED UNITS WIRED & TESTED
ORDER #2001 WT (LESS 9V. BATTERY)
Wired for 12-Hr. Op. if not otherwise specified. **$37.95** EA 3 OR MORE **$35.95** ea.

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master charge
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fine and hopes to get reptr soon. K4KNP WB4DRC an N4GI busy sending out official bulletins. W4HU lead the OO group with 62 notices of 2nd harmonics (40-m band)! K4ZVS qualified for OO CL2, congrats! Nice n rpts from VN, VSN, VSBN and SVSN. Club papers rec and read from PTSMH ARC, SPARC, LARC, AMRAD an W4CA log. Much credit is due to those who "crank-out this info. A group of retired hams in Lynchburg hav formed a luncheon group, meeting once a month in local restaurant. K4DOR sent an FB news clip abou fone patches to the USS Independence (CV-62). W4SG new ORS & VNer has new Century 21 and full wave 40 loop. New OPS WA4FTG rpts a fair tfc total, welcon Margaret! W4NWM has been checking into 2-mtr ARE on "55" for Chesterfield Co., seems to be catching o Also sez 15/10 very good this month. W4OOL rpts th K4BRK heads grp that assisted in Hike/Bike for benef of retarded Citizens. K4DHB enjoyed 5 watt transcvr c OH visit and rpts that it works very well on 10 and 1 CW! K4LEF the new editor of W4CA log & new NCS the VSBN Magazine Session on Sun. afternoon. Als new OBS for VA! W4SUS new EC for Fauquier Co., co grats. K4SPS set up his TS520 & 2 mtr rigs at th Southampton Academy Fair. EC WA4FDV gave ARE Demo at Crater Amateur Radio Society's "Fall at Waln Mall" in Petersburg. The Chesterfield AREC Net is on month old, congrats. EC K4EJ met with Mayor & Re Cross on up-dating their net as being Emerg. Comm Liaison. WA4NYZ recruiting new amateurs in the Cou ty, also planning demo of ham radio at one of th schools he teaches at. W4DZN hopes his wrking hou let him stay on the nets, FB! WB2VYK, PRA and Edit VA Ham got beam up. W4JUJ operated a number of co tests and won 1st place award in the "Four-Land QS Party." N4DR has Drake 2s. Traffic: K4BKX 38 WB4DBK 314, W4LXB 193, WB4ZNB 182, AA4CK 18 W4UQ 163, K4KNP 162, WA4UUX 130, K4GR 120, K4ML 95, WB4FNW 87, K4JM 69, N4FM 62, WB4DQZ 51, N4L 50, WA4YIU 41, WB4WLJ 40, WB4KIT 36, W4SHJ 3 W4SVG 36, WA4FTJ 34, N4RF 34, W4NWM 27, W4OOL 2 K4DHB 23, K4LEF 19, WA4QQI 19, W4SUS 16, WA4PB 15, K4SPS 15, W4YVG 14, WA4FDV 14, N4DW 1 W4KUK 10, K4EJ 6, WA4NYZ 6, W4ZDN 6, W4VF W4AKN 4, WB2VYK 3, WA4QIT 2, W4DM 1, W4JUJ WA4NOB 1, N4DR 1. (Sept.) WD4KUK 26.

WEST VIRGINIA: SCM, Donald B. Morris, W8JM — Sta Radio Council officers, K8KT, pres.; WB8GDY, vice-pres WB8WNZ, secy.; K8SR, treas. Monongalia Wirele Assn. Hamfest, Morgantown, Sept. 3, 1978. MARA, Fa mont officers, WB8BMV, pres.; WB8WXW, vice-pres WD8EBI, secy., W8JM, treas.; WB8LAI, act. mgr. Ne amateur Buckhannon, WD8PAD. 2-meter FM nets, Pa sons, 13/73. Morgantown, 16/76. Charleston, 28/88 Fa mont, 31/91. Clarksburg, 72/12. W8WVA in operation New River Bridge ceremonies, excellent PR work b Kanawha ARC. Net, Freq. Time(Z)Days, Ck-in, Tfc, Ses Hillybilly 14290, 1700 Su, 178, 63, 4. Phone 3990, 1700 D 511, 128, 31. Phone 3990, 2300 Dy, 1028, 282, 31. C 3567, 0000 Dy, 126, 32, 27. Novice 3730, 2215, Dy, 156, 4 30. Traffic: K8BT 70, WD8EGW 60, W8JM 58, WB8YM 57, W8HZA 36, K8MS 36, WB8VAZ 29, WB8IIi 27, K8K 22, W8WVA 20, W8CKX 19, K8ZDY 15, WB8ZTL 14, W8F 12, WD8CDQ 11, WA8RUZ 11, K8JQ 9, K8QEW 9, K8VN 9, W8JWX 9, WD8DHC 7, WD8JNU 5, WD8LDY WB8YFC 5, K8SR 5, WB8IHA 5, W8IBE 5, W8AHZ K8MHR 4, W8BZTV 3, WD8CNM 3, WB8CNN 3, W8BN 3, N8FB 3, WB8WNZ 2, K8YL 2, K8MZM 2, WD8IGN W8KWI 2, K8CFT 2, WB8WTS 2, WA8RHT 2, WA8LFW K8ZPN 1, W8DYB 1, WB8YUG 1, WA8LFZ 1, K8GEP K8SVH 1, WB8NSL 1, WD8CUC 1, WB8TJO 1, W8UT WA8NJB 1, K8TW 1, K8LSN 1, WA8YCD 1, WD8COS WB8SAW 1, WB8RTJ 1, K8MSP 1, W8ETF 1, K8ZDV 1

ROCKY MOUNTAIN DIVISION

COLORADO: SCM, Clyde O. Penney, WAØHLQ — SE KØFLQ. RM: KØTER. PAMs: KØCNV WAØYGQ. KØHPE e joyed many contacts during recent 10-meter band ope ing to Europe, Japan & Ea. Coast. WØGW is enjoying h new Kenwood TR7400A. KØOHU happily reports he ca finally straighten out the 80-meter dipole at his ne QTH. WØHXB advises that DTWN now meets at 7:00 AM MDST/MST, on 3930 kHz. Everyone is invited to check i — all are welcome. Net Tfc. for Oct.: Hi Noon QNI 116 QTC 65, informals 158, QNF 1289, 30 sessions. Traffi (Oct.) WØWYX 1903, KØYFK 1086, KØDJ 491, WØHXB 25 WØEJD 185, WBØZQG 126, WBØPVT 97, WBØMCL 8 WAØREX 74, WBØQPO 73, KØPVI 65, WAØYNP 49, KØTE 47, WØLAE 38, WØMDT 28, WDØBNL 12, WAØTMA WAØYED 6, WØNFW 4, WBØUMV 4. (Sept.) WBØIBS 30 WØFV 103, WØHXB 90, WBØPVT 77, WØETT 76, KØWZ 62, WØLQ 53, WBØZQG 37, KØOHU 34, WØPT 22, WØNF 16, WØMYB 12. (Aug.) WØHXB 96, KØWZN 62, WØMYB 1 WBØZQG 6. (July) WØHXB 47, WBØZQG 2. (June) WØHX 62, WBØZQG 2. (May) WBØZQG 22.

NEW MEXICO: SCM, Joe T. Knight, W5PDY — SE W5ALR. PR: W5QNR. PAM: K5IKL. RM: K5KPS Southwest Net (SWN) meets daily on 3585 kHz, at 191 local time and handled 75 msgs with 255 stations repo ting in. New Mexico Roadrunner Net (NMRRN) meet daily on 3940 kHz at 1800 local and handled 63 msg with 945 stations reporting in. Nex Mexico Breakfa Club meets daily on 3940 kHz at 0700 local, handled 5 msgs with 550 check-ins. W5TDB and W7DEJ are in proving after stays in the hospital. Pecos Valley AR doubled membership in one year with several new ARR members. Lots of Search and Rescue activity in th state — Good job, fellows. Traffic: W5DAD 360, W5JO 294, N5NG 179, W5KH 174, K5KPS 165, W5ENI 9 K5MAT 61, WB5ROP 48, WA5MIY 16, W5YQ 12, WA5OH 11, W5BWV 8, WA5TGL 7.

UTAH: SCM, Carl R. Ruthstrom, W7GPN — SE WA7ZBO. Your SCM visited the Moab RC Oct. 4 and wa greeted by an active and enthusiastic group. There ar 16 licensed in the Moab area, 12 of whom were at th

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BARREL KIT #249 UTILITY AC OUTLET 12 for $1.98 — Great for AC appliances, stereos. For 1/2 x 15/16" mounting hole, with 6" wire leads! Wt. 12 ozs. Cat. No. 1M3766

BARREL KIT #244 HOBBY 1702A ROMS 3 for $1.98 — Hobby fallouts of the famous erasable programmable ROM, 2048 bit. Cat. No. 1M3729

BARREL KIT #239 SHIELDED CABLE 40-ft. $1.98 — For mikes, stereos; 1-cond. plus shield, 22 ga. vinyl jacket. Wt. 1 lb. Cat. No. 1M3577

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☐ 1702A	Erasable PROM	4.95
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☐ 11C90DC	650 MHz Prescaler	14.95
☐ KR2376-139	BCD Encoder ROM	6.95
☐ KR2376-ST	ASCII Encoder ROM	14.95
☐ MM5369	60Hz Time Base	1.95
☐ 3.579MHz	Time Base Xtal	1.95
☐ 1.00MHz	Touch Tone Xtal	5.95

BARREL KIT #225 SOUND TRIGGERS 3 for $1.98 — "Hand clap" sensitive crystal mike amplifier, triggers SCR. Use for alarms, etc! Wt. 6 ozs. 1M3628

BARREL KIT #221 IC SOCKETS 8 for $1.98 — Mfr unloads! Four 14-pin, four 18-pin. Solder tail, lo-profile. No. 1M3621

BARREL KIT #219 MIXED READOUTS 15 for $1.98 Hobby — Barrels of untested .17", .3", .5", 7-segs, like FND-357, 500, 503, MAN-3's. What a buy! No. 1M3619

BARREL KIT #210 GLOWIN' PANELS 3 for $1.98 — 4" x 1" panels that glow blue-green with 110VAC. Use for nite lites, indicators, etc. Cat. No. 1M3550

BARREL KIT #205 MINI BLOCK CAPACITORS 50 for $1.98 — Unbelievable! Worth $50. High precision subminicaps for all applications. Wt. 8 ozs. No. 1M3528

BARREL KIT #203 CALCULATOR KEYBOARDS 10 for $1.98 — It's true! 20-key, 4 function keyboards at ridiculous give-away. Wt. 12 ozs. Cat. No. 1M3624

BARREL KIT #201 6V INDICATORS w/leads 15 for $1.98 — Test lamp manufacturer dumps inventory! Worth 60¢ ea. Like grain-o-wheat. Cat. No. 1M3526

BARREL KIT #200 6 DIGIT READOUT MODULES 5 for $1.98 — Barrels and barrels and no time to test. Calculator and driver chips beneath epoxy on back. Wt. 6 oz. 1M3515

BARREL KIT #185 PC BOARDS 400 PARTS $1.98 — Computer maker dumps 1000's of PC boards loaded with IC's, resistors, diodes, transistors. 100% good. Wt. 2 lbs. No. 1M3388

BARREL KIT #184 ¼-WATT METAL FILM 150 for $1.98 — Popular, 100s projects, hi-fi, etc. Factory dumps into barrel! Excellent asst. of 100% metal film resistors. Long leads 1M3413

BARREL KIT #182 JUMBO RED LEDS 15 for $1.98 — 100% material, user cancellation from factory dumps. 3V 10 mils. For 100's of projects, red lens. Cat. No. 1M3369

BARREL KIT #181 MICRO ZENERS 100 for $1.98 — 1-Watt, tiny, 100% material, from 2V to 30V. Axial leads. No shorts, no opens. DO-7 & micro epoxy units. Cat. No. 1M3368

BARREL KIT #177 LED DRIVER ICS 30 for $1.98 Hobby — ITT version of 75491 and 2's, for driving multiple LEDs. Clocks, calculators, etc. 14-pin dips, untested, excellent yield. 1M3360

BARREL KIT #163 MINI TRIM POTS 30 for $1.98 — Brand new pots, for pc use. Asst. values 100 to 1 meg (approx) because factory discontinued line & barreled 'em. What a buy. Single turn, ¼ W. 6 oz. 1M3345

BARREL KIT #160 HOBBY VOLTAGE REGULATORS 10 for $1.98 — LM-309K TO-3 barreled, but by the pound, but who wants to check 'em? Your gain. Cat. No. 1M3330

BARREL KIT #159 MODULAR SWITCHES 25 for $1.98 — Centralab "push-ON" switches. TV-makers excess. Dpdt, 6pdt, etc. Brand new. Cat. No. 1M3150

BARREL KIT #158 MAGNIFIED MAN-3's 20 for $1.98 — Famous MAN-3 seven segment readout, built on magnifiers. Factory discontinued line. Untested, guaranteed 90% yield. 1M3325

BARREL KIT #149 ROCKER SWITCHES 12 for $1.98 — Barrels 'n barrels, so many, our customers should get the deal. No. 1M3302

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Type	Sale	Type	Sale	Type	Sale
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☐ SN7403	.14	☐ SN7472	.26	☐ SN74154	.98
☐ SN7404	.17	☐ SN7473	.31	☐ SN74155	.78
☐ SN7405	.18	☐ SN7474	.31	☐ SN74156	.68
☐ SN7406	.19	☐ SN7475	.48	☐ SN74157	.64
☐ SN7410	.14	☐ SN7476	.32	☐ SN74160	.89
☐ SN7411	.19	☐ SN7478	.28	☐ SN74161	.87
☐ SN7413	.39	☐ SN7483	.69	☐ SN74163	.87
☐ SN7414	.61	☐ SN7485	.88	☐ SN74164	.95
☐ SN7417	.24	☐ SN7486	.29	☐ SN74165	.95
☐ SN7420	.14	☐ SN7488	2.95	☐ SN74166	1.15
☐ SN7423	.26	☐ SN7490	.69	☐ SN74173	1.19
☐ SN7427	.26	☐ SN7491	.63	☐ SN74174	.93
☐ SN7430	.14	☐ SN7492	.45	☐ SN74175	.88
☐ SN7432	.24	☐ SN7493	.45	☐ SN74177	.77
☐ SN7437	.24	☐ SN7494	.69	☐ SN74179	1.49
☐ SN7438	.24	☐ SN7495	.69	☐ SN74180	.69
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☐ SN7451	.14	☐ SN74123	.49	☐ SN74193	.83
☐ SN7453	.14	☐ SN74125	.39	☐ SN74194	.83
☐ SN7454	.14	☐ SN74126	.39	☐ SN74195	.75
☐ SN7455	.14	☐ SN74132	.63	☐ SN74197	.75
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		☐ SN74141	.52	☐ SN74200	5.50
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BARREL KIT #145 MINI TRANSFORMER 15 for $1.98 — Miniature transformer back again. Asst. outputs, interstage and audio, only 1" sq. Wt. 2 lbs. 1M3294

BARREL KIT #144 RCA PHONO PLUGS 40 for $1.98 — 1,000,000 RCA phono plugs for this one. You hi-fi-ers know what they are . . . 100% material. Look at the price. No. 1M3293

BARREL KIT #138 PANEL SWITCHES 30 for $1.98 — Did you hear of Oak? Another equipment maker barrelled all types of rotaries, electric, slides, etc. 1M3268

BARREL KIT #135 MICRO MINI LAMPS 20 for $1.98 — "Skinny C-Thru's". New, Monsanto, infra-red led, photo darlingtons, photo transistors. No. 1M3262

BARREL KIT #128 MINI-DIP IC'S 100 for $1.98 — 741's, LM380, 703, 567, 555, who knows? Factory mixed, you test. Untested and hobby. Wt. 1 lb. Cat. No. 1M3245

BARREL KIT #127 AXIAL ELECTROS 40 for $1.98 — Truthfully the factories (by mixing 'em in barrels) do all of us a favor. WOT A BUY! Asst. capacities and voltages. No. 1M3227

BARREL KIT #126 UPRIGHT ELECTROS 40 for $1.98 — Wide asst. of values from 1mf to 300mf in mixture of voltages, 100% marked 'n good. Why barreled? Cat. No. 1M3226 4 ozs.

