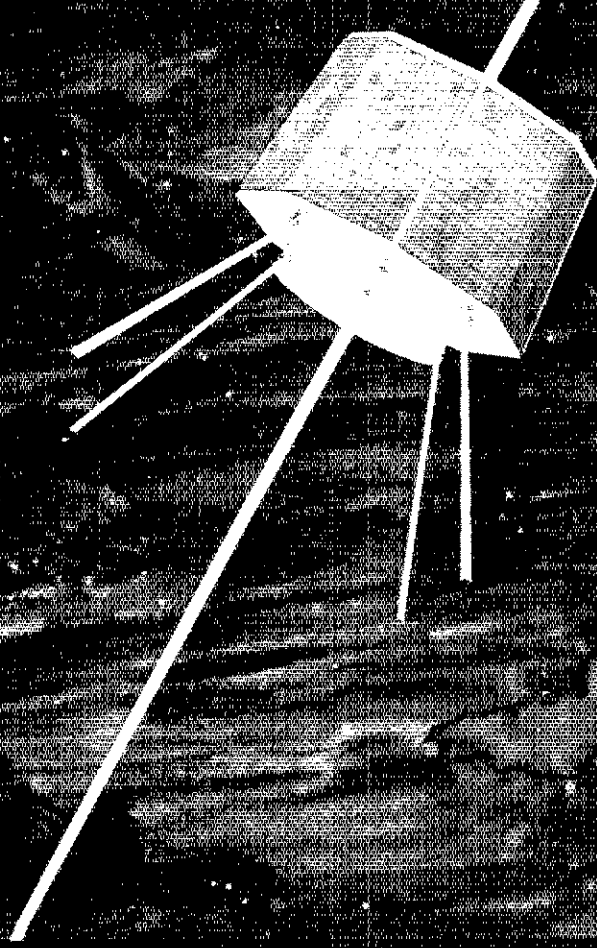


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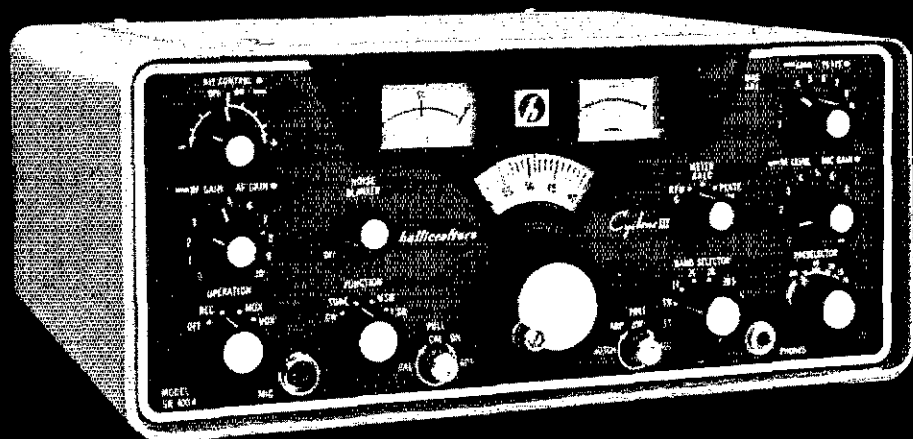
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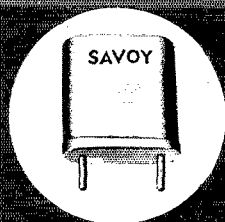
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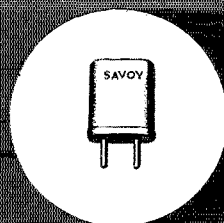


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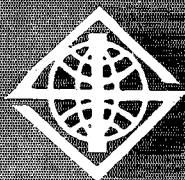
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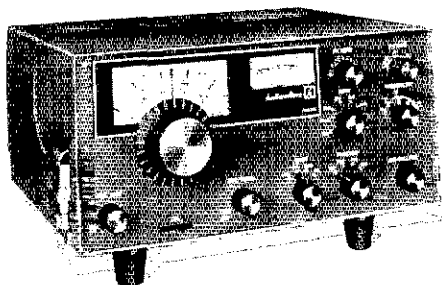
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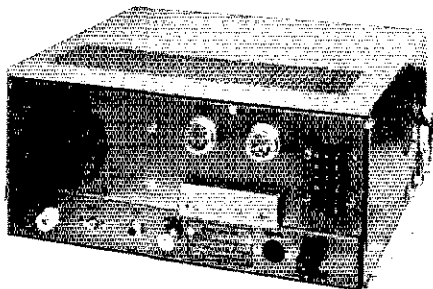
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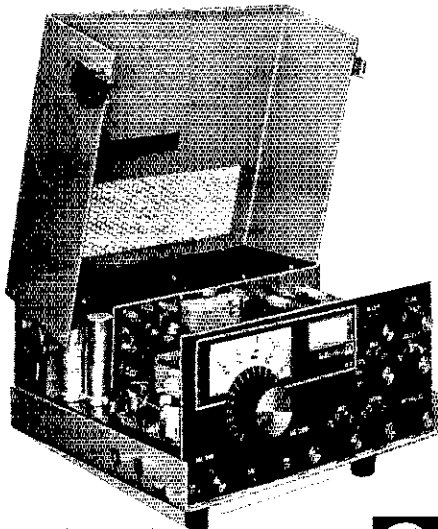
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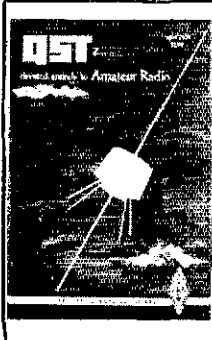
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**OUR COVER:**  
Shown this month is an artist's conception of the Amsat-Oscar 7 satellite now nearing completion.

# QST

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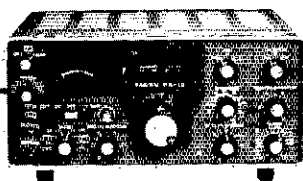
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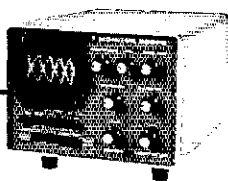
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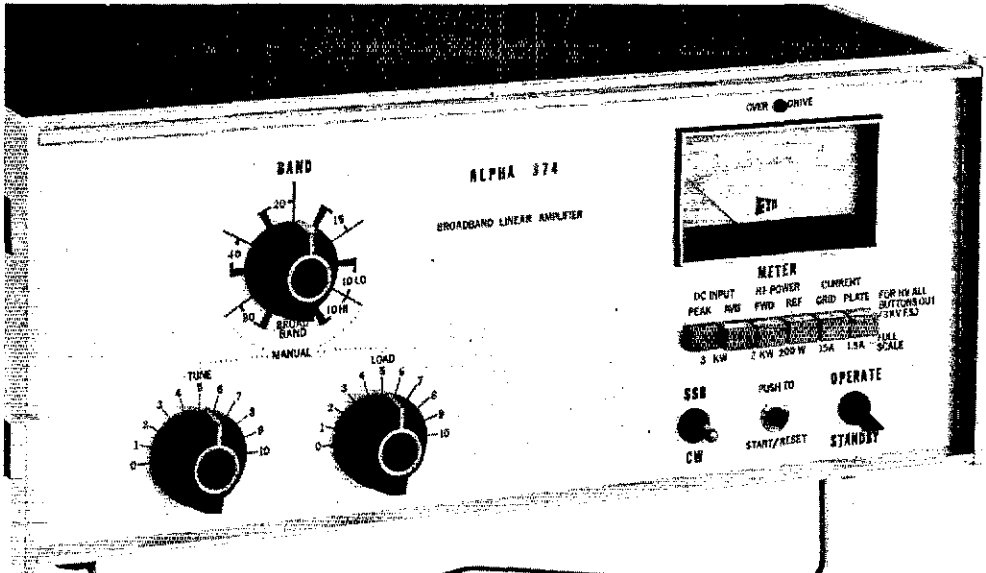
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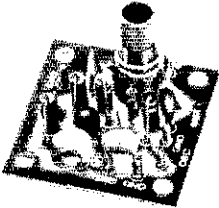
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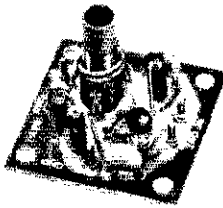
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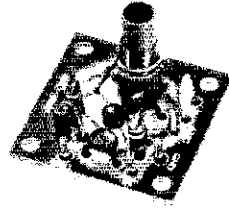
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It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. 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 worth-while 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.

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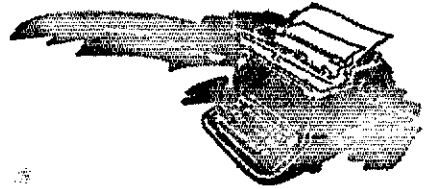
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## "It Seems to Us..."



### TRENDS

A CURRENT SURVEY of amateur characteristics by an independent research firm shows no radical, unanticipated changes in amateur demographics compared with our own figures acquired in recent years. The average age appears continuing its very slow climb to around 47, despite a substantial input of teenagers among the newcomers. Half the amateur body still is professionally employed in one phase or another of electronics science. Ragchewing remains far and away the most popular operating activity, though the "traffic and nets" classification gets a good play. Our 2-meter band, as expected from the burst of repeater activity, is much more heavily populated than a few years back. And in the present stage of the sunspot cycle, 10-15-20-meter activity has, naturally, fallen off.

One difference, however, we find to be particularly interesting, because it is the first confirmation of a view we've expressed about amateur growth (or lack of it) on a number of occasions. The view? That imposition of license fees, in two rounds (\$4 and \$9, just a five-year license term apart), was eliminating a lot of the "deadwood" on the FCC computer. These were, as we saw it, license holders of long duration who hadn't been able to get on the air in years, but kept hoping things would change — and finally decided a dormant ticket wasn't worth four (or nine) bucks. To cries of alarm at the apparent static total of amateur licensees, we've responded that the figure is not a reliable measure, and that true growth from an active newcomer group is being offset in pure numbers by heavy dropouts. The confirmation? Well, for years, numerous surveys showed almost exactly 50% of the amateur body active at any one time, the other half off the air. The present survey shows active amateurs now comprising 63% of our total. This 13% jump means about 35,000 signals on the air we didn't have a few years ago. Who says ham radio isn't healthy?

One final item concerns responses to questions of magazine readership. Keep in mind this was not an ARRL survey of just League members, but an independent polling by a sampling of all amateurs selected at random from the *Callbook*. More than twice as many read *QST* regularly (66%) as read the No. 2 publication (29%), and more than three times as many read *QST* regularly as

read the No. 3 (21%) and No. 4 (18%) mags. Asked to name their favorite, *QST* rated 57%, compared with 10, 9 and 7 per cent for the other three (17% gave no answer). By age groups, the highest regular readership, nearly four to one over second place, was of *QST* by teenagers.

We think our official journal is entitled to take a bow.

### BASICS

FOR SOME YEARS now our "Beginner and Novice" column has treated a variety of subjects — from Antenna Matching to Zero Drift. Generally the theme is selected because it is the one most often mentioned in recent queries to our Technical Information Service, or in Novice forums at conventions. Starting with this issue, and largely because of member suggestions spurring some of our own latent thoughts, we institute a more specific format, structured for beginners rather than hit-and-miss subjects. It will teach basic theory and construction, while providing as an end result a working piece or two of equipment suitable especially for Novices. In other words, it will combine "book learning" with simple lab projects.

We start with an FET voltmeter and rf probe, a basic unit even an old-timer could find useful. Then, looking toward an eventual complete receiver, in instalments our technical crew will do an audio strip, and show how to bias it for minimum distortion. Next in the series is the local oscillator and head end, describing how to connect things for an 80-meter direct-conversion receiver. And then, on to an i-f strip and BFO — perhaps even showing how to convert the existing modules for a superhet hookup.

When a reader completes the series, he should have a good understanding of solid-state, how a receiver works, how to test it, and how to use it in practice. Even several of the non-technical crew here have resolved to do the whole bit on their own as a refresher. So even if not in the beginner class, try it — you might like it!

**QST**

## League Lines . . .

Just at press time FCC adopted, effective May 1, a new schedule of fees for most services, including amateur. Our basic fee goes from \$9 to \$10, with \$5 (instead of \$4) for modifications-without-renewal. Still no fee for Novices, RACES, military recreation stations. Moral: Don't put off until after May 1 what you can do today!

Members receiving first notices of expiration of membership are urged to respond promptly. Some folks wait six weeks to two months and then expect the next issue of QST to arrive on schedule -- no way! A supplementary QST mailing to such late renewers, though only a couple of days after the main run, will take weeks longer in postal delivery -- the Post Office pays more attention to a railroad car full of QSTs than to a few sacks.

One of numerous problems with FCC's proposal to put CB in 224-225 MHz is derogation of the international regulations, particularly concerning Canadian and Mexican borders. We understand Canada has now registered objection in very strong terms. Truth and justice may yet prevail!

While it sometimes seems unfair that CB violations exist by the hundreds (thousands?) while an amateur less than Extra Class gets a ticket for calling CQ on 14,024.98 kHz a rule is a rule is a rule -- so watch those band edges. (And see "Haps" this month for evidence of continuing "get-tough-with-CB" policy by FCC.)

A threat to phone patches and other interconnections with telephone lines was raised by the utilities commissions in North Carolina, Nebraska and Oklahoma, creating quite a stir. But the matter has been cleared up by FCC in Docket 19808, in effect reaffirming the Carterphone case.

Another repeater directory is taking shape at Hq., with a net directory following on its heels. Deadlines for listings, May 1 and June 1, respectively. Complete dope in ARPS column this month.

While no official conclusions have been reached about amateur emergency communications in general and RACES in particular, FCC is still interested in suggestions for improvement. ARRL's Emergency Communications Advisory Committee continues its study, and wants as much input from interested parties as possible. Address Chairman WA4PBG or Hq.

Dean Burch is leaving the post of FCC Chairman, having been appointed to the White House staff. Welcome to his successor, Commissioner Richard E. Wiley, who has demonstrated keen insight into the problems of the Amateur Radio Service (page 90, November QST), particularly concerning repeater regulation.

Five- and six-band WAC awards are now available, but QSOs must be made any time after January 1 this year. See "IARU News" for details. Won't be easy, in the present sunspot phase; but maybe you can try it on 6 or 2??

The Hudson Council crew are hard at work on National Convention plans. Got your vacation schedule set to coincide with the July 19-21 dates?

Writing Hq. on several subjects? If you put one thought to a piece of paper, each with name and return address, the various departments here can answer "in parallel" instead of "in series." Much less chance for one question to be overlooked, too.

The W2 QSL Bureau is moving from Ridgewood to Box 8160, Haledon, NJ 07508.

Quote-of-the-Month: W5JJ says a group (not all amateurs) was discussing hams and felt that as a rule, they were just a cut above the average cross-section of people. Why? "The consensus was that the need for a spirit of dedication, a dedication to stick to and master a discipline, was the filter that eliminated the dilettante, the piddler, the wishy-washy type who never sticks to any cause that requires sustained effort to achieve success." Amen.

**N**OW THAT MY 5-band DXCC is under the belt with reserve, and a few contests for dessert, I feel a call to share some of the "secret weapons" with my fellow competitors. The addition of the 7-MHz dipole to the TH6DXX is one of the most significant improvements to the endeavors of DXing at W9RX. Perhaps others may be interested in this dipole in order to obtain similar benefits.

Living on a city lot and trying to have 5-band antenna farming that will equal or surpass the competition of dollars and acres poses a real threat to those who want to be "first in the pileup" or win a contest now and then. As we gradually compress the world in which we live to make room for all, the same can be said for city lot antenna farming. If you own a monoband or triband Yagi, good for 20 through 10 meters, you may be able to install a super good rotatable dipole for 40 meters. It can be piggybacked to the Yagi and will enable you to take a healthy whack at a good band. Such an approach has been used at W9RX for over a year with a TH6DXX triband Yagi and a 40-meter full-length dipole, piggybacked to the boom!

Prior efforts had the TH6DXX rotatable at 120 feet, and the full-length 40-meter dipole fixed at 100 feet. While there was no complaint with the performance of the dipole into Europe and the Southwest Pacific, the Asians and South Americans had to be worked virtually off the ends of the antenna — a most difficult task in contests or at anytime! The yearn to rotate that dipole and utopinize the antenna farm had become almost an obsession. Before any moves could be made to accomplish the feat, several major factors had to be fully considered:

1) Compensating for the additional structural load on the TH6DXX, the dipole, the mast, the boom, and the additional rotational torque.

2) Mutual degradation in performance caused by the interaction of the TH6DXX and 40-meter dipole antennas now in close proximity.

3) Would the feat be mechanically practical without dismantling the antenna farm or causing other problems.

Factor 2 was the primary one to be considered since failure of antennas would not make any amount of mechanical success an objective victory. Adding a 40-meter dipole in the same plane as the TH6DXX elements could cause undesirable electrical interaction. Previous attempts by others indicated such interaction exists and this mode of construction was ruled out. Only one practical possibility was left; piggyback the 40-meter dipole to the boom of the TH6DXX. It was assumed that the performance of the TH6DXX would not be degraded by the dipole, but conjecture as to the effect of the boom on the dipole was not encouraging. However, this type of construction offered the best possibilities.

While important, overcoming the mechanical problems was considered secondary to solving the electrical ones. Nevertheless, the project seemed worthwhile if the performance of the dipole strapped to the boom was as good as it was in the fixed position. Other antennas such as verticals and

# A Four-Band Whopper

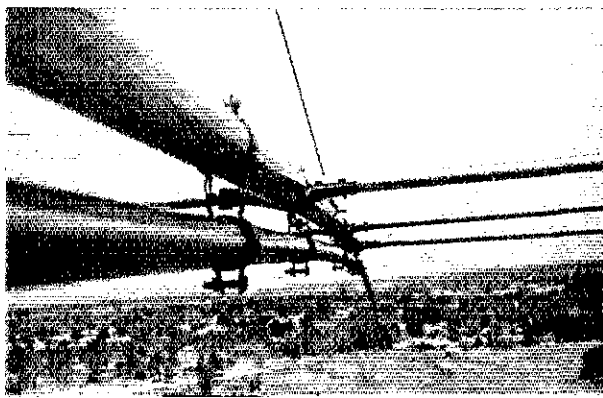


inverted-V antennas were tried but none could compare to the high dipole. This was especially true on receiving.

Factors 1 and 3 were evaluated "ham style" and it was hoped that the assumptions made would turn out to be favorable later on. First, it was assumed that piggybacking the dipole to the boom would mutually strengthen both antennas, provided that the mechanical interfastening was adequate. Second, the overhead outrigger on the TH6DXX, an absolute necessity, would have to be beefed up to handle the extra weight and wind load caused by the addition of the dipole. The

† 22637 Ridgeway, Richton Park, IL 60471.

Photograph of clamp-and-insulator method of joining dipole to boom.



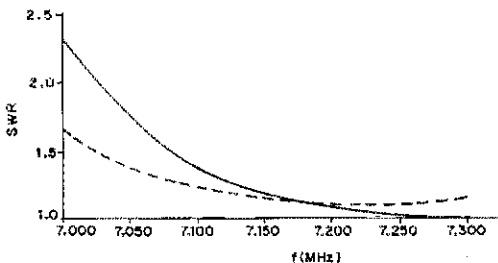


Fig. 1 — SWR vs. frequency curves of the 40-meter dipole. The solid curve is for the fixed dipole at 105 feet and the dotted curve is for the rotatable dipole with matching network at 120 feet.

assumptions proved correct and paradoxically enough, the rotational torque caused by the wind seemed to be reduced. The dipole torque tended to counter the torque of the wind from the elements of the TH6DXX. The lateral loading of the wind on the tower was not reduced, however.

Before installing the dipole, each half was preassembled in two sections. The TH6DXX was tipped in a seesaw fashion and the dipole was installed by sections, keeping the weight balanced as much as possible. The operation was considerably simplified by the fact that the dipole and boom were in a vertical position while the elements were assembled. After completion of all four sections, the TH6DXX and dipole were locked in the horizontal position. But the question was, "Would it work?" Mechanically, everything seemed in order but the interaction between the boom and the dipole proved to be the most time consuming and challenging problem.

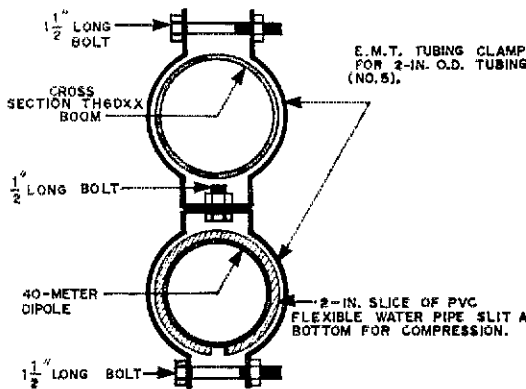


Fig. 2 — Clamp detail showing PVC insulators. Hardware is size 1/4-20, plated. See text for further details.

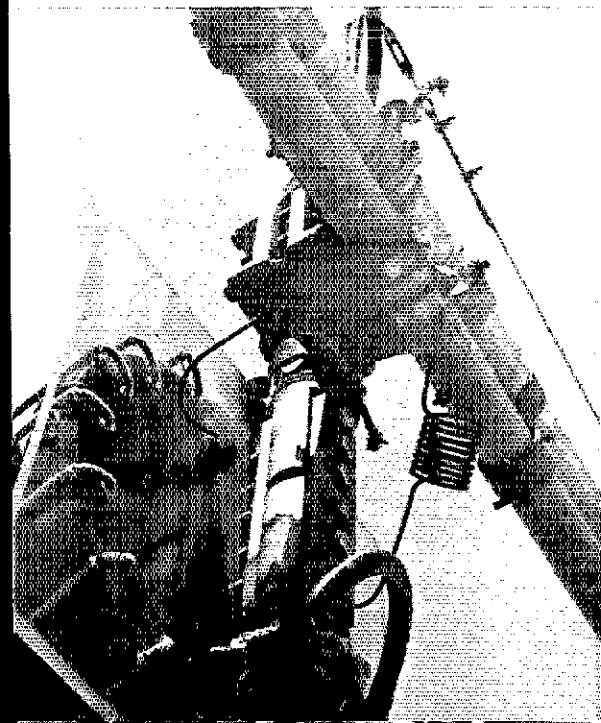
### Initial Performance — Both Antennas

A feed line and balun were connected to the dipole and initial tests indicated that a matching network was necessary. The SWR was over 5:1! A Millen Transmatch was installed and immediately on the air tests gave S9 reports from far-reaching DX locations despite the high SWR on the line (this ought to take the salt out of some beliefs). Being able to rotate the dipole was a dream come true. It showed directivity comparable with a 2-element Yagi. Signals in Asia and South America as well as other places worked when the dipole was fixed were now all readable. It gave the incentive to carry on and lick the SWR problem on the line.

Through some degree of foresight, and a practice I recommend for all Yagis, the TH6DXX was originally installed with a strong swivel/tilting arrangement whereby the TH6DXX could be installed and serviced on top the tower by one person. This made adding the 40-meter dipole to the boom an easy feat without removing the TH6DXX or any part of the antenna farm as it existed. It turned out that the entire operation and installation of the dipole took about 4 hours. It was accomplished by the writer single-handedly on top with the XYL at the bottom tying ropes!

### A Brief Discussion of Installation Techniques

The 40-meter dipole was installed on the boom of the TH6DXX with 12 pairs of equally spaced clamp sets made beforehand from back-to-back E.M.T. (Electrical Metallic Tubing) conduit clamps of the appropriate size. The dipole was insulated from the clamps by means of 2-inch (5 cm) pieces



Physical layout of balun. The tilting arrangement mentioned in the text can be seen just above the Lucite mounting plate of the balun.

of 1-1/2-inch ID flexible PVC water pipe (slit for compression) at each clamping point. Since the voltage at the center of the antenna is relatively low, there was not too much concern for the dielectric losses of the PVC insulators. A solid Teflon centerpiece approximately a foot long, was machined to fit inside the center pieces of the dipole halves to accommodate strength and electrical considerations.

Prior to going further with the dipole, it was felt best to examine the TH6DXX to see if anything had happened to its SWR, front-to-back ratio, and gain. On the air tests compared to the original installation results (carefully recorded) showed absolutely no change. It seemed that the theory and assumptions concerning interaction had born fruit. The 40-meter dipole had absolutely no effect on the performance of the TH6DXX.

With beaming enthusiasm, the problem of the high SWR on the dipole was tackled next. In the interim, the Matchbox at the transmitter was used and DXing was superb. Naturally, I was not content with the high-line SWR. I might lose a couple of dB in a critical pileup! A long series of measurements of SWR and impedance at the top of the antenna and in the shack gave me the data from which I drew the following conclusions:

1) The 5:1 SWR on the 40-meter dipole transmission line was present across the entire 40-meter band and appeared to have been caused by the close presence of the TH6DXX boom.

2) No amount of end-stub adjustment on the 40-meter dipole would improve the SWR.

3) At the input terminals of the dipole, two resonances were observed. First, there was a very broad resonance on 40 meters which appeared to be the natural, full-length resonance of the dipole. Second, a very sharp resonance was observed around 9 MHz. The latter appeared to be the effect of the mutual coupling between the boom and the dipole.

4) A matching network might be devised at the antenna terminals to correct the SWR if the input terminals could be seen as a network of electrical parameters.

5) The natural resonance of the 40-meter dipole appeared to be dictated by the length of the outer stubs rather than by the massive aluminum center structure consisting of the boom and elements of the TH6DXX. The latter ran parallel to the dipole for approximately 24 feet (7.2 Meters).

### *Eliminating the High SWR at the Feed Point of the Dipole*

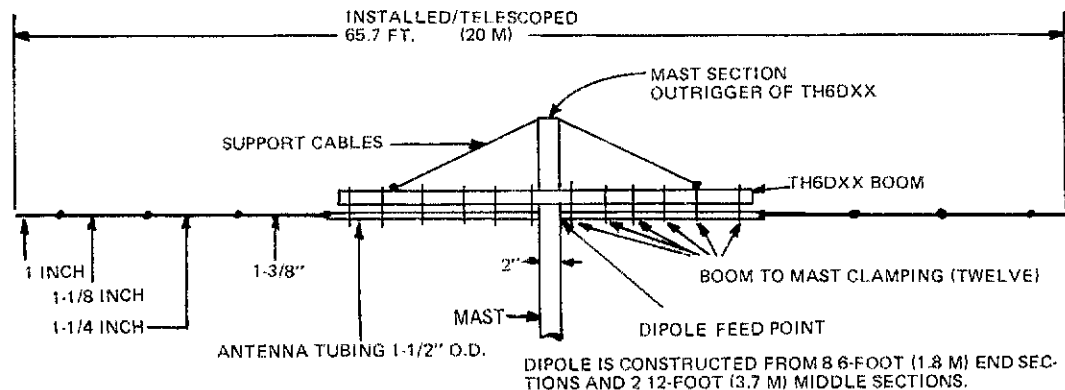
After many sessions at the kitchen table with slide rule, Smith Chart, and accumulated data, an analysis of the interaction problem produced some practical answers. As seen from the antenna terminals, the effect of the boom and insulated mounting clamps produced a series capacitive reactance which had to be tuned out. Two inductors (of approximately 1  $\mu$ H each) were then placed in series with each half of the dipole. The resulting SWR as a function of frequency is shown in Fig. 1.

An equivalent network showing the effect of the interaction is given in the appendix. While other models could be derived perhaps, this one proved useful in obtaining the final results. It might be of interest to others who want to venture into the same territory. One thing is certain; the solution to problems resulting from the interaction of magnetic and capacitive coupling between two antennas is certainly no picnic.

### *Construction*

The overall length of the dipole was 65.7 feet (20 m) with each half consisting of five telescoping sections. The details of the construction can be seen in the photographs and in Figs. 2 and 3. In addition, an rf-choke type of balun was used which had provided good isolation when the antenna was at the lower level of the tower. It consisted of 20 turns of the RG-8A/U coaxial feed line wound on a plastic bucket which was 10 inches (255 mm) in diameter. The bucket was strapped to a Lucite mounting plate with nylon rope (see photograph). The matching coils were made from 1/4-inch copper tubing and consisted of 10 turns 1-1/2 inches (38 mm) in diameter and 1-1/2 inches long.

Fig. 3 - Side view of boom with 40-meter dipole attached. The telescoping sections are fastened with stainless-steel hose clamps. The overlap between sections should be at least 6 inches (150 mm).



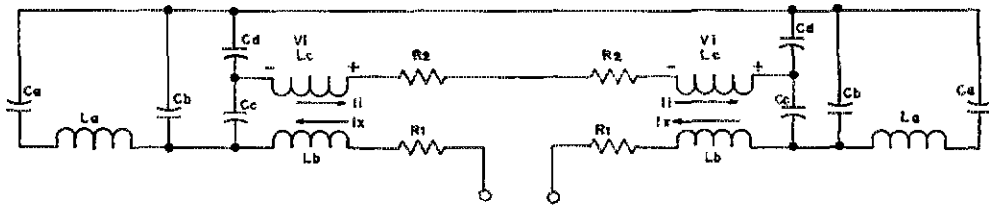


Fig. A1 - Approximate circuit of the dipole-boom interaction.

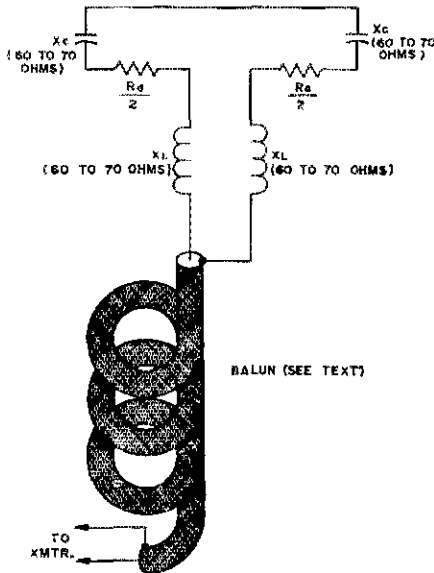


Fig. A2 - Circuit details of dipole, matching network, and balun.

The center two sections of the dipole were made from two 12-foot (3.6 m) sections of 6061-T6 aluminum tubing. These were 1-1/2 inches OD and had a wall thickness of .058 inches (1.47 mm).

### Conclusions

For all those who own small city lots, there is always a way to prepare for the big pileups in competitive events. To make the picture complete, the 80-meter antenna problem was solved quite nicely using three directional half-wave tilted verticals, separately end fed, all hanging from the same "stick" and contained on the city lot. They can be fed also as quarter waves for 160 meters making a 6-band location. Thoughts are presently being lent towards a 5-band rotatable Yagi based on further additions to the TH6DXX, possibly making the 40-meter dipole serve a dual-band function.

Sincere thanks must be extended to the XYL for the rope-tying help, the kids and neighbors for the action-watching committee, and Dr. Fred Morris, W9ICE whose PhD in physics didn't hurt matters any.

### Appendix

Equivalent circuit of the interaction between the 40-meter dipole and the TH6DXX boom. The circuit shown in Fig. A1 was used in evaluating the effects of the boom on the dipole input impedance.  $R_1$  is the radiation resistance of the dipole,  $L_b$  is the equivalent (or distributed) inductance of the center section of the dipole in proximity to the boom,  $C_b$  is the equivalent capacitance of the latter section to its opposite half (on the other half of the dipole).  $L_a$  is the equivalent inductance of the outer end of the dipole and  $C_a$  is the equivalent capacitance of the outer end to its opposite on the other half of the dipole.

The boom is considered to be a radiator in proximity to the dipole and a similar set of parameters are assumed;  $R_2$ ,  $L_c$ , and  $C_d$  being the equivalent radiation resistance, equivalent inductance and capacitance, respectively.  $C_e$  is the mutual capacitance between the boom and dipole (which also includes the capacitance of the PVC insulator clamps), and the dots on  $L_c$  and  $L_b$  represent the mutual inductance between the boom and dipole. This means that a current  $I_x$  in the dipole will produce an induced emf in the boom ( $V_1$ ) such that the induced current ( $I_1$ ) will be in the direction shown.

Analysis and measurements indicated that the inductive component  $L_b$  was reduced while the capacitive component was increased. The net effect was that the impedance at the antenna terminals consisted of a capacitive reactance in series with the radiation resistance. The final equivalent circuit is shown in Fig. A2 where  $X$  is the capacitive reactance and  $R_a$  is the radiation resistance of dipole-TH6DXX combination. QST

Remember the "Let's Talk Transistors" series by Robert E. Stoffels, WB9ESH? We've put together a reprint booklet of this 9-part transistor primer and it is available from ARRL for \$1 including postage.



# A Simple and Efficient Mixer for 2304 MHz

With Suggestions for Use At Other Frequencies

BY LEROY MAY,\* W5AJG/W5HN AND  
BEN LOWE,\*\* K4VOW/WA5UVM

**S**EVERAL GOOD articles have been published on the design of uhf mixers. However, some conventional circuits may be difficult to adjust and require expensive test equipment not available to the average ham, or average vhf operator, for that matter. This article describes a simple-to-build 2304-MHz balanced mixer that requires no tuning and has very good isolation between ports. It uses inexpensive hot-carrier diodes, requires low power for local oscillator injection, and has a 50-ohm output. Nothing new or startling is claimed for this approach, and these mixers may not be any better than other types. The attraction is that satisfactory performance is easily obtained by the average worker.

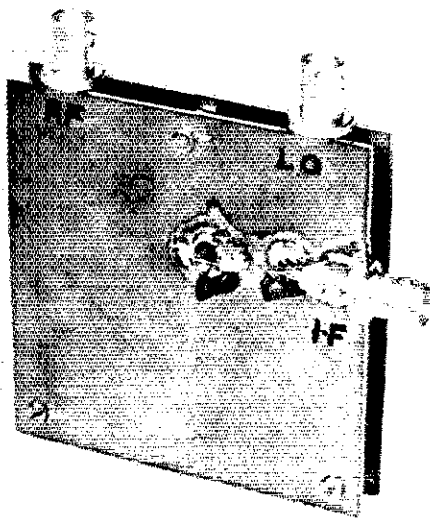
The procedures and techniques described here also work well at 1296 MHz or 432 MHz by altering the physical dimensions, but their main worth is on 2304 MHz where rf preamplification is still rather difficult to obtain. All this is to say that when low-noise rf preamplification is not available, the very best mixer possible is mandatory, along with the best possible i-f post amplifier that the uhf man can secure. An i-f amplifier circuit with an excellent noise figure, to be used in conjunction with the 50-ohm mixer output, is included. For the receiver using a mixer with hot-carrier diodes, the receiver noise figure is essentially the mixer conversion loss in dB plus the i-f post amplifier noise figure in dB.

In the last section of this article an interesting and useful nomogram is presented which relates sensitivity in microvolts, dBm, noise figure and noise temperature, as well as bandwidth, for the receiver being used. This chart is tailored for

ham-type communications work and uses such noise figures as are possible for the average amateur to achieve with simple equipment.

## Electrical Circuit Details

Simple mixers may take several different forms. The 2304-MHz mixer described herein assumes the configuration of the so called "rat-race" or hybrid-ring mixer. It is similar to the Magic T balanced mixer but has a somewhat more limited bandwidth, a feature that is desirable for amateur applications. Many uses for the rat-race arrangement have appeared, but not much information has been published in amateur circles on its use as a balanced mixer. Very briefly, the operation is as follows: By referring to Fig. 1 it can be seen if a signal is applied to the rf-input port, it shifts 90° in phase as it travels 1/4λ to the cathode of CR1. A 270° shift in phase occurs as the signal travels 3/4λ to the anode of CR2. Since the LO and rf signals are fairly close in frequency, the lines are effective for both. For the LO-input to reach the rf port, the energy must travel 1/2λ or 180° phase shift, when going in the clockwise direction from the LO port to the rf port. There is a 360° phase shift as the signal travels a full wavelength in the counter-clockwise direction. Assuming negligible line loss the LO energy from the two paths arrives



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A BNC fitting is spot soldered to the bottom ground plane, outside, allowing very short connections for the i-f output matching components. The i-f feedthrough terminal is not a capacitor.

Fig. 1 — A representation of the "rat-race" mixer, patterned after the coupler of the same name that has been described in microwave text books for many years.

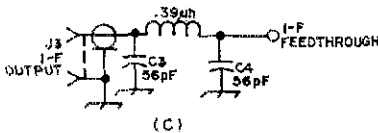
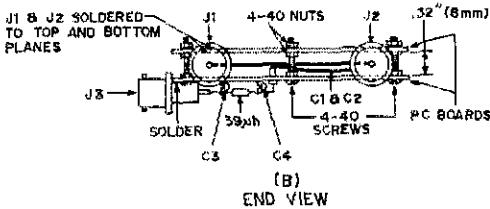
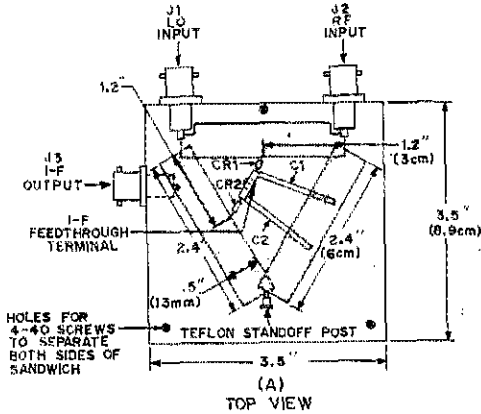
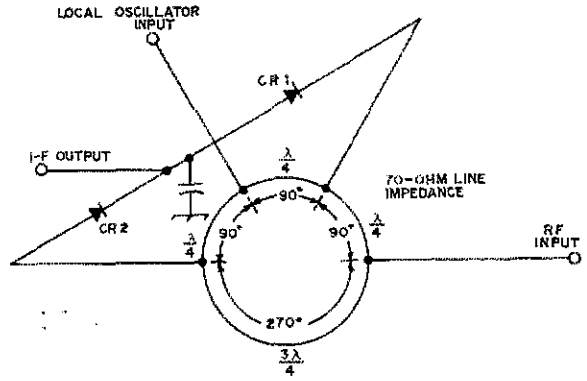


Fig. 2 — A top and an end view of the balanced mixer. The top and bottom ground planes are pieces of double-sided pc board material. BNC connectors are soldered to the foil as the first step in assembly. Copper strips are used as center conductors in a strip-line sandwich. The diodes are Hewlett Packard 5082-2835. At C, values are given for components to match the mixer output to the i-f amplifier.

at the rf port 180° out of phase, thereby canceling itself. The same argument holds for the rf signal arriving at the LO port. A 72-ohm line provides a fairly good impedance match for the rf and LO ports and the diodes. This line can either be RG-59/U cable or of strip-line construction.

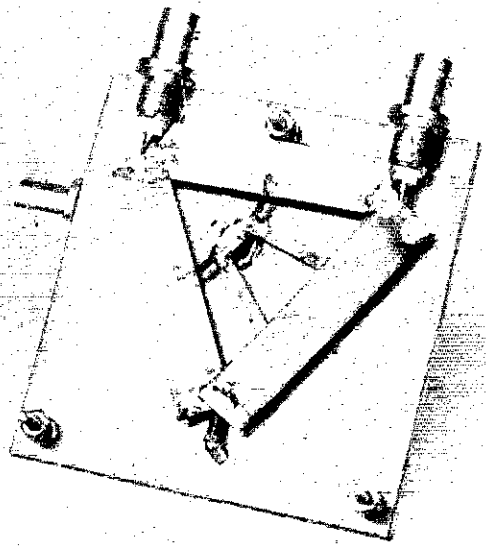
The biggest apparent advantage of the rat-race mixer is the high isolation afforded between the ports; values of 20 dB or more are achieved. As a result of this inherent isolation in the device, efficient use of local-oscillator injection power is realized. That is, virtually all of the power reaching the LO port ultimately reaches the two hot-carrier diodes. The same reasoning applies to the rf input signal. One other distinct advantage of the rat-race balanced mixer is that the phase relationships of the unit operate in such a fashion as to greatly suppress noise from the local oscillator.

The two diodes used in this mixer are the popular Hewlett Packard 5082-2835 which retail for 90 cents each. Incidentally, more expensive microwave diodes rated for minimum noise at 2 GHz (5082-2578) were tried and compared, but there was no advantage discernible when using them.

### I-F Amplifier

Very little matching is required at the i-f port of the mixer to offer a 50-ohm source impedance to the i-f post amplifier. The post amplifier is designed for 28 MHz and is connected to the mixer by means of a short piece of RG-58/U cable. A good, low-noise amplifier design is shown in Fig. 3. The performance of this amplifier has been measured on laboratory test equipment, and exhibits a noise figure of less than 1.5 dB. Duplication of results is no problem if the values shown are used. Two points should be kept in mind: The noise figure of the post amplifier adds directly to the mixer noise figure, and, the mixer i-f output should be matched to appear as 50 ohms at 28 MHz. Low-noise amplifiers are designed to exhibit minimum noise when connected to the proper source impedance.

The top ground plane has been removed to show the placement of the strip-line components and mixing diodes. Two open-ended decoupling stubs can be seen connected to the i-f output terminal, near each diode. The open ends are under one section of the strip line, and spaced equally between the line and the ground plane.



There is one other point concerning the mixer circuit and it is worth mentioning at this time. At 2304 MHz it is difficult to obtain a really good bypass capacitor. Since the rat-race mixer needs such decoupling at the diodes, a different scheme is employed to solve this problem. In the layout of the 2304-MHz strip-line version of the mixer, Fig. 2, shows two small open-end quarter-wave lines attached to each diode at the i-f side of the diode. These two pieces of copper offer an effective short circuit at the signal and LO frequencies while not affecting the i-f signal.

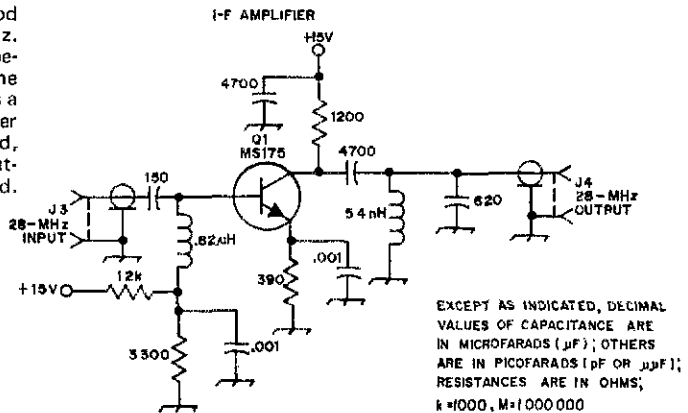
### Mechanical Layout and Construction

Since the type of mixer under discussion lends itself readily to strip-line construction, that approach was pursued for the 2304-MHz version. The design takes the form of a sandwich using two pieces of printed-circuit board as the ground planes and a triangular piece of flashing copper mounted inside the sandwich for the circuit element. The triangle is actually constructed by cutting three separate  $1/2\lambda$  lines (at 2304 MHz) and soldering each separately into place in the circuit. Three BNC connectors are soldered to the pc board and serve as rf input, LO input, and i-f output. The layout gives all the information necessary, including the sandwich spacing for proper circuit-element impedance, and the lengths of the three sides of the triangular copper strips. The rat race was shaped into triangular form since copper is easier to cut in straight lines than in circles. This layout allowed short diode lead length, yielding less series inductance.

The lengths should be followed closely, but they really are not overly critical. The bandwidth of such a device is more than sufficient for amateur work. The matching circuit at the i-f output is likely to be the limiting factor.

For proper circuit operation the lead lengths of the mixer diodes should be kept very short. The diodes are rather delicate, so a minimum amount of heat should be allowed to reach the body of the diodes while installing them in the mixer. The BNC connectors are soldered to the lower ground plane first. Next, the strip line is constructed and put into place, to be followed later by the top ground plane. Before the top plane is bolted on, the diodes are placed on the strip-line circuit in their proper places. Since the diode leads should be too short to heat sink, the soldering job must be completed quickly. Rather than use a small, low-wattage iron, it seemed that a larger iron, such as a 100-watt job with a clean point, actually was easier to use. Just a quick touch and the diodes are tacked in as the last operation.

Fig. 3 — A low-noise i-f amplifier is essential in obtaining a good receiving system at 2304 MHz. Also important is a match between the mixer output and the amplifier input. The transistor is a Texas Instruments MS175. Other low-noise transistors may be used, provided that their input and output impedances can be matched.



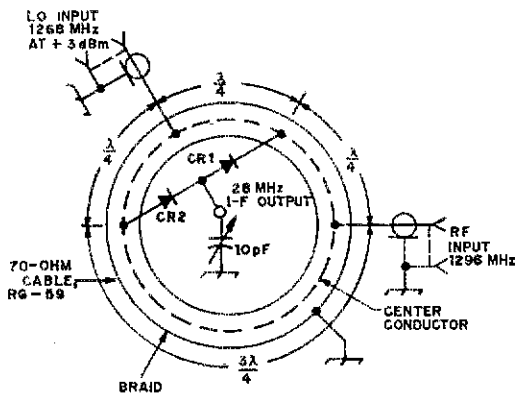


Fig. 4 -- For 1296 or 432 MHz, a rat-race mixer may be constructed from sections of 70-ohm coaxial cable. RG-59/U is used by the author in this illustration.

### Other Bands

As for using this same type of mixer on 1296 MHz and 432 MHz, a word should be mentioned about techniques used for those frequencies. At 1296 MHz very good results have been obtained with a coaxial-cable version rather than a strip-line arrangement. The coax (RG-59A/U), can be either tapped at proper points through the shield, or the proper lengths can be cut and secured with tie points at the proper places — kind of a point to point thing. If tapping the coax is chosen as the method to be used, the following procedure can be followed. Cut a length of coax 4 or 5 inches longer than necessary for a 1296-MHz rat race (1.5λ times velocity factor of the coax). Strip the insulation off and discard it. Remove the braided shield by hunching the braid together to increase its diameter. At the proper lengths for 1296 MHz, see Fig. 4, tap points are made by cutting insulation away from the center conductor, soldering a small insulated wire to the center conductor, and then covering the connection with one layer of electrical tape. A small hole can be punched in the tape through which the tap wire can be brought. Then the braid is pulled over the tapped center conductor, and the tap wires are pulled through the braid. The braid is then pulled down tight against the center-conductor insulation to restore the 70-ohm line impedance. No doubt the coax-cable version could be used at 2304 MHz also, but the short lengths tend to make the process difficult.

At 432 MHz the lengths of coax cable begin to get somewhat long, so they are folded around to decrease the size of the mixer. This folding arrangement does nothing to alter the performance, but care should be taken to ground the shields effectively at a number of places. A good design method would be to lay the coax down on a piece of pc board and solder along the whole length of the element. However, since transistors that do a good job at 432 MHz have long since

been available at cheap prices, it seems a little academic to use this type of circuit when a transistor mixer would offer a conversion gain rather than a loss. Moreover, with an effective rf preamplifier at 432 MHz to set the overall noise figure of the receiving system, any mixer noise is overridden anyway.

### Adjustment and Operating Procedures

There really are no operating adjustments. This is the big advantage over the single-ended mixer with various input links for signal, LO and i-f ports, as well as the troublesome reaction between all three. Merely connect the rat race to the i-f post amplifier with a short length of cable. The output of the 28-MHz post amplifier should be connected to the station receiver in use.

The local-oscillator injection power to the 2304-MHz strip-line mixer should be about 3 mW. Actually, 1.5 mW may be sufficient, but it is well to have a little extra power available. Not much difference in operation should be noted when the LO power is varied between 1.5 and 5 mW.

Perhaps the reader will wonder what kind of interference may be apparent when the antenna is connected to the input port, since no mention has been made of any kind of preselection on the front end. This is kind of an "iffy" question. Should the station location be near an airport or where strong radar is operating near the 2304- or 1296-MHz bands, it is entirely possible that trouble may be in the books. In such a case, as with any type of receiving system, it may be necessary to resort to some kind of a coaxial-cavity filter — or perhaps a strip-line filter — to gain some relief. If an effective rf preamplifier, such as a parametric or traveling-wave tube job, is available at the frequency involved, of course this would help. Even then it might be necessary to place a sharply resonant preselector between the rf amplifier and the mixer to decrease the trouble from the radar signals.

Hopefully, one will not need to resort to such measures, and, since a good rf preamplifier may not be available to the starting 2304-MHz enthusiast, good results can be obtained without such sharply resonant preselectors.

Now we come to the numbers department. This is a dangerous area for most of us who do not have sufficiently elaborate and sophisticated test gear. Even those that do have such gear can have difficulty communicating with others in the same area. Commercial numbers and amateur numbers are many times incompatible. The sharp-eared uhf DX man who can copy a weak burst of code through the residual noise of his receiver, is a far different person from the commercial customer whose reception levels are based on an S/N ratio of anything from 3 to 10 dB. Nevertheless, it might help a little to relate what was found with this type of mixer compared to other types, and describe the limited tests available to the average ham.

At W5AJG, a signal generator at 1296 and 2304 MHz is available. Also available is a commercially made TWT (traveling-wave-tube) low-noise amplifier with a published noise figure of 5.5 dB at 2304

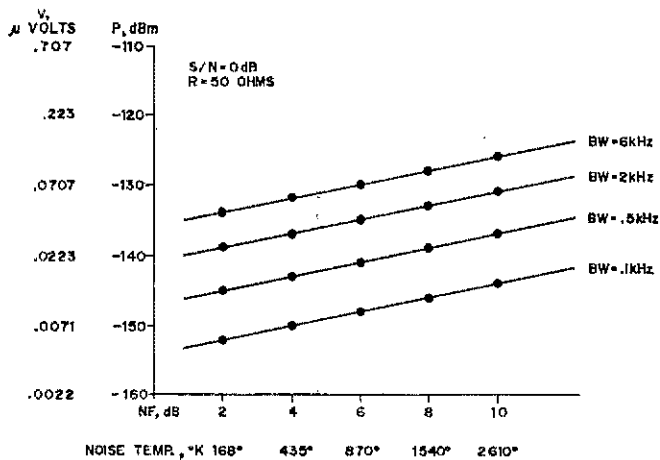


Fig. 5 — This nomogram may be useful in helping a reader to determine receiving-system performance.

MHz and 5.0 dB at 1296 MHz. Later a parametric amplifier at 1296 MHz became available for testing, and this device has a noise-figure specification of 2.5 dB.

These preamplifiers were inserted and removed on various tests with the signal generator in an attempt to determine the minimum discernible signal so some sort of a sensitivity quantity could be obtained. Additionally, on 1296 MHz, working circuits of about 250 miles, 75 miles, and 25 miles were maintained, and comparisons and tests too numerous to mention were carried out for many months. About the only rigid test that was made of the 2304-MHz rat-race mixer was the conversion loss. This test was made using sufficient equipment in a laboratory. It was found that the ratio of the available signal input power to the available rf output power was 5.2 dB, for the mixer only.

At the home station, using the signal generator at 2304 MHz into the rat-race mixer with an LO power of 2 mW, thence into the post amplifier feeding the station receiver (51J4) set for 6-kHz bandwidth, a minimum discernible signal of  $-130.5$  to  $-131$  dBm could be copied. This type of signal would be compared to a DX station putting in a signal just slightly above the noise but 100-percent copy on cw.

Inserting the 2304-MHz TWT low-noise amplifier between the signal generator and the rat-race mixer resulted in no improvement in the signal-to-noise ratio but, of course, did provide overall gain. This would tend to indicate that the rat-race mixer is at least as good as the TWT at 2304 MHz. As seen on the chart, this would correspond to a 6-dB noise figure or perhaps slightly less.

Using the coax-cable version of the rat-race mixer on 1296 MHz, the same order of sensitivity, as measured with the signal generator, was observed. However, upon inserting the TWT amplifier a slight improvement in the S/N ratio could be observed. This would also tend to show that the rat-race mixer alone was not quite as good by about 1.5 dB. This was also borne out by the on-the-air tests with stations at 25 to 250 miles

distant. Upon inserting the 1296-MHz parametric amplifier, a quite noticeable difference occurs, which is to be expected with a preamplifier having a 2.5 dB noise figure. All of this shows that if no rf preamplifier is available, the mixer gives a very good accounting of itself. And the better the mixer, the less demanding will be the requirements when the preamplifier does become available.

#### Related Information

In making tests on mixers and rf front ends, several different types of test equipment may be used. As shown in Fig. 5, an attempt has been made to produce a chart which will allow the amateur to relate the data obtained with his particular piece of test equipment to another form of the same data. Basically, this chart equates signal level in  $\mu V$  across a 50-ohm load or signal power level in dBm to either noise figure or equivalent noise temperature for a given bandwidth. This chart was derived from the definition of noise figure:

$$NF = \frac{S_i/N_i}{S_o/N_o}$$

where

$S_i$  = signal power at amplifier input,

$N_i$  = noise power at amplifier input or generated by amplifier,

$S_o$  = signal power at amplifier output, and

$N_o$  = noise power at amplifier output.

The equation for noise figure is rearranged as follows:

$S_i = N_i \times NF \times S_o/N_o$ , and  $N_i$  = noise power generated in a device at given temperature.

$$N_i = KTB,$$

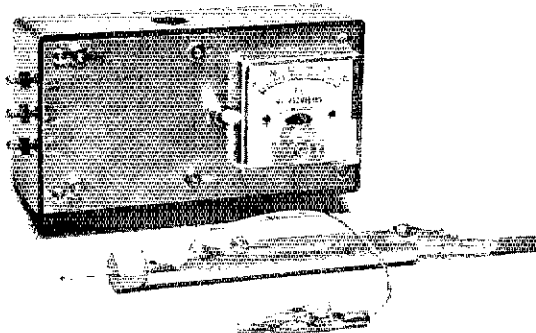
where

$K$  = Boltzmann's constant =  $1.38 \times 10^{-23}$ ,

$T$  = temperature in  $^{\circ}K = 290^{\circ}$  for room temperature, and

$B$  = noise bandwidth in Hz.

(Continued on page 31)



# Learning to Work with Semiconductors

BY DOUG DE MAW,\* WICER AND  
LEW MCCOY,\*\* WIICP

*This is the first part of a course in fundamental theory and application of semiconductor devices. This series is for the newcomer to radio and the tube-oriented amateur who wishes to cross over into the interesting world of transistors. The course illustrates how transistors function in active circuits, how to test and evaluate circuits in which transistors are used, and how to build and use an FET voltmeter in addition to constructing an amateur-band receiver. The use of integrated circuits has been dodged wherever practical in order to make the course easier for the beginner to comprehend. Similarly, the employment of mathematics is avoided except where absolutely necessary to aid in understanding the concepts discussed here. At the conclusion of this series the reader will have built an FET voltmeter, an rf probe, and a ham-band cw/ssb receiver of simple design and above-average performance.*

This shows the completed instrument and the rf probe. The protruding bolts at the end of the meter case are the test lead connecting points.

## Part I

LET US commence by examining the transistor and comparing it to a vacuum tube. The first working model was announced to the public by *The New York Times* on July 1, 1948. The brief disclosure read, in part, "A device called a transistor, which has several applications in radio where a vacuum tube is employed, was demonstrated for the first time yesterday at Bell Telephone Laboratories . . . where it was invented." The inventors were John Bardeen, William Shockley, and Walter Brattain. The term *transistor* was derived from the words *transfer* and *resistor*, presumably because current was being transferred through a resistive material (semiconductor). Tremendous strides forward have occurred, and still continue, in the sophistication of that first solid-state device which amplified audio-frequency energy.

The basic transistor has long been called a *bipolar* device (bipolar transistor). The expression *bipolar* signifies that the transistor has two electric poles, as does a magnet with its north and south poles, or a battery with its positive and negative terminals. Modern-day bipolar transistors are manufactured for use from dc to the microwave frequencies, and are available in power ratings up to nearly one hundred watts, singly. Mass production techniques, plus high consumer demand, has brought them within the reach of hams -- for pennies in many instances! Generally speaking, transistors perform as well as or better than vacuum tubes, particularly at low signal levels. Radio amateurs have been attracted to circuits in which transistors are used because battery-operated portable and emergency equipment is much easier to realize than when working with tubes. This results from the greater efficiency made possible by solid-state circuits (low voltage, low current, and no filaments to power). This rationale is bolstered by the fact that transistorized circuits require less maintenance than do those in which tubes are employed. Semiconductor devices have shorter lead lengths, and are physically smaller than tubes. These two characteristics provide excellent miniaturization capability. Greater circuit stability than is typical with vacuum tubes results from the shorter internal lead lengths of transistors.

Bipolar transistors can be compared to triode (three electrodes) tubes by understanding that transistors also have three elements. This feature makes them triode devices, just like the triode

\* QST Technical Editor.

\*\* Beginner and Novice Editor.

tubes are. That, however, is where the basic similarity ends. Tubes amplify *ac* and *rf voltage*, but bipolar transistors amplify *current*. Furthermore, the terminal (input and output) impedances of bipolar transistors are considerably lower than is the case with triode tubes. This does not mean that transistors are more difficult to work with. Rather, it calls for specific techniques when designing the networks which are used between stages of a circuit, or between the transistor and the external device to which it is connected (microphone, antenna, VFO, and the like). A triode-tube amplifier stage might exhibit typically an input impedance (grid) of, say, 500,000 ohms. An equivalent circuit in which a bipolar transistor is used may present an input impedance (base terminal) of 500 to 1000 ohms. This characteristic is not formidable to those who learn basic matching techniques. Examples of the latter will be seen and applied throughout this series.

### Another Kind of Transistor

Thus far we have talked only about the bipolar transistor. A transistor which more closely resembles the triode tube in performance is the *field-effect transistor* (FET). The term "field effect" is derived from the fact that the internal current flow in an FET is regulated by the variation of an *electric field* within the device. Changes in this electric field are brought about by application of an external control voltage which is supplied to the FET *control element* (gate). Those who are familiar with the operation of vacuum tubes will be able to equate this principle to the application of negative control bias to the grid of a tube to change its conduction (amplification characteristics).

The basic field-effect transistor is the junction FET, or JFET. The junction is similar to that of a bipolar transistor, being formed so as to fuse together the semiconductor materials which comprise the device elements — collector, base and emitter in a bipolar transistor, and drain, gate and source in an FET. These elements correspond in general to the plate, grid and cathode of a triode tube, respectively (Fig. 1).

A variation in the basic FET is becoming more and more prominent in circuit design — the MOSFET, or *metal-oxide silicon* FET. For the most part there is little difference in the performance characteristics of the JFET and MOSFET, though there are some subtle differences which will be seen later in the course. Basically, a MOSFET has a layer of insulating material (silicon dioxide) between the gate and the remainder of the semiconductor junction (drain and source). MOSFETs are sometimes called IGFETs (insulated-gate FETs). Regardless of the two acronyms, they are the same fellows. Triode

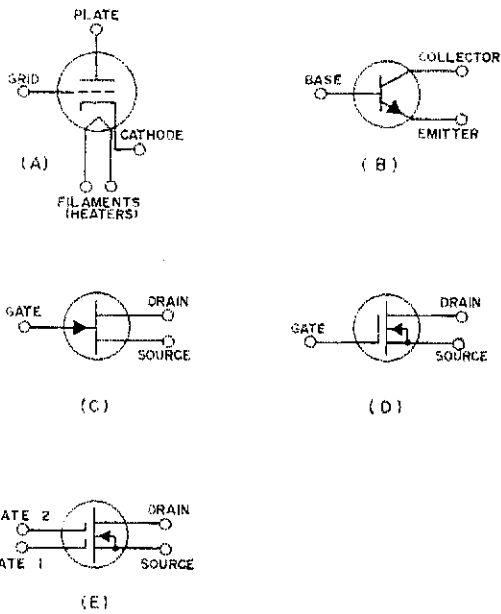
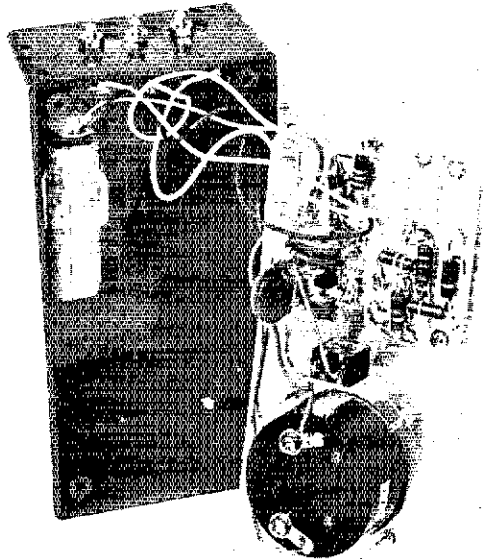


Fig. 1 — Symbols for a triode tube and the various transistors discussed in this beginner's course. A bipolar transistor is shown at B. At C, a JFET; at D, a single-gate MOSFET; at E, a dual-gate MOSFET.

MOSFETs (gate, source and drain) have been superseded for the most part by *dual-gate* MOSFETs. The latter has two gates instead of one, but is the same as the triode MOSFET in most other respects. Later on we will point out the advantages in having two gates available in circuit applications.

The foremost feature of field-effect transistors which makes them akin to triode tubes is the high input impedance they exhibit at the gate terminal.



Be sure to check the battery placement before mounting in place, to provide clearance for the lid.

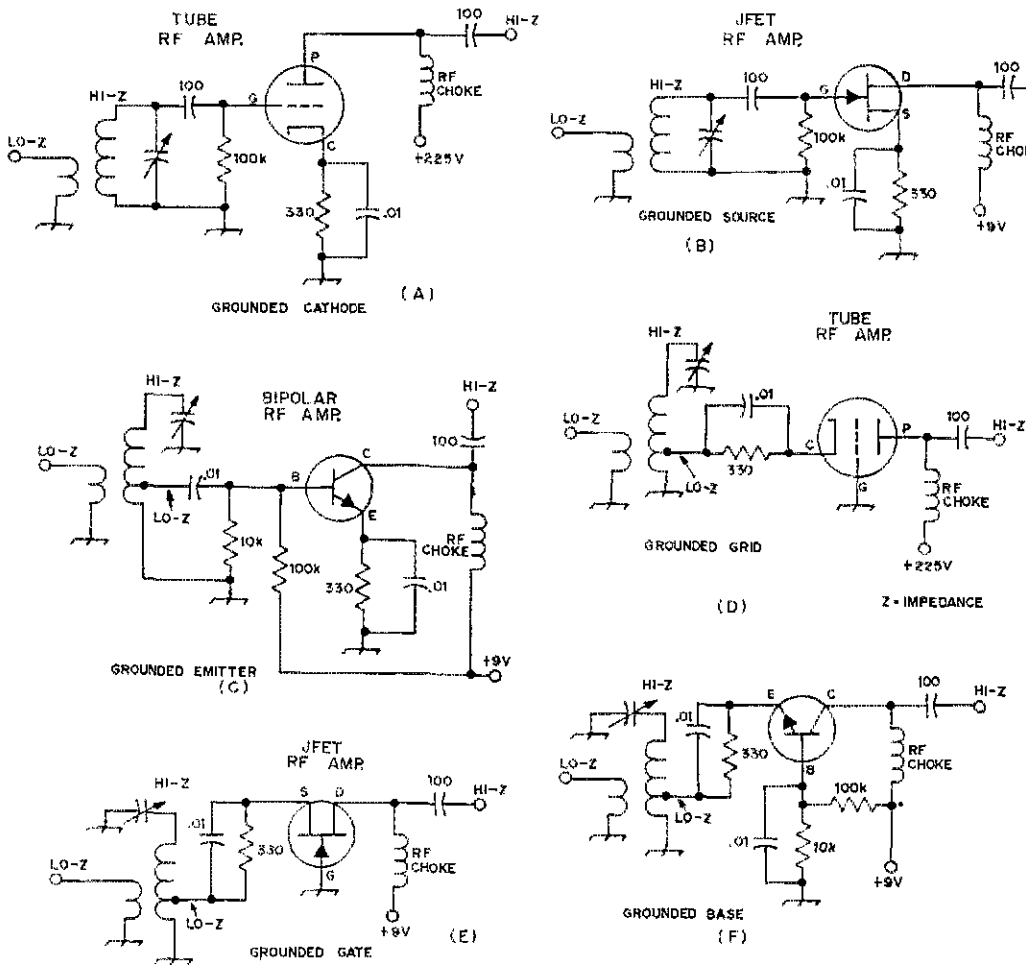


Fig. 2 - Representative schematic diagrams of rf amplifiers which use tubes, bipolar transistors, and field-effect transistors. Illustrations A through C show the conventional hookup where the cathode, source, or emitter elements are grounded at rf (ac). The .01- $\mu$ F bypass capacitor across the 330-ohm resistor in each instance provides the ground-return path for the element. The modern terms for grounded-source or grounded-emitter service are, "common source," or "common emitter," respectively. The grounded or "common" grid, gate, and base configurations are shown from C through E. It will be noted that in each instance the 330-ohm resistor is bypassed by means of a .01- $\mu$ F capacitor to permit the rf energy to reach the device element from the tuned circuit. The cathode, source, and emitter are low-impedance (low-Z) terminals and are tapped down on the tuned circuit accordingly.

A representative gate impedance in a grounded-source FET amplifier (Fig. 2) is between several hundred thousand ohms and millions of ohms (megohms). This characteristic makes them useful in most circuits where tubes are used, and with little need for circuit modification other than a lowering of the operating voltages. Therefore, the amateur who feels comfortable in a vacuum-tube environment should have little difficulty when working with FETs. Even the amount of gain in a given circuit (rf amplifier, i-f amplifier, mixer, and the like) is nearly the same for an FET as it is with a triode tube.

### A Practical Circuit

If we are going to be able to test the circuits we will build and use in this series it will be necessary to have at least a simple voltmeter which can provide readings of dc and rf energy. The instrument must have a high input impedance to prevent it from disturbing (loading down) the circuits to which we shall connect it for measurements. Vacuum-tube voltmeters (VTVMs) are normally used for the purpose because they have triode tubes in them, and triodes have a high input impedance at the grids, as mentioned pre-



viously. When a voltmeter does not exhibit several hundred thousand ohms of resistance to the circuit being tested (ordinary volt-ohmmeters, or VOMs, do not) the meter can absorb some or all of the voltage being measured. If that happens the readings are meaningless. Therefore, it is wise to use a VTVM or equivalent when making measurements of voltage in circuits other than power supplies.

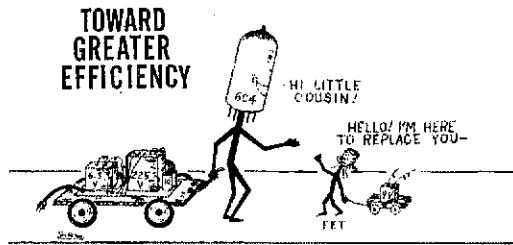
We stated earlier that FETs are like triode tubes with respect to having high input impedances (gate terminal), so we should be able to build the equivalent of a VTVM by using a JFET instead of a tube (Fig. 3). (Those who already own a VTVM or FET voltmeter can avoid the expenditure of time and money by not constructing the circuit of Fig. 3. However, it will be helpful to follow the text and learn how the instrument works.)

### Understanding the Circuit

We learned earlier that the gate of an FET is the control element of the transistor. Therefore, if we change the gate voltage there will be a corresponding change in the electric field within the device, thereby resulting in a shift in current flow. The voltmeter of Fig. 3 will utilize this principle if we connect the FET gate to the voltage we wish to measure, through resistors R1 and R3. The unknown voltage is impressed between gate and ground, causing an increase in dc current flow through Q1 and R4. The greater the amount of dc voltage applied to the gate element, the larger will be the amount of current flowing in Q1, until a level is reached which will saturate the FET. As the current through R4 increases, the greater will be the voltage drop across it ( $E = IR$ ), giving rise to a higher dc potential at the source terminal. This change in voltage is indicated by means of M1, a 0- to 100- $\mu$ A meter.

Even when no dc voltage is being applied to the gate of Q1 there will be a certain amount of current flowing in the junction (drain and source) of the FET. This characteristic is common to vacuum tubes and bipolar transistors as well. We shall refer to this small flow as *static current*. Another expression for this condition is *quiescent current*. Because of the existing static current we must make certain that our indicating meter reads zero when no external voltage is applied to the gate of Q1. A convenient way to do this is to place a sufficient amount of positive-polarity dc potential on the minus terminal of M1 to match that amount which is present at the positive post of the meter under static-current conditions. When both terminals see the same potential, the meter reads zero. Variable resistor (potentiometer) R8 is used to "zero" the meter.

Because of differences in the characteristics of any given type of transistor from a manufacturer's production run, it is seldom that any two units possess identical electrical characteristics. This means that the internal resistances of each device will differ, and of greater significance, the amplification capability of each transistor will be slightly different. As a result of the foregoing condition,



we will not know how the FET we purchased for the voltmeter will perform in our circuit . . . not exactly, that is. Because of the foregoing proposition we must add another potentiometer to the circuit (R3) to give ourselves a "fudge factor" when calibrating the completed circuit. We have chosen in this example to have a full-scale meter deflection when 20 volts dc is applied to the test probes of the meter. R3 is adjusted to permit full-scale deflection of the needle when 20 volts are present across the probes.

To improve the flexibility of the instrument, we have also provided a 2-volt range. In the 2-volt arrangement, R4 and R3 serve as the fixed-value potentiometer.

Resistive divider R1/R2 (a fixed-value potentiometer) contains values that allow only 1 volt dc to reach the gate of Q1 when 20 volts are present across the probes. This measure is necessary to prevent the FET from being saturated, which would happen if too much control voltage reached the gate. Too high a gate voltage could even burn out the FET!

### Measuring RF Voltages

We will be concerned in subsequent lessons of this course with the measurement of rf voltages. Therefore, some means by which to convert rf to dc will be necessary if we are to use our FET voltmeter for that purpose. An easy way to achieve our newest goal is to employ a simple, inexpensive half-wave rf probe (Fig. 3B). Diode CR1 is a *high-speed switching* type of the variety used extensively in computer circuits. In general terms, high-speed switching means simply that the diode must have low internal resistance and capacitance through and across its junction. The greater the internal resistance and capacitance, the lower will be its useful upper frequency limit ( $R/C$  time constant effect). The thickness of a diode or



DC VOLTMETER

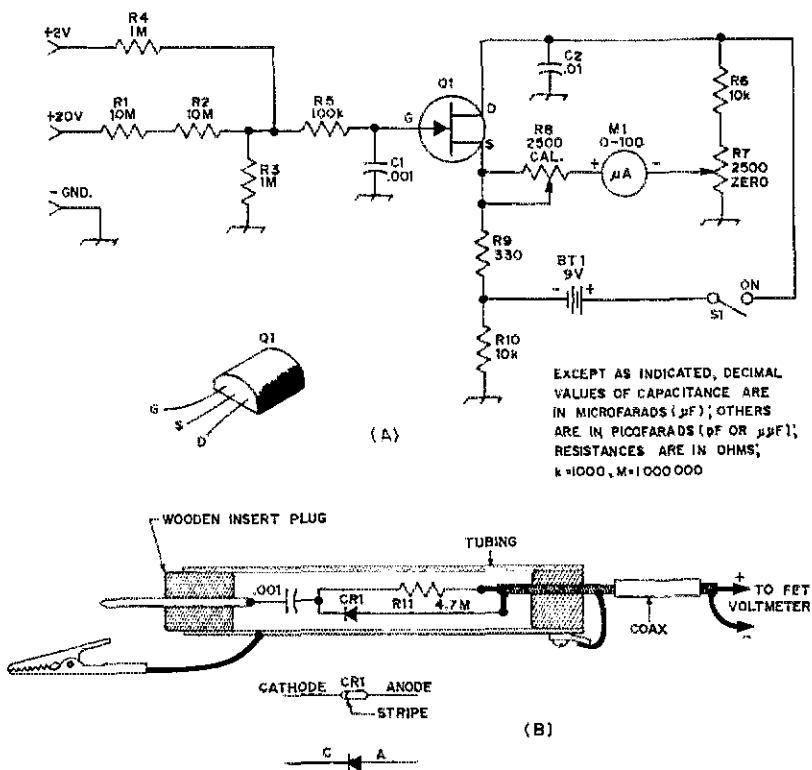


Fig. 3 - Circuit diagram of the voltmeter and rf probe. Most of the materials used can be obtained from Radio Shack stores. Fixed-value resistors are 1/2-watt composition types. C1 and C2 are disk ceramic capacitors. Approximate cost for all parts (new) is \$10. Numbered components not contained in the parts list are identified for layout purposes only.

CR1 - High-speed silicon switching diode, 1N914 or equivalent. (1N34A germanium diode can be used.)  
 M1 - 100- $\mu$ A dc meter (Radio Shack Micronta No. 22-037).

Q1 - *N*-channel JFET (audio or rf type). Motorola MPF102, HEP802, or equivalent.

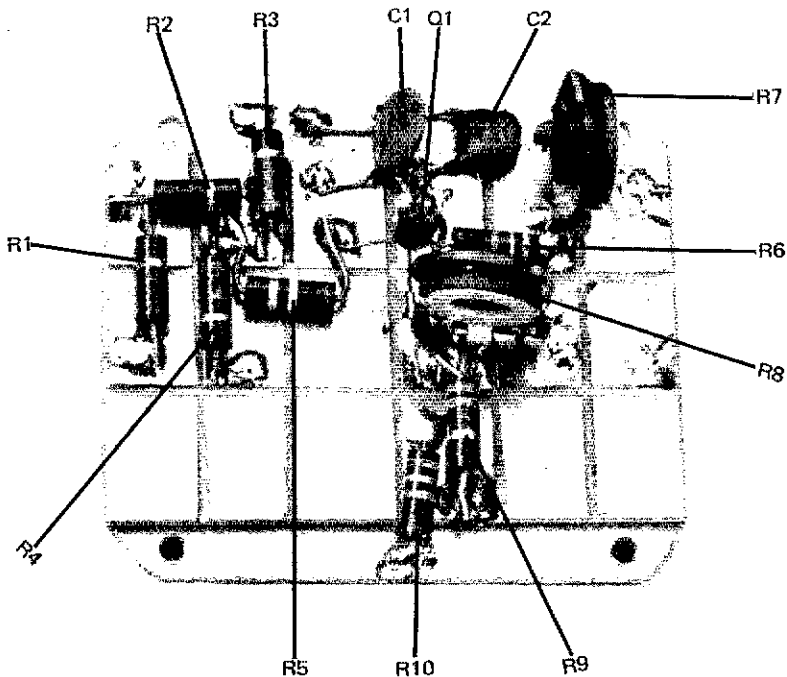
R7, R8 - 2500-ohm carbon composition control, pc-board mount type.

transistor junction establishes a *transit time* for the rf energy that is passing through it. The higher the transit time, the lower will be the useful upper frequency limit of the device. For this reason we cannot use silicon diodes of the kind found in power supplies. They will work satisfactorily at audio frequencies and lower, but are not suitable for rf work. The 1N914 specified for CR1 is a special kind of silicon diode which works well into the uhf range. A 1N34A *germanium* diode can be used in place of the 1N914, but will not sustain quite as much peak voltage as will the 1N914. For our immediate application, however, either diode will be satisfactory.

Our rf probe will respond to the *peak* rf voltage being measured, but most voltmeters are used to measure the *root mean square* voltage (*rms*) when an rf probe is attached. The rms value of a sine wave is 0.707 of the peak value, and it is that amount which should be seen by our FET voltmeter. In order to reduce the peak voltage to an

rms value we have inserted the component R11. Its precise value depends upon the voltmeter with which it is used. The value of resistance used in the voltage-multiplier network (R1-R2-R4 of Fig. 3A) must be considered as part of the resistance used in the probe. Accurate calibration can be assured by connecting the probe to a known 10-volt rms source (generator), then adjusting R11 of Fig. 3B until the voltmeter reads 10 volts. The value given for R11 will be accurate enough for our tests.

If the rf voltages we measure are pure sine waves, our dc voltmeter will assure reasonable accuracy. But, if the waveform is distorted by superimposed harmonic energy, the readings will not be as reliable. Similarly, waveforms which are clipped when a stage is overdriven (square waves or nearly so) will not enable us to obtain accurate rms readings with the voltmeter. Thus, some of the measurements we will make later on will be *relative* (comparative) at best, but useful in testing or trouble-shooting our equipment.



Photograph of the assembled circuit board, showing where the components are mounted.

### Construction

The voltmeter construction is based on a breadboard method described in a recent issue of *QST*.<sup>1</sup> It consists of using copper-plated circuit board (material used for etched circuits) and separating the board into isolated squares by drawing a hacksaw blade across the copper, cutting away just enough to remove the copper covering. This leaves "islands" of copper that are used for mounting the components. The board with the squares is then glued by means of GE Silastic cement to a slightly larger piece of board.

The photograph shows the completed board before installation in the meter case. Also, Fig. 4 shows the placement of the components on the board. When soldering to the squares, certain precautions should be observed. Apply heat from your soldering iron to the square and then flow just enough solder onto the square for your component lead connection. Apply only enough heat to connect the component lead to the square. Some newcomers are inclined to use too much heat.

The completed board is mounted on the top of the meter case. The case measures 1-1/2 x 2-5/8 x 5 inches (38 x 67 x 127 mm). Incidentally, the meter box and all the other components (with the exception of Q1) are available from Radio Shack stores.

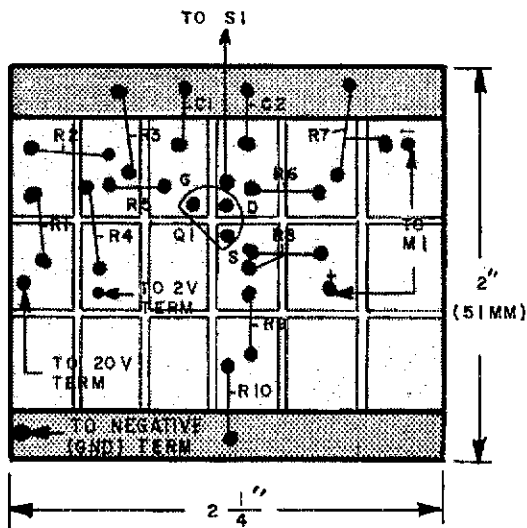
The meter is mounted at one end of the top of the case, S1 is at the center, and the circuit board is at the other end, below deck. The battery and

<sup>1</sup>Leslie, "Breadboard Revisited," *QST* for February, 1974, p. 30.

holder are mounted at one side on the bottom of the box. You'll have to arrange the placement of the battery so that it doesn't touch any of the other components when the lid is placed on the cabinet. Terminals for the voltmeter probes are nuts and bolts, the bolt heads extending out from the end of the box. Alligator clips on the ends of the probes can be clipped on the bolt heads when using the meter.

(Continued on page 41)

Fig. 4 — Layout plan for the circuit board, showing how the squares (isolated pads) are cut, and where the parts connect to them.



# Another Look at REFLECTIONS

Parts I through IV of this series appeared in the April, June, August and October 1973 issues of QST.

Part V – Low SWR

for the Wrong Reasons

BY M. WALTER MAXWELL,\* W2DU/W8KHK

**I**N PART I of this series of articles the statement was made that misconceptions concerning SWR and reflections are rampant among amateurs, both in print and on the air. So to reiterate further, this series has been written with one primary goal in view – to identify some of the misconceptions and to provide correct answers in the hope of clarifying some of the confusion resulting from the misconceptions. One outstanding area of confusion concerns the nature of reflected power and how it is accounted for in the circuit. In short, is it *real* or is it *fictitious*, and where does it go? Now the nature of reflected power was discussed in Part III, where it was shown why reflected power is *real*

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power. And in Part IV we delved into the question of where the reflected power goes, as the role of reflections in conjugate matching was discussed. There the stub form of matching was used to illustrate the wave action which accomplishes the matching function and which also derives the total incident power from the combined source and reflected power. We will recall that learning of this wave action stripped away the mystery of how a mismatched load can absorb *all of the power delivered by the source*. We learned this as we saw how the reflected power adds to the source power at the conjugate match point so that the reflected power can be subtracted from the total, enlarged incident power at the mismatch point to leave a net power in the load equal to the source power.

Now that we have established this relationship between the source, reflected, and incident powers in terms of the wave mechanics of the conjugate match, we have the necessary background and tools for identifying some of the improper usage of SWR, and for clarifying in greater detail the reasons for the misunderstanding that still prevails concerning what happens to the power reflected from an antenna that is mismatched to its feed line. Further clarification of the misconceptions will enhance the appreciation of the mismatched feed line as simply an impedance-transforming device, particularly as we see somewhat later how the Transmatch type of feed-line matching network and the pi-network tank circuit of the transmitter perform the conjugate matching function in the same manner as the stub. Additional perspective in relating the discussion to practical feed-line operation will be gained as some of the thoughts presented in Parts I and II of this series are now expanded.

If it appeared to some readers that the importance of SWR was overly minimized or downgraded in the treatment accorded it in Part I, it was not so intended. The intent there was to focus

attention on the importance of understanding the subject of reflection and SWR correctly and in such depth that we may retain complete control over them in our antenna system design engineering. Thus, instead of letting SWR become king to take control and deprive us of a breadth and flexibility, we may use SWR in the system design choices in ways which many are unaware exist.

How many of us have acquiesced to the King in pruning an 80-meter dipole, with great pains to obtain the best possible match to a half-wavelength feed line at a specific frequency, but cannot operate more than a few kHz from that frequency without fear of the King's apparent dire consequences? But how many are aware that King SWR can be outwitted and his consequences averted without pruning either the dipole or the feed line? And how many have been aware that the matching operation can be performed at the transmitter end of the line at any frequency within the entire 75-80 meter band without suffering any significant loss in power in spite of the SWR remaining on the feed line? Although it contradicts the word published in many articles during the past two decades, this revelation is true, and is indicative of the flexibility or freedom that really is available in our choice of antenna systems designed for all the hf bands, simply by having a better understanding of SWR and reflection.

### Valid Reasons for Low SWR

There are good and valid reasons for being concerned with SWR and reflection, from both the amateur and commercial viewpoints — with this there can be no argument. As we well know, these reasons are concerned basically with voltage breakdown and power-handling capability, efficiency and losses, and with line-input impedance as it relates to transmitter output coupling. In amateur practice, power-handling capability and voltage breakdown don't become serious problems unless we try to shove the legal limit of power through RG-58/U or RG-59/U at a high SWR. Losses and efficiency concern us, but to a much smaller degree than is generally realized, and for a different reason than many are aware, as will be shown very shortly.

The chief reason why the amateur should be concerned (but not alarmed) with SWR is in its relation to line-input impedance and transmitter coupling. This will be discussed in great detail in a later section. There we will see how to tame impedance and coupling for any reasonable value of SWR, and in that discussion the relative *unimportance* of having a resonant antenna will also become evident. But it is of great importance that we first clarify some of the prevalent misunderstandings of SWR and reflected power, because they are causing many amateurs to strive for a low SWR for wrong, invalid reasons, and often needlessly. Probably the most serious and widespread misconception concerning SWR prevailing throughout the amateur fraternity is the erroneous notion that there is a direct one-for-one relationship

between reduction in reflected power and a resulting increase in radiated power. In other words, every decreased watt of reflected power is thought to provide an additional watt of increased output. No so, but the tremendous number of amateurs who have been misled to believe this invalid, unscientific, and untenable premise is simply unbelievable!

Another related concept, popular, but also erroneous, is that when terminated in a mismatch, the coaxial feed line becomes part of the radiator, causing radiation from the feed line due to the standing wave (ref. Part II of this series, statement 18). This is untrue because the line voltages and currents, and the standing waves resulting from the mismatch, are entirely contained in and between the outer and inner conductors, inside the coax. *No standing wave develops on the outside because of mismatch.* However, feed line radiation may result from standing waves on the outside of the coax caused by current unbalance if a balanced dipole is fed with coax and no balun is used. This feed-line radiation may or may not be of any consequence, but the topic is covered well by McCoy (ref. 45).†

Misunderstanding of how the benefits accrue from a low SWR, and of just how little benefit is obtained, is driving many of us to attain SWR values far lower than where the benefits continue to be significant in relation to the efforts expended to attain them. It is for this reason that we often set an unrealistically low limit on SWR that needlessly restricts the operating bandwidth, or range of usable frequencies on either side of the antenna resonant frequency, to a far more limited range than is necessary. In rectifying a misunderstanding such as this, it often helps to learn first how the misunderstanding originated.

### "Impedance" Bridges

One aspect of the misunderstanding has been created to a large extent by narrow and often erroneous interpretations of matching principles found in various instructions for instruments such as noise bridges<sup>2,3</sup> and the antenna-scope for determining the terminal "impedance" of an antenna. Contrary to what is stated in some of the instructions, these devices cannot measure *impedance* — they can measure *resistance only* — and then *only in the absence of reactance*. (Suggestion: Look up and compare the definitions of impedance and resistance; the term impedance is often misused when the correct term should be resistance. The reader is also invited to see ref. 46). Consequently, in using these devices we have been coerced into finding only the resistance component of the antenna terminal impedance, and only at the resonant frequency of the antenna, because this is the only frequency where the impedance has zero reactance, or  $R + j0$ .

†This and all subsequent references in italics refer to the bibliography which appeared at the end of Part I of this series; supplemental listings appear at the end of Part III and of this part.

<sup>2,3</sup>Hart, "The Case for the ½ Wavelength Feedline," 73, March, 1969, p. 58.

In following this tack, erroneous emphasis has been given to requiring the antenna radiator itself to be resonant, thus nurturing the misconception that it needs to be resonant to radiate all the power being supplied to it.<sup>24, 25</sup> Thus, many have been misled to believe that the antenna just won't perform properly at any frequency except the resonant frequency. (See Part II of this series, p. 21, statements 5, 6 and 7 and refs. 20, 21, and 24.) In addition, emphasis on the further necessity for obtaining a resistance component reading equal to the line impedance  $Z_0$  has in many cases caused us to go to extreme lengths, such as adjusting the antenna height above ground in small increments to achieve that exact resistance reading in quest of the perfect 1.0 match.<sup>26</sup> (See Part II of this series, p. 22, statement 15.) Adjusting heights in large increments to obtain control of radiation in the vertical plane is realistic. But controlling radiation resistance by adjusting the height is neither necessary, realistic, nor practical, because the efficiency thought to be gained through this action is illusory.

The truth of this will become evident somewhat later as we see why there is no justification whatever for expending any matching effort at the load to improve a mismatch of 2:1 or less, simply to remove the standing wave with the expectation of improving efficiency. Furthermore, because of the reactance that appears as we depart from the resonant frequency, the sacred but overrated perfect match found at some carefully adjusted height can be obtained at only one frequency without retrimming the radiator length, thus continuing the vicious cycle. However, the widespread practice of this philosophy in antenna-system operation has completely conditioned us to think only in terms of using a  $\lambda/2$  transmission line with no reflection, and to obtain its perfect 50-ohm nonreactive input impedance by operating only at the resonant frequency. So we have, in effect, been deterred from learning of the real effect of reactance in antenna impedance, and of how the line transforms any terminating impedance in a straightforward and predictable manner.

In becoming so conditioned, many of us have forgotten that we can obtain the desired 50-ohm nonreactive input impedance from the line-transformed antenna impedance with a simple line-input matching network in the shack, often more easily than it can be obtained at the antenna. In fact, in some transmitters the impedance seen by the transmitter at the line input for SWR values of 2:1 or higher can be matched for optimum loading by adjustment of the transmitter tank circuit itself. If a transmitter does not contain sufficient matching range, a separate line-matching network between the transmitter and line input offers a more judicious matching arrangement than playing games out at the antenna. We will see why there are many situations where this same

matching approach should be considered when the load mismatch yields SWRs of even 5:1 or higher as one departs from the self-resonant frequency of the radiator (ref. 24).

One further misconception exists that has also resulted in needless and unwarranted reliance on the  $\lambda/2$  feed line to repeat the resonant antenna resistance at the transmitter. This one concerns the effect of line-input reactance on tank-circuit resonance when the line with reflections is fed directly by the pi network. Consider a tank circuit which is first loaded and tuned to resonance with a resistive load, and then when the load is changed to one containing reactance. If the tank component have sufficient retuning range to compensate for the reflected reactance and return the circuit to resonance at the proper load level, all is well; the tubes still see a proper resistive load as before. The misconception about this point has been generated by some writers who apparently don't understand resonant circuits, for they proclaim that the retuning introduces reactance that detunes the circuit, causing improper loading, and increases plate current and dissipation. Not so — much more detail on this point will appear in a subsequent part.

### Low SWR for the Wrong Reasons

We have discussed "low SWR for the wrong reason," as practiced (often unwittingly) in using the perfectly matched antenna operated only at the self-resonant frequency of the radiating element. But another wrong reason for desiring a low SWR is interpreting feed-line SWR as the sole criterion for indicating the quality of an antenna's radiating performance across a band of frequencies with low SWR across the band getting the rave and high SWR getting the boos. This is a definite misuse of SWR, because there are cases where the low and high SWRs occur in just the opposite relation, with respect to indicating antenna efficiency over a given bandwidth, for reasons which will be explained shortly. As a result of this misuse of SWR, good antennas are too frequently rejected as "bad" because the feed-line SWR swings relatively high, and poor antennas are accepted as "good" when the SWR remains relatively low.

In most cases the use of feed-line SWR alone to indicate antenna efficiency is completely invalid because SWR indicates only the degree of mismatch, not efficiency. However, we will see presently how a relative change in SWR, to a value either lower or higher than a previous value known to be correct in a given antenna system, can indicate that a change has occurred somewhere in the system. That change may affect its radiating efficiency. The popular vertical antenna having from two to four ground radials (an insufficient number for efficient operation), or perhaps having only a buried water pipe or a driven rod for a ground terminal, is one case where lower-than-normal SWR obtained over a frequency range indicates a poor quality of radiating efficiency rather than a good one. But conversely, improving the ground system by adding a sufficient number

<sup>24</sup> See footnote 23.

<sup>25</sup> Glanzer, "More Words on Antennas," *CQ*, July, 1957, p. 40; see p. 48 for material being referenced.

<sup>26</sup> See footnote 25.

of radials can increase the radiating efficiency to nearly 100 percent, and this improvement will be accompanied by a significant increase in SWR readings over the same frequency range to higher values, which are the normal or expected values.

With an adequate ground system, the SWR is predictable over the frequency range, because a load impedance of any specific  $R + jX$  value yields an exact SWR on a given feed line, and because we know approximately what the antenna impedance should be at whatever frequency we may wish to use (refs. 47, 48, 49, and 58, p. 3-1). But when the ground system is inadequate there is an unknown ground-loss resistance added to the known antenna impedance, which changes the SWR to some lower, unpredictable value. Yet, without being aware of these facts, we often tend to be happier in the discovery of an unsubstantiated low SWR than we do in determining whether we have SWR values that *should* be obtained with the existing configuration. This is a very important concept that requires a clear understanding if we are to avoid misinterpretation of SWR data in our effort to optimize radiated power.

It will help in understanding this concept if we have a clear physical picture of how the ground-loss resistance develops. It appears that we have still another misconception here, this one concerning the current and field behavior in the vertical-over-ground antenna system. Most of us know that conventional grounding techniques used for lightning protection, such as rods or pipes driven deeply into the ground, provide an excellent low-resistance current path for the lightning current. Many are unaware, however, that these techniques are totally inadequate for conducting the entirely different pattern of current flow of the vertical antenna system.

### Vertical Radiator over Earth

Let us digress a moment for a brief look into the field and current behavior of the vertical antenna system, to see what type of ground system it takes to meet the current-pattern requirements. Consider a base-fed vertical antenna; one terminal of a generator is connected to the base of the vertical radiator and the other generator terminal is connected to ground, just below the base of the radiator. During the half cycle in which the conduction current in the antenna radiator flows upward, all the current returns to ground through displacement currents, which follow the lines of force in the rf electric field through the radiator-to-ground capacitance. See Fig. 8. The electric field surrounding the antenna, which excites the displacement currents, fills the entire volume of space surrounding the antenna in the shape of an oblate or somewhat squashed hemisphere. This hemisphere intersects the ground to form an imaginary circle having a radius of slightly over  $0.4\lambda$  for radiators of  $\lambda/4$  in physical height. (The radius decreases as the physical height of the radiator decreases.) The displacement currents enter the ground *everywhere over the entire surface within the circle* and then flow back *radially* to reach the

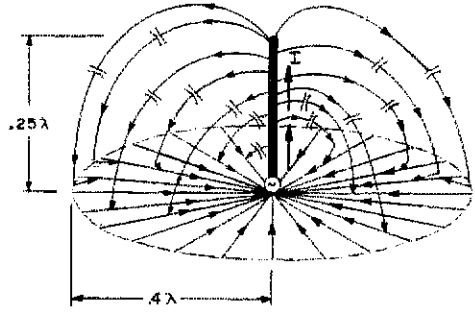


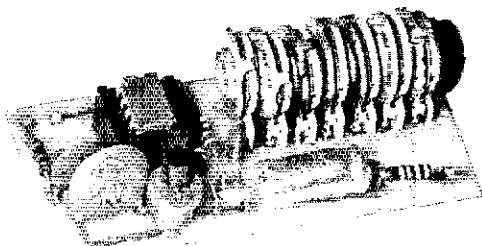
Fig. 8 — The hemisphere of current which flows as a result of capacitance of a  $\lambda/4$  vertical radiator to the earth or a radial system. At frequencies above 3 MHz, rf currents flow primarily in the top few inches of soil, as explained in the text. Ground rods are of little value at these frequencies, and spikes or large nails are sufficient to secure the outside end of each radial wire. With a sufficient number of radials, annular wires interconnecting the radials offer no improvement in antenna efficiency, as the current path is radial in nature.

grounded generator terminal. Although some of the current penetrates somewhat more deeply, most of the flow at frequencies above 3 MHz is restricted by skin effect to the upper few inches of the ground.

Now a ground system comprising only a simple water pipe or a driven rod or two is simply a terminal — the ground-feed terminal of the antenna system. So all the returning currents must flow entirely through the poorly conducting ground to reach the terminal. This ground system is often measured to have an "acceptably low" resistance *at dc* (which may be satisfactory for lightning protection), but it injects a series loss resistance in the antenna circuit *at rf*. The rf resistance often exceeds the radiation resistance of the antenna itself! Adding two to four wire radials to the system will provide good conductivity toward the ground terminal for the currents which reach those radials, but only a tiny amount of the total current entering the surface inside the circle is intercepted by the radials. Thus, all the remaining currents *still* flow only through the lossy ground, and the result is that we still have a high loss resistance.

Now if a sufficient number of equally spaced radials (90 to 100) extending out to  $0.4\lambda$  are present to intercept all the currents, all the returning displacement currents find highly conductive paths everywhere within the circle, which lead the currents through negligible loss resistance directly back to the ground terminal of the generator. This can be visualized by examining Fig. 8. Currents which do enter the ground between the closely spaced radials quickly diffract to a radial wire, and thus travel only a short distance through

(Continued on page 160)



# A Tone - Burst Generator for Repeater Access

Repeaters are beginning to crowd some parts of the vhf spectrum, with the inevitable result that some overlap of coverage areas can be found near heavily populated regions. Whether to avoid keying up more than one repeater or for other reasons of privacy, some groups have turned to tone access. Here is a low-cost, stable, and easily made unit that will meet the need for activating that "whistle-on" machine.

BY GLENN M. DICKSON,\* WBSBAF

**T**HIS CIRCUIT was brought forth in an effort to side step some of the problems of tone-burst generators, such as instability, temperature effects, difficulty of adjustment, or hard-to-find components. Cost was also a consideration; the unit can be duplicated with all new parts (excluding the pc board) for \$10 or less. Stability is such that drift is less than one hertz after an hour of operation. Potentiometers allow ease of adjustment to the desired frequencies of operation.

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### Circuit Description

The design is centered around a Signetics NE566V phase locked loop IC.<sup>1</sup> The tone frequencies are determined by C1 and R1 plus R2 through R7. The capacitance remains constant and the resistance is changed to set the various tones. The formula

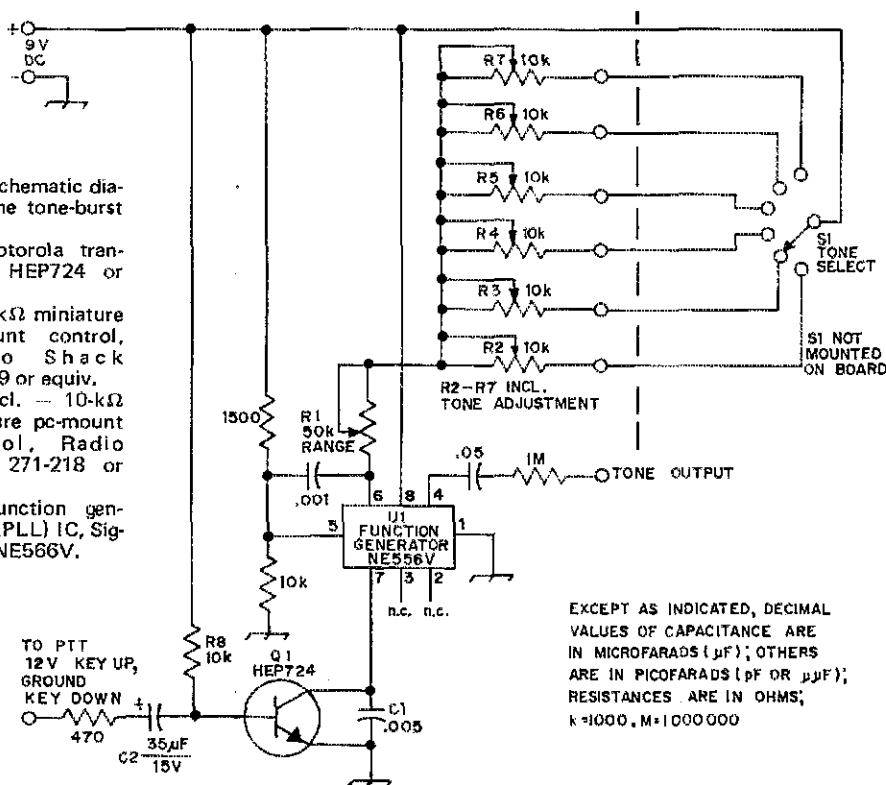
$$f = \frac{1}{3 \cdot R1 \cdot C1}$$

is used to calculate the frequency of oscillation.

<sup>1</sup>Phase-Locked Loops Applications, Signetics Corporation, 811 East Arques Ave., Sunnyvale, CA 94086.

Fig. 1 - Schematic diagram of the tone-burst generator.

- Q1 - Motorola transistor, HEP724 or equiv.
- R1 - 50 kΩ miniature pc-mount control, Radio Shack 271-219 or equiv.
- R2-R7, incl. - 10-kΩ miniature pc-mount control, Radio Shack 271-218 or equiv.
- U1 - Function generator (PLL) IC, Signetics NE566V.



EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF); OTHERS ARE IN PICOFARADS (pF OR μμF); RESISTANCES ARE IN OHMS; k=1000, M=1 000 000



The total resistance needed is approximately 28 kΩ for 1800 Hz and 20 kΩ for 2400 Hz. Since the overall resistance, between the extremes, is only 8 kΩ, potentiometers of 10-kΩ value were used to adjust the frequency and a 50-kΩ unit was used to set the range. Shunting C1 with Q1 causes the tone to cease. The values of C2 and R8 determine the burst duration.

In operation Q1 has +12 V applied to the base and is in full conduction, shunting C1. When the PTT line is grounded, Q1 will cut off and allow the PLL to oscillate. C2 will begin charging through R8 and again force Q1 into conduction, shunting C1, and stopping the oscillation. The .05μF capacitor and the 1-MΩ resistor provide isolation and a high impedance to the audio line.

### Construction

Since the NE566V is a voltage-controlled oscillator, it is very sensitive to voltage changes and a Zener-diode regulated supply is a necessity. The HEP724 (Q1) must be removed from the circuit in order to adjust the tones; therefore, a socket should be used for this transistor.

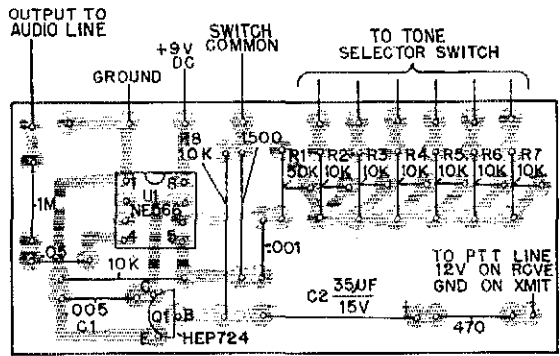
The circuit is constructed on a pc board measuring 1-1/4 × 2-7/8 inches (32 × 73 mm). A single-pole, 6-position switch is used to select the desired tone. Don't forget to provide an ON-OFF switch. Some people get upset if you are using tone-burst and the repeater doesn't require it.

### Adjustment

Remove Q1 from the circuit. This will allow the oscillator to run continuously. Connect a counter to the junction of the .05μF capacitor and the 1-MΩ resistor.

Set R2 through R7 to minimum resistance, then adjust R1 for 2500 Hz. Set the selector switch to position 1 and adjust the corresponding control for the desired frequency. Repeat this with the rest of the potentiometers.

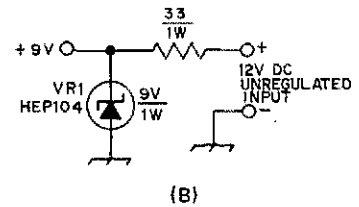
After setting all of the controls replace Q1 and check the burst duration. Using a value of 35 μF for C1 will give a burst duration of 0.4 second. If a



FULL SCALE

(A)

Fig. 2 -- Parts placement guide for the generator. View is from the component side; shaded areas are copper foil. A method of obtaining regulated power for the generator from a 12-volt source is shown at B.



(B)

different duration is desired change the value of C1. Do not change the value of R8.

### Comments

During the testing of this circuit one unexpected advantage of using a range control (R1) came to light. If you should change power sources and a different supply voltage results, the tones will need to be reset. Remove Q1 and select a tone with the switch. Adjust the frequency of that tone using R1. You will find that the other tones will be correct and need no further adjustment. QST

## 2304 MHz Mixer (Continued from page 19)

Since  $KTB$ ,  $NB$ , and  $S_o/N_o$  are multiplied together, the logarithms of the numbers can be added directly, and 10 times this sum yields the input signal level which can be heard in dBm. For the chart an  $S_o/N_o$  of 0 dB is chosen, as it is assumed that most operators can hear a signal at that level. An example is shown for a 7-dB noise figure, a  $S_o/N_o$  ratio of 0 dB, and a 2-kHz bandwidth. Therefore

$$S_i = -174 \text{ dBm} + 33 \text{ dB} + 7 \text{ dB} + 0 \text{ dB} = -134 \text{ dBm.}$$

To convert this to microvolts, first convert -134 dBm to watts.

$$\begin{aligned} -134 \text{ dBm} &= 0.4 \times 10^{-13} \text{ mW} = \\ &0.4 \times 10^{-16} \text{ watts.} \end{aligned}$$

Then use  $P = E^2/R$  to determine the voltage across a 50-ohm resistor at this power level. This calculation yields a value of .045 microvolt, as can be read from the chart.

If the noise figure is known, this can be expressed as noise temperature by making the following calculation:

$$T_e = (F - 1)T_o,$$

where  $T_o$  is defined as 290° for room temperature, and  $F$  is the noise figure expressed as a ratio.

$$F = 5, \text{ for } NF = 7 \text{ dB.}$$

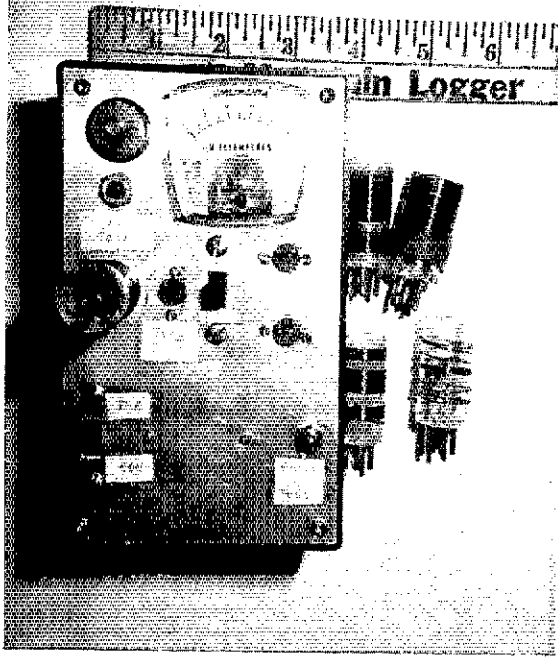
Thus

$$T_e = (5 - 1) \times 290^\circ \text{K} = 1160^\circ \text{K.}$$

Since it may be difficult for the amateur to tell when he has a 0-dB S/N ratio, this chart will not guarantee complete accuracy, but at least he can tell when he is in the ballpark. QST

# How High Will It Go?

BY HOWARD HANSON,\* W7MRX



READERS WITH long memories may recall an article by the author entitled, "A Junk Box Transistor Tester," (*QST* for October, 1969). That article described the design and construction of a unit for testing various unknown transistors that hams acquire from time to time. In addition to a circuit for testing the dc beta (current-amplification factor) of a transistor, this unit contained a circuit for determining whether said transistor was npn or pnp.

However, the above tester left one big gap in our knowledge of the unknown transistor's capabilities. It could not determine the transistor's fre-

quency limitations. This deficiency is corrected in the unit described below. Basically this new tester will do the following:

- 1) Test itself for run-down batteries.
- 2) Determine whether the transistor is an npn or pnp type.
- 3) See how high in frequency the unknown transistor can go and still maintain a reasonable current gain.

The complete circuit is shown in Fig. 1, but for simplicity's sake Fig. 2 shows each of the three above functions separately. The circuit in Fig. 2A shows the battery test feature, which merely taps a No. 47, 6-volt lamp across the battery. Since this lamp draws 150 mA from a 6-volt source (the usual transistor draws far less), you can assume that if the batteries light the lamp to full brilliance, they are live enough to handle the average small transistor. Fig. 2B shows the circuit for transistor-type testing. Its operation is based on the fact that the emitter-base junction (or for that matter, the base-collector junction) of a transistor is equivalent to a crystal diode, and hence will conduct current in one direction only. Which direction the current flows depends on the transistor type. In Fig. 2B,

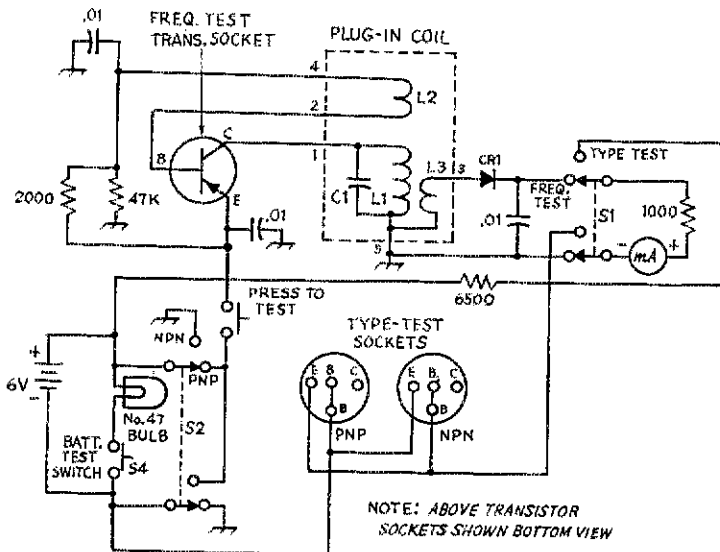


Fig. 1 — Schematic diagram of the transistor tester. Capacitors are disk ceramic and resistors are 1/2-watt composition.

CR1 — Germanium diode, 1N34A or equiv.

L1, L2, and L3 — See Table I. Different amounts of turns will have to be used for forms other than 3/4 inch.

S1, S2 — Dpdt slide switch.

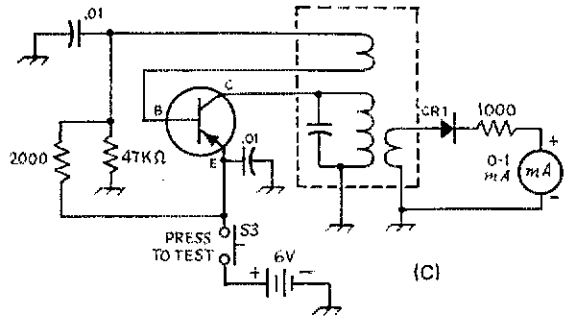
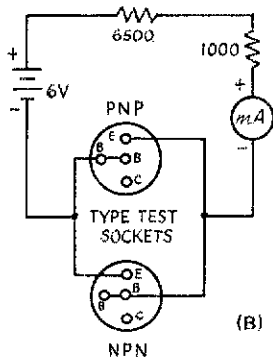
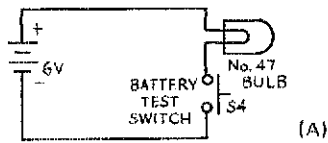


Fig. 2 — See text for discussion.

the two TYPE-TEST sockets are connected in parallel with each other, and in series with the meter and two current limiting resistors. If a pnp transistor is placed in the npn socket its emitter-base diode will be in the nonconducting direction and the meter should read zero. Placed in the pnp socket however, the transistor's diode will be in the conducting direction, and the meter should read a current. Similarly, an npn transistor would show current when placed in the npn socket, and would show none in the pnp socket. If you get a transistor that shows current in both sockets, you have a shorted (or at least a leaky) transistor. Better throw it out!

Fig. 2C shows the circuit for determining the frequency limitations of the transistor. Basically, it amounts to a self-excited oscillator (tickler-coil type) with the frequency being determined by the plug-in coil used. If the transistor is capable of operating on the frequency of that particular plug-in coil it will oscillate. Some of the rf energy will be drawn off by coil L3, rectified by the diode CR1, and will actuate the meter. I used five plug-in coils, representing frequencies of 1, 3, 12, 31, and 60 MHz, respectively. These frequencies correspond to the labelings of the various compartments of my spare transistor tray. One that tests good on a dc beta checker, but will not actuate the meter on this checker with any of the coils is considered an audio transistor.

Operation of the unit is simplicity itself. To check a transistor type, set switch S1 to the TYPE-TEST position, and plug the unknown transistor into each of the TYPE-TEST sockets in turn. To test frequency capabilities, set switch S1 to FREQ TEST. Set switch S2 to pnp or npn, depending on transistor type, and plug the transistor into the FREQ TEST socket. Plug in the highest frequency coil (in my case 60 MHz) and press test switch S3. If the meter reads, the transistor is capable of handling 60 MHz, and

probably more. If the meter doesn't read, remove the plug-in coil and substitute the second highest frequency coil. Press switch S3 again, and check for meter indication. Continue to use lower and lower frequency coils until finally one is found that will cause the transistor to oscillate. You now know the approximate frequency limit of that particular transistor.

Table 1 — Plug-In Coil Data

Frequency (MHz)	L1 (Turns)	L2 (Turns)	L3 (Turns)	C1 (PF)
60	3	3	3	25
31	7	6	4	25
12	12	7	6	80
3	22	10	9	270
1	34	20	8	1000

Note: Above coils close-wound, 3/4-inch (19 mm) diameter.

(Continued on page 39)

Construction of the tester.



# A Competition - Grade CW Receiver

## Part II

*Part I of this presentation was published in QST for March, 1974, and treated the design philosophy of the author. Circuit descriptions were offered for the early stages of his receiver. Part II concludes the series with discussions about the i-f and agc systems. Additional data are given for those who may wish to incorporate an LED frequency-readout system in an amateur-band communications receiver.*

BY WES HAYWARD,\* W7ZOI

SHOWN IN Fig. 5 is the i-f system used in the receiver. The heart of this module is the KVG XL-10-M crystal filter. This 9-MHz unit contains ten crystals which yield a 6-dB shape factor of 2. This would correspond to a shape factor of about 1.2 in an ssb type filter, a very good skirt response, indeed. The filter is followed by two i-f stages which use Motorola MC1590Gs. Each IC contains three differential amplifier pairs, so a gain of over 50 dB per device is possible at 9 MHz. Since this much gain was not required, the ICs were operated in a video-amplifier configuration with the advantage of better amplifier stability. The MC1590Gs were chosen over other ICs due to their excellent agc characteristics. The attributes one seeks are a smooth, logarithmic decrease in gain with applied control current, and minimal distortion, even with heavy applied agc. The pair of amplifiers, as shown, provides a gain of a little over 70 dB. The FET used as an output buffer serves the triple purpose of providing a low-impedance drive for the agc amplifier, a proper termination for the second crystal-lattice filter, and isolating the input of the second filter from the agc system.

The reader will recall that the front end of the receiver had a net gain of around 20 dB. However, the first crystal filter has a loss approaching 10 dB. Hence, the signals at the input to the first i-f amplifier are only 10 dB or so above the antenna signals. If these signals were amplified with no additional selectivity, the wide-band noise generated in the i-f amplifier would inject excessive hiss in the receiver output. The output filter serves to confine the i-f generated noise to that chunk of the spectrum which also contains information. It is important that the two crystal filters have well-matched frequency characteristics. (Spectrum International will provide matched units for a minimal charge.)

The reader may ask whether the second filter is really required. Although one might do without it,

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the addition is very worthwhile. Indeed, if economic considerations become a constraining factor, it would be much better to use a pair of the KVG 4-pole filters than to employ a single 10-pole unit.

The 10-pole crystal filter has one deficiency which occasionally presents a problem. The ultimate rejection of the filter is only 80 dB. Even this level of out-of-passband rejection is hard to realize unless the filter is mounted carefully, and directly against a metallic ground plane, then shielded properly. However, the addition of a second filter largely overcomes this problem as far as information reaching the product detector is concerned. With an 800-Hz beat note, the single-tone sideband rejection of the i-f appears to exceed 120 dB. Indeed, with both filters in the system, the author has never heard an audio image. The deficiency in the input filter is significant only when a strong local station comes on the air and activates the agc system, which occurs long before front-end nonlinearity becomes a problem.

One of the outputs from the main i-f strip is applied to the 9-MHz agc amplifier consisting of Q10, Q11, and Q12. The first stage has a tuned output and has emitter degeneration for control of the gain. The second stage has an emitter follower for low output impedance, and negative feedback for gain stability. The output of Q12 is applied to a hot-carrier diode peak detector which charges C1, the main "memory" capacitor in the system. The voltage on C1 is sensed with an FET source follower, Q13, and is then applied to U3, a  $\mu$ A741C op amp. This IC operates as a noninverting dc amplifier, with appropriate level shifting to provide the forward agc drive for the MC1590G i-f amplifiers. Manual i-f gain is controlled by adjusting the output offset of the op amp.

The low-impedance output of Q12 is very effective in charging C1 quickly. Once this occurs, there are two ways in which the charge is drained away from C1. One is through the 22-megohm

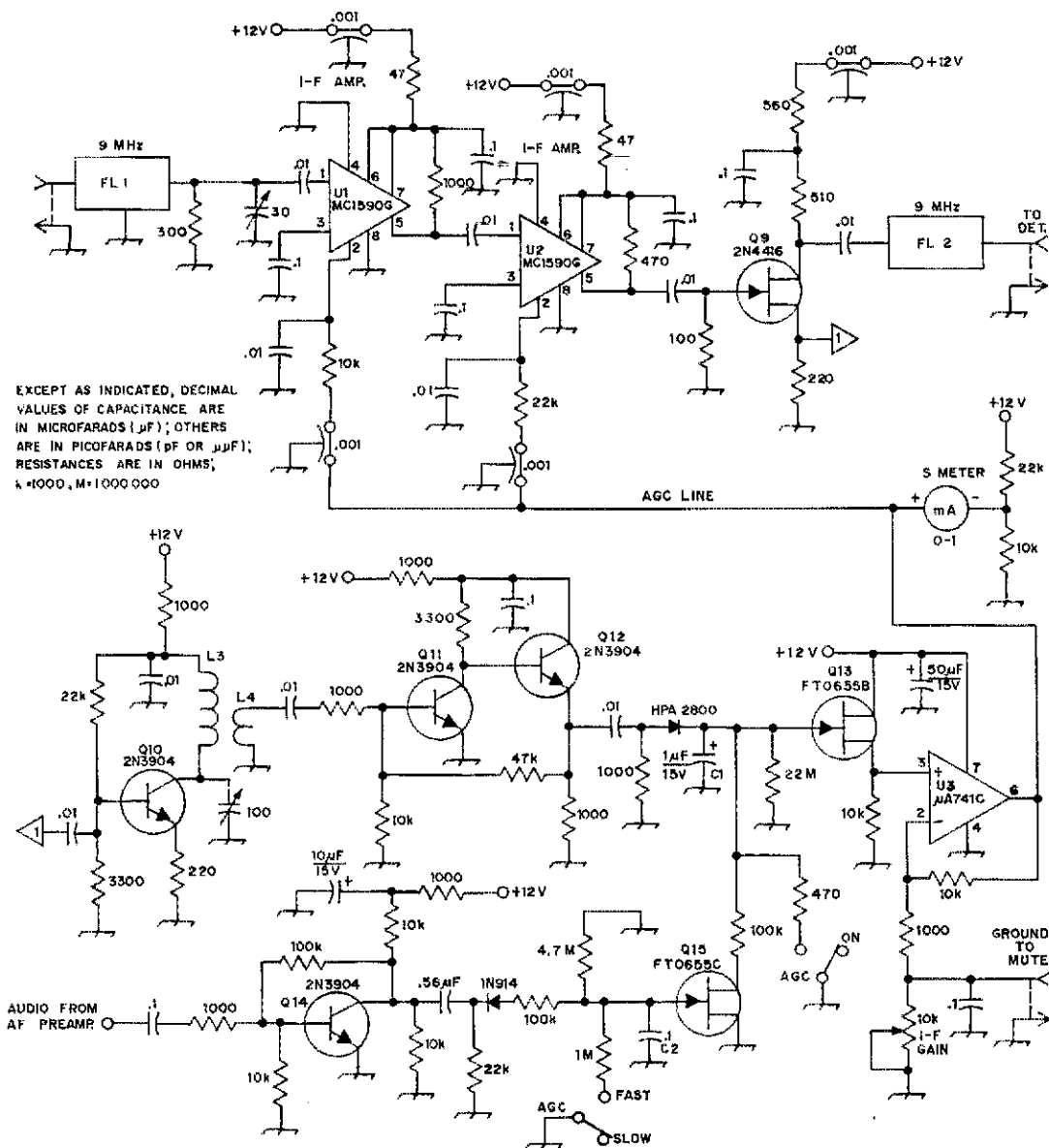
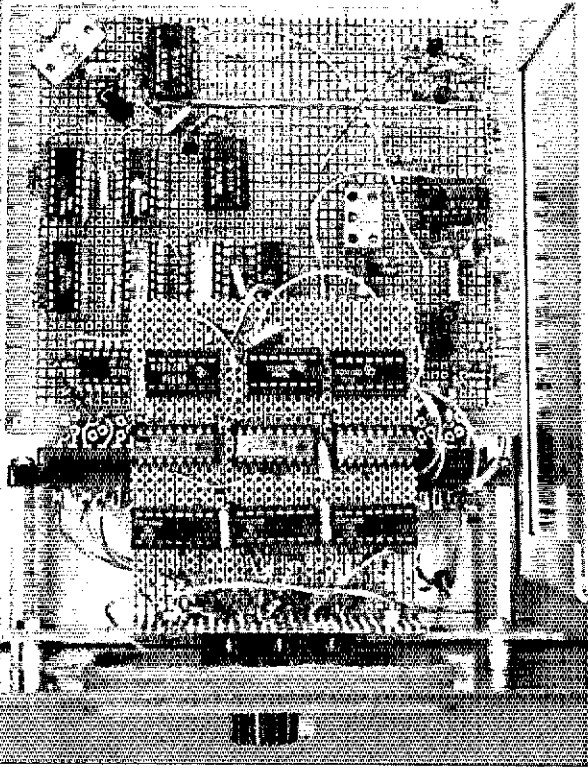


Fig. 5 — Schematic diagram of the i-f amplifier and agc system of the W7Z01 receiver. FL1 is a KVG XL-10-M and FL2 is a KVG XF-9-M (Spectrum International. See *QST* ads.). L3 contains 50 turns of No. 28 enameled wire on an Amidon Associates T-50-2 toroid core. L4 is a 10-turn link wound over L3.

resistor shown, and the other is through a 100,000-ohm resistor and the drain of an FET, Q15. Under normal operation, a signal is injected into the i-f strip, is amplified and detected, and C1 is charged to an appropriate level. As soon as output occurs at the audio-gain control, this audio signal is applied to Q14, a limiting amplifier with a maximum output of 6 V pk-pk. This audio signal is rectified and the resulting dc slowly charges C2

negatively. Capacitor C2 ultimately will charge to -6 volts, which causes FET Q15 to pinch off. In this condition, the drain-to-source resistance of Q15 exceeds 100 megohms. Hence, the memory capacitor, C1, is quite effective in maintaining a constant i-f gain between cw characters. However, when the audio signal disappears, capacitor C2 charges toward ground. After about 0.5 second (agc switch in SLOW DECAY), FET Q15 begins to



Shown in this photo is a close-up view of the digital circuitry. The lower plug-in board contains the 2-MHz clock oscillator, the associated count-down circuits, control functions, and the input buffering circuits. The upper board contains the signal counters, the latches, and the decoder drivers. The LED readout segments are mounted vertically on an attached board. The time-base rotary switch is located between the socket for the lower board and the front panel of the instrument.

conduct, which now causes the memory capacitor, C1, to discharge, bringing the amplifier quickly back to full gain. This dual time-constant loop was adapted from a system built by W0YH (*QST* for July, 1970).

The use of Q15 and associated parts provides two very desirable features in an age loop. First, if a noise pulse of short duration appears in the i-f amplifier, it will be detected and will reduce the loop gain momentarily. However, the charge on C1 quickly bleeds off through Q15 and full i-f gain is again available. The second feature is that loop recovery time is essentially independent of signal strength.

The reader will note that age is applied only to the two i-f amplifiers, U1 and U2. No age is applied to the front end since this can often alter the receiver immunity to cross modulation and blocking. Of equal significance are the dynamic characteristics of the age system. The total age

loop is contained between the two crystal-lattice filters. Hence, the loop bandwidth is very wide in comparison to that of the crystal filter, allowing the system to respond quickly to any input. A triggered oscilloscope was used extensively in evaluating the age response, and demonstrated the complete absence of pumping or overshoot. The first cycle of audio output is identical to the 1000th for any applied signal within the dynamic range of the receiver.

With an antenna input signal of 0.1 microvolt, the audio output drops by 6 dB when the age is switched on, indicating a suitably low threshold. The age loop will easily handle a receiver input of 0.1 volt — the upper limit of the signal generator used for testing.

The product detector is a Motorola MC1496G. This IC is biased exactly as shown in the Motorola applications literature<sup>2</sup> except that a 500-ohm input resistor is used to terminate the crystal filter properly. A crystal-controlled FET BFO is used, both for reasons of stability and for low oscillator noise. Care was taken to insure that the BFO injection was symmetrical, which is necessary to preserve balance in the MC1496.

The output of the detector is applied to an audio preamplifier consisting of an LM301A operating with a closed-loop voltage gain of 30. The energy is routed through an audio gain control which is used to regulate the drive to the output stage. Many of the audio power ICs available produce considerable distortion when operating at the low levels required to drive efficient low-impedance headphones. Hence, the writer used a Class A audio-output stage. This was built from a  $\mu$ 741C operational amplifier, driving a power emitter follower with a standing current of 65 mA. The follower is within a feedback loop which sets the stage voltage gain at four. Since the audio and detector circuits are very straightforward, they are not presented schematically.

### Digital Frequency Readout

In this age of inexpensive and reliable integrated circuits, few will question the desirability of digital methods for receiver frequency readout. However, some readers may not appreciate the simplifications afforded by such an approach. Many of the problems usually associated with the receiver local-oscillator system can be avoided. For example, the tuning capacitor can be mounted according to mechanical convenience, with no worries about a dial system. Requirements of tuning linearity are avoided. Long-term stability requirements are relaxed, making it much more practical to use free-running oscillators at higher than normal frequencies. The typical built-in crystal calibrator is redundant. Finally, of course, there is the obvious advantage that the readout can be as accurate as the crystal oscillator used for the clock.

In spite of the attributes listed, a digital readout can introduce problems. The most significant of

<sup>2</sup> *Linear Integrated Circuits Data Book*, Motorola Semiconductor Products, Inc.

these is the proliferation of rf "garbage" which may result if sufficient shielding and decoupling are not employed. Also, the dc-current requirement of such a system is high.

An expanded block diagram<sup>9</sup> of the counter system is shown in Fig. 6. This counter started as a general-purpose bench unit. It was only after much of the receiver was finished that it was decided to incorporate the counter in the receiver, with the general utility of the counter retained by providing a switched auxiliary input at the back of the receiver. The input buffering circuits will handle signals from 50 mV to 50 volts (peak to peak) at frequencies of a few hertz to 25 MHz. The counting time base will run out to 1 second to provide a 1-hertz resolution.

Since the author's receiver is a cw-only machine, a counter is used easily with the receiver by directly measuring the local-oscillator frequency. This is because the receiver i-f is at 9 MHz exactly, and in a cw system frequencies are referenced to the i-f center. In an ssb system, the usual reference is with respect to the suppressed carrier, which, after mixing, coincides with a BFO which is offset from the center of the i-f by a little over 1 kHz. Hence, in an ssb receiver, additional circuitry would be required.<sup>10</sup> The counter has only three digits of display, for reasons of economy. On 20 meters, with the time base set for 1 ms, the readout will display the number of kHz above the bottom of the band. Typically, the counter is used with a 10-ms time base, yielding a display with 100-Hz resolution. The nominal extra expense of a fourth display digit would clearly make it a worthy addition.

Referring now to Fig. 6, we see that the incoming LO signal is preconditioned<sup>11</sup> and then applied to the main counting gate. This gate is controlled by the time base. The output of the gate is counted in standard fashion by three SN7490 decade counters. The BCD output of the counters

<sup>9</sup>The reader interested in designing his own counter should review the numerous fine papers on the subject in the amateur literature. An excellent general reference is *The Integrated Circuits Catalog for Design Engineers*, Texas Instruments, Inc.

<sup>10</sup>Hagen, "A Simple Frequency Counter for Receivers," *QST* for Dec., 1972.

<sup>11</sup>Recent Equipment, *QST* for April, 1972.

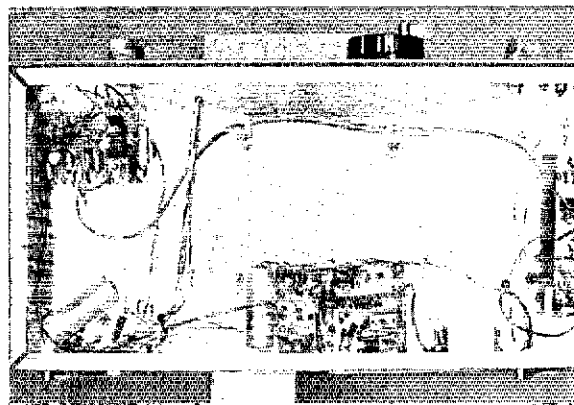
is fed to SN7475 latches. The latch outputs, still in BCD, are fed to 7447A decoders, which drive the seven-segment light-emitting diode display devices. The LEDs chosen are Opcoa SLA-1s, which have decimal places and are 1/3 of an inch high. With 1000-ohm cathode resistors, and the common anodes operated from the 12-volt supply, the LEDs produce a very readable display, even at several feet away.

Although generally standard, the design of the time-base system does depart slightly from the norm. First, a 2-MHz crystal-controlled clock oscillator is used in preference to the usual 1-MHz design, the reason being simply that there are no harmonics falling in the 9-MHz i-f. Assume for the moment that the clock gate shown in Fig. 6 is bypassed, with the crystal-oscillator output applied directly to the chain of six SN7490s. Assume also that the time-base switch is set to the 1-ms position. Hence, the output of the third 7490 is selected and applied to a divide-by-two circuit which uses a type-D flip-flop. This output is now a square wave with a 1-ms period. This is applied to another D type flip-flop which gives us a square wave that is high for 1 ms and low for 1 ms. This output is used to control the main counting gate. That is, when it is high the counting gate is open, allowing LO signals to enter the counters.

The output of the second D flip-flop is differentiated so that a 0.5  $\mu$ s pulse is derived and used to strobe the 7475 latches and update the display at the instant the main counting gate is closed. The falling edge of the strobe pulse is again differentiated to provide a pulse which is used to reset the signal counters.

The system described in the foregoing section is very basic and will, indeed, work. However, it suffers from two problems. The first is an update rate on the display which is too fast. The second problem, which could be of major significance when used with a receiver, is that we have high-speed digital circuits operating continuously and generating rf garbage. These potential problems were solved by placing the clock gate at the output of the crystal oscillator. This gate is controlled by an R-S flip-flop which is formed from cross-coupled NAND gates. When the reset pulse is derived as described above for resetting the signal counters, this pulse is also used to reset the R-S flip-flop and, hence, the countdown chain. At this instant a slow oscillator which uses a D-13T programmable unijunction transistor (PUT) starts. One half-second later, the PUT fires and sets the

In the upper left corner near the panel is the audio system. The product detector and BFO are on the central board, adjacent to the second crystal filter. The right-hand board contains the agc system. The large electrolytic capacitors were found to be of value in decoupling the various subsections, to prevent cross-talk problems from affecting the counter circuits. The small box mounted on the rear panel contains a switch and coax connector which allows the counter to be used for general-purpose applications.







R-S flip-flop. This now turns the clock gate on and the timing proceeds. The overall result is a half-second interval for display update and, more significantly, digital circuitry which is operating for only 2 ms out of each 0.5-second interval (1-ms time base assumed). Hence, even if rf noise is getting into the main receiver circuit, it won't cause major problems, because of the low duty cycle.

The front-panel time-base switch controls inputs to an SN7401 open-collector output, quad dual-input NAND gate. The open-collector configuration allows wire ORing the four outputs. All other gates are SN7400 NAND types. Sockets are used for all ICs and 0.1- $\mu$ F disk capacitors are used liberally to bypass the power-supply lines. To the writer's amazement, no shielding was needed around the counter circuits. This, however, is a bit deceptive, for most of the rest of the receiver is well shielded. Under normal conditions the only detectable spur introduced by the counter is the seventh harmonic of the clock at 14.000 MHz. This is very weak (0.1- $\mu$ V equivalent) and presents no problem. The low duty cycle used for the time base was found generally to be unnecessary. However, with a higher duty cycle and the resulting increased amount of undesired rf in the system, many unwanted IM products can be observed when the receiver is subjected to very strong external signals (e.g., 0.1 volt).

### Conclusions

In reviewing the project, the performance realized is more than adequate. The sensitivity, selectivity and stability are sufficient for contesting and DXing activities, and strong-signal performance has not been compromised to meet these ends. While some of the obvious features, such as digital readout and a 120-dB age range, are impressive, the most exciting conclusion reached in the ex-

periments was an appreciation for the necessity of having a low-noise local oscillator.

The builder of a sophisticated receiver should plan on spending a great deal of time doing careful measurements and adjusting his circuits. While an excellent superhet of simple design is easily built by bootstrapping one's way through the project without test equipment, there will be some compromise in performance. Test gear used in this project included the usual VTVM and VOM as well as a Tektronix 647 oscilloscope with a 50-MHz bandwidth. Also used extensively was a URM-25D signal generator, a variety of attenuators, three homemade signal sources, the counter which is now built into the receiver, and a home-built ac voltmeter. The writer continuously found himself wanting more and better test gear — specifically a pair of high-quality, low-noise signal generators, a sweep generator and a modern spectrum analyzer.

In building the receiver, the directions to be taken in future designs became clear. Many of these impressions were presented in the text. For the present though, it is refreshing to realize that the amateur can still build a receiver which is at least as good as anything he can buy.

### Acknowledgements

The writer gratefully acknowledges the assistance and advice of many of his friends. Jim Richardson helped with mechanical construction problems, yielding a machine which was fairly nice looking — a pleasant departure from the norm for this writer's gear. Test equipment was borrowed from W7TYR and W7RM. Many useful comments and constructive criticisms were received from Larry Lockwood, W7JBY, and Fred Telewski, WA7TZY. Finally, the writer would like especially to thank Rudi Fisher, DL6WD, for the 10-pole crystal filter, and Bill Sabin, W0IYH, for his frank criticism and sincere encouragement. Q5T

## How High

*(Continued from page 33)*

If you suspect weak batteries, merely press S4, the BATTERY TEST switch and check the lamp for full brilliance. This can be done regardless of the settings of the other three switches.

### Construction

Construction of the unit should pose few problems. A hint on drilling the square holes for the slide switches — drill two holes with a 1/4-inch drill and file the corners with a small square file.

The parts layout is not critical and the one used by the writer need not be followed exactly. About the only requirement is to keep the FREQ TEST transistor socket close to the plug-in coil socket so as to allow short rf leads. It's also a good idea to locate S3 far enough from the coil-form socket that it can be pressed without getting the hand too close to the coils.

The last item has to do with the tickler-coil windings (L2) on the coil forms. As any old-time

ham from the regenerative receiver days is aware, the winding relationships are important. If the windings are phased right you get positive feedback and oscillation. If they are phased wrong you get negative feedback, and nothing. The best way to meet this problem is to make one coil as shown except leave the two ends of L2 unconnected. Plug in a transistor that you *know* will handle the frequency, and temporarily solder the ends of L2 to the pins. Plug the coil in, and press S3. (Make sure S1 and S2 are positioned properly.) If the meter reads, it indicates oscillation, and also indicates that you have L2 properly connected. Make the connections permanent. If the meter doesn't read you should reverse the two ends of L2 and try again. You should get a reading this time, but if you don't, check your connections carefully. You might also try another transistor. The diode, the meter, and S1 should also be checked out. Once you get one tickler coil wound correctly, you've got the problem solved. Just wind the coils on the other forms in the same direction. Q5T



# Modernization of an Old Favorite

Fig. 1

## or, "the Sideswiper Revisited"

BY JOHN J. MYERS,\* W9LA

ON RETURNING to the air after a 30-year absence I was astonished to find a general unfamiliarity with the sideswiper, the basic speed key of pre-WW II impoverished hams. Therefore, I was determined to give this old favorite its just dues by getting one into operation. In the course of building my new one I devised an improvement in design, which I feel must be shared with my fellow sideswiper enthusiasts.

### Background

It is important first to review fundamentals for those who may never have had the opportunity to use a sideswiper or hear one on the air. The sideswiper is the forerunner of the modern paddle<sup>1</sup> used with electronic keyers. As is the paddle, the sideswiper is essentially a spdt switch with a return-to-neutral feature that assures you that your carrier doesn't remain on the air between dots and dashes. With it, a practiced operator can sideswipe along at a good clip, well above the speed anyone without a rubber wrist can achieve with a straight key. In use, one swings the arm of the key back and forth between the contacts, with elements of Morse character being formed alternately at right and left (left and right does just as well). It's a dot if your dwell time on the contact is shorter than your dash dwell time — although sometimes dots tend to come out longer than dashes. Sideswiping compared to straight keying is something like flag waving as compared to using a well hand pump, a wagging versus a pumping motion.

One of the important characteristics of this basic instrument is that its action is faster than that

of a straight key. On the other hand, perhaps its most important feature (which sets aglow the warm feeling many of us have for the sideswiper) is that it gives real character to one's fist. Such character isn't achievable with modern keyers by any but the most dogged — and it's impossible with a keyboard. It's easy to remember the beauties of the "accents" sideswiper users developed. There was the draggy Southern drawl, the distinct New England inflection, the mid-Western flat drawl that was almost accentless (I'm an ex-W8), the clipped accent of the British, and of course the special accents of the stutterer. The accent was a much more reliable identifier of the operator than was his chirp or his 120-cycle note (in sideswiper days 120-Hz hum was virtually unknown). The accent was almost better than a fingerprint. It never was clear why the FCC didn't record a little bit of each operator's sideswiper fist for its gumshoe operations (maybe they did!) since his accent couldn't be faked as can a call sign.

The ARRL *Handbook*<sup>2</sup> gives well-intentioned advice to the effect that the objective of a good cw operator must be "the formation of well-formed, rhythmical characters," which is unachievable by the use of special keys like sideswipers. And later on, "Any recognizable swing is a deviation from perfection." The basic fallacy in the advice lies in the premise that sideswipers can't give well formed, rhythmical characters — especially rhythmical. In fact, in addition to developing his own rhythm, each user of a sideswiper can choose his own style — swing<sup>3</sup>, boogie, rock — and even send in any key. With a sideswiper there's an opportunity for each cw operator to do his own thing that is much more in harmony with modern ideas of individuality than is the homogenization of fists

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<sup>1</sup>It is not possible to use a paddle key as a sideswiper and get anything like the results achievable with a properly used sideswiper; the converse is not true.

<sup>2</sup>1972 edition, pages 646-47.

<sup>3</sup>Note to *Handbook* editor: swing is definitely out and rock's in.

resulting from the use of such modern electronic aids as keyers and keyboards.

It is suggested that each cw operator review his own fist objectives and consider the sideswiper, particularly the modernized version that is described below, for character building<sup>4</sup>. There will always be the turnip who doesn't seek to extract from any key the intrinsic advantages it offers, but this article won't interest him anyway (except possibly the hardware details described here).

### Construction Details

The classical homebrew sideswiper is built from fundamental items found in any ham's workshop 35 years ago: a porcelain-base dpst knife switch (just try to find one now!), a hacksaw blade, a 6-32 x 1/4-inch machine screw and nut, and about two feet of friction tape. The switch is disassembled, the two blades are used to form a pair of rear supports for the sideswiper arm, and the terminals are reformed<sup>5</sup> to make the opposing contacts spaced about 3/32-inch apart. The exact dimensions are unimportant as long as the result is

<sup>4</sup>The term "character building" should be interpreted in the context above to mean the synthesis of Morse characters from a loosely formed series of sideswiper dots and dashes.

<sup>5</sup>Note in Fig. 1 the file marks that are evidence of the tender, loving care taken to remove the dents caused by hammering and gripping the terminals.

generally as shown in Fig. 1. A hacksaw blade is then selected (those with a number of teeth missing are preferred over new blades, but the number of teeth per inch is unimportant since they are ground off anyway), cut to length, and mounted as shown. Finally, the classical key is completed by winding the friction tape over the end of the blade to produce a soft, comfortable 'knob' (much better than the cold feel of a plastic knob). Experienced users will mount the key on a wooden baseplate that is large enough to prevent the key from scooting around in use and that is finished to match the decor of the shack.

### Basic Design Improvement

After lengthy experimentation during the building program, required by an inability to find in the junk box any non-dried-out friction tape of the type required for the classical design, it was determined that the currently available plastic electrician's tape is an entirely satisfactory substitute — and in fact provides the basic modernization. One's fingers no longer stick to the knob when the key is first made. Instead, the smooth, plastic tape encourages the use of the sideswiper immediately on completion and does not require dirty fingers to eliminate the stickiness, as was necessary with tape of the earlier specifications. Experienced sideswipers will recognize this basic improvement in the homebrew key as a valuable contribution to the evolution of the instrument. QST

## Semiconductors *(Continued from page 25)*

### Adjustments

You'll need a known power source to adjust the meter. The simplest source is two 9-volt transistor batteries (fresh) connected in series to provide 18 volts. The batteries are inexpensive and they won't be wasted, as you can use them in future projects or for replacements in the voltmeter.

The voltmeter circuit has two scales, 0 to 2 and 0 to 20 volts. Our meter comes with a scale that shows 0 to 100 divisions, so all we have to keep in mind is that we multiply any reading by a factor of two and leave off the last digit. To calibrate, the two batteries connected in series gives us 18 volts so our meter would read 90. This may sound confusing but you'll quickly get the hang of it. One could make a new meter face but it probably isn't worth the effort.

The first step is to turn on S1, then zero the meter reading by adjusting R7. Connect the two batteries in series and connect the plus side to the plus terminal on the voltmeter and the negative terminal to the negative battery side. You'll probably find that the reading won't be anywhere near 90 (18 volts), so you'll have to adjust R8 to set the reading on 18 volts. Then remove the battery connection and see what the meter reads. You'll probably have to adjust the zero control again. You'll find that it will take a few adjustments back and forth between R7 and R8 to

obtain a zero reading without the calibration batteries and 18 volts with them. Once the voltmeter is calibrated it will hold calibration as long as BT1 delivers 9 volts. The total drain of the voltmeter circuit is about 10 mA, so the battery should last a long time.

### The RF Voltmeter Probe

The rf probe is housed in metal tubing. The unit shown in the photographs uses a piece of aluminum tubing, 1/2 (13 mm) inch in diameter and 4-1/2 inches (115 mm) long. A piece of copper tubing would do just as well. The tip of the probe is a short length of solid wire. No. 12 or 14 is suitable. This piece of wire runs through a 1-inch (25 mm) length of wooden dowel which is inserted in the tubing. The wooden dowel 1/2 inch (13 mm) diameter is filed down to fit tightly into the end of the tubing. The piece of dowel is drilled to accept the wire tip, snugly.

The drawing shows details for making the electrical connections in the probe. Insulated sleeving (spaghetti tubing) is used over the components to prevent accidental shorting to the metal tubing. Shielded rf wire should be used for the probe leads. The shield of the wire (RG-174/U coax) is connected to the end of the tubing by means of a soldering lug to complete the circuit at the probe end. Alligator clips are used on the other end of the shielded wire for making connections to the voltmeter. — *W1ICP*

# Monitoring an SSB Amplifier Chain for Linearity

BY WIN WAGENER,\* W6VQD

ONE OF THE better means of monitoring the linearity of a chain of ssb linear amplifiers to establish the proper gain levels and avoid flat topping, is to observe a suitable triangular modulation pattern. This pattern is obtained when an rf sample from the antenna feed line is fed to the vertical plates of an SB-610 oscilloscope, and an early sample of the envelope of the low-level ssb signal is placed on the horizontal plates. See the block diagrams in Fig. 1.

The resulting patterns on the SB-610 oscilloscope appear as shown in Fig. 2. The formation of these patterns results from the application of two signals on the two axes, as shown in Fig. 3. The output rf is on the Y axis, or vertical plates, and the rectified envelope of an early sample of the ssb signal in the amplifier chain is on the X axis, or horizontal plates, of the scope. They combine on the X - Y coordinates as in Fig. 3, just as they do on the face of the CR tube in the monitor.

If the amplifier chain is linear, the rf amplitude in the antenna line should rise and fall exactly in step with the amplitude of the ssb signal applied to the first stage of the amplifier chain. Please note

\* 12481 LaCresta Drive, Los Altos Hills, CA94022.

that the straight lines OA and OB are in no way related to the shape of the envelopes of the input and output signals. As long as the signals rise and fall together the lines OA and OB will be straight.

The instructions for the operation of the SB-610 say to put the rf output of the exciter in and out of two coaxial connectors (phono jacks marked "exciter") and the rf output of the power amplifier in and out of two coaxial connectors en route to the antenna (see Fig. 1A). This enables the SB-610 to sample the rf line from the PA to antenna, and sample the rf line from the exciter to the PA. The SB-610 rectifies the exciter rf to get an envelope signal, and this is applied to the horizontal plates through the internal horizontal amplifier. However, with this connection the SB-610 monitors only the linearity of the amplifier. If the exciter is putting out a nonlinear signal, or is flat-topping, the SB-610 can't show this, and you could be beguiled into thinking the linearity of your signal on-the-air was beautiful, because only the linearity of the PA is being monitored.

### Corrective Measures

Now, if instead of taking the sample signal for the horizontal plates from the exciter output, one

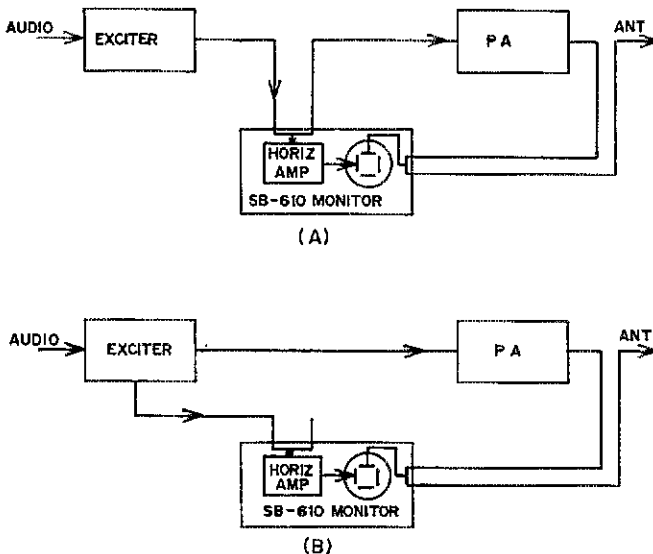


Fig. 1 - Block diagrams of monitoring connections for the SB-610 scope. Checking the linearity of the amplifier stage only is shown at A. Checking over several stages is shown at B.

were to take this sample from an early stage within the exciter, the pattern on the scope would show the combined linearity of all succeeding stages, including the PA. I chose to take the sample of the ssb signal at the intermediate frequency of my Swan 350 (see Fig. 1B). The envelope shape of the ssb signal at the i-f should be the same as the envelope shape at the final frequency, because the mixer only translates the desired signal to a different frequency. In the case of the Swan 350 I took a sample of the signal from the plate of the first amplifier tube following the crystal filter, and inserted it into an "exciter" jack of the SB-610, in order to go through the demodulator diode and horizontal amplifier of the SB-610.

At this moment my troubles with the SB-610 began. In order to get an adequate signal on the horizontal plates I had to run the built-in horizontal amplifier of the SB-610 wide open. I got a beautiful triangular pattern just like the one portrayed in Fig. 2A. I was very happy until one day I discovered that I got the same perfect pattern even if I removed the sampling line of my Swan from the "exciter" jack of the SB-610! It turns out that the stray rf pickup within the SB-610, from the antenna rf line to the vertical plates, was enough to give a suitable signal to the horizontal amplifier. Of course the pattern would be perfect, because the same rf envelope was applied to both the vertical and horizontal plates and the voltages to these plates would rise and fall together, because it was the same signal! Now the problem was to reduce the accidental stray coupling to the horizontal circuits to a negligible value.

The demodulator diode for the horizontal voltage is one of the two diodes built into a 6BN8 in the SB-610. The other diode in the 6BN8 is used as part of the clamper circuit to remove the cathode-ray spot when no signal is applied. To accomplish this the rf output of the final PA is fed to this diode. The two diodes are close together, as are the leads through the stem of the 6BN8. The cure was to take the horizontal-voltage demodulator circuit out of the 6BN8 and use a 1N55 diode, and to fully shield the rf portion of the horizontal-voltage circuit from the rf power of the PA output. When this was done, the horizontal signal would drop to zero when the rf sampling line from the Swan 350 was removed from the SB-610. Thus now the horizontal signal resulted only from the desired low-level rf ssb signal in the Swan transceiver.

Fig. 2 - Single-sideband modulation patterns, showing perfect linearity, A, tolerable linearity, B, and bad flat-topping and splatter, C.

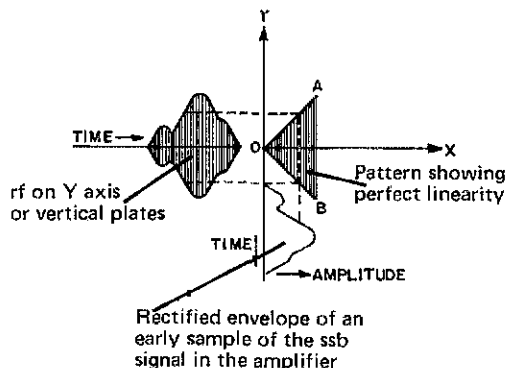
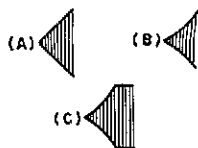


Fig. 3 - Applied rf and envelope voltages and resulting pattern on the axes of the SB-610 scope.

The sampling of the low-level i-f in the Swan followed the instructions of the SB-610 for sampling incoming receiver signals in the i-f line. I used a 3.2-pF capacitor connected to the output circuit of the first i-f tube after the crystal filter, and after the dc plate voltage of the tube was removed by the blocking capacitor. A shielded coax line carried this sample to the "exciter" jack of the SB-610. (Note: The sample is not applied to the vertical amplifier, as one would do to display received signals against a linear horizontal sweep.)

### Results

In station operation it is a real satisfaction to monitor the linearity of all the important linear stages continually as one talks. It is also devastating to realize that one must be careful of the level of the audio, lest one flat-top momentarily on the peaks of one's voice. Any visible flat-topping, even momentarily, gives splatter outside the channel required for voice frequencies. The triangular modulation pattern allows one to see such momentary flat-topping.

QST

## Strays

Recently we showed what happened to W1FBY's antenna installation when an ice storm hit Connecticut. Bob saved one of the chunks of ice by keeping it in a freezer until we could take this photograph. It measured slightly over three inches in diameter! Anyone want to calculate the weight of the ice on an 80-meter dipole 135 feet long?





# Hints and Kinks

For the Experimenter



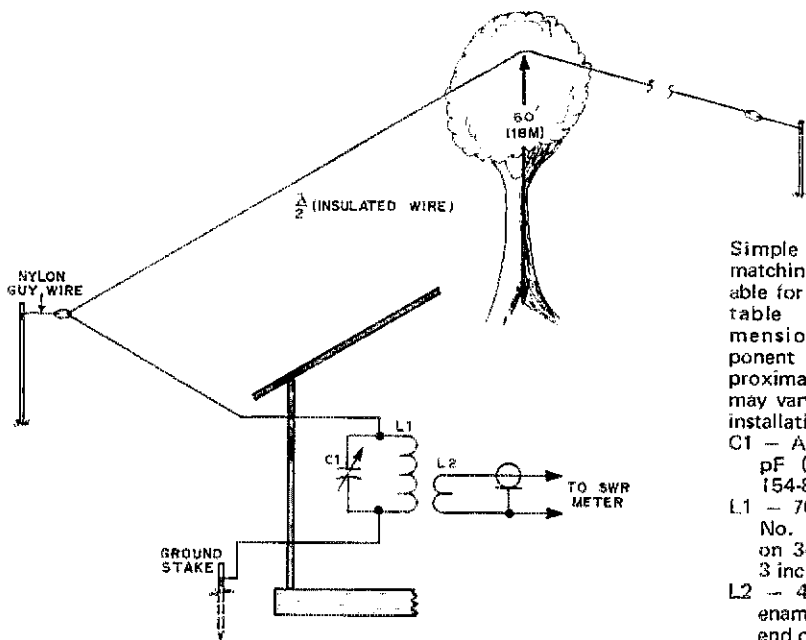
## SOME ANTENNA IDEAS FOR 1.8-MHz PORTABLE OPERATION

Antennas for portable operation should be simple to erect and easy to adjust. The hi bands present few problems, but 160 and perhaps 80 meters require a bit more thought. A cottage was available to the writer, where the local operating competition was minimal, so this location was used during the last few ARRI, 160-Meter Contests. Since frequent ice storms in the area made permanent antennas unadvisable, a Field Day approach to the problem evolved. Some of the more successful ideas may be of interest to amateurs in similar situations.

While a number of antennas were considered, the end-fed half-wave wire antenna had a number of desirable features. It can be bent into a variety of shapes and doesn't require a low-loss ground connection at the feed point. A single ground stake should suffice since a current node exists at the ends of a half-wave radiator. Other types of ground loss exist (unless an extensive radial system is used) but resistive losses at the feed point are minimized. Most of the useful radiation results from those parts of the antenna where the current distribution is the highest. In the half-wave case, this occurs in the middle third, which should be the highest part

of the antenna. An inverted-V arrangement can be used, but if it is symmetrical about the center, be sure the apex angle is greater than 90 degrees. The outer thirds can then be run off in some convenient direction and folded back if necessary. In fact, one of them can act as a lead-in to the matching network. A half wavelength on 160 meters may seem like a lot of wire to get up in the air but remember, only the middle third (approximately 90 feet) has to be strung between the highest support points.

Before the contest, the writer spotted an assortment of plastic-coated hookup wire at the local outlet of Allied Radio Shack. There were five rolls of various gauges with 100 feet on each roll. The price (less than \$4) was attractive. A roll of the heavier-gauge wire was used for the middle of the antenna where the current distribution is the highest, with the lighter-gauge wire spliced on each side. A line attached to an arrow was shot over some trees and then the wire was pulled through. The plastic coating on the wire eliminated the need for insulators. While existing structures can be used to support most of the antenna, one portable support is usually needed for the most convenient layout. Surplus MS-44 mast sections are handy for this purpose since they are practically self-supporting up to 25 feet.



Simple antenna and matching network suitable for 160-meter portable operation. Dimensions and component values are approximate only, and may vary with different installations.

C1 - Air variable, 150 pF (E. F. Johnson 154-8).

L1 - 70  $\mu$ H, 28 turns No. 18 enam. wire on 3-3/4-inch form, 3 inches long.

L2 - 4 turns No. 18 enam. wire on cold end of L1.

The matching network shown in the drawing can be constructed easily from junk-box parts. With a receiver and the antenna connected, C1 is peaked up for maximum signal strength. Only slight adjustment with the transmitter on should be necessary to get the SWR to a minimum.

Although the height of the antenna might be considered low, the performance of this one was very satisfactory. Signal reports were superior to those with previous antennas used. But perhaps best of all, the entire system can be dismantled in a few minutes and the wire rolled up on a short piece of board for next time. — *WJ YNC*

### A BACKYARD 160-METER VERTICAL

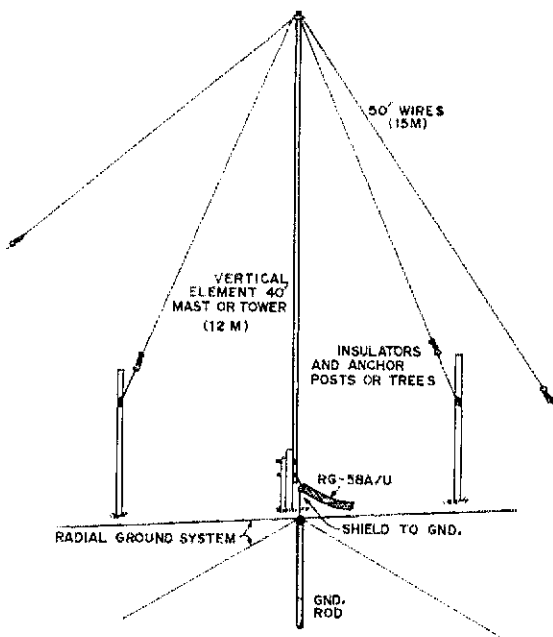
The 160-meter band was the favorite one at my QTH this winter. The same could be said for many other amateurs and the simple antenna described here may be of interest.

Some of the old timers will tell the newcomer to 160 meters that the best antenna for local and DX work is the vertical. Since a full-size vertical would be very large, the question is finding a type that will fit into a closely packed residential area.