BARREL KIT #115 MOLEX SOCKETS 150 for $1.98 — Calculator maker dump! We got a zillion of 'em. Used for IC sockets. 1M3144

BARREL KIT #112 MICRO MINI LEDS 40 for $1.98 — All the tiny leds, axial, upright of Monsanto, Litronix. Yield 60% or better. Cat. No. 1M3139

BARREL KIT #109 TERMINAL STRIPS 100 for $1.98 — Wide asst. of terminal strip connectors, from 1 contact up. Strip manufacturers barrel dump 1M3136

BARREL KIT #107 SQUARE OHMS 60 for $1.98 — Factory people are sometimes "squares" when they topple prime square ohms mix 'em up in barrels. Asst. values watts. 1M3096

BARREL KIT #104 SLIDE VOLUME CONTROLS 15 for $1.98 — Used in hi-fi, volume control maker unloads. Asst. values, what a buy. Worth $1 ea. 1M3057

BARREL KIT #101 RESISTOR SPECIAL 200 for $1.98 — Includes: 1/8, 1/4, 1/2, 1, 2-watters, carbon, % oz. 100% good. 1M3054

BARREL KIT #99 PHOTO ELECTRIC CELLS 10 for $1.98 — Asst. GE types, CDS types. Mixed by factory. Big job for us to separate. 100% good. Cat. No. 1M3052

BARREL KIT #93 HALF WATTERS 200 for $1.98 4 oz. 1M3046 — Resistor factory tried to fool us by mixing 100% color-coded resistors in barrel. But value is there.

BARREL KIT #87 NATIONAL IC BONANZA! 100 for $1.98 1M2860 — Hobby and untested, factory mixed in barrels. Linears, 7400's, ROMS, DTL'S, registers, clock and calculator chips and more. Wt. 12 ozs.

BARREL KIT #86 HOBBY LEDS 40 for $1.98 — WOW! Top U.S.A. maker dumps discretes in barrels. Hobby and untested. Useable yield 50% or better! Wt. 4 ozs. No. 1M2859

BARREL KIT #82 LM-340T VOLTAGE REGULATORS 15 for $1.98 — Factory rejects, hobby, cosmetic rejects. May include 5, 6, 12, 15, 18 or 24 volts, TO-220 power tab. Wt. 4 ozs. 1M2635

BARREL KIT #81 SUBMINI RESISTORS 200 for $1.98 — PC, upright type, color coded. 1/8 watt. Asst. values. Came to us in a barrel. Cat. No. 1M2746

BARREL KIT #76 1-WATT ZENERS 100 for $1.98 Untested — Factory same as 400-mw's. Never-to-see-again offer. 6, 8, 10, 12, 15V, under glass. Double plug 1M2741

BARREL KIT #73 TRANSISTOR ELECTROS 50 for $1.98 — It "bugs" us why the factories dump 'em in barrels. We don't wish to separate wide asst voltages & values to 300 mf. 1M2747

BARREL KIT #71 CAPACITOR SPECIAL 100 pcs. $1.98 — 100% good. Emptied stockrooms into barrels of mylars, poly's, micas, moldeds, plastics, ceramics, discs. 1M2738

BARREL KIT #68 2 WATTERS 100 for $1.98 — 100% good. So many suppliers don't count, but throw 'em in the barrel. It's a li'l gold mine. All marked. 1M2728

BARREL KIT #62 MIXED IC'S 100 for $1.98 — All types, 7400's, 8000's, 9000's, RAMS, ROMS, RTL, DTL, linears of all kinds. What a mix. Hobby and untested. Wt. 12 ozs 1M2730

BARREL KIT #61 POLYSTYRENE CAPS 100 for $1.98 — Finest caps made. As a gamble we bought 10 barrels from factory, mixed values; all good. 1M2729

BARREL KIT #58 SLIDE SWITCHES 25 for $1.98 1M2726 — All shapes, sizes, spst, dpdt, momentaries, etc. Tremendous shop pak for 100's of switching projects

BARREL KIT #56 POWERS! POWERS! 100 for $1.98 — Large distributor cleaned house. Barrels of power resistors 4 to 7 watts. No. 1M2724

BARREL KIT #54 6 & 8 DIGIT READOUTS 10 for $1.98 — Bargain of a lifetime. We got a barrel of 'em, but no time to test. Untested and hobby. Multiplexed, blisdor type. Wt. 8 ozs 1M2722

BARREL KIT #40 HOBBY PNP POWER TRANSISTORS 15 for $1.98 — Popular germanium and silicon TO-3's, factory "off-spec" and fallouts. 100% hobby, no opens, no shorts! Wt. 16 ozs. No. 1M2618

BARREL KIT #39 HOBBY NPN POWER TRANSISTORS 15 for $1.98 — Factory fallouts and "off spec" TO-3 powers. 100% hobby, no opens, no shorts! Wt. 1 lb. No. 1M2617

BARREL KIT #36 GERMANIUM DIODES 200 for $1.98 Untested — Famous maker, popular item. Never grows old. But this is the way the RE-TESTERS buy 'em from the factories. 1M2614

BARREL KIT #35 NEON LAMPS 30 for $1.98 — Famous NE-2's. All prime, but factory made millions and barrel'ed 'em. Your advantage. 1M2413

BARREL KIT #31 METALLIC RESISTORS 100 for $1.98 — Made mostly by Corning, the finest resistor made. Mostly ½ watters, 1% to 5% tol. & a barrel of values. 1M2609

BARREL KIT #30 PREFORMED RESISTORS 200 for $1.98 — We got barrels of ¼ and ½ watters for pc use. You'll get even amount 100: ¼, 100 ½ watters. Cat. No. 1M2608

BARREL KIT #27 PREFORMED DISCS 150 for $1.98 — Hi-Fi mfr's shelf inventory but he dumped 'em in barrels. Preformed, for PC use. Mixed values too 1M2605

BARREL KIT #26 PLASTIC TRANSISTORS 100 for $1.98 — Untested and hobby plastic transistors, TO-92 (TO-18), asst. 2N numbers, asst. manufacturers. Wt. 8 ozs. Cat. No. 1M2604

BARREL KIT #25 METAL CAN TRANSISTORS 100 for $1.98 1M2603 — Factory unloads barrels of prime, hobby and untested TO-5, TO-1, and TO-18 transistors. Marked and unmarked. Wt. 20 ozs.

BARREL KIT #19 DIPPED MYLARS 60 for $1.98 — Finest capacitors made, shiny finish. Imagine factory dumping 'em in barrels. Cat. No. 1M2597

BARREL KIT #17 LINEARS AND 7400's DIPS 100 for $1.98 — Untested and hobby, from factory to you. Marked and unmarked, some with internal numbers. Wt. 18 ozs. Cat. No. 1M2431

BARREL KIT #14 PRECISION RESISTORS 200 for $1.98 — Marked ½, ¼, 2 watts. 1M2428

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BARREL KIT #10 ROMS-REGISTERS 75 for $1.98 — Hobby and untested, marked and internal numbers, from 28 to 40 pins. Wot a buy! Wt. 16 ozs. No. 1M2424

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BARREL KIT #8 SCRS, TRIACS, QUADRACS 40 for $1.98 — All the famous plastic power tab type. Raw factory stock! All the 10 amp types. Cat. No. 1M2419 Untested

BARREL KIT #4 "4000" RECTIFIERS 100 for $1.98 — These are the famous micro miniature rectifiers of the 1N4000 series. May include 25, 50, 100, 200, 400, 600, 800 and 1000 volters. Cat. No. 1M2417

BARREL KIT #3 1N4148/914 SWITCHING DIODES 100 for $1.98 Hobby — You never saw this before. Imagine famous switching diodes at these prices! Untested. No. 1M2418

BARREL KIT #2 LINEAR OP AMPS, DIPS 75 for $1.98 Untested, hobby — May include 709's, 741's, 703's, 560 series, 555 includes marked and unmarked Cat. No. 1M2416

BARREL KIT #1 SN7400 DIP IC'S 75 for $1.98 — Marked 14 and 16 pin dips, may include gates, flip-flops, registers, counters, who knows? Guaranteed satisfaction. Untested, hobby. Wt. 14 ozs. 1M2415

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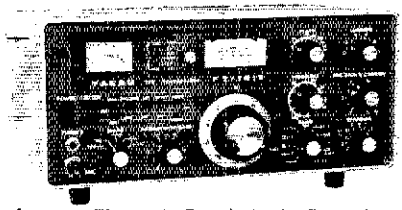

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YO-100 Monitor scope	199.00
YP-150 150w Dummy load/wattmeter	69.00
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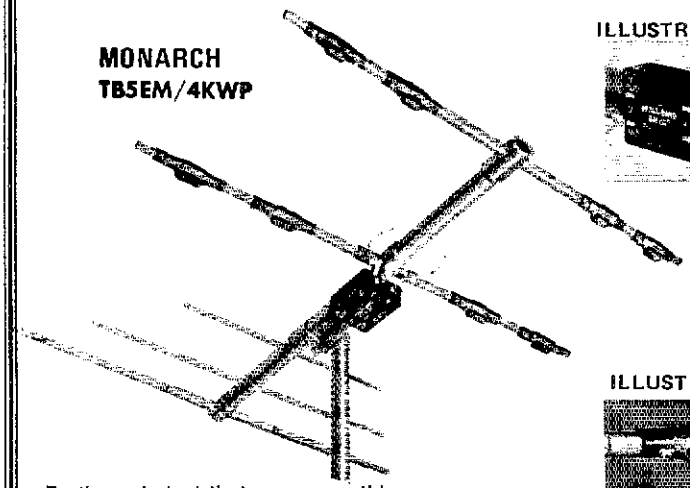

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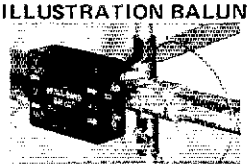

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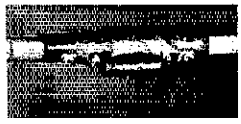

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RX50C Kit . .	30-60 MHz rcvr w/2 pole 10.7 MHz crystal filter	64.95
RX50C W/T . .	same as above—wired & tested .	117.95
RX144C Kit. .	140-170 MHz rcvr w/2 pole 10.7 MHz crystal filter	74.95
RX114C W/T .	same as above—wired & tested .	119.95
RX220C Kit. .	210-240 MHz rcvr w/2 pole 10.7 MHz crystal filter	74.95
RX220C W/T .	same as above—wired & tested .	117.95
RX432C Kit. .	432 MHz rcvr w/2 pole 10.7 MHz crystal filter	84.95
RX432C W/T .	same as above—wired & tested .	129.95

RXCF	accessory filter for above receiver kits gives 70 dB adjacent channel rejection	8.95
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

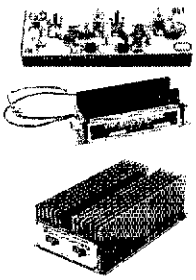
TRANSMITTERS

TX50	transmitter exciter, 1 watt, 6 mtr.	44.95
TX50 W/T . . .	same as above—wired & tested . .	64.95
TX144B Kit . .	transmitter exciter—1 watt—2 mtrs	34.95
TX144B W/T .	same as above—wired & tested. . .	59.95
TX220B Kit . .	transmitter exciter—1watt—220 MHz	34.95

TX220B W/T .	same as above—wired & tested . .	59.95
TX432B Kit . .	transmitter exciter 432 MHz . . .	49.95
TX432B W/T .	same as above—wired & tested . .	79.95
TX150 Kit. . .	300 milliwatt, 2 mtr transmitter .	24.95
TX150 W/T . .	same as above—wired & tested . .	39.95

POWER AMPLIFIERS

PA2501H Kit .	2 mtr power amp—kit 1w in—25w out with solid state switching, case, connectors.	64.95
PA4010H Kit .	2 mtr power amp—10w in—40w out—relay switching	64.95
PA50/25 Kit. .	6 mtr power amp, 1w in, 25w out, less case, connectors & switching	54.95
PA144/15 Kit .	2 mtr power amp—1w in—15w out—less case, connectors and switching	44.95
PA144/25 Kit .	same as PA144/15 kit but 25w .	54.95
PA220/15 Kit .	similar to PA144/15 for 220 MHz	44.95
PA432/10 Kit .	power amp—similar to PA144/15 except 10w and 432 MHz	54.95
PA140/10 W/T	10w in—140w out—2 mtr amp .	219.95
PA140/30 W/T	30w in—140w out—2 mtr amp .	189.95



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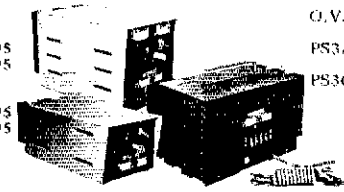
Model	BAND	Power Input	Power Output	
BLC 10/70	144 MHz	10W	70W	149.95
BLC 2/70	144 MHz	2W	70W	169.95
BLC 10/150	144 MHz	10W	150W	259.95
BLC 30/150	144 MHz	30W	150W	239.95
BLD 2/60	220 MHz	2W	60W	164.95
BLD 10/60	220 MHz	10W	60W	159.95
BLD 10/120	220 MHz	10W	120W	259.95
BLE 10/40	420 MHz	10W	40W	179.95
BLE 2/40	420 MHz	2W	40W	179.95
BLE 30/80	420 MHz	30W	80W	259.95
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. . .	94.95
PS15C W/T. . .	same as above—wired & tested. . .	124.95
PS25M Kit. . .	25 amp—12 volt regulated power supply w/case, w/fold-back current limiting and ovp, with meter	164.95
PS 25M W/T. .	same as above—wired & tested. . .	179.95



O.V.P.	adds over voltage protection to your power supplies, 15 VDC max. . .	12.95
PS3A Kit . . .	12 volt—power supply regulator card with fold-back current limiting . .	10.95
PS3012 W/T .	new commercial duty 30 amp 12 VDC regulated power supply w/case, w/fold-back current limiting and overvoltage protection	249.95

REPEATERS

RPT50 Kit. . .	repeater—6 meter	499.95
RPT50	repeater—6 meter, wired & tested	799.95
RPT144 Kit . .	repeater—2 mtr—15w—complete (less crystals)	499.95
RPT220 Kit . .	repeater—220 MHz—15w—complete (less crystals)	499.95
RPT432 Kit . .	repeater—10 watt—432 MHz (less crystals)	579.95
RPT144 W/T .	repeater—15 watt—2 mtr.	799.95
RPT220 W/T .	repeater—15 watt—220 MHz. . . .	799.95
RPT432 W/T .	repeater—10 watt—432 MHz. . . .	849.95

DPLA50	6 mtr close spaced duplexer	575.95
DPLA144 . . .	2 mtr, 600 KHz spaced duplexer, wired and tuned to frequency . . .	379.95
DPLA220 . . .	220 MHz duplexer, wired and tuned to frequency	379.95
DPLA432 . . .	rack mount duplexer	319.95
DSC-U	double shielded duplexer cables with PL259 connectors (pr.) . . .	25.00
DSC-N	same as above with type N connectors (pr.)	25.00

TRANSCEIVERS

TRX50 Kit . .	Complete 6 mtr FM transceiver kit, 20w out, 10 channel scan with case (less mike and crystals).	244.95
TRX144 Kit .	same as above, but 2 mtr & 15w out	234.95
TRX220 Kit .	same as above except for 220 MHz	234.95
TRX432 Kit .	same as above except 10 watt and 432MHz	264.95
TRC-1	transceiver case only	29.95
TRC-2	transceiver case and accessories . .	49.95

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.	$ 7.95
CD2 Kit	10 channel xmit deck w/switch and trimmers	15.50
CD3 Kit	UHF version of CD1 deck, needed for 432 multi-channel operation.	13.50
COR2 Kit . . .	carrier operated relay.	22.75
SC3 Kit	10 channel auto-scan adapter for RX with priority	19.95
Crystals	we stock most repeater and simplex pairs from 146.0-147.0 (each). .	5.00
CWID Kit . . .	159 bit, field programmable, code identifier with built-in squelch tail and ID timers	39.95
CWID	wired and tested, not programmed	54.95
CWID	wired and tested, programmed .	59.95
MIC 1	2,000 ohm dynamic mike with P.T.T. and coil cord	12.95
TS1 W/T	tone squelch decoder	59.95
TS1 W/T	installed in repeater, including interface accessories	89.95
TD3 Kit	2 tone decoder	35.95
TD3 W/T . . .	same as above—wired & tested .	59.95
HL144 W/T . .	4 pole helical resonator, wired & tested, swept tuned to 144 MHz ban . .	29.95
HL220 W/T . .	same as above tuned to 220 MHz ban	29.95
HL432 W/T .	same as above tuned to 432 MHz ban	29.95

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club meeting. Their calls are: W7AWK W7JBW WA7JTG WB7POD K7QEQ WB7QYJ WB7QYL WB7RBW WB7RFX WB7SJC K7SQD and K7VJP. Club officers are: K7QEQ, pres., WB7RBW, vice-pres.; WA7JTG, secy-treas., W7AWK, act. mgr. So far this year 7 have been licensed with new potentials in view. Club members expressed their appreciation for the new ARRL license manual and the need for a slow speed cw net. K7VJP is EC for Grand Co. K7QEQ activated their 2-meter repeater on Bald Mesa Oct. 4. The frequency is 146.16/76. Coverage looks good for southeastern UT. W7KHY received his Extra Class license. Ex-W7ISY now N7UT. K7RGY was married and will be in new home soon. K7CKF received Utah code net certificate. WA7TSB home from mission. WA7OXZ studying nursing. W7QDY is a Silent Key. He will be missed. Renewed ORS are W7KHY and WA7DAU. Traffic: K7HLR 177, WA7MEL 96, WA7JRC 82, WB7DMS 24, W7UTM 8.