As a starter, I took an old 40-foot (12.2 meter) telescoping mast and insulated it from the ground. (This can be done by setting it on top of a large soft-drink bottle, or clamping it to a wooden post.) The antenna was fed at the base with RG-58A/U 52-ohm coaxial cable. The shield was wired to a radial system and a ground rod. A hint for the radials — buy some aluminum clothesline and cut a number of slits in your yard with a flat spade. Next, push the wire into the slits and tamp the grass back together. If there are any swampy parts of the yard, these seem to make the best ground areas.

Rather than using a loading network at the base of the antenna, I constructed a capacitive hat to load it at the top instead. The top hat was made from four fifty-foot (15.2-meter) pieces of wire strung out from the top of the mast in guy-wire fashion. They are connected electrically to the top, and stretched until they are as close to a 90-degree angle with respect to the mast as is possible.

The system described works well with a 40-foot mast but other lengths could be used instead. However, the top hat may have to be adjusted in order to bring the system to resonance. While my vertical occupies very little space, it seems to perform as well as do many "full-size" antennas on 160 meters. — *Mike Mussler, WBSJA*



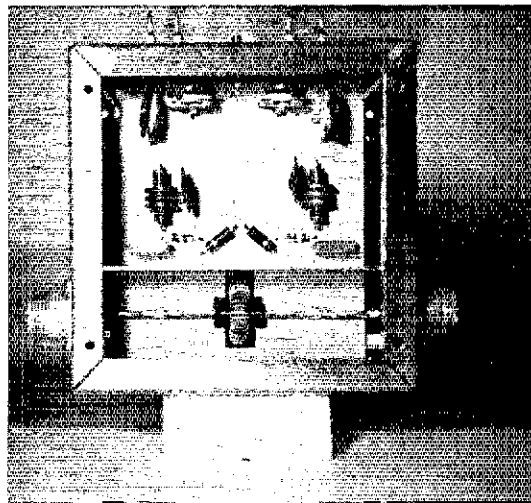
A space saving vertical for 160 meters. While not always possible, it is desirable to have the wires for the top hat run off at right angles to the mast.

considering. This should be helpful to others who plan to build one. You will note that the RG-8/U which supports the toroid coil, L1, is cut to run from J1 to J2 and this in turn supports the printed circuit board by virtue of soldered contacts to C1 and C2 lugs. An aluminum L bracket is no longer required. Two solder lugs are mounted under the retaining screws of each coax connector and the two free ends are soldered to the ground foil which does establish a good ground. I do have some doubts that copper foil can carry heavy currents such as may be encountered at 2 kW and a high SWR. This construction eliminates any doubts that may exist. Instead of the flashing copper shield I used aluminum to get away from possible electrolysis effects. — *T. C. Galbreath, W2AXX*

### IN-LINE POWER-METER MODIFICATIONS

I built the in-line rf power meter described in the December, 1969, issue of *QST*. It does everything claimed for it and I have liked it so well that I have recommended it to others. To me, it is more useful as a tuning indicator than as a power meter and for this purpose I have made a slight modification to take care of this need. This means the addition of an external potentiometer to control the sensitivity of the indicating meter.

The photo of the bridge shows a modification in the construction which I believe is worth



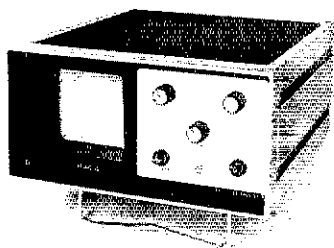


# Recent Equipment



To acquaint you with the technical features of current amateur gear.

## Venus Slo-Scan TV Monitor



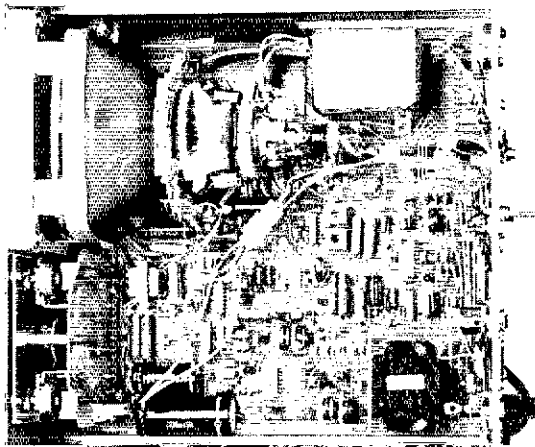
**B**Y NOW almost everybody has had a chance to listen to that strange chirpy sound called slow-scan television, heard down in the lower portion of the phone bands. If you aren't yet on SSTV yourself, you probably at least know what it is. For those who haven't heard, slow-scan television is a means of sending pictures over an audio channel (such as a telephone line or ssb transmitter). Amateur SSTV standards call for 128 horizontal lines (nominal) in each frame, being swept out at a rate of 15 lines per second. With 128 lines, about 8.5 seconds per frame are thus required. The picture is displayed on a cathode-ray tube just like fast-scan TV, except that since each frame lasts over 8 seconds, the CRT must have a special long-persistence phosphor so that the whole picture is visible at the same time. Commercial TV is amplitude modulated in the U.S. and Canada, but amateur SSTV is an fm type of signal. The higher the audio frequency, the whiter the signal: 2300 Hz corresponds to white, 1500 Hz to black, and frequencies in between to the various shades of gray. The horizontal and vertical sync pulses,

signaling the end of a horizontal line and vertical sweep respectively, are 1200-Hz tones. This is "blacker than black," so the CRT electron beam is automatically blanked during retrace.

The Venus slow-scan system is advertised as being of "second generation," and hence the model designation, SS2, implying ultramodern design and features. The unit is all solid state except for the cathode-ray tube, and modern components are used throughout. A digital type of discriminator is used, and single integrated circuits regulate the  $\pm 15$ -volt power supplies. The attractive black-accented cabinet measures a compact  $10\text{-}3/4 \times 5\text{-}1/2 \times 13$  inches. We found the  $3\text{-}1/2 \times 3\text{-}1/8$ -inch screen just about right for viewing from a comfortable distance.

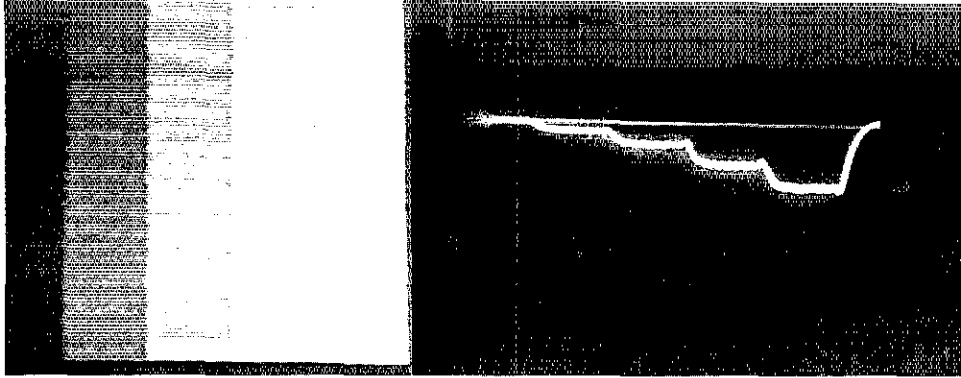
The monitor has some nice operational touches also. One of the most convenient is a function called "accu-sync." This feature enables accurate receiver tuning of the SSTV signal and is a useful diagnostic aid when servicing the device. In this mode, the horizontal sweep works normally, but the vertical sweep and intensity modulation are disconnected. In place of the picture the discriminator output is displayed with a linear horizontal sweep, synchronized to the scan-line frequency. You can actually see the video signal with the horizontal sync pulse appearing as a blip on the right hand side of the screen. You simply tune for maximum blip amplitude. See Fig. 1.

Other especially useful features include "instant on" for the CRT heater and a RE-SCAN switch for manually resetting the vertical sweep. Either receiver, tape recorder, or camera video inputs can be switch-selected from the front panel. Whichever input has been selected for display is available at the jacks on the rear of the chassis for tape recording and/or transmitter mic input. A "VOICE/VIDEO" switch is provided for interjecting comments into your homemade TV shows. The SS2 also has a built-in isolation transformer to provide for connection to telephone lines. The CRT bezel accepts either the optional viewing hood (for brightly lit rooms) or the adapter for connecting a polaroid camera for instant confirmation of that rare one. (No good for DXCC, though!) You can personalize your unit by attaching your call-letter identification plate (made up from materials provided by the manufacturer) to the front panel.



An inside view of the SS2 monitor with the top cover removed. One large etched circuit board contains most of the small components, and also acts as a "mother" board for a second circuit board which is associated with the front-panel controls. Extensive use of integrated circuits is made throughout the instrument.





At the left, a gray-scale pattern as it appears on the CRT screen of the SS2. Audio tones being fed to the monitor for this exposure were 1500 Hz (black), 1700, 1900, 2100, and 2300 Hz (white). At the right is shown the "accu-sync" presentation of the SS2 for the same picture-signal input. The leading edge of the horizontal sync pulse may be seen at the right, and the five dc levels of the gray-scale pattern appear as steps in the display, black being more positive than white. During reception, the "accu-sync" feature simplifies the correct tuning of an SSTV signal; one need only tune the receiver for maximum amplitude of the horizontal sync pulse. (*Gray-scale test pattern courtesy of W4TB*)

### Circuit Operation

Audio tones from the receiver are fed to the monitor input. A limiter first removes any amplitude-modulated noise before it is applied to the sync and fm detectors. (This gives the same signal-to-noise advantage as voice fm.) The sync detector actually consists of two active filters tuned to the 1200-Hz sync frequency and followed by the detector proper. The vertical-sync separator integrates the sync pulse for about 20 milliseconds to separate the long (30 ms) vertical sync pulses from the shorter horizontal sync pulses (5 ms). The vertical sweep generator, as well as the horizontal, is free-running, which provides a raster whether an input signal is present or not. The sweep-failure detector turns off the brightness if the horizontal sweep fails (which could otherwise cause a burned hole in the CRT phosphor screen if the brightness were left on.) In the ACCU-SYNC mode, output from the video detector is fed directly to the vertical amplifier.

The fm discriminator, or frequency-to-voltage converter as Venus calls it, uses a ramp (sawtooth) generator synchronized to pulses generated by the incoming fm video signal. The higher the video frequency the more often the ramp is discharged. The more quickly the ramp is discharged, the lower the peak voltage it attains. This peak voltage is detected by a sample-and-hold circuit whose output voltage is thus inversely proportional to input frequency. The output is an a-m video signal which is amplified and applied to the CRT control grid. In the ACCU-SYNC mode, no intensity modulation is used, so the grid is grounded.

### Installation and Operation

At least three hookup cables equipped with either 1/4-inch-phone or RCA type phono plugs are required to connect the monitor to the receiver output (speaker coil or high-impedance output),

transmitter mic jack, camera or tape recorder, and microphone. A tape output and a three-conductor phone jack for telephone connection are also provided on the monitor. Because of the limiter at its input, the monitor will accept a wide range of input signal levels. Plus and minus 15 volts regulated is available at a Jones plug on the rear for operating a camera or other accessory. Once the patch cables are made, it is an easy matter to connect the set and begin monitoring.

The only problem encountered in operating the SS2 was oversensitivity in the vertical sync circuit. Strong interference, especially low-frequency pulse-type noise, would cause the vertical sweep to reset prematurely.

Operation of the SS2 is simple. Turn the function switch to receive; the instant-on feature eliminates the wait for the CRT heater to warm up. Switch the ACCU-SYNC on and tune in the SSTV signal for maximum height of the horizontal sync pulse on the right-hand edge of the screen. Return the switch to the OPERATE mode and adjust the brightness and contrast for a pleasing picture. To transmit, switch to tape or camera input and press your mic button. To talk, move the VIDEO/VOICE switch to voice. That's all there is to it! "See" you on 3845! - W4JJSU/1

### Venus SS2 Slo-Scan Monitor

Dimensions (HWD):

5-1/2 x 10-3/4 x 13 inches.

Weight: 12-3/4 pounds.

Power requirements: 115/230 V ac (factory prewired), 50-60 Hz, 20 watts.

Price class: \$350.

Optional accessories: Camera adapter P-1, for mounting of Polaroid Color Pack or Square Shooter cameras to monitor bezel; Slo-Scan Camera C-1.

Manufacturer: Venus Scientific, Inc., 399 Smith St., Farmingdale, NY 11735.



Left to right, Howard Lester, W2ODC, Chairman of the ARRL Repeater Advisory Committee (VRAC), Roy Albright, West Gulf Division Director and Board Liaison for VRAC, and Lew McCoy, W1ICP Hq. Liaison. At the January Board meeting, these gentlemen got together to correlate the VRAC information and to prepare filings on repeater regulations.

## FM REPEATER NEWS



### FCC Form 714

FCC has asked us to pass along the following information when filing Form 714. There has been some confusion concerning filings for repeaters or remotely-controlled stations when a Form 714 is required. When you fill out Form 610 and check "yes" for item 10 (or item 11 on Form 610B), then all of the items shown below must be provided on Form 714 and Part III, Section 1, must be completed.

1) If the repeater antenna is to be mounted on an existing a-m, TV or fm tower, be sure to include the call sign of the station (the a-m, TV or fm station).

2) If the tower to be used for the repeater antenna is being used by any other communications service and already has FAA approval, be sure to give the name of the owner (individual or corporation), and call signs of at least one of the licensees. Also include the FAA file number for that station license.

3) Be sure to give the geographical coordinates to the second on Form 714.

4) On Form 714 under "E" be sure to include the overall height of the tower, the ground height above sea level, and the sum of the two which is the overall height above mean sea level.

If the antenna is to be installed on a building and the combined height exceeds 200 feet, you may or may not have to file a Form 714. Let's talk about the "may not" first. When your antenna *does not* extend 20 feet above the highest part of the building or of any other antenna system on the building, you do not need to file. Additionally, if there is any building or structure within a 500-foot radius of your antenna that is higher, then you do not need to file.

If you cannot meet these conditions, you must file Form 714 for the building installation. Be sure to include the postal address of the building plus the exact geographical coordinates. Also, include a block diagram type sketch of the building and antenna installation so the antenna survey branch of FCC can visualize what the installation looks like.

### Operating from National Forests

If your repeater is to be operated from a location that is under National Forest management

or under the Bureau of Land Management, there are certain steps that must be followed:

1) You must apply to the local agency with a request for site approval. The agency will then send you the proper application forms.

2) If the site already has radio users you still have to apply for the forms and in addition, must fill out "Technical Data - Electronic Type Land Use" form. This form is available from the same agency.

3) The agency will notify FCC and the applicant that the site use is approved or disapproved.

4) If No. 2 above applies, the agency will notify the other users of the site, that the amateur has applied for use of specific frequencies at that site. These other users then have 30 days to notify the agency if they should have objections. The FCC will analyze the situation and make whatever engineering judgement is required and notify the agency of their decision. After the FCC receives OK's from all the agencies, FCC will complete the processing of the amateur application and issue the license. The amateur then notifies the land agency that his license has been granted. The land agency will issue a "Final Site Permit" and then, *and only then*, can the amateur commence operation.

### Cross-Band Filing

At press time, we would like to pass the word along that ARRL has filed a petition with FCC asking for the deletion of cross-banding restrictions in repeater hands. Hopefully we will see quick action on this petition.

### Easing Control Requirements

Since the inception of 18803, repeater owners have been particularly concerned in being able to meet the control and monitoring requirements set down by FCC. FCC has stated that they are looking for "automatic" methods for taking care of control and monitoring. To that end, they have issued a few special temporary authorizations "STA's" for experimental repeaters. These repeaters are using what is called "semiautomatic" control. Briefly, this is a closed system, open only to club members or to hams who are appointed control operators by the licensee. The ARRL repeater advisory committee (VRAC) has accepted this concept only to the degree that it is an *option* to repeater operators.

The more popular type of repeater would be the "automatic" control method, and VRAC and your reporter have discussed this concept with the amateur division of FCC. In the automatic mode, the trustee or licensee assumes full responsibility for the communications that are carried over the repeater. In the simplest language, the licensee says to the FCC, "I trust the amateurs who use my repeater. They will not violate the FCC rules for forbidden communications, and so forth." In the

(Continued on page 57)

## A-M Telephony

**T**HE INCREASED efficiency of ssb and its reduced demands on valuable spectrum space has now nearly caused the complete disappearance of a-m in the amateur bands, despite the a-m advantages of simpler transmitting apparatus and ease of tuning for reception. Still, it would not be in the nature of scientists, experimenters, and inventors to leave well enough alone. Would it not be possible to devise a radiotelephony modulation system which would have the advantage of both ssb and a-m -- plus, hopefully, some advantages of its own over both?

A few years ago it was suggested by one author that we could communicate by suppressing the sidebands and turning the carrier on and off.<sup>1</sup> This is an excellent example of what Larson E. Rapp, a former contributor to *QST*, referred to as "holes in our thinking." The a-m boys laughed at ssb; let the ssb boys now laugh at ssa-m!

For in looking through many volumes on the subject of modulation, one remarkable fact struck us: the amplitude of the modulated carrier was never modulated in amplitude modulation! To verify this, one needs only to listen to any a-m signal with the BFO on in the receiver. The carrier just sits there and carries. Only it doesn't really even "carry" anything either. It just sits there. That's why we got rid of it with ssb. The carrier is merely the rf source with which we mix audio to get sidebands. Then, in an ssb system we throw out the carrier and one of the two sidebands.

Is this not doing things a bit the hard way? To rely on sidebands for our audio transmission is to rely on precisely that component of an a-m signal which occupies valuable spectrum space. The poor carrier, which occupies no spectrum space whatsoever, we have painstakingly thrown out the window!

So let's go back a step: Since we didn't really modulate the carrier with a-m, why *don't* we modulate the carrier, and dispense with the spectrum-wasting sidebands altogether? To understand just how it was that the carrier remained unmodulated in traditional a-m systems, we should examine the standard method of attaching a modulator to a transmitter.

<sup>1</sup> Pickering, "NSB," *QST*, April, 1958.

BY N. G. ATTAWAY,\* VOIDER

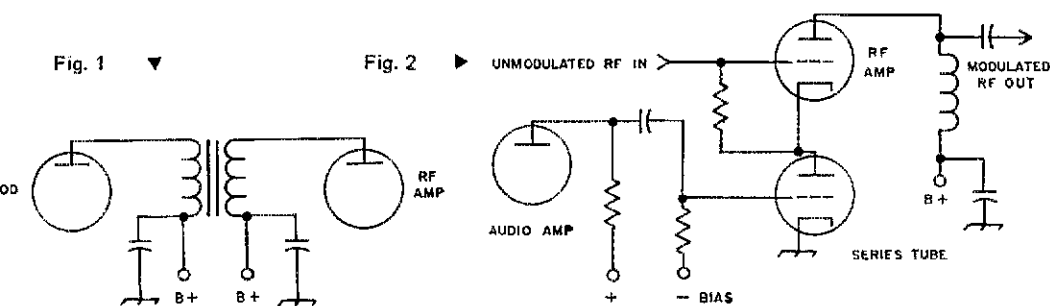
Fig. 1 shows a typical system. In nearly all modulation systems the audio transformer is an indispensable part of the circuit. It is important, therefore, that we understand the function of the audio transformer in an a-m transmitter. Now a transformer, as we all know, consists of two mutually-coupled inductances. When we look into the nature of inductance we find that "The polarity of an induced emf is always such as to oppose any change of current in the circuit."<sup>2</sup> So it is evident then, that if the current is not changing in the first place, an inductance will have no effect whatsoever on a circuit. And this is indeed the case, since the audio transformer is connected to the plate supply of an rf amplifier, the current of which remains constant. Likewise, in grid modulation systems the audio transformer is connected to the rf amplifier through portions of the circuit which do not vary in current. From this it can be seen that the audio transformer cannot possibly have a direct effect of modulating the carrier of a transmitted signal. It can only have a "coupling" effect, and in particular it couples the frequency-consuming sidebands adjacent to the unmodulated carrier.

To modulate the carrier and avoid introducing the sidebands requires a different approach altogether. In order to approach the efficiency of ssb, we want to have a no-signal condition when no modulation is present; and to have maximum rf with maximum audio input. The solution, fortunately, is very simple. We need merely to insert a tube in series with the dc plate input of the rf amplifier, and to attach the audio output from the modulator to the grid of the series-tube.

The series-tube ssa-m modulator is nearly as simple in design as an old-fashioned a-m modu-

\* P.O. Box 87, Green Island, Newfoundland, Canada.

<sup>2</sup> *Radio Amateur's Handbook*, 1973 ed., p. 26.



lator, and certainly far simpler than any ssb system. The only restriction on basic design is that the series-tube must be a sharp-cutoff type biased just to cutoff. One may well ask, of course, what happens to the negative half of the modulating wave. Supposedly we need the carrier so that we can reduce it to nothing with the negative half of the modulating cycle, while we have already reduced it to nothing. Here, the effect of ssa-m is similar to ssb. In ssb you also have no carrier to down-modulate in the negative half of the modulation cycle either, and as we all know this does not result in any distortion in an ssb system.


On examining the ssa-m system, we find that we have indeed obtained the advantages of both a-m and ssb. The ssa-m signal is essentially one whose amplitude is proportional to the instantaneous amplitude of the modulating waveform, so when there is no modulation there is no signal. This explains the efficiency of ssa-m, which is comparable to ssb. Curiously enough, this very property of ssa-m has been mistakenly applied to ssb itself.<sup>3</sup> However this cannot possibly be an accurate description of ssb, since there is usb-ssb and lsb-ssb, and this description allows for no such distinction.

<sup>3</sup> *QST*, Feb. 1956, p. 39.

The signal is received as easily as an a-m signal. The only difference is that you do not tune to a sideband, since no sideband is there. Instead, you tune to the exact frequency of the modulated carrier. It is in tuning an ssa-m signal that we are delighted to discover the superiority of this system over both a-m and ssb: the signal has no bandwidth! The bandwidth of a-m and ssb is caused by the sidebands; since in ssa-m we have only a modulated carrier we have a signal which, as in cw, has no actual bandwidth. The bandwidth is only a function of the selectivity of the receiver.

Since ssa-m makes such more efficient use of spectrum space than ssb, surely it is as imperative that ssa-m replace ssb as it was for ssb to replace a-m. The transition, however, will be far less painful. Since ssa-m has no bandwidth it need not cause QRM to other stations.

In fact, in all our transmissions to date, we have received no reports of having caused interference to anyone!

The manufacturers may resist ssa-m, since the simplified circuitry will reduce costs, and will therefore tend to reduce prices and profits as well. However, it is a fertile field for homebrewers, and as amateurs lead the way into ssa-m the manufacturers are sure to follow. BCNU on ssa-m! 

## ● Technical Topics

### Some Data On Toroid Cores

A number of circuits in *QST* and other ARRL publications call for toroidal inductors and transformers of various sizes and types. Not all readers wish to purchase the brand of toroid which we most often specify (Amidon Associates). We have been receiving letters requesting specific data about the toroids we list - permeability, frequency characteristics, core size, and such. Knowledge of

the pertinent facts about Amidon cores should enable the equipment builder to substitute other brands of toroid cores, so we are herewith publishing a chart which spells out the characteristics of interest.

The core identification system used by Amidon indicates the core size and "mix" (recipe for the powdered iron used in a particular batch). For example, a T-68-2 core is one that has an outer diameter of 0.68 inch and is made from a No. 2 iron mix. The chart shows the  $\mu$  factor for each mix, and provides a recommended useful frequency range for each type.

The ferrite beads used in *QST* projects are sold by the company whose cores we have been specifying. The material No. is 43. Initial permeability of the beads is 950, saturation flux density is 2750 gauss at 13 oersted. Maximum permeability is rated at 3000. Loss factor at 2 MHz is  $2.5 \times 10^{-5}$ . These No. 43-101 miniature beads will slip over No. 18 or smaller wire. The larger beads (No. 43-801) will slip over No. 14 wire.

Additional information concerning the beads and toroid cores can be obtained from a brochure which is available from Amidon Associates, 12033 Otsego St., N. Hollywood, CA 91607. - WICER

CORE SIZE	Outer Diameter (inches)	Inner Diameter (inches)	Height (inches)
T-200	2.000	1.250	0.550
T-130	1.300	0.780	0.437
T-106	1.060	0.560	0.437
T-94	0.942	0.560	0.312
T-80	0.795	0.495	0.250
T-68	0.690	0.370	0.191
T-50	0.500	0.303	0.190
T-37	0.370	0.205	0.128
T-25	0.255	0.120	.096
T-12	0.125	.062	.050

-41 Mix Green 'HR' 20 kHz - 50 kHz $\mu = 75$	-3 Mix Gray 'HP' 50 kHz - 500 kHz $\mu = 30$	-2 Mix Red 'E' 500 kHz - 10 MHz $\mu = 10$
-6 Mix Yellow 'SF' 10 MHz - 30 MHz $\mu = 8$	-10 Mix Black 'W' 30 MHz - 60 MHz $\mu = 6$	-12 Mix Grn-Wh '1RN-8' 60 MHz - 200 MHz $\mu = 3.5$

# ● Technical Topics

## Hot-Carrier-Diode Balanced Mixers In UHF Front Ends

The diode mixer has always looked like the logical approach in uhf converters. Until the advent of low-noise transistors, it was practically the only device usable for frequencies above our 420-MHz band, and it was popular for that band as well. Most mixers so used in amateur work were of the single-ended variety. Balanced mixers looked good on paper, but the difficulty of securing matched sets, and the fragility of the better diode types, tended to prevent this type of mixer from being widely used.

The modern hot-carrier diode can provide a solution to these problems. It is physically and electronically rugged. Production runs are substantially uniform, eliminating the need for tedious selection of matched types. They have excellent noise characteristics well into the microwave range. Injection levels required are low. Cancellation of unwanted frequencies is good. The list of desirable qualities goes on and on, so it is not surprising that amateurs interested in better receiver performance on frequencies above 144 MHz are trying hot-carrier diodes in balanced mixers.

So far, three articles describing converters using this type of mixer have been submitted for publication in *QST*. When will they be running, did you say? Never, unfortunately. None of them worked well enough to threaten older methods. What was wrong?

The first of these converters was a 144-MHz model. It was a nice-looking job and it would have made an attractive *QST* article — but its sensitivity was so poor that no knowledgeable vhf operator would have given it bench space, if he tried it in comparison with any reasonably good converter made in the last 20 years. Its builder assumed that the HCD mixer would be so good that no rf or i-f amplifier could be needed with it. Actually one or the other (and in some instances both) must be included, if the diode mixer is to be worth its salt — whether the devices used are the latest hot-carrier diodes or WW II surplus 1N21s!

The second converter was for 432 MHz. Its HCD mixer was very nicely made, and there were two good-looking rf amplifier stages ahead of it. But a bench test showed that it just about broke even with an old vacuum-tube trial-horse converter we've used for years for just such evaluations. So a quick check was made on the mixer and injection system, minus the rf amplifiers. The threshold sensitivity turned out to be about 7 microvolts! In this case the injection system was at fault. Even though the injection requirement of the HCD balanced mixer is low, this converter's oscillator and multiplier were not coming close to making it. With the rf stages working fairly well, the overall noise figure was up around 7 or 8 dB.

A third converter was built for the 220-MHz band. Like the others, it was well-made, but it was too simple to do what any good 220-MHz enthusiast expects his receiving gear to do. Suspecting low injection to be a cause for the inadequate

weak-signal sensitivity that showed up on the first test, we used a signal generator in place of the builder's injection system. Result: the sensitivity improved by at least three dB, but it was still going up when our signal generator was cranked up to full output. There was another change with the signal generator in use for injection. The converter noise output *dropped*, while the signal level improved perceptibly. This oscillator/multiplier chain was full of unwanted harmonics of the crystal frequency, and they were adding to the mixer noise. They also caused the converter tuning range to be full of spurious responses to signals outside the desired frequency range. One more converter rejected!

### What To Do?

This is not to say that a hot-carrier diode mixer isn't a good bet. What we are saying is that certain principles must be followed before any passive mixer will show promise in weak-signal reception.

1) The injection must be of adequate level. This is easily determined, without complex equipment. After the mixer is peaked for maximum response to a test signal, reduce the multiplier output. If the signal-to-noise ratio (not the output signal level) drops, you haven't got enough injection. The desirable level is that at which some reduction in level can be tolerated without losing s/n ratio simultaneously.

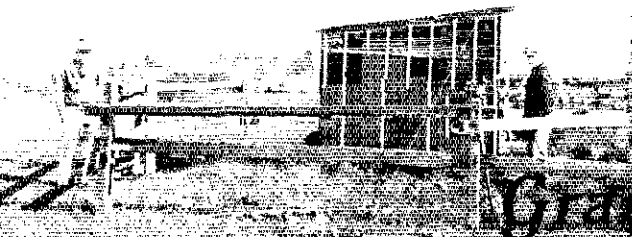
2) The injection should be as near to pure as possible. A high-*Q* trough-line system with aperture coupling, as in the 1296-MHz converter that has been a fixture of many ARRL publications, is a good bet with any uhf mixer system. We'll have some new examples of this in *QST* before long.

3) Especially if no rf amplifier is used ahead of the mixer, the stage following it should have the lowest possible noise figure. Don't work any diode mixer directly into a communications receiver. The latter is certain to have a fairly high noise figure, as other factors are much more important than noise figure in good hf reception.

4) Even if one good rf amplifier is used, the i-f amplifier should have a low noise figure. When it is so easy to get hf noise figures of around 1 dB, there is little reason to have much higher than that, handicapping your mixer and rf stage.

5) Don't skimp on transistor quality in the rf amplifier. If you've got a good hot-carrier-diode mixer, a pure and adequate injection system, and a low-noise i-f amplifier stage following the mixer, one rf amplifier should be enough at 432 or even 1296 MHz. The noise figure from the mixer on, can be as low as 8 dB; perhaps better, with a really good system. Thus, the rf-amplifier gain need only be enough to override this much noise. If there is any doubt on this score, use two stages. Put the best transistor in the first stage. The second is by no means so demanding, and if you're going to save some transistor expense, here is where to do it.

New and better uhf transistors are coming along all the time. They're now available for up through our 2300-MHz band, capable of delivering overall receiving-system noise figures under 5 dB. Down to about 3 dB is fairly easy in the 1215-MHz band. Better than this is almost routine at 420. The solid-state revolution has made our uhf bands come alive, as has no other single factor. If you haven't tried "the world above 420 MHz" lately, you're in for the surprise of your life. But don't go looking for it with just any old mixer — or even just any new one, that is not well-engineered. Just an eye-catching new name is not enough! — *W1HDQ*



# A Gleam In Your Grandfathers' Eyes

"Chief Engineer" Phil Scofield, u6JK, and "Chief Op" Brandon Wentworth, u6OI. The station was in a pasture on Stanford University hills — cows all over the place, and walking was hazardous for a dark-night sked. The antenna was a vertical 1/4-wave cage (40 meters), matching counterpoise. Today in the same cow pasture are a 150-foot parabola, other smaller dishes, and several half-mile-long arrays of log periodic Yagis — so Brandy chose his location well.

BY HANK BROWN,\* W6HB

**I**N QST for March, 1972, G3IDG pointed out that WAC was the oldest continuing DX operating award in amateur radio. The number of certificates, still being issued, makes it the most popular.

WAC had its beginnings at a meeting of the Santa Clara County Amateur Radio Association in San Jose, California. It was in late 1925, at a time when 40-meter activity was spreading world-wide, and 20 was in its beginnings. The land-mark first transatlantic QSO between 1MO and 1XAM with 8AB in France had taken place just two years earlier.

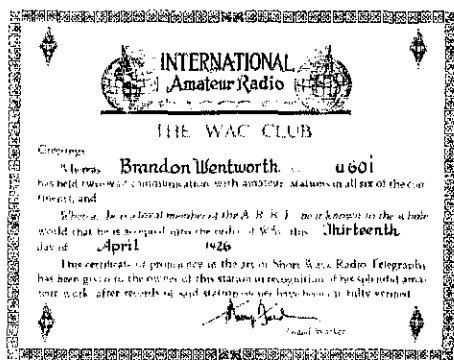
The club meeting sounded like one of those described in a W9BRD foreword to "How's DX?," as we moaned and complained about how the emerging hams in all the "new" countries seemed to come back first to the same old stations. We kept getting beaten out. u1AAQ, u6OL, u9ZT, c4GT, u6AWT, etc.,<sup>1</sup> all seemed able to move in at will ahead of us also-rans. There was competition and it was keen. Anyway, the club meeting managed to adjourn to the local beanery and, while walking there, u6HM tried on for size the idea of a "worked all continents" award. His thought was

<sup>1</sup>"u" to indicate U.S. nationality, "c" for Canada, self-assigned identifications in the early DX days.

\* P.O. Box 637, Menlo Park, CA 94025.



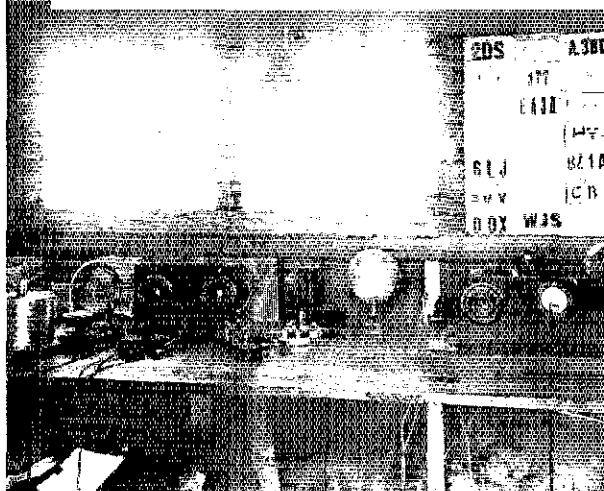
The cards that started it all were submitted by u6OI, earning Brandy No. 1, the first of many sought after DX awards. The cards of both g2LZ and f8YOR were included as in some circles at that time there was a question about Great Britain being part of Europe! Since the time these cards arrived at Headquarters in 1926, it is impossible to estimate the number of cards handled by the League and other IARU member societies in behalf of WAC applicants. Cards sent to and returned by ARRL for DXCC alone no doubt number between four and five million. The numbers become more staggering when one includes cards handled here and elsewhere for other awards such as WAS, WBC, WAZ, WAE, county and certificate hunters, etc.



WAC certificate No. 1, awarded Brandon Wentworth, u6OI. Since 1971, "Brandy" is now Extra Class and active as K6UJ. The 44-year shutdown, he says, was to make up for the sleep lost at u6OI!

that a proven ability to work DX was a good criterion of excellence in operating skill and station equipment. He even suggested the requirement that an applicant submit confirming QSL cards as proof of qualification. It was a great idea! So Clair Foster, u6HM, wrote headquarters, proposing WAC as an international award. Secretary K. B. Warner replied, and WAC came into being.

WAC was first announced in the "IARU News" section of QST for April, 1926; the June issue carried a photo of WAC certificate No. 1 issued to



u6OI — (left to right). Wavemeter, calibrated from WWV. Receiver, two-tube circuit by ARRL's Fred Schnell. Transmitter, 203A tptg oscillator, 200 W input, r.a.c.

u6OI. Subsequent listings appeared in QST, and the number of amateurs qualifying quickly grew. It wasn't long before the list of members exceeded the space available. During its first years WAC was an ARRL award, but in 1930 the IARU formally assumed responsibility for the issuance of WAC certificates.

So, kiddies, that's how it all began. Away back before some of you, too, were gleams in, even, your grandfathers' eyes.

QST

### ARRL QSL Bureau

The function of the ARRL QSL Bureau is to facilitate delivery to amateurs in the United States, its possessions and Canada, of those QSL cards which arrive from amateur stations in other parts of the world. All you have to do is send your QSL manager (see list below) a stamped, self-addressed envelope, about 5 by 8 inches in size, with your name and address in the usual place on the front of the envelope and your call printed in capital letters in the upper left-hand corner.

Cards for stations in the United States and Canada should be sent to the proper call area bureau listed below. Recent changes are in bold face.

- W1. K1, WA1, WN1 — Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.
- W2. K2, WA2, WB2, WN2<sup>1</sup> — North Jersey DX Assn., P.O. Box 505, Ridgewood, NJ 07451.
- W3. K3, WA3, WN3<sup>1</sup> — Jesse Heberman, W3KI, RD 1, Box 66, Valley Hill Rd., Malvern, PA 19355.
- W4. K4 — North Alabama DX Club, P.O. Box 2035, Huntsville, AL 35804.
- WA4, WB4, WN4 — J. R. Baker, W4LR, P.O. Box 1989, Melbourne, FL 32901.
- W5. K5, WA5, WB5, WN5<sup>1</sup> — ARRL W5 QSL Bureau, Box 1690, Sherman, TX 75090.
- W6. K6, WA6, WB6, WN6 — No. California DX Club, Box 11, Los Altos, CA 94022.
- W7. K7, WA7, WN7 — Willamette Valley DX Club, Inc., P.O. Box 555, Portland, OR 97207.
- W8. K8, WA8, WB8, WN8 — Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, OH 43215.
- W9. K9, WA9, WB9, WN9 — Northern Illinois DX Assn., Box 519, Falmhurst, IL 60126.
- W0 — Reggie Hoare, W0QSP, P.O. Box 115, Mitchellville, IA 50169.
- K0, WA0, WB0, WN0 — Dr. Phillip D. Rowley, K0ZPI, 5209 Road 5.3 South Alamosa, CO 81101.
- KP4, WP4<sup>1</sup> — Alicia Rodriguez, KP4CL, P.O. Box 1061, San Juan, PR 00902.
- KV4 — Graciano Belardo, KV4CF, P.O. Box 572, Christiansted, St. Croix, VI 00820.

- KZ5 — Lee DuPre, KZ5OD, Box 407, Balboa, CZ, KH6, WH6<sup>1</sup> — John H. Opa, KH6DQ, P.O. Box 101, Aiea, Oahu, HI 96701.
- KU7, WI7 — Alaska QSL Bureau, Star Route, Box 65, Wasilla, AK 99687.
- VE1 — L. J. Fader, VE1EO, P.O. Box 663, Halifax, NS.
- VE2 — A. G. Daemen, VE2II, 2960 Douglas Avenue, Montreal, Quebec, H3R 2F3.
- VE3 — R. H. Buckley, VE3UW, 20 Almont Road, Downsview, ON.
- VF4 — D. F. McVittie, VF4OX, 647 Academy Road, Winnipeg MB R3N 0E8.
- VE5 — A. Lloyd Jones, VE5JI, 2328 Grand Road, Regina, SK, S4S 5E3.
- VE6 — D. C. Davidson, VE6TK, 3108 Traford Dr. N.W., Calgary 47, AB.
- VE7 — B. R. Hough, VE7HR, 1291 McKenzie Rd., Victoria, BC.
- VF8 — Frank Van Der Zande, VF8OO, P.O. Box 72, Fort Smith, NW1 A9E 0P0.
- VO1 — William Coffin, VO1KN, P.O. Box 6, St. John's NF.
- VO2<sup>1</sup> — Stan L. Parsons, VO2AS, P.O. Box 232, Goose Bay, LR.
- 5W1 — Leroy Waite, 39 Hannum St., Ballston Spa, NY 12020.

<sup>1</sup>These bureaus prefer 4 1/4 by 9 1/2 inch or No. 10 business envelopes.

QSL Bureaus for other U.S. Possessions and for other countries appear in the "IARU NEWS" section of the June and December issues of QST.

### Changes of Address

Please advise us direct of any change of address. As our address labels are prepared in advance, please allow six weeks notice. When notifying, please give old as well as new address and Zip codes. Your promptness will help you, the postal service and us. Thanks.



# Results, 4th ARRL 160-Meter Contest

W7NQ

REPORTED BY RICK NISWANDER,\* WAIPID

**T**HE FOURTH ANNUAL ARRL 160-Meter Contest, held this past December 7-9, recorded a very healthy log increase of over 30% — 338 entries were received, surpassing the previous record of 272 in 1971. Foreign country representation hit a new high of 11 — 3 more than the old mark of 8 in 1972. We list 78 multipliers this time — another record. In fact the only thing that did not set a new mark was entries received from different sections (67) tying the record set in 1971 and eclipsing last year's total of 63.

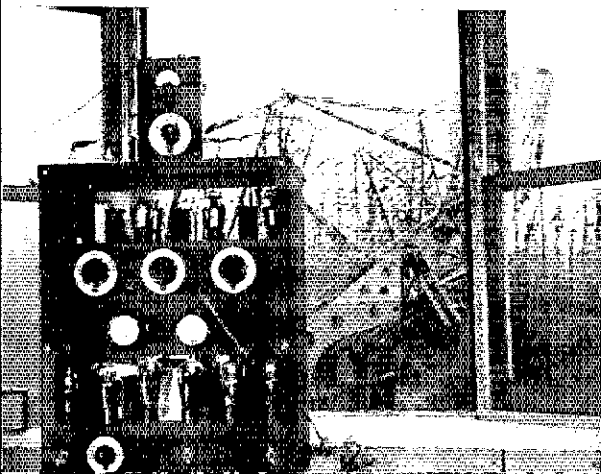
Incorporated in the writeup this year is a listing of the all-time record holders by division. This year single ops chalked up ten new division highs — multiops had 7.

Antennas have always been a point of interest among hams especially when 160 is considered. A quick evaluation of summary sheets from those describing antennas reveals a few interesting num-

\* Asst. Communications Manager, ARRL

bers. Center-fed wire antennas (dipoles, inverted vees, zepps, etc.) were the most popular types, with 127 entries mentioning that they used one. Many of these are 80-meter (and even 40-meter!) dipoles somehow brought to resonance on 160. The next category was verticals with 85 — these varying from 120 foot monsters to 20 foot midgets. End-fed wires accounted for 65 entrants. The inverted L wire configuration was used by 22. Other antennas numbered 11. Two of the more unusual antennas used were a tower guy wire used by KH6IJ, and K5PFL's 100 foot vertical with 204BA top hat (which is just a clever way of saying that he loaded his tower).

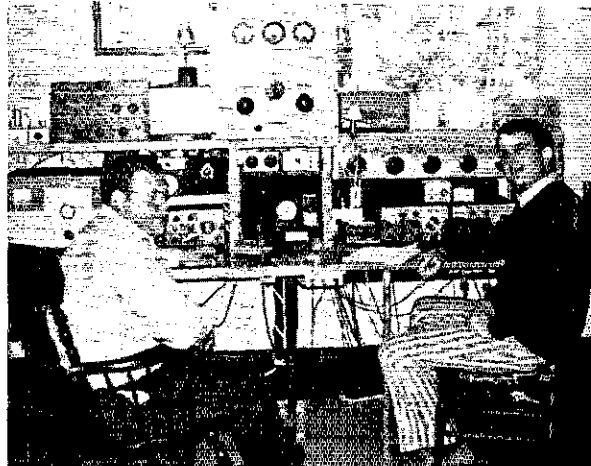
Notable notes . . . Probably the longest haul QSO during the contest was between KL7CL and LUSHF1 at 0910Z on December 9, a path of about 8500 miles. . . . WB4ADT and K4ADT ran into the "QSO B4" routine. Be thankful you're not both in the same state, guys! . . . Hawaii activity was up this year. Four — count 'em, four — logs this time. KH6CHC came up with top honors with a very nice 100 QSO total. . . . W6MUV used a homebrew solid-state transmitter with a 2N3919 final running 12 watts, and a Hallicrafters SX-9



This is the transmitting setup of W1SL. The rig was made by Gross Radio of New York in the mid-1930s. It uses type 46 tubes at about 25 watts input. The antenna? Oh, yes — a 30-foot dish sitting on a German WW II radar mount; it is used for 432 and 1296 EME work. Taking this picture was no small feat. Besides having to get both units in focus, Tom had to take the window out since it was too foggy to get a clear shot of the antenna — all this in the middle of December in Connecticut.



The multiop crew at W88APH. That's APH on the left and K3RUQ at right. They used a 130-foot vertical with over 200 radials, plus 5 beverage receiving antennas and racked up 84K — good enough for number 2 nationwide in the multiop class.



receiver — and took the SJV certificate. . . . K6NY used all homebrew gear and a 40 foot vertical to grab the San Diego award.

Reporting methods will be changed for the next contest. A valid entry will require your log and summary sheet. Check sheets will not be necessary. This change will go into effect for the 1974 contest which is scheduled for December 6-8.

Certificates, are scheduled for an April 15 mailing.

### SOAPBOX

QRM is bad news. Seems like every time I called a 7, somebody called CQ on the frequency. — (W2FHU). I was surprised at what a random wire can do. — (WB4ASW). Fine turnout and the old band jumped with all those stations, including many new ones that I heard or worked for first time. — (W0II). Appreciated the many stations that stayed with me until we completed QSOs through QSB and heavy QRN at this QTH. — (K7ZIA). Even with short call signing "stroke 2" takes so much time. — (K2FJ/2). Didn't pile up much of a score but it was more than I had hoped for from a 12-watt transistor rig. — (W6MUV). I may be the lowest powered station on — 960 milliwatts input. — (W4EZW). Very good contest. Lots of local QRM and competition. CU again next year. — (WA8SIX). Work made it necessary for me to not be at the home QTH for the contest but did QSO with quarter-wave from San Francisco hotel and heard G3ZEM and PA0HIP. — (WIHGT). Seems like some of the loudest stations on the band have the worst ears. I had little luck calling some of the "big guns" while calling some stations barely readable produced instant replies. Vote for best effort goes to DL2GG/YV5, who tried for 5 minutes to get my call through the noise; all in vain. — (WA9AUM/1). I was impressed. Here was a

band with people operating many different modes who, for one weekend a year, could go all cw without anyone getting uptight. The day after the contest everything was back to normal with everyone discussing how they did. The results, from the conversations, appear to be impressive. I'm looking forward to reading the report even if I am somewhere under the pile. — (WA6CCM). Beautiful moonlit nights both nights here, but Murphy was over in the neighboring provinces playing with his thunderbolts. The resultant 40-dB-over-9 QRN was raising havoc with my reception. I sincerely apologize to the many who called who I simply

(Continued on page 57)

### 4th ARRL 160-Meter Contest

Within each section, scores are broken down by callsign, final score, contacts, sections and operating time. Example of listings: VE1CD 33,453-252-59-25 or final score of 33,453, number of contacts 252, number of multipliers 59 and total operating time 25 hours. An asterisk denotes a Hq. staff member, ineligible for an award. The station first-listed under each section or non-W/VE country is the award winner. Multi-operator stations are grouped in order of score following single-operator station listings in each section tabulation.

Single Operator			Division	Multi Operator		
Call	Score	Year		Call	Score	Year
W3IN	78,432	73	Atlantic	WA2WLN/2	95,920	73
WA9MCC/9	76,923	72	Central	W9YB	38,316	72
W0A1H	61,028	71	Dakota	K0IJL	30,180	71
W5SUS	53,868	73	Delta	W5GWD	8,112	73
K4GSU	75,096	73	Great Lakes	W8IJI	69,450	73
W2PV	61,488	73	Hudson	WA2SPL	38,880	72
WA0V DX	44,689	73	Midwest	WA0QJX	2,760	70
K1PBW/1	82,871	73	New England	K1RQE	46,345	73
K7IDX	26,796	73	Northwestern	K7JCA	38,056	73
WA6DKF	31,806	72	Pacific	W6NUT/6	41,820	73
K4CIA	51,191	72	Roanoke	W88APH	84,777	73
WA0CVS	48,960	73	Rocky Mtn.	W0MS	25,144	72
W4YWX	42,746	71	Southeastern	W4HAW	6,876	71
W7NQ	47,668	73	Southwestern	W6YRA	18,048	72
W5SZ	64,528	72	West Gulf	K5DEG	30,031	71
VE3BMV	65,895	73	Canadian	VE1MX	15,540	72

VE		Northern New Jersey		Tennessee		W6GWQ 7956-109-36-7	
<b>Maritime</b>		WA2UOO	58,625-424-67-22	K4PJ	33,824-302-56-	W6NSF	3564- 81-22-12
VE1CD	33,453-252-59-25	W2KHT	14,924-176-41-18	K4ON	7840-112-35-	W6RC1	1597-47-17-15
VE1MX	22,295-202-49-33	WB2URU	10,836-129-42-13	W4UD	7800-100-39-7	CRK1/W6	1482-46-16-12
VO1KE	7095-79-33-	W2HUG	10,404-153-34-10	W6GBY 833- 32-33-7			
<b>Quebec</b>		W2GUB	8560-107-40-12	W6NUT/6 (+W6AUG2)			
VF2GS	5346- 81-33-	W2DEN	7912- 56-26-	41,820-299-68-			
<b>Ontario</b>		WA2TWS	850- 25-17-5	<b>San Diego</b>			
VE3BMV	65,895-467-69-	W2MPP (+W2OG)	1050- 35-15-6	K6NY 10,660-130-41-25			
VE3BBN	7696-104-37-	<b>Southern New Jersey</b>		W6MAR 6156- 81-38-5			
VE3LB	5040- 84-30-11	K3MNT/2	6200-100-31-7	K6SDR 2400- 60-20-5			
VF3RI K	4860-90-27-13	W2PAU	720- 24-15-1	<b>San Joaquin Valley</b>			
VE3AUI	352- 16-11-	W2BP	672- 15-14-6	W6MTU 1170-39-15-9			
<b>Saskatchewan</b>		W7BAY	532- 19-14-2	K6YI Z6 792- 33-12-			
VF5XU	30,656-238-64-21	WA2WLN/2 (+WA2SRQ)	95,920-544-80-40	<b>Sacramento Valley</b>			
<b>British Columbia</b>		<b>Western New York</b>		WA6JVD 18,706-199-47-			
VE7HQ	8514-128-33-	W2EHU	19,552-227-43-14	W6ZGM 16,468-179-46-17			
VE7AGN	6270- 45-18-	K2PJ/2	18,576-192-48-18	W6VD 5700- 95-30-19			
<b>USA</b>		W2QIP	13,172-178-37-12	W6NIU 2520- 60-21-3			
<b>I</b>		WA2BDM	4980- 84-30-10	<b>Hawaii</b>			
<b>Connecticut</b>		W2VXA	2496- 67-24-1	KH6CHC 8260-100-35-			
K1PBW	62,871-445-79-31	W2UKA	56- 7- 4-1	KH6JJ 6012- 76-36-16			
WA1PID*	29,146-235-59-15	WA2RFR (+WA2UKS)	1558- 41-19-	KH6RS (K2SIL KH6HI)			
K1ZND*	23,800-273-50- 4	<b>Delaware</b>		7600- 92-40-			
W1FX	18,912-182-48-21	W3GL 14,473-175-41-12		720- 24-15-14			
W1CJR*	14,430-195-37-15	<b>Eastern Pennsylvania</b>		<b>7</b>			
W1BY*	13,817-158-41- 5	K3CY	35,197-269-61-12	W7NQ (W7CF), opr.)			
WA1ODX	11,020-145-38-16	W3QOR	14,617-154-47-7	47,668-343-68-26			
W1QV	10,840-134-40- 4	W3AIS	13,580-166-35-21	3864- 69-28-			
WA9ALM/1*	10,744-158-34-10	W3CNS	7820-115-34-6	<b>Idaho</b>			
W1LNG	10,500-150-35- 8	G3HLW/W3	4756- 82-29-5	W7HZL 11,452-132-43-19			
W1AW (WA3JSL, opr.)*	7980-114-35- 4	W3KV	3696- 66-28-5	W7KVF 6480- 90-36-14			
WA1KD	6600-110-30- 4	WA3ATX	3267- 49-27-2	W7UO 674- 26-13-3			
W1BIB	4416- 69-32-	WA3NAF	1260- 35-18-	<b>Montana</b>			
W1HOT/1*	2600-100-26- 4	<b>Maryland</b>		W7MKB 1224- 34-18- 4			
W1YNC1*	2844- 53-24-3	W3IN	78,432-498-76-31	<b>Nevada</b>			
W1RSC (WA7WXY, opr.)	352- 16-11-35	W3GN	47,515-387-65-	W7ABX 6272-112-28-17			
W1S1*	144- 12- 6-	W3JRE	18,400-200-46-24	<b>Oregon</b>			
WA1WJL/1*	120-13- 6-1	W3MXT	4140- 69-30- 5	W7IXZ 17,800-178-50-22			
WA1RDN (K1ZND WA1AB)*	10,800-129-40-5	W3XK	1540- 35-22- 4	K7WWR 11,782-137-43-17			
<b>Eastern Massachusetts</b>		W3CSZ	816- 34-17-2	W7RKN 3696- 77-24-18			
K1CPE	42,775-349-59-26	<b>Western Pennsylvania</b>		W7IMP 1806- 43-21-3			
WA1JUY (WA1JY, opr.)	37,584-315-58-20	W3SN	7548-102-37- 9	<b>Utah</b>			
W1PI	33,687-270-57-26	W3BZN	4080- 68-30-30	K7ZIA 16,524-162-51-14			
K1NOL	23,912-217-49-11	W3HWT (+K3BSY)	27,552-246-56-25	W7CYH 7696-104-37-10			
W1BHI/1	8964- 75-36-15	WA3FOO/3 (+WA3PTV)	4968- 69-36- 4	WA7OAU 320- 16-10- 3			
WA1NRV	7392-112-33-3	<b>Alabama</b>		<b>Washington</b>			
W1DUC	2928- 61-17-11	K4MG	7770-105-37-11	K7IDX 26,796-225-58-26			
W1AX	1496- 44-17-	WB4ADT	4002- 69-29- 4	W7NPN 8890-127-35-12			
WA1MSK (+WA1OML)	13,330-152-42-12	<b>Georgia</b>		W7U 8280-115-36-			
<b>Maine</b>		W4YWX	32,940-267-61-18	W7EUF 3618- 67-27-12			
W1VI	7462- 76-41-13	WB4R1A	18,411-179-51-12	K7TAK 2376- 54-22-10			
K1RQU (+K1MTJ)	46,345-325-65-34	WA4AQL (WB4JSK, opr.)	18,078-195-46-12	W7TMM 900- 30-15- 6			
<b>New Hampshire</b>		WA4APG	12,330-137-45-20	K7GGD 30- 5- 3-1			
W6MZW/1	16,074-168-47-	<b>Kentucky</b>		K7JCA (+W7EXM Auggie)			
W1LZ	12,402-159-39-11	K4GSU	75,096-514-72-29	W7RM (+W7AGW1)			
W1MIU	1596- 38-21- 3	W4GSH	38,130-306-62-18	27,877-227-61-14			
W2MKN/1	1056- 33-16-10	K4E1U	31,978-271-59-14	<b>Alaska</b>			
<b>Rhode Island</b>		W4YOK	12,384-144-43- 8	K7LCL 781- 31-11-			
K1IKN	11,268-155-36-16	W4KFB	1890- 45-21- 8	<b>8</b>			
W1OP (K1HZN WA1S PJD POJ QOG RTT)	14,952-178-42-24	WA4AU	40- 5- 4-1	<b>East Bay</b>			
<b>Vermont</b>		<b>North Carolina</b>		K6IHG 14,190-165-43-21			
WA1ABV/1*	22,464-231-48-12	W4TMR	34,257-299-57-30	WA6CCM 1056- 3-16-5			
W1K1/1	2300- 50-23-3	K4ZCP	30,752-242-62-14	W6ROZ 400- 25- 8-3			
<b>2</b>		K4EQA	15,456-165-46- 9	<b>Los Angeles</b>			
<b>Eastern New York</b>		K4CAD	3720- 62-30- 4	W6DGH 30,303-239-63-15			
W2PV (WB2OU, opr.)	61,488-400-72-	K4CAX	2832- 59-24- 3	W91VT/6 9438-121-39-10			
WA2SPL	55,141-387-67-	<b>Northern Florida</b>		W6YY (+WA6MBP, opr.)			
W2HHC	28,249-262-53-29	WB4VUP	22,472-212-53-22	7632-106-36-10			
W2LW	8056-106-38-7	W4GGU	19,900-199-50-14	6572-106-31- 5			
K2BOU	5644- 80-34-10	<b>South Carolina</b>		W6GZVC 5974-103-29-10			
W2AGQ	5504- 86-32-6	WA4LDM	24,168-209-57-13	W6SGJ 5000-100-25-15			
WA2KUL	1320- 33-20- 4	<b>Southern Florida</b>		K6UDQ 4692-102-23-10			
W2FW	286- 16- 8-	W4BRB	25,193-202-61-10	K5MHG/6 336- 21- 8-5			
<b>N.Y.C.-L.I.</b>		K4ROR	24,136-208-56-17	<b>Orange</b>			
W2GP	11,248-152-37-12	W4OZF/4	23,693-219-53-28	W6AMO 10,656-144-37-13			
W2KTV	5460- 91-30- 8	K4KO	7527- 95-39-15	W6BNI 2928- 61-24-			
WA2YIN	3904- 61-32- 3	W4VJH	4288- 67-12-	<b>Santa Barbara</b>			
W2CUQ	2964- 57-26- 8	K4NE	3496- 62-29- 5	W6UA (W6UM, opr.)			
				20,185-182-55-			
				W6JFO 1312- 41-16- 9			
				<b>Santa Clara Valley</b>			
				WA6PGB 15,916-173-46-			
				W6PAA 10,560-120-44- 6			

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could not pull thru even tho they were as loud as 5 or 10 dB over 9. LU6EF, tho he worked nobody, wants it to be known that he heard W5RTQ, WA2WLN/2, W4BRB, W4EX and KV4FZ. - (LU5HF). Very interesting contest. I worked my first W and VE stations on Top Band. Best conditions about 1/2 hour before sunrise. - (OH2BO). KH6 stations driven off air by 1200 GMT Saturday morning due to static discharge. This was peak time for East Coast. More activity noted but many stations did not look on high end of band. - (KH6CHC). Working OH2BO made it worth the aggravations and lost sleep. - (VO1KE). Two miles from WM and missed it! Next year I won't drive so far north. - (WA1ABV/1). Haven't had more fun since I worked my first SS contest. - (K3CY). Had a ball and expect to do it again next year. - (W3KV). Spent first hour of contest taking an exam. Spent next 2 hours fixing the antenna after some ambitious residents of my dorm had cut it down. Never did get the SWR below 4 to 1 and could not work EU very well even though they were all loud. - (WA1JYY, opr. of WA1JUY). One of the best ARRL contests going. - (WA2UOO). As always a most enjoyable contest. - (W4TMR). Don't know which is most fun. . . working EU on 160 or via Oscar 6. Great contest, can't wait until next year. - (K4ZCP). Keep it like it is. - (K4FU). Gets tougher each year. More and more local stations on each year. Squeezing in 6 or 7 strong ground-wave stations in a 25 kHz segment leaves little elbow room to say the least. The potency of ground-wave signals on 160 is really something else. - (W5RTQ). Think I shall see if I can get a church in Wyoming. Have almost always missed that state. - (W0AIH). Lost antenna in ice storm a few days before contest. It was tangled rather bad in guy wires but did get it to load for two hours of operation. - (W0NFL).

TOP TEN

Single	Multi
K1PBW 82,871	WA2WLN/2 95,920
W3IN 78,432	WB8APH 84,777
K4GSU 75,096	WA81J 69,450
WA9MCC/9 72,451	W4PRO 57,753
VE3BMV 65,895	K1RQE 46,345
W9DL 65,016	K8KAS 44,550
W2PV 61,488	W8LT 42,780
WA2UOO 58,625	W6NUT/6 41,820
W0OAW 58,248	K7JCA 38,056
WA2SPL 55,141	WA8SJX 35,518

DIVISION LEADERS

Single Op.	Division	Multiop.
W3IN	Atlantic	WA2WLN/2
WA9MCC/9	Central	W9YB
W0OAW	Dakota	.....
W5SUS	Delta	W5GWD
K4GSU	Gr. Lakes	WA81J
W2PV	Hudson	W2MPP
WA0VDX	Midwest	.....
K1PBW	New Engl.	K1RQE
K7IDX	Northwestern	K7JCA
WA6JVD	Pacific	W6NUT/6
W4TMR	Roanoke	WB8APH
WA0CVS	Rocky Mt.	W0MS
W4YWX	Southeastern	.....
W7NQ	Southwestern	.....
W5RTQ	West Gulf	W5YG
VE3BMV	Canadian	.....

W8PCS 7560-90-42-7	W9UDK 2208-46-24-3
W9AQ 6160-77-40-	W9HVP 990-33-15-
W8EX 4828-71-34-	
W8PMJ 2900-58-25-3	<b>Indiana</b>
W8CBC 2200-44-25-	W9BRN 51,389-379-67-27
W8VZE 504-21-12-3	W2EQS/9 39,060-307-63-
WA8IJ (+WB8s JKA QMC)	W9SFR 21,465-201-53-10
69,450-448-75-15	WA9FED 20,246-191-53-8
K8KAS (+W8JX)	WA9BWY 13,416-156-43-5
44,550-333-66-12	W9STW 4420-65-34-
W8LT (WALKU W8ERD W8Bs	W9UC 700-25-14-3
DEA FWQ INY JRS JXS RDY	W9GFS 198-11-9-4
T. Merrick)	W9YB (WA5BRB WATUSG
42,780-342-62-22	W89DXK) 31,590-291-54-32
W8YWX (+W8IDM)	W9MDW (+WA9SLU)
29,972-254-59-22	5580-93-30-9
W8GQU (+W8Bs GQH JJI JJ	<b>Wisconsin</b>
KGO MVR)	WA9MCC/9 72,451-460-77-26
10,212-138-37-14	W9AVN 19,136-208-46-17
W8EDU (WA3BGE WARTKW)	WA9BYZ 15,000-50-50-24
3960-66-30-4	W9FID 6208-97-32-8
<b>West Virginia</b>	K9WFH 1344-42-16-
W8JWX 1760-44-20-	W9MUA 540-18-15-3
W8RAPH (+K3RUQ)	W9DK (WA9SWX W9NFB)
84,777-528-77-34	29,400-294-50-26
<b>9</b>	<b>0</b>
<b>Illinois</b>	<b>Colorado</b>
W9DL 65,016-447-72-23	WA0CVS 48,960-360-68-24
W9FIU/9 48,824-358-68-	W0BWJ 408-17-12-4
W9ABA 30,360-253-60-24	W0MS (+W0CMM)
W9G9Y 24,472-217-56-23	18,522-189-49-
W9PNE 20,628-191-54-18	W0HBJ (+W0DJJ)
W9BMY 14,878-173-43-16	468-18-13-8
W9RAT 11,176-127-44-10	
WARTDR/9 10,742-131-41-13	<b>Iowa</b>
W9REC 9460-110-43-16	WA0VDX 44,689-332-67-17
W9IOG 8424-108-39-13	W0H 14,496-151-48-8
W9UCN 7194-109-33-8	W0MOQ 9064-103-44-5
W9WYB 4726-68-34-8	W0NFL 3904-61-32-2
W9TAL 4104-76-27-5	
K9KEP 3658-59-31-9	<b>Kansas</b>
W9KXX 3408-71-24-29	K0KU (WA0TKJ, opr.)
K9AKC 2280-60-19-9	41,844-317-66-28

W0GVR 11,970-133-45-11	<b>Wates</b>
W0PSF/0 2226-53-21-6	GW3UCB (G3s WKH WXS XZK
	G4BRK) 3072-64-24-11
<b>Minnesota</b>	<b>Switzerland</b>
W0OAW 58,248-400-72-20	H8PNL 418-19-11-
W0AIH 54,031-376-71-15	<b>Japan</b>
W2TA/0 39,650-305-65-20	JA7NI 70-7-5-
K0HP 25,812-236-54-	IA2UEO 30-5-3-
K0FA 23,744-212-56-20	IA7MJ 4-2-1-
W0HW 19,440-180-54-8	<b>Argentina</b>
W0IH 6400-80-40-14	LU5HF 2376-44-27-
W0RH 1886-41-23-5	<b>Austria</b>
	OE5KF 224-16-7-3
<b>Missouri</b>	<b>Finland</b>
K0JPL 11,176-127-44-11	OH2BO 18-3-3-
W0BV 4560-76-30-5	<b>Czechoslovakia</b>
<b>Nebraska</b>	OK1ATP 756-27-14-
W0MSC 21,280-190-56-17	<b>Netherlands</b>
W0VEA 240-12-10-5	PA0HIP 272-17-8-6
<b>North Dakota</b>	<b>Venezuela</b>
W0ZTL 13,800-138-50-8	DL2GG/YV5 6528-96-34-
<b>South Dakota</b>	<b>Check Logs</b>
WA0CPX 11,266-131-43-9	VE7XN WA4DRU
<b>DX</b>	
<b>Ireland</b>	
EI9I 272-17-8-	
<b>England</b>	
G3XVY 1596-42-19-3	

FM Repeater News

(Continued from page 48)

event violations occur, the licensee is obligated to show the FCC how he will prevent such occurrences - in other words, tighter control. It is possible that we will see a notice of proposed rulemaking from FCC very soon on this subject. Staff level discussion with FCC continue toward this end. - *W1ICP/WR1ABH*



## Silent Keys

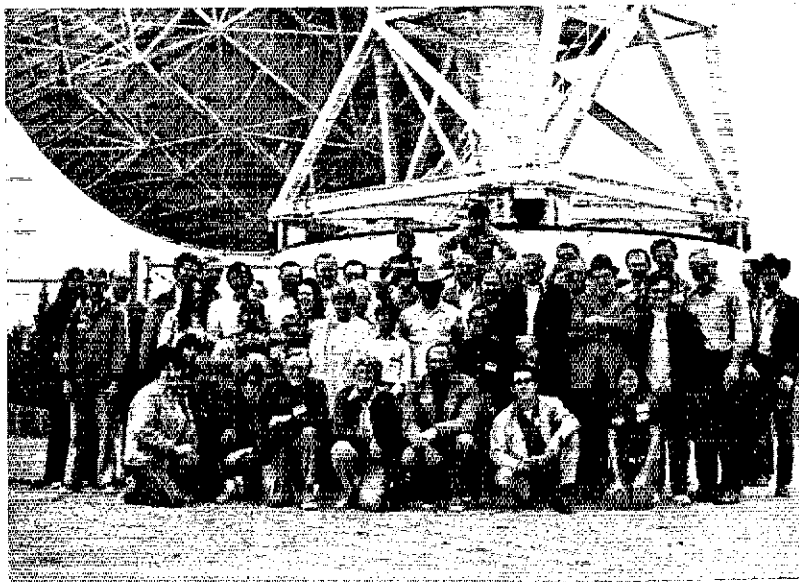
IT IS with deep regret that we record the passing of these amateurs

Ex-WIAMS, Milton A. Howe, Sr., Pittsfield, MA  
 W1BGZ, Edward M. Neal, North Berwick, ME  
 K1BNV, Richard F. Sheperdson, Springfield, MA  
 K1BVA, Roland J. Marcoux, Manchester, CT  
 K1CC, Albert E. Scartlett, Jr., Ridgefield, CT  
 W1CFG, Irving F. Mower, Merrimack, NH  
 W1GJK, Francis E. Vinal, North Reading, MA  
 W1KUA, David B. Tullen, New Canaan, CT  
 W1SSK, Harrison B. Morgan, Pembroke, NH  
 K1YQK, Charles L. McCluskey, Lowell, MA  
 K2CWP, Sherman G. Bassler, Red Bank, NJ  
 K2GRI, Richard M. Williams, Porter Corners, NY  
 WB2HYS, Walter R. Garrison, Morristown, NJ  
 K2IF, Loughran S. Smith, Rhinebeck, NY  
 K2LBB/W3NT, Bert E. Martin, Jr., Endwell, NY  
 WA2POR, David A. Solow, Yonkers, NY  
 W2PUV, Arthur H. Dewey, Elba, NY  
 W3BWT, Eppa W. Darne, Takoma Park, MD  
 W3BK, Fred C. Dietz, Philadelphia, PA  
 K3EBT, William F. Culp, McKeesport, PA  
 W3KG, William R. McShaffrey, Monessen, PA  
 WA3LNL, Alex Mitch, Philadelphia, PA  
 W3MTY, Samuel R. Leisifer, Pittsburgh, PA  
 W3TUD, Francis M. Schmidt, Pittsburgh, PA  
 W3YPT, Lionel F. Muller, Croydon, PA  
 W4CSP, Lynn D. Hunting, N. Charleston, SC  
 W4DBX, Edna B. Moss, Cherokee Falls, SC  
 WA4EQ, Leon C. Love, Tallahassee, FL  
 K4LCN, Walter A. Kent, Fort Lauderdale, FL  
 WA4NBQ, Arthur K. Stone, Dunedin, FL  
 WB4NRV, John R. Carlidge, Cape Coral, FL  
 W4RHA, William D. Ready, Satellite Beach, FL  
 WB4TAR, Harry T. White, Punta Gorda, FL  
 W4ZAK, William H. Smith, Tampa, FL  
 W5EA, Leo V. Brians, West Monroe, LA  
 WB5EIO, Warren B. Miller, Starkville, MS  
 K5HJA, Ben L. Behrens, Beasley, TX  
 WB5IHK, Jack B. Jenkins, Conroe, TX  
 WA5IWY, Kenneth A. Sifer, Harrison, AR  
 W5OWC, Paul J. Bolles, Austin, TX  
 WA5WNJ, Charles J. Meyer, Dallas, TX  
 W6A0J, Lorenzo B. Platt, Playa Del Rey, CA  
 WA6BLI, Nathaniel A. Lewis, Sr., Pasadena, CA  
 WA6BWX, Walter D. Blalock, Santa Fe Springs, CA  
 WA6CAK/WASNRV, William L. Harter, Beverly Hills, CA

W6DKS, Frank S. Hannah, Bodega Bay, CA  
 WB6DNA, Louis J. La Bonte, Auburn, CA  
 W6IHW, Paul D. Zirkel, Long Beach, CA  
 W6GAK, John W. Eliasson, Seaside, CA  
 W6HO, Raymond W. Harter, Long Beach, CA  
 W6JDU, Philip O. Garner, La Puente, CA  
 K6LU, William H. Bickel, Beaumont, CA  
 W6QNK, Wallace A. Woods, San Clemente, CA  
 WB6REW, Alan R. Goldman, Seaside, CA  
 WB6TZR, John M. Bertram, Concord, CA  
 WA6UDC, Donald E. Lennen, Coleville, CA  
 K6UWW, Bent E. Holtsmark, La Jolla, CA  
 WN6VUB, John H. Lutz, San Bernardino, CA  
 W7AQI, Thomas A. Herrmann, Portland, OR  
 W7CDF/W6NAS, Donald A. Bybee, Forest Grove, OR  
 W7HMQ, Everett E. Young, Puyallup, WA  
 W7IFY, Lester L. Thompson, Phoenix, AZ  
 WA7KQT, Preston B. McKay, Orofino, ID  
 WA7QBS, Walter E. Baker, Silverdale, WA  
 WN7SVX, George S. Jennings, Medford, OR  
 W8AH, Leslie P. Misch, Hineckley, OH  
 WA8ALD, Arthur W. Walstrom, Castle, MI  
 WB8DNK, Carl E. Nelson, Ironwood, MI  
 WB8AH, Clarence A. Gillilan, Cleveland, OH  
 W8GKH, Harry P. Bitzer, Muskegon, MI  
 W8JI, William D. McPherson, Monroeville, OH  
 W8JZO, Roscoe J. Bailey, Weston, WV  
 W8KR, Leo B. Wilcox, Owosso, MI  
 K8SKZ, Stanley C. West, Ypsilanti, MI  
 W8YCV, John R. Armstrong, Mansfield, OH  
 W8YQ, Edward B. Thompson, Cincinnati, OH  
 K9AVQ, Clarence A. Huffman, Shattuc, IL  
 W9BZK, Thomas L. Featherling, Sullivan, IL  
 K9DUV, Estes E. Henricks, Arcadia, IN  
 WB9HNX, Thomas E. Kring, South Bend, IN  
 W9IVZ, Robert S. Palmer, Chicago, IL  
 W9IRQ, Gilbert L. Hummelheber, Jeffersonville, IN  
 W9NAB, Walter D. Steben, Elmburst, IL  
 K9UZL, Hugh W. Blair, Elgin, IL  
 W0DDX, Roscoe L. Conger, Smithville, MO  
 W0IA, Harrison O. Byers, Wichita, KS  
 K0LYT, Jimmie V. Causey, Colorado Springs, CO  
 WA0SVD, Helen M. Swanson, Rochester, MN  
 W0ZLC, Thomas J. Keogh, Clinton, IA  
 VE3MW, L. F. Brown, Kingston, ON  
 VE4RA, Emmerson G. Partridge, Winnipeg, MB  
 9G1BF, Josiah R. S. Innes, Nsuta-Wassaw, Ghana, Africa

## Strays

This group of Alaskan amateurs posed with ARRL Northwestern Division Director Robert B. Thurston, W7PGY, during a visit to Comsat's Battlet Earth Station at Talkeetna, Alaska.



# AMATEUR RADIO PUBLIC SERVICE

## NTS RACES AREC

*In the Public Interest, Convenience, Necessity*

CONDUCTED BY BILL MANN,\* WA1FCM

### *SET - Afterthoughts*

**T**HE 1974 SIMULATED EMERGENCY TEST was held January 26-27. Many AREC groups have held critique sessions to evaluate their exercises. Net members have aired their conclusions. And Emergency Coordinators, Radio Officers and net managers have filed their reports with Hq. There's nothing left except the results which will appear in *QST* in a few months. Well, not quite. Before SET '74 is forgotten, let's cite some of the problems observed and possible solutions.

*Problem:* In some areas traffic was too heavy; circuits were greatly overloaded. Others experienced a dearth of traffic. Do we try to even out the traffic load?

*Possible solutions:* (a) Leave the situation just as it is. In a real emergency some areas will naturally be flooded with traffic; let's strive to find ways to *handle* the overload more efficiently. Suggestions? (b) In areas where there was a deluge of traffic this year, participants could originate fewer messages next year. (But isn't this yielding to convenience?) In areas starved for traffic, stations must originate more traffic. (c) Send traffic only to Delaware, North and South Dakota, Vermont and Wyoming.

*Problem:* Band conditions "washed-out" some net sessions.

*Possible solutions:* (a) More AREC and NTS stations should equip themselves for higher-power operation and install better antenna systems. (b) Increase the use of 160 meters for some section and region net operation. Most local net activity will be on 10 meters or vhf. (c) Establish a system whereby amateurs in skip zones could relay traffic

between two stations who can not copy each other. (d) Support investigations to mass-produce artificial sunspots.

*Problem:* Because of the energy crisis, gasoline was hard to find for mobile activity and for powering generators.

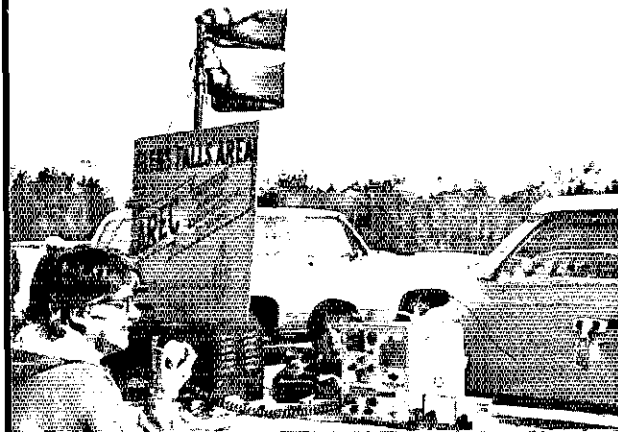
*Possible solutions:* (a) Amateurs should keep a supply of gasoline on hand specifically for emergency (and simulated-emergency) use. (b) De-emphasize the use of emergency power in the SET for the duration of the immediate crisis(!). (c) Employ more tank circuits in mobile and emergency powered rigs.

*Problem:* Some National Traffic System net managers did not follow the NTS schedule outlined in the SET Bulletin. As a result the normal flow of traffic from one NTS level to another was disrupted. One reason given for not following the schedule was that some sections have more than one section net on each mode.

*Possible solutions:* (a) Have only two distinct NTS cycles each day. The "daytime" nets conduct a complete cycle ending at about 1800 local time and the "evening" nets hold only their usual cycle in the evening beginning at 1900 local time with liaisons between the 1800 and 1900 section nets. (b) If there is more than one section net on each mode, they can swap off on meeting times. For example the high-speed cw net could meet at 1900 local time and the slow-speed cw net could meet at 2200 local time. (c) Another schedule should be developed which incorporates both "daytime" and "evening" nets with more efficient liaison between the phone and cw nets. Suggestions? (d) Dispense with the NTS schedule and let net managers conduct net sessions whenever the net frequency is clear.

*Problem:* Some traffic was not cleared in order of precedence (*EMERGENCY* first, followed by

\* Assistant Communications Manager, ARRL.



On October 6-7, members of the Glens Falls Area AREC provided communications for the Warren County Hot Air Balloon Festival, held near Glens Falls, NY. Links were set up between the launch site and Festival Headquarters. Here, K2PBE operates at the launch site.

Priority, Inquiry and Routine). *EMERGENCY* precedence traffic, on occasion, was not treated as a "net stopper."

*Possible solutions:* (a) Net control stations (and prospective NCSs) should familiarize themselves with the correct order of handling non-routine traffic. Remember that when an *EMERGENCY* message is listed on the net, the *first* order of business is getting that traffic cleared before any other traffic is considered. (b) Eliminate precedence. Have strongest stations send their traffic first (incentive to improve signal).

*Problem:* Many messages contained handling instructions to cancel at the end of the SET period if not delivered, even though the messages had nothing to do with the SET.

*Possible solutions:* (a) Only test messages should carry the word "TEST" as part of the precedence and contain the handling instructions HXB and the words "TEST MESSAGE" as the first two words of the text. Greeting messages and the like, even though originated during the SET, can continue on their way after the test without losing their meaning. (b) Rather than using handling instructions, any operator who receives a message after the SET period should call the originator collect to determine whether or not the message should be delivered.

These are some of the problem areas suggested by the recent SET. Please note that the last possible solution in each of the above instances is not to be taken seriously!