WYOMING: SCM, Chester C. Stanwaity, W7SDA — Asst. SCM: Tom Graham, W7HKK. PAM: WA7WFC. RM: K7KSA. N7BQ and K2QLT/7 have moved to Worland. John is Diesel instructor at the Industrial Institute. WA7TCQ is now WD0FBO. WB7UBV, XYL of WA7EUT is new General in Etna. WB7TRQ WB7TSL and WB7TUF are new Novices in Cheyenne. WB7TSQ is new Novice in Rock Springs. WB7TVD is new Novice in Sheridan. WB7TWJ new Novice in Casper. W7VEW reports having a ball one evening this month during an Aurora opening on 2 meters. He worked several new states. K7SLM reports Wyoming Cowboy net held 21 sessions, 681 QNI, 24 QTC. Traffic: W7SQT 479, K7VWA 381, W7TZK 348, K7SLM 8.

SOUTHEASTERN DIVISION

ALABAMA: SCM, Jim Brashear, WB4EKJ — K4UMD operating 2 meters from Smith Lake; he says W4WLC still not on low bands yet. WB4UNY is now AA4LC, first in Ala? WA4VEK now Advanced Class. W4MHC relocated and getting tower back up. Congratulations to our newest club Enterprise Amateur Radio Society with 18 charter members; 8 months ago there were only 2 act- tive hams in Enterprise. Officers are K4HKR, pres.; WB4 JSO, vice-pres.; WD4KYV, secy-treas.; WA4YQT, act. mgr. K4HJM reports AREC interest still high in his area. If you handle traffic, report the count to your SCM. If you don't handle traffic, report items to him that may be of interest to others in our Section. Proposed changes to Section FD rules are that our NTS nets should not be used to provide contacts to Section clubs/groups operating FD. NTS Net Controls should not be serving as NCS while operating from a FD site. Let the SCM know your feeling on these plus any others you may have. Thanks to each of you who have helped make my job a little easier while I served as SCM. Good luck in the new year. Endorsed K4AOZ as OBS. Traffic: (Oct.) WA4 JDH 991, N4MD 308, WB4EKJ 109, WB4KSL 106, K4AOZ 98, WA4RND 80, WA4AJA 45, WA4TMG 34, WA4VKD 29, WB4NNA 23, K4UMD 17, WA4RMP 16, W4EF 10, WB4N QG 10, WB4TVY 10. (Sept.) WB4KSL 91, WB4NNA 29, WA4RAJ 29, K4UMD 14, WA4TMG 4.

CANAL ZONE: SCM, Paul F. Ebdon, KZ5TJ — KZ0DX was on the air for the World Wide CQ Contest. The special call was issued to KZ5JM. Helping Jim were KZ5s BA BV ED FR JA TJ UH and some very understanding and forgiving XYLs. The Canal Zone ARC has started putting out a Newsletter for the members of the Club. Those KZ5s and others interested in ham radio who are not members and would like to keep up with happenings on the Zone, who has what for sale or trade, and the latest ARRL bulletins should join the CZARC. Meetings are the first Thur. of the month at the USO-J in Balboa. Time 7:00 PM. KZ5OD has the QSL Bureau at these meetings. Congratulations to KZ5s AS KF TJ and TL on upgrading to Advanced and to KZ5MDN the Canal Zone's newest Novice.

GEORGIA: SCM, A. H. Stakely, K4WC — SEC: K4YRL RM: N4UZ. PAM: K4JNL. Congrats to K4EV WA3NAZ/4 and WB4TEK on making PSHR. GSBN awards Amateur of the Year to WA4AKU. Congrats.! Congrats also to W4FOE receiving a special award and special recognition to K4YRL. FB! New officers of GSBN are W4HON pres.; WA4BZY, veep; WA4NBZ, secy-treas. Albany ARC honored W4DIA W4OIL W4HIJ K4DDM WA4KXU K4KE W4ATO and W4YWP as more than 25 yr. members with W4YWP dating from 1928. New officers of Albany ARC are WA4BDD, pres.; K4CQK, 1st veep; K4KZO, 2nd veep WB4TYF and K8UTY secy's; K4XA, treas.; and K4DDM legal advisor. Sorrowfully we report W4ATP and WB4SKO are Silent Keys. Congrats to WB4NTX making General and N4YA and N4BQ making Extra. New officers of Southeastern DX Club are W4LVM, pres. WA4PYF, veep; WA4JTC, secy.; K4JRB, treas.; K4SMX act. mgr. West GA ARES net QNI 60, QTC 1, GA ARES QNI 153, QTC 3, N. GA Skywarn QNI 35, CVEN No. 1 QNI 57, QTC 3, CVEN No. 2 QNI 988, QTC 65, GA Cracker Net QNI 528, QTC 50, West GA ARES Sept. QNI 58, QTC 1. New Douglas Co. ARES group very active. K4VHC now all band HF mobile. W4JM lost 20 mtr delta loop account WX. N4UZ wrkd 21 states in 2 hours on 80 mtr. W4ELC now mobile on 2 and 75. K4VF WA4CEM and W4MPY had fun putting Augusta 93/33 antenna over 800 ft above sea level. WA3NAZ/4 keeping his Globe King hot on 80 cw. Traffic: (Oct.) W4FOE 442, W4PIM 194, WA3NAZ/4 122, W4EAW 102, N4UZ 86, K4VHC 77, WB4TEK 55, WB4WQL 47, K4YRL 45, W4HON 38, W4BIA 30, W4GH 28, K4EV 26, W4ELO 21, K4HM 15l, K4WC 13, K4BAI 10, WD4IKI 4, W4JM 4, K4PIK 3. (Sept.) WB4TEK 14.

NORTHERN FLORIDA: SCM, Frank M. Butler, Jr., W4RH — SEC: WA4WBM. RM: WB4GHU. PAM: WA4TNC/75 WA4TXM/40: WB4BSZ/VHF. New appts. WA4HHC as EC Marion Co., WD4HIF OPS. K4VFY renewed ORS. SNCs

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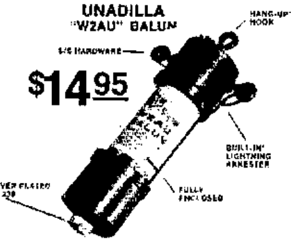

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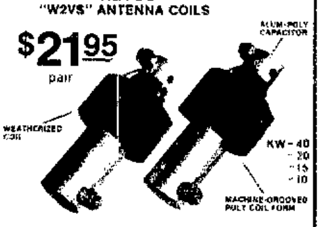

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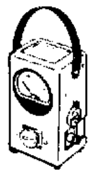

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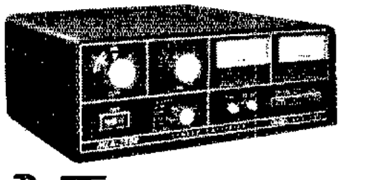

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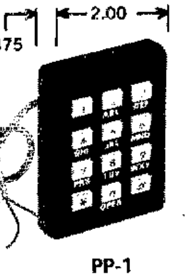

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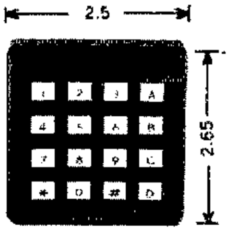

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earned by WB4DTS on QFNS; by N4PL on FMTN; and by WA4BWF, WB4MHJ and WB4WOO on Ala. Emerg. Net. BPLs WA4CRI W4IZ WB4JMM WA4OEM and WB4QBB. New calls: WB4JGY now N4MS; WA4ZVP is N4VY; WA4WCG is AA4US; W2LFR/4 is N4LV. WB4VDL upgraded to Extra. WB4SKI moved to new QTH, bigger antenna farm. W4UUF has 110 watts on 432 MHz and keeps skeds with MS and LA. Playground ARC has 50 new chairs to go in redecorated clubhouse. Officers of the Panama City ARC: WA4MED WB4LZK K4JJE and WA4AVP. WB4YKV active with phone patch traffic on 20 meters, thanks to WB4VDL and N4NN for new list of Big Bend area amateurs. WB4GTY new secy. of Tallahassee ARC. Gator Radio Club, W4DFU active on traffic nets, thanks to WA4BZV. K4MZK top OO in Section activity. Well known Jax ham K4OBO a Silent Key. WB4BMB WD4JWR & WA4WPQ new Generals. WB4ANW and WB4RUT continuing work on the Jax 10-meter repeater — will be 29.56 in; 29.66 out. N. FL DX Assn. officers: WB4EYX. K4UTE, N4UF and W4ORT. NFDXA member N4IB moving to High Springs — watch out, W4GUJI! WA4QHV has a new 70 ft. tower. Daytona Beach ARA officers: WB4OWX WA4SNH WB4FKL WB4VAP and WB4WWP. DBARA now operates both the 34/94 and 75/15 repeaters. Final word on ham license plates, they are $5. Traffic: (Oct.) W4IZ 1727, WB4QBB 966, WB4JMM 608, W4JL 418, WA4OEM 415, WB4GHU 349, N4WA 240, N4PL 193, WA4CRI 179, K4YX 132, WB4DTS 112, WB4TZR 94, W4KIX 93, WA4EYW 64, K4VFY 62, WB4FJY 55, WD4IIO 51, W4LDM 51, WA4TNC 45, WD4HIF 43, W4RH 42, W4DFU 36, N4DY 34, WB4VDL 34, WB4YKV 34, WA4EYU 33, W4MVG 33, WB4OWX 32, WB4LNO 28, W4DTV 27, K4OER 27, WB4NJI 26, WB4VAP 25, K4RNS 23, WB4WWP 19, WB4EXA 18, WB4YPS 16, W4MGO 14, K4KUU 10, WB4VMP 6, WB4RIS 5, WB4WYX 4. (Sept.) WA4OEM 117, K4YX 51, WB4HRG 27.

SOUTHERN FLORIDA: SCM, Woodrow Huddleston, K4SCL — SEC: WB4ALH. Asst. SEC: W4WYR. RM: W4MEE. PAMs: WB4AID WA4NBE. New appointments: WB4CDQ EC Southern Brevard; W4KMN EC Highlands and OPS, K4SJA EC Western Palm Beach, W4ESH OPS. K4GRM OPS, WB4WYG OPS, W4ZJ OBS and OPS. Congratulations to W4MEE and K4TH for BPL again. New stations active on 446.0: K5IHH/4 WA4VRP WD4EFM and K4SCL. W4GAC, St. Pete Club station has new TS-700A for 2-meters. WB4VWO has moved into new house in Safety Harbor and has put up a tall tower with multiple beams. WB4LXH has a new house under construction in St. Pete. K4NAN has a new home-brew antenna tuner which works fine. K8PXM and W4IRA have new linear amplifiers. A recent computer readout from ARRL HQ and zip code count by W4RH shows 4997 ARRL members in Southern FL Section. A new net on 3940 kHz at 8 AM each Sat. is the ARRL Information Net. It is ramrodded by WB4ALH and WA4WBM, SECs of Southern and Northern FL, respectively. The purpose is to provide an on-the-air meeting place for all ARRL officials, appointees and members to get acquainted, air problems and resolve questions. Average attendance of 22.3 for first 4 sessions indicates it is going quite well. We understand WA4NBE will be MC of the Traffic Meeting at Tropical Hamboree in Miami in Jan. Hope to see you there. Traffic: (Oct.) W4MEE 1089, K4TH 638, K4SJH 430, WA4SCK 362, K4SCL 362, WB4WYG 321, WB4AID 203, WA4GYR 185, WA4NBE 170, W4WYR 139, K4NAN 132, WA4PFK 129, WD4ABT 115, WB4ALH 115, WB4NJU 91, W4NTE 85, WA4JPV 81, N4KB 79, W4GPL 66, W4KMN 63, WD4KPG 60, W4IRA 54, W4QM 51, K4BLM 51, K4EUK 45, W4DVO 42, WA4QGV 40, W4ESH 31, W4GDK 29, W4SMK 28, WA4HDH 24, WB4PIB 24, WB4SNX 23, W4IYT 22, K4SJA 21, WA4MNX 20, W4BNE 18, K9NSS/4 15, N4XR 15, WB4NAZ 12, W4ZJ 12, WA4EIC 10, K4GRM 10, WB4FYE 9, WA4TOP 9, K4RCP 7, WB4FVN 6, K8PXM/4 6, WA4ZQH 6. (Sept.) N4KB 90, W4YW 2.

SOUTHWESTERN DIVISION

ARIZONA: SCM, Marshall Lincoln, W7DQS — PAMs W7UQQ, WA7KQE; RM W7EP. Officers of the newly-formed Amateur Radio Society at Ariz. State Univ are WB7TPY, pres.; WB7OEC, vice-pres.; WBØJSD, secy.; WB7OMZ & WB7CDK, advisors. WB7OWW, club station at the Flagstaff Jr. HS, was active during the school's open house. Members of the Tucson and Phoenix repeater clubs provided communications for a fund-raising "bike-a-thon" from Tucson to Phoenix using a Tucson repeater. The Phoenix repeater club reports a new repeater will be set up for the east side of town. The Scottsdale ARC has a project of converting 23-channel CB radios to low power ten meter amateur channelized operation. WA7NRS is now N7FU. ATEN NET 62. Traffic: K7UXB 134, W7EP 80, WB7TPY 47, W7HFR 29, WA7IYG 29, WA7KQE 28, K7NTG 24, W7AMM 16, WA7WEB 13, K7NMQ 12, N7FU 10, W7DQS 7, K7GH 4, K7JKM 2.

LOS ANGELES: SCM, Stanley S. Brokl, K6YYQ — I wish to thank everyone who voted for me and I hope I can be of service. Appointments: Asst. SCM: Perry Masterson, W6RHS. SEC WB6FRM. W6NKE has a new call, N6KJ. K6EA/Ø reports from Minnesota he is keeping skeds with Novices and helps them improve cw. N6HE has a new DK-5 Freq. Counter. The Los Angeles Area Council of Amateur Radio clubs is preparing to handle four March of Dimes walkathons on Jan. 29, 1978. Contact WB6UIA WBI6IPY or W6LPJ to lend your help, 200 ops needed. The JPL ARC W6VIO had a solar powered radio station at the Energy Fair in Anahiem. The Orange County and LAACARC helped with operators. Traffic: N6PZ 100, W6SGZ 81, W6QAE 54, K6EA/Ø 46, W6INH 42, W6BRO 31, K6CL 25, WB6MKV 19, W6NKE/N6KJ 5, WB6AIT 3.

ORANGE: SCM, Wm. Heitritter, WB6AKR — Asst. SCM: K6KNC. SEC: W6AQB. ECs: WB6ARK K6GGS W6LKN K6KNC W6WPP WA6YWS. RMs: WA6TVA WB6AKR. PAM: W6CPB. K6LL has Tri-Ex LM-470 tower installed with three-element Wilson 10-meter at 77 ft.; three-

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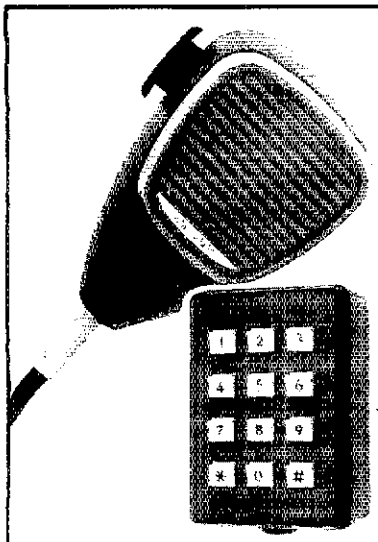

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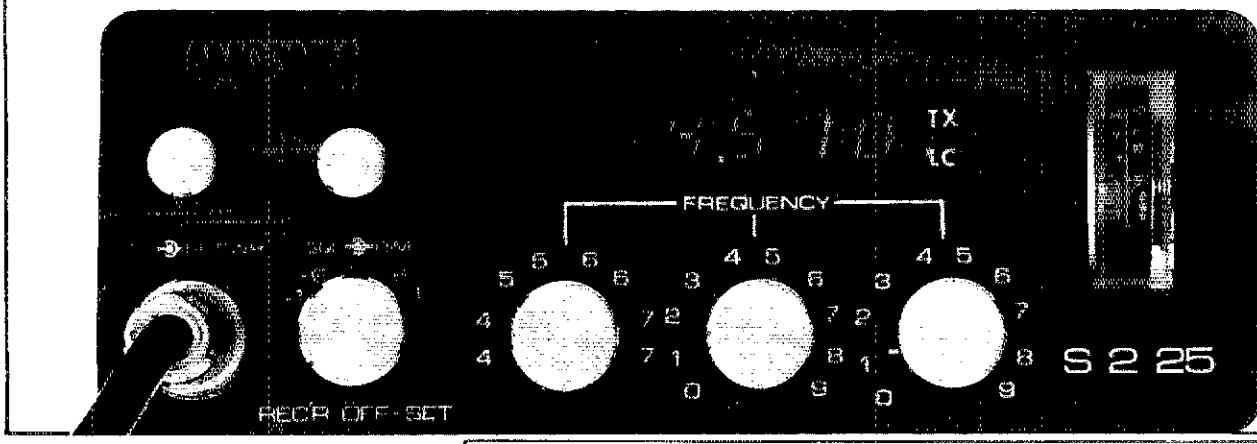

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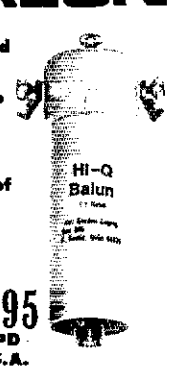

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P-9T	C-9T	9,10,11
P-10	C-10	10
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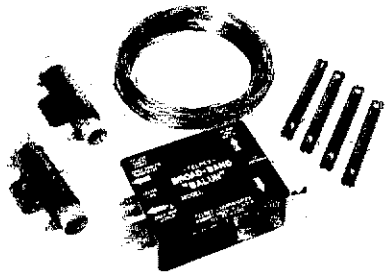

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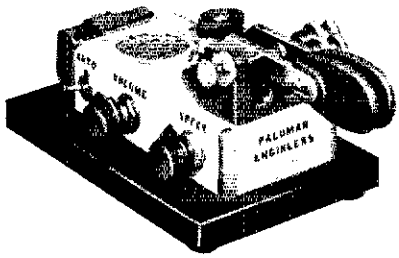

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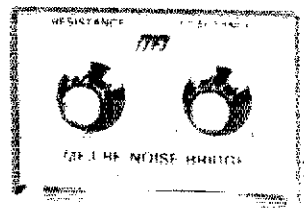

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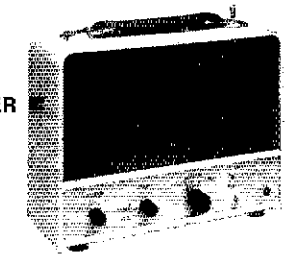

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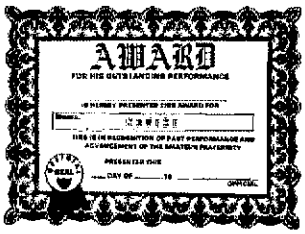

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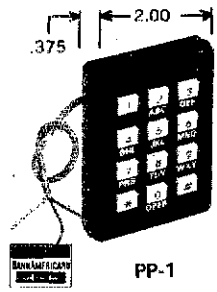

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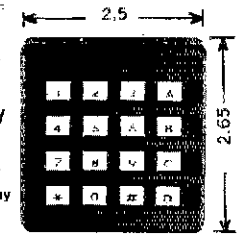

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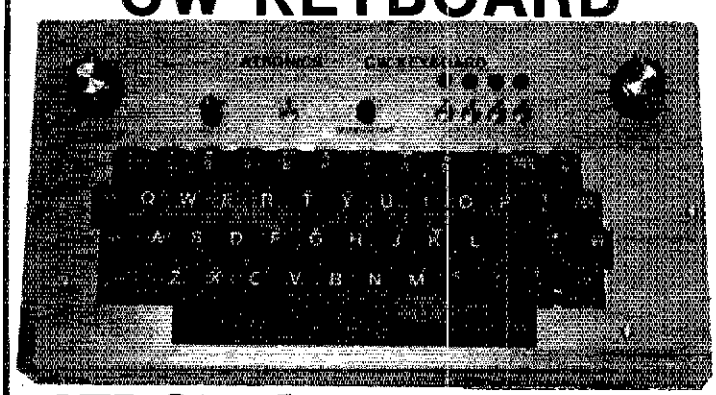

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element 20 and 15 at 70 ft. and 80/40 inv. vee at 68 ft. WA6NSZ is now N6NQ. WA6ORJ has relocated to San Diego Section and acquired AA6EE. K6JT has new Ten-Tec Triton IV Digital transceiver. The following provided communications for American Cancer Society Bike-a-thon: K6KNC WB6LSP WB6JJS WB6LAR WA6MCT WD6AZA WA6VZO K6MXL WB6AYO WB6DCC WB6DCB WB6VXQ WA6SFP WB6ULU WA6ALC N6RH W6IBR WA6TSU WB6ROT WA6MUP WA6PUS K6LJA WB6QIO K6IQ WB6DAG W6RE WD6BIQ K6TWK W6TIO WA6CUE WA4GJS/6 WA6SID K6WS WB6UIG WA6OZF WA6COX WA6LVR WA6HNQ WB6ARK WA6QWO. Anaheim ARC reports WA6BIG upgraded to General and WA6QBI to Advance. The Orange Council of ARC has awarded their ARRL Field Day Plaque for 1977 to the Orange County ARC. The October issue of Worldradio News contains an artiacle on the ARES presentation of K6KNC. Contact K6KNC fora this program at your club soon. Hemet club reports W6IWU has new Kenwood TR-7400A. WA6YWS reports NEN has stable NCS crew and looking for more new operators to QNI for traffic training. NEN is on 3730 at 9:30 A.M. on Sat. for newcomers wishing to learn traffic handling. Traffic: WB6EIG 406, K6JT 62, W6RE 40, W6CPB 37, W6QBD 3, WA6YWS 3.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — Only eight months to the ARRL National Convention, San Diego, Sept. 22-24, 1978. Now is the time to make reservations at the Town & Country Motel through Convention Chairman Sam Dear, K6BWT, 13031 Papago Dr., Poway, CA 92064. All public-service minded amateurs are invited to participate in the Simulated Emergency Test now in planning stage. Contact SCM W6INI for info, or ECs N6AT WA6LAW WA6UAZ or WA6UFY. San Diego County Office of Emergency Services is looking for qualified hams for assignment to Disaster Action Teams. Call Jack Duncan, 448-4611. Imperial Valley ARA meets second Thur. at 1900 in conference room of Imperial County Airport. Officers are: WA6FND, pres.; W6NGC, vice-pres.; WA6KEW, secy.; K6AXU, treas. Upgraded: WA6OIL WB6VSA to Advanced; WB6CGU to General. Call sign change: WA6ORJ to AA6EE. New ARES members: WD6AUU WD6BEF WD6BKI WD6BPD WD6CWP WD6CXW W6JUT W6KLG K6LKW W6LMH W6OGR WB6ORX WB6SIS WA6SJX WB6WOK. ARES members with new generators: WB6BDY WA6EOO WA6IPW WA6MAE WB6NYL K6PM N6RD WB6SUE WA6SYN W6TZV WB6VIQ WA6VMO. Traffic: (Oct.) WB6PVH 249, WB6FTY 163, WA6UAZ 131, N6GW 55, N6AT 45, N6RD 35, W6DEY 24, K6LKW 20, WA6UFY 9, W6UQF 2. (Sept.) WB6PVH 242.

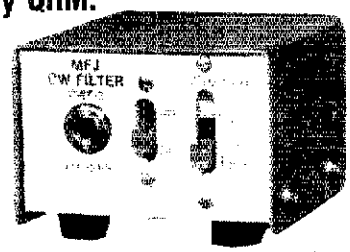
SANTA BARBARA: SCM, D. Paul Gagnon, N6MA — Classes all over the section continue to produce results. In Santa Barbara WD6s OVV CZU new Novices; WB6IOR WHU WD6DJG, Techs; WB6ZYG, YFQ Generals; WA6ASY Advanced, W6SXV GTI Extra. In Ventura, new Novices WD6s DMK DMG DML are XYLs of W6RIC WB6RVA and K6OKC respectively. In Lompoc WD5FTY is new Tech (XYL or K6WI). SBARC held a town hall meeting with W6EJJ and W6ZH. They also caravaned to QTH of W6AM for a tour. WB6JKM spoke on computers at Camarillo MAKRAC. K6PGX presented OSCAR to the Simi Settlers ARC. WB6GNS presented computer animation to the VCARC of Oxnard. Officers of VCARC are WA6IJZ, pres.; K6VMN, vice-pres.; WA6WYD, treas.; WD6ASD, secy. K6WI and N5MR are NCS on SCN. SCN is our section CW net on 3598 daily at 1830. Section SSB net meets Sun. at 10 AM on 3935. WA6s SHC ZYG ATE OQZ, WB6IYW and W6HMV provided comms for the annual Santa Ynez bike race. RACES/ARES combined in Ventura Co. to assist with County medical disaster drill. N6GC publishing a great ORBIT for the Satellite Club. WB6AGX moved to Okinawa after working all Calif. counties and passing his Extra. K6YLQ moved to AZ and received a send off by SMRA thanks to WD6ASB and W6MOM. We will miss WA6GOR, a Silent Key. Lompoc organizing an ARES group. If you can help contact WA4CZQ. N6MA spoke on public service in Lompoc. PSHR: WA6VBS 41, K6WI 34, KH6IQU 34, N5MR 34, N6MA 16. Traffic: KH6IQU 334, WA6VBS 108, N5MR 102, K6WI 84, WA6MBZ 51. N6MA 13.

WEST GULF DIVISION

NORTHERN TEXAS: SCM, Ted Helthecker, W5EJ — SEC: K5PC. RM: W5LA. PAM: W5GSN. "Who's Who" in North Texas ARRL activities? As of Oct. 31; EC's: K5QKM K5JD WA5GYP K5HT K5ZNF W5ZNN WB5KTD WA5KHE WA5PPF W5BCB WA5TZB WA5DFP W5GY WA5CMC WA5RQS W5KOW WB5LAT WB5HSL K5DOI W5YK K5MWC WB5QWI. OBS's: W5SOQ K5SR K5LHL WB5EWW K5JD W5IZU W5LGY W5IAR W5BNG WB5LWB K5AVT W5RVC. OO's: W5PBN W5QPX W5TI K5PC WA5ZNZ W5UGM K5ARG W5TGA WB5GII WA5EBQ W5KYD W5ARV K5PCW W5PW. OPSs: W5YR K5JD W5JHA WB5AAR WA5ZNZ W5IRD WB5MFQ N5AU WA5KHE WA5RUF WB5MTN WA5PPF WA5UCT W5NFO WA5QWA W5PBN WB5DXB W5IZU W5GSN WB5EBC WB5AOF WB5BNG. ORSs: K5ETX WA5KHE WB5DXB K5YL WB5MTN W5LR WN5SOU W5WLA W5LA WN5PYT W5PBN W5HY W5YK K5SXO W5OWV. OVSs: K5ZCO WB5GII WA5VJB WA5ZNZ W5KXD K5WIQ W5UGM WB5CHW K5FOG WA5UNK WB5GBR W5UOJ. We need more monthly reports, folks! Your appointment depends on it. Your SCM solicits your application for any leadership appointment you feel qualified for: check ARRL Handbook for job description and details. New ECs recruited at Texoma Hamorama: WB5LAT K5DOI & WA5GYP. Stations reacently overheard signing "Interum DL": WB5EWW (E) WB5GBR (G) W5PTF (A). Congrats guys! W5YK active in ttc work plus MARS. W5TI going "wild" on 160m but still finds plenty of time for much public service work. EC W5GY reports active on all bands; RTTY, SSB & OSCAR. Doc is in his 83rd year as active amateur! K5MWC reports "recurrent training" program on Collin Co. ARES net. K5CO home from stint as TT8SM: don't ask Scotty "how's DX" unless you have some time to kill! OO W5QPX very active on in-

This MFJ Super CW Filter . . .

gives you 80 Hz bandwidth, and extremely steep skirts with no ringing for razor sharp selectivity that lets you pull signals out of heavy QRM.



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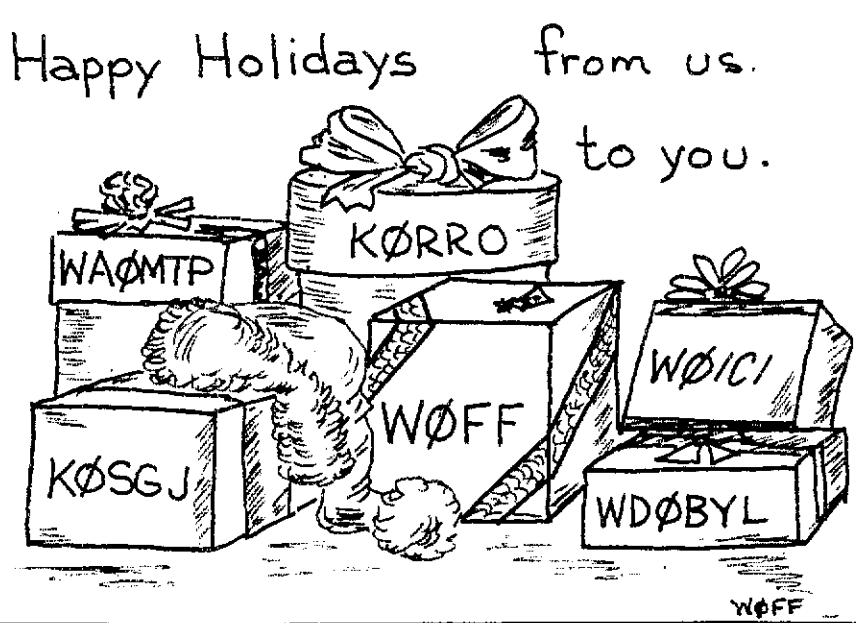

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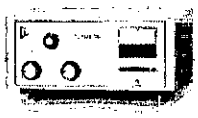

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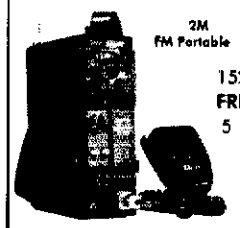

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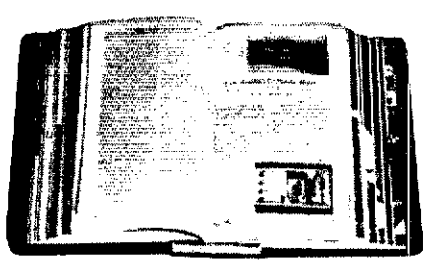

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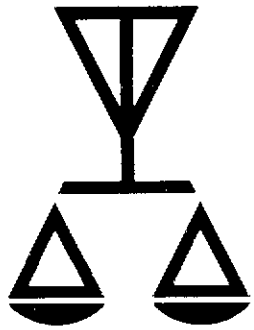
truder Watch program; sends in long, beautiful reports each month. Fantastic work Mr. Baker! WR5s AHE and AJG sporting new GE Master II repeaters with emergency power. Traffic (Oct.) W5TI 267, K5SOR 71, W5GSN 55, WB5LAT 39, K5PC 36, WB5KTD 20, K5QKM 16, W5YK 12. (Sept.) K5QKM 89, W5YK 8.

OKLAHOMA: SCM, Leonard Hollar, WA5FSN — Asst. SCM: W5REC. SEC: WA5MLT. RMs W5RB & WB5NKC. PAMs: K5CAY WA5MLT WB5OSN and WA5OUV. Some fine net reports received. But feel that we should have more net activity, particularly in the VHF Bands. FCC examiners here last month most popular was the visit to Texoma Hamarama. 150 took tests with 75 per cent plus passing. The relaxed atmosphere helped. WA5YMZ went to Extra and WB5RRR to General at one of the other test points. Hamarama '77 is over, very successful. Usual fine programs and huge crowd. Lots of new equipment changed hands. I must repeat: I need to hear from all appointees, particularly any changes, calls, addresses, or just plain news. How about WB5NKD & NKC making BPL in Oct. Oct. traffic reports reflect more and more traffic handled. However, I still feel that our originations count should be much higher. Originations and deliveries are some of our best PR and we should be using these tools more. Traffic: WB5KND 512, WB5NKC 504, W5REC 323, W5RB 288, K5OWK 114, WB5SOH 94, WB5OYU 82, WB5KKT 76, WB5JYF 63, WB5RLR 62, W5UYH 59, WB5OSN 55, W5BYC 52, WB5OCZ 45, W5SUG 44, WA5FSN 38, W5VOR 34, WB5TTU 19, WB5ELG 18, WA5OUV 15, K5CAY 12, WA5ZKI 10, W5JJ 8, K5ZDB 8, W5FFW 6, WB5UCM 5, WB5AOH 3, WA5FLV 3.