What are your thoughts concerning solutions to these and other SET-related problems? What other areas do you feel should be explored before the SET rolls around again? If you chose not to participate in this year's SET, we'd like to know your reasons along with constructive suggestions as to how the yearly event can be improved. With sufficient input we may be able to make the SET even more realistic and more meaningful.

Early reports indicate an outstanding performance by many groups and nets in the 1974 SET. Our thanks to the ECs, ROs, net managers and all the others who contributed to the effort.

Oh, there is one more "problem" which seems to be mentioned each year in connection with the SET.

*Problem:* It's hardly realistic to have a simulated emergency which covers the entire U.S. and Canada. No real situation, short of an enemy attack (when amateur radio communications



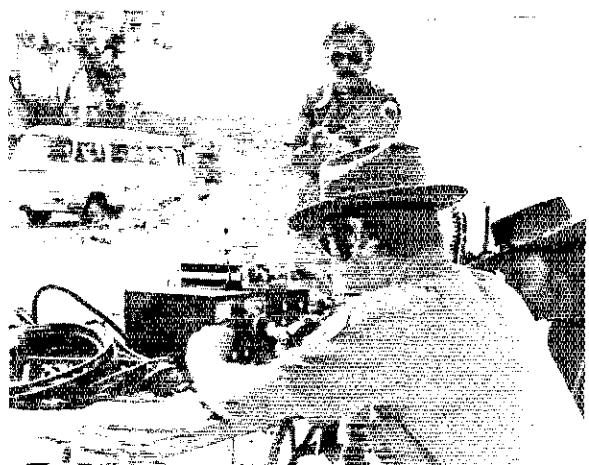
K0MXJ and WB0LHJ are pictured at the Central Kansas ARC Awards Dinner, January 12, 1974. K0MXJ received the CKARC traveling trophy for his service providing communications to Clay Center, Kansas, after the September, 1973, tornado.

would be limited to only Radio Amateur Civil Emergency Service - RACES - operation) would cause such widespread emergency conditions.

*Possible solution:* In addition to the Annual Simulated Emergency Test, perhaps AREC groups and local and section nets should be encouraged to have one (or more?) local or section-wide simulated emergency test any time during the year. The *modus operandi* can be the same as the annual event: participants originate messages to their SEC, to friends, and on behalf of agencies; a simulated disaster is devised incorporating mobile, portable, fixed and emergency-powered operation; contact is made with local officials, etc.

How could the idea be implemented? Simple, we publicize the request for groups to sponsor local SETs. We remind amateurs that these tests may be conducted at any time during the year. We indicate that any SET traffic should be handled just as it would be during the Annual SET, i.e. the word "TEST" in the precedence, "TEST MESSAGE" in the text and HXB (followed by a number) would tip off the operator that he was handling an SET message even though he may be far removed from the locality or section conducting the test.

How about it? Would it be advantageous to conduct such "practice sessions" more than once per year? Could we get some of the guys to "come



The San Diego Mountain Rescue Radio Club has assisted in numerous rescue operations in the southern California area. Recently, WA6ARQ was snapped at the controls of club station, WB6OIX, during one of the rescue activities. January rescue operations are described in the Public Service Diary.



Christmas was made a little brighter for about 200 hospitalized youngsters in the San Francisco Bay Area shortly before Christmas, when Santa's Head Elf (WA6TKP, shown here) let each child talk directly to Santa via the WR6ABM repeater. Grizzly Peak ARC members were aided by cooperation from the Amateur Communications Society, WR6ACS.

out of the woodwork" more than once a year? Might it attract some operators who, for one reason or another, could not participate the last weekend in January? Would you participate?  
WA1FCM

### It's Registration Time

Springtime means it's time to register repeaters for the Repeater Directory and nets for the Net Directory. Work on the Repeater Directory begins in May with the final product available for summer use. The Net Directory will be ready for early-fall use. Both are available as a free service to the membership. But it is necessary that we receive current information on the various repeaters and nets, annually. Here's where the registration comes in.

All licensed repeaters are eligible for listing in the Repeater Directory. Closed repeaters may be listed to indicate that the frequencies are used. Repeater not yet in receipt of their new WR calls may also be listed; if the new call arrives after the repeater is registered, promptly forward the information, including the old call. Form CD-85A is convenient for repeater registration and is obtained from ARRL (s.a.s.e. please). Registration deadline is May 1, 1974.

There are three simple requirements for Net Directory listing: (1) the primary function of each net registered must be a public service activity; (2)

the net frequency must be within the amateur bands; and (3) the net must be registered for each annual revision of the Directory. Form CD-85 (see cut elsewhere in this column) is used for Net Directory registration (s.a.s.e. please). Deadline is June 1, 1974.

If in doubt as to whether your repeater or net has been registered within the last year, check with the trustee, net manager or other official, or send along accurate information yourself. We'd rather select the latest information from two or more registration cards than not have a repeater or net listed because no one bothered to supply the data!

### With the AREC

What does the AREC do? Everyone knows (don't they?) that when there is an emergency situation, AREC members are activated to provide communications for various agencies such as Red Cross, c.d., police, search-and-rescue groups, etc., who need supplementary communications. In an effort to prepare for emergency communications, AREC groups are urged to participate in the Annual Simulated Emergency Test. Active AREC groups also provide communications for special events such as parades, walkathons, boat races, etc. Most AREC groups hold some sort of weekly or monthly on-the-air meeting or net.

Let's expand on the idea of regular net activity. AREC nets run the gamut from formal training sessions to rag chews. We'll focus on the training aspect, assuming that the rag-chew portion will be held until after the net is secured. The question is: What can the EC (or someone designated by the EC) plan to make the net interesting as well as educational?

To keep in shape for handling messages in standard form, net members can be requested to send messages to friends or relatives. The local net (if it is part of the National Traffic System) should have a station or stations who can relay the traffic destined outside the local area to the appropriate section net. In a similar vein, stations can be asked to originate practice messages to other members on the net. Perhaps some intentional errors in message form or procedure can be incorporated to see if others on the net can spot the errors.

The EC may write up some questions for net members to answer based on information contained in the *Public Service Communications manual* and *Operating an Amateur Radio Station*.

Other net sessions can be devoted to discussions of pertinent topics such as how to set up for emergency-powered operation, an explanation of NTS, duties of the EC and his relation to the SEC, SCM and others, implementation of the local Emergency Plan, etc.

Periodically, local simulated emergency tests or drills may be conducted. Activate the mobiles, portables and emergency-powered stations for a short time to ascertain that all equipment is working properly. Plan an exercise which will utilize the AREC members within the local area. The AREC net will probably be the focal point for coordinating the activity.

At the conclusion of the net sessions, stations may remain on frequency to discuss their activities, make suggestions for improved emergency-communications capabilities and perhaps a general rag chew.



Net managers: have you registered your public-service net since last summer? CD-85, available on request from ARRL Headquarters, should be used to forward net data by the June 1 deadline (see text).

If the local AREC net meets less frequently than weekly, it may be necessary to remind members to report into the net. This can be accomplished by sending postcards, or if your emergency plan calls for a telephone calling tree to alert members in times of emergency, it can be employed to remind stations of the net session.

January SEC reporting slipped from December's 1973 high of 43 reports to a total of 35 SEC reports received. The reports listed 13,340 AREC members in December, but down to 11,491 members in January. That's still about 2-k more members than covered in the same number of reports in January, 1973. Sections reported: Ariz, Colo, Conn, Del, ENY, Ill, Kans, Ky, Mar, Mich, Miss, Mo, Mont, Nebr, Nev, NC, NFla, NTex, Ohio, Okla, Org, Oreg, SV, SDgo, SCV, Sask, SDak, SFla, STex, Utah, Va, Wash, WMass, WNY, WPa.

### Traffic Talk

"Yeah, thanks for the information, Mac. Say, why don't you put a number on that so the net can count it as a message passed?"

"Message follows number 8. Break. West Coast Traffic Net for April 1. Seventeen stations, eight traffic. Break. Signed John."

"Number 72. Temperature 58 degrees. Barometric pressure 30 point 25 and falling. Wind out of the west at 7 miles-per-hour. No precipitation."

Ever heard "traffic" such as the examples above being passed on amateur nets? Does simply adding a message number to some information constitute a formal message?

For net reporting purposes in QST, it is expected that the only messages counted as traffic in net reports are formal, written traffic which is passed using standard ARRL message format: complete preamble, address, text and signature (or correctly-sent "book" traffic).

The same expectation applies to the monthly traffic totals reported to the SCM: only formal traffic using standard message form should be reported.

The reasoning behind this should be obvious. Why should some stations get "credit" for handling messages improperly? One of the main purposes of traffic handling is to prepare amateurs for the handling of messages on behalf of served agencies during emergencies. Place of origin, time filed, number of words in the text, etc., are vital

WA9PDS is very active on the Midwest Amateur Radio Service, both on 40 and 75 meters using this station. Dave is also EC for Catlin, Illinois.

NET REGISTRATION		
1. Net Name:		
2. Net Designation (if any):		3. Freq.
4. Dayn per GMT:	5. Starting time(s): GMT	
6. Net meets 1 hour earlier per GMT during DST? <input type="radio"/> YES <input type="radio"/> NO		
7. Purpose: <input type="radio"/> Traffic <input type="radio"/> Weather <input type="radio"/> Emergency <input type="radio"/> .....(specify)		8. National Traffic System? <input type="radio"/> YES <input type="radio"/> NO If yes, check: <input type="radio"/> Local Net <input type="radio"/> Section Net <input type="radio"/> Region Net <input type="radio"/> Area Net
9. Direct Coverage:		
10. Liaison(s):		11. Manager's Call:
12. Date Submitted: 19....		13. Sender's Call:
CP-85(8670) ARRL, 225 Main Street, Newington, Connecticut 06111		

information to the recipient. Are amateurs gaining the proper experience by simply putting a number on information? How about the stations who may be monitoring. Will they learn the proper procedures for handling traffic?

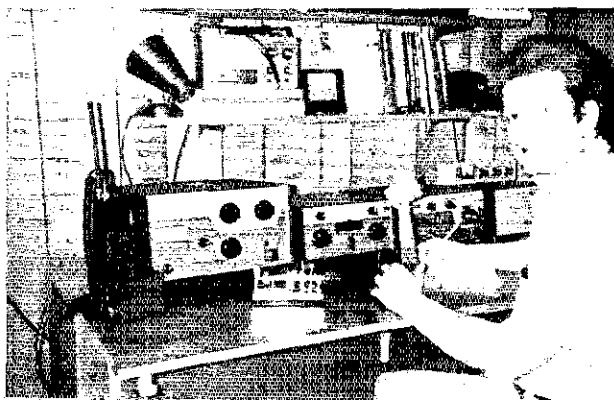
What purpose is served by "puttin' a number on it," other than building up a false traffic total?

Preliminary totaling of the number of traffic reports and the amount of traffic handled as reported monthly in Station Activities indicates that the total reported traffic has dropped below the 1 Megamessage mark for the first time in years. The number of stations reporting traffic to their SCMs has also dropped somewhat.

Band conditions are undoubtedly partly to blame. Scores of net sessions were "washed out" by long skip conditions during the winter months. Next winter band conditions may be even worse!

But what we need are more originations. (Where have we heard that line before?) Some of the net regulars receive and relay piles of traffic, but hardly ever originate any. Those received-relayed messages have to be originated by someone! Let's all pitch in.

**National Traffic System:** EAN's K2KIR reports long skip (or rather lack of short skip) has hung-in a lot longer than in previous years of a sunspot minimum. Even with the shift to DST, band dumped midway thru net very often. The Jan. rate on CAN hit a new high. A third annual 2RN certificate was earned by WB2AEH, second annuals by WA2s CLB PJL and initial certificates by WB2s FLE PYM. D3RN certificates were issued to the following: W3ABT, K3CR, WA3s EUE RCI URV. W4HFU filed his first report as RN5 manager and says conditions treated RN5 well until the SET. DRN7 needs more representation from British Columbia and Idaho. New manager WA8MCR submits his first D8RN report. A time change for ECN has helped the rate. W0LRN submitted his 1WN report from a drilling platform 120 miles out in the Gulf of Mexico!



January Reports

Net	Sessions	Traffic	Avg.	Rate	% Rep.
EAN	33	2235	67.7	1.380	99.0
CAN	33	1831	55.5	1.194	99.5
PAN	33	1649	50.0	.987	95.0
1RN	56	481	8.6	.375	78.3
DIRN	34	220	6.5	.331	82.4
2RN	67	608	9.1	.526	98.5
D2RN	37	221	6.0	.298	100.0
3RN	66	749	11.4	.520	95.8
D3RN	35	277	7.9	.458	100.0
4RN	55	623	11.3	.497	79.3
DRN4	12	54	4.5	.180	38.7
RN5	65	1567	24.1	.665	96.6
DRN5	28	122	4.4	.151	53.6
RN6	62	928	14.9	.470	100.0
DRN6	31	440	14.2	.223	70.7
RN7	58	296	5.1	.346	68.7
DRN7	28	45	1.6	.143	57.6
8RN	63	602	9.6	.410	90.5
D8RN	35	285	8.2	.390	88.6
9RN	65	699	10.8	.534	88.9
TEN	66	795	12.1	.486	89.1
DTRN	35	104	2.9	.125	68.6
ECN	69	459	6.7	.569	90.8
TWN	53	347	6.5	.188	83.3
DTWN	26	73	2.8	.104	43.2
TCC Eastern	140 <sup>1</sup>	889			
TCC Central	104 <sup>1</sup>	761			
TCC Pacific	131 <sup>1</sup>	1252			
Sections <sup>2</sup>	3710	21488	5.8		
Summary	4855	40100	8.3		
Record	3995	38538	19.1		

<sup>1</sup> TCC functions not counted as net sessions.

<sup>2</sup> Section and local nets reporting (104): APSN (AB), APN (Mar.), CM GBN ODN OPN OON (ON), WQ-V/UHF (PQ), SATN (SK), AENB AEND AENM AENR (AL), ATEN HARC (AZ), OZK (AR), IEN NCN NEN (CA), BEN CN CPN (CT), DTN (DE), QFN FAST FMTN GN NFPN TPTN VEN (FL), GSNB GSN GTN (GA), IMN (ID, MT), ILN (IL), TLCN (IA), QKS KPN KSNB KWN (KS), KNTN (KY), LAN LSN (LA), SGN (ME), MDD MDCN (MD, DC), EMR WMN WMPN (MA), MNN QMN (MI), MJN MSPN MSN PAW (MN), MTN (MS), ACE JC2AN MoAREC MON MoSSB MTN WEN (MO), MTN (MT), NJN NJPN NJSN WEN WEPN (NJ), NYS NLI (NY), CN NCSSBN VHF-TN (NC), BN COAREC-10 COAREC-2 OSBEN (OH), OLF OPEN GPON PZZ OTWN STN (OK), BSN OSN (OR), EPA EPAETN PFN STT WPA (PA), SDN (SD), TN TNN (TN), TEX TEX-SS TTN (TX), BUN UCN (UT), VSN (VA), NSN WSN (WA), WVN (WV), BEN (WI).

Transcontinental Corps

W3EML sez Jan. was a fairly good month for TCC-E and congratulates the Corps for hanging in there under impossible conditions at times. TCC-C also experienced a good month. KØAEM has issued certificates to all TCC-C stations. Percent successful functions for TCC-P rose in Jan., but still lower than in past years.

Area	Functions % Successful	Out-of-Net		
		Traffic	Traffic	
Eastern	151	92.7	3072	1115
Central	115	90.4	1542	761
Pacific	146	89.7	2539	1252
Summary	412	91.0	7153	3128

The TCC roster (Jan.): Eastern Area (W3EML, Dir.) - W1s NJM QYY, K1HTV, W2s FR GKZ, WA2s CXY ICU/4 UWA, WR2s RKK VEJ, W3EML, K3s CB MVO, W4s SQO UQ, K4KNP, WB4s OMG SGV, W8s PMJ VDA/4, K8KMQ, WA8PIM, VE3SB. Central Area (KØAEM, Dir.) - K1ONW/S, W4OGG, W5s GHP QU SRM TNT, WBSs DLW FDP FML, W9s CXY DND NXG, WA9EED, WØs HI LCX ZHN, KØDDA, WAØROK. Pacific Area (K5MAT, Dir.) - W5RE, K5MAT, W6s BGF EOT IPW ISC MLF RSY VNO VZT, WA6DEL, W6s AKR VKV, W7s BQ GHT KZ UTM, K7s NHL QFG, WØLQ, KØOTH, WØs AXW HCK.

Independent Net Reports (January)

Net	Sessions	Traffic	Check-ins
Hit & Bounce Slow	16	78	115
20 Meter ISSB	22	1524	245
North American Traffic	27	340	536
Mike Farud	30	68	268
Northeast Traffic	31	199	241
IMRA	27	548	1279
Hit & Bounce	31	947	423
7290 Traffic	47	711	2250
75 Meter ISSB	31	257	1203

Public Service Diary

■ On Dec. 24, the Denver, CO, area was hit by a heavy snow storm. More than a dozen amateurs were active on several 2-meter repeaters providing information on road and weather conditions which was used by WØBÆE over a local broadcast station. Liaison was set up with NTS operators for possible health and welfare traffic. Also, liaison was maintained with surrounding states for condition reports. Operation began at 0800 and ended at 1200. - (KØFLQ, SEC CO)

■ During the month of Jan., Harris Co. (TX) amateurs, operating through WR5AAA, made first reports and summoned aid to 18 auto accidents, one fire and reported 7 inoperative traffic signals. Amateurs using WR5ABX summoned aid to three auto accidents. Participating were: W5s DNE NRJ PMQ QKA, K5s MIZ MJA, WA5s ABA PAL, WR5BAE. - (WA5ABA, EC Harris Co.)

■ While traveling on the Interstate highway in Tampa, FL, on Jan. 5, WB4EVP came across an automobile accident. He called on the Tampa repeater; K4RMU answered and phoned police, who arrived at the scene a few minutes later. - (WB4TUP, EC Hillsborough Co.)

■ When driving home to San Juan, PR, on Jan. 7, KP4QM developed car trouble about 6 miles from Arecibo. Via 2 meters, he got the name of an amateur in Arecibo, and when he reached town, found KP4s AET RE waiting to assist. An SWL heard of KP4QM's problem and drove 25 miles to help. Later, through KP4CK, KP4QM contacted his son who drove to Arecibo to tow the car home. - (KP4QM)

■ On Jan. 10, the San Diego Mountain Rescue Team Radio Club, WB6OIX, supplied communications for a search for a stranded hiker lost for 6 days in the San Diego Mountains. The hiker was found alive. - (W6GBF, SCM SDgo)

■ On Jan. 15, while traveling on I-70 near Washington, PA, WA3SYN/3 spotted a traffic accident. He called WA3TOB through the K3PSP repeater, and police were called. Help arrived within a few minutes. - (WA3OKK, EC Washington Co.)

■ After learning of a missing plane in the vicinity of the Ithaca (NY) Airport on Jan. 16, EC WB2TQF contacted police and offered services of the local AREC. Police accepted and a call was made on WR2ABD for volunteers to report to police barracks. Enroute, it was learned that two occupants of the plane had been picked up and taken to the airport. Since the victims were dazed, the location of the plane or possibility of other passengers was not determined, so amateurs and police set out on foot to search for the crash site. WB2TQF and WA2ECQ carried portable units and relayed information to WB2TNL/mobile who was with police at the airport terminal. After an

hour-and-a-half search, WB2TQF located the wreckage and reported that there were no other occupants. — (W2CFP, SEC WNY)

■ A farmer accidentally severed an underground telephone cable on Jan. 19 about 14 miles from Alliance, NE. WBØFTS/mobile contacted WØRJA who relayed the information to the phone company in Alliance. A repair crew was sent and service restored in about an hour. — (KØOAL, SCM NE)

■ On Jan. 18, W5DNE/mobile and W5QKA/mobile witnessed a motorcycle accident. Through WR5ABX, WA5PAL was contacted and ambulances and crash vehicles arrived within minutes to assist the badly injured cyclist. — (WA5ABA, EC Harris Co.)

■ K5BFA/mobile came across a robbery in progress on January 19. He notified police through WR5ABT to report where the suspect was hiding. — (WA5FII, SEC MS)

■ While traveling on the Natchez Trace Parkway on Jan. 20, W5s HTV SYA saw a serious accident. They used WR5ABT auto patch to notify park rangers and request assistance. — (WA5FII, SEC MS)

■ On Jan. 21, WB2WYX spotted a disabled auto on I-55 near Pickens, MS. He used WR5ABT auto patch to notify Highway Patrol to assist the motorist. — (WA5FII, SEC MS)

■ While mobile near Mount Olive, MS on Jan. 24, W5HTV found a large truck was off the road and disrupting traffic flow. He called W5PAY who made an auto-patch call through WR5ABT for Highway Patrol assistance. — (WA5FII, SEC MS)

■ Members of the Tampa Bay (FL) Repeater Association were called upon by the Hillsborough Co. Sheriff's Department to assist in a search for a lost child on Jan. 27. Several amateurs provided communications for over 3000 searchers, but the child was not found. — (WB4TUP, EC Hillsborough Co.)

■ The San Diego Mountain Rescue Team Radio Club assisted in the search for a missing hiker in Riverside Co. (CA) on Jan. 27. The subject was found in one day of searching. — (W6GBF, SCM SDgo)

■ Construction crews severed telephone and teletype communications lines between the Brownsville (TX) International Airport and the National Weather Service on Feb. 4, W5OOG called W5KR on 2-meter fm and W5KR called long-distance to the National Weather Service in San Antonio, notifying them to activate their hf ssb emergency circuits to the Brownsville installation. Communications were immediately established and the phone line was repaired in two-and-a-half hours. — (WA5YXS, SEC STex)

■ On Feb. 5, at 1100, Allegany and Garrett Counties (MD) were declared in a state of emergency because of the fuel shortage amplified by the truckers strike and further hampered by freezing rains and snow. The Mountain ARC club station, W3YMW, was activated on 75 and 2 meters. Since the local phone circuit to c.d. building was swamped with calls, a 2-meter link was set up to relay messages to an amateur's home where he could use his telephone. This continued until 2400. Another link was established on 3920 kHz with c.d. in Pikesville, MD. More than 25 amateurs were involved in the communications which did not end until 2230, Feb. 6 — (W3DFW, EC Allegany Co.)

■ At 0900, Feb. 8, an explosion and fire occurred at a refinery in Baytown, TX. The c.d. and AREC groups were activated and provided communications for ambulances, fire and c.d. units through WR5AAA. A local high school was safely evacuated. The operation continued for two-and-one-half hours until the fire was brought under control. — (WA5ABA, EC Harris Co.)

■ Since commercial Telex and satellite information were not working, WA5VBM was asked to run a phone patch for the Geophysical Institute in Lima, Peru, to obtain information from the International Earthquake Center in Boulder, CO, regarding the possibility of a tidal wave developing from a quake on the Pacific Ocean floor. Lima was on c.d. "Green Alert" until negative answer was received via WA5VBM — (W5KR, SCM STex)

### BRASS POUNDERS LEAGUE

Winners of BPL Certificates for January Traffic

Call	Orig.	Recd.	Rel.	Del.	Total
W3CUL/4	286	1096	970	49	2401
W1PEX	318	528	411	31	1288
KØONK	115	582	567	22	1286
WAØVAS	109	575	65	510	1259
WØWYX	57	470	121	349	997
W6RSY	58	452	346	36	892
WA2UWA	18	460	410	2	890
K9CPM	17	391	114	311	813
W3VR/4	217	286	259	9	771
WB4AIW	39	363	330	33	765
WB2RKK	37	384	259	51	731
WAØROK	13	339	334	-	686
WA9EED	179	356	137	9	681
K48CL	77	313	218	25	633
WB5DEW	149	248	226	-	623
W48MCR	41	290	239	51	621
W6YBV	30	285	265	27	607
WA2EPI	217	184	115	65	581
WB5FML	73	282	225	-	580
W3EML	26	323	218	3	570
WA3RCI	110	237	150	52	549
WA1FCM	58	259	124	107	548
W48PIM	52	244	246	1	543
VE3SB	72	252	193	11	528
WA1MSK	40	251	162	61	514
K1ONW/S	32	244	187	51	514
WB4DXN	101	250	157	6	514
K1BCS	349	114	15	30	508
WAØAUX	190	157	6	151	504

### BPL for 100 or more originations-plus-deliveries

WB5EIN	210	K4WC	128	K6UYK	110
K9MWA	209	WB9NJA	126	WA8ETX	110
WB4VBG	187	WA4ATF	121	VE3JGJ	107
W4PAY	185	WB6PVH	121	WA3DUM	105
WN4CTL	182	WB8WZF	120	W7GVC	105
WB6MKV	181	VE3DPO	120	WB8NRC	105
WAØVYT	178	WA5VJV	116	WNØJJQ	105
W8QCU	173	WBØGVR	115	K4MNE	103
WB8ITT	162	W2URP	114	WB2KDC	102
VE3DV	158	WB8EEZ	114	WA1RYL	101
WB5BWW	144	W2QE	113	K3PJE	101
WN4FZQ	138	WB8ZNC	113	WN5HYR	101
VE3FOZ	136	WA1LR	112	WB9IHH	101
WB3FRG	135	WN1RFD	111	WNØKW1	101
W5ABQ	131	WA4JQS	110		

### More-Than-One-Operator Station

K4WAR 215, K3CR 152, K4HY 125,  
W8MRM 120, K4FTW 104

BPL Medallions (see December, 1973 QST, p. 59) have been awarded to the following amateurs since last month's listings: WN1RFD, WA3PXA, WB8ITT, K9MWA.

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.

**Public Service Honor Roll January 1974**

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.

WB5AMN	75	K2QQI	50	WA3SWF	44
WABETX	69	WA3QJA	50	WA3URV	44
WA0VYB	68	WA4AVD	50	WB4EJJ	44
WA0VAS	65	WB8NRC	50	WA4GBC	44
WA1MSK	64	WB0HSZ	50	WB5RFW	44
WB2RKK	64	WB2FWW	49	WA5IQU/S	44
WB0GVR	64	W2MTA	49	W5NTN	44
KL7JDO	64	K5MAT	49	WA5ZOO	44
WA1LR	63	W5MYZ	49	WB6AKR	44
WA5ZZA	63	W7GHT	49	W7BO	44
K0BIX	62	K7OUP	49	W8GLC	44
WA3DUM	61	W7UTM	49	WB8JGW	44
WB5ELY	61	WB8NCD	49	W80P	44
W7OCX	61	WB9RI	49	K0PIZ	44
WB0HBM	61	K0MRI	49	WB4TVU	43
WA3RCJ	60	W0OYH	49	W5ABQ	43
WA1FCM	59	VE3GFN	49	K6UYK	43
WA1PHJ	58	VE3GT	48	WA8UPL	43
W4OGG	58	WA2CNE	47	WA0MLE	43
WARZNC	58	W5ELI	47	K1ONWF/S	42
W8MCR	57	VE3FRG	47	WN1RF	42
WB0CZR	57	VE3GIG	47	WA3ATO	42
WA1MYK	56	VE3SB	47	WA3MOP	42
WA3UKZ	56	W4BYG	46	K4MC	42
W5GHP	56	WB40XT	46	WB5DBK	42
K8MLU	56	WB5GZG	46	WA5VBM	42
WA9QVT4	56	WA7OCV	46	W2FR/S	41
K0BAD/4	56	WB8ITY	46	WB4RUA	41
WA0TFC	56	K0JTW	46	W4WCG	41
VE1AMR	56	K6GMI	45	W4XZZ	41
WA6TVA	55	WB8HWE	45	W6AUC	41
WA2EPI	55	WB1HW	45	W7DAN	41
W5ATHM/S	53	WB8RA	45	W7WAH/S	41
W7PL	53	WB9HEG	45	WB9NIA	41
WB8CSH	53	WA0YVT	45	K9UTU	41
WB2JRX	52	W1BYR	44	VE1ARB	41
W3ABT	52	WA1PGY	44	WA1PHP*	40
WB4DXN	52	WA2CWS	44	WA2BSU	40
WB5DLW	52	WB2FCD	44	W3FC	40
WA9EED	52	WA2SHQ	44	W3QU	40
VE3DPO	52	WA3PHQ	44	W5GSN	40
VE3FQZ	52	WA3PXA	44	W5RBB	40
WB4SVH	51			WA6IDN	40

\*Denotes multioperator station.

The following are excerpts from a letter to President Dannals expressing gratitude for amateur radio assistance in foreign disaster relief operations. The letter was prompted by discussions at a recent conference of the Agency for International Development's Office of Foreign Disaster Relief Coordination with a number of U.S. voluntary agencies which often become prominently involved in providing relief assistance during times of major foreign disasters.

"At the conference a strong consensus emerged that American voluntary agencies and the U.S. Government owe a debt of gratitude to amateur radio operators for their outstanding services in relaying important information during major foreign disasters.

"The purpose of this letter is to express our sincere gratitude to the amateur radio operators throughout the United States and abroad who give so generously of their time and talents during major disasters overseas. Without their cooperation and help, the voluntary agencies could not have accomplished what they were able to do in alleviating misery and suffering - the earthquake in Peru, the floods in Bangladesh, the civil war in Nigeria, the earthquake in Nicaragua are but a few of the instances in which the assistance of the 'hams' was instrumental in helping carry out disaster relief programs more effectively and efficiently than would otherwise have been possible. These 'hams' are an anonymous voice and a string of incomprehensible call letters at the other end of a telephone line: for the people we attempt to help, these same 'hams' are often one of the more important links in a chain through which pain and suffering may be alleviated."

Dated: January 16, 1974

Signed:

Russell S. McClure

Foreign Disaster Relief Coordinator

**Stolen Equipment**

Swan 270 serial M-252616 along with automobile was stolen in front of Holiday Inn in Sumpter SC, September 15, 1973. Contact: Harold L. Manning, W4NTB, 2107 Princess Place Drive, Wilmington, NC 28401.

Stan on Dec. 12, 1973: Marker Luxury (Kuranish Keisokuki Kenkyujo), Ser. No. 2296. Karl A. Moellmer, 1430 Augusta PL, Monterey, CA 93940. 373-6696.

Regency HR2-A, 2-meter fm xcvr. Serial No. 04-05632, stolen on December 12, 1973. JoAnne E. Moore, WB8NSU, 12 Seward No. 307 Detroit, MI 48292.

Drake TR-22, No. 620 024 stolen from Robert Lepelletier, Jr., P.O. Box 9544, Alexandria, VA 22304.

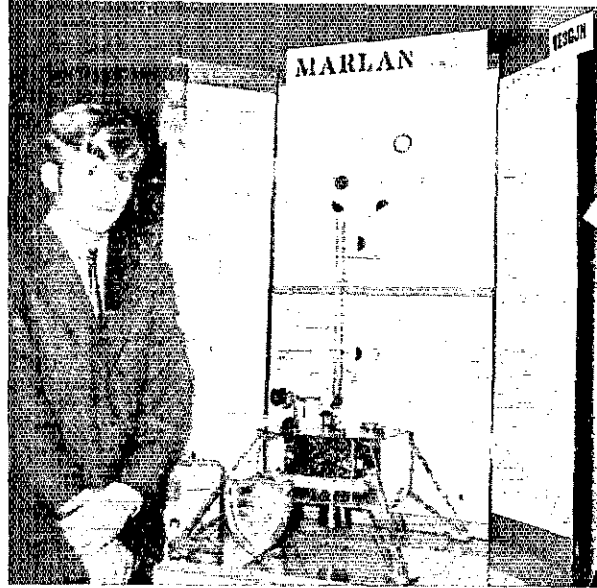
**FEEDBACK**

The Micro Beam for 40 meters has an incorrect coil dimension given on page 26 of February, QST. The reflector coil should have 24 instead of 14 turns.

In "A Simple Computing SWR Meter." Fayman, QST for July, 1973, U6 is listed as an SN7412 and should be an SN74121. Also, Q3 is drawn as an npn type (Fig. 6) and it should be shown as a pnp type. The information in the caption is correct.

# Strays

Placing first in the Intermediate Engineering division of the 12th Canada Wide Science Fair was Bob Miner, Jr., VE3GJN, with his Mars Landing Vehicle (MARLAN). The device transmits data from its sensors after a command is sent to it; after all the sensors have been scanned it shuts itself off. The transmitter used is W1CER's 2-meter im Pip-Squeak (March, 1971 QST).



Last year's West Virginia State Convention at Jackson's Mill saw four members of the Morris family get together for an informal reunion. Enjoying the outing were Albert, WB8FER, of Huntington, West Virginia; Staten, WA9YKM, visiting from Peru, Indiana; Carl, WB8GDY, from St. Albans, West Virginia; and Albert Jr., WB8FEQ, of Huntington. Albert, Staten, and Carl are brothers. Needless to say, the travel to and rendezvous at the convention was fully coordinated by amateur radio (Photo by K8PFK)

After an interval of thirty-four years, I. L. McNally, K6WX, of Sun City, California and A. B. Ward, W4PQL, of Arlington, Virginia, re-established contact on 20 meters on Friday, December 7, 1973. Their earlier contacts were on cw in 1939 when McNally was KA1MX in Cavite, Philippine Islands and Ward was XU2AW in Peking, China. Both were then young Navy warrant officers; both are now retired from the Navy as commanders.

Quite by chance, W4PQL, while "reading the mail" on 20 meters, heard his name mentioned by Gordon Edwards, W4ABF of Fairfax, Virginia. Breaking in, he discovered that the California station was none other than his old Navy friend, Irvin McNally.

An interesting sidelight is the fact that this contact occurred on Pearl Harbor Day - a day that had significant effect on both "old timers."



Here's a shot guaranteed to make fm repeater types mouths water! Shown 1485 feet above Chicago is the superintendent of an antenna erection project for two TV stations atop the Sears Tower, the tallest building in the world with 110 stories. - UPI photo courtesy Daily Evening Item, Lynn, Massachusetts.

## DAKOTA DIVISION CONVENTION

Mankato, Minnesota

May 4, 1974

Come and renew old acquaintances and make new friends at the 1974 ARRL Dakota Division Convention in Mankato, Minnesota on Saturday, May 4. Rain or shine, activities will get underway at 9 AM at the Mankato State College Gymnasium. The facilities will accommodate 2000 people. Along with Minnesota's largest flea market and swapfest there will be a number of interesting programs covering such topics as satellite communications, public service activities, and equipment troubleshooting techniques. An FCC staff member from Washington will be on the program. ARRL President Harry J. Dannals, W2TUK, and other League officials will attend and participate in the ARRL Forum.

Talk-in on 3935 kHz and 146.94 MHz. There are several conveniently located motels. An inexpensive lunch will be available at the convention. Pre-registration - \$2, registration at the door - \$3. \$1 more if bringing parts or equipment for sale at the flea market/swapfest. Pre-registrations must be received before April 27. Registrations and requests for information to Dakota Division Convention, VARS, Box 3, Waseca, Minnesota 56093.

## Hamfest Calendar

**Alabama** - The 21st annual Birmingham Ham-Fest is May 4-5. Giant swap circle, meetings, MARS, nets and forums. Write: Birmingham Amateur Radio Club, P.O. Box 603, Birmingham AL 35201.

**Arkansas** - The Arkansas CW traffic net picnic is Sunday, April 21, at Pavilion No. 7 in Burns Park, North Little Rock, 10 AM-4 PM.

**California** - The 1974 California DX convention is April 27-28 at the Fresno Hilton. Featured speakers, ZKITA Gang. Write: Frank Cuevas, W6AOA, 14919 Yukon Ave., Hawthorne CA 90250.

**California** - The Fresno Amateur Radio Club hamfest is May 10-12 at the Sheraton Inn. Info from WB6IDW.

**Illinois** - The 8th annual Rock River Radio Club hamfest is Sunday, April 28, at the Lee County 4-H Fairground (1 mile east of jct. U.S. Rt. 52) Amboy. Rain or shine, camping - bring your camper, 146.94 MHz talk-in frequency, swap 'n shop. Tickets \$1.50 advance; \$2 at gate. Tickets write: W9ECF, Karl Carlson, Box 99, Nachusa IL 61057.

**Illinois** - Moultrie Amateur Radio Klub's 13th annual hamfest is April 28 at Wyman Park, Sullivan. Indoor, outdoor market. Tickets \$1 advance; \$1.50 at gate. Write: M.A.R.K., Inc., P.O. Box 327, Mattoon IL 61938.

**Illinois** - The DeKalb County hamfest is May 5, 7 AM-4 PM, at the Notre Dame High School (3 miles south of DeKalb off Rt. 23), signs posted. Tickets \$1.50 advance; \$2 at door. Talk-in 146.52 and .94 direct. Write: Crawford's Electronics, 301 Main St., Genoa IL 60135.

**Indiana** - The Tri-State ARS annual hamfest is May 11 at the 4-H Fair Grounds (U.S. 41, 3 miles north of town). Overnight camping, auction, flea market, ladies bingo. For info or advanced registration write: Steve, W9MDB, 5805 Berry Lane, Evansville IN 47710.

## COMING ARRL CONVENTIONS

May 4 - Dakota Division, Waseca, Minnesota.

May 26 - Virginia State, Vinton.

June 7-9 - Rocky Mountain Division, Pueblo, Colorado.

June 8-9 - Georgia State, Atlanta.

June 15-16 - Florida State, Orlando.

July 6-7 - West Virginia State, Jackson's Mill.

July 19-21 - NATIONAL, New York, N.Y.

November 1-3 - Southwestern Division, San Diego, California.

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.

**Louisiana** - The Baton Rouge hamfest is May 4-5. Featured speaker is Justin Wilson, well-known Cajun humorist who has appeared on many TV shows as well as recordings. Write: P.O. Box 53194, Baton Rouge LA 70805.

**Massachusetts** - The Waltham Amateur Radio Asso.'s annual auction is April 6 at 1 PM at the Kennedy Memorial Jr. High, Lexington St., Waltham. Talk-in 04/64 and 52.

**Massachusetts** - Central Mass. Amateur Radio Asso.'s annual auction is April 20 at the Knights of Columbus Hall, Rt. 9, Spencer, at 1 PM. Talk-in on 94 and 37-97. Write: WA1FIH/1, 1622 Worcester Rd., Apt. 421 B, Framingham MA 01701.

**Missouri** - The 5th annual Northwest Missouri hamfest is May 5, 10 AM-4 PM, at Kansas City North Community Center, 3930 N.E. Antioch Rd. (1/4 mile east of 135 & 29 jct.). Swap tables, food, programs of interest, talk-in 3.925 & 146.94. For info write: P.H.D. Amateur Radio Asso., P.O. Box 11, Liberty MO 64068.

**New Jersey** - The Tri County Radio Asso.'s auction sale is Sunday, April 27, at the Arbor Inn, West 7th and Rock Ave., Plainfield. Set-up equipment noon, sale at 1 PM. For further info write: George A. Diehl, W2IHA, 20 Wilson Ave., Chatham NJ 07928. Tel: (201) 635-8703. Somerset Bus from NYC.

**New Mexico** - The Mesilla Valley Radio Club of Las Cruces annual bean feed and swapfest is April 28 at La Mesa Park. Featuring chef "Whitey," W5ECQ. Food, beverages, family fun. Info on: 16/76 and 3940.

**North Carolina** - The Raleigh Amateur Radio Society's hamfest is Sunday, April 21, at the Crabtree Valley Mall (Highway 70 west 1/2 mile west of the beltline in Raleigh).

**Ohio** - The expanded Dayton Hamvention is April 26-28 at the HARA Arena and Convention Center. Open house Friday, exhibits, technical sessions to run on Sat. and Sun.: DX, ARRL, vhf, fm, RTTY, MARS, antennas, space communication, transmitter hunts, ladies programs and others. Giant flea market for 2 days. Free bus service from downtown Dayton via motels and hotels. Free parking at the Arena with self-contained trailers and camper units permitted in designated areas overnight. Saturday banquet at 7 PM, with Sen. Barry Goldwater, K7UGA, as guest speaker. Registration \$2.50 advance; \$3 at door. Banquet is \$4.50. For info program and map write to Dayton Hamvention, P.O. Box 44, Dayton OH 45401.

**Ohio** - The 5th annual "FM Bash" of the Miami Valley FM Association is Friday evening, April 26. Details from W8SLY.

Ohio - The Erie Amateur Radio Society's semi-annual equipment auction is at 1 PM Sunday, May 5, 1205 West Perkins Ave., Laborers' Union Hall, Sandusky OH. Refreshments. Call in on 94/94 and 52/52.

Pennsylvania - The second annual 3917 kHz Butterfly Fling is April 27 in the Tamaqua Elks Club, Tamaqua. Cocktails at 4 PM, dinner at 6 PM. All reservations advance; closing date April 19. Make inquiries and reservations: K3NYX, 127 Market St., Tamaqua PA.

Pennsylvania - The annual Buzzards fly-in is May 4 at the Capitol Motel, Rt. 22, Harrisburg. Advance Reservations by April 26 write: Col. A. A. Manning, W3ND, 550 Belmont Dr., Harrisburg PA 17112.

South Carolina - The Blue Ridge Radio Society's annual hamfest is May 5 at the Re-

creation Bldg. in Cleveland Park, Greenville. Flea market, prizes, fun from 9 AM 'til 3 PM.

Texas - The annual picnic and get-together of the 7290 Traffic Net is April 27-28 at Lake Whitney State Park. Camping sites, cabins and motel rooms available. Registration is \$2. Mail to: Jane Eastman, WA5JFZ, Rt. 1, Box 432, New Braunfels TX 78130.

Washington - The Skagit ARC of Washington State will hold its 21st Annual Hamfest and Banquet at Bryant Grange Hall on April 20. An all-day program is planned, with Northwestern Division Director Thurston and other ARRL officials on hand. Special activities for the women and a tour of the Navy's million-watt radio station at Jim Creek are planned. For further information and advanced registrations contact Norman Ray, W7LFA, 14005 132nd Ave., Kirkland WA 98033.

## NEW BOOKS

**Solid State Servicing**, by RCA. Distributor Products, Harrison, NJ 07029. TSG-1673A, 8 x 5-1/4 inches. Price \$3.95. 352 pages including index.

From time to time, ARRL Headquarters receives letters asking why we do not publish either a course or articles about servicing or troubleshooting equipment. One drawback to such an undertaking is that to be useful, the article would be prohibitively long. A second consideration is that there are already many sources of servicing information, so why reinvent the wheel?

However, this recent publication by RCA has done an admirable job of placing a veritable storehouse of information in one handy volume. Although the book is primarily directed at those who would like to service hi-fi, tape recorders, TV, or a-m/fm receivers, the contents are so all-encompassing that almost any amateur should find it extremely useful in the shack or home.

The book starts its presentation with a discussion of basic solid-state theory to get the serviceman on speaking terms with modern techniques. Internal construction, typical circuit uses, and biasing requirements of the more common devices from simple diodes through transistors to dual-gate MOSFETS are explained.

Basic amplifier circuits are discussed in great detail, including the distinctions between Class A, B, and C. Those amateurs who persist in calling every amplifier a "linear" would do well to study this portion of the manual in depth. Types of amplifiers discussed include audio, i-f, and rf. Biasing and stability are explained as well as changes in performance because of device beta variations. Both discrete-component and integrated-circuit examples are given.

Chapter 3 is a very compact but clear course in power-supply theory and circuits. Discussions include types of rectifiers, filtering, device limitations, and regulation. An interesting circuit for an SCR regulator is given.

Chapter 4 treats the more practical aspect of servicing by delving into a-m and fm receivers. It begins with a discussion of what the various circuits are supposed to do, and why, then provides an explanation of how different techniques can accomplish the same end, and includes information

about measuring the performance of the different sections of a typical receiver. The how and why of stereo decoding is also covered clearly.

Hi-fi and tape-recorder amplifiers are treated in chapter 5, starting with an explanation of power ratings and ratios as related to dB. Frequency response and harmonic distortion problems are discussed, as well as hum and noise.

The same thorough presentation of color and black-and-white TV receiver theory is found in chapter 6. Since these receivers are more complex than items treated in previous chapters, this portion of the book is of greater length: 101 pages. The discussion starts with the tuner and proceeds in a logical manner through all sections of the typical TV receiver. All of the parameters that can affect the performance of a section are explained. Of particular interest are the age circuits and the sweep wave forms in detail.

In chapter 7 the book gets down to the nitty gritty of servicing under the title, "Finding The Defective Component." It starts with a listing of the test equipment needed and warns of some pitfalls to watch for when attempting to measure component values while they are in the circuit. Tests that can be made by using a VOM or VTVM are shown. Two interesting and useful testing devices attracted the attention of this reviewer; a simple transistor curve tracer and a tester for dual-gate MOSFETS. The former is called "Quick-tracer," and uses only a transformer and three resistors. It can be connected to almost any oscilloscope to obtain the patterns that are the "life signs" of a transistor. A good interpretation of these patterns is also given.

The MOSFET tester is called a "GO/NO-GO" circuit, using a bipolar transistor and incandescent lamps. It will enable the user to check either gate of a dual-gate MOSFET. Single-gate devices may be tested also.

The remaining three chapters, 8, 9, and 10, are devoted to the application of the foregoing theory and technique to typical problems as might be found in the field. A-m and fm receivers, black-and-white TV receivers, and color-TV receivers are the objects of the treatment. The convergence portion of the color-TV chapter is very thorough and is recommended for close reading.

Many of the newer receivers for amateur use are of solid-state design, and it would behoove many amateurs to be equipped to troubleshoot their own gear. This ability becomes more important when one realizes that service facilities for much

(Continued on page 93)

# I A R U News

INTERNATIONAL AMATEUR RADIO UNION, THE GLOBAL FEDERATION OF NATIONAL NON-COMMERCIAL AMATEUR RADIO SOCIETIES FOR THE PROMOTION AND CO-ORDINATION OF TWO-WAY AMATEUR RADIO COMMUNICATION

## FIVE-BAND AND SIX-BAND WORKED ALL CONTINENTS AWARDS

The International Amateur Radio Union announces the availability of five-band and six-band versions of the popular Worked All Continents award. These new awards are intended to promote the more uniform use of the high-frequency amateur bands for international communication and to recognize outstanding achievement by amateur stations in establishing two-way communication with the six continental areas of the world on each of the amateur bands available for such communication.

The following rules apply:

1) The basic award shall be known as "Five-Band Worked All Continents" ("5BWAC"). An endorsement for "Six-Band Worked All Continents" ("6BWAC") shall be available upon submission of proof of this additional accomplishment.

2) Applications shall be sent by the applicant, accompanied by the originals of the required confirmations, to the headquarters of the member-society for the country in which he resides. The headquarters of the member-society shall then examine the application and, if it is found to be satisfactory, shall so attest to the Headquarters society, ARRL, which shall issue the certificate and deliver it directly to the applicant. If the applicant resides in a country not represented in the Union, the application shall be sent directly to ARRL.

3) Where the applicant resides in a country which is represented in the Union, it shall be necessary for him to hold membership in the representative member-society in order to be eligible for the award.

These Scouts in Jakarta, Indonesia enjoyed a contact in their own language with countrymen visiting VS6SJ in Hong Kong during the 1973 Jamboree On-The-Air activities. YBØAD was operated from the Scouts' headquarters, and is pictured here with YBØIZ at the mike. (Photos courtesy YBØCJ)

4) The continental boundaries defined in the WAC rules shall apply to 5BWAC and 6BWAC.

5) To be used toward the award, contacts must be made from one station (in terms of license and call letters, but not necessarily of equipment) operated at one location. The term "location" shall be construed as representing one metropolitan area, or, alternatively, an area not exceeding 25 miles (about 40 km.) in diameter.

6) Contacts must be made on or after January 1, 1974 to be used in qualifying for this award.

Application forms for amateurs in the U.S. and Canada are available from ARRL headquarters.

## WORLD TELECOMMUNICATION DAY, MAY 17

Each year, to mark the anniversary of the founding of the International Telecommunication Union, the ITU celebrates World Telecommunication Day on May 17. The theme this year is "Telecommunications and Transport." In connection with the event, the *Departamento Nacional de Telecomunicacoes*, the regulatory authority of Brazil, is sponsoring an international contest on the previous weekend. Details are in "Operating Events" this month.

The ITU also calls attention to April 25 as the 100th anniversary of the birth of Guglielmo Marconi, one of the pioneers of radiocommunication.

## DX OPERATING NOTES

### Reciprocal Operating

United States reciprocal operating agreements exist only with: Argentina, Australia, Austria, Barbados, Belgium, Bolivia, Brazil, Canada, Chile,





Amateurs throughout the Pacific area kept busy during the last half of 1973 supplying a communications network in support of *Las Balsas* raft expedition. The three rafts, carrying twelve men from nine countries, took 177 days to float from Ecuador to Australia. VK2SG served as Australian communications coordinator for the expedition. H.R.H. Prince Philip (with microphone) is shown enjoying an amateur radio contact with the expedition from VK4TC, Townsville, Queensland. (Photo courtesy Wireless Institute of Australia)



Colombia, Costa Rica, Denmark, Dominican Republic, Ecuador, El Salvador, Fiji, Finland, France,\* Germany (Federal Republic), Guatemala, Guyana, Honduras, India, Indonesia, Ireland, Israel, Jamaica, Kuwait, Luxembourg, Monaco, Netherlands,\* New Zealand, Nicaragua, Norway, Panama, Paraguay, Peru, Portugal, Sierra Leone, Sweden, Switzerland, Trinidad and Tobago, United Kingdom,\* Uruguay, and Venezuela. Several other foreign countries grant FCC licensee amateur radio operating privileges on a courtesy basis; write ARRL headquarters for details.

Canada has reciprocity with: Belgium, Brazil, Costa Rica, Denmark, Dominica, Dominican Republic, Ecuador, France, Germany (Federal Republic), Guatemala, Israel, Luxembourg, Mexico, Netherlands, Nicaragua, Norway, Panama, Peru, Portugal, Senegal, Sweden, Switzerland, U.S., Uruguay, Venezuela, and Commonwealth countries.

### Third-Party Restrictions

Messages and other communications — and then only if not important enough to justify use of the regular international communications facilities — may be handled by U.S. radio amateurs on behalf of third parties *only* with amateurs in the following countries.\*\* Argentina, Barbados (only U.S. stations /8P), Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Greenland (XP calls only),

\* Agreement includes overseas entities.

\*\* By special agreements, third-party traffic is also permissible with amateurs in Australia and the Federal Republic of Germany for traffic regarding amateur satellites, with 4U1ITU, and with personnel of Project Hope in Jamaica.

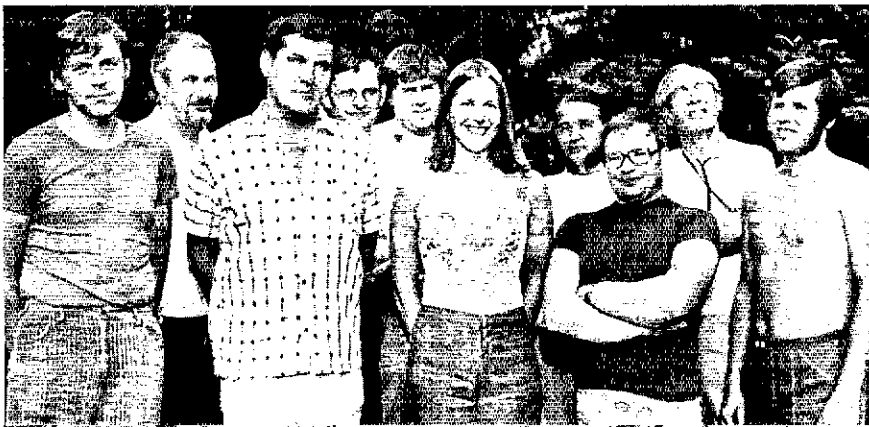
Guatemala, Guyana, Haiti, Honduras, Israel, Jordan, Liberia, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad & Tobago, Uruguay and Venezuela. Permissible prefixes: CE CM CO CP CX EL HC HH HI HK HP HR JY LU OA PT PY TG TI VE VO W or K/8P XE XP YN YS YV ZP 4X 4Z 8R and 9Y4. Canadian hams may handle these same type third-party messages with amateurs in Bolivia, Chile, Costa Rica, Dominican Republic, El Salvador, Honduras, Israel, Mexico, Peru, Trinidad & Tobago, U.S., and Venezuela. Permissible prefixes are: CE CP HI HR KO OA TI W XE YS YV 4X 4Z and 9Y4.

### DX Restrictions

Amateur licensees are warned that international communications are limited by the following notifications of foreign countries made to the ITU under the provisions in Article 41 of the Geneva (1959) Conference.

The Director General of the Posts and Telegraphs Department of Vietnam has notified the ITU that there is no objection to communications between amateur stations in other countries and XV5AC. However, communication with other amateur stations in Vietnam (XV or 3W8) is forbidden. Canadian amateurs may not communicate with Cyprus (except ZC4 and special 5B4 stations), Gabon, Iraq, Pakistan, Turkey, Khmer Republic (except XU1AA), Vietnam, Libya, and Yemen. Prefixes to be avoided by Canadians include AP TA TR8 XU XV YI 3W8 4W 5A. QST

This informal photo was taken by OH5YV during a meeting of the Board of Directors of the *Suomen Radioamatööriitto e.y. (SRAL)*, the Finnish national society. Pictured are (l-r) OH2MM, OH0NI, OH5NW, OH2BEW, OH2BH, OH2BIN, OH8RK, OH1VR, OH2XK, and OH2QV.





# Correspondence From Members -

The publishers of *QST* assume no responsibility for statements made herein by correspondents.

## WARNING SIGNAL

● *QST* has regularly been drawing our attention to the need to get ready for the next general frequency allocation conference (now set for 1979) and warning that *all* amateurs had better get on the ball and do something about the too-frequent bad image a minority of amateurs create in the minds of some government officials in those countries which do not have a historical perspective of amateur radio and who are not likely to be too receptive to giving out any frequency favors.

If anyone is inclined to pass off such warnings as overreaction, consider this excerpt from an editorial in the ITU's *Telecommunications Journal* (Vol. 41-1/1974), commenting on the recently concluded Torremolinos Plenipotentiary Conference:

"The first undeniable fact that comes to mind is the fundamental role played by the countries of the third world. For the first time in the history of the ITU the Conference's work was dominated by problems particular to those countries from the day it opened until the close. These countries brought their full weight to bear on the Conference's work not only because of their numbers but also because of their united viewpoint on most of the basic problems dealt with and the pertinence and quality of the statements of many delegations.

"Nevertheless, at one time it was feared that some of these interventions, which were of an outspokenness hitherto unknown in the ITU, might leave a bitter aftertaste with some delegations which contribute in a most effective and positive way to the work of the Union.

"... This grasp of the fundamental problems and their political implications for the future of our Union must be stressed."

Like a traffic signal, *QST* (and ARRL) have been flashing a warning amber light; we should also think about the red stop light that follows the amber, and what we can do to avoid it. — *J. Richard Cote, VE7DAO, Vienna, Austria*

## METRICS

● Was W4VCY kidding in his February letter against metric? Why, he ought to have quit reading his meters ages ago since volts, amperes, ohms and all the rest of the units have never been anything *but* metric! His kilodollars of toolroom instruments have Bureau of Standards comparisons against the International Meter supplied to their U.S. makers or else were made in Europe or Japan where metric was converted to inch, perforce. Maybe he can be happy that the old cockeyed "second" stays the same in metric, even if it is the bumpy 24(60)(60) instead of decimal.

Luckily, being brought up in physics before getting into engineering, either method of measuring is familiar to me; I even carry a 3-meter/10-foot tape and it's mighty handy for laying out antenna lengths without funny numbers. Wonder

what that OM does for millihenries or picofarads? — *Temple Nieter, W9YLD, Evanston, IL*

● "... Under what pretense of having our best interest at heart do you justify backing the movement to change our standard of measurement to the metric system? It is very interesting to watch how this idea has been very carefully and intensely propagated by the mass media as the "wave of the future" and that it is "inevitable," hoping to allay from the start any opposition to it. What is most distressing to me is how the public can be so conditioned that they salivate like Pavlov's dog at the mention of anything "international." Any need for us to change is so far from logical as to border on the asinine. It is, in fact, just another attack on the American consumer. Do you have any idea how broad that change would be? What it would involve in the way of tools, machines, books, maps and on and on and on? Who would it benefit? And, conversely, to whom would it be an adversity? The cost would be astronomical and we are consumers first. There is no conceivable benefit to the American public for such an absurdity to be forced upon us. Let's be logical, or should I say practical, in this instance, as we have in the past, and resist this retreat from sensibility. We are the largest industrial nation in the world. We should be its leader. If other nations want to follow us, fine; but let us not go in reverse and follow them. Let's think of US for a change. — *V. R. Yarbrough, W5YGX, Green Forest, AR*

● The angry letter from W4VCY concerning conversion to the metric system by *QST* struck a sympathetic chord.

It reminded me of the time, a few years back, when the hospital in which I work decided to "go metric," from pounds and inches to kilograms and centimeters and from Fahrenheit to Centigrade on the temperature charts. There was a lot of discussion about the many problems to be solved. For instance, how would Mother react when she was told by the nurse in the clinic that Junior weighed 14.6 kilograms and was 96 centimeters tall.

The measure appeared to be heading for defeat when one of the physicians charged with instituting the change, and himself a strong supporter of the metric system, announced in staff meeting that he had just ordered and received twenty gross of rectal thermometers calibrated in the centigrade scale and if the hospital didn't "go metric" what did the staff suggest he do with them.

This light touch produced the desired result and the metric advocates gained the necessary support. There have been some compromises but the metric system is clearly superior and most hams should be able to bear the shock. — *William F. Karl, M.D., W2EGX, Cooperstown, NY*

## FORBID WOMEN HAMS?

● A senior ham from this area who says he wishes to remain anonymous, has requested that I send in the following for publication.

As proof that women are against getting ham licenses I quote from page 25 of the 1974 *Radio Amateur Callbook*. Of the 280,262 ham operators of the U.S.A. only 11,670 are YLs, it is reported. Out of 437 hams in D.C. only 7 are YLs.

This lack must be seen in the light of the privileged position of women in our nation. Don't women own 80% of the wealth of the U.S.A.? Most women have far more free time than male wage earners in the daily rat-race, and women live on the average of something like 8 years longer than mere males.

This is not because women do not like to talk. It is unreliably reported that scientific tests show that kindergarten girls released to raid big department stores free of charge, in 99.99% of the cases come out with a doll in one arm and an extension telephone in the other. . . .

As a first step towards male liberation I propose that no male ham should phone-patch a woman. Do I hear any non-hysterical comments? - *Amateur Anonymous*

A conversation with our mystery man revealed that he has anti-women's-lib inclinations. He believes that women are inherently - uh, different. And the stated reason why he wishes to remain anonymous is that the next time he goes to Denver he might be mauled. Old Sigmund Freud would have had a lot to say about this.

In his letter, the choice of extension telephones by young girls may merely mean that they have enough sense to know that the land line generally offers a better circuit than ham radio does.

Luckily for the ham fraternity (fratority?), there are two anomalies in the picture, right in the Boulder Amateur Radio Club. One is Colorado's own Amateur of the Year, Margaret, WBØBEM. The other, of all things, is the mystery man's own XYL, who, along with the OM, holds an Extra Class license. You see, he just hasn't leveled with us. We know where his fears really lie. I hope he summons the courage to reveal himself to us some day.

I myself refuse to become involved in the issue of whether the difference between men and women is inherent or "role-conditioned." Anyway gals, "Vive la difference." And welcome aboard if you can pass the exams, but don't ever entice my XYL out of the kitchen. - *Richard Silberstein, WØYBF, Boulder, CO*

### BEST JEST

● John Beal's letter ("Satire," February Correspondence), is the best I have seen since the column "Dixie Jones' Owl Juice," in pre-WW II *QST*, and is probably the very best! Somewhere I think I have read that "a lot of truth is contained in jest" - or something like that.

We need more such letters; or maybe a column dedicated to protection of our interests and frequencies.

Anyhow, our friend John Beal does a real fine business job (I wish I could write like that). *QST* should, perhaps, hire him. But then you could not pay him enough. If he needs a job Art Buchwald would surely pay him very well! - *John R. Henthorn, WAENP, Capt. USCG (Ret.), Daytona Beach Shores, FL*

### FT-101B REVIEW

● Your review of the FT-101B in the February issue is perhaps the finest ever in *QST*. You are easily as choosy as any of us. Unlike the balance of

the group of nit-pickers you solve the problems as well. *QST* reviews have come a long way from the days of reciting the factory spec sheet as gospel.

This type of review is a handy tool in deciding among various factory products. The only possible fault is its unannounced nature. I have all too often bought gear and found *QST*'s condemnations based on all too apparent defects. Were there some way to know ahead of time of an impending comprehensive review this type of disaster could be avoided or at least lessened in frequency. In old *QST*'s (my collection goes back to 1964) there were occasional glimpses as to what next month's reviews would contain. Perhaps this custom should be rejuvenated. Gear costs far more than a mere 10 years ago.

Keep up the good work. You have no need to fear a coming dues hike. The technical side of *QST* is cheap at twice the price. - *Stanley Jaffin, WB4IRK, Arlington, VA*

● Having served overseas, I was very dismayed and disappointed at a reference made in the article evaluating the FT-101B which says, in effect, "no need for a-m as the 11-meter band could have been left off."

The 11-meter band is there for the foreign buyers, so if I were reading the article as a foreigner, I would interpret that sentence to mean, "They could have eliminated 11 meters because we can't use it in the U.S., and the hell with the rest of the world's amateurs who can."

Don't you think it is a bit selfish to suggest that Japan (or anyone else) design rigs for the American with only U.S. band privileges in mind?

I cannot sincerely believe this is the image we want to convey to our foreign friends - I suggest you proofread articles more carefully to assure that statements made are not biased toward any one amateur group, nor suggestive that any one country is more important than another. A ham is a ham is a ham regardless of nationality. - *Hugh Vandegrift, WA4WME/Ø, St. Louis, MO*

### COLUMNAR CONFUSION

● It looks like the editors and proofreaders of *QST* are getting so confused by the conversion to the metric system that they no longer can tell time!

According to page 50 of February '74 *QST* this is either the year 1949 or the year 1999.

February 1924 is under the "25 years ago this month" column, and February 1949 is under the "50 years ago this month" column.

Maybe you oughta change the name from *QST* magazine to 73? - *Joel D. Jensen, Mankato, MN*

### EXTRA INTEREST

● I have long thought that some of the excellent technical articles in *QST* should be edited into a convenient Technical Handbook.

A case in point is the series of articles by Walt Maxwell, "Another Look at Reflections." These should be published in the antenna handbook or put into a booklet by itself. It would be a shame to let this excellent article die in the old issues of *QST*. Mr. Maxwell is flashing much light on a subject we should know more about but somehow don't.

"Another Look at Reflections" exhibits once again the fine quality of *QST* technical articles. - *Paul A. White, W6BKX, Mill Valley, CA*

# Happenings of the Month

- ARRL Files on EMS, Alaska Dockets
- W8JMW, VE3WT, New Vice Directors
- Executive Committee Minutes

## ARRL COUNTERPROPOSAL FOR EMS

Opposing the latest attempt to raid amateur bands, Docket 19880, the League has suggested to FCC that frequencies for radio paging in the proposed new Emergency Medical Service be taken from the remote pickup broadcast service at 455.8-456.0, rather than from 449.8-450.0 MHz. Aside from the reasons obvious to us amateurs, this suggested allocation would be better for EMS, since it would be free of the possibility of QRM from government radar which shares the 420-450 MHz space with the amateur service.

The full text follows:

Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D. C. 20554

In the Matter of

Amendment of Parts 2 and	)	
89 of the Commission's	)	
Rules and Regulations	)	Docket
Relating to Communications	)	No.
for Emergency Medical	)	19880
Services	)	

TO: The Commission

### COMMENTS AND COUNTERPROPOSAL TO NOTICE OF INQUIRY, PROPOSED RULE MAKING

The American Radio Relay League, Incorporated, the national non-profit organization of amateur radio operators, respectfully submits the following comments and counterproposal in response to the Notice of Inquiry and Proposed Rule Making released December 4, 1973. 38 FR 33617.<sup>1</sup>

#### Summary

The Amateur Radio Service is and always has been an integral part of the overall disaster and emergency communication system of the United States. It is short-sighted to impair the emergency

<sup>1</sup>This and other footnote references appear at the end of this item.

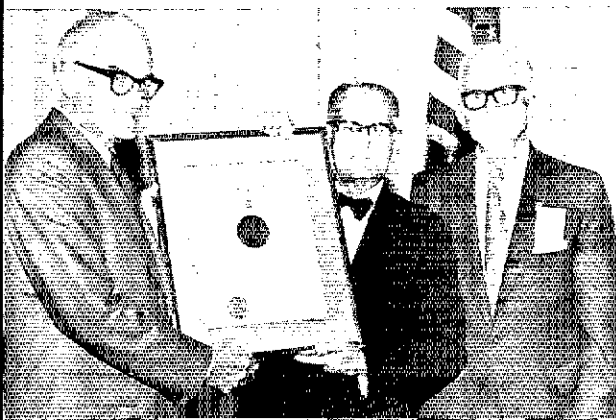
effectiveness of one service by removal of some of its frequencies to improve the effectiveness of another emergency service, particularly when other frequencies are readily available.

#### The Commission's Proposals

1) The establishment of a vastly improved emergency medical service (EMS) is universally urged by medical and health agencies and authorities to supplement and in some instances to replace the emergency services now being rendered by numerous organizations including hospitals, police and fire departments, ambulance services, and various volunteer groups. Additional radio communication channels are essential if the new service is to be effective. Exclusive channels must be found to supplement the shared channels now available in the Emergency Radio Service, Part 89 of the Commission's Rules. Studies of communication requirements by Advanced Technology Systems, Inc. (ATS), under an FCC contract and by an ad hoc committee of the Interdepartment Radio Advisory Committee (IRAC) of the Office of Telecommunications Policy (OTP), have set forth in considerable detail the system requirements.<sup>2</sup>

2) Among the services for which effective radio communication is essential are (1) dispatching and controlling the movement of emergency vehicles; (2) messages related directly to the patient and his care, i.e., medical telemetry and a "doctor's talk" channel; (3) extensions of both (1) and (2) from an emergency vehicle to the actual location of the patient, e.g., in an apartment, in a field, or a boat, etc.; (4) messages necessary for effective coordination and preparedness for reception of the patient, i.e., intra-hospital, hospital-to-hospital, and a coordination center; (5) paging systems to call individuals and mobilize medical personnel, including possibly two-way portable radio paging to supplement or replace the "beep" systems now used; (6) interface with police, fire and other local Government agencies; and (7) disaster situations.

3) Three of the seven channels IRAC recommends for radio paging, 449.850, 449.900, and 449.950 MHz are located within the 420-450 MHz band which the Amateur Radio Service shares with



Senator Barry Goldwater, K7UGA/K3UIG, received the first David Sarnoff Citation for his "significant contributions in electronic communications." The award was established by the Radio Club of America in memory of General Sarnoff, guiding spirit of RCA Corporation for decades. Making the presentation is Fred M. Link, president (at center), backed up by Jack R. Poppele, a director of the club. (RCA Corporation photo)

Jim Rafferty, WA9UCE, won the Illinois Ham of the Year trophy presented annually by the Hamfesters Radio Club of Chicago -- but then things got confused. The award was actually presented at the Pacific Division Convention by ARRL President Harry J. Dannels, W2TUK, and this photo was snapped by Roanoke Director Victor C. Clark, W4KFC! Until his move to California, Jim was a member of ARRL's Contest Advisory Committee.



Government Radiolocation. All other channel proposals, including those for paging, fall outside an amateur band. These comments will be limited to the proposed reallocation of amateur frequencies.

#### *Amateur Retention of the Entire 420 MHz Band is Essential to Proposed Emergency Medical Service*

4) The record of service of radio amateurs in providing communications with the outside world in times of major disasters, such as the Alaska earthquake in 1964 and the Nicaragua earthquake in December 1972 is known and documented. Less publicity has been given, however, to the more localized and internal service provided by radio amateurs in such recent disasters as the San Fernando Valley, California, earthquake in February 1972 and the tropical storm Agnes floods of June 1972 in north central Pennsylvania and south central New York. Little or no publicity is given to the scores of reports each day to police and other emergency agencies via amateur radio of traffic accidents requiring immediate ambulance or medical attention. With respect to the latter, the following is again quoted from the IRAC report:

The first 30 minutes following an injury or heart attack generally determine whether the victim will live or die.

Immediate summoning of aid is stressed time and again in both the IRAC and ATS reports. One such reference is on page I-6 of the ATS report:

The emphasis is upon saving time in reporting emergencies by providing citizen access to the EMS System, in responding to an emergency and in realizing an improvement in the medical treatment provided prior to and in preparation for delivery to a patient at a hospital.

5) The upper vhf and lower uhf frequency bands allocated to the Amateur Radio Service are uniquely suited for local and regional disaster and emergency communications, particularly when repeaters are employed. The vhf bands were used to provide intra-community communications during the Alaska and Nicaragua earthquakes, and the vhf and uhf bands were widely used to handle a very high percentage of all emergency traffic during the 1972 San Fernando Valley earthquake and the 1972 Pennsylvania-New York tropical storm Agnes floods. Scores of automobile accident reports by amateurs each day are via vhf or uhf repeaters.

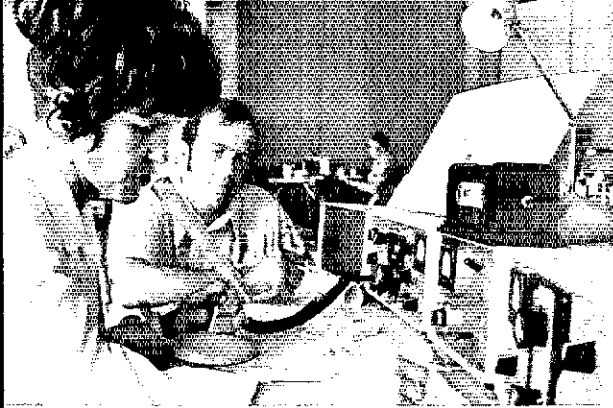
6) Interest of radio amateurs in the vhf and lower uhf bands has increased dramatically over the last ten years and particularly since the adoption by this Commission in September 1972 of rules concerning repeater operations and controls. (Docket No. 18803). A very high percentage of the mobile voice communications are via repeaters which, pursuant to Section 97.61(c), are restricted to certain subbands in the vhf-uhf region. The control and auxiliary link stations required for

remote transmitter and repeater control by radio must operate above 220 MHz, but not in the space window between 435 and 438 MHz. (Sections 97.109 and 97.110).

7) Amateur repeaters operating within the 442-450 MHz repeater subband in some heavily populated areas have been and are being developed with the same basic standards of 25 kHz channeling and 5 MHz separation between input and output frequencies specified by the Commission's rules for the land mobile services. Thus, under this standard, there are 118 pairs of channels available for repeaters within the subband. Not all are available in some areas, however, because of Government radiolocation operations. Just as with the land mobile services, the heaviest demand and usage for frequencies is within the largest metropolitan areas. Thus, any allocation plan must be based upon the minimum needs of the megalopolis extending from Washington, D. C., to Boston, Massachusetts, and the heavily populated area of Southern California extending from Santa Barbara south to the Mexican border below San Diego.

8) Loss of even 200 kHz<sup>3</sup> of this subband, as proposed in this proceeding, would inhibit the operation and growth of the amateur service, particularly in the major metropolitan areas and in areas where frequencies are limited by Government radiolocation operations. For example, the California Amateur Relay Council, which participates in frequency coordination of the Amateur vhf and uhf bands in Southern California, reports that 115 major repeater or remote controlled transmitter systems already utilize one or both of the channels of the 118 repeater pairs and that 10 systems are utilizing the 25 kHz channels between 449.800 and 450.000 MHz. The number of such transmitters, standing alone, is not a true indication of usage as each has a number of individual amateur stations in its system. Other repeaters are being planned and are in various stages of construction. The clearing of 8 channels between 449.800 and 450.000 MHz could only be accomplished at the expense of established repeater and other systems and would most seriously inhibit any further expansion to accommodate the ever-increasing needs and demands.

9) The financial impact upon individual amateurs throughout the United States would be more severe if even 200 kHz should be removed from the band. The number of individual amateur stations equipped to operate on these or most other repeater channels in a given area is not known with but an occasional exception because, unlike the land mobile services, specific operating frequencies are not specified in the licenses. The number of



stations heard on a channel during any day, week or even month does not reflect the number already equipped to operate on that channel. It is reasonable to assume that, in only the California area, at least 1,000 amateurs are equipped to operate on an average of two channels between 449.800 and 450.00 MHz. With receiver and transmitter crystals costing an average of \$20 per pair, the cost of shifting just those equipments from that 200 kHz would be at least \$40,000. Nationwide, the cost might be \$100,000 or even more. Unlike expenditures by commercial licensees, those of the amateur must come from his own pocket and cannot be considered as tax deductible business expenditures.

10) The proponents and supporters of the proposal to reallocate 449,800-450,000 MHz obviously overlooked the all-important role of radio amateurs in providing ever-expanding emergency communications. They apparently proceeded upon the assumption that deletion of even 200 kHz would have little or no impact upon the Amateur Radio Service and individual amateurs, either now or in the future. Their error must be recognized by the Commission.

#### *The Proposed Reallocation Would Be A Breach Of Faith With Amateurs*

11) The Commission amended Part 97 of its rules in September 1972 after a rule making proceeding stretching over some years and assigned the 442.0 to 450.0 MHz subband for repeater operation, (Docket No. 18803). In reliance upon the new rules, many hundreds of radio amateurs throughout the country have spent tens of thousands of dollars of their own hard-earned money and have devoted countless hours to developing and placing in operation repeater and associated stations in that band. Much of the investment of money and time has gone into equipment operating on the frequencies now proposed to be withdrawn from the Amateur Radio Service. It is indeed difficult to understand why the Commission "flashed the green light" in September 1972 and then only 15 months later serves notice that it might change its mind. Seldom, if ever, has the Commission so changed its course in such a brief period.

#### *Restrictions to EMS Imposed By Government Radiolocation Should Be Avoided*

12) The objective of this proceeding is to provide nationwide, dedicated, (unshared) interference-free channels for the new Emergency Medical Radio Service. The proposed use of

They do things big down in Texas. When the world's largest airport was dedicated last autumn, amateurs of the Dallas/Fort Worth area operated special-events station WD5FWA from the terminal, for 33 hours, snagging 2105 contacts on five hf and three vhf bands, working all states and 26 countries. Here Betty Bowling, WA5VHW operates while Stu Bonney, W5PAW, logs.

449.800-450.000 MHz will not meet that objective because restrictions in all probability will be required in some areas to prevent interference to or from Government radars. Information concerning the locations and characteristics of such radar installations are classified and not generally available to the public. However, amateurs are aware of the presence of radar in the band and have been able to design their installations and pattern their operations to avoid harmful interference. It is known that some radars change frequency from time to time. Amateurs can tolerate such periodic disruptions which would be totally unacceptable to a service such as EMS. Therefore, the frequencies are entirely satisfactory for use by amateurs but most certainly not for a nationwide, dedicated, non-interference service.

#### *The Reason for Selection of Amateur Frequencies Has Not Been Disclosed*

13) The reasons for proposing reallocation of a portion of the 420 MHz amateur band, particularly since it is shared with the Government Radiolocation Service and subject to interference, cannot be determined from the IRAC report. What consideration, if any, did the IRAC ad hoc committee give to use of frequencies assigned to other services? Why were uhf frequencies selected for three paging channels? The answers to these questions should be made available comment by interested parties before this proceeding is concluded and any rules are adopted.

#### *Another 200 kHz Band is Available*

14) In keeping with its policy of offering constructive counterproposals, the League instituted a study of allocations and assignments in the 450-470 MHz band to determine if a 200 kHz band can be made available on a nationwide, dedicated, non-shared basis without seriously disturbing another service. Although a number of possibilities were worthy of study, the brief time provided by the Commission for submission of comments made it necessary to limit the study. Nevertheless, it was most productive.

15) Two bands, each 1 MHz wide, are now allocated to the Auxiliary Broadcast Service on a non-shared basis for remote pickup operations.<sup>4</sup> Ten 100 kHz channels are assigned exclusively to the remote pickup broadcast stations in two uhf bands, 450.00-451.00 MHz and 455.00-456.00 MHz. These are the only bands between 450 and 470 MHz in which 25 kHz channeling is not mandatory. The only service in the 450-470 MHz land mobile band which has not instituted frequency conservation practices, including industry channel coordination and channel splitting, is the Auxiliary Broadcast Service.

16) A study of uhf remote pickup assignments as of August 1973 has disclosed the following:<sup>5</sup>

Table I

Channel (MHz)	Assignments		Base
	Total	Mobile	
450.050	410	341	69
450.150	259	205	54
450.250	220	170	50
450.350	224	183	41
450.450	139	94	45
450.500 <sup>6</sup>	1	—	1
450.530 <sup>6</sup>	1	—	1
450.550	228	177	51
450.650	181	135	46
450.750	227	185	42
450.850	137	101	36
450.950	262	219	43
455.050	220	183	37
455.150	182	148	34
455.250	177	127	50
455.350	174	132	42
455.450	138	105	33
455.500 <sup>6</sup>	2	2	—
455.550	172	137	35
455.650	116	87	29
455.750	158	112	46
455.850	134	100	34
455.950	175	145	30

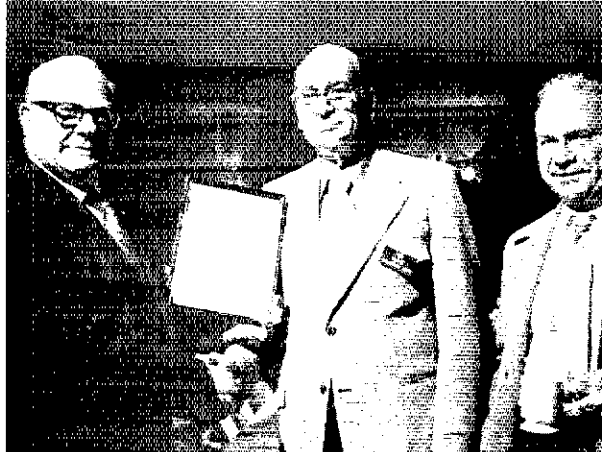
17) Since reallocation of 200 kHz from the amateur band is proposed by IRAC, the above totals were analyzed on a two channel (200 kHz) basis.