SOUTHERN TEXAS: SCM, Arthur R. Ross, W5KR — Asst. SCM/PAM: N5TC. SEC: W5TQP. RM: WA5RKU. OOs rprtng: K5DL WB5CIT. Late for Oct.: N5ZZ. OVSs rprtng: N5AF WB5CIT. OVS WB5CIT was on the air and helping during San Antonio blackout, thanks to emergency power. OPS WB5LTW reports Colorado Co. ARC organized Oct. 5 with 10 charter members: K5KZF, pres.; N5JD, secy-treas.; club will have two meter repeater (147.75 MHz in/147.15 MHz out) on air soon. W5BGE enjoyed Lake Texoma Hamorama; plenty QRM with more than 40 ham trailers in the park. OPS WA5VBM received A1 Operator certificate in Sept. Asst. SCM N5TC says W5AC has all new Drake station, including 2- and 6-meter converters. EC WB5TNN rprts on busy month for self and Brazosport ARC. 12 of 25 members attended West Gulf Division Convention in Austin. ARES activity on 2 and 10 meters have excellent participation. WA5RVT WB5VER WB5UVI and WB5TNN regulars on traffic nets giving the area good coverage. WB5VER is active on Oscar Mode A, will soon operate on Mode B. Oct. 30. BARC had weiner roast at Lake Jackson which included 2-mtr transmitter hunt (also rprtd by WA5RVT). WD5DLF WD5DOQ upgraded to Tech. From Hamtides, bulletin of Tidelands ARS: K5BOU upgraded to Advanced and changed call to W5VQN. Editor WB5NVH recvd YLCC certificate, needs 2 states for YL WAS (from Alvin Co. ARC bulletin) OPS WA5YEA ran a series of orientation sessions on CW traffic net operation; sessions held following regular evening session of TTN on 3961 kHz; attendance good and hoping for increased CW net participation. From Houston HARC News: club has new tri-band quad. N5AF (ex-K5LZJ) reports W5DN has two F9FT Yagis and 2kW PEP; WB5VQY upgraded to Extra. Traffic: (Oct.) W5KLV 617, WA5VBM 480, WA5YEA 289, N5TC 195, K5DG 100, WA5JYH 50, K5GDX 43, WB5TNN 34, W5BHO 37, W5BGE 19, WB5LTW 16, K5RG 14, WB5UYV 14, WA5RVT 12, W5KR 10, W8UX/5 8. (Sept.) WA5VBM 257.



THE PERSONAL COMMUNICATIONS FOUNDATION

Legal research for the amateur radio and citizens band services.

The Personal Communications Foundation is a non-profit, tax-exempt California corporation established in November, 1976. Its Board of Trustees, Officers and Advisors consist of lawyers, judges and law school professors with substantial experience in the representation of users who have encountered communications related legal problems.

The Foundation has been organized expressly for the purpose of creating a comprehensive personal communications law library. The Foundation continues to collect available court decisions, briefs and legal memoranda relating to personal communications.

The Foundation has already expended thousands of dollars in funding special studies. One study on the issue of Federal Pre-emption has already been incorporated into a brief before the California Court of Appeals.

Why you, the user, need the Personal Communications Foundation...

1 In 1976 there were over 7,000 legal matters involving all aspects of non-profit personal communications. In 1956 there were only 200.

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3 *If you use a transmitter*, you may be sued if you interfere with a neighbor's TV or stereo, even if the interference is due to the inadequate designing of the TV or stereo.

4 Litigation of this nature can cost $10,000 or more. It is estimated that 40% of that amount represents time expended in research. By providing your attorney with our research material, the Personal Communications Foundation can save you thousands of dollars in addition to helping your attorney better represent you.

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The Personal Communications Foundation is a membership corporation. Four classes of membership have been established, known as Associate Membership, for a yearly contribution of $10.00, Full Membership, for a yearly contribution of $25.00, Contributing Membership, for a yearly contribution of $100.00, and Life Sustaining Membership, for a single contribution of $250.00 or more. All contributions are completely tax deductible. All members of the Foundation will receive the newsletter.

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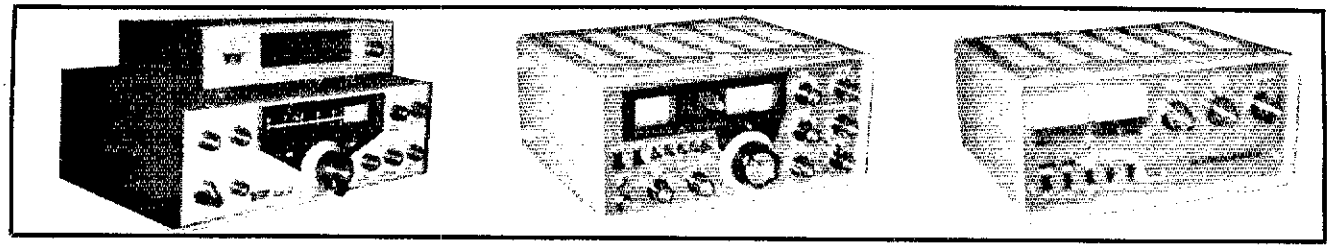

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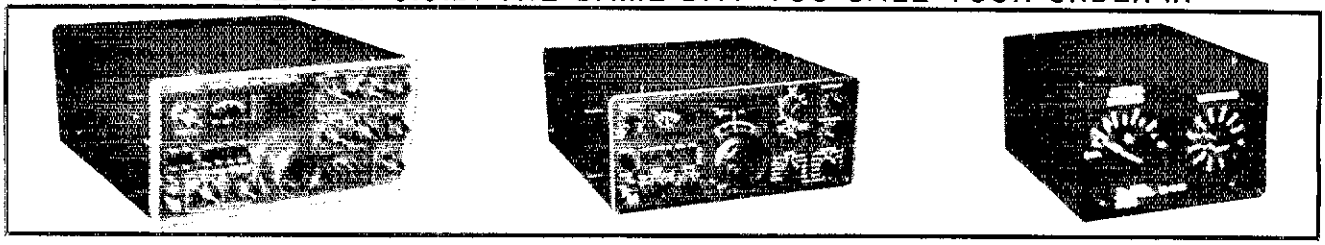

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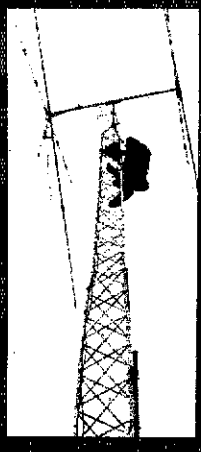

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PROGRAMMABLE MEMORY KEYER SYSTEM

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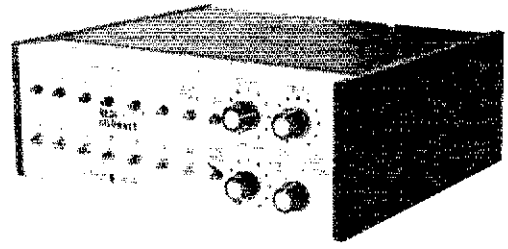

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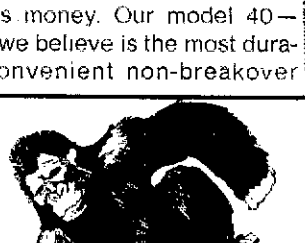

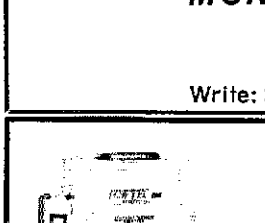

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MOTOROLA HT-220, 2 meter 2W, omni 6-channels of 2 xtals. Late HI i-f xtal filter board, excellent condition needs tune up. W/charger, ni-cads, antennas. $32 replys via W7PQ.

TELETYPE for sale: model 28ASR's, KSR's, typin reperfs, and TD's. New and used parts available in cluding cabinets, tables, mod kits, gears and gearshifts Paper, ribbons, and supplies. Some 8-level Model 33 an 35 equipment available. Send s.a.s.e. for complete lis and prices. Lawrence R. Pfleger — K9WJB, 2141 N. 52n St., Milwaukee, WI 53208.

CASH for your clean ham gear. Beacon Communica tions — used equipment specialists, 879 Beacon St Boston, MA 02215. 617-267-1975.

WANTED: "Radio Antenna Engineering," E.A. Lapor "Antenna Theory and Design," Volume II, H. P. William and "Antenna Theory and Practice," Schelkunoff Friis. W5QPH 128 South End Boulevard, Lufkin, T 75901 713-632-1830.

CRYSTALS: S.a.s.e. my list. K8LJQ. 355 Mower Rd., Pir ckney MI 48169.

MOBILE OPS. Tired of ignition noise? Please sen s.a.s.e. for info on shielded ignition systems. Summ Enterprises, 20 Elder Street, Yarmouthport, MA 02675.

HALLICRAFTERS SR-2000 2kw transceiver with P-200 supply, $500 firm. HA-20 external VFO, $100 firm. E cellent condition with manuals. Prefer pick-up buye John, W1JA, 203-756-6058.

HEATH HR-10B rcvr with HRA-10-1 xtal calibrator, D 60B xmtr, HG-10B vfo, matching spkr $150. HW-104 xc with HWA-104-1 10m acc, SBA-104-1 nb, SBA-104-3 40 Hz cw filter, HP-1144 ac pwr supply, HS-1661 spkr $50 Jay Benson, WB1CXE, 72 Navy Dr., Winter Harbor, M 04693. 207-963-7938.

HF SEPARATES or transceive: SB400/SB301 with ssb cw, & am xtal filters, 25 kHz cal, 2 & 6m conv's, manuals cables. FB rig.$225 each or $375 pair, incl. UPS Chuck/WA2IXE 914-277-4168, Union Valley Rd., R.D. Carmel, NY 10512.

STOP LOOKING for a good deal on amateur radio equip ment — you've found it here — at your amateur radi headquarters in the heart of the Midwest. We ar factory-authorized dealers for Kenwood, Drake, Collins ICOM, Ten-Tec, Atlas, Hallicrafters, KLM, Wilson Regency, Tempo, Swan, Midland, Alpha, Standard, Der tron, hy-Gain, Mosley, Cushcraft, and CDE, plus ac cessories. Thousands of thrifty hams from coast t coast already know us and we invite you to join them b writing or calling us today for our low quote and tryin our personal and friendly Hoosier service. Hoosier Elec tronics, P. O. Box 2001, Terre Haute, IN 47802 812-238-1456.

WANTED — Heath SB-600 speaker SB-630 station con sole. P. O. Box 7 Somerset MA 02726. 617-678-4391.

QRP HW-8; HS-1661 speaker, built-in regulated suppl and IC audio amplifier. Mint condition. Need 572B's W7ESE, 1208 East Fairmont, Tempe, AZ 85282 602-966-5244.

WANTED: 10, 15 meter traps (blue) from original Hy-Gai TH2, 3 or conversion kit. M. Silevitch 70 Harvard Ave Brookline MA 02146. 617-734-4170.

WANTED: Johnson Navigator. State condition, price Shipping paid. WA2QKF.

SELL: KWM2-A $1200 high number mint, 312B5 $42 516F2 w/speaker $150., PM2 $90., MP1 dc supply $85. A are round emblem, mint condition. Call Mart 215-884-6010, a 24 hour answering machine.

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COLLINS RECEIVER 75A-4, serial 4584, excellent condi tion, $400. WA7ZBX, 1109 Yew St., Bellingham, WA 98225.

WANTED to purchase for the ARRL Library the followin magazines: January 1968 & November 1968-Ham Radi Magazine January 1972-73 Magazine. Please contac Marian Anderson, Technical Department, Tel. 666-1541 Ext. 279.

YAESU — FTDX-560, speaker and microphone, $400 K9YMX, 815-485-6541.

NATIONAL NCX-3, ac/dc ps, $225. Regency HR-2B loaded, $225. WAØCAE, Bruce Frederickson, Box E, Bagley, MN 56621.

FOR SALE: Drake Model MN-4, brand new, $75, firm. Certified check only. Crowell, 640 Stonehenge Drive, Mary Esther, FL 32569 904-244-0307.

FOR SALE: All copies QST from Nov. 1935 to present (less April 1937-May 1939), Ham Radio Nov. 1969 to date. CQ Jan. 1946 to Oct. 1964. $150 takes lot. Bill Siegel, W2NRB, 22 Colgate Road, Great Neck, NY 11023. 516-487-6033.

SELL: Transceivers SB-100 with SB-600, ac pwr and spkr $275. Also Drake TR4 with AC-4 supply, $475. Sorry, can't ship. WB2BMC, 914-949-8143 or 428-7684.

WILL PAY $150 for AX-190 mint condition. K3ZGL, Joe Brislin, 439 Elm Ave., Kingston, PA 18704.

YAESU FTDX100 transceiver, ssb, cw, 80-10 meters, 120W, 110vac or 12vdc. WA7UVE 602-969-5978.

MOVING: Must sell. Make offer. 32S-1 with power supply; Hammarlund Super Pro, ART-13; APX-6, HP-23 and HP-13 power supplies; SWR bridge; Johnson kW Matchbox, Heath ssb adaptor; capacitor checker; rf generator; WA9QJH, Kryger, South Range, WI, 54874. 714-398-6280.

SELL — New Standard keyboard plus 28 extra keys, $33 — W1BBJ.

HEATH HW-101, 2 yrs old, HP-13B, HP-23B, Mint $330. HW-2036 mint. Works we.. $270. Certified check or money order. Jim Moore, WA5ZVB, 705 E. Lafayette, Fayetteville AR 72701 501-521-4776.

COLLINS 32S-1, 516F-2 $430. WA2SZQ 7 Stevens Dr., Holmdel, NJ, 07733. 201-946-2879.

IC230 like new synthesized 2m fm xcvr with Heath 5/8 mobile ant. $275 takes both. Len Lehmann 840 Coleman Ave. 14, Menlo Park, CA. 94025 415-327-3927.

NATIONAL HRO 1935 Serial 241 offers. Few used 837, 805, 211. High voltage components. VE6TR.

WANTED: Globe "Chief" 90 and Knight T-50 cw transmitter, must have "like new" exterior. Bill Downs, KØMNA, 4805 Sullivan, Wichita, KS 67204. 316-838-5385.

COLLINS 75S1 $325; Heath DX60 and HG10 with mods. $100; PCS four channel radio control system $90. All excellent, all with manuals. Harrisburg, PA 717-652-0868 after 6 PM. WB3UFG

COLLINS 75S3B receiver, winged, mint. $525. K6YH W. Wood, 11481 Anderson St. Loma Linda, CA 92354. 714-796-2268.

MONTHLY bulletin on used gear. We'll list your used gear free. Upon sale it's 10 percent commission plus $5. each item clerical fee. No sale, no charge. Looking? Tell us your needs we'll list them free. List the following: Make, use (xmtr, rcvr, etc.), manual, condition (describe), sales price. R-S-T Marketplace Inc., Box 234, Clarksburg, MD. 20734, 301-926-1166. Subscription to R-S-T Bulletin plus supplements is only $6.00/year (limited time only).

R-4 W/MS-4, $250. HX-20 w/HP-23B, $75. SP-600, $175. BC-221, $30. IO-14 lab scope, triggered, $150. K4MSG, 124 N. Harrison Rd., Sterling, VA 22170 703-430-1023.

ROHN Tower special limited time sale 25G-$29 section 11G-$19 section. Hill Radio, 2503 G E Rd., Bloomington, IL 61701 309-663-2141.

DESPERATELY need relay coil of VOX circuit of central electronics 200V transmitter. Will answer all letters. Robert Kennedy, K9DXB, Route 1, Box 12, Merom, IN 47861.

OUR CHURCH BASEMENT is filled with electronic rummage goodies, new and unused, such as: CDE oil-filled condensers, 8mfd/2KV: $4.00 each. 9 lbs of new capacitors and resistors: $2.59. Sams Photofacts, relays, switches, micros, meters, equipment for testing, etc. Send for our new "Scratch Sheets." Stamp, please. Padre-K9DNR, OLGC Church, 916 No. Western Ave., Chicago, IL 60622 312-486-1086.

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THE BENCHER Paddle — in stock now, the ultimate in iambic paddles — $39.95 with free UPS delivery. Yaesu FRG-7 Mark II $270. TS-820S and VFO-820 $1048. We now stock Microwave Modules and F9FT antennas! Rohn Towers in stock. We have working OSCAR Mode A and Mode B stations set up in our store; bring your license. We're now open Sundays noon til 3PM. Ham Radio Outlet, 2620 W. La Palma Ave., Anaheim, CA 92801. 714-761-3033.

KENWOOD Service Manuals: TS-820(S) $7.50, all others $5, free delivery. FT-221R shop book $15. Ham III rotor $129.95 (latest model). KLM multi-2700 $660. KLM PA 10-160BL amplifier $205. IC-245 SSB $539. ATB-34 antenna $215. Ameco PT-2 pre-amplifier $63. 14AVQ $59.95. 18AVT/WB $87. RG-213/U mil. spec. 50 ohm coax .33c/foot. Astro 200 in stock $895. Still have some Drake at the old prices. All above includes free UPS insured delivery. Ham Radio Outlet, 13754 Victory Blvd, Van Nuys, CA 91401. 213-988-2212.

WHY WAIT until the next hamfest? Your call sign and handle custom printed on a quality T-shirt. Colors available: white, black, tan, gold, red, yellow or blue. Sizes: Small-Medium-Large-Extra Large. Clubs quantity discounted. $6. Tee Shirtery, K9PM, P. O. Box 101-F, Medinah, IL 60157.

KLM Echo II 2M SSB, preamp, USB/LSB, $250 ppd. K3YWY, 410 S. 12th St., Emmaus, PA 18049. 215-967-1127.

SELL: Heath Mohawk RX-1. Beautiful. WB8CZX, 60 Winnet Dr., Dayton, OH 45415.

WANTED — Panadapter. Send details and price to Bob Morrison, P. O. Box 240 Montague, NJ 12771 201-293-3096.