Table II

450.05-450.15	669	546	123
450.15-450.25	479	375	104
450.25-450.35	444	353	91
450.35-450.45	383	277	106
450.45-450.55	369	271	98
450.55-450.65	410	312	98
450.65-450.75	408	320	82
450.75-450.85	364	286	78
450.85-450.95	399	320	79
455.05-455.15	402	331	71
455.15-455.25	359	272	87
455.25-455.35	351	259	92
455.35-455.45	312	237	75
455.45-455.55	312	244	68
455.55-455.65	288	224	64
455.65-455.75	274	199	75
455.75-455.85	292	212	80
455.85-455.95	309	245	64

18) A further study was made of the actual assignments on the 455.85 and 455.95 MHz channels because this pair has the lowest number of assignments of any 200 kHz band edge. The study disclosed the following geographic assignments:

State	Total	Mob.	No. of City/	
			Base Lic.	Areas
Alabama	8	7	1	1
California	72 <sup>7</sup>	60	12	12
Colorado	10	7	3	2
Connecticut	7	5	2	1
Florida	21	13	8	2
Georgia	1	—	1	1
Illinois	11	9	2	2
Indiana	4	2	2	3
Kansas	10	8	2	2
Louisiana	4	3	1	1
Maryland	9	9	—	1
Massachusetts	11	11	—	2
Michigan	14	10	4	3
Minnesota	4	3	1	1
Missouri	1	—	1	1
Nevada	2	1	—	1
New Jersey	5	4	1	2
New Mexico	5	4	1	1



Dean Davis, W5BGE, receives the West Gulf Division Certificate of Merit from Director Roy Albright, W5EYB, left, while South Texas SCM Arthur Ross, W5KR, looks on.

New York	45	43	2	2	1
North Carolina	6	5	1	2	2
Ohio	4	4	—	3	3
Oregon	1	1	—	1	1
Pennsylvania	1	—	1	1	1
South Carolina	3	2	1	1	1
Texas	24	20	4	4	4
Utah	11 <sup>8</sup>	—	11	4	1
Virginia	5	5	—	1	1
Dist. of Col.	5	3	2	1	1
Puerto Rico	3	—	3	2	3

Transmitters assigned to either or both 455.85 and 455.95 MHz as well as to at least one other channel are as follows:

California	23
Florida	7
Illinois	8
Indiana	1
Kansas	1
Michigan	4
New Mexico	2
New York	45
Ohio	3
Pennsylvania	1
South Carolina	3
Utah	6
District of Columbia	4

The June Cover Plaque went to Peter John Bertini, K1ZJH and Richard Van Hooft, WB2MBI for their article, "A Practical Approach to Two-Meter Frequency Synthesis." New England Director Robert York Chapman, W1QV (right) presents the plaque to John, while Calvin Phillips, W1MDM, President of the Mount Tom Amateur Repeater Association looks on.





Fred "Doc" Westervelt, W4NO, receives his plaque for fifty years of League membership from Victor C. Clark, W4KFC, who has just moved up from Roanoke Division Director to First Vice President of ARRL.

Thus, only 165 of the 273 transmitters having assignments of either or both 455.85 and 455.95 MHz must acquire modifications of license and frequency control crystals to operate on at least one other channel other than either 455.85 or 455.95 MHz. At \$20 per crystal, the total cost of replacing all 455.85 and 455.95 MHz transmitter crystals would be only \$6,180. A lesser number of receiver crystals would be replaced. The overall cost to the broadcast industry of making these two remote pickup channels available for three channels in the Emergency Medical Service would be less than \$10,000.

19) In every city and area except perhaps Los Angeles, Chicago and New York City, the number of unoccupied channels in the 450-451 and 455-456 MHz bands is more than adequate to permit reassignment without any difficulty whatsoever. With respect to the Los Angeles area, all 14 transmitters now assigned to only 455.85 or 455.95 MHz are licensed to Westinghouse Broadcasting Company. Commission records disclose that Westinghouse is the licensee of three additional mobile and one additional base station operating on other channels in the 450-451 MHz band in Los Angeles. With respect to Chicago, only two mobile and one base transmitter owned by the American Broadcasting Company do not have at least one other assignment. Commission records show that ABC is licensed to operate 16 mobile transmitters on 450.750 MHz and is the principal occupant of that channel. With respect to New York City, every transmitter is licensed to operate on at least one other channel as well as on either 455.85 or 455.95 MHz. Five of the transmitters have at least two other channels, 12 have at least three other channels, and 14 have at least four other channels. No scarcity of replacement channels exists in any of these three cities.

20) The need for twenty 100 kHz channels in the 450-470 MHz band for remote pickup broadcast service to meet either present or future needs is highly questionable. Should 20 channels be required, some could be reduced to either 75 or 50 kHz. There appears no valid reason why the broadcast service cannot make a more efficient use of at least one of its two 450 MHz bands, particularly since future expansion of the remote

pickup service requiring 100 kHz channels is not anticipated as the standard fm and vhf television broadcast bands are virtually saturated. With expansion of the number of broadcast stations almost halted, there will be little demand for additional remote pickup stations. Even a sizeable demand can be accommodated on the many channels which would remain available.

21) The League's counterproposal, then, is that the 200 kHz lying between 455.800 and 456.000 MHz be reallocated to the Emergency Medical Radio Service in lieu of the proposed reallocation between 449.800 and 450.000 MHz. Not only will a more efficient use of the spectrum be achieved, including provision for the certain expansion of amateur uhf activity, but also the necessity of imposition of restrictions upon the Emergency Medical Service because of Government radio-location interference will be removed.

### Conclusions

22) Three frequencies proposed for the Emergency Medical Service, 449.850, 449.900, and 449.950, are not satisfactory for a nationwide, dedicated, non-interference paging service because of interference to and from Government radio-location operations in the band. Reallocation of those frequencies will seriously disrupt present amateur radio operations and will inhibit future growth of amateur radio emergency communication capability. The Commission is urged to reallocate 200 kHz of the 455-456 MHz remote pickup broadcast band and assign 455.850, 455.900, and 455.950 MHz to the new Emergency Medical Radio Service.

Respectfully submitted,  
**THE AMERICAN RADIO RELAY LEAGUE,**  
 By Robert M. Booth, Jr.  
*Its General Counsel*

January 31, 1974

<sup>1</sup> The Notice of Inquiry and Proposed Rule Making contains no reference to the proposed frequencies. The only reference to frequencies is in an attachment which wasn't printed in the Federal Register. A question is raised concerning compliance with Section 553(b)(3) of the Administrative Procedure Act.

<sup>2</sup> The following consensus of the medical profession is quoted from the IRAC report attached to the Notice of Inquiry and Proposed Rule Making:

20% of the annual accidental deaths could be prevented with prompt and proper care at the accident scene and with efficient transport to a suitable medical facility.

25% of the annual cardiovascular deaths could be prevented through public education and the provision of prompt and adequate treatment.

15% of the 56,000 highway deaths could be prevented as demonstrated in Illinois by a statewide system of regional hospital trauma centers supported by a communication network and an ambulance system of highly trained attendants. The major improvement can be expected in rural areas where 65-70% of highway deaths occur. In 1971, it was reported by the Division of Emergency Health Services of USPHS [United States Public Health Service], DHEW [Department of Health, Education and Welfare], that while 50% of the ambulances in the country had two-way radio communications with a dispatching center, less than 10% maintained such communications with hospitals or their emergency department. (Footnotes omitted)

<sup>3</sup> Although the IRAC report refers to 25 kHz channeling, the separations proposed are for 50 kHz channeling. Adherence to 25 kHz channeling will reduce by half, to 100 kHz, the subband required.



<sup>4</sup>Part 74, Subpart D, provides, in pertinent part, as follows:

(a) "Remote pickup broadcast mobile stations are "used for transmission of program material from the scene of events which occur outside a studio and for the transmission of cues and orders and other related communications necessary to the accomplishment of such broadcasts . . . A remote pickup mobile station may communicate with the broadcast station with which it is operating, with the base station or stations with which it is associated, and with other remote pickup broadcast mobile stations." (Section 74.431(a)).

(b) "Remote pickup broadcast base stations may be used for the transmission of cues, orders and instructions to remote pickup broadcast mobile stations for the purpose of dispatching them to the scenes of events to be broadcast, and directing their operations on the scene." (Section 74.431(b)).

(c) "Remote pickup broadcast base and mobile stations may be used for operational communications on condition that such use does not interfere with the transmission of program material or preparations for the transmission of program material by other remote pickup stations." (Section 74.421(c)).

(d) There is no limit upon the number of remote pickup transmitters licensed to one broadcast station licensee, but a separate license is required for each transmitter. Frequencies between 1606 and 1646 kHz, 25.87 and 26.47 MHz, 152.87 and 170.15 MHz, and 450.05 and 456.00 MHz are allocated in bands and groups. More than one frequency in any one group will be assigned to a single transmitter if requested by the application. Frequencies are not assigned on an exclusive basis. Licensees must coordinate their operations to prevent interference to other remote pickup stations of other licensees. (Section 74.402).

<sup>5</sup> Frequency assignments, many of which are to but one transmitter.

<sup>6</sup> Special assignments on frequencies not specified in the rules.

<sup>7</sup> Represents only 41 transmitters as 31 transmitters are assigned to both 455.85 and 455.95 MHz.

<sup>8</sup> Represents only 6 transmitters as 5 transmitters are assigned to both 455.85 and 455.95 MHz.

## ARRL FAVORS KL7 EMERGENCY FREQ.

FCC proposed, in Docket 19909, to establish 4383.8 kHz as a common emergency frequency in Alaska, for intercommunication of stations in the amateur service and various of the fixed and mobile services (see page 67, March *QST*).

The League has filed comments supporting the proposal. Extracts appear below:

2) The Commission's notice poses a number of questions. Each will be answered, but not necessarily in the order of presentation in the notice.

3) *Frequencies:* Propagation characteristics in Alaska are so unique that the League cannot suggest an optimum frequency or frequencies. A frequency closer to the upper edge of the 3,500-4,000 kHz amateur band is desirable, however, to permit more participation by individual amateurs, a large percentage of whom now operate ssb (voice) near the upper edge of that band. It is significant that the largest number of potential participating stations are amateur. Some, but by no means all, of the amateurs will encounter difficulty in modifying their transmitters, receivers, transceivers and antennas for operation at 4,383.8 kHz. Stations in other services should encounter less difficulty of operating at a lower frequency because of the design characteristics of the equipment.

4) *Participating Services:* The League concurs with the views expressed in the notice that the Amateur Radio Service should be permitted to participate and that the Citizens Radio Service must be excluded, both because equipment not suited to that service would be required and "because of the past history of rule violations in the Citizens Radio Service, their inclusion could jeopardize the success of the emergency network." (Notice, para. 9). The proposal to limit participation by those services now using hf ssb equipment is reasonable.

5) *Frequency Control:* Crystal control or highly stable accurately calibrated variable frequency oscillators (VFO) should be permitted.

6) *Participating Stations:* Two views have been expressed by League members to the League's Emergency Communication Advisory Committee. One is that all licensees of the participating services automatically be permitted to participate in the network. The other is that the licenses of participating stations must bear a special endorsement. Insofar as radio amateurs are concerned, a special endorsement should not be required and any amateur holding a grade of license permitting radiotelephone operation in the 3,500-4,000 kHz amateur band should be permitted to participate.

7) *Station Power:* Stations other than amateur should be permitted to operate with maximum power authorized in their licenses. Amateur stations should be permitted to utilize the maximum power permitted in the 3,500-4,000 kHz amateur band, i.e., 2 kW PEP input. There most certainly will be situations where there never can be too much power.

8) *Permissible Communications:* Experience has demonstrated that an emergency often is difficult to define. A broad and flexible interpretation as to what constitutes an emergency should be left largely to the discretion of the individual station.

9) *Control:* Firm control by one or more designated stations must be maintained, and reasonably rigid and uniform operating procedures and practices must be employed. Control should be vested in and exercised by an appropriate office or agency of the State of Alaska. An operations manual should be prepared and followed.

10) *Practices and Drills:* No emergency system can be effective without periodic practice and drill sessions. Experience with equipment operation and propagation capabilities and limitations is essential. Therefore, moderate and routine use of the channel should be permitted for such purposes. However, casual transmissions must be avoided.

11) *Monitoring:* Monitoring at a number of different points throughout Alaska is considered essential if the occasional all-important weak signals are to be heard and understood. Uninterrupted monitoring can be handled by stations in other services such as public safety. Monitoring by stations authorized to participate, other than by specific designated stations, should not be required.

12) Should such an emergency network be established, the League will make available the expertise of its Communication Department, Section Emergency Coordinators, and Emergency Communications Advisory Committee and various operating and training aids . . .

(Continued on page 153)



# YL news and views

CONDUCTED BY LOUISE RAMSEY MOREAU,\* W3WRE

## Who Were You?

**O**FTEN, when we are asked if we know a certain woman, our first question is "Who was she?" for names can be very deceptive. We change our names easily, and answer to new ones with little troubles from nicknames, to the big change when we are married. In amateur radio we are all on a first-name basis from the opening transmission, and are Betty, Madge, Anne, or Jane. If we add anything to it when we are discussing contacts with each other we just add the call which is a far more familiar designation. Sometimes when we are working we hear a voice with a call that we have never logged because a move to another call area, or country doesn't stop a YL from operating.

Leading the list of women whose calls have changed is Darleen, HC2YL, with her thundering list of 22 calls from around the world. W4HWR, Hilda has held DL3AAB, K2IWO, W9HWJ, and KA2HA. Two other YLs have held multiple calls: W1YL, Ellen (W1YYM, W6YYM, KH6QI, W2RBU), and Louisa, W5KZJ (W0SCF, W7OOH, W2OOH, W1OOH).

There are many others — our Navy MARS calls disguise us completely, while the Air Force, and Army MARS calls change the prefixes.

For the gals who must change, it is off with the old, and on with the new as quickly as possible for it is the YL behind the call that counts.

## New WAS-YL Custodian

YLRL announces the appointment of a new custodian of the club sponsored WAS-YL certificate. WA3GBJ, Agnes Helinski, RD No. 4, West McClain/Timms Lane, Belle Vernon, PA 15012, will be the new custodian. It is requested that all requests for this certificate be addressed to her.

The new appointee replaces Chris Haycock, WB2YBA, who is the 1974 YLRL Vice President.

\*YL Editor, *QST*. Please send all news notes to W3WRE's home address: 305 N. Llanwellyn Ave., Glenolden, PA 19036.



Rosie Lamb, W3NNGS, holds an Advanced Class amateur license, and is at present working towards Extra Class. Rosie is an avid DXer. (W3BWZ photo)

## 1975 CLARA Convention

CLARA, Canada's nationwide YL organization, plans a Canadian YL Convention as a part of the International Meeting of Amateur Radio Clubs in Calgary, August 1, 2, 3, 1975, in connection with the Centennial Year.

Donez Booth, VE6YL, has been selected to act as CLARA Convention Chairman. The YL program will include a CLARA meeting, program for all licensed women amateur radio operators, and a full two days program for the ladies who attend.

## CLARA Net Certificate Changes

Because of the difficulty of differences in frequencies for Canadian operators, rules for the CLARA certificate have been modified to accommodate amateur operators in this country. The new requirements, now in effect, state: "No change of rules for CLARA members. Other YLs, and OMs in Canada work 10 YLs in 5 call areas with no more than 4 VE3 contacts. USA and DX

Amy Surace, I8YLS, and OM Bruno, I8SUD. Amy is sponsored by the North County YLRC as a YLRL member under that club's "Adoptee" Program.



MINOW net members who attended the annual picnic were, (l-r) front row: WA7BDD, Joan; K7MFS, Gladys; W7SLX, Ethel; W7SPA, "Tiz"; K9TWQ, Jessie; WN7UFS, Mona. Second row: K7RAM, Bobbie; WA7IRD, Willie; W7NOB, Gwen; K7RBE, Velda; WA7TPU, Bernice; K7PVG, Frieda; W7LOQ, "Tiny." Back row: K7UBC, Verda; WA7FRM, June; WB6RFE, Lucie; W7FDE, Alma; WA7RBR, Margaret; WA7RVA, Ruth.

stations work 5 YLs in 3 call areas with no more than 2 VE3 contacts.

The CLARA Net schedules a "free day" each month in order to facilitate those persons who are anxious for contacts with members to acquire the certificate. The Net Control Station will announce when this net session is scheduled.

#### 1974 WRONE Officers

WRONE, the YL club of women amateur radio operators in New England, have elected the following women as the club's officers for the year 1974. President, Peggy Harnois, K1SGF; Vice president, Alice La Vigne, K1TOP, Secretary-Treasurer, Carolyn Thompson, K1BJZ; Hospitality, Cecile Malo, W1VBT, and Rita Hale, W1UZR.

Peggy, K1SGF, is a former editor of *YL Harmonics*, the official YLRL publication.

WRONE sponsors two nets, the "Yankee Lassies," meeting Wednesdays on 3.910 MHz, at 1330 GMT, and the "New Englanders," a vhf net, also on Wednesdays, on 56.65 MHz, at 1900 GMT. The club, an on-the-air organization due to the large geographical coverage, sponsors the WRONE certificate.

#### 1974 Colorado YL Officers

The 1974 officers of the Colorado YL Club are President, Joan Ehlis, WB0ALK; Vice President, Helen Cox, K0WZS; Secretary, Ollie Shriner, WA0WAD; Treasurer, Elaine High, W0HEM; Historian, Linda Vidmar, WA0MNM.

The Colorado YLs, a YLRL affiliated club, sponsor two certificates: the "Silver Dollar," and the "Colorado Counties." Club membership is open to any licensed YL living in Colorado.

#### YLRL DXCC-YL Certificate

A sixth certificate sponsored by YLRL has been approved by the club's Board of Directors.

This certificate will be issued upon proof of contact with YLs in 100 different countries, and has been under consideration by the club for the past year.

DXCC-YL will be available later this year after the rules have been formalized, and a custodian has been appointed by the YLRL President, WA8EBS.

At present there are only two certificates available for those who work DX YLs. The YLRL sponsored DX-YL Award that is limited to women amateur radio operators only, for contact with 25 DX women; and the newly announced YLCC-DX sponsored by CLARA.

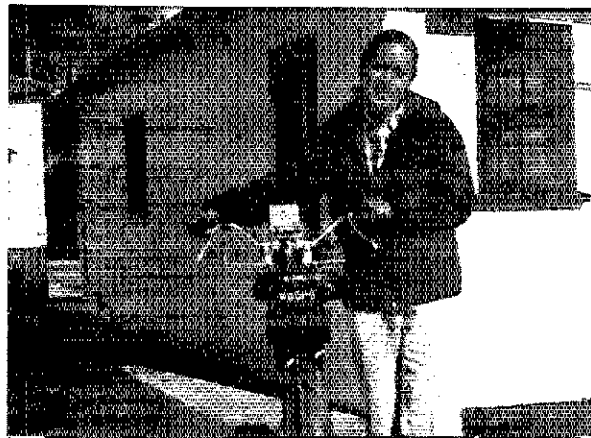
#### Meet the Club - North County YLRC

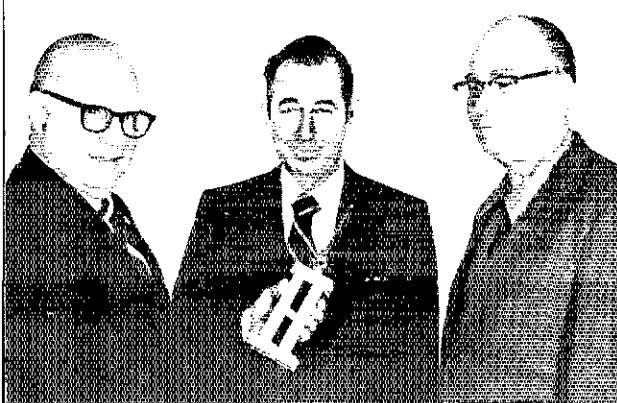
The North County YLRC was no product of the energy crisis, for although the distance from the San Diego and Orange County areas to YLRC-LA meetings in the Los Angeles area is great, most of the members belong to both clubs and attend both meetings. Rather, it was organized as an outgrowth of a desire to continue friendships with women in that area, and, as has always been the purpose of all YL clubs, the encouragement, and furtherance of women who are interested in becoming amateur radio operators.

Organized by six YLs in 1971, this club has been very active in the YL picture in California. The members were responsible for the decorations commemorating the 33rd Anniversary of YLRL at that club's Sixth Quadrennial Convention at Long

*(Continued on page 93)*

Mary Garlow, K6QPG, 1974 Secretary-Treasurer of the North County YLRC in southern California.





Joe C. Patterson, W5VY (center), receives from W5EYB (l), West Gulf Director, Amsat trophy for having worked all 50 states through Oscar 6. At right is Assistant Director W5BGE, editor of the San Antonio radio club bulletin.

# OSCAR NEWS

## Sub-Bands For Phone and CW?

Some amount of interference is inevitable in amateur on-the-air activity; the more popular the activity, the heavier the interference is going to be. In general, amateurs accept this as a fact of life. Oscar 6 has enjoyed tremendous popularity, so it isn't surprising that most operators have encountered interference at one time or another.

One feature of the interference in Oscar 6 work, though, is new to most amateurs. Virtually all operation is on either cw or ssb; in this respect the only difference between satellite work and normal high-frequency operation is that the level of cw activity is somewhat higher on the satellite. However, within the Oscar 6 passband no attempt has been made to segregate the phone stations from the cw stations, as has been done by a combination of regulation and gentleman's agreement on hf. Stations listening for cw are usually using narrow receiver selectivity, which

means they may interfere with nearby phone stations without realizing it. Similarly, an operator with his ears attuned to phone may not even be aware of weak cw signals within his receiver passband.

Several Oscar enthusiasts, notably W1FTX, have suggested that this situation could be alleviated with Oscar 7 by a gentleman's agreement setting aside half of the passband for phone and half for cw, similar to present hf practice. Others, pointing out the value of making crossmode contacts possible and the difficulty of changing frequency on some simple crystal-controlled cw rigs used for uplink service, feel that this cure would be worse than the disease. What do you think? Amsat is interested in receiving comments from informed parties; we may be able to print a cross-section of comments in a future column.

Everyone seems to agree that it would be most desirable to spread the activity over a larger portion of the usable satellite passband. Presently, activity is very heavy near the center and rather light toward the edges. Suggestions as to how this might be accomplished would be most welcome.

## Amsat Membership

Over 1,000 radio amateurs, 60 amateur radio societies, and others interested in amateur space communication are members of the Radio Amateur Satellite Corporation (Amsat). Since its creation in 1969 Amsat has been responsible for two highly successful satellite projects: Oscar 5, which carried 29 and 144 MHz beacons into orbit in early 1970, and Oscar 6, still in operation after 17 months in orbit. Amsat is currently involved in a third, even more ambitious program: Oscar 7, scheduled for mid-1974 completion and with an expected lifetime of three years.

**Space Science INVOLVEMENT**

A CURRICULUM SUPPLEMENT FOR CLASSROOM USE OF AN ACTIVE COMMUNICATIONS SATELLITE WITH ACTIVITIES FOR

- SCIENCE
- HISTORY
- GEOGRAPHY
- CIVILIZATION

## STATES WORKED VIA OSCAR 6

W3TMZ*	50	W0NQQ*	50
K4TI*	50	VE2BYG	49
W9OII*	50	K2KNV	49
W5VY*	50	W1NU	49
DJ6RD/W9*	50	K2ZRO	47
W8DX*	50	W6DMN	47
W0LER*	50	W1FTX	45
K2GUG*	50	W3BWU	43
W6EJJ*	50	K2QBW	41
W9TGB*	50	W7ZC	40

\* Has qualified for special Amsat Satellite-WAS

A curriculum supplement to aid teachers in the use of Oscar 6 in classroom instruction has been developed for ARRL by the Talcott Mountain Science Center. Any educator may obtain a copy from ARRL headquarters.

**Recent Satellite DX  
Achievement Award Winners**

F2NB JA1ANG W3TUW K2QBW F6BEG  
WB8BGY DK3RS DC1XC W3KMW K9JUJ  
VE6NS LA7AE ON5GF HB9QP DK3UA  
WA2HGS DL8DF G3WPO EA4AO F1FG  
W1MX WA5TJB W2LX W6OAL/KM6  
LZ2FA W6RGG G2BVN JA1MIN W1GBO

Certificates have been issued to 202  
stations in 32 countries and 5 continents.

Amsat's operating funds are derived entirely from donations, membership dues, and grants from the ARRL, ARRL Foundation, and similar organizations. Individuals and clubs may lend their support by joining Amsat. Annual dues of \$5 for

individuals and \$10 for clubs will bring a quarterly newsletter devoted entirely to amateur satellites. Write: Membership Section, Amsat, P.O. Box 27, Washington, DC 20044.

**First North America - Africa QSO**

On January 12, W1NU and CN8BO completed what is believed to be the first Oscar 6 contact between North America and Africa. CN8BO, who signs K7VAT when in the U.S., is running about 10 watts of cw to a 5-el Yagi with a downlink frequency of about 29.510 MHz. Gary reports that his signal is fairly rough, about T6, due to the surplus signal generator he is using to drive the much-modified Motorola fm transmitter.

The W1NU QSO was followed the next day by one with K1HTV. Thirty Oscar 6 contacts were in the CN8BO log after the first two weeks of operation, the remainder in Europe. Many thanks are due Gary for giving North Americans their first chance for an African QSO by satellite. -K1ZND



April, 1924

... Plenty of solid technical material in this issue. Increasing phone activity is promoting interest in non-regenerative amplification: M. B. Sleeper describes a simple r.f. circuit with fixed coupling pre-adjusted to prevent oscillation; W. W. Harper goes a bit further to ask, "Should Regeneration Be Eliminated?"

... Loose coupling to the antenna lessens interference to other amateurs, says 9ZG. And Technical Editor Kruse keeps us on channel with wavemeter calibration info; but use only WWV, he says, since "ordinary radio stations are not particularly careful about being on their correct waves."

... 5KM unravels the workings of mercury arc rectifiers, including some 3-phase circuits; 3YO clarifies basic transmitter circuit terminology; more info on tower construction and antenna insulators round out the issue.

... A February blizzard paralyzed the middle west, but dozens of amateurs stepped into the breach for emergency communications, dispatching trains, handling news stories, and coordinating Red Cross relief work. Editor Warner nevertheless says there were glitches, and self-appraisal will show how we can do better next time.

... The story of the Royal Order of the Wouff Hong is related by Supreme Secretary Frank Fallin, on behalf of the Flint (Michigan) crew which originated and perfected it as the "secret fraternity within the fraternity."

... The 1923 Hoover Cup goes to Don Wallace, 9ZT (yes, the same W6AM). Station descriptions include 9EKY, now W1AAC/WB4LZD.

The League Headquarters building is open to visitors Monday through Friday, 7:30-5 P.M. on a "drop-in" basis (except April 12, May 27, July 4, Sept. 2, Nov. 28 and Dec. 25), and at other times by appointment. The headquarters is on Main



April, 1949

... With portions of 160 coming back to amateur use, this month's lead story describes a basic 200-watt rig for cw operation on the band; author W1FTX, incidentally, is today an Oscar enthusiast. More for higher frequencies, Technical Editor Grammer summarizes the extensive knowledge gleaned from several years' experimentation on television interference problems; "it is possible to reduce harmonics to the point where they will not cause objectionable interference to TV reception . . ." Proper by-passing, shielding, filtering of leads and antenna, coax to the antenna coupler - are all fundamentals in the modern approach.

... Low-frequency antennas get dual treatment - grounded folded dipoles are described by W5TH, and W7BHF shows us a 75-meter vertical. That ingenious April author Larsen E. Rapp takes a giant step, advising us to reduce wire antenna length by removing the center rather than cutting off the ends, thus getting much better current distribution and better radiation!

... Blizzard, tornadoes, floods and ice storms east of the Rockies in late 1948 once again called for emergency communications by amateur radio. Outstanding performance is recorded by ARRL National Emergency Coordinator W11N, along with kudos from FCC, signed by W3AP (now K4AP).

... ARC-5 aircraft transmitters are big in the surplus market, especially suitable for 3.5- and 7-Mc. conversion; W6SAI shows us one more step, modification for 14-Meg. work. And way down the spectrum, W1PYO provides hints on better 2-meter operation of surplus SCR-522s.

... WWVH is now operating from Hawaii with standard frequency and time signals. - W1RW

Street (Conn. Route 176 and 176-A) about a mile north of the center of town, and about 3 miles west of Conn. 15-U.S. 5, the Wilbur Cross Highway. (For W1AW visiting hours, see the schedule in "Operating News.")



CONDUCTED BY BILL SMITH,\* W5TVB

### 2.3 GHz Tropo DX

WITH THE increasing exploration of our microwave bands undoubtedly we will see the tropo DX on these frequencies expanded. Such was the case February 16, 1974 when W6FZJ, San Jose, worked WA6HXW, Torrance, over a 330-mile path on 2304 MHz. Most previous DX attempts at 2.3 GHz and higher have been from portable mountain-top locations, but this record was established between regular home-station locations over a mostly-mountainous path.<sup>1</sup> W6FZJ was located (he has since moved to Boston) in the center of the Santa Clara Valley, about seven miles from a mountain range, and WA6HXW is located on the side of the rolling hills area of Southern California about 450 feet above sea level overlooking Los Angeles.

Most of the equipment used at both stations was homebuilt. You don't buy under-the-dash black boxes for these frequencies! W6FZJ's receiving equipment was all homebuilt and solid state, using two Fairchild FMT4005 transistors (3.5 dB noise figure) driving a balanced mixer. WA6HXW's receiving chain is very similar, but with a somewhat lower noise figure. The transmitter at W6FZJ consisted of an all-homebuilt up-converter from 50 MHz feeding a modified Huggins surplus travelling-wave tube, delivering 5 watts output. The antenna was an Andrews 6-foot dish with cavity-backed dipole feed and 1 dB of feedline loss. The center of the dish was only 13 feet above ground level. The antenna at WA6HXW is similar, but the transmitting chain begins with an all solid-state homebuilt varactor up-converter from 50 MHz, feeding a klystron amplifier running one kilowatt.

Like all records, this one did not come easily. Working toward it began some 18 months ago. W6FZJ first heard Harley this past summer, but was unable to transmit. Considerable experience on the very mountainous path had been gathered from three years of 432-MHz tropo schedules. Since there was such a large difference in transmitting power between the two stations, a strong tropo peak was obviously necessary. WA6HXW peaked more than 15 dB above the noise in a 500-Hz bandwidth, while W6FZJ was peaking 4 to 6 dB out of the noise at WA6HXW. No aircraft enhancement or Doppler was evident during the cw contact, although such effects have been observed during other schedules. Both stations then

\*Send reports and correspondence to Bill Smith, W5TVB, ARRL, 225 Main St., Newington, CT 06111.

<sup>1</sup>[EDITOR'S NOTE: For some years all recognized overland records up through 10,100 MHz have been made over beyond line-of-sight distances.]

switched to ssb where WA6HXW was clearly readable, but Joe's signal faded into the noise.

Several other aspects of the contact are interesting, in addition to its having been between home fixed-stations. All equipment, except the power output stages, was solid-state, homebuilt by the operators involved. Extreme frequency stability was needed and achieved by transistorized oscillators and 4-MHz calibrators, accurate to plus or minus 100 Hz at 2304 MHz! There was no liaison of any kind during the schedules and eventual contact. The contact was made on a single tropo peak with 15-second transmissions of the meteor-scatter type, except that the normal RST signal exchange was made, and schedules were carefully planned to coincide with enhanced tropo conditions.

In summary, W6FZJ notes that tropo is indeed possible at 2304 MHz with peaks occurring about 10 minutes apart at sunrise and 20 minutes apart at sunset with short, weaker peaks at sunrise and stronger, longer peaks at sunset. Aircraft scatter seems far shorter in duration at 2304 than at 432, but this is probably due to decreased beamwidths in the microwave antennas. One transmission exhibited a 1-kHz Doppler shift, but duration was only some 10 seconds. A comparison with 432 would suggest that if noise figure, transmitter output power and antenna aperture (not to be confused with gain) were similar at 2304 MHz, that equal or possibly better success could be obtained at the higher frequency.

Joe says Harley and he only scratched the surface of the possibilities at 2304, but that he hopes this contact will cause others to further explore 2.3 GHz and higher amateur frequencies.

We thank Joe for his interesting report and note that his current temporary address, while he and his family search for a new Boston-area home, is Joe Reiser, Jr., 24 Norfolk Lane, Glen Cove, NY 11542. We're sure the east coast gang welcomes Joe to their clan, and that he will be missed on the opposite coast.

### Transpacific Tropo in Winter!

It may be mere coincidence, but there was above-average transpacific propagation on the 131.95-MHz channel used for air-to-ground communication on the SFO-HNL route, Feb. 18. As reported in these pages in November, 1973, QST, W0BWJ, a Western Airlines pilot on this route, was able to supply us detailed weather information for the end-of-July record-breaking vhf propagation period. Now Carl tells us that the AIRINC channel was hot on Feb. 18, with weather phenomena not unlike those that prevailed on July 28. See page 102 of the November QST story.

Carl was able to communicate well with SFO out to more than 1250 nautical miles on the western flight, and heard SFO solid for another 300 nautical miles thereafter. He also worked HNL on the vhf channel from much farther east of Honolulu than is normal. WØBWJ alerted KH6BZF and KH6GQW, but they were unable to find anything unusual at ground level on either 432 or 146 MHz. Carl also stresses that SFO and HNL were not able to communicate direct, as they had done on July 28, but conditions at 39,000 feet were exceptional, for the winter season. Moral: don't relax the DX watch in other months, merely because all transpacific vhf DX has been worked in the summer, thus far! — W1HDQ

### West Coast Moonbounce Tests

Stanford University has granted use of their 150-foot dish antenna to Bruce Clark, K6JYO, and Victor Frank, WB6KAP, for Faraday rotation studies, scheduled to take place in April or May on 144 MHz.

K6JYO says the big dish has a 33-dB gain over isotropic at 144 MHz and that he and WB6KAP have obtained the use of an 8877 amplifier for the two-way tests. Clark says that station requirements to work the Stanford dish via the moon will be an efficient kilowatt input, feeding an 18-dB gain antenna referenced over a dipole. A typical antenna would be an 80-element collinear or a Yagi array developing similar gain.

Full details regarding the operating schedule were not available at this writing, but should now be obtainable from K6JYO, 566 Cuesta Drive, Los Altos, California 94022. Bruce says activation of the 150-foot dish will likely permit "wholesale" California moonbounce contacts and take the mounting pressure for such contacts off W6PO, who has been the sole provider in the past two years. Results of the tests will be prepared for Stanford University which is interested in Faraday rotation information.

### West Coast VHF Conference

The annual West Coast VHF Conference for 1974 will be held May 4 and 5 at the Ramada Inn, Santa Clara, California. The conference site is about one mile from the San Jose airport and room reservations should be made directly with the Ramada Inn.

The Chairman of this year's conference is W6VSV, who is being assisted by K6JYO. The registration fee is \$2.50 and all correspondence regarding the conference should be directed to Bruce Clark, K6JYO; see address above.

Bruce advises that this year's conference, sponsored by the informal "W6GD Society" of Bay Area vhfers will feature such program material as W6PO, of Eimac, discussing band-by-band vhf power amplifier design; W6GFS, a QST author, discussing solid-state power amplifier design, and a program by the San Bernardino Microwave Society on microwave techniques and 2300-MHz solid state design.

Bruce says further that the conference will also include the usual, and popular, noise figure contest

Column editor W5TVB in his Oklahoma City shack. Included in the racks is equipment for television DXing, vhf and uhf tropo DX monitoring, 400-MHz satellite propagation, 146-MHz fm and 432, including a 100-watt amplifier.

hosted by WA6EXV and an antenna measuring range will be set up for gain measurements and frequency response sweeping of antennas. This is an excellent opportunity to test antenna designs and to determine the actual resonant frequency of your favorite system.

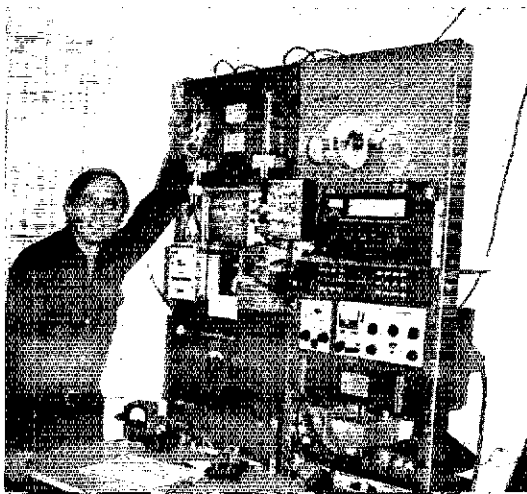
Conference rooms will be open around-the-clock for informal bull-sessions that are probably the most popular activity of any vhf conference. This writer personally recommends this conference and I look forward to renewing old friendships and meeting some of you for the first time. See you in Santa Clara May 4 and 5!

### A Personal Note

With this edition of the column, your writer begins his eighth year of sitting behind a typewriter to prepare this monthly missive of what's happening in the world above 50 MHz. Seven years of writing this column has been a rewarding experience and no one could place a value on the friendships derived. I thank each of you for the support rendered and although due to personal and business reasons over the past 15 months I have not been as active on-air as during the past nearly 20 years, I am now again active and look forward to meeting you on the air, or in person and the various vhf gatherings around the country.

### OVS and Operating News

50 MHz will be nearing another summer E season in a few short weeks after a disappointing winter E peak and a period of infrequent E during 1974 through the time this was written. But the New Year's Day opening was still bringing mail, such as that from WAIDEL, Mass., who reports the opening lasted about 12 hours, and WA1FSZ, N.H., who reports similar duration. WA1FSZ says also the January 5-6 contest weekend produced E to 4s, 9s and both Dakotas. A January 31 ice storm lowered his antennas so Dale is off the air until warmer weather. WA1FE, Mass., worked the January 1 session to 4s and 8s. That nationwide flu bug laid low K3KEL, Pa., but Dave found January 2 and 28 openings to Florida, Wisconsin and Minnesota. K4MSG, Virginia, says the January 1 opening should go down in history for duration and intensity. Paul worked stations throughout the U.S., including California, as did his neighbors W4DNK and WA4ZWB. Also in Virginia, WB1LAI/4 reports E January 1, 5, 6, and 20, mostly 4s 5s and 0s. WA4GPM, WA4FOX and Bill are beginning a mid-Atlantic states 50-MHz newsletter and details are available from either.



WA4GPM reports E from Virginia on December 31, January 1, 2, 5, and 20. W0Y1L, North Dakota, was a popular catch during the contest weekend. In Georgia, WB4WXE had good success during the January 1-2 affair running 50 watts of a-m. Contacts included Wyoming, New Mexico and South Dakota, plus many 8s and 9s.

From Texas, K5ZMS, San Antonio, reports openings January 7, 8, 14, 23, 25, 26, 27, 29, and 30, which included most areas of the U.S. except the Northeast. San Antonio has to be one of the best locations in the country from which to work E. WA5IYX reports openings on January 18, 19, 23, and 30, since his previous report. Pat worked 50-MHz E on 8 January days and on February 2. Pat says also that the Quadrantid meteor shower January 3 produced excellent activity between 1700 and 2100 GMT. From El Paso, WA5ZLJ reports openings January 1, 2, 3, and 5 to 2s, 3s, 4s, 5s, 7s, 8s, 9s, and 0s.

In California, W6DPD, Fresno, worked to the East Coast January 1 and Colorado on the 3rd. Using the fm mode, WA6FVC, Chino, had contacts January 1 into Virginia, Kentucky, and Kansas, and has now confirmed 18 states on 5.2525.

K7ICW, Las Vegas, has been spending time on the low-frequency bands and needs only Rhode Island for WAS on 160 meters, but caught 50-MHz E on January 1, 2, 8, 14, 17, and 23, including much multihop on the 2nd. Al reports VE8BL and VE800 are both interested in 6 meters and that VE8BL has been active. In Oregon, K7ZCB says the band was open for E for eight consecutive days beginning December 30, and then on several other January days. Also from the Portland area, WA7GCS reports openings January 2, 3, 4, 13, and 14, mostly 5s, 6s and 0s. WA7TDU, Klamath Falls, reports similar success. K9OXY, Wisconsin, worked the January 1 session as did WA0TRO, Kansas, and WA0QHC, Duluth, Minn., caught a January 20 opening to 4s.

144 MHz news continues to be dominated by moonbounce. The most recently reported new station using that mode is WA2BIT, Far Rockaway, New York. Barry received assistance from WA2WOM in the engineering and design of his EME system and on January 31, the first night the system was operational, strong echos were received. Barry says he was so surprised he spent several hours listening to them. The following evening Herb, WA2WOM, helped set a schedule with W6PO, but Barry later found preamp trouble, which precluded a contact. On February 2nd another schedule was run and this time it was W6PO's turn to have trouble, a broken pin in his elevation system. Elbow-deep in grease, W6PO solved the problem and a few minutes later the contact was made. WA2BIT runs an 8877 amplifier and 80-element collinear array mounted near ground level on an "Armstrong" az-el mount. Barry says while the array was being constructed and tuned, he and Herb stood for hours in two feet of mud and water, and until a different mount is completed, hip waders are in order every ten minutes to keep the array on the moon. Now there is dedication!

Bob, W6PO, reports WA7KYZ in Washington is another new station on EME. WA7KYZ, using an array of sixteen 5-element Yagis designed by WA5UNL, worked W6PO on their first schedule, February 9. W6PO reports further that WA7BJU in Oregon is now on active with four 15-element Yagis, and as soon as amplifier problems are corrected will add that state to the EME list.

WA7BJU has made good tapes of W6PO. In Montana, W7JRG is active and schedules W6PO. It is reported by W6PO that W8KPY worked both VK3ATN and VK6MC in early February, which makes four states on 144 MHz for VK3ATN, and three for VK5MC.

In Illinois, W9YYF made his first moonbounce contact February 7 by working SM7BAE in Sweden. W9YYF's antenna is a 600-foot long stacked rhombic. In other EME news, WA5UNL, Arkansas, after working his 42nd state on 144, W6PO via moonbounce, has moved to Oklahoma City where he is employed by W5ORH and designing an EME station for both to use.

Elsewhere, K4EJQ, Tennessee seeks schedules on tropo and WB4MJY, S.C., has stacked 11-element Yagis and 600 watts available for meteor and tropo schedules. He says W4USW, at Charleston, S.C., has a new kilowatt and is interested in moonbounce. Both stations are also active on 432. WA9QZE/5, Plano, Texas, caught a couple of January tropo openings into Kansas. Al, too, is on 432 with low power and single Yagi. WB6JNN, Santa Cruz, is working Oscar and building 220 equipment. Mike, WA7NIY in Phoenix, says ATV interest there is alive again with K7UOP and WA7RIQ active. KH6GRU says a certificate is available for working Hawaiian stations from KH6HP. Hawaiian stations active on Oscar include KH6GRU, KH6HP, KH6LJ, KH6BTV and W0NQQ/KH6. KH6GRU and KH6HLP are preparing for Oscar 435 work this summer.

220 and UP news comes first from W3MSN, Maryland, who reports 223.5 fm simplex operation. In Wisconsin K9OXY sports a 4X150 final and 20-element collinear on 220. W0EAH, Davenport, Iowa is active on 220 ssb and 223 fm and says K9UYK, Moline, is also on 220 ssb. Walt reports that other 223.5 fm stations include WA9OKJ, WA9RMS, WB9ITE and W0OJD. I am curious just how much 223 fm activity there is in the country. Anyone DXing similar to the fm DX interest on 146, and how about 440? Speaking of fm simplex DX, Japan does not allow any repeater operation, but 144 to 146 MHz is filled with fm simplex and there is some DXing via that mode.

Moving to 432, W1ALP, Mass., and K2LGI, Buffalo, work nearly every night, after making system improvements. W1ALP has nine states on 1296 and is considering EME on 432 and 1296, with his 16-foot dish. K2LGI, with tongue in-cheek says, "The January contest was just great. I worked every station I heard on 432, six in four sections, and in the process of running up this fantastic score blew the tower-mounted preamp. I'm still trying to forget that weekend."

W5GVE, Waco, Tex., worked Missouri during a January 15 duct on 432, for state number 7. This was the opening reported last month by W5KHT and his satire on amateur DXing. W5GVE logged educational television stations as far as Ohio but wonders where all the 432 DXers were.

Before departing the West Coast for Boston, W6FZJ worked nine states in six call areas on 432, the last being W4NUS in North Carolina via EME, January 7. Six states worked by Joe were on moonbounce, as was Australia. WA6EXV, Ridgecrest, reports 3.3-GHz contacts with WA6QYR over a 5-mile path. Chuck says while the distance isn't great, at least WA6QYR is the first station available in many years with similar in-

(Continued on page 93)





# How's DX?



CONDUCTED BY ROD NEWKIRK,\* W9BRD

## How:

Old Sol is starting to pitch shut-out ball with skip erratic enough to frustrate even the most casual take-it-or-leave-it DXer. How would you like to be stuck with responsibility as control station for a farflung DX network under 1974's crummy conditions? 'Twould tax a saintly patience but there are plenty of OMs and YLs who thrive on such a challenge. We're indebted to Newark News Radio Club's *Bulletin* for a tabulation of recent DX net activity. Frequencies are kHz, times and days are Greenwich Mean, and call signs represent net control stations or net managers:

- Africa* - 14,180 Sundays, 0700, TU2DO.
- Africana* - 21,335, daily, 1730, Ws 2PPG 0GX, WA6BJS.
- Afro-Caribbean* - 7085, weekends, 0345, VP1BH, SZ4KL.
- Amsat* - 14,280, 2nd & 4th Sundays, 1800, W3ZM; 21,280, 1900, W3ZM.
- Arabian Knights* - 14,250, Mondays, 1400, A6XP.
- British Commonwealth* - 21,354, weekdays, 1430, G3LQP; weekends, 1000, G3SUW.
- Caribbean DX* - 14,170, 1115.
- Danish* - 3740, Saturdays, 1030.
- DX Information* - 3780-3790, daily, 2030, DAS 1LA 1WX 2EL 2LJ, DK8FZ, DL5AA, G3PCG.
- East Germany DX* - 3660, Thursdays, 1800.
- European* - 14,290, Saturdays, 0930.
- European Certificate Hunters* - 14,320, Saturdays, 1400, SMs 5UH 0BYD.
- Ex-G* - 14,346, Sundays, 1900, W4RP.
- G* - 3740, Saturdays, 0900.
- Hungarian* - 14,225, Sundays, 1700.
- International DX ARA* - 14,300, Sundays, 1600; 21,360, Sundays, 1630, 9V1QJ.
- International Short Wave League* - 21,360, 1200.
- KL7* - 14,292, daily, 1700, KL7HAC.
- MARCO* - 14,280, daily, 0200.
- Maritime Mobile* - 14,100 & 21,100, daily, 1800.
- Medical Information* - 14,280 & 7260, Mondays, 1200; Wednesdays, 0500, K3YGG.
- Micronesia* - 14,305, Tuesdays-Thursdays-Saturdays, 0830.
- Norwegian* - 3740, Saturdays, 1430; Tuesdays, 1730.
- Okinawa* - 28,505, Saturdays, 1100.
- Pacific* - 14,265, Tuesdays & Fridays, 0600-1000.
- Pandora's Box DX* - 14,227, 0400-0600, KH6s CCL HIF HMD.

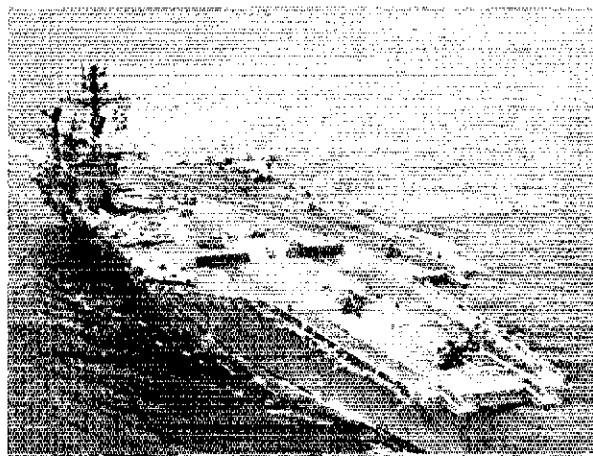
- QRP* - 14,060, Sundays, 1300.
- QUAX* - 28,650, 1000-1500, G3DME.
- Royal Signals ARS* - 3720, 7050, 14,075-14,080, 14,280, 21,075-21,080, 21,180, 21,380.
- Scandinavian* - 7090, first Sundays, 0830.
- Scouts* - 21,360, Saturdays, 1800.
- Southeast Asia* - 7 MHz, Tuesdays & Fridays, 1500, SZ4KL, 9M2DQ; 14,320, 1215.
- USSR* - 3620-3630, daily, 2100, UA6LO, UB5WJ, UK3ABO.
- USSR DX* - 14,250, Saturdays, 1000, UI81L.
- VK* - 14,120, 4th Saturdays, 2300.
- West African* - 21,300, daily, 1930; Mondays & Wednesdays, 1900, W8KGR.
- Western Hemisphere* - 7205, Wednesdays, 0200; 3845-3852, 0330, KP4CL.
- World DX* - 14,250, Fridays, 0400 & 1400, UK5MAF, UW9WR.
- Yugoslavia* - 3700, Thursdays, 1830.
- ZL|VK|Oceania* - 21,225, weekends, 0700, VK3PA, ZL1BKX.
- 4X4* - 21,360, daily, 4X4HF.

Pardon inevitable inaccuracies. Efforts to compensate for propagational vicissitudes these days may cause times and frequencies to vary with scant notice. Yet several groups, especially those with net headquarters below 21 MHz, have clung successfully to given specifications year after year. By definition radio nets are usually invitational and directed or controlled. Sooner or later in their scheduled sessions most of them stand by to welcome visiting breakers. Until such times 'tis far more blessed to receive than to transmit, particularly with the prospect of new countries for your log. In net-hopping politeness pays!

† † †

## What:

**15** Novice DX developments merit detailed attention this time of year. Spring's equinoctial surge rarely fails to shake the 21-MHz tree vigorously, but does DXotic fruit still dangle from shriveling branches? In a time of shortages everywhere is there finally a serious DX scarcity on 15? If so, the "How's" mailsack gives no evidence of a shortage of DX enthusiasm among 21-MHz WN



\*c/o ARRL, 225 Main St., Newington, CT 06111.

K7OVM/mm has a QTH of the Month free of neighbor nuisances with low horizontal takeoff in all directions. It's the aircraft carrier *America*. No, you can't borrow it for Field Day. The hamshack that goes with this portable location is pictured on a following page. (Photo via Bill Smith, W1-7897)



9N1MM is Mr. Nepal in DX circles with this interesting layout in far-off Kathmandu. Fr. Moran recently completed a visit Stateside where he was in demand as guest of honor at several DX conclaves. (Photo via KJKWJ)

denizens. Apparently there's still truth to the old-timers' adage: The best DX is scarce DX. WN-type chatter from the QST DX mailbag follows, many contributors sporting fresh WA or WB prefixes by now. . . . Took me nine months to accumulate 67 countries on 21 MHz. With the trend toward strictly north-south 15-meter skip the Novice gang would appreciate more DX activity in the numerous Caribbean, Central and South American countries. Some of those "easy" ones surely would boost DXCC chances. (WN7UMU) . . . Ninety percent of my DX was worked with an HW101 and 4-element Yagi. For months I had no rotator so I got plenty of exercise climbing fifty feet to swing my beam toward DX! (WN6UCC) . . . Forty-meter dropouts he advised there's interesting Central and South American DX in the 7-MHz Novice range. (WN6VVH) . . . Fifteen was going great last September just before I passed my General. Now for a linear and beam on 20! (WN5HVY) . . . G3AMR (VP7BA) dropped by the shack to deliver his QSL in person. (WN9MFC) . . . CQ DX sometimes pays off just above 7100 kHz but we need more DX stations to do more listening on 40-meter Novice frequencies. (WN6SWM) . . . FP8EF was an interesting 7-MHz item encountered in the wee hours. Sure look forward to 20-meter DXing with my new General ticket. (WN9JTC/5) . . . My mere dipole was good enough for varied 15-meter DX last autumn just before I joined the Generals. (WN4ZVF) . . . Poor 10 is now quiet even on weekends when it should be jumpin'. In my first seven months on 21 MHz I managed 65/23 countries worked/confirmed with no VFO. As WN9IWY says, being rockbound adds quite a DXing challenge. (WN0JFJ) . . . The Novice 28-MHz band in Brooklyn is wiped out by illegal taxicab two-ways and CB splashes. (WN2SZR) . . . My 20-foot-high dipole surprised me by hooking up with JH1WIX's 90-foot-high CL33. (WN9MVD) . . . Surely last year's Labor Day weekend was one of the best 15-meter DX periods in recent Novice history. Short skip was solid at the same time and my WAS total jumped from 36 to 42 with a Novice gallon and vertical. Now for 14 and 7 MHz DX with new General credentials! (WN4DLY) . . . Bryce of ZL3JC, a Novice-unter for years, won't give up easily on 21 MHz. (WN2E00) . . . Africa was the last WAC holdout here on 15, and VE8 eludes me among Canada's call areas. I use a 2NT, 2HO and 55-foot-high inverted-V dipole. Not much luck on 28 MHz except for an odd KP4, PJ, etc., plus some interesting downlink Oscar listening. New Hampshire and Rhode Island QSLs will clinch my

WAS. (WN6RX1) . . . Occasional DX keeps answering my 15-meter CQs. FORDR has a good 28-MHz signal from Tahiti at our local club station. (WN0HZZ) . . . Overdue QSLs from JAs 2EQ and 6HKC will be valued souvenirs of my Novice DX career. (WN6TYA) . . . Wish "How's" had more space available for those old in-depth band-by-band DX activity discussions. (WN9MII) . . . My first two weeks on fifteen were great DX fun. The band is still entertaining for WN2s with plenty of patience. (WN2NRY) . . . Five months on 21 MHz brought me interesting DX including an abundance of JAs. Enjoy catching Hawaiians and Alaskans on 40, too. Worked my first 40 countries with an Apache, Ten-Fec receiver, 3-element Yagi and 3-element quad. Those outgoing QSLs get expensive! (WN6UFW) . . . You can still catch 21-MHz DX goodies with a simple 30-foot-high inverted-V, especially such Novice-oriented regulars as CX2XA and JH1WV. (WN7THP) . . . Good s5h-to-cw luck helped beef up my 15-meter DX total. Fortey meters is sometimes interesting in the wee hours thanks to occasional South Americans, KZ5s, etc. The 7-MHz Novice gang is eager and anxious for more DX but frequency allocations are inhibitive. My friend WN6ION also graduated to General ranks after fifty Novice countries. (WN6OSS)

You never really appreciate propagational prosperity until you look back on better days from the depths of a sunspot decline. Consensus has it that 21 MHz hasn't been the same since last autumn when the Novice notch performed DXceptionally indeed. Even north polar paths popped open like old times with Europeans galore. Ah, all too briefly. Most recent captures on 15 reported by WN2 2E00 2NRY 4DLY 4ZVF 5HII 5HVY 6OSS 6RX1 6SWM 6TYA 6UCC 6UFW 6WVH 7THP 7UMU 9MFC 9MII 9MVD 0GTJ 0HZZ and 0JFJ include A2CAB, CEs 3BF 3FF 3HN 5BB, CM2AF, CO2FC, CP3CN, CR6AL, CTs JID ISX 2AC, CUs 1NE 2CS 2FD 2PH 2XA, DA1LH, DJs 6OG 0JE, DKs 4ET 5LD 5QK 6ED 7ED 8GT 8KW, DLs 1ET 1ZU 3BC 3BD 3BE 6GB 6PE 6SB 0JP 0PM, ELs 2NS 9A, EEs 6BJR 6BOD/FM7 6BPP 6BWF 6KCO 8CX 8FI 8KA, EK8DV, FM7s AO WG, ER7AU, Gs 3AMR 3JQI 3JVU 3YJI 3ZZR 4AMJ 5AO 6OX, GM3AWW, HAs 3KMA 4XS 5KBM, HB9s AMZ ARW AUW, HC2JP, HKs 3CTJ 5BWK, HL9VR, HW6KBR, Is 2CEX 2KIX 0JX, IS9DRD, JAs 1MCU/C21 2EQ 4EBZ 5BHL/mm 6HKC, JDIYAA, JH1s 0GF WDN WIW WIX, K4VMA/VP7, KAs HG WS, KGs 4FX 6AAY 6JAO, KH6s HFJ HOU IUE SP, KJ6s BZ DI, KL7GSC, KP4s BLK CY DCY WF, KS6EM, KX6s BU LA, KZ5s AYN EK KP MS NG ORN VV, LA9JM, LU5 IDOW ISH 2EN 3EX 5HFI 6DJX 6EF 8HAP, OAs 4AHA 4HO 6CV, OH2BAD, OKs 1DJM 2BIX 2QX, ONs 4KD 5IU 6BI, OZs 6PI 7AN, PJs 2HA 2IW 8NLO 9JT, PYs 1BDV 1CKV 1DMJ 1DRT 1DUB 1MCC 1ZAD 2AS1 2BFK 2BGA 4BTU 5YC, SK2DL, SLs 2ZZY 7ZT, SMs 6FHO/mm 7DEJ 0ETL, SPBGO, TG9s CD KJ YN, TIs LA WX, TY1ABE, UA0FGM, UW0IQ, VE3EMF/VP7, VKs 2VA 4MY 4YI 9MH, VO1s KE JY, VPs 2UAW 2VBU 2HA 9HI, VQ9R, VS5WV, W5ZIS/YV1, WASYSI/HK6, WB4s BUQ/8R1 HIT/VP7 ZNH/6Y5, WNs 4ZYF/KV4 8OPK/KP4, WH6s HPP HQK IBT IEG IEP IFG IFN, WL7HHR, WP4s DOY DPW DQP, XEs 1EF 1FFC 1FI 1XL 2NNW 2UG, Y08FX, YUs 1BFO 1KO 1MW 1OBY 2BST 2HH 2QZ 3OV 3TKL 3WO 4VTN, YVs 4A00 5BFQ, ZF1s FBI KXJ, ZLs 1ATV 1BIB 3JC 5AL, ZM2GH, ZP5s DX FN HZ, ZS6s AFC

CK, 3D2EK, 4Z4NKB, 6W8DY, 6Y51A, 8P6BU and 9Y4MH, the majority in the vicinity of 21,100-21,130 kHz. Quantity's down, all right, but quality's holding up fine!

† † †

### Where:

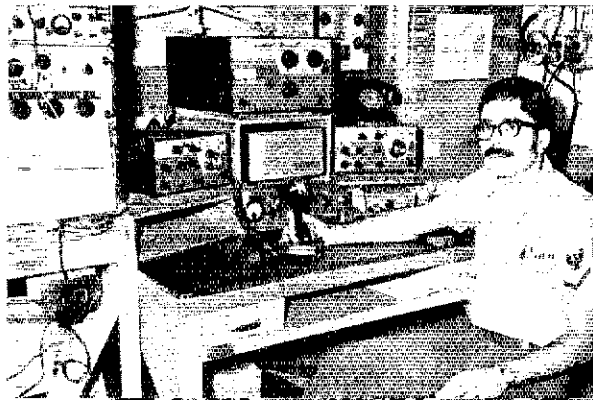
**NORTH AMERICA** - QSLers of the Month, saluted for swift pasteboard returns by "How's" contributors Ws 10PI 6SO 7JAC 7JTS, K0CVD, WAs IPYA 6GZG 6SXL, WBSHVY and WN6UFW, include CT11D, DK5QK, DL6GB, FG7s AH JG, HB9s AUY AXD, is 2BJS 01X, K4VMA/VP7, KGs 4FX 6AAY 6JAO, KH6s BIH IGC, KJ6DI, KP4DCY, KV4CK, KX6BU, KZ5s NG QRN, LUs ISH 3E4 8BAO, OH2BD, SM3ABG, T12BFV, VE800, VPs ISYL 2VAP 9HI 9HM 9V, W5ZIS/YV1, WA6MWG, WB4s BUQ/8R1, ZNH/6Ys, ZE1FCC, YN1BBR, YV4AGP, ZF1AG, ZLs IACP 1LZ 4CO, ZM2GH, ZP5HZ, 4S7EA and 9J2BL. Any praiseworthy promptitude out your way? . . . When TG9HC passed away in June of '68 a portion of his log was missing. Records of QSOs from April 22, 1967, to May 14, 1968, have now been found. Anyone needing confirmation of a TG9HC contact during that period is invited to submit details and self-addressed envelope to my QTH. (WA8LST) . . . I hold TI2DX logs for QSOs dating from February 13 to August 8, 1973, plus plenty of blank QSLs. (K7NHV) . . . VP11WW says old British Honduras is now the Republic of Belize, ham calls as yet unchanged. (WB4WHK) . . . Wish "How's" could run a listing of stations known not to QSL. Sure would save the gang a heap of postage. International Reply Coupons, DXing time, etc. (WA3ERG) . . . Right, OM, but QSLing circumstances are sometimes so mitigating you'll find the same station mentioned simultaneously in "QSLers of the Month" and "Halp!". When a callsign shows up repeatedly in the latter category, such as FM7WU, ZK2AU, 8P6BU and the USAF-styled CE0AE to name a few, we can take the hint and save our stamps. But will we? Hope springs eternal! (W9BRD) . . . The wailing wall, now, where parenthesized parties plead for hints toward collecting tardy wallpaper from holdouts specified: (W10PJ) FG7KP, PZ9AB, VP2VW; (W2EXS) CN8CG, CTs IUM 2AO, FM7AD/FS7, HP11E, IS0PLT, JZ0A, K9YTI/4X4, KA6AY, M1S, OH0AM, OY5NS, SV1XX, VR1AA, ZD8JK, 8P6s AU BU, 8R1W; (W3TV) SV1DB/a, VR61C, ZK1TA; (W7JAC) UA1KED, VP8LV, 6W8BA; (W7JTS) TF8AQ; (W9DDL) 5X54S; (W0LTB) KM6DZ, LX1BJ, LZ1s AZ KPZ, UQ2KCT, VP2s DH VI, VQ9BP, ZS6MP, 5B4KP, 7X2BK, 9Q5FH; (WA3FRG) FM7WG, FY7YQ, TU2s AF BK, WAs 4GQM, 5UHR, WBSA/F/KC4; (WA6KHK) IS0EPH, JX1AP; (WN6UFW) KX6LA, ZF1FB1; (ZS1KZ) KC6SK, KG6SW, TY0ABD, VS9UA, YB1BH, 8Q6AC and 9X5JC. Any 'alp: By the way, some of us are a little overeager. QSLs shouldn't be considered truly overdue until even QSL bureau transit time is exhausted and that can be a year or more. Relax, hang loose and be of good faith. . . . I'm managing cards for ZF1BR. Requests unaccompanied by s.a.s.e., or s.a.e. plus IRCs, must be answered long-path via bureaus. (W4KA) . . . Costa Rica displays its TE prefix now and then, sometimes from Cocos isle. (DXNS) . . . In its twelfth year our DXpedition of the Month staff

does QSLing for some 250 callsigns. Writing the call of the desired confirmation on the outside upper left of your application envelope will help speed our labors. (W2GHK) . . . Correction - W2AZX runs the foreign mint postage concession mentioned in February QST. (W2AXZ) . . . VO1KM takes over Newfoundland's QSL bureau from the late VO1AA who managed it for 25 years. The address is unchanged. Our amateurs now are authorized to substitute VX for the usual VO prefix. (VO1FX) . . . VA is another Canadian prefix due for DXtensive use this year, suffixes the same. (VE7BBL) . . . The CF label also represents Canada on occasion. (WCDXB) . . . With postal rates getting completely out of hand amateur radio is fortunate to have such a fine international QSL bureau system. (WN6UFW)

**ASIA** - At present W1YRC cannot help you in a QSLing XU1AA contacts made by operators other than Don, K7CBZ. Bob also manages for CT2BD, IS1A and XV5AC. (L1DXA) . . . W6ISQ can confirm the QSOs he made from XU1AA in November 24-25, 1973, contest activity. (WCDXB) . . . Some 700 QSLs arrived from FAJHY for distribution. Perhaps the hamming situation is brightening for Turkish amateurs. (W5QPX) . . . My friend UG6JJ, who likes to work W/Ks in rarer U.S. regions, is an avid philatelist. (E. Hamill) . . . The new 900-page Japanese ham directory is out. If you dig the lingo JAIYCN can expedite your copy. (WCDXB) . . . SM1CNS still awaited AP2KS logs in February. (DXNS) . . . All QSLs for JA1OCA/C21 contacts with W/Ks were cleared via bureau by January. I QSL 100 percent and hope for high returns. (JA1OCA) . . . The call VS9AI was misused from this area in mid-January. Sorry to say that the W1 who thought he worked Aden really QSO'd some nut in the U.K. (G3JKY) . . . Stations that have yet to receive my deserved QSLs should inquire via my new QSL manager, OK3YAO. (JT0AE)

**EUROPE** - I can confirm SY1MA Mt. Athos QSOs made on April 21-25, 1973. Apply to my address or via Postbox 585, Stuttgart, a valid independent QSL bureau since 1945. (DL1CU) . . . My QSL management for SV0WXX includes QSOs only for September 17-19, 1971. The latest holder of the call, R. W. Grigg, can be reached at 322 South Boulevard, St. Petersburg, Florida. (W3HNK) . . . I can supply QSLs to about 175 W/Ks worked on 40 cw from SV1DB/a. Inquiries are welcomed direct or via ISW1. (DJ6SI) . . . Sometimes I find myself wondering if there really is a Box 88. (WA1PYA) . . . I would say that amateurs in West Germany are about the fastest and steadiest QSLers in the game. (W10PJ) . . . Some of those French HW calls are being worked as 5W in cw contest activity. (W2ESX) . . . As a regular reader of QST I expected to see my old SV0WOO call listed in the "Halp!" paragraph sooner or later. I still intend to QSL 100 percent as promised on the air. I have more than a thousand cards ready to mail with another three or four thousand to order as soon as I scrape up the required petty cash. More requests are arriving all

K7OVM/mm has all the ham comforts of home aboard the carrier *America* shown on an earlier page. Chuck is QSO'd far and wide on the higher DX bands. Join the Navy and work the world! (Photo via Bill Smith, W1-7897)



the time - patience, please. Repeated follow-ups complicate the job. Note that I was SV0WOO only from December 18, 1970, to August '72 and cannot help confirm QSOs made by former or later users of the call. (WA3KCP/3)

**AFRICA** - I find almost thirty percent of those applying for QSLs from EL2s DG DS and NS fail to include s.a.s.e., or s.a.e. plus IRCs. This means I must foot the bill for slow bureau shipment, no small expense with today's exploding postal costs. More attention also should be given to correct use of GMT and GMD, specification of emission mode, frequency, etc., when filling out cards. (WB4SRX) . . . W1AM handles XT2AK's W/K QSLing, F6AXP the rest. (L1DXA) . . . My request to DL9FS for a 5X5FS QSL brought back only a DL9FS card. Halp! (W9DDL) . . . K4TXJ, QSL manager for ZSs 3KC and 4KC, cautions that no cards for those stations should be sent via bureau, only through his address. (W4WFL)

**OCEANIA** - I'm forwarding my QSL to WN6TYA per his plea in last August's "How's." I've replied to all cards received here since 1930 when I first fired up as VK3DM. His QSL failed to reach me and I cannot afford to QSL before receipt. (VK4MY) . . . In trying to confirm a 1949 QSO with VK6DX I learned the OM joined Silent Keys in '63. (W1OP1) . . . VK9JK became P29JK at the same location on December 20, 1973. Fr. Joe's QSLs continue to be handled by our DXpedition of the Month facility. (W2GHK)

**SOUTH AMERICA** - KZ5SD is somewhat behind in HC8GI QSL chores due to unexpectedly heavy influx. (WCDXB) . . . Chile's XQ label gets intermittent contest employment, suffixes the same. (L1DXA) . . . PYs still become ZYs in occasional test action. (W2ESX) . . . Now for the month's specific postal suggestions with understanding that each item is necessarily neither "official," complete nor accurate. Could net you a nifty, though - help yourself. . . .

- A7XA, Box 83, Doha, Qatar (or via DJ9ZB)
- DJ3DH/ET3 (via DL6ME)
- DL7RT/HB0 (to DL7RT)
- DU2EL, D. McCarthy, PSC-2, Box 18873, APO, San Francisco, CA 96311
- EA9FY, P.O. Box 234, Ceuta, Spanish North Africa
- EL0U/mm (via YU3TUA)
- EG7AM, Box 957, Pointe-a-Pitre, Guadeloupe, F.W.I.
- EM7AQ, Box 137, Fort de France, Martinique
- FR7ZL/t (to FR7ZL or via F8US)
- G3RWL, R. Limebear, 60 Willow Rd., Enfield, Middlesex, England
- HS4AJW, P.O. Box 2008, c/o GPO, Bangkok, Thailand
- JD1s ACH ACK ADM AFE AFF AHN AHR AIV AJA/JA3 (via JA3GZN)
- JX7AX/UA1 (via NRRL)
- KB6RCT, Box F-153, APO, San Francisco, CA 96401
- KH6IJ/KS6 (to KH6IJ)
- P29s GO KA (to VK9s GO KA)

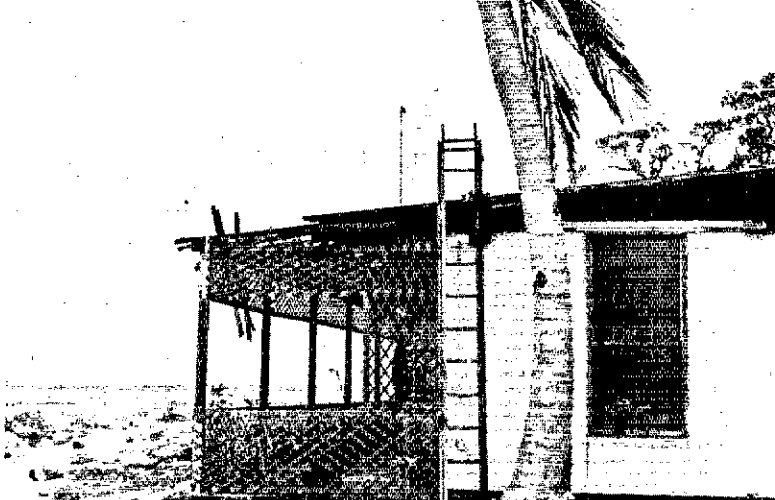
- PY7ZAH/0, C. P. 91, Recife, Brazil
- ex-SV0WOO, J. Luthy, WA3KCP/3, 509 3rd St., Carlisle, PA 17013
- TJ1AF, P.O. Box 27, Bertova, Cameroon
- TJ1BF, P. Johnson, P.O. Box 1185, Yaounde, Cameroon
- TU2EG, P.O. Box 6655, Abidjan, Ivory Coast
- VE3AH/SU (via VE1AL)
- VK9ZC, K. Collins, c/o P.O., Croydon, Victoria, 3136, Australia
- VO-VX1XXV, Society of Newfoundland Radio Amateurs, P.O. Box 1226, St. John's, Newfoundland, A1C 5M9, Canada
- ex-VP2LI, J. Rafferty, WA9UCE/6, 555 W. Middlefield, Apt. H-103, Mount View, CA 94043
- VP2s MOP MUS (via VE4OP)
- VS6s AU GN (via HKARTS)
- WA1CQA/HC1 (to WA1CQA)
- WB6LAI/KJ6 (via KJ6BZ)
- YV4OW/7, P.O. Box 78, Margarita Island, Venezuela
- ZF1s FOC JW TW (via WB2JYM)
- ZL2AOV/mm (via ZL1TQX)
- ZSs 3KC 4KC (see text)
- 9L1JM, P.O. Box 16, Freetown, Sierra Leone

- CT2BM (via WA5BDJ)
- CV8B (to CX8BB)
- EA8JJ (via W3HNK)
- ET3USE (via WB4QKE)
- FB8DX (via F2MO)
- FG7AYO (to W2JKN)
- FY7AQ (via WB4VUP)
- GB3MKB (to G16YM)
- HZ1AB (via DJ9ZB)
- JT0AE (via OK3YAO)
- KC4USX (via K7WPZ)
- KC6VE (via W7PHO)
- KW6HF (via WA6BBI)
- KX6LA (via K2BT)
- M1C (via 14EAT)
- M1FOC (to DL1RK)
- OJ0AM (to OH0MA)
- P29GG (via JA1WC)
- P29GO (to VK9GO)
- P29JK (via W2GHK)
- P29RJ (via JH3HPX)
- PJ8AK (via F6AEV)
- PJ8HR (to W2JKN)
- SV0WXX (see text)
- TG9HC (via WA8LST)
- TJ2BEV (to K4VW)
- TI2WD (via SM6CVX)
- TU2EN (via F6CEE)
- VA7MRE (via VE7BCP)
- VP2DI (via VE3MJ)
- VP2GGG (via W5MYA)
- VP2SV (via K3GYD)
- VP5GS (via W4BRB)
- VR1PD (to W6LUV)
- VU2ABV (via ARSI)
- VU2ANI (via K61WT)
- VX1KE (via WA1QBH)
- VX2PB (to VO2PB)
- XE1FFC (via LMRE)
- XQ3CZ (via CE3AQW)
- XQ3ED (via RCC)
- ZD7MP (via VE1AII)
- ZD9GD (via ZS6AO)
- ZF1BR (via W4KA)
- ZF1CW (via WB4TAF)
- ZS6CM (via VE1CV)
- ZY2GAT (to PY2GAT)
- 3D2CC (via VE6AKV)
- 3D6AC (via W2LGU)
- 5T5DY (via REF)
- 5T5LO (via K9KXA)
- 7Q7DW (via G3AWY)
- 8P6EZ (to W1RED)
- 8Q6AF (to SM7AFV)

Data donors this run include Ws 1CW 1JUB 1OPJ 1YL 2ESX 2GHK 2HNK 4WFL 9DDL 9DY 9LF 0KMN, K0CVN, WAs 1BOV ISOB 3ERG 4ZVF 6KHK 6SXL 0EMS, WB2EOO, WN6UFW, KH6IJ, VE6AXB, VO1FX, G3JKY, Columbus Amateur Radio Association *CARAscope* (W8ZCQ), *DX News-Sheet* (G. Watts, 62 Bellmore Rd., Norwich N. 72T, England), International Short Wave League *Monitor* (E. Chilvers, 1 Grove Rd., Lydney, Glos., GL15 5JE, England), Japan DX Radio Club *Bulletin* (JA3GZN), Long Island DX Association *DX Bulletin* (K2KGB), Newark News Radio Club *Bulletin* (M. Witkowski, Rt. 5, Box 167, Stevens Point, WI 54481), Northern California DX Club *DXer* (Box 608, Menlo Park, CA 94025), Southern California DX Club *Bulletin* (W6RJJ), *VERON's DXpress* (PA9s INA TO), West Coast *DX Bulletin* (WA6AUD) and Western



ZF1s FOC JW and TW were W4ZMQ. WB2s VPZ and JYM on an autumnal DX lark. Much DX was worked from Georgetown's luxurious Seven Mile Beach with a simple 14AVO. Here W4ZMQ stirs up something on 20 with Drake and Heath gear while his companions are off sampling the sensational Caymans surf and sunshine.



JA1OCA/C21 included some 1300 W/K customers among his 2350 contacts from Nauru on a visit to that tiny Oceania republic last summer. Isao and friends look forward to renewed island action in the '74 Pacific DXpeditionary season upcoming.

Washington DX Club *Totem Tabloid* (WA7JCB). That's A-1 help, all right, and we can use more!

† † †

SP-DX Club officers for the new term are SPs 9AI 3DOI and 9PY in that rank with SPs 6BZ 8HR 9BDQ 9BPF and 9ZD in lesser posts. . . . Holland's annual PACC DX Contest comes off on the last weekend of this month. All set?

#### Whence:

**EUROPE** - On the 11th-16th of this month I watch for DL7RT/HB0 on 3.5 through 28 MHz, voice and code, especially split-frequency near 3760 and 7095 kHz. Several Berlin OMs will join me in Liechtenstein. (DL7RT) . . . W1PL, WA1NRV, WB2FMK, WA0KDI, W8VSK, WA3JENM 2DLV, W4JUK, WB4NRI, WA5ZWC, KL7HDX, WB4SPG and WA2ZWH enjoyed our 1973 Poland DX Contest and finished in that U.S.A. scoring order. VO1AW, VES 3EVK 3EDC 4MF and 2QJ ranked in sequence for Canada. There were 377 SPs and 526 foreign radio-telegraphers participating. (SP5HS) . . . G3XAP turned the 160-meter WAC trick on only nine watts input, VK6HD the clincher last December 28th. Phil persevered for two years at the task and now intends to do it again on half the power. (W1BB) . . . May be reactivating C31EF and other European spots this spring. (W4WFL) . . . DJ8SW, a policeman in Wuppertal, likes cw contesting on 15 and 20 from club station DL0WU. (W2GX) . . . XYL OE1YBA and I are trying two-meter DX life in Vienna. (OE1PBA) . . . That large 80-meter signal from DJ1US is launched by a full-size 3-element wire Yagi. (W2ESX) . . . I hear that Warsaw Radio Club has an 80-meter ZL-Special beam aloft, quite an impressive pair of phased dipoles. DJ5TH visited my diggings last fall and votes for reactivation of the old International Ham Hop Club. (W5QPX) . . . SRAL chairman OH5NW combines aviation with his avid amateur radio interest. (OH5YV) . . . Continental commentary courtesy the aforementioned DX press: Light-house-keeper OJ0AM keeps Market Reef active but heavy family and work responsibilities come first. . . . WA1NGK/TF indicates that Yanks will find it more difficult to obtain Icelandic operating privileges this year because of various international complications. . . . VERON's PA0AA transmits amateur news and code practice each Friday on 3600-KHz cw beginning 1900 GMT, by 45-baud RTTY at 2030, and with phone at 2100. Code-proficiency runs occur on the last Friday of each month at 2130. . . . SY5MA was interesting DX sport last fall but W3AG admits his cw 25-watter, ground-plane and makeshift straight key weren't destined to make him a world-shaker from Mt. Athos. Bill used a battery-powered Tempo I. . . .

**ASIA** - JA7AO's new WAC is believed to be the first 160-meter job from Japan. JAs IMCU and 7NI also made the long 1.8-MHz hop to PY1RO. 4X4NJ is filling in Asia for numerous other top-band WACs. (W1BB) . . . Radio Society of Okinawa, P.O. Box 465, APO, San Francisco, CA 96331, still issues a certification for five contacts with KR6s prior to May 15, 1972. (RSO) . . . JA8AIP, active on 14,050-kHz cw each Saturday at 2300-0100 GMT, seeks QSOs with Delaware and Vermont to complete his WAS. (WA1BQV) . . . Enjoyed traveling the Singapore and Hong Kong areas with VS6DR and other Asian amateurs while visiting those parts last fall. (W6ISQ) . . . 4W1GM, formerly SV0WUU, digs for W/Ks every weekend at 1800 GMT on 14,222 kHz. (W3HNK) . . . UG6JJ is most anxious to confirm Mexico through the W/K curtain, no easy stunt from his part of the world. (E. Hamill) . . . As a League member since 1962 I enjoy working the ARRL gang on 15 and 20. (JA1OCA) . . . More orientalism via the literature of clubs and groups: W1GFY may get a chance to demonstrate amateur radio in mainland China this month if all goes well. The line forms around 14,201 kHz. . . . 8Q6s AC and AF, with SM7AFV and 4S7YL respectively officiating, offered Maldivé jive to cool 20-ssb cats this winter. VS9MJ joined their chorus. . . . HS4AGN regates 5B-DXCC buffs around 3795 or 7030 kHz at 1300-1500 GMT. . . . SM2DWH/S2 could spend another month in Bangladesh, weekending on 14,230-14,290 kHz at 1200-1600 GMT. . . . 4W1AF makes a flock of 5B-DXCC friends near 3795 kHz at 2030 GMT. . . . A6XG puts A6XP's old TH6DXX to work in Dubai with an S-line: near 14,22kHz at 1400 GMT. Near-by A7XA draws a ravenous Qatar-starved mob near the same frequency a few hours earlier. . . . The world-wide energy-deficiency problem is beginning to hobble DXpeditionary pursuits and the activity of DXers in rarer regions. Fuel shortage bogged down potential transportation routings and harked the efforts of VU2KV and W6KNH to get a Bhutan thing going last winter. Petrol paucity also is acute in the Phnom Penh vicinity where K7CBZ now finds it increasingly difficult to keep XU1AA audible. Can we use sail and windmill to keep that rf flyin'?

Q57

## APRIL

1-June 30 *International Italian YL "Jolly-Flower" Contest*, p. 101 March.

4 *West Coast Qualifying Run* (W6OWP prime, W6ZRJ alternate) 10-35 wpm at 0400 GMT on 3590/7090 kHz. This is 2100 PDST the night of April 3. Please note that dates are always shown at least 2 months in advance and times are always the same local "clock time," i.e. 9 PM local Pacific time. Underline one minute of the highest speed copied, certify copy made without aid and send to ARRL for grading.

6-7 *CD Party* cw. This is a quarterly event for League appointees and officials, notified separately by bulletin. The July Parties are open to all ARRL members. Check with your SCM (p. 6) to see if you can qualify for an appointment. Remember the event starts at 2300Z April 6 and ends 0500Z April 8. *SP DX Contest*, *VHF Space Net Contest*, p. 101 March.

12-14 *Novice QSO Party*, p. 101 March.

12-15 *County Hunters SSB Contest*, p. 101 March.

14 *WAB LF CW Contest*, p. 101 March.

16 *WIAW Qualifying Run* (10-35 wpm at 0130 GMT) on 1.805 3.580 14.080 21.080 28.080 50.080 and 145.588 MHz. This is 2130 PDST 9:30 PM EDT the night of April 15. Underline one minute of top speed copied, certify copy made without aid and send to ARRL for grading. Please include your full name, call (if any) and complete mailing address.

20 *Earth and Air Art*, a worldwide linkup by ham radio, sponsored by the Auckland City Council of New Zealand. Ten stations will operate simultaneously from 0300-1030Z. Attempt a contact and exchange info, regarding location, weather, etc. Call used will be ZL1AA. Special QSLs.

20-21 *CD Party*, phone. *Zero District QSO Party*, *RTTY WAEDC*, p. 101 March. *Bermuda Contest* phone, sponsored by the Radio Society of Bermuda from 0001Z April 20 to 0200Z April 21. (CW first weekend of May.), 80-110 meters. W/VE/U.K. hams will transmit report plus state, province or county. W/VFs work U.K. stations and VP9s only. U.K. stations work U.S., VE and VP9. Each contact must be complete and will count 3 points. No crossband or crossmode contacts permitted. Contestants are reminded with regard to the rules governing operation on 7 MHz. To scores: on-VP9s multiply no. of complete contacts times 3 times the total no. of Bermuda Parishes on each band. Parish abbreviations: Sandys SAN, Pembroke PEM, Southampton SOU, Hamilton HAM, St. George STG, Devonshire DeV, Warwick WAR, Souths SMI, Paget PAG. Single operator only. Trophies and other special awards. Log in GMT, submit log and check sheets plus signed statement. Print name, call, address on each sheet. Contest Committee Decision final. Send no later than June 29 to: Radio Soc. of Bermuda, Box 275, Hamilton S. Bermuda. Logs and summary sheet for large s.a.s.e. to VP9GR, G3RZI or WA2AMU.

20-22 *QRP QSO Party* p. 101 March.

27-28 *Florida QSO Party*, PAUC, H-22 Contest, p. 102 March.

29 *Special WIAW Evening Qualifying Run*, Sunday night local, times/details same as under the April 16 listing.

## MAY

1 *West Coast Qualifying Run*.

4-5 *Bermuda Contest* cw, see April 20-21 listing for general details.

11 *Frequency Measuring Test*, open to all, begins with a callup at 0130 and 0430 GMT May 11. (Please remember that this is the evening before, local time.) The periods for measurement start at 0137 (80 meters), 0145 (40 meters) and 0153 (20 meters); for the late run, 0437, 0445, 0453 respectively. Each measuring period lasts 5 minutes. Submit your AVERAGES for each 5-minute period which will be compared with the umpire's averages during the same period. (The umpire is a professional frequency measuring laboratory.) Tell how many readings you took to form your averages. Approximate frequencies for the early run are 3557, 7062 and 14,105 kHz. Late-run frequencies are 3538, 7108 and 14,077 kHz. Your entry must be received by May 22 to qualify for the QST report of the competition. WIAW will start transmitting the official readings May 23. *World Telecommunications Day Contest*, cw, sponsored by the Brazilian Ministry of Communications, the full 24-hour GMT period, 160-10 meters. Each participant will attempt

to make the highest possible number of contacts with the different ITU zones of the world, in order to enable his country to win the ITU Trophy. Send report plus ITU Zone (see p. 87, April 1972 QST). Contacts with stations in the same country = zero points; in another country in the same ITU zone 80/160 meters = 2 points, 10-40 meters = 1 point; on the same continent and in another zone, 10/15/20 = 2 points, 40 = 3 points, 80/160 = 4 points; on another continent, 10/15/20 = 3 points, 40 = 5 points, 80/160 = 6 points. Final score the sum of QSO points times the number of different ITU zones worked. Medals to the 3 highest world scorers per mode. Logs must be postmarked by June 30 and sent to: Minister of Communications, DeNTEL, 7000, Brasilia, DF, Brazil. *YL International SSBers QSO Party* cw, the full 24-hour period GMT (one 6-hour test period); phone May 18-19, which will be a 48-hour operating period with two 6-hour rest periods. All bands, same station may be contacted on different bands for contact points but not for country multiplier (use multiplier once only). Non-members welcome, categories are DX/W-K teams, YL/OM teams, single operator. Exchange name, RST, SSBer number, country, state, partner's call (if applicable), if non-member send no number. Two points for member contacts on any continent, one point for non-member contacts. Suggested freqs.: cw, 3565 7084 14070 21070; phone, 3879 7273 14333 21373 28673. Non-members may single operate only. Only YL-SSB members in each country worked count as multipliers. Logs must show date, time(Z), reports, SSBer number, partner's call, mode, period of rest time. Logs must be postmarked on or before June 30 and received by July 15. Logs go to and further info, available from Lyle Coleman, W7EQI, 412 N. 19th St., Great Falls, Montana.

11-12 *Russian Contest* cw, this is the normally scheduled weekend for this event though no details by copy deadline for this issue.

11-13 *Georgia QSO Party*, sponsored by the Columbus Amateur Radio Club, starts 2000Z May 11 and ends 0200Z May 13, no time or power restrictions. Contacts may be made once on phone and once on cw on each band with the same station. Ga.-to-Ga. contacts permitted. Exchange QSO no., report and QTH (county for GA stations, state/province/country for others). Score 2 points per contact. GA stations multiply QSO points by the total no. of different states/VE provinces worked. DX stations may be worked for QSO points but do not count as multipliers. Out-of-state stations use the no. of GA counties worked for multiplier (possible total of 159). Appropriate certificates/plaques. Suggested freqs.: cw, 1810 3590 7060 14060 21060 28060; ssb, 3900 3975 7260 14290 21360 28600; novice, 3718 7125 21110 28110. Try 160 at 0300Z, 10 on the hour and 15 on the half hour during daylight periods. Logs must show date/time in GMT, stations, exchanges, bands, emissions, multipliers. Check lists would be appreciated. Include the usual declaration and mail by June 10 to the Columbus ARC, attention John L. Laney, K4BAI, Box 421, Columbus, GA 31902. Enclose a large s.a.s.e. for a copy of the results.

15 *WIAW Qualifying Run*.

18-19 *YL ISSB phone*, see May 11 listing. *Tennessee QSO Party*, from 2200Z May 18 through 2200Z May 19, sponsored by the Tennessee Council of Amateur Radio Clubs, all bands. Tenn. stations may work each other. Exchange report and QTH (non-Tenn. stations give state or country, Tenn. stations send county). Logs must include date, time (Z), stations, exchanges, band, mode and multiplier. Stations may be worked on each band/mode. Portables and mobiles may be reworked if they change counties. Only those portions of the bands licensed to Generals may be used. Suggested areas as follows: cw, 3550 7050 14050 21050 28050; phone, 3980 7280 14280 21380 28580; novice, 3725 7125 21125 28125. Outside stations multiply Tenn. QSOs by the no. of different Tenn. counties worked (max. 95). Tenn. stations multiply QSO points times no. of states worked plus VE districts worked (max. 8) plus Tenn. Counties worked, plus bonus. Bonuses for Tenn. stations as follows: for each cw-cw contact count 1/2 points, phone contacts count 1 point; if no home stations are single op., if operated from a county other than the regular QTH just for the contest you receive a 10% score bonus; all club stations are multiplier, and if operating in the field on emergency power (a good FD test), they will receive a 10% bonus and an additional 10% bonus if operating from a county other than the club's QTH; all mobiles are considered multiplier, may be worked in motion or parked. Stations may be reworked from each county, 100 bonus

points for each county. Awards, plaques. Any station disrupting a Tenn. traffic net or whose log exhibits obvious irregularities will be disqualified from award consideration.

**18-20 Connecticut QSO Party**, sponsored by the Candlewood Amateur Radio Association, 2100Z May 18 to 0200Z May 20, phone and cw. Exchange QSO no., report, ARRL section (Conn. stations send their county). Stations may be worked once on each band and also on each mode. To score, stations outside Conn. multiply total no. of QSOs by no. of Conn. counties worked (max. 8). Conn. stations use ARRL section or provinces as multiplier. Suggested freqs.: cw, 3540 7040 24040 32040 28040; phone, 3925 7250 14300 21375 28540; novice, 3725 7125 21125 28125. Certificates to the high scorer in each section/province and in each Conn. county (min. of 6 QSOs needed for an award). In addition, a special WACC (Worked All Conn. Counties) certificate to any station working all 8 counties. Logs must show category, date, time(Z), stations, numbers, exchanges, bands, QSO points and claimed score. Enclose large s.a.s.e. if results desired. Logs must be postmarked by June 20 and sent to: Candlewood AR Assn., Donald Crosby W1EJM, 10 Royal Rd., Danbury, CT 06810.

**25-26 New York State QSO Party** sponsored by the Rensselaer Polytechnic Institute Radio Club W2SZ, from 1700Z May 25 to 0500Z May 26 and 1200-2359Z May 26. Stations may be contacted once on phone and once on cw on each band. NY stations may work other NY stations; Exchange QSO no., RST and QTH (counties for NY, ARRL section or country for others). Suggested freqs.: cw, 1810 3560 7060 14060 21060 28060; phone, 3975 7275 14285 21375 28575; novice, 3725 7125 21125 28125. Score 1 point per QSO times number of multipliers: ARRL sections (including ENY WNY NLI), plus countries, for NY stations, maximum of 62 countries for others. Number the first contact for each new multiplier. A check sheet is requested from stations making over 100 contacts. Appropriate certificates. Logs should be sent no later than July 1, 1974 to John C. Yodis WA2EAH (that is WA2EAH), 43 Beacon Ave., Albany, NY 12203. Please note that results will ONLY be sent to those enclosing a no. 10 s.a.s.e. **One-Land QSO Party**, sponsored by Murphy's Marauders and the MIT Radio Society, from 1600Z May 25 until 1600Z May 27. Single operator stations only. Stations in the first call area of the U.S.A. will work as many stations in any and all parts of the world as possible (this includes other one-land stations). Others work as many stations in the U.S.A. first call area as possible. Stations in the first call area will send report, county and state. Others will send report, serial no. starting with 001 and section or country. Partial QSOs will not count for points, each valid QSO worth 2 points. Novice QSOs worth 4 points. Multipliers: One-land stations add no. of different sections (EM/WM will count as 1 section) and foreign countries; others use the no. of different counties in the first call area as mult. Points times mult. equals score. Appropriate awards (only when entrant has 15 or more QSOs and tops his section, country, first call-area county). One-land mobiles and portables may be reworked on the same band if located in a different county. No crossband or QSOs through repeaters. Suggested freqs.: cw, 3560 7060 14060 21060 28100; phone, up from 3890 7225 14275 21350 28600; novice, 3710 7120 21120 28110. Check 15 on the hour between 1600-2000, check 10 on the half hour between 1630 and 2130. ARRL disqualification criteria will apply. Entries consist of logs/summary. Send to: Murphy's Marauders, Box 11331, Newington, CT 06111. Entries must be postmarked no later than June 21, 1974. Include s.a.s.e. for contest results. Awards for Mass. stations will be handled by the MIT Radio Society, W1MX. all others by the MM cw.

#### JUNE

- 1-2 *Minnesota QSO Party.*
- 6 *West Coast Qualifying Run.*
- 8-9 *VHF QSO Party.*
- 9-15 *Massachusetts Amateur Radio Week.*
- 13 *WIAW Qualifying Run.*
- 15-16 *All Asian Contest phone (cw in Aug.).*
- 22-23 *FIELD DAY*
- 26 *WIAW Morning Qualifying Run.*

*July 3-4, Straight-Key Night.*

*July 6-7, DL Activity Group cw QRP Contest.*

*July 13-14, Open CD Party cw.*

*July 20-21, VHF Space Net Contest, IJK Contest.*

*July 27-28, Open CD Party phone (new date to avoid conflict with*

*ARRL National Convention), CW County Hunters Contest.*

*Sept. 7-8, VHF QSO Party.*

*Nov. 9-10, SS, phone.*

*Nov. 16-17, SS cw.*

ALL SPONSORS OF THE ABOVE ACTIVITIES ARE REMINDED TO SEEK ALL POSSIBLE AVENUES OF PUBLICITY FOR THEM. LET THE GENERAL PUBLIC KNOW WHAT IS GOING ON!

## YL News

(Continued from page 81)

Beach, California in 1972. It was a member of the North County YLs who created the souvenir ceramic pins for those who attended. The communications from the take off point of the 1973 Powder Puff Derby was headed by W6YZV, and four members of the club.

Current officers are President, Genevieve Johnson, WA6KKQ; Vice-President, Edith Nichols, K6AYJ; Secretary-Treasurer, Mary Garlow, K6QPG.

Meetings are held the fourth Saturday of the month at members' homes. Any and all licensed YL operators are welcome to join.

### K6QPG, Mary Garlow

The top cw score for the Sixth YLRL District, and Secretary-Treasurer of the North County YLRC, in southern California, studied for her license because the OM, W6PEU's cw fascinated her and he thought she couldn't master it. An avid cw operator, Mary holds the ARRL CP-35 certificate. She enjoyed being a part of a pile up, a rare experience for an operator in this country, when she operated in the CQWDX, both fone and cw, and the ARRL DX competition in 1959, and 1960 as portable KW6. She holds WAC, YLCC on cw, the YL-OM-1000, also on cw, and Lads 'n Lassies certificates.

Mary is retired from federal service. The last 10 years of her professional duties were as a nurse in federal prisons, and with the California Youth Authority. She also was in the Grey Nurse Corps for 3 years, two of them in service in India.

Now retired, Mary is very active in contests, cw variety, and in hunting DX. She is a member of ARRL, YLRL, YLRC-LA, the North County YLRC, and participates in the Legion Net, and the Ironing Board Net.

**QST**

## World Above

(Continued from page 86)

terests and someone to test with on microwave.

In Michigan, WABULG says several stations in the southern part of the state are active on 432, including himself, W8s CVQ, PYQ, GOV, K8AEM, K8GMR, WA8s MCD, MFL, PSS, PST, MOA and NWY. WABULG runs a kilowatt on sideband to an array of four Yagis. Ted wishes other stations would 'think and point' Michigan.

**QST**

## New Books

(Continued from page 69)

imported gear are distant and slow. The knowledge gained from this manual need not be limited to receivers. By remembering that the power levels involved are higher — and the impedances are usually lower — in solid-state transmitters, the amateur should feel more competent to cope with problems in any piece of gear in the shack. — W1SL

# Operating News

GEORGE HART, W1NJM  
*Communications Manager*  
 ELLEN WHITE, W1Y1  
*Deputy Communications Mgr.*

ASST. COMMS. MGRS.: DXCC, R. L. WHITE, W1CW; *Hq. Station*, C. R. BENDER, W1WPR;  
*Contests*, F. D. NISWANDER, WA1PID; *Public Service*, W. C. MANN, WA1FCM.

**Appointment Status.** This is the time of year of the "Great Juggling Act," when we try to do half a dozen jobs at once, such as answer correspondence, answer the telephone, participate in office conferences, prepare *QST* copy (all of which are more or less routine), write the mid-season *CD Bulletin* — and prepare the annual report. The latter is an annual chore which summarizes CD activities of the previous year, and which is submitted to the Board of Directors for their information. It deals with all phases of CD activities, which are manifold — administration, contests, DXCC, Public Service, Affiliated Clubs and WIAW, and all the problems connected with them. It is a year-end review, partially statistical, partially analytical. If it were not required by the Board of Directors, we would prepare it anyway, because it assists in keeping everybody concerned abreast of the status of the League's sponsored operating activities.

The trouble with statistics is that they are often used to prove or substantiate a point rather than to indicate status. That is, first you decide what it is you want to prove, then you dig out the statistics to prove it. This is both statistical debasement and a form of intellectual dishonesty, and a backwards approach besides. The true value of statistics is to take what they show at face value, to heed what they have to tell you and, if need be, to take action accordingly.

Okay, end of lecture on the value of statistics. It was given for a purpose, as you will see; because

the 1973 year-end statistics on appointments show some things we would much rather not believe — that our appointment structure continues to deteriorate, in terms of numbers at least. The deterioration, if you can call it that, is not rapid, but pretty steady. It has been going on for quite a few years, per the following table:

Appt.	1973	1972	1971	1970	1969	1968	1967	1966
EC	982	1003	1052	1120	1319	1151	1205	1243
RM	108	119	120	114	123	114	119	116
PAM	124	122	132	135	163	135	131	132
ORS	1290	1267	1257	1265	1305	1251	1251	1258
OPS	1045	1038	972	902	915	902	886	884
OBS	377	397	406	416	509	447	470	451
OO	458	482	473	440	582	509	554	551
OVS	430	437	478	476	488	546	614	621
Totals	4814	4865	4890	4868	5404	5055	5230	5256

From the above, you can see that we are down 442 appointees in 7 years, a decrease of 8.4%. From the 7-year high in 1969, we are down 590 appointees, a decrease of 11%. SECs and Asst. SCMs are not included in the above data, since SECs remain nearly constant and Asst. SCMs operate in no specific specialty, so their number is not significant.

Shall we be concerned about this trend? Well, perhaps not especially about the overall trend, but certainly about the trend in two appointments — Emergency Coordinators (EC) and Official Observers (OO). The former play a big part in leading our emergency preparedness efforts, the latter are important as our principal entry in the self-monitoring field. Yet, in four years our emergency preparedness leadership has declined over 25%, and our self-monitoring corps over 20%.

Are we making up in quality what we are losing in numbers? We hope so, but it's a pretty difficult thing to evaluate. We do have a number of very dedicated local emergency preparedness leaders and observers, that's for sure. But assuming other things to be equal, why the drop overall, and why the specific drop in the two appointments requiring the most dedication and/or having the highest requirements?

Could be any or several of a number of reasons, and conjecturing might be fun, but not particularly progressive. One thing that seems apparent is that our appointment structure was not planned but grew "like Topsy" in accordance with the demands or pressures of the times. For example, we have Official Phone Stations whose duties are largely to set an example of proficient phone operating, but no Official CW Stations to do the same thing



Florida SCMs comparing notes at the SE Division Convention this past January in Miami are: left, Frank Butler, W4RKH SCM Northern Florida and Woody Huddleston, K4SCL, brand new SCM of Southern Florida.



## W1AW SCHEDULE

The ARRL Maxim Memorial Station welcomes visitors. Operating-visiting hours are Monday through Friday 1 P.M. - 1 A.M., Saturday 7 P.M. - 1 A.M. and Sunday 3 P.M. - 11 P.M. (all times local Eastern). The station address is 225 Main Street, Newington, Conn., about 7 miles south of Hartford. A map showing local street detail will be sent upon request. If you wish to operate, you must have your original operator's license with you. The station will be closed Jan. 1, Feb. 18, April 12, May 27, July 4, Sept. 2, Nov. 28, Dec. 25, 1974.

Times/Days GMT	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
0000				CW Bulletin <sup>1</sup>			
0020-0100 <sup>4</sup>			3 7 Nov. 5*	14.080 <sup>1</sup>	14.080*	7.15 Nov. 5*	14.080*
0100	Oscar <sup>10</sup>			Phone Bulletin <sup>2</sup>			
0105-0130 <sup>4</sup>			3.990*	50.190*	145.588*	1.820*	21.390*
0130							
0230-0300 <sup>4</sup>							
0300	RTTY Bull. <sup>3</sup>						
0330	Phone Bull. <sup>2</sup>						
0335-0400 <sup>4</sup>							
0400	CW Bull. <sup>1</sup>						
0420-0500 <sup>4</sup>							
1240							
1300							
1700-1730							
1730							
1800							
1900-2000							
2000-2030	Oscar <sup>11</sup>						
2030							
2100-2130							
2130							
2200							
2300							
2330							

<sup>1</sup>CW Bulletins (18 wpm) and code practice on 1.805, 3.580, 7.080, 14.080, 21.080, 28.080, 50.080 and 145.588 MHz.\*\*

<sup>2</sup>Phone Bulletins on 1.820, 3.990, 7.290, 14.290, 21.390, 28.590, 50.190 and 145.588 MHz.\*\*

<sup>3</sup>RTTY Bulletins, on 3.625, 7.095, 14.095, 21.095, and 28.090 MHz.\*\* Bulletins repeated when time permits.

<sup>4</sup>Starting time approximate, following conclusion of bulletin or code practice.

<sup>5</sup>W1AW will tune the indicated bands for Novice calls, returning the call on the frequency on which called.

<sup>6</sup>Participation in traffic nets.

<sup>7</sup>Operation will be on one of the following frequencies: 21.02, 21.08, 21.1, 28.02, 28.08, 28.1 MHz.

<sup>8</sup>Operation will be on one of the following frequencies: 21.260, 21.390, 28.590 MHz.

<sup>9</sup>When an Oscar satellite is in orbit, daily updated orbital data is sent at 18 WPM on cw frequencies.

<sup>10</sup>Oscar orbital data for the coming week, on RTTY frequencies.

<sup>11</sup>Oscar orbital data for the coming week, on cw frequencies.

\*General contact period.

\*\*No 10- or 15-meter activity from 0130-0500.

### W1AW CODE PRACTICE

W1AW transmits code practice according to the following schedule. Approximate frequencies are 1.805 3.58 7.08 14.08 21.08 28.08 50.08 and 145.588 MHz. For practice purposes the order of words in each line may be reversed during the 5-13 wpm transmission. Each tape carries checking references.

Speeds	Local Times/Days	GMT
10-13-15	7:30 PM EDST dy	2330 dy
	4:30 PM PDST	
5-7½-10-	9:30 PM EDST SnTThS	0130 MWFSn
13-20-25	6:30 PM PDST	
5-7½-10-	9:00 AM EDST MWF	1300 MWF
13-20-25	6:00 AM PDST	

35-30-25-	9:30 PM EDST MWF	0130 TThS
20-15	6:30 PM PDST	
35-30-25-	9:00 AM EDST TTh	1300 TTh
20-15	6:00 AM PDST	

The 0130 GMT practice is omitted four times a year on designated nights when Frequency Measuring Tests are sent in this period. To improve your fist by sending in step with W1AW (but not over the air!), and to allow checking the accuracy of your copy on certain tapes, note the GMT dates and QST practice text (from the issue 2 months previous) to be sent in the 0130 GMT practice on the following dates:

Apr. 8: It Seems to Us	Apr. 23: ARPS
Apr. 11: Correspondence	Apr. 26: World Above
Apr. 17: League Lines	May 3: YL News

for cw; the closest we have to this is the Official Relay Station, whose duties have to do exclusively with the handling of third party messages - on cw only. This anomaly came about a few decades ago when A-3 was new and its aspirants, although still a minority, demanded recognition.

After World War II, vhf and uhf started to gain in popularity as an experimenter's part of the

spectrum, so the Official Experimenter's Station (OES) was created, just for vhf and above. But this excluded the hf experimenter, and besides wasn't really operating, so the name was changed to Official VHF Station and public service operating was emphasized along with vhf-uhf experimenting. So now we have an OVS appointment, but no OHS (Official HF Station), an OPS but no OCS (Official

CW Station) and an Official Relay Station which phone operators aren't eligible for.

And the present appointee group appears to want to keep it that way, since two or three polls of them have in effect turned down proposals to localize the present structure and include other operating interests in it, such as DXing, contesting and repeater operating. The alternative (aside from status quo, of course) is to use methods of encouraging exemplary amateur operating other than the time-honored one of holding official SCM appointments with certain basic requirements and the duty to perform a function and set an example of proper operating within that specialty.

Has the above exposition inspired anyone with some brilliant thoughts on the subject he'd like to share with the rest of the operating fraternity? In short, what should we do to improve our operating organization? Or are we doing all right as we are? — WINJM.

### DXCC Notes

Minute 30 of the January 1974 ARRL Board Meeting empowered the ARRL Communications Department to issue DXCC membership pins with provisions to indicate the holder's current country status. The cost of the basic pin to be paid by the applicant.

We are pleased to announce that these new DXCC pins will be available by July 1 and will be issued automatically with each new DXCC certificate. For those already in DXCC, the pins will be available upon request for \$1.00.

For many years, new DXCC applications have been returned to the applicant by registered first-class mail. In most cases it has been found that the applicant *does* provide a sufficient amount to cover this postal fee. In view of the continuing rise in postal rates it has now become necessary to make this mandatory.

What does this mean? Effective July 1, for a full member in Canada, the U.S. and Possessions, Puerto Rico (and all foreign amateurs), the application fee for a new DXCC will be \$3.50 U.S. (or equivalent in IRCs). This returns the cards by registered first-class mail and supplies the certificate and DXCC pin. For non-members, a service fee of \$5.00 is *added* to the above to cover the processing (a total of \$8.50). Foreign amateurs are subject to the application fee but *not* the service fee.

The non-member service charge for endorsements will remain at \$2.00 (plus return postage).

### SCM ELECTION NOTICE

To all ARRL members in the Sections listed below.

You are hereby notified that an election for Section Communications Manager is about to be held in your respective sections. This notice supersedes previous notices.

Nominating petitions are solicited. The signatures of five or more ARRL full members of the Section concerned are required on each petition. No member shall sign more than one petition.

Each candidate for Section Communications Manager must have been both the holder of amateur Conditional Class license or higher (Canadian Advanced Amateur Certificate) and an ARRL full member for at least two years immediately prior to receipt of petition at headquarters. Petitions must be received on or before 4:30 PM Eastern local time on the closing dates specified. In cases where no valid nominating petitions were received in response to previous notices, the closing dates are set ahead to the dates given herewith. The complete name, address, Zip code of the candidate and signers should be included with the petition. It is advisable that a few extra full-member signatures be obtained, to insure that it will be valid.

Elections will take place as soon after the closing dates specified as full information on the candidates can be obtained. Candidates' names will be listed on the ballot in alphabetical order.

The following nominating form is suggested. (Signers should be sure to give city, street address and Zip code.)

Communications Manager, ARRL (Place and date)  
225 Main St., Newington, Conn. 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.

You are urged to take the initiative and file nominating petitions immediately.

George Hart, WINJM, Communications Manager

Section	Closing Date	Current SCM	Present Term Ends
Ont.	5/10/74	H.H. Shepherd, VE3DV	5/11/74
Iowa	5/10/74	A. Culbert, K0YVU	6/10/74
Wyo.	5/10/74	W.M. Moore, W7COL	6/25/74
N.N.J.	5/10/74	J.M. Crovelli, WA2UO <sup>1</sup>	12/10/74
Mo.	5/10/74	L.S. Phillips, K0VWH <sup>2</sup>	3/19/75

<sup>1</sup> Resigned 2/15/74.

<sup>2</sup> Resigned 2/15/74.

<sup>3</sup> Resigned 1/24/74.

### SCM ELECTION RESULTS

Valid petitions nominating a single candidate were filed by members in the following sections completing their election in accordance with applicable rules, each term of office starting on the date given.

Manitoba	S. Fink, VE4EQ	1/11/74
N.D.	H.L. Sheets, W9DM	1/11/74
SCV	J.A. Maxwell, W6CUF	1/11/74
S.N.J.	C.E. Feavers, W2YPZ	3/4/74
E.N.Y.	G.G. Berry, Sr., K2SIN	6/10/74
W.Pa.	D.J. Myslewski, K3CHD	6/12/74
L.Mass.	E.L. Baker, W1ALP	6/15/74

In the Main Section, Mr. Martin J. Feeney, Jr., K1OYB and Mr. Peter E. Sterling, K1TEV were nominated. Mr. Sterling received 122 votes and Mr. Feeney received 115 votes. Mr. Sterling's term of office began December 28, 1973.

In the Oregon Section, Mr. Jeffrey A. Freedman, WA7MHP and Mr. Leonard R. Perkins, WA7KIU were nominated. Mr. Perkins received 260 votes and Mr. Freedman received 205 votes. Mr. Perkins' term of office began Feb. 1, 1974.

In the Southern Florida Section, Mr. George V. Cooke, W4LEP and Mr. Woodrow Huddleston, K4SCL were nominated. Mr. Huddleston received 612 votes and Mr. Cooke received 282 votes. Mr. Huddleston's term of office began Feb. 4, 1974.

In the Eastern Pennsylvania Section, Mr. Allen R. Breiner, W3ZRQ and Mr. Richard Klinman, K3JOI were nominated. Mr. Breiner received 646 votes and Mr. Klinman received 391 votes. Mr. Breiner's term of office began Feb. 4, 1974.

### New A-I Operators

WA3SWF<sup>1</sup> WASTYH K7NZO W8MVN K9MWA  
DK3UG DK4CQ HA3MB OE2JG OE3AX  
OE7AZ VO2AS XE3LK YU2OB

# DX CENTURY CLUB AWARDS

## New Members

Radiotelephone listings follow the general-type "New Member" and "Endorsement" listings - January 1-31, 1974

OK2BOB	234	JA6RCH	139	WB2BOG	116	TU2DF	108	DJ3CO	102	YU2RJO	101
JA3BRI	227	WA2WBE	137	JA7BJO	114	K3LWM	106	LA5IS	102	JA3ANW	100
K9HLW	195	G3RTU	136	WB0EQZ	111	WB5EHF	105	LA8VP	102	KH6GHZ	100
F6KBD	183	DJ4JO	133	DK5ZX	110	4Z4IX	105	YS1DHE	102	VE2JQ	100
JA3PBJ	175	YU2CB	127	JA3GJJ	110	KH6HDB	104	DK2ET	101	W3EKT	100
W3CTE	170	FL8AG	126	DL7ND	109	YU3TCQ	104	WA2PCW	101	WB4FSM	100
W3YFV	168	WB5EAZ	121	WQKMN	109	ZP5RL	104	WB5EAY	101	W6FTQ	100
YU2CDS	146	WA2GUQ	120	DL0WO	108	K6JLM	103	WB8MCR	101	WA8ZZZ	100
VE4MG	144			OK1OAT	108	WB2EQR	103	W0MJA	101	WB8BOR	100

K4DXO	259	WB4VUP	124	WB4ECE	114	K6GNZ	108	8JH	104	WB4TBI	101
I3DSE	200	W0RUH	117	DK1GW	113	TU2DF	108	WB5EHF	104	WB8MCR	101
JA3BRI	189	O4AAKL	115	OK2BOB	112	YV9AF	107	JA3AAW	103	K8GWM	100
JA3PBJ	175	YALLM	115	WA0VXI	111	ZL3AFA	106	W6UFJ	103	PY8ADD	100
WB2EXK	144	DK4OG	114	GI3ZSC	110	DJ3KX	104	ZP5AN	102	WA1MQO	100
JA6RCH	139	I3RSK	114	ISFCK	108	DL0WO	104	LU2DC/W3	101	W8DOG	100
KG4CS	129										

## Endorsements

In the endorsement listings shown, totals from 120 through the 240 level are given in increments of 20, from 250 through 300 in increments of 10 and above 300 in increments of 5. The totals shown do not necessarily represent the exact credits given but only that the participant has reached the endorsement group indicated.

11AMU	345	W9IGW	300	W6JHV	260	W2RHK	220	VE3FLE	180	KG4CS	140
GI3IVJ	340	W9OW	300	W8VFK	260	W9JVF	220	W2EGI	180	W1EWD	140
W9DWQ	340	G3KDB	290	JA8JO	250	WA3NBM	220	W3DNI	180	W2QXR	140
W5WZJ	335	K6LQA	290	K7GYA	250	WA7MGK	220	W3FUM	180	WB2FVO	140
K8WOT	320	K6PZ	290	W2ABM	250	WA9MGK	220	WASLMG	180	W3CY	140
W3VW	320	W1VRO	290	W4HY	250	JA8AQX	200	H83AIG	160	W7NJ	140
W3AEV	315	WB8EUN	290	DJ5BW	240	K3AMI	200	JA1ITV	160	W8DSO	140
W4KFC	315	DK1FW	280	DK9WB	240	W3ZWR	200	WA3SRV	160	WB8KNZ	140
VE1KG	310	K4EKJ	280	KP4DDO	240	W4GEO	200	WB4RUA	160	3D6AX	140
W2MZV	310	W9LNO	280	VE3CVZ	240	WB4LXF	200	W5KV	160	DJ8CR	120
WASQYR	310	WA9UCE	280	W5KFN	240	WASLMG	200	W6MYP	160	JA1SR	120
DL8CM	305	K4GLA	270	WAS5MW	240	W6OK	200	WA6ZHD	160	SP6BAA	120
W1F1J	305	K5FKD	270	W90EQ	240	YU2CBM	200	ZE2KV	160	WA2KWP	120
W6ANB	305	K6TWT	270	WA9EQG	240	YU2HDE	200	JH1O4W	140	WA6CPP	120
JA2PJC	300	W4BBP	270	W0HBJ	240	I4CJW	180	K4HQI	140	WRTTV	120
K6LAE	300	WA6LLY	270	DL1AM	220	K5DUT	180	K7CYZ	140	W9LQN/9	120
OESRT	300	K8CSG	260	DL3TJ	220	SM6DBB	180	K9DDA	140	WB9FKL	120

11AMU	345	W0BN	290	K6PZ	250	WB4TPU	220	W3ZWR	180	VE3DF	140
CT1PK	325	CR4BS	280	K7GYA	250	W5HCJ	220	WAS5MW	180	W7FKL	140
WASQYR	310	DK1FW	280	W2EV	250	8JN	200	WA7MGK	180	W0YZK	140
F9MD	305	W4HOS	280	WA6LLY	250	I8LEL	200	I3GZI	160	VE3CVZ	120
G6LK	305	WB4KZG	280	WRJXM	250	WA2EJS	200	KL7HFQ	160	WA1EUO	120
JA8ADQ	305	WB8EUN	280	WB5DJA	240	W6OK	200	W2CML	160	WA1NSJ	120
W6ARB	300	DL8CM	270	DK4YA	220	W90EQ	200	WASLMG	160	W4GEO	120
W0YDB	300	K8LSG	260	DK9WB	220	WA0RRJ	200	FR8O	140	WB4SJT	120
K4BYM	290	W8VFK	260	W2MPK	220	LU1DAR/W3180		K7UXN	140	WA6CPP	120
W2PDB	290										

**IN A COMMUNICATIONS EMERGENCY,  
MONITOR WIAW FOR SPECIAL BULLE-  
TINS AS FOLLOWS (times in GMT).**

Phone: On the hour.

RTTY: At 15 minutes past the hour.

CW: On the half hour.

## 5-BAND AWARDS

*(Updating the March 1974 listing.)*

**5BDXCC:** (Starting with number 302),  
W2BXA W3GL K4THA CE8AA HB9KB  
W2AO W3GRS I4ZSQ K6WR JA3UI  
YU2HDE DJ0YD WA5VDH

**5BWAS:** (Starting with number 172),  
W2BXA.

January CD Party  
High-Claimed Scores

Scores, and especially multiplier totals, are up this time. VE activity was especially good. Thanks, gents.

New CACer W6PAA racked up the second highest score recorded in a January party which is also the second highest total for all CD parties except "Opens." On phone WB9HAD topped the previous all-time record of K2EJU/5 (set in 1969) by a comfortable margin.

The July phone CD Party date is being moved to the 4th weekend in July. See the CD bulletin for further details.

The following are high-claimed scores: they read, from left to right, call, total score, number of QSOs, number of sections and operating time. Final scores will appear in the April CD Bulletin. — WA1PID

CW	
W6PAA	341,280- 941-72-20
W6DGH (WB6ZVC, opr.)	293,230- 821-71-20
W2GUH	280,800- 775-72-20
K7NHV	280,700- 795-70-20
K4PUZ	267,330- 791-67-20
W8MFO	252,700- 720-70-19
WBFAW/4	245,660- 686-71-20
W3IN	223,920- 616-72-16
WA1NNC	217,000- 615-70-20
W1MX (WA2CNE, opr.)	215,280- 617-69-15
WB9HAD	215,280- 620-69-20
WA9BWW	211,720- 628-67-17
W3EZZ	199,660- 591-67-15
VE7TT	198,900- 579-68-18
WB2RKK	196,645- 580-67-14
W5KL	196,645- 580-67-14
W9OOY	193,200- 555-69-13
W9PJT	190,740- 556-68-13
W5QGZ	185,980- 540-68-13
W6MAR	185,640- 539-68- 9
W6GLTV	185,255- 548-67-20
W4UQ	180,780- 517-69-15
WB6LJO	178,920- 501-71-15
K6OHC	172,525- 515-67-13
W2SZ (WA2LUX, opr.)	172,380- 502-68-16
K4IAF	171,810- 493-69-17
WA9AUM/1	170,280- 510-66-11
W7GHT	156,445- 461-67-15
K4FU	156,400- 453-68-11
WB2MHT	154,980- 488-63-17
W3GN	151,800- 453-66-13
K4BAI	150,885- 472-63-10
K3OIO	150,255- 472-63-15
WB2UGF/5	144,625- 438-65-10
K5LUR	140,075- 431-65-15
K2KIR	137,940- 411-66- 8
WA3SWF	135,360- 418-64-11
WA1NLD	131,950- 400-65-12
WA8URW	130,560- 378-68- 8
W7TVE	129,350- 392-65-18
WA1ABV	129,280- 400-64- 7
WA2UOO	125,125- 378-65- 6
WB6ZVC	124,410- 372-66-18
W5RE	118,200- 387-60-10
K0AZJ	112,770- 354-63- 7
W2FVS	111,910- 356-62- 8
K6SDR	110,400- 368-60- 7
K3HXS	107,665- 349-61-13
W3ADE	107,260- 339-62-16
W5RUD	107,260- 342-62- 7
WA2PJL	107,100- 350-68-10
WA1MYK	105,090- 334-62-15
W1DAL	104,960- 321-64- 6
WA9FFD	103,350- 314-65- 9
W1AX	103,025- 310-65- 5
K6EZH	102,920- 325-62-10
W5TXA	102,785- 330-61-10
WA2FAH	102,690- 320-63- 8
W6DOX	102,300- 335-60- 4
WB4UHH	101,400- 334-60-12
WA5ZBN	100,440- 320-62-13

Phone	
WB9HAD	212,645- 595-71-20
WA9BWW	185,925- 581-67-17

WA3RDU	177,675- 511-69-17
W6DGH	147,560- 427-68- 8
W3EZZ	141,705- 418-67-11
W5QGZ	140,160- 431-64-13
WB2RKK	130,680- 389-66-10
WB2UGF/5	127,725- 386-65-12
K4PUZ	127,680- 392-64-11
WA1STN/1	109,800- 354-61- 9
WB6LJO	107,100- 303-70-11
W9PJT	105,835- 342-61-11
W1FJL	105,530- 340-61- 8
K3HXS	104,580- 328-63-13
K4FU	102,960- 305-66-10
WA1NLD	88,740- 300-58- 8
VOZAS	84,900- 283-60-16
WA2EAH	77,380- 286-53- 9
K3CR (WA3JH, opr.)	74,200- 258-56- 9
W3PCS	71,960- 253-56-10
W6PRP	67,750- 210-65- 4
W3CZS	62,700- 205-60-12
W42BSU	61,740- 209-49-17
W1RML	61,655- 203-59- 7
W6PAA	61,560- 209-57- 2
WA3AFQ	60,480- 219-54- 7
W6ASJ	59,885- 200-59- 8
WB9AN	59,640- 200-58-10
K7VIC	53,200- 190-56-10
W5LL	52,205- 191-53- 8
W1AX	51,870- 175-57- 5
WB8KXV	51,205- 206-49- 7
W49SVE	50,220- 183-54-15
KH6GMP	49,225- 179-55-12
VE6BAT	48,880- 188-52-10
W5RUB	48,195- 185-51- 3
W6MAR	47,170- 171-53- 3
W2GKZ	45,900- 173-51- 8
W1APYV	45,840- 188-48-11
W1EFT	45,570- 181-49-12
W5SFM	45,315- 167-53- 7
K1VSD	43,120- 171-49-12
K3OIO	43,010- 182-46- 4
K2PWK (WB2FCD, opr.)	40,655- 169-47- 3
W4OZF	39,120- 158-48- 5
K4KZP	37,230- 141-51- 5
VE5J	36,990- 134-54-12
WA3SWC	35,550- 153-45- 5
WA3GUU	35,200- 128-55- 2
K7NHV	33,565- 130-49- 2
K9UON	33,000- 127-50- 6
W3CSZ	32,625- 138-45- 4
K4FTN	32,625- 145-45- 7
W46CPP	32,500- 121-52- 5
W7GHT	31,400- 125-48- 4
W1MX (WA2CNE, opr.)	28,980- 131-42- 2
WRNOH	28,980- 121-46- 3
WA3BGE/R	27,800- 134-40- 4
W4YZC	27,720- 119-44- 4
K2HNV	27,600- 133-40-10
K0FLO	26,910- 117-46- 5
WRJM	26,550- 113-45- 7
W5SFEV	26,085- 106-47- 6
WA9VDX	25,650- 110-45- 2
WB2IC	25,255- 110-43- 5
W1AW (WA1MBK WA3JSD)	61,480- 226-53- 6
WB4VBG (+WB4WCM)	58,800- 206-56-10

FEBRUARY 10 FMT RESULTS

The February 10 ARRL Frequency Measuring Test brought in a total of 119 entries representing 1197 individual measurements. Entries received after the announced date of February 21 are not listed (that is the date W1AW started carrying the results of the test). Conditions were extremely poor and the umpire was not able to make readings on 20 meters for both runs and the late run on 40 meters. He measured frequencies for the early run at 3531.202 and 7084.767 kHz. The 80-meter late run checked out at 3554.252 kHz.

W0HJ shown as .9 ppm in the Jan. report of the Nov. FMT should be corrected to better than .4 ppm, another Honor Roll candidate - fb!

Interested in an appointment as an ARRL Official Observer? If so, please check with your SCM (p. 6) to see if you can qualify. Plan now to participate in the May 11 FMT, full rules Operating Events this issue. - W1YL

HONOR ROLL

This top listing is the standing of the frequency measuring leaders. In consideration of the minimum possible error due to Doppler and other unavoidable factors, we credit as of equal merit all those reports computing 4110th parts per million (or higher) accuracy. A participant must submit a minimum of 2 measurements to qualify for this listing.

W1BGW W1PLI K1VHO W3BFF W3LPL W3PYW  
W4AAD/K3WIK K4BE K4KA W4NTO W5FMO W5LJW W5NBI  
W5QIV/W5ZTN W6AAL WA6CKD W6CLM W6NBS W6OQI  
W6RQ W8CUJ W8GRG WA8NSC W9KO W9MNY W9ZTK  
W0HJ K0JTA K0QVF K0RPH K0VQM VE3AC VE7TT.

In the following tabulation, error percentage can be determined by moving the parts-per-million decimal point (the figure shown in parentheses) 4 places to the left. Class I QOs must demonstrate an average accuracy of better than 36 parts per million, Class II QOs must show at least 179 ppm.

- (.6) W6CBX Ireland, (.7) K6MZN, (.8) W4LDF K6DM WA9VJD WA9YEW, (1.0) WB4SST, (1.1) WA1LNF K4LO, (1.4) E7-7HM, (1.7) WAIQF, (1.8) K6BCT, (2.3) WB2OEU, (2.6) WHN, (2.8) K0AZJ, (2.9) WB9BDH, (3.1) K0TTY, (3.2) WIDD, (3.6) W6CFB, (3.8) K9WGN, (4.2) W4UCL, (4.3) K4JK, (5.1) W1IG W0KH, (5.7) WB4RUA, (5.8) K5DPG, (5.9) WA0TLT, (6.1) W1VH, (6.2) W8DPW, (6.7) K6EC, (6.8) K0TCG, (7.2) WB4BAP W4HU, (8.0) W5TFW, (8.2) VE6MI, (8.8) W2AIO W6EJ, (9.7) W2GCT, (9.8) W2JDC, (9.9) WA1FBE K9UON, (10.0) WA1STN, (10.2) WA2MD, (10.5) K1EPW, (13.8) K4KPC, (14.6) K6CL, (15.2) WA5WQF, (16.8) K5PCW, (20.4) W4NPG, (21.6) W5MPE, (22.8) WA5ROU, (25.2) K8IHA (27.7) K3STU, (28.6) W8HZA, (29.4) K6ASK/6, (31.1) W2DYS WB8NTY, (34.3) K3HNP, (35.7) K9LPZ, (35.9) WB0FTU, (37.4) K6QPG, (42.7) W9WYB, (45.8) W6AEE, (49.2) K5ARK, (51.5) K4QC, (52.9) WA9YED, (59.2) WB2TFH, (61.6) WB4FBD, (62.5) W8BU, (63.1) W9AG, (63.7) WA3QER, (96.9) WB2MDR, (135.7) WA0RIO, (141.5) WA8LBR, (144.7) WA8VWX, (199.4) K4CVJ, (224.7) W7CHI, (224.6) W5PW, (254.7) W9VVG, (355.8) WA7LKI/5, (416.9) K1EPL, (482.8) W9REC, (530.5) W9NMD, (2542.5) Moore, (4265.9) W6ASH, (7226.9) W8GXI.



I would like to get in touch with . . .  
 . . . retired amateurs interested in teaching an amateur radio course in a private high school in Manhattan. WN2RSI.  
 . . . members of United States Power Squads who are licensed amateurs. WA4UPX.  
 . . . presidents and faculty advisors of high school radio clubs. WA2UDS.  
 . . . amateurs interested in participating in French language QSOs for practice. Rendezvous Wednesdays at 0100 GMT on 7170 kHz. VE2ACP.  
 . . . anyone interested in Spanish language QSOs on 21102, 21120 and 21174 kHz. WN9MFC.

All operating amateurs are invited to report to the SCM on the first of each month, covering station activities for the preceding month. Radio Club news is also desired by SCMs for inclusion in these columns. The addresses of all SCMs will be found on page 6.

### ATLANTIC DIVISION

**DELAWARE** — SCM, Roger E. Cole, W3DKK — SFC: K3KAJ. RM: W3EEB. PAM: WA3GSM. Jan. BPL and PSHR WA3DUM. WA3LMY received two tickets in the same day, his Extra and one for overtime parking. Congratulations to WA3QFF on attaining the rank of Eagle Scout. K3NEZ again made the OO Honor Roll. W3FEB returned from Fla. in time to experience Delaware's worst ice and snow storms in two years. W3WLO from Lewes is a regular VOI on the DEPN and keeps in touch with home via W3FEG. WA3GAY will have a new TR-4 on the air as soon as the power supply arrives. K3OCE reports new Kent County Radio Club officers as K3NVV, pres., W3GAB, vice-pres./treas.; K3NYG, secy. OTN QNI 205, OTC 90. Traffic: WA3DUM 235, W3DKX 105, W3EEB 35, WA3GSM 24, W3YAH 18, WA3SYT 12, K3NEZ 6, WA3DUH 4.

**EASTERN PENNSYLVANIA** — SCM, Allen R. Breiner, W3ZRO SFC: W3BFB. RMs: K3PIE, W3EML, K3MVO, WA3QLG. PAMs: K3BHU, WA3PZO. W3KEK has completed 10 years as OO and is now upgraded to Class I. WA3TVT at Temple U. ARC now utilizing Oscar and also operating RTTY. The gear at W3EU didn't blow this time, but the power failed. If you want to learn traffic procedure, check into the PFTN. WA3QLG will welcome you and any EPA reps that can spare the time. SFT operations took up the slack one week end, among those EC's reporting, W3ID kept things rolling in Bucks county via 2 and 10 meters. Back-to-back, W3CL and W3LC were among the traffickers in SET. New officers at R.F. Hill ARC are WA3KEY, pres.; WA3FV1, vice-pres.; WA3UTM, secy.; WA3MOY, treas. WA3TMP and WA3CKA are getting some extra time on 2 meters. The Pennsylvania ARC via WA3RCA and WA3SBI set up station in the Germantown hospital over Christmas and originated traffic from the patients. Nothing ever happens in Jan. according to W3WRE. Lou is still collecting keys. No! you can't have mine yet. Traffic is fine, winter is rough, claims WA3ATQ. The Univ. of Penna., WA3BT and Penn-Wireless Assn. have a tremendous turnout for the spring Novice class. If you haven't noticed by this time, the editor's name on the first line has been changed, also the format of printed matter. As before, I shall print news in this column that has been received in written or printed form. BPL and PSHR is listed elsewhere so need not be relisted here. Every one in the section is awaiting my first moves. Please note, there have been no appointment cancellations. I plan to have a few general section meetings each year and one of them will be in the form of a picnic which will be held on Aug. 18. Being a section manager is a big job and takes a lot of help. Your comment, suggestions, and objection will be appreciated. When traveling through Tamaqua, Pa. stop in, the shack door is always open. Traffic: W3EML 570, W3AVJ 375, W3ABT 264, WA3PZO 255, K3PIE 240, K3OJO 169, WA3ATQ 154, K3MVO 145, WA3MOP 108, WA3UKZ 105, W3WRE 85, WA3PHQ 76, W3ZRO 68, K3BHU 63, K3HNP 61, WA3SBI 57, W3VA 54, WA3CKA 49, W3ADE 28, W3AXA 28, K3KTH 21, W3OGD 19, W2HIF/3 18, WA3TMP 17, W3ZRR 16, W3BNR 14, WA3QYY 14, W3HUR 9, W3ATI 8, WA3AIB 7, W3C1 7, W3HK 7, W3OML 7, W3OY 6, W3JD 5, W3KCM 5, WA3QLG 2, WN3UDV 2.

**MARYLAND-DISTRICT OF COLUMBIA** — SCM, Karl R. Medrow, W3FA — SFC: K3LFD. RM: W3QU. PAM: K3TNM. NCM: W3LDD. WA3RC1 leads the section in traffic and shows up on all the nets with regularity. MEPN toppers are W3ADO, WA3IIV and W3LDD; others W3DKY, W3HWZ and W3IQN. MDD brass W3QU, K3KAJ, W3HMT, W3FA and WA3DUM. WA3URV operated by WB2NOM took first MDC certificate in the NC QSO Party. Early SET reports indicate a success by all participants. Congrats to those

emergency powered stations. Early warning: MDD/MEPN/MDCTN picnic Sat. July 27 same Patapsco State Park. W3QU manages a lot of activity despite a busy and uncertain work/travel schedule. WA3QIA a new ORS/OPS. WA3SEE a new OPS/OVS. WA3CZT a new OO. WN3VGV has a good traffic total and manages EEFN/3773/1030Z and RNN/3745/2100Z. W3OKN scrounges some traffic between conferences. W3FCS handled his NCS job with cool efficiency in the SET. K3TNM had his MEPTN all primed for SET. WA3AFQ has his eye on the DX tests. K5FMF/3 has settled for W3HMT and has HW7 with converter for emergency use. WA3IIV goes great with the fone nets. W3FZV finally getting his mail service squated away. WA3RBI enjoyed the SET and looks to Field Day. WA3RDU received his old call WA4HVC back for number 2. W3LDD likes those unrecorded informals. WA3SCR up to his old tricks. W3SKY held the emergency powered hot spots with WA3TJM at the mike and WA3RVU at the key. WN3VPL has a bunch awaiting Novice tests as soon as his General comes. W3BHE is on shift work these days. W3FC1 visiting IARU (4U1ITU) and the R.F. WA3IYS had a sojourn to NYC, London and the R5GB between semesters. His SNJ call is WB2TIR. W3ADO visits White Neck on the water. W3FOV doing his antenna tuning inside. W3ZNV finds daylight saving time to his liking. W3JZY likes 2 meters in Frederick. W3CDQ has a new Triton II. W3EWP back in traffic. W3MSN covers 80 through 1 1/2 meters and says use 'em or lose 'em. K3NCM helps son WN3VGV with overflow traffic. WA3RJS has found joy with his 1 milliwatt. W3JPT has 17 states through Oscar 6 with homebrew. With the nets: Sessions/OTC/QNI average; MDD 66/3517.7; MEPN 22/124/21.7; MDCIN 16/65/20.7; E-FN 28/90/60.4. Patuxent ARCS has a fine new newsletter with WA3TNK doing the work. Received the Baltimore ARC Modulator, and QRN from the Antietam RA. Traffic: (Jan.) WA3RC1 549, W3QU 287, WA3QIA 166, WN3VGV 155, W3OKN 122, W3FA 116, W3FCS 87, K3TNM 78, WA3AFQ 66, W3HMT 63, WA3URV 57, WA3IIV 55, WA3RBI 47, W3FZV 42, W3LDD 40, WA3SCR 28, WA3RVU 26, W3SKY 25, WN3VPL 20, WA3RDU 19, W3BHE 10; W3FC1 10, W3ADQ 6, W3FOV 5, K3TEZ/3 4, W3ZNV 3, W3JZY 2. (Dec.) WA3LOV 61, K3TFZ/3 34.

### SOUTHERN NEW JERSEY — SCM, Charles E. Travers, W2YPZ — Acting SEC: W2YPZ. PAMs: WB2FJE, WB2RKK. RM: W2JJ.

Net	Freq.	Time	Sess.	QNI	T/c.	Mgr.
NJPN	39.30	6 Su	4	98	31	WB2FJE
NJN	36.95	7 Dy	37	583	256	WB2RKK
NJN	36.95	10 Dy	31	230	61	WB2RKK
NJSN	37.30	8-15 Dy	31	154	55	WB2RKK
NJPN	39.50	6 Su	38	773	500	WA2AFVH

The GCARC reports WA2AIH now an Extra Class licensee. Congratulations to you, Bob, and the other members who also have upgraded. SCARA News reports the following officers for 1974: WB2EYE, pres.; W2HBI, vice-pres.; WB2UON, secy.; WB2FTD, treas. On Jan. 21, NJPN under the leadership of WB2FJE established a traffic net, frequency 146.52 MHz. The North Jersey section meets MWTH and Sat. with W2EPI as NCS. The South Jersey section meets on Th and Su with WB2FJE as NCS. The time slot is 10:30 P.M. for both sections. This should become the link for delivering traffic into some of the less accessible towns. Why not look in often. The 10VRA received its repeater license — WR2ADE. The club also did a fine piece of work in the recent SET. WB2FNK reports transmitting four bulletins on 3965 at 1620. WA2TRK received his WAS and now working on the DXCC. W2ORS completed a linear for use on 20 meters and also helped two hams with transmitting problems. It is with deep sorrow that we report the passing of W2CDZ on Feb. 2. His passing is a great loss to the fraternity. Our deepest sympathy to WA2FGS and family. Traffic: WB2VEJ 334, WA2TRK 135, W2ZO 85, WB2FCD 65, WB2FJE 41, W2YPZ 41, WB2UUV 26, WB2FNK 23, W2HIF 18, WB2SFX 12, W2ORS 8, K2PWK 2.

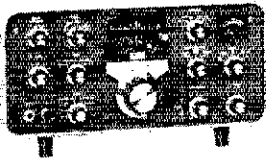
**WESTERN NEW YORK** SCM, Richard M. Pitzeruse, K2KTK — Asst. SCM: Rudy Ehrhardt, W2PVI. SEC: W2CFP. Two SET reports so far, one from W2MTA for NYS showed a total of 632 points for our section net the other, a very fine report from WR2YEM, FC for the Niagara frontier showing a total of 417

(Continued on page 102)

**There's  
plenty  
of energy  
around.**

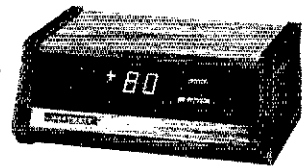
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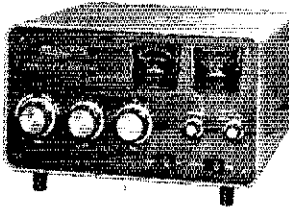


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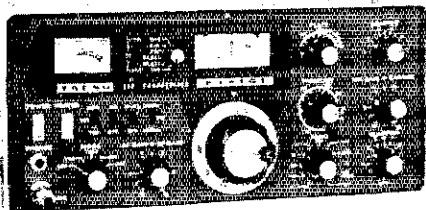


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points. Pete and his assistants, K2HYO and K2DWI continue to an outstanding job with that AREC group. New officers for the Walton Radio Association (W2LZ) are WB2DCX, pres.; K2EZ vice-pres.; WN2RML, secy. W2FMJ, treas. WA2CY finds increasingly difficult in coping with the WNY wind with regards his cubical quad. K2IMI off the air most of the month with a trouble, but now OK again. In the "I couldn't have said it better department," this from K2LJG; "since the National Traffic System is always looking for good QTC how about us VHFers originating traffic ourselves or via a local NIS rep to set up our VHF skeds, etc. It sounds more in the spirit of the hobby." That from QVS K2LC WN2TLO runs ORP on 40 and 15 with 38 states to his credit. W2 and WA2NW each have new F1-101Bs. WB2YOO will be hearing wedding bells in July. An era came to an end with the passing of ex-WB-W2SOK to Silent Keys. He was a pioneer on the 2, 5, and 10 meter bands. W2KFA OSYs permanently to 6Y5-Land. New officer for the Chenango Valley Amateur Radio Association are WA2EY pres.; WB2YMF, vice-pres.; W2RME, treas.; WA2LFL, secy. Congratulations to WN2LDA on passing his General. Hey, did you catch the picture of WNY's own W2ROF in the New York Daily News? He sure looked cold to me! WB2JRX, WB2SLM and K8WVW/2 all playing chess on 2-meter fm. "Boris" K2KTK, aka "Bobby" K2KIR doing likewise with "Bobby" leading "Boris" 7-5 at last count. SEC W2CFP received 115 messages during SET. Ni work to the originators, next year lets give him 500. WN2RX pleads for more Notices originating traffic. WB2LVW sports a new HR-2A in his car. K2UR reports ESS handled 91 QTC with 4 QNL. WB2JRX reports on MARN, 110 QNL, 42 QTC, 8PL the month to W2OE/4. Traffic with \* indicating the now more difficult PSRR: W2FR 303, W2RUF 267, WB2JRX\* 224, W2MTA\* 21, W2OE/4 178, W2CFP 121, WA2TPC 121, WA2HSR 112, WB2AD 97, WB2VND 96, WA2PUU 74, WB2JWM 64, W2GLB 53, W2RC 53, W2MSM 50, W2HYM 43, K2KQC 42, WA2TSR 38, K2UR 3, K2KTK 27, W2RUT 27, WA2TLB 26, WN2KCW 25, W2PNW 2, WA2LDF 23, W2PVI 22, WA2DRC 21, K2OFV 19, WN2LDA 1, WA2AIV 14, W2EAF 14, WA2DDD 11, W2PZL 10, WA2OMF, WA2SMM 8, WA2SMQ 8, WA2CJY 7, WA2GLA 7, WN2RXL 2.

**WESTERN PENNSYLVANIA** - SCM, Robert E. Gawryl W3NEM - SEC, W3KJP. PAM: K3ZNP. RMs: W3KUN, W3LO, WA3PXA. WPA CW Net meets daily on 3585 kHz at 7:00 PM local time and KSSN meets daily at 6:30 PM local time on 3585 kHz. It with deep regret that we record the Silent Keys of W3MT, WA3CPA, W3RNO. The South Hills Brass Pounders & Modulators have elected the following officers for 1974: W3MML, pres. WA3JVB, vice-pres.; WA3LVA, secy.; K3FIW, treas.; W3BWA, W3LDB, W3QNI, dir.; WA4DB, K3WNZ, K3VXV, trustee. WA3QOR went from Advanced Class to Extra Class. WN4JWJ now WN3VWJ. WA3IYA is experimenting with a CD net on 372 Sat. at 1800 local time. This is the Clarion area. The Penn Sta Univ. ARC announces the following officers for 1974: WA2JH pres.; WA2QNT, vice-pres.; WA3JH, secy.; WA3QOR, treas. WA3JBN, sta. dir. The Pittsburgh Chapter of QUWA announces W3LGD as pres. and W3YD as secy. Steel City ARC says they had a thief in the club house who made off with much of their fine gear. Sorry to hear that fellows. WPA had 38 sessions, 457 stations Q and handled 355 messages during Jan. PSRR credits for Jan. a WA3PXA 44, WA3SWE 44, W3LOS 39, W3NEM 39, WA3SWE 3, WA3IYA 30. K3UR received BPL again for their efforts. The third month in a row. Congrats men. Traffic: W2KAT/3 411, WA3SW 357, K3CR 286, W3LOS 117, WA3PXA/3 112, W3KUN 8, WA3IYA 49, WN3VWJ 47, W3NEM 42, WN3UJ 38, WA3SWE 3, K3VQV 33, K3HCT 28, W3SN 28, W3RUL 24, K3SMB 24, W3ID 8, K3LVO 8, W3ATO 6, K3SN 5, WA3JH/3 5.

**CENTRAL DIVISION**

**ILLINOIS** - SCM, Edmond A. Metzger, W9PRN - Asst. SCM, Harry J. Studer, W9RYU. SEC: W9A+S. PAM: WA9LDC RN W9NXG. Cook County FCC W9HPC.

Net	Freq.	GMT/Days	1Yr.
ILNN	3720	2215 Dy	29
ILN	3690	0300 Dy	342
ILN	3690	0400 Dy	14
HI PON	3915	1245 Dy	383
HI PON	148.5	0200 MWF	
HI PON	50.28	2000 M	no report
NCPN	3915	1800 MS	23
NCPN	3915	1300 MS	80
LEN	3940	1400 S	no report

Reports coming in indicate that the activity this year in the participation in SET were better than last years with more stations and clubs active according to the Radiograms received by this SC. WB9REG has a new 2-meter fm base and mobile. W9HPC, W9LN



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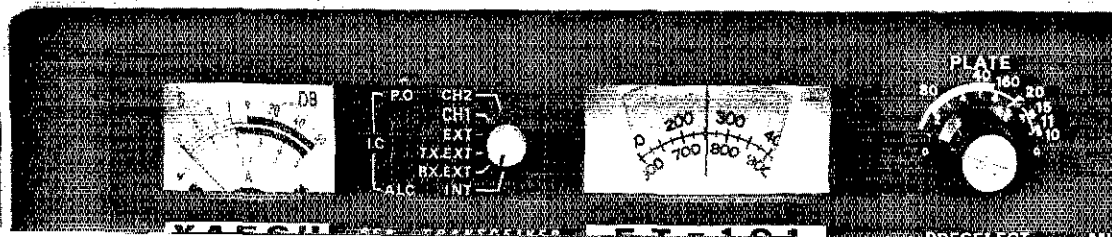
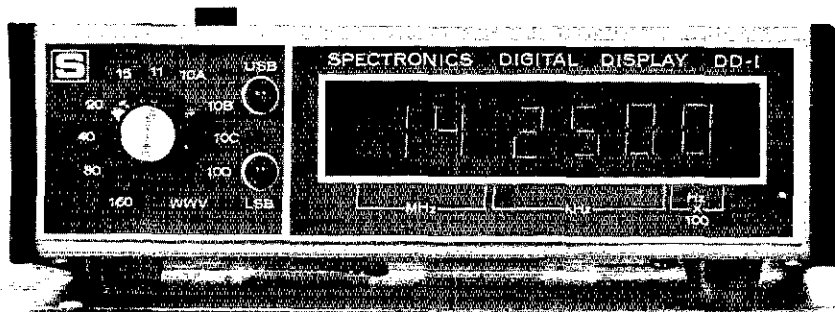
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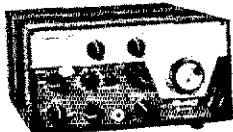


TR-72



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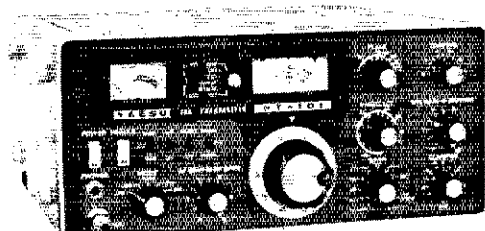
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and A. Wilke received 25-year certificates of membership in the Hamsters Radio Club at their annual banquet in Chicago. K9DQI has completed a vest pocket (200 milliwatts) QRP transmitter for 80 meters. W9ZAV received his 25 wpm code proficiency award from the League. Start planning now for the National ARRL Convention which will be held in New York City, July 19-21. Announcing of conventions, the Starved Rock Radio Club will hold their annual Hamfest at Princeton, Ill. June 2 instead of the usual 4H club grounds near Ottawa. This year's representative from the League will be the ARRL General Counsel Robert Booth, W3PS. W9OKE received an assistant director certificate at the Lake County annual dinner from Director W9HFG. WA9ENA presented a slide program at the Jan. meeting of the Northwest Amateur Radio Club (Chicago). WA9EXP is back in the Arlington area. The Rock River Radio Club Hamfest will be held Sun. Apr. 8, 1974 at the Le County 4H Club Center at Amboy. New Novice heard was WN9NSF. New appointment this month is WB9JPS as an OO. K9MWA is now an A-1 operator, having received his certificate from headquarters. W9JXV worked a ZL on 80 meters. Traffic: K9MWA 418, W9NXG 377, W9MTT 188, WB9IPS 184, WA9ES 150, W9OYL 136, W9JXV 113, K9ZTV 105, WA9LDC 98, WB9DED 78, W9LNO 59, K9BGL 57, WB9FWO 54, WB9HFG 54, WB9JTK 51, K9DQU/WB9AIE 50, W9ZAV 25, W9HFG 16, WA9ULP 15, WB9FLP 14, WB9KZO 14, W9PRN 14, W9RYU 14, WA9MZS 8, WA9LHU 1.

INDIANA - SCM, Michael P. Hunter, WA9FED - SEC. WA9YXA. PAMs: WB9FOT, W9HWR, W9PMT, RMs: WB9LHI, W9HRV, WB9KVN, WA9EED.

Net	Freq.	GMT/Day	QNI	QTC	Mgr.
LIN	3910	1330-2300 Dy	3222	507	WB9FOT
QIN	3656	0000-0300 Dy	249	315	WB9JH
IPON	3910	1300-2130 Su 2000 S		9	WB9AHD
IPONCW	3712	2330 Dy		66	WB9KVN
IPONVHF	50.2	0200 Dy			WB9CXY
CIPON	50.7	0100 Dy			24 K9OHC
SIPON	50.7	0200 MTh			19 WA9ULP
Hoosier VHF			503	7	

I'm beginning to get things sorted out now. Much thanks to you fellows for your valued assistance. Beginning next month, a list of new appointments and endorsements will be included. Congrats to W9E on being named QIN operator of the year. Fantastic work. Congrats to WB9LHI on earning his Extra Class. Rumor has it that WA9BWX swept both phone and cw during CD. Although the high bands have been dying, the 160/80 activity is in full swing. Plenty of DX each evening. Net activity on 80/75 has been good despite lousy conditions. It's got to get better. SET activity was reported very low. Appointee activity reports are on the upswing. If they would devote one-tenth of their efforts to their appts, the activity would be fantastic. K9OXA and the Indpls. Red Cross conducted a flood survey on Dec. 27 on 6 m. Very happy to report no problem existed. BPLs: WA9EED, WB9NJA, WB9IHH. Traffic: WA9EED 681, WB9NJA 441, K9FZX 235, WB9KVN 227, WB9IHH 222, WB9FOT 180, W9BUQ 115, W9VWH 107, W9KX 94, WA9TIS 92, K9HYV 83, WA9OHX 60, K9CRY 52, K9PSL 50, W9OLW 48, K9RPZ 42, W9HGO 40, W9JPK 30, WA9OAD 30, W9PMT 28, WA9ZIV 27, W9IGF 20, K9RWQ 20, K9JOY 15, W9HWR 14, WA9BVS 12, WB9CAC 12, WB9RAP 9, K9LZN 9, WA9ULH 8, W9KWB 7, W9BDP 5, WA9ENU 5, K9YBM 5, K9DIY 4, K9PNP 4, WB9BE 3, W9FC 2.

WISCONSIN - SCM, Roy A. Pedersen, K9FHI - SEC. W9NGT. PAMs: K9UTQ, WB9CVB, WA9OAY. RMs: W9UCR, K9KSA, K9LGH.

Net	Freq.	Time(Z)/Days	QNI	QTC	Mgr.
BWN	3985	1145 M-S	454	515	WA9OAY
BEN	3985	1700 Dy	760	124	WB9CVB
WIPON	3925	1701 M-F	682	102	WA9NIX
WSBN	3985	2230 Dy	1341	184	K9UCR
WIN(E)	3662	0000 Dy	327	240	W9UCR
WIN(L)	3662	0003 Dy	134	59	K9LGH

With deep regret I report W9APl, W9JAW as Silent Keys. Certificates renewed: W9DND as ORS, OBS, WIN; K9CPM for BWN, BEN, WSBN. Monitor 7070 kHz NTF for traffic and emergencies 8:30 AM to 4:30 PM local time. W9ZGO renewed BWN, BEN, WSBN ORS, OPS certificates to WA9ZAZ. WN9JIA resigned as treas. for WARAC. ORS cert. to WA9GJU. WNA picnic July 14 at Wisc. Rapids. BEN certificates to WB9CVB, WB9LKA/9, W9MMP/6 WA9ZTU, WA9GJU on 2M. J4. WSBN cert. renewed to WA9KRF and W9KKK. WA9AJW EC for Walworth Co. OPS certificate to W9DXV. Renewals: K9UTQ as OPS and EC, also his

# The 2 meter leader that's crystal clear!



The modified Clegg FM 27B transceiver now covers the entire range of 146-148 MHz . . . and needs NO additional crystals. It's the only 2 meter rig available now with built-in total coverage that also offers greater than 25 watts output power, uses 10 IC devices, and has Teflon\* wiring throughout. Not a single bi-polar device is in the RF path in transmitter or receiver . . . ensuring greater reliability. Accessory power supply and sub-audible tone on transmit are available too. At home or in your car, the FM 27B gives you the ultimate in total 2 meter performance. See your Clegg Dealer NOW or write or phone us today for detailed data sheet on our 2 meter leader.

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### GENERAL

#### POWER REQUIREMENTS: 12 to 14 VDC

Current Consumption at 13.5 VDC:

Receive: 4 amps squelched, 1.2 amps unsquelched.

Transmit: 6 amps max.

**DIMENSIONS:** 7½" x 3½" x 9¼" deep; 4 lbs. net weight.

### RECEIVER

**TUNING RANGE:** 146.00 to 148.00 MHz, continuously tuneable with reset capability of approx. 1 KHz to any frequency in range.

**SENSITIVITY:** .35  $\mu$ v max. for 20 db quieting; .1  $\mu$ v for reliable squelch action.

**SELECTIVITY:** 11 KHz at 3 db; Less than 30 KHz at 70 db. Adjacent (30 KHz spaced) channel rejection more than 70 db.

**AUDIO OUTPUT:** 2.0 watts (min.) at less than 10% THD into internal or external ohm speaker.

### TRANSMITTER

**TUNING RANGE AND CONTROLS:** Same as RECEIVER.

**POWER OUTPUT:** 25 watts Min. into 50 ohm load. P/A transistor protected for infinite VSWR.

**MODULATION:** Internally adjustable up to 10 KHz deviation and up to 12 db peak clipping.

\*DuPont trademark

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BWN, BEN, WSBN certificates. K9FHI renewed his RFN, WSBN certificates, also OPS, Yellow Thunder Hamfest May 18 Dell View Hotel. Contact WB9EWR 624 14th St., Baraboo, Wis. Green Bay annual banquet Airport Inn Mar. 23. Oshkosh RC new officers are W9BDE, pres.; W9LIV, vice-pres.; K9LWV, secy-treas.; W9KKK exec. comm. WSBN certificates to WB9LKA/9, WB9ESM, WA9GJ starting Novice class of 4-6 members who are handicapped. Nic going Dick. Experimental Aviation Assn. Net 3977 7:00 P.M. M-F NCS W9KKK, ORS to WB9EWO, WN9MFA worked XF1TD XE2SRC, KL7s, WP4s, VP9HI, WB2FA/VP7, on 40 meters with Yiking 2, HR10B, dipole up 10 feet. K9CPM made RPL, K9CGT K9RHA on 2 meters. WN9LKC went from Novice to Advanced Class last Dec. WIN-I certificates issued to W9AYK, W9BCC W9CTI, W9CXY, W9DND, WB9EWO, K9LGU, W9MFG, WA9Z4Z WB9HLM; BEN to WB9ESM, K9WRQ, K9OXY worked Fla., Tenn-Miss., and La. on 6 meters; also Tex. N.C., is also on 220 MHz running 2 watts. Traffic: K9CPM 833, W9CXY 291, W9DND 258 WA9ZAZ 194, K9FHI 124, K9LGU 115, W9MFG 107, W9HCR 86 K9LTO 69, WA9GJU 47, WB9ABF 46, K9JPS 45, W9AYK 43 W9THW 41, W9KRC 40, W9FSJ 38, W9MMP/Ø 36, WA9OAY 34 WB9CVB 32, W9HXV 30, K9KSA 23, WB9KMO 22, WA9AJW 21 WA9PKM 17, W9ZRD 17, WB9KPX 7, WN9JSS 4, W9RTP 4 WB9IEB 2.