QUAD KITS from $16.25 to $30. Send s.a.s.e. for information. WAC, 404 Sanders Rd., SW, Huntsville, AL 35802.

DRAKE TR-4C, RV-4C, AC-4 $575. Excellent. K4CUU 205-766-4175.

R-4C — Perfect, n-b, SWL crystals $500. Shipping. B. Armstrong, Box 24011, Cincinnati OH 45224.

FOR SALE: Mint, Collins station. 75S-3B receiver S 15448 32S-3 transmitter S 13922 30L-1 1kW Linear S 13422, 1-516F-2 Power supply & speaker Complete with manuals. Collins Factory overhaul 9/77. $2000. Ronald L. McAfee P. O. Box 909, Henryetta, OK 74437. After 6:30 P.M. 918-652-9594.

MOTOROLA MOCOM 70 High band 30 watt four frequency radio, model U33BA-1170. Manufactured 1977. Trade for UHF Mocom 70. Don Davis, 2929 Quincy St., N.E., Albuquerque, NM 87110 505-243-3518 weekdays.

GUARANTEED demonstration and prime reconditioned equipment bargains. ICOM IC-211, $600. IC-3PS with clock, $70. IC-215, $165. BC-20 Nicads and charger fits in IC-215, $37.50. IC-30 UHF with 4 repeater and 3 simplex channels, perfect, $250. SWAN 500C with ac supply, $400. Kenwood PS-5 ac supply $65. Closeout on new TS-700A with free VOX $499. New CDE CD-44 rotators, $109. We keep good inventories of Kenwood, ICOM, Atlas, etc. Bankamerica and Master Charge. Phone 512-883-5103, ask for Bob, W5GEL. Douglas Electronics, 1118 South Staples St., Corpus Christi, TX 78404.

BOUGHT new rig. Have for sale Yaesu FT-101EE with cw filter, tan $575. Yaesu speaker $10. Drake TR-4C $450. RV-4C$100. All mint with manuals, cables. Will sked. 80 foot broadcast-type tower $150, pick-up only. HM-102 $25. Gonset 6 mtr linear, Black Widow 2 mtr rig, fair condx, make offer. Scott Gray, K7WPC, 1156 Crocker, Coos Bay, OR 97420. Tel. 503-888-9492.

MANUALS for most ham-gear made 1937/1970. Send only 25c coin for list of manuals postpaid. H. I., Inc., Box 0864, Council Bluffs, IA 51501.

ROBOT 300 slow scan converter factory modifications and updated, with manual $460. GBC 3000 TV camera with 1.8 lens and manual $165. units mint, shipped prepaid. Gerald Tetrault 1369 Front St., Manchester, NH 03102.

COLLINS 75S-3C, 32S-3 516F-2 and 312B-4 winged emblem. All mint. $1600. K5UYL. Phone 318-981-2336.

COLLINS 51S-1 $1000; 75S-3 $495 excellent. W8NUE, 427 Allan Lane, Corralitos, CA 95076 408-724-2659.

VARIABLE Capacitors, new split-stator 180-pf per section, 2,000 volt spacing, Cardwell MO-180-BD, 1/4-inch dia shaft, original box, best quality, can also be used as 360-pf single-section, $12.00 each. Air-Dux new air wound coils for 80-10m 250-watt pi or tuner, each turn accessible for tapping, 1-1/2 dia X 4-1/2 long, 82-turns with 5-1/2 inch clear mounting plate, $2.50 each. Genuine Whisper fans, 115v 60Hz, with grille like-new $8.50 each. New, boxed 829B's, $10. each; 816's, $4.00 each. Prices include shipping, USA. J. M. Hoffer, W1DL 24 Cherry Road, Framingham, MA 01701.

TEMPO 2020 xcvr and matching speaker, excellent condition, used sparingly, $650. Chuck Dommer, WB8VVC 119 North Mason, Battle Creek, MI 49017. 616-964-4786 evenings.

NEED semiautomatic key. W7KIZ, 1402 Craig, Mosee Lake, WA 98837.

SELL: Heath SB-401 and HR-1680 both for $400 WD4HRY, 4402 8th Ave., N., St. Pete, FL 33713.

TRITON II, 262 power supply, KR-40 keyer, $525 WA1RIT 11 Greenwood Rd., Andover MA 01810.

WANTED: Heath HA-14 and ac ps. W6QVI, 24765 Cal Roga, Hayward, CA 94545.

CAPACITORS 13.5µf. 4kv $23. Power transformer(s) for ± 15v at .5adc each, and 5v at 1.5adc regulated supply with 115/230v primary $7. 1mAdc 3-1/4 X 1-1/4" meta edge meters $9. All above unused, I pay shipping. Chris Wartes, K7UWT/K7II, 706 Harvest Rd., Bothell, WA 98011. 206-485-5344.

SELL: Dentron 160 xvrtr $125. Dentron 160-10 1kW tuner $95. Kenwood TS-511s xcvr, matching spkr/ac supply, F VFO $425. WA0PQG — Box 252C River View Park, Thief River Falls, MN 56701 218-681-2366.

HW-101, ps, mint $300. WB8DAR 419-833-2813 after P.M.

FOR SALE: Collins 51S-1 receiver, round emblem, excellent, $1295. Jack Yeoman, 3284 Yeoman Rd Washington, C. H., OH 43160.

ICOM 215 2m FM portable for sale. Like new. $170 W2F 609-429-5902.

FOR SALE Heath transceiver HW8 with power supply and bi-linear amplifier factory aligned and checked manual mint $160. Eley 804-428-4105.

WANTED: Heath HW12 or HW22 with AC supply to Heath HW32 with DC supply. Mark S. Starin WA1TZ 225 Main St., Newington, CT 06111.

SACRIFICE: New Bearcat 16 channel programmable scanner, $285, EBC — 144 Jr. two meter synthesized transceiver, $500. and Genave GTX-100, 220 MHz transceiver, $200. All in original factory boxes with manuals and warranties. Russ, KØRBR, 303-794-4761, 6469 S. Vine St. Littleton, CO 80121.

HEATHKIT SB-500 transverter $140. Ameco converters CN-50/CN-144 ten i-f $40.; Janel CN-144F converter Ten i-f. $66. WA4BVE, 1005 Tradewinds Rd., Virginia Beach, VA 23462 804-424-1855.

KWM-2, 516F-2, 312B-4, round emblem, excellent condition, $1100 firm, package only. K5VEL, Gary Price 512-656-2591.

SQUIRES-SANDERS SS-1R with SS1S noise blanker in SS-1RS speaker, manuals, 160-10 meters. Overhauled by Sherwood Engineering. $295. 1268 South Ogden Street, Denver, CO 80210. 303-722-2257.

FOR SALE: Excellent Drake TR-4C, never mobile, very low operating time $450. DC-4 ps $85. Jene Melton, WAØDEM, P. O. Box 413, Deadwood, SD 57732. 605-578-2192

SB-104 $500, HD-10 $15. K4QDK, 804-272-0871, 8635 Fieldcrest, Richmond, VA 23235.

RF 401 two meter transceiver 5 or 50 watts ,output 12 chan $175. WA2FFW 607-627-6628.

ACHTUNG SSB homebrewer, McCoy 9 MHz filter, BM, VFO module, all new $21 FOB. Want duobander Robb WØBHA Bird Island, MN 55310.

SELL Drake R-4C with MS4 including crystals for eight foreign boradcast bands and WWV serial number 18091 Mint condition $400 Mahler — Wedgewood Drive, Danbury, CT 06810, 203-792-1725.

HW-101, cw filter, HP23A, mic, spkr, mint, $350. WD8NWL, 508 W. College, Granville, OH 43023, 614-587-1122.

KENWOOD Station: four months old; TS-820; VFO-820; SP-520; DG-1; YG-88C; MC-50; cartons, manuals, mint condition; $1190. U Ship; WB4KSP 919-793-4325.

TRADE: International Science and Technology; fifty-four issues for VHF ham gear W3BAF 117 Presidio Verona PA 15147.

BARLOW-WADLEY XCR-30 Mark II receiver. Continuous tuning 0.5-31 MHz and 87.5-108 MHz FM. Excellent condition, in original box. $225 or offer. Harris, 171 Kresge College, Santa Cruz, CA 95064.

TECH manuals for Govt. surplus gear — $6.50 each: SP-600JX, URM-25D, OS-8A/U. Thousands more available. Send 50c (coin) for 22-page list. W3IHD, 7218 Roanne Drive, Washington, DC 20021.

30L1 linear, round emblem, mint, $400. 312B4 station control, round emblem, mint, $150. Jim Cain, K1TN, 263 Williamstown Court, Newington, CT 06111, 203-667-3170.

WANTED: SB-610, SB-630, SB-640. WA1WLW.

FOR SALE: SX-100 Hallicrafters rcvr. .55-32 mc. Excellent condition, $70. F.O.B. phone 415-455-9348.

SELL: Mint S.B.E. 36 transceiver and ac supply $500 Kenwood TS-520 with cw filter $535, Yaesu FV-101 remote VFO $75, New Hy-Gain tri band antenna TH3 Mk III, unopened carton $175. Richard Shark, 417 North Ferry, Ottumwa, IA 52501. Tel.: 515-682-5741.

QSTs in binders 1927 and 1929 $50 each, 1930, 35, 36, 37 $40 each 1949 $30, 1950 thru 1959 $20. each, 1960 thru 1967 $15 each, Terry Clark, WA1VUW, 22 Pinehurst Dr., Meriden, CT 06450.

ORIG owner. Sell Collins Sta. 32S-1, 516-F2, 75S-1, spkr, Central Elect. MM-2, TH6DXX, Exc. condx. Best reasonable offer. K5AW Hoxbar Rt. Box 203, Ardmore, OK 73401.

OLD QSTs wanted for collection. Al Blank, W1BL, 727 Pine St., Bristol, CT 06010.

WILSON no. 1404SM, Mint, with i-f filter, BC-1, BP-1, LC-2, SM-2, Tone Pad, Book, $334. Jeff, K1YLV, 203-281-6038.

HEATH SB102 with RIT, spare finals, HP23A p/s, SP600 speaker, cw filter. $350 or best offer. Prefer Baltimore DC area. Rob Becker, WA2NYE/3, 2912 N. Calvert St., Baltimore, MD 21218. 301-243-0582.

GONSET GSB100 Model 3233 $85 plus UPS manual — W2AWM 404 Claridge Court, Point Pleasant NJ 08742.

HEATH SB-104 xcvr, completely checked out & aligned by heath factory; with noise blanker, HP-1144 pwr supply, & SB-604 spkr; all mint cond. $700. Bill Pearce, 204 Ave. B West, Bismarck, N. D. 58501. Will pay shipping w/i cont. U.S.; 701-223-2890 (office), 701-258-9294 (home).

QSL Service — DX operators in need of stateside QSL manager, write: QSL EXPRESS, 30 Lockwood Lane, West Chester, PA 19380.

CREATIVE QSL Cards — Personal attention. Imaginative new designs. Send 50c. Receive catalog, samples, Wilkins Creative Printing, Box 787-1 Atascadero, CA 93422.

QSLs — Rubber stamps. Low prices. Free catalog. Forwardco, Box 76 Massillon, OH 44646.

QSLs. Catalog 35c. N & S Print P. O. Box 11184 Phoenix AZ 85061.

QSLs with class!! Unbeatable quality, reasonable price. Samples, 25c. QSLs Unlimited, Box 27553-Q, Atlanta, GA 30327

US & DX QSL Forwarding — To US: 7c per card, to DX: 4c per card (VE to VE: 7c per card). Other QSL services offered. Send s.a.s.e. for details & any cards I may have on file for you. W7IZH QSL Service, Box 17987-Q, Tucson AZ 85731.

SELL: SBE-34 $200. Wanted: 75A-4, 2C and 2NT. Russell Adams, 225 Gray Ave., Ames, IA.

FOR SALE: Heath SB401, SB303, w/sb 104-1 noise blanker, SB600 spkr. All $525. WB6FFZ, 213-836-3102.

WANTED: Accessories for Galaxy 5 line. Condition & Price a must. First reply. WBØYOD.

FOR SALE: Sencore PS163 scope-dual trace $550. Want:10-160m. self powered VFO. Jeri Healey, Marshfield, VT 05658.

WANTED: Heathkit HP-24. Sell: CMOS Accukeyer and MFJ CWF-2BX, both $50. K7HI, 415-474-1862.

FOR SALE — Clegg FM-DX & Touch-Tone pad. $395. EC-175 Regency frequency counter 175-MHz — xtal oven, $275 HAL ST-6 (RTTY) demodulator/keyer, $325. Bob Goodman (WA5KXH), P. O. Box 452, Alexandria, LA 71301 Phone 318-640-1466.

WANTED: Coil sets for HRO-60T receiver. Please advise coil set number, condition and price. Bert, W5PDE, Rte. 1, Box 345, Shepherd, TX 77371.

HW-8, pwr, $100. Walt Colquitt, WD5FDV, 713-482-5540.

SELL: HW101 w/HP-23B, HP-13B, SBA-100-1, HS-24, mike, w/manuals 375. WD9APG, 810 S. Park, Springfield, IL 62704.

GROUNDED Grid filament chokes 30 amp — $5.00; plate chokes 800mA — $4.; 2AMP — $6.; PPUSA48, William Deane, 8831 Sovereign Rd., San Diego, CA 92123.

RTTY — NS-1A PLL demodulator. Board +3.50; Parts $15.00; W/T $24.95, all postpaid. S.a.s.e. for info. Nat Stinnette Electronics, Tavares, FL 32778.

MONTANA Callbook. Listed alphabetically by call letters and city. Has Montana Repeater Map. Well constructed with commercial printing and heavy paper cover. $2.50 postpaid from Hiline Amateur Radio Klub. WR7AIL, Box 1251, Cut Bank, Mintana 59427.

HOME built for year round living. Two bedrooms plus radio room, two baths. Central electrical heat and air cond. Rohn tower with TH6DXX ant. Box 813, White Mtn Lake, AZ 85912 602-537-2842.

TI SR-10 scientific calculator, make offer. 14 AVO WB, needs work, $19.95. Ameco CN-50 conv., $25. Swan SWR-1, $19.95. W6ROZ, 1330 Curtis, Berkeley, CA 94702.

COMPLETE mobile station for $500. Drake TR4 with noise blanker, DC4, MC4, Telex earphones, Shurehand mike, installation kit, Ball and base assembly. Also Millen grid meter $80; Heath SWL meter $10; CDR Ham antenna rotor $85; Turner mike $35; B & W 425 filter $10; Drake LN4 filter $10; W2AU Baluns 1-1, 1-4 $5 each. W8QQW, Box 4271, Copley, OH 44321. 813-472-2576.

WANTED: Hammarlund S100 or S200 speaker; 1626 tubes; Sell: Turner + 3 microphone, $35; Shure 444, $30. W2WHK 210 Utica St., Tonawanda, NY 14150 715-692-5451.

HEATH SB-303 Mint condition with optional crystal filters $350 John Walsh 203-869-1967.

HEATH 6M SB110A W/HP23 $295; SB200 $275; Swan 250 w/117XC 250; Clegg 99er $39; Atlas 215 w/nb $575; Collins 516E1 $125; MP1 $75; Collins mobile bracket $50. W2FNT 201-486-6917

VIKING Valiant I, classic xmtr, needs minor work, any reasonable offer. Pick up only. George Schnepf, WB2ROV, 212-924-1338, Eves.

WANTED: Triband beam. 2 or 3 element. WA2QEA. 315-866-0234.

ANTENNAS — dipoles, single and multiband, traps, verticals, baluns, apartment portables. See ad QST June 77 and 73 Nov. 77. Large S.a.s.e. for catalog or call 813-585-9688 to order. Antenna Supermarket, PO Box 1682, Largo, FL 33540.

RECEIVER, Radio R-390/URR Capehart Corp. 115/230 VAC Mint cond & working. P. O. Box 683, Woodbury, NJ 609-848-2169.

TS700A. Very clean. Used Mostly for OSCAR. Never mobile. $450. Carl Mills, WA3ZHW, RD6, Stroudsburg, PA., 18360. 717-992-4538.

450 REPEATER, Motorola 74BBB-3000, 100W, PL, outdoor cabinet, manual. Good condition. $350. or swap SB110A or Swan 250C. WA1RHT 203-589-7086.

DENTRON for sale. Like new MLA-3000A $600. Like new MT-3000A $250. No shipping. Pick-up only. K9GEL 11100 Springmill Road, Carmel IN 46032 317-846-1207.

QSTs 1924-1030, 63 issues. Model 28 KSR, $200 pick-up only. Sanders. P. O. Box 31, Rock Island, TN 38581. 615-686-2461.

NOVICE Gear HQ-170 rcvr $140; Sonar SRT-120 xmtr 80-10M 100W $50; Viking Challanger xmtr $35, VFO $15, 2M converter, Navy TDQ 2m xmtr, More. K2DCE, 50 N. Middletown Road, Montvale, NJ 07645, 201-391-6343.

WANTED: 1000 watt modulation transformer. WB1CHM, 216 Whisconier Rd., Brookfield, CT 06804.