## DAKOTA DIVISION

MINNESOTA - SCM, Casper H. Schroeder, WAØVAS - WBØYVI moved to Detroit Lakes, Minn. and is on 6 meters ssb and 2-meter fm. WØGPO has new HR-2B. Traffic: WAØVAS 1259 WBØFMN 356, WAØVYT 257, WAØRRA 200, KØPIZ 162 WAØVYB 142, KØCSE 134, KØZRD 127, WAØTFC 99, WAØGR 93, WBØFTL 92, WBØFCX 87, WAØVTZ 86, WBØCNM 84, KØGN 73, WBØBDD 67, KØFLT 44, WBØMI 44, KØZBI 42, WAØJIF 39 WBØCYM 36, WAØVUP 30, KØJTW 28, WAØCUA 26, WØIPN 18 KØZKE 17, KØWXH 15, WAØHB 14, KØRMX 13, WBØNRK 10 WØIRI 10, WAØYAH 8, WAØJPR 7, KØSKO 5, WAØMMV 4.

NORTH DAKOTA - SCM, Harold L. Sheets, WØDM - SFC WAØAYL, OBS: KØPVG/Ø, RM: WAØMLE, OO: WØBF, WØHBE continues to improve and on the air regrowing DX and nets. He recently received a 25 year membership pin from ARRL. WBØBP made high score for N.D. in the recent PON CCPX. Congrats. The YL WX had some rugged going with the time change and long skip but NCS WAØRWM hangs in there. Nice going! WØTUF recently retired, has gone to west coast. The SET was quite successful. WAØWLP/Ø held forth after PON in the evening for belated traffic there. WAØSUF reported 4 sessions of RACES with ONI 85 and 132 QTC. The Theodore Roosevelt ARC of Dickinson installed WBØETR, secy-treas. Also two new Novice Class calls: WNØLKI and WNØKFN. WNØKSD worked in the recent Novice Round-up. WAØSIB/Ø sends his greetings to all, has his 75-meter Inv. V up but not the beam or tower. WAØMLE and WAØBMG again made the PSHR.

Net	kHz	CDST/Day	Sess.	QNI	QTC Mar.
Goose River	1490	0900 S	4	52	1WØCDO
RACES	3996.5	1730 M-F	50	890	177WRØATJ
		1830			WAØSUF
YL WX Net	3995.0	0730 M-F	23	337	329WAØRWM
PON	3996.5	0900 S	12	254	31WBØBMG
		1830 S-S			WBØBPS

Traffic: WAØRWM 259, WAØMLE 109, WAØSUF 81, WØCDO 60 WØDM 55, WØWWL 48, WAØWLP/Ø 47, WAØRWK 26, WØEFJ 22 WBØBMG 20, WBØBMH 15, WBØBHI 6, WAØIPT 6, WØMXF 3.

SOUTH DAKOTA - SCM, Ed Gray, WAØCPX - The 1974 South Dakota ham picnic is scheduled to be held in the Watertown area this year, under the sponsorship of the Lake Area ARC. The dates are Aug. 17 and 18 with a probable site of Lake Kampeska. More details will be provided as the date approaches. WBØHAT and WNØLOG are promoting amateur radio during "Mini Course Week" at Washington High in Sioux Falls. Tentative plans call for a Dakota Convention May 4 at Mankato, Minn. The Sioux Falls ARC will hold an Auction Apr. 24 at 7:00 P.M. WBØIJV received her Advanced Class license. WAØJNL and his XYI received their Advanced and General respectively. Net reports: WX Net - 246/131; NIQ - 343/25; Early Evening - 80R/7; Late Evening - 1516/45; SDN CW - 298/205. Traffic: WAØBROK 686, WØZWI 348, WAØTNM 232, WAØNZA 100, WØHOJ 90, KØUSY 44, WØMZ 25, WAØKKR 18, WBØIJV 15, WØKJZ 9.

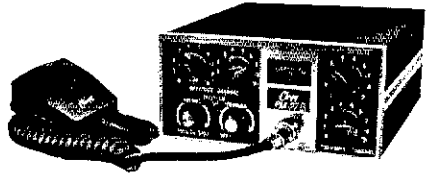
## DELTA DIVISION

ARKANSAS - SCM, Jimmie N. Lowrey, WA5VWH - PAM WA5FDP, RM: W5EU, Former Wisc. SCM W9NRP, has moved to

# THIRD CHANCE TO BE TOP HAM

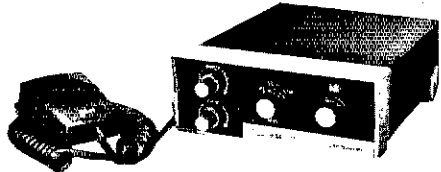
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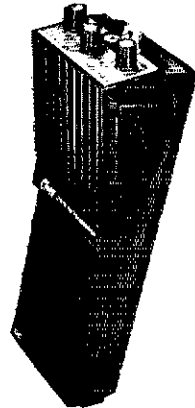
**SECOND.** The world of 220. . . away from the 2 meter crowd with the Clegg FM-21. This transceiver has a unique triple-duty crystal feature. . . it uses just one crystal in any channel. The specs are tough to beat. . . so is the price. . . extend your range! Join the world of 220.

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**AND NOW . . .** the Clegg HT-146. Wait 'til you get your hands on this all-new hand-held 2-meter transceiver. Designed to give you reliable commercial quality performance at low cost. All solid-state with a host of features including a unique battery saver design. See your Clegg Dealer, call or write us now, or fill out the coupon below for detailed data sheet on what we're handing you.

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XD9-01	± 5 kHz	RTTY	\$24.10
XD9-02	± 10 kHz	NBFM	\$24.10
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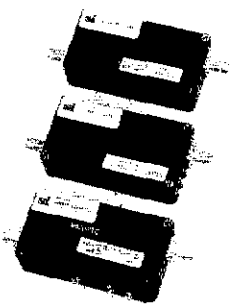
## 9 MHz CRYSTALS (Hc25/u)

AF9-00	9000.0 kHz	Carrier	\$3.80
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XF9-02	9001.5 kHz	LSB	\$3.80
XF9-03	8999.0 kHz	BFO	\$3.80
F-05	Hc25/u Socket	SG	

## 9.0 MHz FILTERS

XF9-A	2.5 kHz	SSB TX	\$31.95
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XF9-E	12.0 kHz	NBFM	\$48.95
XF9-M	9.5 kHz	CW	\$34.25

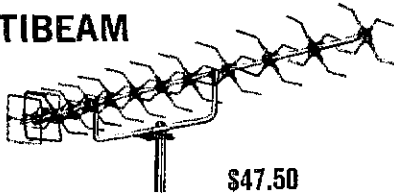
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Standard I.F.  
28/32 MHz. Other  
ranges to order.  
Size 4 1/2 x 2 1/2 x  
1 1/2 in. plus  
connectors. Power  
12V. DC. All  
specifications apply  
to 50-ohm system.

Model	MMc50	MMc144	MMc220	MMc432	MMc1296
Freq. (MHz)	50-54	144-148	220-224	432-436	1296-1300
N.F., typ. (dB)	2.5	2.8	3.4	3.8	8.5
Gain, nom. (dB)	32	30	26	28	9.0
PRICE	\$53.70	\$53.70	\$64.45	\$64.45	\$85.95

# MULTIBEAM



\$47.50

46 element MULTIBEAM 70/MBM 46  
(for 420-450 MHz)

50 Ω coax feed	Weight.....6 lbs.
Power rating.....1 kw	Hor. Beam.....19 dgs
Length.....104 ins.	Wind load.....38 lbs.
Width.....18 ins.	(at 100 mph)

Stacking Kits Available



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Horseshoe Bend and is now WSUAU. Sorry to report Silent Key WA0JDB, of Kansas City, who checked in Ark. nets regularly. Several hams report trouble with brand new rigs — makers must be copying the auto industry. The next OZK sponsored picnic will be at pavillion number 7, Burns Park, North Little Rock, Apr. 21. WBSCBZ in Benton has the new Drake twin line of R4C-TX4C, 50-ft. Rohn foldover tower with four band three-element beam. K5OKQ has a Heath Comanche/Cheyenne/Hustler combination mobile for cw operation and was active with it during the SCL. New Novice in Benton is WNSLAK who was assisted in training by WBSAFR. The OZK CW traffic net ended the year with 3182 QNT. K5OKQ passed the Extra Class exam Feb. 5.

Net	Freq.	Time(Z)/Days	Mgr.
Razorback SSB	3995	2330 Dv	WB5FDI
OZK	3765	0000 Dv	W5MYZ
Ark Phone	3937	1100 M-S	W5POH
Ark Post Office	3928	2130 M-F	W5OEO

Traffic: (Jan.) WSTNT 303, W5MYZ 120, W5LH 38, K5OKQ 11, WBSAFR 7. (Dec.) WSTNT 341, W5EJ 96, W5MYZ 86, WNSIGF 25, K5OKQ 15, WBSHHR 7, WBSAFR 5, WSKL 4, W5TXA 3.

LOUISIANA — SCM, Robert P. Schmidt, W5GHP — Asst. SCM: John R. Soavestre, WA5NYY. SEC: K5VXD. RM: WASZZA. PAM: WB5FKU. VHF PAM: WASKND. Thanks to all who helped make SFI one of the best ever in La. New officers of the Jefferson ARC are K5PME, pres.; W5SGM, vice-pres.; WASSRA, treas.; W5SCXK, secy. New mgr. of the Slow Speed Net is WASIQU/S. K5DPG, W5SEW and W5LXI appointed asst. dir. WNSJZP scored 420 points in the 10-Meter contest. W5SDVS new Army MARS member. Congratulations to WAS1QA on receiving his Section Net Certificate for work on LAN. K5LXZ passed Extra Class exam. K5DZE/S busy with new antenna anticipating Oscar 7. K5UEN active on RTTY. Twin City Club started new Novice class in Feb. W5HGT new ORS appointment. WBSAAA new Life Member. GNOARC now meeting in their new club room. K5ARN has new 2-meter amplifier. WASTXQ now operating ssb on 40 meters. W5PR1 active on LAN. WASZZA LAN mgr. needs check-ins from Slueveport area. All Novices are invited to check into LSN the Slow Speed net on Mon. and Tue. New members of the Delta DX Club are W5LLL, W5SZW and WASAWI.

Net	Freq.	Time(CDT)/Days	QTC	QNT	Mgr.
LAN	3615	6:40 & 10:00	221	279	WASZZA
1 FN	3910	6:45 Dv	152	220	WB5FKU
LSN	3703	8:00 M-F	24	48	WASIQU/S

Traffic: WASZZA 452, W5GHP 399, WASTQA 114, WASIQU/S 72, W5EJF 62, W5HGT 62, WNSJZP 41, WB5FKU 35, W5OQV 25, W5SDVS 21, W5GAD 12, W5LJZO 10.

MISSISSIPPI — SCM, Walker J. Coffey, W5NCB — SEC: W5FII. The ECHO Group sponsored a "Talk To Santa Claus" via 2 meters at the Miss. Childrens Hospital. A HT was used to get to Ole' Mr. Santa with W5HTV and W5GYM doing the switching at the North Pole with W5FII and W5IWI at the Hospital. W5GBN supplied the HT. Vicksburg has organized a Club; officers are K5IMT, pres.; W5SFC, vice-pres.; K5VHV, treas. Group hopes to get a repeater on the air. K8YUW/5 has a DXpedition to Guam courtesy U.S. Navy. W5DCY lacks RI/10 to have his 5RWAS. WBIRG/5 gave slide and sound talk on working Oscar at MIRA meeting. Gulf Coast Shrimp Net has 27 members on 2 meters. W5SKDV building SB401/SB303. W5KYB back on air 10 through 432 kHz. WASKMS building new solid state auto repeater for his Gautier site. W5SKDV and W5SKYV have new 2-meter rigs. W5DDQ putting up new tower and quad. W5VOO active on 2 with channelizer. K5VIN putting up tower and tri-bander. W5GWD has up a 70-ft. tower and three-element beam on 20.

Net	Freq.	Time(Z)/Days	QNT	QTC	Mgr.
MIN	3665	0045 Dv	231	328	W5YZW
MNN	1733	1300 MWE	121	243	W5DLW
GCSBN	3925	2330 Dv	-	-	W5JHS
CGCHN	3935	0100 Dv	1523	165	W5SDVS
MSFON	3970	2345 MS	234	23	W5GVO/S
MSHN	3987.5	2315 Dv	130	216	W5RKM
GCSN	146.52	0100 Dv	-	-	W5DCY

Traffic: W5DLW 623, W5FMI 580, W5YZW 252, W5EIN 240, W5EDT 140, W5NCB 141, WNSHYR 135, K5YTA 91, W5THM/S 87, W5WZ 62, W5SGJH 36, W5BCKM 34, W5EHA 29, W5BW 16, W5SHVY 12, W5SYA 12, W5KEY 11, W5QDC 9, W5BUE 8, W5DCY 4.

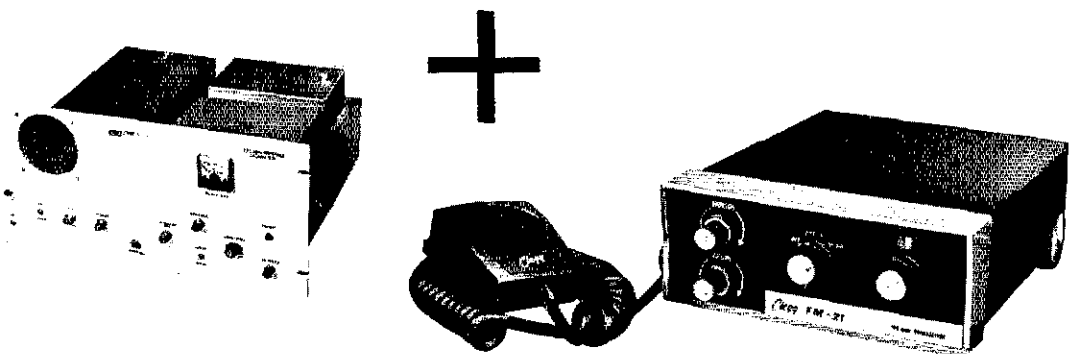
TENNESSEE — SCM, O.D. Keaton, WA4GLS — SEC: WB4DYJ. PAMs: W4RUW, WA4NEC. RM: W4ZJ.

Net	Freq.	Time(Z)/Days	Sex	QNT	QTC	Mgr.
TPN	1980	1140 M-F	60	1466	127	WA4LWW



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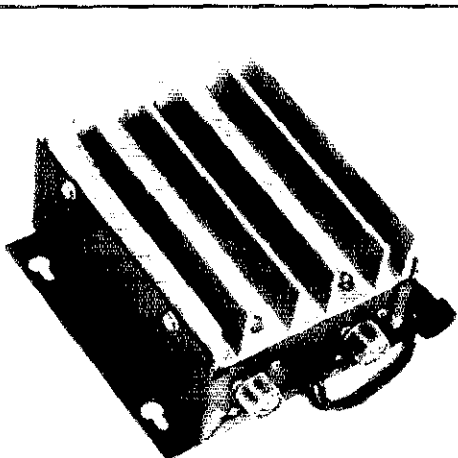
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		0030 M-S				WB4PFE
		1400 SSH				
CPON	3980	0030 Su	4	125	16	WB4BHZ
TN	1645	0000 Dy	24	134	10B	W4ZJY
CNN	3707.5	2300 Dy	18	68	32	WB4NIR
EIVHEN	50.4	0000 MWF	11	103	0	W4SGI
EIVHEN	145.2	0000 TTh	7	25	0	WB4DZG
ETIMN	28.7	0200 W-F	7	51	0	WB4NFI
MITMN	28.8	0200 TTh	4	20	0	W4PAY
ACARFCN	146.28	0100 I	5	91	1	WA4BXX
	146.88					
TTIN			9	37	0	WB4PPY

New officers for KARC and BMRC are WB4MPJ, pres.; Robert Lambert, secy-treas., BMRC, Jim Salyer, vice-pres.; Charles Benedict, asso. ed. of Zero Beat; Hank Resch, ed. and Jim Roller, secy-treas. of KARC. WB4PFE is now the net mgr. of the evening sessions of the 1PN. The 1974 SFT was a success, three sessions covering twenty two and one half hours with 451 stations participating and handling 300 messages. TN Honor Roll for Dec. 73, WB4NIR, WB4DJU, K4YFC, K4CNY and on the 1NN WN4FOY, WA4BOQ, WB4NIR. Dec. top ten QNI club go to WB4NIR, WB4DJU, K4CNY, WB4CRT, WN4FOY, K4YFC, K4VVE, K4SXD, WB4KHV, WA4BOQ. We are looking for Novice traffic operators who want to become jr. ORS, please apply if interested. All appointments now are for a two year term instead of the one year as before. Traffic: W4OGG 330, K4CNY 243, WB4DYJ 219, WB4DJU 173, WB4NIR 147, WB4DCO RR, W4CYL 57, WB4YPO 56, WA4GLS 52, WB4LPS 48, WN4FOY 32, WA4AVD 30, WA4LAX 25, W4RUW 23, WB4UZD 22, WB4MPJ 21, W4SGI 17, WB4ANX 14, WA4BMV 12, WA4ZBC 11, K4SJV 9.

### GREAT LAKES DIVISION

KENTUCKY — SCM, Ted Huddle, W4CID — SEC, WA4GHO. BPLs: WB4VBG, K4MNF and WA4JQS.

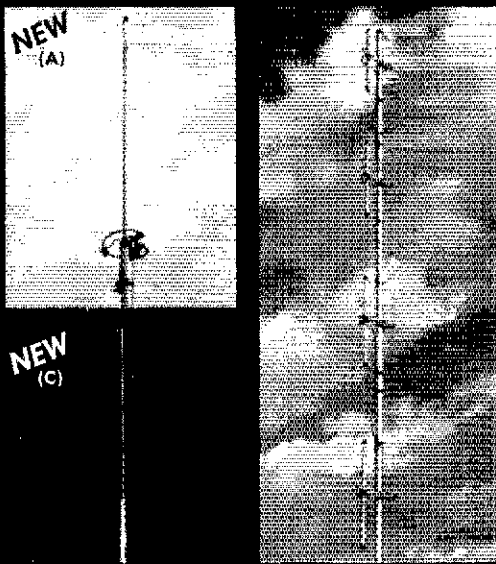
	QNI	QTC	Net	QNI	QTC
KRN	276	46	KNIN	121	178
KTN	1258	198	KPON	82	37
KYN	357	344			

The annual section meeting held Jan. 20 in Louisville was a big success with 34 attendees. Director WREIU and Vice-Director W8IMI were on hand to answer League questions. Preliminary results indicate that planning pays off. Owensboro had a claimed score of 1775! The Blue Grass ARC visited the "other side of the tracks" by tuning a local TV station recently. WB4ZKC now has his General. WB4TPU made Phone DXCC 230. Traffic: WB4VBG 412, K4HY 379, WA4GHO 331, W4CID 301, WA4JQS 274, W4BAZ 220, K4MNF 217, WB4ZMK 165, WB4ZML 100, W4BEJ 91, WB4YOS 86, WA4VZZ 78, WB4RFN 72, W4CDA 58, WB4WCM 55, WB4EOR 54, WB4ILF 43, W4OYI 43, WA4EAF 41, K4DZM 32, K4UMN 27, WB4OVS 21, WA4AVV 19, W4IOZ 17, K4AVX 14, K4HOE 10, WB4NHO 9, WB4HUS 9, WB4YAF 4, K4LOL 3.

MICHIGAN — SCM, Ivory J. Olinghouse, W8ZBT — Asst. SCM: A.L. Baker, WRTZZ. SEC: W8MPD. RMS: WB1YA, WB8VVL, W8RTN, K8KMO, W8GLC, W8RMI. PAMS: W8GVS, W8NDI, VHI-PAMS: K8AEM, W8WVY.

Net	Freq.	Time	Days	QNI	QTC	Secs.	Mgr.
QMN	36632200	Dy	1359	347	95		WB1YA
W8SHN	39357300	Dy	830	269	34		W8GVS
BR/MEN	39302130	Dy	907	146	31		W8NDI
UPEN	39222130	Dy	772	56	35		W8RMI
GLEIN	39320130	Dy	258	30			W8BCH
PON	39581500	Dy	1075	431	31		K8LNE
PON/CW	36452300	M/S	165	27	27		VE3DPO
ML6M	50.72300	Dy	200	40	23		WA8VXE
MI,NN	37202130	Dy	316	162	31		W8BJAD

W8CVO reports 52 QNI, 2 QTC, 4 sessions of the S.W. Mich. 2-Meter Net. The S.W. Mich. 6-Meter Weather Net held 4 meetings, 52 QNI, K8ZWR as net control. W8WVY's Catfish Net had 49 QNI in 4 sessions on 2 meters. W8RQU, W8FZ, W8BPTI and W8BCEP have joined Silent Keys. W8SRHG is new call in Hazel Park. K8GOU ran a note in the Bulletin and in one week got his basement cleaned out of radio "junk." K8BWC is N.C. for SVARA Net on 146.94 every Wed. at 8:00 P.M. DST. Macomb Co. has a new repeater operating 6 A.M. to midnight, 146.22 in-146.82 out with carrier access. W8MQU and W8NKE are W8Bs, Madison High School now has the call W8RHQ. New club in the Howell area is the Livingston Area Radio Society (LARS). SET in Mich. was very active, 30 messages were received by the SCM. Many were using emergency power. W8CUP operated in a tent with a putt-putt outside two days and ran up 152 SET points using 100 watts, he also got 6120 points in two hours fifteen minutes in CW CD party.



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AR-2	100 watts	135-175 MHz	\$14.50
AR-25	500 watts	135-175 MHz	18.50
AR-220	100 watts	220-225 MHz	14.50
AR-450	100 watts	420-470 MHz	14.50
AR-6	100 watts	50-54 MHz	19.50

**(B) 4 POLE:** A four dipole gain array with mounting booms and coax harness 52 ohm feed, 360° or 180° pattern.

AFM-4D	1000 watts	146-148 MHz	\$46.50
AFM-24D	1000 watts	220-225 MHz	44.50
AFM-44D	1000 watts	435-450 MHz	42.50

**(C) FM MOBILE: IMPROVED** Fiberglass 3/4 wave mobile antenna with new molded base and quick grip trunk mount. Superior strength, power handling and performance.

AM-147T	146-175 MHz mobile	\$26.95
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**(D) POWER PACK:** A 22 element, high performance, vertically polarized FM array, complete with all hardware, mounting boom, harness and 2 antennas.

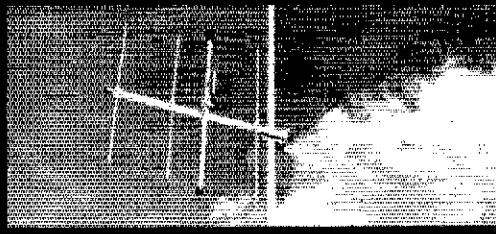
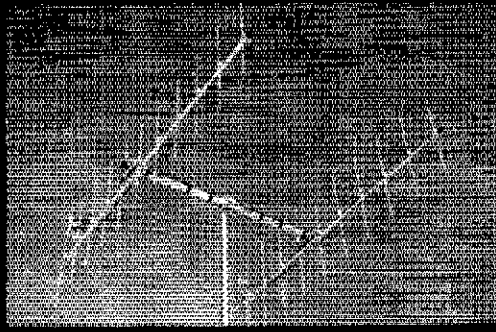
A147-22	1000 watts	146-148 MHz	\$56.50
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**(E) 4-6-11 ELEMENT YAGIS:** The standard of comparison in VHF/UHF communications, now cut for 2 meter FM and vertical polarization. 4 & 6 Element models can be tower side mounted.

A147-4	1000 watts	146-148 MHz	\$11.95
A147-11	1000 watts	146-148 MHz	19.95
A220-11	1000 watts	220-225 MHz	17.95
A449-6	1000 watts	440-450 MHz	11.95
A449-11	1000 watts	440-450 MHz	15.95

**(F) FM TWIST:** A Cush Craft exclusive—it's two antennas in one. Horizontal elements cut at 144.5 MHz, vertical elements cut at 147 MHz, two feed lines.

A147-20T	1000 watts	145 & 147 MHz	\$39.50
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WBRII has worked 251 DX countries and has 132 confirmed. WRNWW now active on 432 MHz. KNIGUE out of the Navy and back on the air. WBROWU waited 14 weeks to receive his General ticket. W2ZXM told of early sabb days during his visit to the CARS Nov. meeting. Members also had him tell of his experience as Captain aboard a crippled ship. My sincere thanks go to WRTZZ for the fine job he did for me while I was hospitalized. Traffic: (Jan.) W8PIM 532, W8WZF 435, WB8TT 401, WB8JAD 333, W8MRM 272, WRTZZ 216, K8DYI 198, W8NCD 186, W8JYA 171, W8BBPY 166, W8DC 159, K8SJL/8 115, W8GLC 114, W8RIN 107, K8LNF 102, W8VFS 102, W8ZBT 97, W8MO 86, W8NDI 83, W8BFG 82, W8BGB 75, K8ZJU 73, W8GJ 64, K8LJS 59, W8IBX 55, W8RENW 47, K8SWW 46, W8NOH 45, W8VVL 45, W8APN 42, W8OIS 39, K8JFD 39, W8BDK 37, W8GVS 37, W8BBI 36, W8SYP 36, W8LXY 34, W8ZUL 31, W8CUP 30, W8UC 30, W8OW 28, W8VZ 28, W8CUP 27, W8NII 26, K8AMU 24, W8FZL 22, K8AYJ 21, W8FCN 20, K8JJC 20, W8YIO 19, K8WRI 18, K8IDX 17, W8OAA 16, W8BYB 14, W8FU 14, W8BKA 14, K8GXV 14, W8OJI 14, W8HKL 12, W8MII 12, W8MDR 11, K8SDA 10, W8VXM 10, W8PQ 9, W8FEU 9, K8JHA 9, W8QBE 9, W8REZ 8, W8MFG 8, K8PVC 8, W8DRT 7, W8SEYM 7, W8WW 7, W8FXR 5, K8PYN 5, K8ACO 4, W8SCW 4, K8HGA 3, W8KHB 3, W8JFQ 1. (Dec.) W8NCD 137, W8LXY 23, K8MJK 8, K8PYN 5, W8FEUN 1.

OHIO - SCM, William E. Clausen, WBIMI - Asst. SCM: Kenneth L. Simpson, W8ETX. SEC: W8COA. RMs: W8WAK, W8KKI. PAMs: K8URK, W8YLW. VHF PAM: W8ADU.

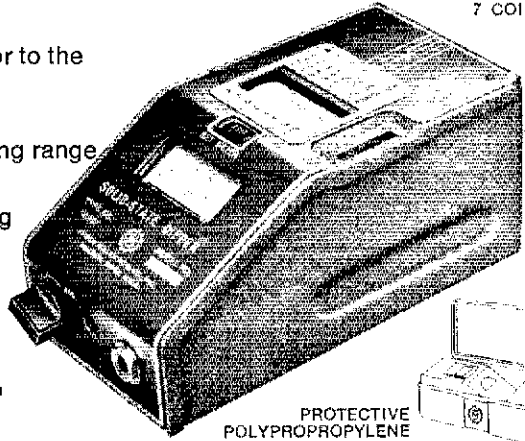
Net	QNT	QTC	Sess.	Freq.	Time(Z)	Mgr.
OSSBN	5431	1905	100	1472.5	14.10/2000/2245	K8URK
BN	691	400	65	3577	2245/0200	W8WAK
OmTrn	516	92	55	50.16	0100	W8ADU
OSN	329	167	31	3577	2210	W8KKI
NOVICE	307	121	31	3707	2220	W8MZZ
HN-RTTY	211	63	33	3605	2200	K8NCV

New appointees: W8KKI, RM; W8DFD, FC, Hamilton County; W8NLM, OPS/OBS; W8HWO, OPS. Renewal: K8OYR, OPS. The Columbus ARA invites you to meet ARRL Pres. W2TUK and Dir. W8LIU at 8 P.M. Apr. 5 at 280 East Broad St. W8ZYE and W8HDI have started ham radio classes at Springfield with 35 students. The Cuyahoga Falls RC newsletter tells us that W8HIW received a Public Service Award and that W8BHC and W8RNL are the new editors. Southwest Ohio ARLC groups again provided communications for Cincinnati's St. Patrick Day Parade. New officers of the Battelle RC are W8QND, pres.; W8CGX, secy-treas. The Cincinnati FM Club honored W8SCK with its Presidential Award. W8DIW spoke on police radio systems to the Massillon RC. SEC W8COA visited the Toledo area and addressed the Sylvania High School RC and the Toledo Mobile Radio Assn. New officers of the Westpark Radios are W8YWX, pres.; W8NVW, vice-pres.; W8BFT, treas.; W8BPCZ, secy. LC W8KPN issued the best report on SET that I have seen: "We learned - and how!" K8SFZ demonstrated amateur TV for the Mansfield area Intercity R. Dir. W8FJU and NTS Mgr. W8MCR addressed the Dayton ARA. OVS W8ZUO made 106 contacts in 11 sections during VHF SS. The Stark County Mutual Aid Net meets on 28.8 Sun. at 1145 local time and averages about 50 check-ins. The ARRL Board of Directors established a new public relations program with a number of PR assistants to be appointed in each division. W8COA will head this program in the Great Lakes Division. The 1973 year end ARLC report shows Ohio having 1213 members and 52 local emergency nets. See you at the Dayton Hamvention. Traffic: W8MCR 621, W8KKI 292, W8PMI 361, W8MJC 350, W8ZNC 331, W8ETX 298, W8HWE 291, W8OCU 249, W8TBJ 240, W8HIW 237, W8YVW 232, W8RRR 208, W8BHG 177, W8XLD 177, W8SUS 175, W8NRC 174, W8FEZ 171, W8RKA 152, W8ROA 148, W8KKV 146, W8WAK 139, W8JGW 136, W8ENI 123, K8MLO 118, W8MKZ 116, W8MGA 113, W8BINM 111, W8MFD 91, W8RVZ 85, W8RGR 84, W8CHT 81, W8JD 66, W8KSH 65, W8MAZ 56, W8KX 55, W8DDG 53, W8DCX 52, W8HUP 52, W8ADU 48, W8VWR 47, W8GOF 46, W8HMF 45, W8KPN 45, W8CLT 43, W8VND 41, W8HHL 40, W8GVX 38, W8MHO 34, W8UPI 34, W8MGI 32, W8OZK 31, W8SSI 31, W8FTU 29, W8MII 28, K8RYR 20, W8IZI 20, K8PFI 19, W8WEG 19, W8VVI 17, W8BIH 16, W8JHA 16, W8GLU 15, W8ARW 14, W8HJL 14, W8KKQ 12, W8SEF 12, K8BNL 11, K8RPX 11, W8EGD 11, W8NAL 11, W8FMW 8, W8LXI 8, W8KWD 8, K8JQB 7, W8MGM 7, W8NORU 7, W8RCE 6, W8BFC 6, K8GRO 6, W8RI 6, K8OYR 6, K8RND 6, K8SIB 6, W8RRC 3, W8MRP 2, W8AQ 1, W8HBP 1.

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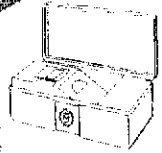


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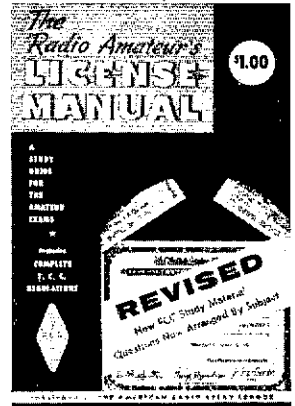
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Catalog

**HUDSON DIVISION**

EASTERN NEW YORK - SCM, Graham G. Berry, K25JN Asst. SCM/PAM: Kenneth Kroth, WB2VJB, SEC: W2URP, RM WB2IXW, WA2FBI, K2DN (RTTY). Nets: NYS twice daily 0001Z and 0300Z on 3.675 MHz; ESS daily at 2300Z on 3.5 MHz. Novice Training Net Mon.-Fri. at 2200Z on 3.728 MHz st looking for ENY check-ins. NYSPT&EN daily at 2300Z on 3.9 MHz. Division P/R Net 2nd and 4th Sun. at 2300Z open to all f mutual discussion of P/R problems. RTTY Net daily at 2300Z (3.613). Appointments: All renewals and a handful of cancellatio for non-reporting now in effect. Sorry to lose WA2JWL as l Westchester due to business pressure. Successor is WB2VUK. W addition of W2KGH in Columbia and WB2KDE in Putnam, W2URP lacks now is someone to take Orange Co. over fr WA2WGS, who holds EC spot for both Ulster and Orange. On tl club circuit: Albany ARA heard WA2ETB on synthesizers and pha locked loop theory. Schenectady ARA heard A.C. Hall, Chief FA Controller for Albany airport on air traffic control and cor munications. Communications Club of New Rochelle had Direct K2SJO as Installation Officer for new officers and director WB2IKW, pres.; WA2RAU, vice-pres.; WA2VYK, secy.; WB2MOU, treas.; W2YLE, W2DPV, W2IB, WB2VQB and WA2JZE as di Westchester ARA heard K2CE on early days of ssb. Section clu very active with pre-plans for National Convention in NYC at th Waldorf. Details from your HARC representative as they develo write WA2CCF in N.J. for Registration Forms and plan to be th July 19-21. W2URP BPL No. 14. WA2YOY trying to set up liais between RACES and other groups in Rensselaer Co. W2EV hupe on automatic protection of towers against high winds - writ him for details. Somehow missed giving WA2PJJ credit for PSH for four successive months - sorry! WB2CFE back in section, in la CD Party ORP with Heath unit. WB2FUH needs Miss. and KL7 fr WAS. W2FB now Life Member ARRL. Look for Official Bulletins o 76116 via WB2VUK and 3.925 via new OBS WA2IQQ week end and on Clearing House net in A.M., morning, that is - not "antiqu modulation." County EC's will meet next month with W2URP fr Second Annual Get-together. See you there. Traffic: (Jan.) W2UR 322, WB2KDC 259, WA2PJJ 201, WB2NKN 163, WA2CNE 12; WA2EAH 90, WB2VVS 89, WB2IXW 81, WA2IQQ 66, W2GPH 61; K2SJJ 59, WA2RFP 55, WB2FUH 17, WN20HH/2 10, WA2BR 9, WN2RKL 8, W2OOJ 1. (Dec.) WA2PJJ 176, WB2NKN 57, WA2BKV 9, WN2RKF 6.

NEW YORK CITY AND LONG ISLAND - SCM, John H Smale, WB2CHY - SFC: K2HTX. RM: WB2LZN. PAM: WA2UWA VHF PAM: WB2ROF.

NLI*	1630 kHz	1900/2200 Dv	WB2LZN Mgr
NLI VHF*	145.8 MHz	1900 MTWThF	WB2ROF Mgr
NLI Phone*	3928 kHz	1730 Dy	WA2CXY Mgr
Clear House	3928 kHz	1100 Dy	WA2VY Y Mgr
All SVC	3925 kHz	1300 Su	W2QE Mgr
MIC FARAD	3925 kHz	1300 MTWThFS	W2OE Mgr
NYSTPEN	3925 kHz	1800 Dy	WB2QAP Mgr
ESS	5590 kHz	1800 Dy	K2URR Mgr

\*Denotes section net; all times are local. St. Albans VA Hospital is looking for members or a complete club to operate at its amateur radio station, for further details, contact WA2ZHA. WA2UWA reports that NLS will be starting again the 1st of Apr. on 3730 kHz at 1830 local, this net isn't just for the Novices or beginners, it needs people who have been around, people who can teach the newcomer the proper procedure for NTS operation. The Suffolk County Radio Club held it's annual Dinner Dance at Land's End Inn, new officers: WB2BAU, pres.; WA2CXG, vice-pres.; WB2CHY, rec. secy.; WB2CRY, corr. secy.; WB2TSB, treas. Mid Island Radio Club officers for 1974: WA2EXP, pres.; WA2LJS, vice-pres. W2NYN, secy.; WA2CJE, treas.; W2OWP, trustee. Congratulations to new ORS W2MLC. This seems to be a bad winter for antennas just about all reports received indicate some loss of antennas. WB2LZN is trying 160-meter operation. Bob reports that he ran into another traffic station, W2ZGP, there. WB2AEK will soon be retiring and moving to new QTH in the Lake Champlain area. Welcome to the traffic world to W2GLE. Everyone is reminded of the National Convention being held July 19, 20 and 21 at the Waldorf Astoria. For more information, please contact either WB2CHY or K2SJO. All stations submitting traffic totals please try to get the station activity report forms into me by the fifth of the following month. Congratulations to new D2RN Mgr. WA2UWA K2VGD is sporting a new R4B and SB220, he also has built another station, not for the ham hands though, to see this result just tune your JV to Channel 67 WSNL with 5 MW output that's some rig! Traffic nets are still looking for outlets for traffic in all parts of the section, you don't have to be a regular, just once a week would really help. The Hall of Science Radio Club has a new beam up a

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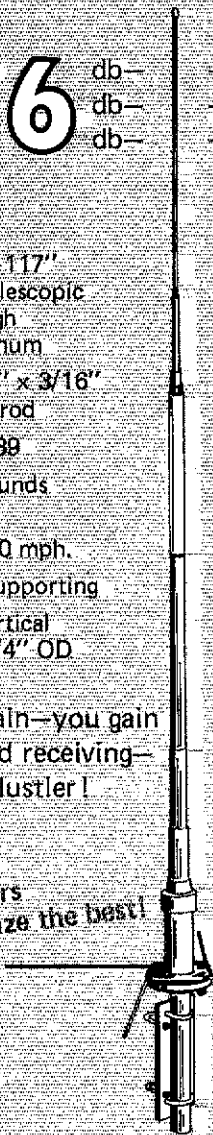
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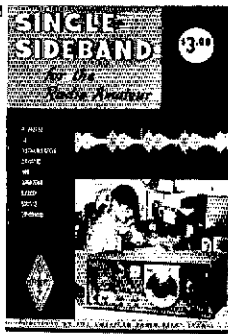
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their site at the old World's Fair Grounds. Traffic: WA2UWA 890, WB2LZN 290, W2EC 246, WB2FLF 240, WB2OYV 232, WA2CLB 201, WB2CHY 83, WB2UEG 62, W2MLC 42, W2GLE 33, WB2WJF 20, WB2FKF 17, WA2LJS 16, W2EW 14, WB2AEK 12, W2PF 12, W2DBQ 9, WB2LYB 9, K2JFE 5, W2AML 4, WB2FKF 3, WA2KXE 2.

NORTHERN NEW JERSEY SCM, John M. Crowell, WA2UO - SEC: K2KDQ. RMs: W2ZEP and WB2RKK. PAMS: K2KDQ and WA2FVH.

Net	kHz	Time (PM)	Days	Sess.	QNT	Tfc.	Mgr.
NJN	3695	7:00	Dy	37	583	292	WB2RKK
NJN	3695	10:00	Dy	31	230	61	WB2RKK
NJSN	3730	8:15	Dy	37	154	71	WB2RKK
NJPN	3950	6:00	M-S				
		9:00	Su	38	773	433	WA2FVH
NJPON	3930	6:00	Su	4	98	31	WB2FIE
PVTEN	145710	8:00	Dy				K2KDQ

The Edison Emergency Net (AREC) meets on Sun. 11 A.M. on 21135 kHz; at 8 P.M. on 7135 and Thu. 8 P.M. on 21425. EC for Edison is WB2HSD and invites all interested to check in. WB2YPO setting up new OBS sked on 144.9 at 7 P.M. Tue. W2CVW worked a VP5 on 160 meters. Intruder Watcher W2WHB is using a new vertical. WB2NOM having outstanding results on 80 cw working 20 new countries. WA2ELW recently received his General. WN2GMO, WN2HSG and WN2PCF active on NJSN. All interested in NJSN should give it a try. Code speed is only 5-8 wpm. WA2UDT active in VHF SS despite Rutgers Grad School work load. The Lafayette School ARC station WA2RGV is active on 40/15 with an HW-16. The SET pointed up the need for emergency powered capability by more of us. WA2DSA busy passing traffic on HBN and HSN using an SB-101. KARCN active during the SET passing over 50 messages. WN2HSG working hard toward his General. W2DYS and WB2TFH are receiving some thankful replies from OO notifications issued. I regret to inform you that because of circumstances beyond my control I have resigned as SCM effective Feb. 15. Bill Keller, WB2RKK has volunteered to be acting SCM until an election is held in the near future. I wish to thank all of you for the privilege of serving as SCM hope you give my successor the same great support. I leave one or two suggestions - join your local radio club and support your section nets. Good luck to all. Traffic: (Jan.) WB2RKK 731, WA2EPI 581, WA2GAX 157, WA2CWS 150, WA2SHT 143, WA2BSU 121, WB2ELF 112, K2OOJ 103, WB2AEH 102, WB2PFW 72, W2ZEP 72, WA2UO/D2 70, WA2DSA 69, W2CU 63, WA2DVE 52, WB2AXY 45, WB2RJ 27, WA2DIW 22, K2ZFI 21, WA2CCF 20, WB2KNS 14, W2CVW 13, WB2NOM 11, WA2RGV 11, WA2CAK 10, WB2HSD 7, W2ABL 5, WA2CFT 5, K2EQP 5, WA2EUO 2, WN2IYY 1. (Dec.) WN2GSG 55, WN2TES 5.

### MIDWEST DIVISION

IOWA - SCM, Al Culbert, K0YVU - Judging from the activity I heard during the week end of SET, Iowa will be among the lowest of the Sections. This is a far cry from a few short years ago when we were right at the top of the heap. I am however confident that our new SEC will be able to induce a much better showing in the '75 SET. WB0EFG reports that W0DSP has 6 new Novices at Osage, a nice showing for a winter's work. K0DDA and WA0AUX have been making sure that Iowa is well represented on the Daytime Tenth Region Net. W0EIT has completed the conversion of an old HRO (s/n 61) to completely solid state, and is he proud! WB0LTI and WB0FEL are a father and son team at Elgin. Congratulations to WN0GUU of Cedar Rapids who recently passed his General Class exam. WB0BPH has a newly completed ST-5 RTTY converter working and has been busy on 14 MHz RTTY. I have had a few inquiries regarding the availability of the ARRL public relations films, and anyone wishing to schedule the loan of the Midwest Division copies, should contact W0CY at Salina, Kans. direct.

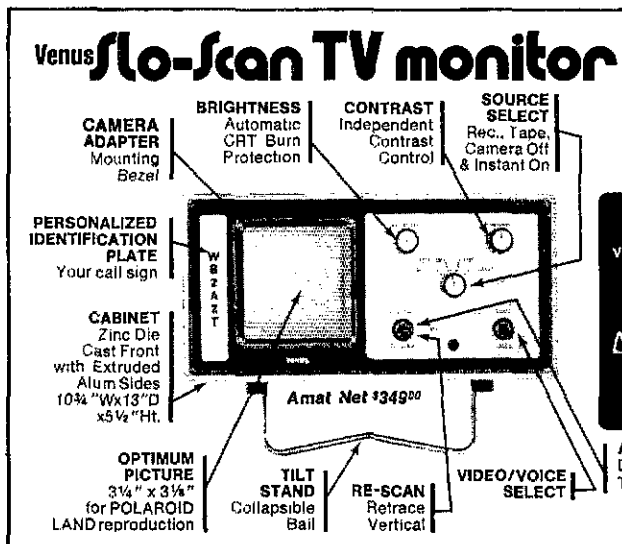
Nets	QNT	QTC
Iowa 75 (noon)	1352	108
Iowa 75 (eve)	986	31
Falldorn (cw)	146	56

Traffic: WA0AUX 504, K0DDA 302, K0AZJ 273, WA0TAQ 140, W0MOQ 69, W0LCX 66, WA0VZH 46, W0WSV 32, WA0FN 1, K0YVU 14.

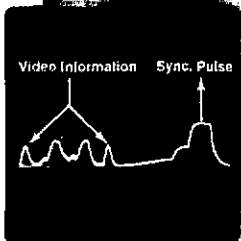
KANSAS - SCM, Robert M. Summers, K0BXF - SEC: K0JMF. RM: K0MRI. PAMS: W0GCF, WB0BCL. VHF PAM: WA0TRO. Mid-States Mobile Monitor Service for Jan., QNT 905, serving 25 mobiles, 90 QTC. Kans. Weather Net 31 sessions, WNI 575, WNT 211. Hambutchers Net QNT 286, QTC 14. Kans. CW Net (OKS) QNT 361, QTC 541. Kansas Phone Net (KPN) QNT 132, QTC 14. Kansas



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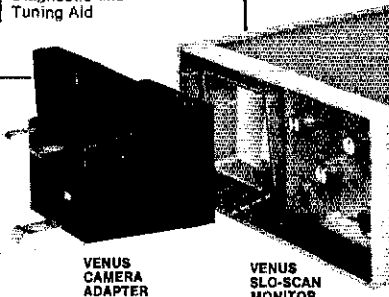
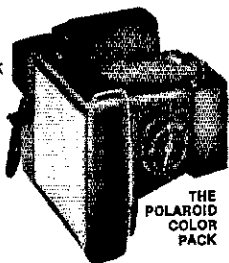
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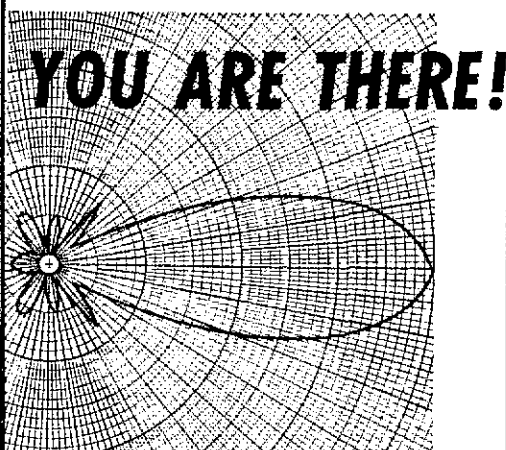
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Side Band Net (KSBN) QNI 946, QTC 111. The following receive certificates of Merit for outstanding achievements during 1973 from: The Wichita ARC, W0HL, W0PE, WA0UTT, K0DVN, WB0BVI, K0BHI, W0LNZ, K5FNV/0. Believe all who were on the stick list last month are on the slow but sure recovery list this month. K0K has been off the air for sometime due to construction work. W5URM, New Mexico wishes to remind Kans. amateurs of the Nation Traffic Frequency (NTF) 7070 kHz, 8:30 AM to 4:30 PM, local time daily. Johnson County Radio Amateur Club announced May as their Club Auction date. While we are on the subject of dates how about a notification from each club with reference to the forthcoming Hamfest or other activities, for listings in this column: SET reports are not all in as yet, but info from K0JMF indicate band conditions played had games with us during the St-L week end. Traffic: WB0GYR 315, WB0HBM 254, W0HI 192, W0OY 187, WN0KWI 181, WN0JF 178, K0MRI 174, WN0HTR 161, W0OF 167, WB0CZR 150, WN0JQ 138, W0FIR 99, W0MCH 77, W0PB 68, K0PFC 61, K0YTA 51, K0BFX 43, W0CUI 38, W0CG 36, K0JMF 31, W0MA 19, WA0SEV 15, W0CUI 13, WA0GNC: W0OWH 5, WA0ZTW 4, W0NYG 3, W0FDJ 2, W0RBO 1.

MISSOURI — Acting SCM, Ben Moschenross, WA0FMD — Ass SCM: Clifford E. Chamney, K0BIX. New appointments: WB0ATT, WA0 VLT as ECs; WB0CKI and WA0YNC, ORSs; W0HBI, OP; K0RWL, OBS, OPS and ORS.

Net	QNT	QTC	Net	QNT	QTC
MOSSB	1456	119	JC2AN	55	2
MON	299	183	PHD	53	
MFN	231	15	MOAREC	78	
WEN	154	37	SCEN	43	1
MSN	153	32	ISCN	39	1
MON 2	130	40			

Many thanks to K0VVH for job well done as SCM. Best of luck at his new QTH in Mich. I will do my best to fill in until new SCM is elected. Get your petitions in. Congrats to new club officers: St Louis ARC, WA0TXV, pres.; K0SGJ, vice-pres.; WA0KMF, secy; W0RUR, treas. St. Charles ARC, WA0ABI, pres.; WA0CXI, vice-pres.; WB0EBE, secy-treas. PHD ARA, K0HAS, pres.; K0DI, vice-pres.; WB0ERI, secy.; WA0SON, treas. MOSSB Net picnic scheduled for June 9 at Memorial Park in Jefferson City. I regret to report the passing of K0KWL, XYL of K0KWI, and WA0EPZ. Our deepest sympathy to their families. St. Charles ARC repeater nearing completion of hopes of receiving license soon. Will be on 146.077/67. SEC K0BIX reports many local groups held SET drill. Congrats to K0TVO on appointment to ARRL Repeater Council. Traffic: K0ONK 1286, K0BIX 223, WA0VBG 113, WA0FMD 78, WB0CKI 69, W0OUD 55, WB0FKY 42, WA0FKD 41, K0VVH 35, WA0YNC 34, W0EPL 29, WB0EBE 22, W0RTW 20, W0OAU 15, W0OTF 13, WB0QM 12, WA0KUH 11, W0VZK 9, W0GBJ 7, WA0CXI 3, WB0ESA 1, W0MFO 1.

NBRASKA — SCM, V.A. Cashon, K0OAL — Asst. SCM: Velm Sayer, WA0GHZ, SEC: K0ODF. Appointments: WB0GWR as PAM, WA0ASM as EC. Endorsements: WA0LOY, W0NIK, WA0GHZ, W0DJO as PAMs. WA0LLO, W0IRZ, WA0FEI and WA0TBL as FCS.

Net	Freq.	GMT/Days	QNI	QTC	Mgr.
NEB III	3700	0000/0745 Dy	36	1	WA0GHZ
NSN I	3982	0030 Dy	919	29	WA0LO
NEB 160	1945	0030 Dy	353	250	WA0CB
NMN	3982	1230 Dy	872	6	WB0GWI
WNN	3950	1300 M-S	353	5	W0NTI
AKBC	3982	1330	145	5	W0TR
CHN	3980	1730 Dy	1056	29	WA0GHZ
SHN	3950	1830 M-S	268	0	W0DJO
NAN	3980	2000 M-F	518	17	WA0AUX
NSN II	3982	2330 Dy	1415	31	WA0LO

Nebr. OCWA net meets at 9 A.M. every Sun. on 3980, W0FQB NCS. Nebr. Chapter OCWA Charter meeting held at Grand Island Mar. 99. Lancaster Co. 2-meter ARRL net Jan. QNI 95, QTC 3. Officers for 1974 — Pine Ridge ARC: WN0IUX, pres.; WN0KXH, vice-pres. WA0BHT, secy.-treas. Ak-Sar-Ben REC: WB0GAJ, pres.; WA0UZX vice-pres.; WB0FGR, secy. W0YZV was presented Lifetime Member Certificate; WA0VFE a Service Appreciation Plaque from Ak-Sar-Ben RC. Congrats. WA0PMC most active working Oscar with 16 states including Hawaii, Mex. and 2 Canadian Provinces, or 16 confirmed. WB0IUT also active working Oscar 6. Traffic (Jan.) WA0CBI 55, WA0OEX 53, WB0EYF 29, K0ODF 24, W0IOD 21, W0VFA 21, W0GEO 19, W0FOB 15, W0CSW 14, W0VYX 14, W0AFG 10, WA0OEI 10, W0NHS 9, W0FFV 7, WA0FG 6, WA0GHZ 6, W0HTA 6, WA0YGZ 6, W0DMY 5, WB0RG 5, WB0GWR 5, W0NIK 5, K0MUE 4, W0DFZ 4, W0GK 3, K0BEI 3, WB0GMO 2, W0IAY 2, W0IRZ 2, WA0LOY 2, K0OAL 2, WA0VIT 2, WA0FEI 1, K0SDG 1, K0SFA 1, W0RJA 1. (Dec. K0MUE 4.



Each year, the Handbook is revised to include technical advances as they relate to amateur radio. The 51st Edition is no exception. Theory chapters have been revised where needed, and this new edition features numerous new construction projects for amateurs experienced in hf and vhf operation. It also contains projects for the novice experimenter, who has a choice of many station accessory designs. All important aspects of amateur radio are covered: from basic theory to logic, from a simple 7 MHz solid-state receiver to high power tube-type amplifiers. It is certainly the complete Handbook of Amateur Radio Communication!

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NEW ENGLAND DIVISION

CONNECTICUT - SCM. John McNassor, W1GVT - SEC; W1HHR. RM: K1EJR. PAM: K1YGS. VHF PAM: K1SXF.

Net	Freq.	Time/Days	Sess.	QNT	QTC
CN	3640	1900 Dy	66	495	458
		2200			
CPN	3965	1800 M-S	36	657	512
		1000 Su			
VHF 2	144.98	2200 M-S			
VHF 6	50.6	2100 M-S			

High QNT: CN - W1BYW, W1CII, W1LFCM and W1KV. CPN - W1NLD, W1NOO, K1PAD and W1RFR. SEC W1HHR extends sincere thanks to the many AREC members who helped make the SFT a success again this year. E.C.s, please send your reports. Director W1QV's Annual Report indicates considerable activity representing our interests - please give club members a chance to read it. The '74 SFT was another Winter FD and the highlight of the month. Net Mgrs. supported by capable NCSs and net members did an excellent job - extra sessions held and considerable traffic generated - thanks to all who helped. I enjoyed attending the Bristol AREC members SET results meeting - EC W1DGI. has a most enthusiastic group - no wonder they scored so high! The SET offers an opportunity for fun and learning but a good leader in each category is needed. Plan for next year now! W1MBK looking for more local activity on 10 meters. WB4OOD/I operating MM - I need his QTH and he wants Conn. OSOs. Congratulations to: W1LFCM (the hard way), W1LIR and W1RYI. For Jan. BPL: W1PHI for CP-30; W1HBK for Extra Class; and to W1RYI for Bristol AREC award! Don't be an Apr. Fool - check your ground system and improve it. Don't "cool it", "ground it!" We like your QSOs! Traffic: (Jan.) W1LFCM 548, W1LIR 304, W1RYI 262, W1GFH 253, W1RFR 231, W1NLD 198, W1PHI 191, W1MPW 169, W1CII 124, W1PHF 115, W1RZC 86, W1GVT 83, W1FFW 79, W1KY 79, K1YGS 68, W1DGI 67, W1JCN 50, W1GNC 41, W1S0B 33, W1OPR 29, K1SRF 28, W1RUS 25, W1PPD 20, W1IKN 19, W1KAM 16, W1RUA 11, W1QV 10, W1NRU 10, W1BDI 9, W1JZC 8, W1CUH6. (Dec.) W1PKM 55, W1OPB 23, K1EPW 8.

EASTERN MASSACHUSETTS - SCM. Frank L. Baker, W1ALP - Our SEC writes from Fla. and is enjoying himself. W1AUU had

surgery. I wish to acknowledge the many SET messages sent to me and W1AOG. W1LK is a Silent Key. W1OWO says the RTTY net on 6 going good. Good to hear W1TWG on 75. W1RX back from Tex. vacation. W1TV new FMer. W1AAA has new antenna. W1MI seriously ill since Aug. New officers of Massachusetts ARA are W1AAI, pres.; W1OEX, vice-pres.; W1NHI, secy.; W1GAI, treas. K1WVW active in the P.O. and Echo Nets on 6. W1KO has new HW-12. K1ZZY repaired rotor. K1CLM spends 56 hours a week on Intruder Watch. W1NF new sked with W3OY. W1EIH getting in net and traffic activities on 80. South Shore Club had a "Wahats My Line" program. W1WZ new Genave GTX FM rig. W1MV, W1BFD, W1DW on 2 fm. W1ECK a Genave dealer. W1PLK active on 80 cw. W1PEX, W1RFD, W1MSK made BPL. W1MYK will be on at W1PUO. W1ROG new FT101B. W1UX a Heath weather station. W1RML says W1KN, Tufts Univ. has all Heath equipment and handling messages for students. W1LE has HW202 mobile on ECARS. New officers of W1MX: W1B2BW, pres.; W1JZC, act. coord.; W1SLR, sta. mgr.; W1MKE, secy.; W1QCI, treas. W1PJ fooling around with RTTY, monitor Intruder Watch. New appointments: K1ZZY EC for his town; W1UF, ex-W2URX ORS, OVS; W1PLK OBS; W1RFD ORS-2. Endorsed: W1s YZ, RFP, MNK, BB, BAB, NZP, MOJ, BHD; K1s VVW, NFW E.C.s. W1MX OVS, OPS, ORS; W1RB OO; W1AX OPS, ORS; W1AAI, K1OJO OVS; W1BHD OBS, OVS; K1CLM OPS; K9AOP/I OVS. W1PRI is an asst. Dir. to W1QV. New officers of Framingham RC: W1MTL, prePYF, secy.; K1UUM, treas. W1TYP moved to Fla. I9 RC 40 years old in Apr. K9AOP/I sends OVS report for 1973, active on many of the vhf bands. W1LZW gets on 20. W1BEE worked W4s on 6 in Jan. A nice note from W0HG, ex-W1FL 73 to all. K1OJO back at B.U. On 220 Mhz are K1OJO, W1GXT, W1DC, W1LXU, W1QXX, K1GCU, K1SRZ, W1GGM, K1CHY, W1GAO. W1PMY has General. W1BVL worked W5TOS on 160. Congrats to W1BVL on article in Feb. QST. K1TZX home from hospital. Whitman ARC having Novice classes. Middlesex ARC repeater call W1ACHL Capeway RC met at W1UOH's QTH. W1R1AB is repeater in Framingham, on 2. W1BB busy on 160. Eastern Area Novice Training Net run by W2RUF, see Dec. QST for info. Norwood RC had W1s OBG, RQJ talk about digital synthesizers, used on 2 fm, an Auction is being held. The 6th Annual Mass. Amateur Radio Week coming up in June.

Net	Freq.	Time/Days	QNT	QTC	Mgr.
NEEPN	3945	0830 Su	100	5	K1EPL

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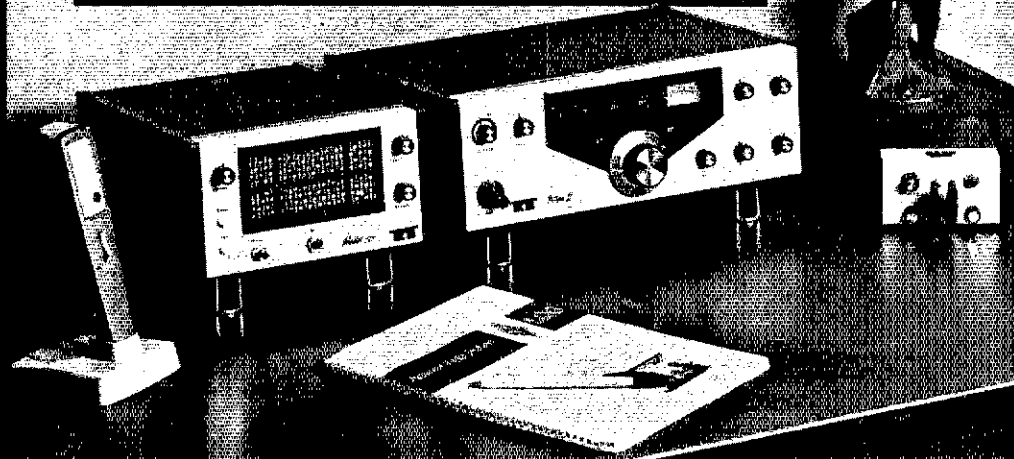
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FMN 3660 1900/2200 459 386 WA1M

Traffic: (Jan.) W1PEX 1288, WA1MSK 514, WA1MXV 225, W1197, WN1RED 181, WA1IGL 124, WA1OWO 121, WA1OML 10, WA1MYK 82, WIEMG 60, WA1ROG 59, WIUX 50, WA1PGY WA1EQ 36, WA1FNM 31, WA1BC 24, WA1IFE 18, WA1EY WA1EC 13, K1LCO 13, WB2KXC/1 10, W1KN 8, W1PL WA1SJR 3, W1EIH 2, WA1HGG 2, W1LE 2. (Dec.) K1PNB WA1EQ 16, W1MX 4, W1PJ 4.

MAINE SCM, Peter E. Sterling, K1TEV - SEC: K1C PAM: K1GUP. RM: W1BIG. The Barnyard Net celebrated it's 20 anniversary Dec. 8 instead of the 9th with a check in of 47. W1S and XYL are in Mt. Dora, Fla. for the winter. WA1SDB of Gorh is bothered with chirps when using his vfo. Any suggestions? He tried all the dope in the handbook. W1CTR's XYL was ill for a week with the virus. The Portland Amateur Wireless Assn. has to find headquarters again. Anyone have any ideas? The Dec. 00 luncheon was held at the Saugus, Mass. Vallee's and attended W1BHA, W1EM, W1CTR, W1GCB, WA1IBM and last of all K1R. The Barnyard Net reports 27 sessions, 794 check-ins, 1 traffic Jan. New ham in Maine is WN1SSV, congratulations. WA1PKV the air again from Calais. The Maine Seagull Net reports 11 check-ins, 144 traffic for Jan. WA1IBM and WA1RER new members of the Barnyard Net. Still looking for news mainly from northern part of the state. W1BIG is still looking for NCSs for PTN. Need an appointment, get in touch with your SCM. W1HIG on with a new FM-27B. WA1GIT has left for overseas duty a hopes to be on soon, hopefully from XW8-Land. Traffic: (Jan.) K1GUP/1 76, K1TFV 11, W1CTR 7. (Dec.) W1CTR 16.

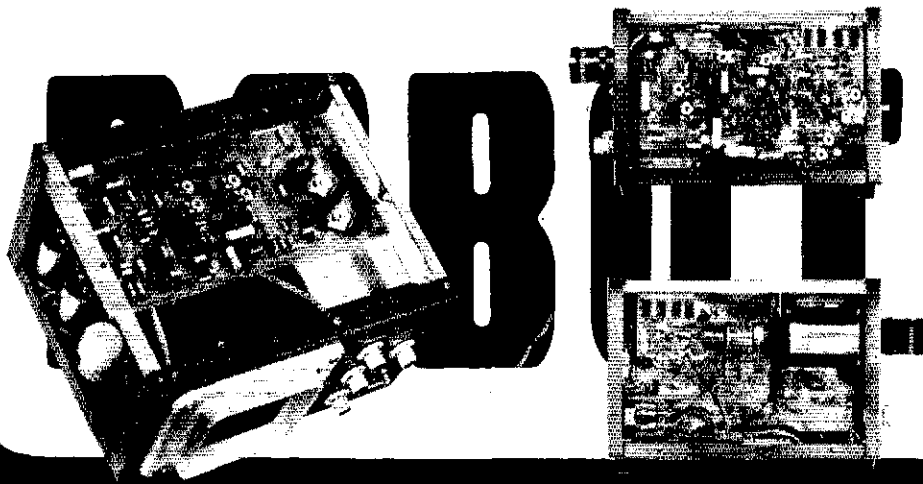
NEW HAMPSHIRE - SCM, Robert C. Mitchell, W1SWX - SE: K1RSC. RM: W1UBG. PAM: K1YSD. Welcome to new ham WA1SPS, WN1SOM, WN1SPX, WA1SOZ, WA1SRU, WA1SS WA1SD, WN1STX and WN1SUH. Congratulations to new K1WKA, retired from MIT and living in Hampton. K1YSD says NHEPN had 6 traffic in 5 sessions with 60 check-ins. Net operation has been difficult due to wintertime skip ORM. VK4ZV, ex-W1M sends regards to the NH gang from QTH in Australia. WA1J having a TVT problem. W1JY now a Life Member of ARRL WA1MZV chasing DX on 20 with an SB200 and HW101. K1Y has rewired and rebuilt the operating position for easier operation. K1BCS again made BPL. WA1FSZ lost his antenna mast antennas during the Jan. 31 wind storm. This report originates from West Palm Beach, Fla. Traffic: (Jan.) K1BCS 508, K1YMH 9, K1YSD 70, K1POV 29, WA1SCE 19, W1SWX 11, W1BYS WA1MZV 4, K1WKS 3, WA1JSD 2. (Dec.) WA1SCE 25, K1YSD

RHODE ISLAND - SCM, John E. Johnson, K1AAV - Dec. L report. The Fidelity RC K1NOG, now has 6 Novices, 5 Generals, Advanced and 3 Extra Class licensees. WN1OKJ and WN1QJ made General. WN1SER passed his Advanced Class exam. The club held their Christmas Party at the home of WN1OKJ and a good time was had by all. The Newport County RC had New England Director W1OV and his XYL as honored guests at their Christmas Party. The club has planned the program of Special Guests for the 3rd Month of the month. Future speakers are Vernon Dameron who will speak and show slides on his DXpedition to St. Pierre and Miquelin Island. W1GO will show his new device that translates audio mode signals into video alphanumeric display and W1AM will discuss amateur radio in Upper Volta, Africa. WA1OOG is operating 10 a 160 meters and is working at the W1OP Club on RTTY projects. is also making plans to work via Oscar 6. RM WA1POJ is still looking for cw ops for the slow net. He is still building on his F machine. WA1RET has a new homebrew 160-20-meter receiver and is working on RTTY converter and a solid state receiver. New Novices WN1SRB, SRE, SRC, SRD, SRF, SQX, SSF, SRP. RI report: 103 ONI, 70 QTC. Traffic: WA1POJ 280, WA1RET 30.

VERMONT - SCM, James H. Viele, W1BRG - SEC: W1VVS

Net	Freq.	Time(Z)/Day	QNI	QTC	M
VTSB	3909	2200 M-S	589	149	WA1H
		1130 Su			
VTPO	3909	2200 Su	77	40	K1B
Carrier	3935	1300 M-S	533	23	W2D
Green Mt.	3932	2130 M-S	485	32	W1J
Vt. Phone	3942	1230 Su	83	5	W1K

Welcome new amateur WN1SSM in Hancock. W1VSA and W1D presented program on repeaters at CVARC meeting. New officers: W1IACA (repeater assn. are K1LEC, pres.; W1RNZ, vice-pres.; K1ZLL, secy-treas.; W1RFP, trustee. Northeast FM Repeater Assn (W1ABI, WA1KFX) held annual meeting at White River Jct. J. 19. New officers are K1BKK, pres.; K1OAJ, vice-pres.; K1Y



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sey-treas. WA2KFX MOTRAC repeater was recently stolen from W2GHR's home in Athens, Vt. Traffic: K1BOB 12.

**WESTERN MASSACHUSETTS** - SCM, Percy C. Noble, W1BVR - SEC: WAIDNB. CW RM: W1DVV. PAM: WA1ITL. UHF/VHF PAM: W1KZS. WMEN held 6 sessions with SET, ONI 92, traffic 21. NCSs: WAIDNB and WA1ITL. WMN held 31 sessions with ONI 166, traffic 178. NCSs: W1BVR, W1KK, WA1LNF, WA1LPI, W1TM. WMPN held 23 sessions with ONI 321, traffic 25. NCSs: WA1ITL, WA1MJE, W1OJA, K1RGO. All WM nets were very active during the SET. Congrats to all who took part! All nets are now keeping complete list of all who check in. Members of WMPN had a fine dinner meeting in Northampton, result of the efforts of Mr. & Mrs. WA1ITL. Berkshire Co. AREC (thru repeater K1FFK) is holding Sun. sessions (except 1st Sun. of the month) at 2:00 PM. WM AREC Repeater held 23 sessions with ONI of 176. WA1LNF is new OO I. W1IBZ is new OBS (M&W 7050 6:45 PM and Tu&Th 3635 6:45 PM). W1ZPB still doing fine job with his 2-watt rig. CMARA reports new FCC office hours, Tue. & Wed. 9:00 to 11:00 AM. Wed. only for those requiring code test. HCRA reports Bulletin contains complete list of paid-up and non-paid-up members. MARC reports WN1ONC now WA1ONC. WN1RJW also dropping the WN. Mt. Tom ARA reports new members WA1LPI, WA1GZO, W1RGF, WA3SEZ/J. WA1EYX would like old call letter plates. NOBARC says YL net meets every Tue. at 10:00 AM thru repeater K1FFK. New B. of D. members are K1ROF, K1VPS, WB2BXP. A fine editorial by WA1LUX re former CBers, new to the ham hands, should be welcomed and not criticized if they occasionally fall back on such expressions as 10-4. Voice of I. Repeater Assn. says a new association was formed on Jan. 3. - the Provin Mountain Repeater Assn. WA1PLS has new portable scanner. W1CSF mobile HT and WA1RLP making an HT. K1TCS has RP synthesizer. WA1JOU now in Pittsfield. Traffic: W1TM 176, W1BVR 155, WA1LNF 130, W1DVV 117, WAIDNB 63, K1RGO 48, WA1MJE 39, W1KK 31, WA1FBE 27, WA1OUZ 17, W1KZS 16, W1JHI 13, W1PUO 6, W1ZPB 6, W1STR 5.

**NORTHWESTERN DIVISION**

**ALASKA** - SCM, Roy Davie, K17CUC - SEC: K17HFM, ECs: K17FPK, K17FKO, K17EKO and K17JDO. Asst. EC: K17HAB. K17CFX reports he is liaison with the AKN net and the Snipers net.

OO K17BJW keeping close watch of the bands. K17HER is active and has nice signal on 75 phone. RM K17HMU for the AKN net would like to have more check-ins. K17GCH reports working JAs and mid-western states on 160 meters with a new 80/160 doublet 40 feet high. The SCM notices there is considerable amount of activity on 160 around 0600 GMT. K17JDO who has been very sick is now on the road to recovery. K17PSE reports a new rig 5B-303 and 5B-401. He also reports he has a 2-meter amplifier under construction. Remember the Ham Flea market is scheduled for Apr. no definite date as yet. FCC's Rule Making proposal 2164 part 2 of the rules for an emergency frequency of 4383.8 kHz kept a few of us busy digging up comments for the ECAC this month. ARRL is using our comments for the basis of their presentation to the Commission. The amateurs of Alaska are going to support the International Iditarod 1000 mile Sled Dog Race from Anchorage to Nome. Please send your reports in earlier so that I can get them in to QST in time. Traffic: (Jan.) K17JDO 16, K17GCH 14, K17HER 5. (Dec.) K17BJW 18, K17CFX 6, K17HER 1.

**IDAHO** - SCM, Dale A. Brock, WA7EWV -

Net	Freq.	Time/Days	Scm.	QNT	QTC	Mgr.
FARM	3.935	0200 Dy	31	903	25	WA7ROT
IM	3.582	0130 M-F	35	138	13	W7GHT
1 PO			14	112	9	W7IY
RACES	3.9905	1515	23	711	80	K7HBC

Lewiston-Clarkston Amateur Radio Club reports their project is to build an antenna for Oscar work. The SFT was very successful in Idaho, thanks to a fine bunch who participated. I attended Moscow's Radio Club meeting last month which included a tour of KUID. Traffic: W7GHT 325, WA7EWV 62, K7NHV 40, W7IY 11, W7FIS 6, K7UBC 18.

**MONTANA** - SCM, Harry A. Roylance, W7RZY - Asst. SCM, Bertha A. Roylance, K7CHA. SEC: WA7IZR. PAM: WA7IZR. WA7MUU, WA7IZR and W7RZY have been appointed asst. dir. Editor for the Static, Hell Gate Radio Club, paper is W7PF with W7EKR as publisher. Lots of activity in Missoula with a dinner scheduled for Feb. Spent a few days in Billings and thanks to the visits from the hams. Made the time pass and hope that the SCM feels a little better after surgery. We are starting work on the WIMU Hamfest and if any of you have any ideas, please pass them on to

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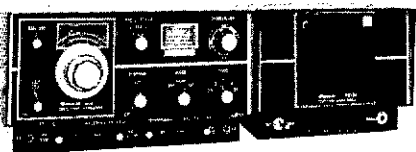


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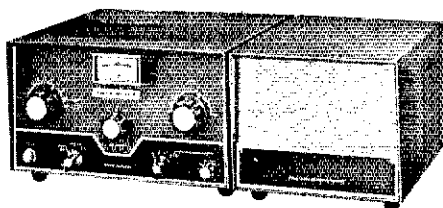
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OREGON - SCM, L.R. Perkins, WA7KIU - SEC: W7HLF. RM: K7GGQ. PAM: K7RQZ. Section nets: WA7RWM reports for the ARFC, sessions 31, traffic 10, contacts 31, check-ins 324. WA7NWW reports for BSN, sessions 63, traffic 174, contacts 224, check-ins 1300. K7OUF reports for OSN, sessions 31, traffic 98, check-ins 97. WA7EUQ reports for Portland Area ARFC Net, sessions 23, traffic 32, check-ins 165, including mobiles 33 and emergency power 28. WA7GCE reports EARS had a much better than expected turnout to the dinner at North's in Eugene, Sat. evening, Jan. 26. Rusty reports EARS has several projects going now. 9 neophyte Novices are working under the guidance of WA7ELP, and WA7OVP is very effectively helping the YL Fumble Finger Club understand the workings of "three wire thing-a-ma-bobs" and even "three stripe do-hickies." On 3710 kHz each Tue. and Thur. evening at 9:00 PM local WA7GCE will be sending cw at various speeds. On the last Thur. she receives. I think we should all ponder a moment what a job K7WWR has done these past six years as SCM. I am certain he will continue to faithfully serve us as Vice-Director. Many thanks, Dale, and for me, "Who can follow an act like that?" Please keep those cards and radiograms coming to 876 Nadine Ave., Eugene, Ore. 97404. Traffic: K7QFG 275, K7IEG 220, W7ZB 179, K7NTS 163, K7OUF 151, WA7NWW 65, WA7EUQ 64, W7DAN 44, WA7MHP 44, K7WWR 42, WA7KIU 30, W7HKE 26, WA7MOK 24, K7IWN 11, W7LT 11, WA7KRH 5, W7MLJ 3.

WASHINGTON - SCM, Mary F. Lewis, W7QGP - SEC: W7IEU. RM: W7JWI. PAMs: W7PWP, K7OUV. VHF PAMs: K7BBO, K7LRD.

Net	Freq.	Time(Z)	QNI	QTC	Sess.	Mgr.
NTN	3970	1130	1712	126	31	W7PWP

WARTS	3970	1730	2068	192	31	W7QG
NWSSB	3945	1900	758	60	31	K7OU
NSN	3700	0200	279	100	31	WA7OC
WSN	3590	1845	376	204	38	K7OZ

All proceeds from Walla Walla ARC W7DF auction were presented to Pendleton 28-88 repeater. W7JFR and KYL have returned from Mex. and visits to their grandchildren. W7IEU enjoying a net FT-101B when he has spare time from S&C duties. Lots of interesting things were learned during SET. SET did give each group an overall look at their plans on paper and proof that paper plan don't always work in actual emergencies. This is why we have practice sessions and make our errors in practice NOT emergency. Wash. is one state but something forgot to tell SKIP controller this CW could NOT be passed from East to West as per RN7 plan. Traffic out of state was by cw on NTS only and several had to be QTAd as circuits were full or inactive. Several cw net controls did not report for their sked. All in all a very excellent job and each of you are to be commended. Mail your group meeting or hamfests to me so I can get you on my sked Skagit Hamfest Apr. 20. Arlington Wa. same place as before. Traffic: W7PI 226, W7GVC 149, W7DPI 141, K7VNI 139, K7OZA 134, W7FOE 129, W7GYF 117, W7IEI 105, WA7BDD 101, WA7OCV 88, WA7KNW 78, K7OXL 66, W7BUN 64, W7BO 60, W7APS 48, W7PWP 44, W7JWI 43, W7IEI 42, WA7RCR 42, W7QGP 37, W7AXT 34, W7LG 22, WA7IKZ 17, W7UNI 17, W7QPZ 13.

### PACIFIC DIVISION

EAST BAY - SCM, Charles R. Breeding, K6UWR - Asst. SCM, Ronald G. Martin, W6ZF. SEC: WB6RPK. Appointments: WB6DS as asst. SEC. WB6DSI will work with W6ZF to better serve the northern counties of Lake, Napa and Solano. WA6JUD as VHF PAM for the section. I was most pleased to have the opportunity to speak before the Jan. meeting of the Mt. Diablo Radio Club. The turnout and response was most appreciated. Once again the Diablo Club had a new Novice class meeting at the College Park High School. For information contact VE2AQV/W6 at 689-5093. WB6DQM back on the air with an SB-101. WA6PSH is on active duty with the Navy in San Diego. During leaves, he can be found at home on 2 meters. K6POU made a business trip to Cedar Rapids. WA6JUD is putting the final touches on a new 2KW, 2-meter linear and working over the antenna system, preparing for moonbounce test.

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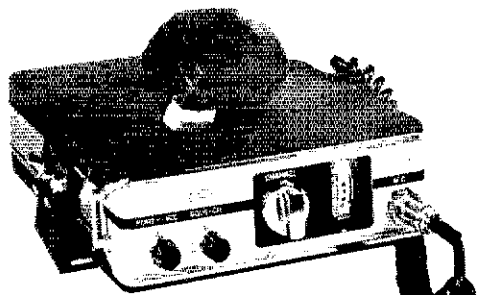
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Freq. range: 144-148MHz.

Channels: 12

Power output: 10 watts

Emission: F3

Max. deviation:  $\pm 15$ kHz.

Mod. system: Phase

Osc. freq. range: 6MHz band

Operating voltage/power:

Transmit: 13.8V @ 1.9A approx.

Receive: 13.8V @ 0.35A approx.

Size: 6-11/16"W, 2-3/8"H, 9-1/16"D.

Antenna impedance: 50 ohms

Rec. sensitivity:

0.5  $\mu$ V for 20 db quieting.

AF output: 1 watt.