APARTMENT Portable antenna Use anywhere. Solves landlord problems. 80-10 meters. 13 feet maximum length. Fully assembled. Folds to 5 foot package. Model AV-1 $49.95 plus $3 UPS. Antenna Supermarket PO Box 1682 Largo FL 33540 813-585-9688.

REPLACE rusted antenna bolts with stainless steel bolts, small quantities, free brochure, Elwick Dept., 256, 230 Woods lane Somerdale, NJ 08083.

HEATH SB-104 W/PS, beautifully built, exceeds specs, $550 or offer. Venus SSTV monitor, mods to exceed specs. $225 or offer. Craig Roberts, WB5HKO, 504-529-5205 days.

SELL: Wilson T-1405SM, nicads, charger, case, TTP, Speakermike, filter, mint, $325. Paul, W5ZVB, 405-789-7534.

SIGNAL/One CX7B $1595; immaculate, warranty. Demo Alpha 77D(s). Payne Radio K4ID. 615-384-2224.

DX-60B and HG-10 VFO $200 Hallicrafter S-120A receiver $40 wanted 20 h inductor for Hammarlund SP-600. Dave Dropkin Raleigh, NC 919-781-6046.

WANTED: Hallicrafters HA-20 DX Adapter. N2EG RD 8 Box 552 Flemington, NJ 08822.

CRYSTALS: Novice and General amateur bands. FT-243, all frequencies, 40M and 40M to 15M & 10M minimum five — $1.25 each, less than five $1.50. 80M five or more $2.50, less than five $2.95. Sockets 30c each. Write for price-information sheet on Novice Combination QSO-calibraion Packages and other crystals. Crystals since 1933, Bob Woods WØLPS Postage 1st-cl, air 20c per crystal. C-W Crystals, Marshfield, MS 65706.

WANTED: Heath HG-10VFO. WD9ANO 210 8th Ave., Mendota, IL 61342.

SELLING: Hustler G6-144A 2m antenna. New. $50. Dan, WB2HXT. 5 Wayne Court, Ardsley, NY 10502. 914-693-3966.

VHF scanning monitor. Heathkit GR-110 with 147,18, marine ch. 16, NOAA WX1, WX2 xtals, manual, $65. Vibroplex keyer $22. W1DWZ 617-378-3619

FOR SALE: Collins 62S1 50/144MHz transverter with high power Eimac 8877 144 MHz amplifier. Following new equipment: Dentron 160XV transverter, 160AT transmatch, W-2 wattmeter. Millen 90652 solid state dipper, 90672 antenna bridge. Turner model Plus 3 transistorized ceramic microphone. Thomas, W2UK, 9 Emmons Avenue, Farmingdale NJ 07727. 201-938-5623.

RECEIVERS, transmitters, test gear, 4000 tubes, magazines, etc. antiques, moderns. Large list. S.a.s.e. W4BLQ. Box 158, Edgewater FL 32032.

TRANSVERTERS wanted for OSCAR. Phillips, 1345 Arizona Avenue, Milpitas, CA 95035.

TEKTRONIX 107 square wave generator. 3 nanosecond rise Tektronix 105 high-level square wave generator. 20 nanosecond rise. $75. each with manuals, Both for complete scope calibration $125. Sherwood, 1268 south Ogden Street, Denver, CO 80210 303-722-2257.

R-4A $299, MFJ keyer $40, Vibroplex bug $25, TO keyer $25. Want Magnum Six (Drake), MN-2000. Don Bishop, NØEA, Box 11384, Denver, CO 80211. 303-455-2163.

HW16 $100, Vibroplex $35. USA 72 Callbook $5. BC-348 $50. Ken hand WB2EUF P. O. 708, East Hampton, L. I. NY 11937.

FOR SALE: Sonar FM-3601 2 meter mobile transceiver 10W eight sets of crystals — very good condition. $125 WB2PTV 212-373-8171.

HEATH SB-650 frequency display; $100. Hy-Gain 18AVT/WB, excellent condition; $55. Shipped UPS. WB6FXJ, 714-256-9576, evenings, weekends.

FOR SALE: Drake 2-NT cw xmtr, factory recondx, $100 firm. Heath HW-8 w/pwr sply, factory aligned, $100 firm. Argonaut 509 xcvr, 210 pwr sply, 206 cw filter, 206 xtal cal. Brand new. $350 firm. Will ship. Certified checks only. Crowell, 640 Stonehenge Drive, Mary Esther, FL 32569. 904-244-0307.

COUNTRY List — Beam headings-distances- time differences, computed individually for your QTH. Seventeen page print-out lists over 700 locations worldwide. Send $12 and your station location to DEI, Box 2370-Q La Habra, California 9061. Distances in miles unless kilometers specified.

COLLINS 30S-1 amplifier, essentially unused. Cosmetically flawless and functionally perfect. Rare opportunity for the discerning, quality-oriented radio amateur. Post-graduate research commitments necessitate sale. $1395 or offer. Robert Neece, KØKR, 1505 Sunset Boulevard, Boulder, CO 80302. Call 303-444-4856.

WANTED: Central Electronics linear, model 600L in good or exc condx. Also need HRO 60 coils E, F, and AC. Tom Fowler, WØLOV 1364 Madison, Denver CO 80206.

KEYBOARD for sale. Telstar. 72 character memory. 4-100 wpm deluxe model. Prog. memory on keyboard. $285. Local pickup. W2HZQ, 212-998-2743.

REPEATER — G.E. Progress line (gold chassis). Four-frequency, 60 watt, commercial repeater with remote capabilities. All shielding, manuals, and remote included. Will deliver within 250 mile radius. $450 or best offer. Schmidt, WA9JDR, 2222 Martin Street, Madison, WI 53713.

COLLINS 75S-1, good condition, $250. Will ship. WD5BFG, Rte. 2, Box 236M Las Cruces, NM 88001 505-526-1857.

TEKTRONICS 511AD scope, Eico VTVM, Eico rf signal generator, EICO GDO, yaesu FL-2100B linear and SP-101P phone patch. Sell or swap, make offer. Also need beam for 10 and 15. WB5NAI, Route 2, Box 433A, Alexandria, LA 71301.

FOR SALE: BC-610, 700 watts am, cw. Surplus SX71 receiver. Ed Farrell, 133 Sutton, East Providence, RI 02914 401-434-8911.

DRAKE R-4B, perfect, extra crystals, manual, dust cover, $320; add UPS. David Rogers, WA7ZYQ, 238 10th St., St. Maries, ID 83861.

COLLINS KWM-2, round emblem, 516F2, MP-1 12vdc supply, 351D-2 mobile mount, instruction books, excellent condition, $995. W6CP, 11 Charro Court, Santa Rosa, CA 95401, 707-528-1246

CLEGG Mark 3 2 mtr xcvr exc. cond. with 52/52, 01/61, 04/64, 055/655, 07/67, 235/835, 28/88, 295/895, 34/94, 78/18, 855/255, 99/39. Complete + 175. Vic Deutchman 26 Berry St., Milford, CT 06460.

CANADIANS: Collins KWM2-A, one year old, Absolutely perfect condition, best offer. Paul Castonguay, VE2DYE, 514-277-6766, 514-341-7630 Ext. 217.

WANTED: Collins directional wattmeter, model 302C-3. State price and condition. K4HCA, 4567 Darlene Way, Tucker, GA 30084.

COLLINS Wanted: Broken, damaged, non-working, basket cases or parts for ham band gear; by Collins collector. H. Kolesnik, WBØRVG/5, 4011 Skyline Drive, Farmington, NM 87401.

SELL or trade: 37 ASR for TS-820 or 520. KØIJF, 5314 Tucker, Omaha NE 68152 402-571-5119.

BUY-SELL-TRADE. Write for free mailer. Give name, address and call letters. Complete stock of major brands new and reconditioned equipment. Call for best deals. We buy Collins, Drake, Swan etc. SSB & FM. Associated Radio 8012 Conser, Overland Park, KS 66204 913-381-5901.

WALKIE-TALKIE, hand held, military BC-611. Good collectors item. Excellent condition. Less tubes. $35. each. Andre Calatayud, 196-23 Jamaica Ave., Hollis, NY 11423.

GENERAL ticket? And Advanced? If I did you can. 32 page "how to" booklet, $2. Slow learners, worry-warts only. WBØPTM 516 9th Ave., Brookings, SD 57006.

WANTED: heavy tower. Rohn 45 or 55. What have you got? Rohn 25 and 45 tilt over section. WA4BCY, Don Hammond, RFD, Fauns-Dale, AL 36738.

MEASUREMENTS no. 59 grid dip meter complete $85. Atlas 215X w/nb $595. 75S-1 $325. 32S-1 $385. FR-101S, Digital, mint $550. Drake RV-4C $105. 75A-4 w/3 filt. $495. Wanted: Drake twins, AC-4, AC-3, MS-4, W2FNT, 18 Hillcrest Terr. Linden, NJ 07036, 201-486-6917.

SB101, HP23, cw filter, HP13A, excellent condition, best reasonable offer. R. Wallace, WB4PSX, 501 Thorngate Dr., Fayetteville, NC, 28303, 919-868-1077.

SWAP: Genave GTX-1, case, charger, nicads. Mint condx, warranty, for Drake C-4 in mint condx and cash. 14 AVQ $35, N2HA, 111-12 75 Rd., Forest Hills, NY 11375.

WANTED: Manual for Viking Challenger. W2KBH, Box 3, La Grangeville, NY 12540.

WILSON 140-SSM, 5 freq., cc, desk chgr, SM-2, more. Mint. $320. Pete, WAØBBS. 303-423-3464 eves.

MIDNIGHT SUN DX QTH: Want to exchange QTH in Stockholm (5 room house, kW rig, car) for mobile home, camper or house in western USA during any 4-5 weeks summer 1979. SM5BKZ, Stig Schyffert, Vallstanasvagen 51, S-19040 Rosersberg, Sweden.

SELL: Hallicrafters FPM-300 MkII 10-80 mtr solid state transceiver. Tube driver & final. Built in ac-dc ps. 250 watts PEP. Mint, $390. Heath HD-1410 electronic keyer $30. Hy-Gain model 270 2 meter ant. $20. Johnson l.pwr. Match Box $30. W6OWD, 415-728-7136.

COLLINS repair and alignment, $75. Former Collins engineer, first radiotelephone, Extra, calibration laboratory. K1MAN 207-495-2215.

GE TPL 80 watt on 2 meters. Split mount complete with cables. $80. includes shipping. WØOZG Rte. 5, Box 113, St. Charles, MO 63301.

FOR SALE, Drake TR22 and AA1OPA, $140. CV57 URR TU, $50. Hallicrafters S9 receiver, make offer. W2GRN, 540 maple Dr. W, New Hyde Pk, NY 11040 516-354-5550.

WANTED: PSR-117 power supply for Multi-Elmac model PMR-7. W6SBH, 1263 Washington St., Red Bluff, CA 96080.

SALE: Hallicrafters 6X-117, HT-44 w/ps, matching kW-amp, mint $535. 40 ft tower, Ham "M" TH-3 beam $175. TO keyer with Brown key $50. Office size metal desk $75. All in mint condition. DuMont scope model 350, $30. 201-741-6896 after 5 pm.

HEATH HX10 Marauder cw/SSB transmitter, 180 watts PEP. Excellent condition, has worked 150 countries. Extra set output tubes, $175. Walt, W2JDH, 201-727-0069 evenings.

SELL — Collins 32S-3, 75S-3B, 516 F-2, round, 312B-4, DL-1, all mint like new, cables, manuals, complete $2,650. Kenwood TS-700, excellent, $425. Crown telephone Valet, $85. Yaesu FRG-7, mint, $250. Vic, 325 Wilson Ave., Westwood, NJ 07675. 201-664-0155.

HEATH SB-102, SB-600/HP-23A spkr./p.s., SB-200 linear as package $650. No split. Also HP-13A dc pwr. supply and SBA-100-1 mobile mount. $40. Hallicrafter SX-100 rcvr. $125. No Shipping. W2GQK, Phone 609-589-4399.

CLEGG FM-27B, excellent condition, four position switch, $279. Gordon Piper, K2GP, 201-891-4255.

HRO-5TAI, $150. Patricia, 10271 Imperial, Montavista, CA 95014.

WANTED: Atlas 180. Also wanted: 100 amp alternator, and two 4-1000A chimneys. Bryan McCoy, N6VE, 714-636-9894.

SELL: Hy-Gain 18 AVT/WB vertical $60. Tim Kean, WBØVDR, Dawson, NE 68337. 402-855-2287.

WANTED — Model 200 Ten-Tec VFO. Mint only. State price. Crowell 904-244-0307.

SELL: FPM-300 $400; SX-122 $245; SX-101 $110; SX-96 $115; R-4 $220; 2-NT $105; HW-16 and HG-10B $170; Valiant $125; Ranger II $120. T-UG8-D104 $35; VF-1 $25; SST-T-1 $22; Dow-Key co-ax relay $35; B&W 550-A (new) $11; Johnson speaker (new) $15; 832A, 829B, 24LQ6/24-JE6C, four 807, 6146, Baldwin phones, Lafayette "Explorer" $25. John Bradley, Box 222, Glenridge, NJ 07028.

WANTED: Johnson Matchbox (275watt). In gud condx please. Contact Mark S. Starin, WA1TZK, 225 Main Street, Newington, CT 06111.

2 METER: Drake TR-33C, case, touch tone mike, Hustler mobile antenna. 3 Month old. $275. K4GVW, 4000 Anderson, 21, Nashville, TN 37217 615-367-0767.

FOR SALE: Very mint Collins 75A-4. s/n 2588 with 0.8 and 3.0 kHz filters, aligned in June. You 75A-4 lovers know this cherry won't last long. Get here to see it! WA2DGU, 322 Broughton Ave., Bloomfield, NJ 07003.

RTTY 28KSR with 28TD, reperf, HAL homebrew ST-6 with AK1-AFSK, $400, complete. Collins 32S-1 with heavy duty homebrew supply, $400. Drake 2B Receiver, 2BQ multiplier, calibrator, speaker, $160. W1BZT, Conant Road, Lincoln, MA 01773.

KR50 KEYER, mint — $70. D. Benke WD8BSG 343 Sycamore Medway, OH 45341.

HEATH SB-300 rcvr, ssb, cw and am filters; SB-400 xmitter with xtal pack — both only $375. Galaxy 2000 B linear with ac supply $195. Galaxy GT-550 xcvr with AC-400 supply in SC-530 $325. Drake MN-2000 matching network — $160. All equipment in good operational condition. Selling only because I am forced to live in an apartment. Revere, WB5AYU, 713-783-4549, Houston, TX.

ATTENTION Novices: Must sell immediately. Two excellent Novice receivers. 1 Heathkit Mohawk ham bands only 160-10 meters $125 plus UPS shipping. 1 Gonset general coverage .550-30.0 MHz. Perfect for Novice use or for setting clocks to WWV in broadcast station. Both in excellent cond. Gonset $100. plus UPS freight. Must sell both as Santa is comming and needs bread. W5QWS 612 Jasmine Street, Mc Allen, TX 78501, 512-686-6310.

RCVR, National NC-303. 160-10 mtrs, cw (400 hz), SSB (2.1 kHz), am, recently aligned. Matching spkr and full set of replacement tubes. Pick-up. $240. R. San Antonio, K1MD/3, 2320 Blue Valley Dr., Silver Spring, MD 20904, 301-384-4060.

CRYSTALS: 2m ($3.75 ea, $7.00/pair), 10m conversion ($3.25), CB (special cut $3.25), also ham, monitor, microprocessor, IC clock. s.a.s.e. for information. Rebel Electronics, 320 Potter Rd., Burlington, WI 53105.

COLLINS 500cps filter for 75S3B-C. F455VO5 metal cased super grade direct plug-in replacement for F455-FA-05, less attenuation, $55. Millen 90651 GDO $55. All pp UPS. Chashier's check or mo. WA6YTR, 35200 County Line, Yucaipa, CA 92399. 714-795-2144.

DRAKE C-LINE, late model, mint. R-4C, 3 xtal i-f filters, n.b., T-4XC AC4, MS4 $1200. 707-938-1012, 20225 Garry lane, Sonoma, CA 95476.

HEWLETT PACKARD programmable calculator, model HP-25, complete with manuals case and charger, $100. Frank R. Whitaker, W5ZI Box 13352, San Antonio, TX 78213 Phone 512-733-8941.

VACUUM RELAY, ITT-Jennings, RJ1A, new, $37 — WA6BUS.

HEATH SB-102A, HP-23A, SP-600, all constructed by NASA certified technician: $375. Tempo VHF/ONE; $250, Tempo SSB/ONE ; $125. Motorola HT-200 (H23-DEN-1110A), excellent condition; $150. New NLN-6316A case; $10. NLN-6259 charger; $25. TEK-52 battery tester; $35. WB6FXJ, 714-256-9576. weekends or after 5:30 P.M. PST.

HW-101, cw filter, RIT modification, HP-23B power supply $280. Certified check or m.o. William Karl, W2BY, 24 Mill Street, Cooperstown, NY 13326.

SELL: Late Collins KWM-2 w/ac supply; Collins 75S-3B and 312-B4 station control; s.a.s.e. for prices, W6CY 521 N. West St., Anaheim, CA 92801.

COLLINS Station: 75S-3B round emblem, 32S-3 and 30L-1. All equipment in mint condition and on the air. 75S-3B and 32S-3 was overhauled by Collins in '74. Total package price $2000, will not sell part. All F.O.B. Pompano Beach, FL. W4MGK, 370 S.W. 13th St., Pompano Beach, FL. 33060 305-943-8174.

FACSIMILE — Stewart-Warner Datafax — 8-1/2 × 11 page in 3 min. 400 ft. paper supply — autostart. Transmitter & receiver — $100. R. E. England, W3JCN. 301-589-8750.

FOR SALE: Complete 5-band, 500-watt station. Swan 350C, 117XC p.s./speaker and desk microphone. Includes vox, calibrator and side-tone. All new tubes, including finals, recently installed $375. Hy-Gain 12 AVQ vertical antenna — $20. MFJ LSP-620BX II Speech Procedssor, used less than 1 hour — $45. Vibroplex Original Standard key — $25. Call Jay, WA2HMB, 201-254-5860, or write 14 Burlington Lane, East Brunswick, NJ 08816.

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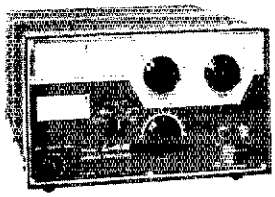

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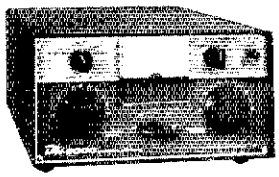

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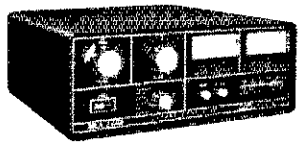

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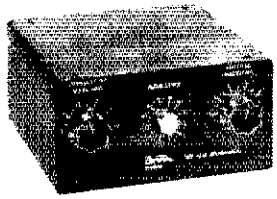

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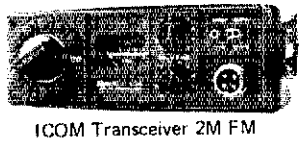

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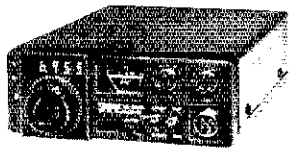

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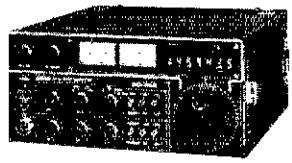

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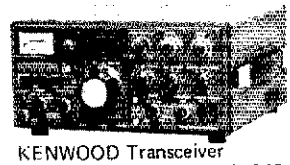

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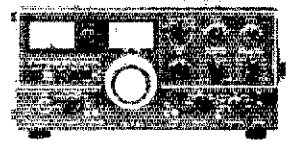

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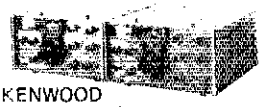

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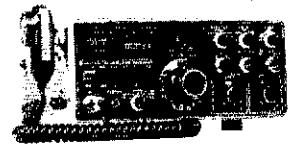

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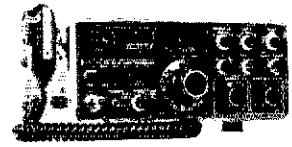

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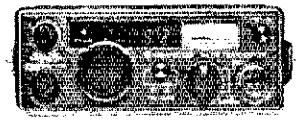

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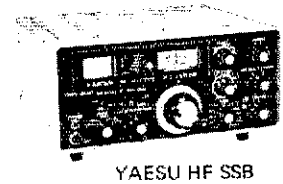

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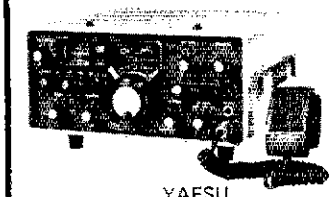
FT-101E, 160 thru 10M $729.



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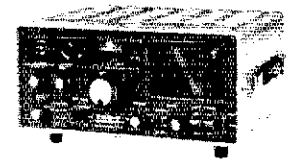

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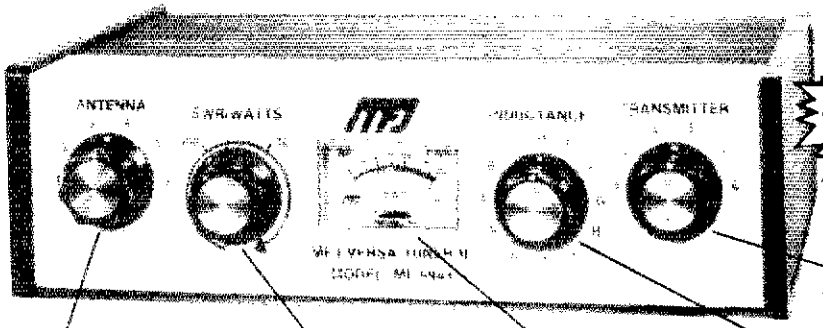
This NEW MFJ Versa Tuner II . . .

has SWR and dual range wattmeter, antenna switch, efficient airwound inductor, built in balun. Up to 300 watts RF output. Matches everything from 160 thru 10 Meters: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balance lines, coax lines.



BRAND NEW

$79.95

Antenna matching capacitor. 208 pf. 1000 volt spacing.

Sets power range, 300 and 30 watts. Pull for SWR.

Meter reads SWR and RF watts in 2 ranges.

Efficient airwound inductor gives more watts out and less losses.

Transmitter matching capacitor. 208 pf. 1000 volt spacing.

Only MFJ gives you this MFJ-941 Versa Tuner II with all these features at this price:

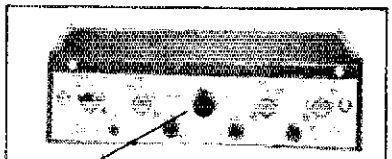
A SWR and dual range wattmeter (300 and 30 watts full scale) lets you measure RF power output for simplified tuning.

An antenna switch lets you select 2 coax fed antennas, random wire or balance line, and tuner bypass.

A new efficient airwound inductor (12 positions) gives you less losses than a tapped toroid for more watts out.

A 1:4 balun for balance lines. 1000 volt capacitor spacing. Mounting brackets for mobile installations (not shown).

With the NEW MFJ Versa Tuner II you can run your full transceiver power output — up to 300 watts RF power output — and match your transmitter to **any** feedline from 160 thru 10 Meters whether you have coax cable, balance line, or random wire.



ANTENNA SWITCH lets you select 2 coax fed antennas, random wire or balance line, and tuner bypass.

You can tune out the SWR on your dipole, inverted vee, random wire, vertical, mobile whip, beam, quad, or whatever you have.

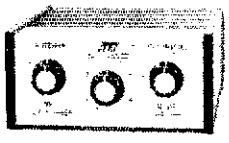
You can even operate all bands with just one existing antenna. No need to put up separate antennas for each band.

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.

It travels well, too. Its ultra compact size 5x2x6 inches fits easily in a small corner of your suitcase.

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 balance line inputs (2), random wire input (1), and ground (1).



$59.95

BRAND NEW

MFJ-901 VERSA TUNER

New efficient air wound coil for more watts out.

Only MFJ uses an efficient air wound inductor (12 positions) in this class of tuners to give you more watts out and less losses than a tapped toroid. Matches everything from 160 thru 10 Meters: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balance lines, coax lines. Up to 200 watts RF output. 1:4 balun for balance lines. Tune out the SWR of your mobile whip **from inside your car.** Works with all rigs. Ultra compact 5x2x6 inches. SO-239 connectors. 5 way binding posts. Ten-Tec enclosure.

$49.95

BRAND NEW

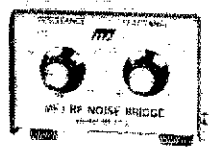
MFJ-900 ECONO TUNER

Same as MFJ-901 Versa Tuner, but does not have built-in balun for balance lines. Tunes coax lines and random lines.

$39.95

MFJ-16010 RANDOM WIRE TUNER

Operate 160 thru 10 Meters. Up to 200 watts RF output. Matches high and low impedances. 12 position inductor. SO-239 connectors. 2x3x4 inches. Matches 25 to 200 ohms at 1.8 MHz.



$49.95

BRAND NEW

MFJ-202 RF NOISE BRIDGE

This MFJ RF Noise Bridge lets you adjust your antenna quickly for maximum performance. Measure resonant frequency, radiation resistance and reactance. Exclusive range extender and expanded capacitance range (± 150 pf) gives you much extended measuring range.

Tells resonant frequency and whether to shorten or lengthen your antenna for minimum SWR. Adjust your single or multi band dipole, inverted vee, beam, vertical, mobile whip or random system for maximum performance. 1 to 100 MHz. SO-239 connectors. 2x3x4 inches. 9 volt battery.

For Orders **Call toll-free 800-647-8660**

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Order today. Money back if not delighted. One year unconditional guarantee. Add $2.00 shipping/handling.

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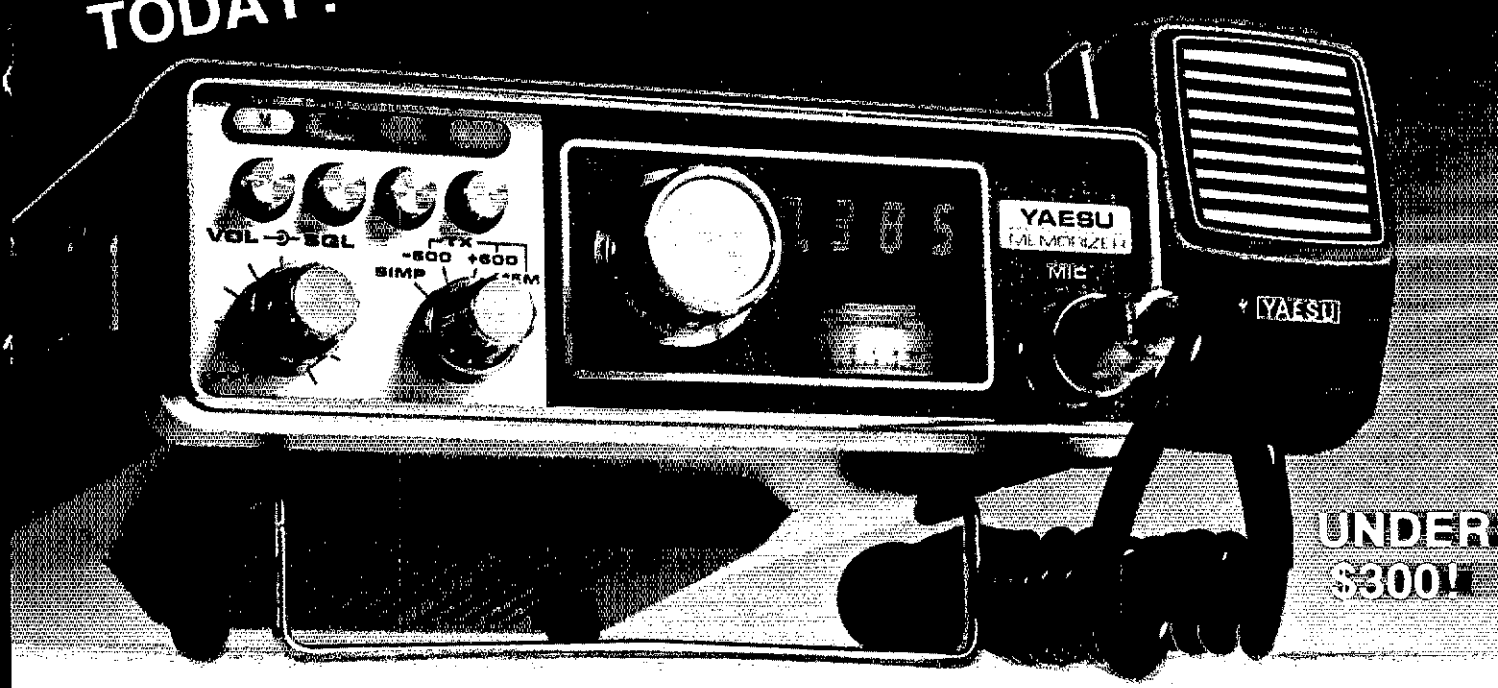
Years Ahead With Yaesu!

Introducing . . .

THE ALL-NEW YAESU FT-227R 144-148 MHZ 800 CHANNEL "MEMORIZER"!

1980's RADIO TODAY!



UNDER $300!

Compare These Features And You'll Know What We Mean When We Say "Years Ahead With Yaesu"

■ one knob channel selection using optical sensing to select 800 channels ■ memory circuit that allows instant return to any frequency selected between 144-148 MHz ■ large 4 digit LED frequency readout ■ fully synthesized frequency control, using PLL techniques in 5 KHz steps ■ built-in tone burst, plus optional tone squelch encoder/decoder ■ spurious well below minus 60dB requirement—superior cross modulation, overload and image rejection ■ standard 600 KHz offsets plus any split within the band using the memory circuit ■ automatic final protection, PLL "unlock" protection and busy channel indicator ■ selectable 10 watt/1 watt output

See this sensational new two meter transceiver at your YAESU DEALER now!

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Cincinnati, OH 45215

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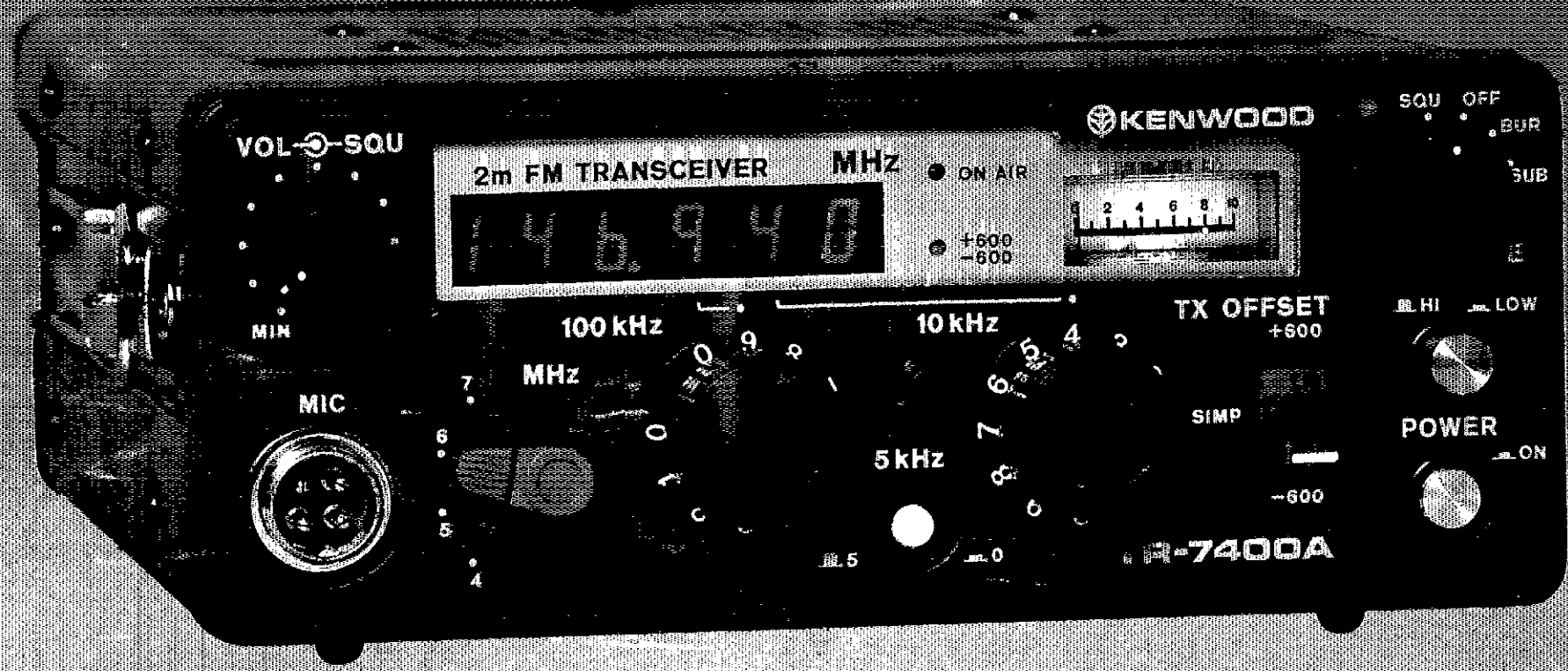

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The TR-7400A exceeds all FCC emission requirements for amateur transceivers. RF output of the TR-7400A is factory spec'd at 25 watts... but typically over 30!

• Dual frequency readout...a large easy to read 6 digit LED display plus a functional dial readout system • 800 channels • Repeater offset over all 4 MHz (144-148 MHz) • Unique continuous tone coded squelch system • Outstanding receiver performance.

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