Selectivity:

$\pm 12.5$  kHz @ 6db.

Filter: Ceramic type

Crystals supplied:

34-94, 94-94, 16-76.

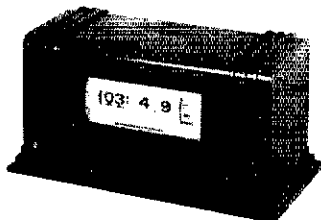
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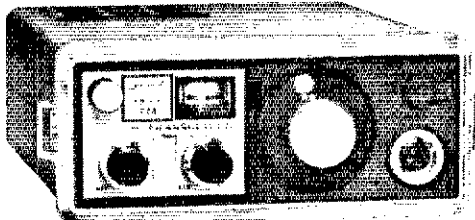


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Congratulations to W6KG and W6ZRJ on their recent election to the Board of the new ARRL Foundation. WB6BBC has been a most active man on VHF, chasing DX and carrying out his OO duties. The SFT was a success with the Mt. Diablo Radio Club and Alameda County EC simulating a major earthquake. Hope they all stay stimulated! Congratulations to the San Leandro Radio Club on their affiliation with ARRL. Traffic: (Jan.) W6IPW 355, W6JXX 48, WB6VEW 19. (Dec.) WB6VEW 16.

**HAWAII** - SCM, J.P. Corrigan, KH6GQW - Appointments: KH6GRU as VHF PAM. KG6JCP EC, Guam; KH6HHG EC Maui; KH6AGS OBS; KH6HGI, KH6GPO OOs; KH6BZF OO, OBS, OVS. Congratulations to KH6HPO, KH6IGF, KH6HSS, KH6AN and KH6HC on their Life Memberships. KH6BZF says K1UXJ and XYL spent the Christmas holidays with their son in KH6. KH6BZF still doggedly trying moonbounce and tropo. Try to help during the energy crisis - even just using the kW only when you need it. Again, hearty congrats to KH6CU on over 50 years with ARRL. KH6GKD had beams for all bands for ARRL DX Test, including 80 meters. KH6DVT and KH6HPK have new tribander and Eleanor mingling with W-YS. Due to generosity of KH6GMP, Canton should soon be on Oscar. Gary donated his gear to KB6. EARC's new officers: KH6FOX, pres.; KH6HGG, vice-pres., KH6HAB, secy.; KH6ICQ, treas. Support your repeater group. Congrats to KH6BZF for Dec. PSHR. KH6IHP promoting new certificate for KH6 QSOs on Oscar. Watch for details in QST. Lx-KR6UL currently on extended stay in KH6. More than one KH6 on DXCC honor roll. K9SYA passed on way to RV-Land for 30 days. KH6GQW off 2-meter commute show - bussing to work. Traffic: KH6BWT 4, KH6GMP 2, KH6IAC 1.

**NEVADA** - SCM, Harold P. Leary, K7ZOK - SFC: WA7BEU. I am sorry to report W7UEW as a Silent Key! W7YKN received Advanced Class license as Christmas present. W7ILX fast approaching BPL. Many individuals in State participated in the SFT. W7JRW installing anchors, getting ready for new tower. WA7MRS is cutting down shade trees in order to install a new rhombic. W7MVY and W7OK went to County Hunters meet in San Diego on Mar. 9. WA7CYC applied for repeater license on 07-67, FB. K7YUJ revamping his tower and big beam. K7YXX is new pres. of Las Vegas Radio Amateur Club. Other officers are WA7LFF, vice-pres.; K7ILX, treas.; WB5IQI/7 and W7NFB, dir. The local 34-94 machine is being rebuilt using solid state equipment. K7MAL is back in town.

Welcome. WA7YDV is really an "ole" timer. AF MARS repeater ops. Traffic: W7ILX 168.

**SACRAMENTO VALLEY** - SCM, Norman A. Wilson, WA6J - SEC: W6SMU. ECs: W6GQT, K6QIF, WA6PCL, WA6TQJ. OOs: W6CEL, W6NKR, K6KWN, K6YZU. OOs: W6BIL, K6WA6OWH, OVS: WB6NKO. Pac. Div. Asst. Dirs.: W6KYA, W6N6KHTM and WA6JVD. Hq. appointments: WB6MDP and K6IWS. New officers for GEARS are WB6CQF, pres.; WB6D, vice-pres.; WB6KAI, secy.; W6ICO, treas.; WA6SCJ, publisher. N. secy. for the Berryessa ARK is WA6RIB. BARK's repeater WR6AHX, on 146.37 - 147.97 has a new duplexer installed. WA6LXT on vacation in KH6 kept touch with family and friends via W6SMU and K6VT on 14 MHz ssb. W6NIU has been doing so publishing on the side and worked a new state and country in Jan. 160-meter test. WB6MDP working on 40-meter quad prep for DX test. WA6JVD erected a 66 foot wire vertical and adding radials with good results. W6SMU reports a good participation in the SFT. Further details forthcoming. WB6S, WA6GMR, VF7ZZ and friends running multi-op in phone DX from Davis. Traffic: WA6JVD 33, WA6OWH 15, W6SMU WB6MDP 3.

**SAN FRANCISCO** - SCM, Tom Gallagher, W6NUT - heaviest rainfall in over a generation caused significant flooding in Northern Calif. in mid-Jan. Communications were ably provided through the No. Cal. Emergency Net under W6BWV and the West Repeater group on 2 meters with WA6ICB net control at Humboldt Co. CD Hq. W6RNL acted as coastal coordinator in cooperation with W6EZO for the inland areas. Other participants included K6YZU, W6NNA, WA6BXJ, W6JN, W6O, WA6NNA, WA6QJA, K6AKF, W6VUZ, W6NCV, WA6WATTAE, W6SIX, W6RNL, WA6HVV, K7VZH, WA6WA6AMH, WB6YNE, K6TNZ, WA6JNW, W6KWN, WA6WA6LUD, WA6BKL, K6SBI and W6LUX. A fine job. New appointees are WA6ICO and W6NL. W6BYS renewed as OPS. Marin ARC transmits Official Bulletins at 1020 local time on 3915/W6SG and on 2 meters/WR6ACS. The Far West Repeater Assn. has elected WA6ICB, W6RNL and W6GGR directors. WA6ASO, secy.-treas. K6MZN has retired to Eureka from the phone company. K6LFY is on ssb after 50 years of cw. The National Traffic Frequency (NTFF) is monitored 0830 to 1630 local

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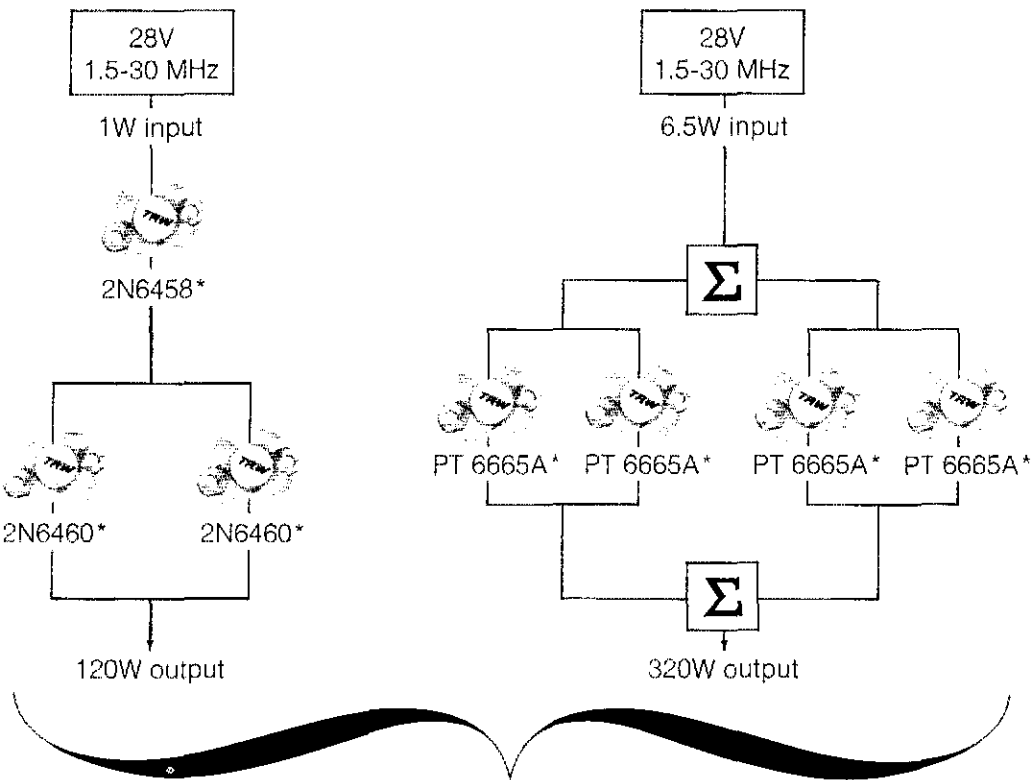
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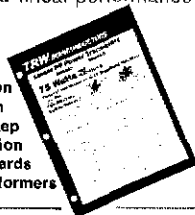
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**SAN JOAQUIN VALLEY** - SCM, Ralph Saroyan, W6JPU - It is with deep regret I report WA6HOU, W6RGB and W6WCS as Silent Keys. WA6RDY's apartment was ransacked of equipment, and found his 2-meter walkie-talkie being used on a local repeater, which he recovered. K6RAU holding local cw practice every morning at 6:30 AM on 3840 kHz. W6PXM heard on 75 sub. W6BOYL on 2 meters fm. EC WB6KZL very active in SET. EC W6YEP Fresno, active in SET reporting 72 check-ins on 2 fm, 3 on 6, and 4 on 75. WA6BUH maintaining the Fresno Repeater. WR6ACU, W6OSH on the road to recovery. WA6BUH won the IARC Boner trophy. WA6SBM waiting for his repeater call. WB6BBS and W6YFP are also helping in the maintenance of the IARC repeater. It is also with deep regret I report W6FOA is among the Silent Keys. Those attending SAROC were WA6ONZ, W6WZM, W66OMD, WA6EDQ, WB6GTT, W66OHB, W66GTT, W6IRV and WA6CUZ with their XYLS. W6DCP and WA6TOL with XYLS were also at SAROC. WA6ABH now in Bakersfield. The Kern Co. RC meets on 1st fm. at 7:30 at the Red Cross Bldg., 18th & V St., Bakersfield. W6OWL has a 75S3B. K6OZL is on 2 fm, has worked 90 countries on 7 MHz. WA6JDB has a Heath 2-meter fm rig. Traffic: WA6SCE 163, WA6RXI 95, WA6JDB 11, WA6CPP 3, W66VRJ 3.

**SANTA CLARA VALLEY** - SCM, Jim Maxwell, W6CUF/K6AQ - SEC WA6RXR reports a successful SET with nearly 100 operators participating. AREC and groups in the Redwood City, Palo Alto, Menlo Park, San Jose, West Valley and Santa Cruz/Monterey Bay areas were active. WA6HAD coordinated a simulated emergency with the help of W6YBV, W6BYB, W6NW and K6PMG which had comet Kohoutek aimed at ARRL Hq. in Newington. SCCARA proxy K6IXR casually worked EA9AA for a new country, then teamed with W6MKE, W6VVO and W6ZRJ to man the SCCARA/ARC station W6UC in the SET. New editor of West Valley ARA Heterodyne is WA6AUF, ably assisted by WA6WEI. WVARA pres. WA6OHT extends an invitation to all hands to attend meetings on the 1st and 3rd Wed. of each month, held at 7:30 at the Los Gatos/Saratoga Red Cross Bldg. W6VZT gave members of the North Peninsula Electronics Club the latest word on antennas at

their Jan. meeting. W6ZRJ reports a successful Board meeting. Newington. Winter conditions slowing things down on NCN, W6NW. K6WR was issued 5BDXCC No. 310. W6AUC rep handling traffic for a tanker sailing the Pacific. K6CQF new USCV. W6QNB took time out from his new duties as NCN secy. bulletin editor to borrow a generator from his local fire dept. for SET. W6BYM, W66BTU and W66BTI are new Novices in section. W6KSY and W6YBV made HPL, both handling over messages during SET. The annual International DX Convention held at the Fresno Hilton on Apr. 27-28. Don't forget National Traffic Frequency of 7070 kHz is monitored for the emergencies daily 8:30 AM to 4:30 PM. NCN had 633 QNLs, pieces of traffic in 62 sessions during Jan. Traffic: (Jan.) W6I892, W6YBV 607, W6NW 204, W6DFF 187, W6BYB 171, W6I11, W6AUC 83, WA6HAD 53, W6KZJ 34, W66IYA 29, W6627, K6AQ 20, W6ONB 14, K6EJF 3, WA6NDN 3, W6MM6KTXR 2, W6MKE 1, W6VVO 1. (Dec.) W6ZRJ 26.

#### ROANOKE DIVISION

**NORTH CAROLINA** - SCM, Chuck Brvldges, W4WXZ - K4FBG, PAM: WB4JMG. VHF PAM: K4GHR. RM: WB4ETF. was SET month and activity ran high on 80, 75 and 2 meters thanks to K4FBG (SEC) for his planning and thanks to all participated. W4OFO and WB4UOU did a splendid NCS effort the Tar Heel Emergency Net during SET. Eight stations qualified PSHR with WB4OXT making it six straight. Mt. Pisgah repeater WR4AEV and WB4LDO is Net Mgr. for Western VHF Tfc. W4KJT sporting new homemade keyer with memory. New off of Brightleaf ARC are W9NTV/4, pres.: WB4ZOM, vice: WA4EPU, secy. treas. The Carteret-Craven ARC had a program Comet Kohoutek and suggests car pools to meetings to save. W4A7L passed General and anxiously waits. Raleigh ARS leased a club station site which has a 200 foot tower, K4CIA as and call W4DW. Buncombe County ARC passed eight new W4 with four others preparing for General. W44TNA now W44 and member of Buncombe CARC. There is an ARRL National Advisory Committee on Emergency Communications so pass suggestions to your SCM, SEC and EC, WA4PBG, SEC Va. is chief of this committee (ECAC) and needs all our support. W44 graduated to WA4GTM and is proxy of Franklin ARC. K4W4APY and WA4GTM are active in Civil Air Patrol. The Alam



## NOVICE RADIO GUIDE

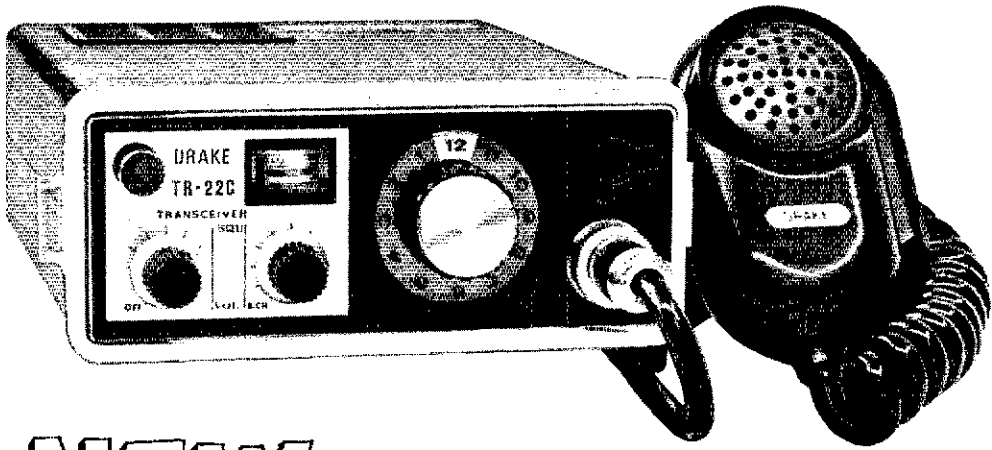
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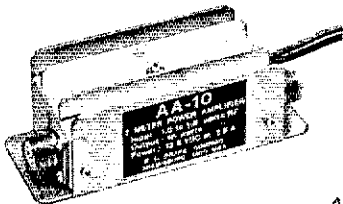
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ARC club station K4FG active in SET and also surveying members on operating events for 1974. Vic Clark, W4KFC who served so faithfully as our Roanoke Division Dir. for seven years now a First-Vice-Pres. of ARRL and is certainly deserving of this honor. Moving up as Dir. is Phil Wicker, W4ACY of Greensboro and Don Morris, W8JM, SCM of W. Va.; moves into the Vice-Dir. slot. Let's all give these gentlemen our support and help them get the job done. Traffic: (Jan.) W4OHO 125, W4WCG 124, K4EZH 110, K4MC 107, W4WXZ 102, WA4FFW 83, W4PCN 60, K4FTB 55, WB4OXT 39, W4EHF 25, WA4KWC 25, W4ACY 23, WB4UOU 20, K4VBG 18, WB4HDS 6, WB4MKI 5, W4TTN 4. (Dec.) K4KH 3.

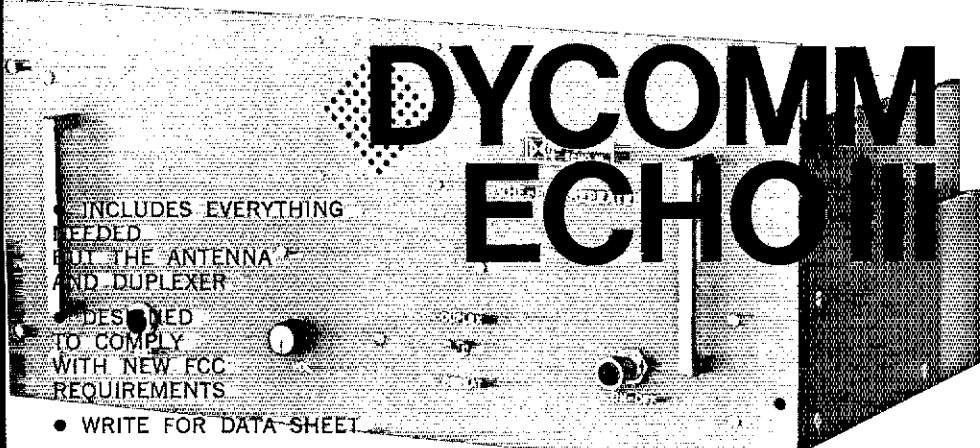
**SOUTH CAROLINA** - Acting SCM, Beth Miller, WA4EFP - SEC: WA4HCJ, RM: K4LND. PAM: WB4KNB, OG: W4NTO. Continuing last month's appeal for information, we list these nets: SSBN, 3915 kHz, 1900 EDT dy., Mgr. WB4RNB; CN, 3573 kHz, 0000Z/0300Z dy (??); SCPN, 3930 kHz, 1200 EDT dy except 0830/1530 Sun.; CRSN, 146.34/94 MHz 2000 EDT Thur. (1800 cps-tone burst); Swap Net, 1st and 3rd Sun. 3915 kHz 3 P.M. EDT. Union County 2-meter net 1st Mon. each month 146.97 MHz at 1930 EDT. It's up to those who know better to keep us advised of any errors. Following is the beginning of a club-schedule list: DX ARC, Camden, 2nd Thur. 8 P.M., Waterco Savings & Loan. Bishopville ARC, Bishopville, 4th Tue. 8 P.M., Brent King's rec room, Highway 154. Rock Hill ARC evidently meets 2nd & 4th Thur. at Beaty Shopping Center. Further details not available. Calling all club pres. or secy's: You, too, can be included in this listing. Send us the data, including calls of officers. There is a two-month delay before these reports appear in QST, so let us know soon. W4NTO and WA4LBO are active through Oscar 6. W4NDH is now K4VO Spartanburg on 2 meters. Traffic: (Jan.) W4NTO 74, WA4EJ 35, K4NJS 21, K4FRK 12. (Dec.) W4NTO 80.

**VIRGINIA** - SCM, Robert J. Slagle, K4GR - Asst. SCM: A.E. Martine, Jr., W4THV. SEC: WA4PBG. RMs: W4SQO, WA4SMR, W4SHJ, K4EBY. PAM: W4HR. This year's SET was the best ever - congrats, gang! SEC WA4PBG and I met with regional and state CD Officials and smoothed up the Va. AREC/CD Interface Plan - we were congratulated by them for initiating the most workable Plan they have seen yet; thanks to WA4PBG. Don't forget LO meeting in Richmond Apr. 6-7. QVS stations report good openings on two meters this month. LARC voted themselves to participate in Lynchburg CD Communications set up. VFN QNI 974, QTC 51;

VSN QNI 373, QTC 188; VSBN QNI 903, QTC 487. County WA4WQG 3056, W4JUJ 2914, WA4EPH 1084, K4YKB and K4M1 new Vienna Wireless Society trustees to FAR, K4GMH running phone patches to CZ. W4LDF reports good DX on 80. New TR4 at W4JUJ. Congratulations to new First Vice-Pres. of ARRL WA4KEC and to our new Dir. W4ACY and Vice-Dir., W8JM. K4KRP out of state work interference over. K4DHB is active at time. WB4OAX launching new Arlington radio club (name yet to be selected). New R-4C/T4XC working well at W4ZM. K4EYL no signs VS6AW, and is QRV from pals in Va. W4ZC new PVRC. WA4QELJ off gutter and on to long wire. K4GTS hanging new sk hooks with bow and arrow. W8VDA/4 found rig alignment help. W4TZC out of the clouds a little. WB4DRB participated in SET. W4PAY. W5VZO/4 says not enough time in the day. WB4WIS has new HW-12. WB4YTL cleaning shack. WB4FDT reports from San Antonio. WA4WQG back to permanent OTH. W4DM has exciting quiks. K4KA working on SBWAS and 5BDXCC. WIKAM regular on VSN in Conn. Traffic: (Jan.) K4KNP 390, W8VDA/4 325, W4UQ 321, W4PAY 311, WB4SGV 223, WA4PIG 214, W4HF 213, K4IAF 180, K4KDJ 177, WB4KSG 145, K4GR 140, WA4SM 136, K4JM 117, W4QDY 115, WB4WIS 96, K4LMB 94, WB4KI 81, K4GTS 67, W4HFH 66, WB4PNY 58, W4YZC 53, WA9NEW/51, W4LDF 49, W4KFC 41, W4ZM 40, K4KA 36, W2TPV/4 30, K4VIG 18, W2VYK/4 18, WIKAM 16, W4SIG 14, WB4YIL 14, WA4WQG 13, WA4EPH 12, W4TZC 12, K4MLC 11, WA4QEL/10, WB4DZL 9, K4MLD 9, W4MK 8, WB4QEB 8, W4THV 7, W5VZO/4 4, K9PIV/4 4, WB4DRB/4 2. (Dec.) W4ZM 30, K4DHB 22, K4GMH 14, W4TZC 2. (Nov.) W4TZC 6.

**WEST VIRGINIA** - SCM, Donald B. Morris, W8JM - SE WANNDY. PAMs: WB4WU, WB1YD. RMs: W8HZA, W8JWX. C Net Mgr.: W8HZA. Phone Net Mgr.: WB8DOX. Congratulations W4KFC on assuming the 1st Vice-Presidency of the League and W4ACY, our new Division Dir., taking over Vic's vacated post. Hopefully the LO meeting can be held in Richmond on Apr. 6 at 7. Monogalia Wireless Assn. officers are WA8CKN, pres.; W8JO vice-pres.; WA9YCD, secy. treas. Dr. John Knight, G3TPB teaches at WVU and working through W8SABM repeater. New Morgantown Novice, WN8CRP. WVN Phone Net in 31 sessions with 795 stations passed 198 messages. WVN CW Net with 27 sessions, 124 stations passed 50 messages. W8HZA quite active in the SET. Active in 160 meter tests were W8RAPH, K8OOL, W8SQO and W8TFZ.

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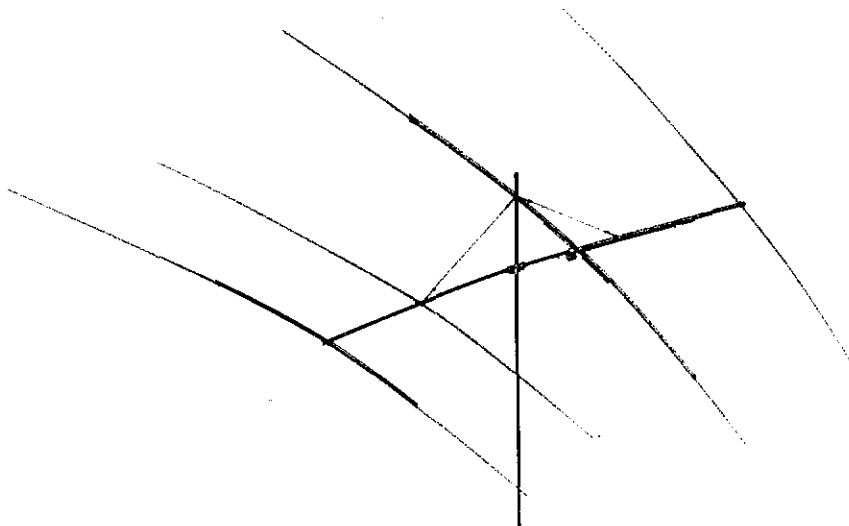


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WARMRK and K8HHV quite active in Co. hunting. WBRAC new call of the Beckley repeater. WBRDQX, K8LSN, W8RLAI and W8RWCK, YL operators active through the Fairmont repeater. W8SABB. Traffic: W8HZA 97, W8BDQX 36, W8JM 16, K8QEW 16, W8RYCD 13, W8BMZI 10, W8C111. K. W8AZNH 8, W8ZQJ8 8, K8CMW 5, W8CZT 4, W8DIUV 4, W8BTF 4, W8LXO 4, W8ALFW 4, W8RCYB 3, W8EIF 3, W8ARFO 3, W8ANDY 3, K8ZPR 3, W8AEC 2, W8SCPI 2, W8BIW 2, W8BQPA 2, K8ZDY 2, K8BCF 1, W8BDM5 1, W8DUW 1, W8DXF 1, W8JF 1, W8JIB 1, W8KGW 1, W8LFFZ 1, K8LSN 1, W8BMKL 1, K8MYU 1, W8NBO 1, W8OKG 1, W8OOL 1, W8SVH 1, W8TGF 1, W8THX 1, W8UNP 1.

### ROCKY MOUNTAIN DIVISION

**COLORADO** - SCM, Clyde O. Penney, WA0HLO - SEC; K0FLO. RM: K0OTH. PAMs: K0CNV, WA0WYP, WA0YGO. Newly elected officers for the Rocky Mountain VHF Society for 1974 are K0UTX, pres.; K0RZT, vice-pres.; W0FNN, secy-treas. Newly elected officers for the Colorado YLs for 1974 are W0A1K, pres.; K0WZS, vice-pres.; WA0WAD, secy.; W0HEM, treas.; WA0MNM, historian. W0LKD, acting in the true spirit of the amateur radio service, was instrumental in organizing and effecting a rescue operation for W0KWK who was stuck in 10-ft. snow drifts on the Gold Camp road, just out of Colo. Springs. Congratulations and a "well done" to W0LKD and all who assisted in this operation. Congratulations to all ARRL appointees and amateurs in the Colo. Section for an outstanding performance in the Jan. SET. Net traffic for Jan.: SSN QTC 187, informals 30, 41 sessions, 947 minutes. Late net traffic for Dec.: SSN QNI 346, QTC 142, informals 28, 31 sessions, 685 minutes. UCN QNI 154, QTC 73, 29 sessions. Traffic: (Jan.) W0WYX 997, W0HSZ 228, K0OTH 182, W0IW 134, W0LQ 143, K0SPR 122, K0FLO 106, WA0YGO 64, W0JRW 53, W0HBT 50, W0LAE 43, W0LLA 39, WA0TMA 38, WA0VNO 31, W0SIN 25, WA0YED 23, W0HUR 19, W0BGO 15, W0BY 6, WA0HLO 4. (Dec.) W0HCK 156, W0SIN 27.

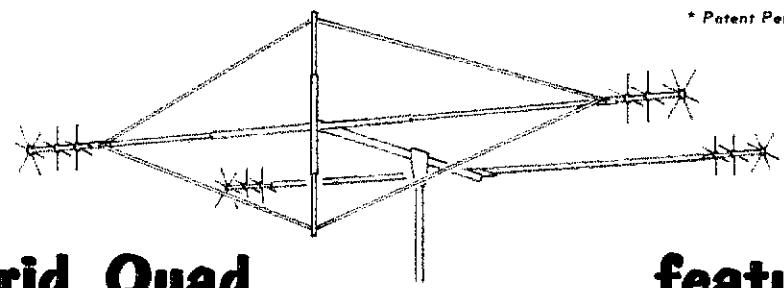
**NEW MEXICO** - SCM, Edward Hart, Jr., W5RF - SEC; W5ALR. RMs: W5UH, K5KPS. PAMs: W5PNY, W5DMG. NMN 3585 kHz 0030 GMT 33 sessions, QNI 254, QTC 256. NMRRN 3940 kHz 2300 GMT QNI 598, QTC 38, K5KPS, Mgr. NMN reports conditions slightly better than Dec. W5QNT is back from Ariz. The

Las Cruces Club was treated to a traffic and emergency talk W5HDK. W5QNO may be heard on 146.76 MWF at 2330 GMT on official Bulletin. W5YGR is receiving and sending SSTV. K5MLTCC dir., Pacific Area has worked all states on 6 bands, 160 thru 10. His next objective is 6. W5CSCO/5 is now on 34/94. W5TLK been elected member-at-large of the Pacific Area Staff. Traf K5MAT 443, W5UH 301, W5RF 169, K5KPS 151, W5ENI W5WXX/5 29, W5TLK 28, W5TVX 25, W5KUL 14, W5QNO W5SHJ 6.

**UTAH** - SCM, John H. Sampson, Jr., W7OCX - SEC; W7GJRM: W7UTM. BUN meets daily 1830 GMT on 7272 kHz, 10 check-ins, 91 messages. UCN meets daily at 0130 GMT on 35 kHz, 336 check-ins, 72 messages. The Utah ARPSC net meets 3 and Sun. at 1400 GMT on RACES frequency 3987.5 kHz. M check-ins and a better section-wide coverage on this net is desired. At long last Ogden has received its 2-meter repeater license W7RACM. W7HE reports a whopping good time at the Old Timers QSO party with both cw and ssh emission. Both W7Q and W7UTM still plagued with local noise. K1JMK/7 working hard at school, less time for hamming, but even so he worked 38 sections in the recent CQ Party. Nice going, Curt. W7UTM monitors 70 kHz afternoons 7 days a week; so if you cannot make the regular Floyd can help you out in the afternoon. WA7BSG filed Intruder Watch reports. Ray and his crew at the Univ. of Utah doing a great job. We are saddened at placing WA7RXA on the list of Silent Keys. I think most of you like to read this column. If you don't send information to put in it, there can be no column. Keep the information coming. BUN and UCN very active in the SET. Both nets had special sessions for participants in the SET. Traffic: W7UTM 289, W7OCX 65, WA7OAU 46, WA7WIB W7GPN 36, W7JXK 28, W7IQJ 24, W7DKB 20, WA7KHE 7, W76, K1JMK/7 5, WA7HCQ 4, WA7BAQ 3.

**WYOMING** - SCM, Wayne M. Moore, W7CQL - SEC; K7NCPAMs: W7SDA, WA7NHP, K7YTG. ORSS: K7NQX, W7SFA, WA7EHA, K7YJG. Nets: Pony Express Sun. at 0800 on 3920; daily at 1830 on 3597; Jackalope Mon. through Sat. at 1215 7260 (alt. 3.920); Wx Net Mon. through Sat. at 0630 on 3920; Net 1900 Mon. through Fri. on 3950. W7PVN has been vacationing in Hawaii. W7SDA and W7OUC are new to the 2-meter band. Names on the air in Casper: WA7NNI and WN7WLT. W7TVK received the PICON award for 1972. Send your nomination in to

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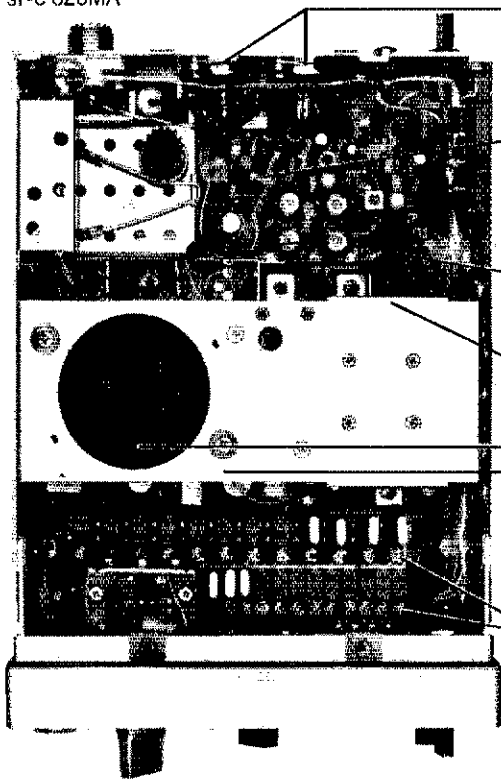
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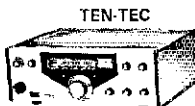
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## SOUTHEASTERN DIVISION

ALABAMA - SCM, James A. Brashear, Jr., WB4EKT - W4DGH, RM: W4HFU, PAM: W4RQS. SE1 was the big new lun. W4RQS, NM of AENM reported 25 check-ins on AENM emergency power and 4 of them were mobile stations. W4OAU, of AENR served as NCS at CD office with W4UYE assisting alternate NCS from his home QTH WA4PNL, EC Madison Co served as NCS on 2 meters (about 60 check-ins on 2) at CD office and served as liaison from 1 and 2 meters to 75 Activity on A and AEND was a bit heavier than usual. K4HJM, IC Calhoun reports most activity during SET was on 2 meters. WB4SVH Tuscaloosa Co. says their SET operation was fantastic. Thanks to who participated. WB41W recently in Huntsville hosp. WB5GTV and W17HOM new members of Huntsville ARC. WB4 the UA-Huntsville station is again on the air, also heard K4 Auburn Univ. station again operating. K4UMD still having problems. W4WLG on 75 meters. K4JCP a new HW-202 on 2 meters - reports the CYRA Club call is WB4GNA. K4JK running patches from South America. He reports WA4GNG is an output and WB4UNM will visit KX6. WB4ZOG trying to get a cw r order to QNI AFND and AENH, has SBF-34 sub only. We still liaison help between AENB/AEND and AENM. Thanks to WB4 and W4LNN for helping out. Sorry to report the Huntsville A first pres. and first Honorary member, W4FOG is a Silent Key. Huntsville ARC making preliminary plans to entertain a group VKs scheduled to be in our Section in May. New officers of North Ala. Repeater Assn. are WA4NPL, pres.; WB41TT, vice-p WB4YKH, secy-treas.; WA4TEM, tech. dir.; K4IKR, board of WA4DBQ, alternate. New officers of the North Ala. DX Club K4VKW, pres.; WB4RIU, secy. Don't forget to register your with ARRL. ARRL also publishes a Repeater Directory repeaters should also be registered if you want yours listed. C back to WB4SON who recently moved to N.Y. K4HNY WB4DSK report working some DX in early Jan. WN4FZQ actr NM of AFND. Appointments: W4USM and WB4KDI as O W4UOJ, WB4BAP and WB4RCF OPS. Endorsements: W4HF RM and ORS; WA4DBO OVS; WB4FIP and WB4KSL O Traffic: (Jan.) WB4EKJ 327, WN4FZQ 210, WB4KDI 140, W4117, WA4AIA 65, WN4FZS 65, K4AOZ 64, WB4SVH 47, WB43 38, K4HJC 27, WB4KSL 20, K4ICP 16, K4HEM 14, WB4ZOG (Dec.) K4UMD 6.

GEORGIA - SCM, Ray LaRue, W4BYG - Asst. SCM/RM: J Boston, WB4RUQ. PAM: K4JNL.

Net	Freq.	Time(Z)	QNI	QTC	A
GSN	3895	2300/0200	658	419	WB4E
G5BN	3975	0000	1411	871	K4
GTN	3718	2200	324	48	WB47
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Appointments: W4AAY as ORS, OPS, OVS; WB4AYN OPS. B K4WC, WN4CTL, K4WAR. K4CBO actively reporting as OO, doing a good job. K4ROZ went to Wash., D.C. to participate in ad-hoc committee's presentation before the full FCC commis Promises of possible changes in some recent rulings were understood. K4BAJ reports the Ga. QSO party is May 11-13. WB4 reports Lanierland ARC is reinstating the "Worked All Chicken award. OSO any member for info. LARC new officers: WB4N pres.; WA4FNY, vice-pres.; WB4TVU, secy-treas. Also Ric interested in starting a contest club, anyone else? W4JM has a F-T-101. W4NXO and K4CBO are now Extra Class. Welcome thanks to WASRPT and K4WZC for activating K4WAR during I QNI the Ga. nets often. WB4DBO DXCC at 138 and climbing. result of the SEJ Bill believes a QRS by many ops. would s things up requiring fewer repeats and fills. K4WC found that ha no PTT is no good if your VOX fails, reg msg. forms are worth expense, transceiver (ssb) is better than split vfos, and originations is a lot of work. K4OSL is a lifer in ARRL. Ga. is in overall population, but 23rd in HAMS. Come you clubs groups, we need some more classes. While WA4BAA was month 3595 for SE1 he heard and worked ZSIZL for a new 80-n country. W4GMS reports the SEBn DX Club members K4DJC, W4MCM, W4SSU, all have their SBDXCC. W4WYX DXCC 160 meters. Club net meets Mon. evenings on 147.9 (K4SAG rpt). The CSC Mon. night net is changing frequen



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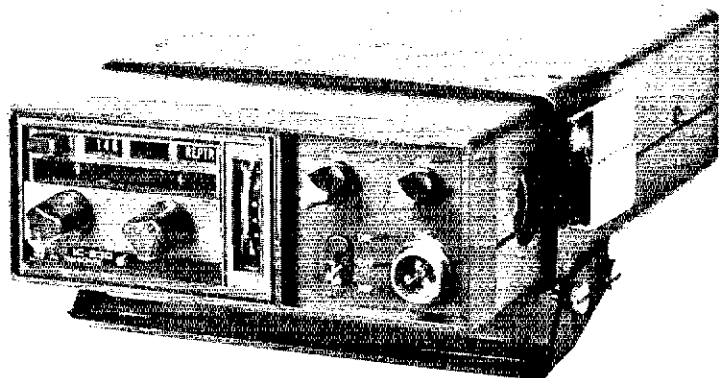
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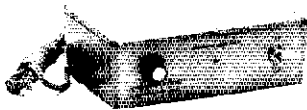
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### SOUTHWESTERN DIVISION

ARIZONA - SCM, Gary M. Hamman, W7CAF - The Coconino FM ARA (WR7ACK) elected the following officers for 1978: W7JRL, pres.; K7UOY, vice-pres.; WA7NEV, secy.; W7LAR, treas.; W7MES, additional dir. Meetings are the first Tue. at 7:30 PM in Bisbee Courthouse. The annual pot-luck lunch and softball game between the Old Pueblo ARC (Tucson) and Ariz. ARC (Phoenix) scheduled for Mar. 31 in Casa Grande at 12:30 PM. A college course for upgrading amateur licenses is in progress at Eastern Ariz. College at Thatcher with 15 students enrolled. Great local exercises during the SET were held in Cochise and Pima counties under the direction of K7UOY and K7CET, respectively. Other counties participating in state exercises were Yavapai and Yuma. A1EN held special sessions to handle SET traffic. WA7TWT and WA7UZV passed their General Class exams. The Phoenix Emergency Net had a national dinner meeting in Phoenix with over 50 attending. Section awards were earned by K7GLA, K7IPZ, WA7KQE, WA7NKK, K7NMQ and W7UQQ. A1EN reported 521 check-ins, 36 QTC, 10 minutes. Traffic: K7NH, 351, K7IPZ 77, W7CAF 55, WB0HZZ, W7UQQ 33, K7MTZ 17, K7NMQ 8, K7GLA 5, K7HGF, WA7NHO 3, WA7KQE 1.

LOS ANGELES - SCM, Eugene H. Violino, W6INH - K6UYK. The National Traffic System now has a monitoring frequency of 7070 kHz for emergency and traffic daily between 8:30 AM to 4:30 PM local time. You cw men can take advantage of this, it's good experience for the newcomer also. Thanks to W6 for his efforts on behalf of the LA hams regarding the proper tower ordinance. Due to his efforts the LA City Council voted to "receive and file" a proposal for tighter controls over radio television antennas. PARC's WB6MFA gave a detailed report on meeting with the seven FCC commissioners in Wash., D.C. regarding the repeater regulations, very good Marty. (Thanks). The United States of San Pedro presented a program on Channel 58 explaining Carson City Adult evening Radio Class, the program was presented by W6SZH and K6LWO. W6OHS went to the Inglewood RC to demonstrate "How to Make Circuit Boards" a very interesting program for the local clubs. W6EJJ has a very interesting presentation on the Oscar satellite operations, another good program for clubs. Jay has a very good program plus slides. Club program chairmen take note these are very informative programs. W6MAB is heard most every night phone patching Antarctic stations using two National NCX-5 and a Kenwood TS-900, that's flexibility. The 1974 SET emergency tests went in good style, with K6IYK, WB6OYN and WA6OTI doing most of the heavy cw work, thanks gang. I would like to hear from those interested in public service work. We need a good ARA organization in the Los Angeles area due to past history, we do need those shakey movements. It was noticed in this last SET operation there was not enough activity from this segment of our operation. WA6KUS and WB6EJG operated a phone patch net for SARC during the holidays for military personnel. The SARC has a look to their Loudspeaker news bulletin with a picture of W6 mobilizing. A recent letter from W6KEC reports the passing of a serious 10-meter DXer W6GAP. WA6HXF took the Advanced in Los Angeles FCC office recently and says that the FCC will give your tests while you wait, after concluding test. The Ramona had a successful Christmas dinner, their first one. Entertainment provided by WB6HUZ, W6MLZ and WB6EJC. The TRW RC has a new appointment for members the "TRW Ham of the Year" is WA6SMS for 1973. New club officers for SARC are WB6POP, pres.; WB6IPY, vice-pres.; WB6OYN, secy.; WA6FIB, treas.; WA6BBK, historian. WB6YIZ beat the weather to SAROC by flying to Vegas. WB6MKV has been sending test messages to all areas to what percentage of returns he will get, also what pct. of hams use telephones. WA6IDN building Heath Keyer and Patch. WA6 very active in the last CD party. WA6TQA ORL night 6-m operation due to 1VI. The QCWA will have their Spring Dinner Rudy's near the middle of Apr. Those interested should contact W6PHI for reservations. For those who knew W6OXS he no longer K6BD and opened up a Radio Shack in Torrance. Traffic: K6 357, W6INH 354, WB6OYN 210, WB6MKV 204, WA6OTU 151, WB6ZVC 68, WA6TCH 58, WA6TLV 37, W6 34, W6USY 28, W6OYD 24, W6BYE 23, WA6ZKI 23, WA6 16, W6NKE 13, W6DGH 8, W6LVC 8, K6EA 6, K6CL 2.

ORANGE - SCM, William L. Weise, W6CPR - Asst. S. Richard Birbeck, K6CID. SEC: WA6TVA. PAM: K6YCI. F.

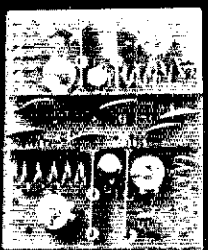


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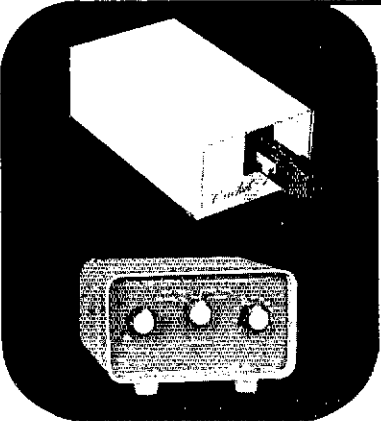
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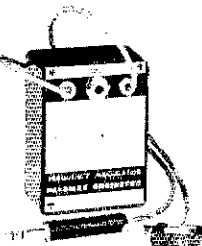
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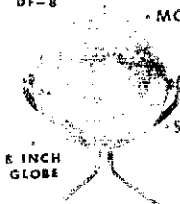
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SAN DIEGO - SCM, Cy Hurvur, W6G6F Asst. SCM: A Smith, W6INI. OPS: WB6BAC, W6ERF, W6BRMG. This month WB6UAW retires and with KYI, WB6BAC moves to Ore. We all miss them in our section, good luck Royal, Bobbie and Tiger. The San Diego Mountain Rescue Team has been very active the past months. The team needs any assistance they can get from section amateurs, contact WA6AKR at area 714-276 5360 for details. All the De Anza Rescue Team operating out of Imperial Valley can use assistance for their communications, contact WA6FOX at area (714) 352 3884. Slog DX Club sec. W6MAR reports members finding lots of DX on 75 meters. Congrats to W6MAR and K6SDR for placing in the top for sweepstakes. K6QPQ won first place in Six-District V.I. CW contest, nice going Mary. New EC for Imperial Valley District W6BRMG; many thanks to K6CXR for many years of service. WA6EYX, W6ZEO, K6UMI have activated the Escondido ARC and have a very efficient Emergency Control Center and Club Station on a Hill of Hiway 395 north of the city. WA6OZ passed her Advanced, W6SVN got his Advanced and W6S1 passed his Tech. W6ZQI7 reports good snowmobiling at Duc Creek, Utah. Sporting new IC-230s W6INI, WB6UAW, K6M1, WB6JZU, W6PYU. Visitor W3YD, ex-K6SZ. Electric Home Shop this month 24 thru 28 see you there. Traffic: (Jan.) WB6PVH 38, W6VNO 305, WA6BEL 190, W6BGE 175, WB6HMY 169, W6LJ 76, W6SRS 46, WB6BAC 32, W6DEY 26, W6PZU 22, WA6BDW 1, WA6DMB 4. (Dec.) WA6AMK 61, WB6BAC 69.

SANTA BARBARA - SCM, D. Paul Gagnon, WA6DEI - SEC, WB6HJW. RM: K6UPL. PAM: K6EVO. We are looking for a new PAM. Contact K6EVO or WA6DEI. Official appointments have been reviewed and renewed as of Feb. 1 to last two years. New appointments include WB6PGK as ORS; WA6YPK as EC for Santa Barbara South and WA6UBF as EC for Ventura Co. inland area. This is a new area for better ARCC coverage. You hams in the inland area (T.O. Simi, Fillmore) contact WA6UBF. WA6MBZ has received Masters in International Management and has been helping with cw net liaison. WB6MKM has renewed acquaintance with a old H18 friend via ham radio. WA6VLI in Fillmore passed his General. WB6HJW, WB6GRW and WA6WRF operated in VHF S. W6GVV and W6TTH passed the General Class exam. Central Coast Relay Society members are working on RITY TUs. Anyone interested in a section RTTY Net? At TRICAR meeting in Jan. WA6DEI was elected chmn.; WB6LDW, vice-chmn.; WB6DHW, sec. Preliminary plans were made for July section picnic. New Ventura Co. AREC meets on 393 Wed. at 7:30. Dir. W6KW spoke Poinsettia ARC; W6VZA spoke at Poinsettia & SBARC on the new WVV setup. Birdman W6MZC gave talk at SBARC. WA6DEI was lapan in Feb. W6ZMS finally received his call after 22 week. K6PHT now OOTC member. W6YOI visited WNGLHR on trip Denver. The SET in Jan. went well thanks to all who participate. We need your help with the AREC. Traffic: (Jan.) WA6DEI 30, WB6PGK 197, WA6MBZ 136, W6CDN 66, WA6LBO 20, WB6MX 20, WA6YDF 13, WA6QBT 12, WA6PEF 9, W6IDU 4, W6UJ (Dec.) WA6PEF 6.

## WEST GULF DIVISION

NORTHERN TEXAS - SCM, L.E. Harrison, W5LR - Asst. SCM: Frank Sewell, W5LZU. SEC: K5KOL. RM: W5OU. PAM: W5GSM. National Traffic System has come out on 14315 daily 1830Z. VHFers please note: OVS appointments available upon request. SET is history. NTEX did OK. Eyeball Net have persons interested in studying for ham exam via "brajile" route. Can you help? DARC issues nice N/I. new pres. and vice-pres. is W5JBJ. K5LZA. Tex. VHF convention at A/M soon. Delta Conventio

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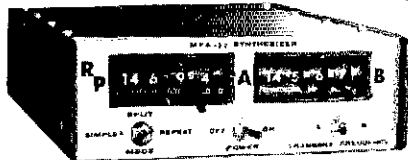
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sooner plus all ARRL brass. SCM goofed last month on K5QKM and WS1ZU's reports. Sorry men. SFC cleaning house amongst current files. WSPW "uppie" from N. Dallas reports frequency counter working FB. He also reports many U.S. hams ride the bands edge. EC WBSFOX appoints W5YK his asst. EC. Mr. Cantrell of Comanche, Tx. completed Novice test from WSPSO. Thanks QM. W5LXS Midland ARC reports Hamfest cancelled due energy crisis. W5TI presented nice certificate by club member, via WG Director reason traffic. Congrats Bill. Aclington ARC W5BCW, pres.; K5VYL, vice-pres. Irving ARC consisting of 1 Extra, 8 Advanced, 7 General, 3 Novice, 3 Conditional, 8 Tech and 5 SWLs met Jan. 25 Cent. Fire Stn. Made tour new airport. CRW Dallas reports total 6,227 members. W5EYB report covers Prose Walker's SAROC talk and expresses hope in accomplishing emergency preparedness, understanding of msg handling rules, QST space for tech. articles, new antenna handbook, simplification repeater rules, expand handbands, explain IARU in plain language. New RACES plans updated by Col. C.O. Lane of State Office 1/14/74. The Tex. slow-speed cw net is in full swing and if any one of you are interested here's your chance. W5VJW is again active on the nets. Her ORS appointment was renewed. Temple ARC meeting of Jan. 14 showed 14 in SET attendance. Congrats folks. PSHR reports received from two members NoTex. A total of 19 stations reported this month. NETEN reports 5 sessions, 67 check-ins, 4 ORS read, 4 messages cleared and two net controls participating. Traffic: W5VJW 214, W5TI 178, W5SHN 154, W5GSM 138, W5BHW 115, W5SOG 115, W5ASNJ 102, K5QKM 52, W5QWV 26, W5GZR 19, W5LR 17, W5WLA 17, W5WLL 10, W5IZU 8, W5YK 6.

**OKLAHOMA** - SCM, Cecil C. Cash, W5PML - Asst. SCM/SEC: Leonard R. Hollar, W5F5N, RM: W2FTR/S. Asst. RM: W5E5Y. PAMs: W5SAZS and W5AOUV. The SET operation seemed to be a great success, at least there were many messages for me and also the SEC in addition to many test emergency messages moving on all the circuits from 75 through 2 meters. K5LUJ and XYL along with W5NUL and XYL reported a great time at the SAROC in Las Vegas. K5LUJ says he has a two-element Mosley now up in place of his Quad which the wind got. K5QXX is having a ball with his new thome brewed that is! keyer. At this writing W5LUI still waiting for the FCC to notify him of a new call without a "B" in it. W5RB reports getting on 160 meters for the first time ever, said it was great fun especially during the contest. Congrats to two known old, old timers, W5AHD and W5AFG upon resolving their FIFTY YEAR PIN. Congrats and welcome to new Life Member K5VWO. Congrats to new Advanced W5JYK all the way from Novice to Advanced in one jump. Congrats to new General W5GMM and to new Novices W5NKLQ, W5N5KQ, W5N5KT and W5N5KTJ. Officers of the new Ada Amateur Radio Club are W5E5Y, pres.; W5BCYL, vice-pres.; W5N5KH, secy.; W5GZY, treas. 1974 officers of the ACARC are W5HXL, pres.; W5WSW, vice-pres.; K5KDR, secy.-treas. Traffic: (Jan.) W5E5Y 154, W5RB 113, W2FTR/S 95, W5LUI 50, W5PML 45, W5SAZS 44, W5F5N 40, W5G5WG 40, K5QJM 39, W5ZOO 29, W5FKL 20, W5FAY 19, W5E5L 19, W5SUG 17, K5LUI 11, W5AOUV 10, K5QXX 2. (Dec.) W5SUG 17.

**SOUTHERN TEXAS** - SCM, Arthur Ross, W5KR - SEC: W5YXS, RM: W5ABQ, PAM: W5HWY. OOs reporting this month: W5RBB, W5NGW, W5SHOB just turned 15 and turned in first report as General. W5AMN, Net Mgr. of TTN, reports some setbacks on SET because of band conditions. RM W5ABQ made BPL third time to qualify for medallion, congrats! ORS W54FDT/S spoke at Austin ARC banquet; has ordered Triton II; made over 100K in Jan. CW CD party but lost several pages of log while moving. Appointees W5RBB, W5AMN, W55DBK, K1ONW/S, W5GZG plus W5SGOH operated from CD Hq., Houston, for SET. EC W5SGFU has new 65-ft. tower, tribander and rotor; building RITTY converter. OVS K5ZMS in new OTH, reports SMIRK going great. W5SIBT appointed secy.-treas. of Brazoria County ARC. W5SIOG reports none heard when he tried to check into TEX ORP during SET. W5SKLM received OSL from 4W1BC. W5SHUV, IS, is new NCS on DRNS. EC W5TFW reports Beaumont .16/76 repeater received new license, W5AC5. W5SHOD just received General. OPS W5VBM had unique experience: read Public service activities. K1ONW/S has been having antenna parties while roof being re-shingled. W55BWV reports new repeater in Corpus Christi: W5SAC1, 22/82. W55YMA is trustee of new Georgetown repeater, W5SACW, .16/76. K5LCV joined Silent Keys. W51BI and W5BHO observed THP couset while on vacation in Mission State Park. All hands report exceptionally active SET exercise. Traffic: K1ONW/S 514, W55CUR 306, W5TOP 292, W55BWV 265, W5ABQ 247, W5AMN 223, W7WAH/S 218, W5YXS 202, W5VBM 147, W5YEA 140, W5AZBN 140, W5KR 133, W55DBK 130, W5KLV 109, W5TST 93, W5SIZN 89, K5HIZR 79,

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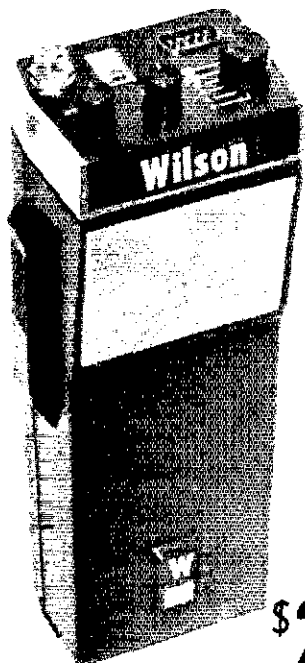
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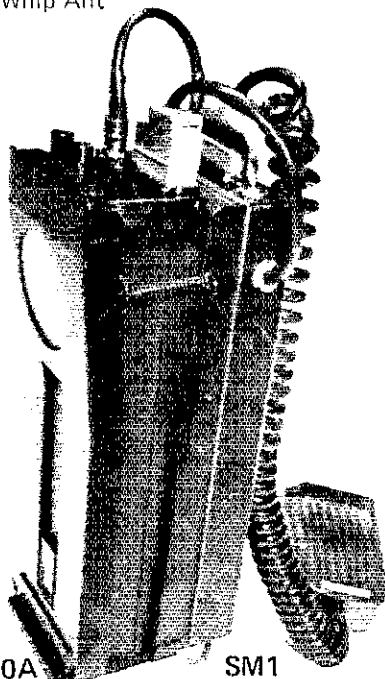
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### CANADIAN DIVISION

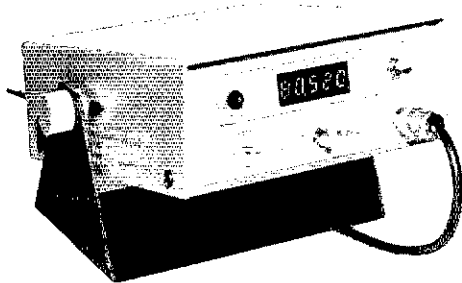
**ALBERTA** - SCM, Don Sutherland, VE6IK - Asst. SCM: Mrs. Donez Booth, VE6YL, SEC: VE6XC. VE6EN has been appointed Mer. RN7 DNTS, VE6AW recuperating at home. VE6FM on a reducing campaign. Expecting a visit from VF6CPA, now retired from the RCMP. VE6TP now VE7DLH and VE6VE now VE7DLA. The SAROC convention in Las Vegas was very interesting - especially with its protective blanket (I believe we call it snow). The convention committee for the Canadian Division Convention in Calgary Aug. 1-3 1975 hard at work. I can assure you that this will be the outstanding event in western Canadian Amateur conventions. CARA has almost completed arrangements with the CNIR to get the Calgary white-canics club underway. This should be a rewarding experience for all participants. Traffic: VF6EN 95, VF6FK 74, VF6XC 32, VE6AMM 30, VE6WN 17, VE6VS 16, VE6ABS 12, VE6YW 11, VE6ASI 10, VE6VF 4, VE6AER 3, VE6ANW 2, VE6ARU 2, VE6BI 2, VE6CE 2, VE6AQQ 1, VE6VR 1.

**BRITISH COLUMBIA** - SCM, H.E. Savage, VE7EB - New ORSs: VE7AKJ and VE7BBL. VE7TN has returned home after two years in VK-Land. VE7ASY has sold his Rancho and building in a district that allows nothing over 25 feet. VE7QQ has taken over as Net Mgr. whilst VE7ASY is building. Nice news from VE8-Land they hope to hold an SCM, SEC and BLS. VE7CW has "The Kenwood Twins, R-5994/15994" tower 60-ft., three-element Yagi for 20. The big problem in VE8-Land is a tour of about three years and just as you get set in, your going out. Nice letter from VE8RO Pine Point ARC, NWT. VE7KM sporting TS-900. VE7BD and family spent time in KH6-Land. A group of retired amateurs decided to apply to a New Horizons grant to buy equipment and rent premises to set up an amateur radio station and for those wanting to become amateurs, theory and code classes. The grant was obtained, premises were found in a Senior Citizens complex on the 18th floor. A 60-ft., tower was installed on top of the elevator penthouse, also a three-element beam. They bought Yuesu-S10. Charter members are VE7BY, VE7AP, VE7ON, VE7KM, VE7OH, VE7SR, VE7AD, VE7BW, VE7CAM, VE7AMW. Traffic: VE7ZK 212, VE7QQ 58, VE7BLO 41, VE7AKJ 35, VE7MW 16, VE7TT 16.

**MANITOBA** - SCM, Steve Fink, VE4FO - With regret we report the passing of Winnipeg EC VE4IH. Bob was very active locally and was in the midst of reactivating AREC in Winnipeg. PAM VE4FO has moved again, this time to Thompson, and VE4DR has OSYed to Cranberry Portage. VE4TY was active in the Jan. CB Party and now has full QSK facilities. Transcona Collegiate's VE4TCI now on the air with operators VE4S VV, OH, TR and QY. VE4OW is the new cw QBS and John transmits code practice as well following MTNs early session. RM VE4IG still shuttling between home and Toronto on IBM courses. MFPN: 31 sessions, 933 ONI, 16 QIC. Traffic: Jan. VE4PG 190, VE4QY 140, VE4RO 104, VE4OW 84, VE4TR 78, VE4IY 47, VE4FO 12, VE4JA 10, VE4HF 9, VE4BM 7, VE4LU 7, VE4TCI 7, VE4CR 3, VE4DS 3, VE4HR 3, VE4NE 3, VE4OP 2, VE4RV 2, VE4VV 2, VE4EL 1, VE4IP 1 (Dec.) VE4RO 134.

**MARITIME** - SCM, W.D. Jones, VE1AMR - SEC: VE1HL. PAM: VO1X. RM: VE1ARB. The VE1 contest '74 showed increased interest again this year, no results at time of writing. The quality of the cw showed a marked improvement over last year. SET '74 showed little activity in the section. The Halifax group held an exercise and the APN was active. Traffic: VE1AMR 183, VE1RO 74, VE1ARB 65, VE1AKB 34, VE1ZH 31, VE1AWP 25, VE1AYI 12.

**ONTARIO** - SCM, Holland H. Shepherd, VE3DV. VE3DU now on road to recovery after operation. Coordination of communications for the Feb. 8-10 1974 Winter Car Rally Toronto-Ottawa and return handled by VE3GFN, EC Metro Toronto, ably supported by VE3RL, Kingston and VE3BB, Ottawa. On behalf of VE3GFN, VE3RL and VE3SB I do thank you for those long, cold, lonely hours most of you spent out on those even lonelier Ont. backroads. VE3BNO coordinating communications for the Marathon Ski Tour Feb. 23-24 and a full report expected later. VE3IJ of Ottawa would like to hear from all OCWA members residing Ottawa or nearby areas to attend a meeting to discuss the formation of an Eastern Chapter of the OCWA. If it gets off the ground it will be a first for Ont. and I urge all of you OTs to give it your support. VE3DU and longtime ORS, spending a holiday in Fla.



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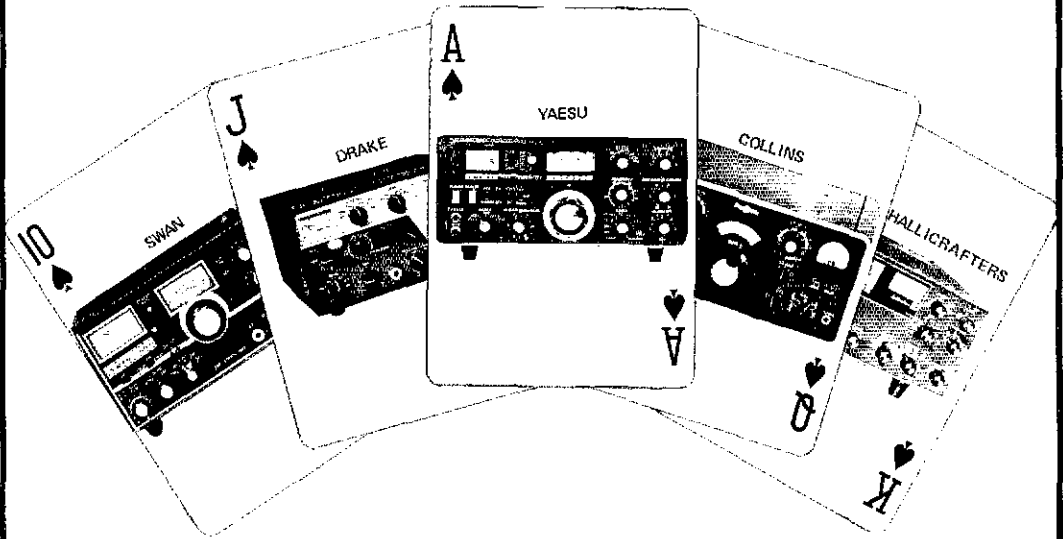


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VEJA holidaying in Mex. but manages to keep in touch with the gang on VE3STP by using the Air-Stream Net and other frequencies. VEJCU after 14 years as Canadian Division Dir. has tendered his resignation to take on the job of Vice-Pres. ARRL. He has also been nominated by ARRL as Pres. IARU. George Spencer, VE2MS of Beaconsfield, Que., automatically takes over as Canadian Division Dir. The Ont. ARPSC (the AREC and member nets of NIS) was very active in SET '74. I am pleased to welcome three new h's to our fast growing Ont. AREC: VE3AKL, Thunder Bay, VE3FSA, Sudbury and VE3GNW, Kemptonville-Merrickville. Traffic: VF3SB 528, VE3DV 358, VE3EHF 321, VE3DPO 313, VE3HQZ 302, VF3AWE 273, VE3GIG 273, VE3FRG 242, VE3GFN 186, VE3EWD 120, VF3FGV 90, VE3ASZ 81, VF3DVE 79, VF3GCE 77, VF3GT 77, VE3ARS 76, VE3GNW 74, VE3DBG 66, VF3ATR 59, VE3EHL 54, VE3GOZ 40, VE3CPG 37, VF3GEO 35, VF3AJN 29, VF3POF 26, VE3CGD 25, VE3EEH 21, VE3RZG 21, VE3GCGZ 21, VE3AKL 18, VE3DH 18, VE3GIX 15, VE3CYR 14, VF3GCC 14, VE3AYZ 10, VE3FGT 10, VE3BKA 6, VF3AJ 2, VE3ARS 2, VE3ECV 4.

QUEBEC - SCM, Joe Unsworth, VE2ALE - Regret to report that VE2BG is now Silent Key as of Jan. 26. He was a fifty year member of ARRL and one of the oldest members of MARC. VE2WM expects to be back to Mont Joli about Mar. 15 and reports that VE3MTA is now operational as club station Air Service Training School in Ottawa. Réseau de la Mauricie is on daily sked on 3.760 MHz at GMT times of 2200 & 0230. VE2KT is now VE3EZX. VE2GA now active on RTTY since Dec. and there are more stations expected from the Montreal area soon. Nomination notice for SCM Quebec section in the Feb. QST. VE3CJ now Vice-Pres. for ARRL and VE2MS has taken over the vacated post of Canadian Director. VE2RB Asst. Net Mgr. QR net held a net controllers forum at his QTH late Jan. and many topics of great interest were discussed and hopefully they will appear during the regular operation of the net. VE2DPI had recent surgery and doing well. VE2DDQ new to 2-meter fm operation. Calls changed: VE2PR to VE3OT, VE2QL to VE3EJR, VE2KN to VE3EFT, VE2OU to VE7SK, VE2BOQ to VE7BQS, VE2BUZ to VE7BUZ, VE2DIE to VE3FJO, VE2MH to VE7DBO. VE2OJ traffic count up due to SKT week end. PSHR: VE2APT 27, VE2UH 11. (Traffic: 1 Jan.) VE2DR 143, VE2OJ 44, VE2EC 42, VE2BP 36, VE2APT 24, VE2ALH 16, VE2UY 2. (Dec.) VE2DR 138, VE2ALH 46, VE2BP 35, VE2UY

32, VE2FC 23, VE2APT 19, VE2OJ 18, VE2ALE 15. (Nov.) VE2EC 36, VE2APT 11, VE2ALE 3.

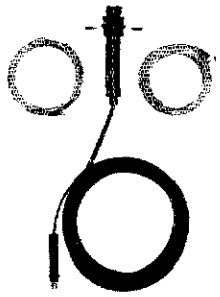
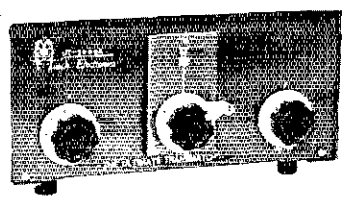
SASKATCHEWAN - SCM, P.A. Crosthwaite, VE5RP - Our section of the ARRL Phone Net has had its problems because of the atmospheric conditions. We hope that those who do check in will bear with the problem for it can't last too much longer hopefully. Just an early reminder that HAM FEST will be held in Melfort, Sask. this year so please watch for further information in QST. VE4FG sent out an emergency signal which was picked up by VE5UZ. A baby was seriously ill in the north and a plane was sent out from La Ronge, Sask. Congratulations to VE5UZ; this is the second time he has responded to an emergency. Traffic: VE5BO 94, VE5FL 39, VE5HP 37, VE5XC 32, VE5WM 14, VE5VK 11, VE5RP 10, VE5HO 8, VE5SM 8, VE5KZ 5, VE5DN 2, VE5HE 2, VE5LC 2, VE5NJ 2, VE5PD 2, VE5PG 2, VE5RB 2, VE5UZ 2, VE5RE 1, VE5RZ 1.



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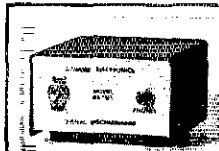
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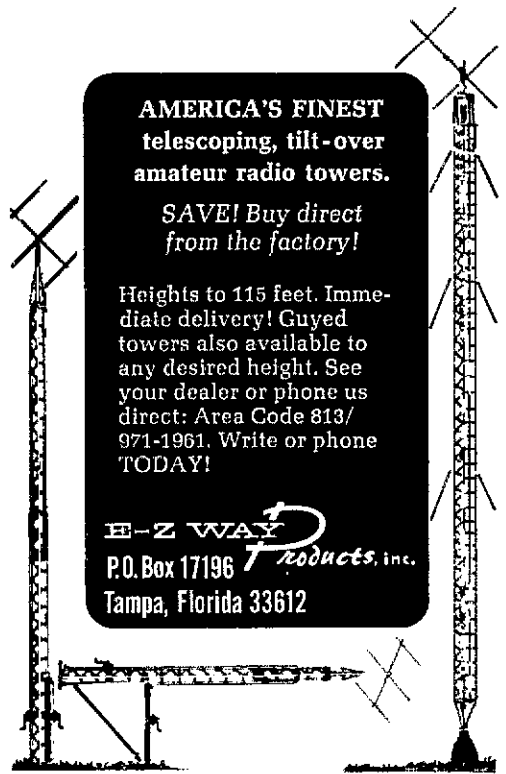
An annual award is made by ARRL for a major contribution to the technical side of amateur radio, the ARRL Technical Merit Award. The 1973 plaque will go to Larry Kayser, VE3QB, "in recognition of his efforts and abilities in acting as a control station for Oscar 6 and his development of 'Smart' - 'System Multiplexing Amateur Radio Telecommands,'" to quote from Minute 22 of the 1974 Annual ARRL Board Meeting. Early in the life of Oscar 6 a control problem arose: the satellite had a tendency to switch itself from mode to mode. If the problem had remained uncorrected, the satellite would have quickly exhausted its power supply system and gone silent. Early correction was by teams of operators at command stations. VE3QB developed an automated system Smart - which sends 8,000 commands a day. With his northerly location in Ottawa, VE3QB is able to reach the satellite on ten of its twelve daily passes. The system was described in a paper produced for the ARRL Symposium at Reston, Virginia, last September. Incidentally, we understand that Larry is well along with hardware for Oscar 7!

**W8JM, VE3WT NEW VICE DIRECTORS**

Vacancies in the vice director offices of the Roanoke and Canadian Divisions have been filled by appointment of the ARRL president, in accordance with the Articles of Association.

Donald B. Morris, W8JM, of Fairmont, West Virginia, has been named vice director for the Roanoke Division. He is 62, and earns his living as an electronic technician for the Monongahela Power Company, servicing its two-way fm radio system and investigating radio and TV interference complaints. Don has been an assistant director since 1967 and is on his third separate stretch as SCM of West Virginia covering the years 1930-1931, 1946-1952 and 1959 to the present. Other credits: co-founder, past president, past vice president, past secretary and past treasurer, Mountaineer Amateur Radio Association, and trustee of its station W8SP; past president, West Virginia State Council of Amateur Radio Clubs; founder in 1959 and continuing supporter, ARRL West Virginia State Conventions, Jackson's Mill; ORS, OPS, AREC, A-1 Operator Club; RACES; Army MARS; Life Member, ARRL; licensed since 1928.

Howard R. Cowling, VE3WT, of St. Catherines, Ontario, is the new vice director for the Canadian Division. Now semi-retired, Howard previously owned and operated a communications business since 1950, and has been employed in fm since 1943, a qualification which led to his appointment to the ARRL VHF Repeater Advisory Committee last summer. VE3WT is a cofounder and past executive of the Western NY and Ontario Repeater Council, with 18 repeater-group members; he is



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also the licensee of VE3NRS. Not all his activity is on the very highs: VE3WT made the DXCC Honor Roll in the March 1973 issue of QST. Licensed since 1948, and a League member even earlier, Howard holds the Advanced Amateur Certificate of Proficiency.

**IOWA CALL PLATE PROPOSAL**

Iowa State Senators Potter and Shaw have introduced a bill, Senate File 1040, into the General Assembly, which would allow issuance of call letter license plates to amateurs for display on light delivery trucks, panel delivery trucks or pickups, in addition to automobiles for which the plates are already provided. The fee of \$5 above the normal cost would continue, as would application for the plates through the county treasurer. Thanks to Harold Kelderman, WBØIKM, who sent us a copy of the bill.

Which reminds us: keep an eye on bills in your legislature. Let us know about any which could help or hurt amateur radio in your state.

MINUTES, EXECUTIVE COMMITTEE MEETING  
No. 348 January 16, 1974

Pursuant to due notice, the Executive Committee of The American Radio Relay League met at the Headquarters office of the League in Newington, Connecticut, at 2:05 P.M. January 16, 1974. Present: President Harry J. Dannels, W2TUK, in the Chair; First Vice President Charles G. Compton, WØBUO; Directors Victor C. Clark, W4KFC, Noel B. Eaton, VE3CJ, John R. Griggs, W6KW, and Robert B. Thurston, W7PGY; and General Manager John Huntton, W1RW. Also present were General Counsel Robert M. Booth, Jr., W3PS, and a number of directors and vice directors.

On motion of Mr. Eaton, affiliation was unanimously GRANTED to the following societies:

Amateur Radio Research And Development Assn. (AMRAD), Springfield, Va.; Arizona Repeater Association, Inc., Phoenix, Ariz.; Brunswick High School Ham Radio Club, Brunswick, Ohio; Buffalo Amateur Radio Repeater Association, Inc., North Tonawanda, N.Y.; Central Ohio Amateur Radio Emergency Corps Membership, Inc., Powell, Ohio; Citrus Amateur Radio Association, Inverness, Fla.; Danville Community College Amateur Radio Club, Danville, Va.; Far Out Amateur Radio Club, Kettering, Ohio; Goshen College Amateur Radio Club, Goshen, Inc.; Granite State Amateur Radio Club, Goffstown, N.H.; Hampton Roads Radio Association, Chesapeake, Va.; Huntington County Amateur Radio Society, Huntington, Ind.; Jacksonville Area Amateur Radio Club, Jacksonville, Ill.; J. W. Robinson Jr. Secondary School Radio Club, Fairfax, Va.; Kappa Eta Kappa Amateur Radio Club (Univ. of Wisconsin), Madison, Wis.; Lake Cook DX Association, Waukegan, Ill.; Mercer County Amateur Radio Club, Greenville, Pa.; New Hope-Solebury High School Radio Club, New Hope, Pa.; Northeast High School Radio Transmitting Society, Philadelphia, Pa.; Oakville Amateur Radio Club, Oakville, Ontario; Paducah Amateur Radio Emergency Corps., Paducah, Ky.; Pickwick Amateur Radio Club, Saramah, Tenn.; Queensborough Community College Amateur

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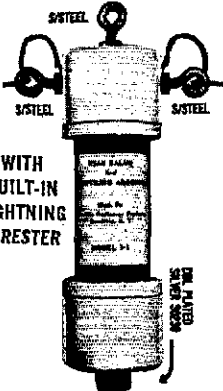
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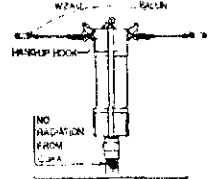
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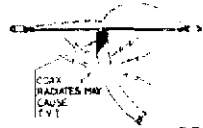
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Radio Club, Bayside, N.Y.; Rome Free Academy Amateur Radio Club, Rome, N.Y.; Ruston Area Amateur Radio Club, Ruston, Louisiana; San Leandro Amateur Radio Club, San Leandro, Calif.; Southeast Polk Jr.-Sr. High School Radio Club, Runnels, Ia.; Southwest Texas State University Amateur Radio Club (SWTARC), San Marcos, Tex.; Springfield-Annandale Amateur Radio Club (SPARC), Springfield, Va.; St. Charles Amateur Radio Club, St. Charles, Mo.; West Holmes Jr. High School Amateur Radio Club, Millersburg, Ohio Widener College Amateur Radio Club, Chester, Pa.; W. T. Clarke High School Amateur Radio Club, Westbury, N.Y.

On motion of Mr. Griggs, unanimously VOTED to grant approval for the holding of a Dakota Division Convention in Waseca, Minn., May 4, 1974; a Rocky Mountain Division Convention in Pueblo, Colorado, June 7-8, 1974; and a Southwestern Division Convention in San Diego, Calif., on November 1-3, 1974.

On motion of Mr. Griggs, Life Membership was unanimously GRANTED to the following applicants:

Bennett R. Adams, Jr., K4FZ; Francis W. Ader, Jr., WA3GTR; David W. Adler, WB2ZPO, Raymond E. Albert, Jr., W3BFC/WA2CZI; Donald S. Alderman, WB4VBM; Gaines C. Aldridge, W5GWF; Lester W. Amundson, K0OSL; Craig "Andi" Anderson, WB9FGM; Richard W. Anderson, W9CXT; James A. Andrisen, W9HQB; Anthony A. Angello, W1VP; John A. Appelget, K0DCF; Donald W. Ashley, W7HMJ; Joseph Balkon, W2CYL; Robert W. Barbee, Jr., W4AMI; Bruce G. Barcome, W3FSR; Billy J. Barfield, W4NMM; Joseph O. Barnes, Jr., WB2SRY; Charles F. Barr, WA3GQU; James

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On motion of Mr. Thurston, unanimously VOTED that, in confirmation of earlier informal action, reimbursement of expenses for the operation of the International Affairs Committee in 1973 is authorized up to a total of \$2,000.

The Committee examined a petition from amateurs in the New York counties of Warren, Washington and Saratoga to transfer their areas from the Western New York Section of the Atlantic Division to the Eastern New York Section of the Hudson Division. After discussion, on motion of Mr. Compton, unanimously VOTED that the General Manager poll the ARRL membership in the named counties to seek their views on the proposed change.

The Committee noted, with approval, a progress report from the Hudson Amateur Radio Council on plans for the 1974 ARRL National Convention in New York City, July 19-21.

There being no further business, the Committee adjourned, at 3:05 P.M.

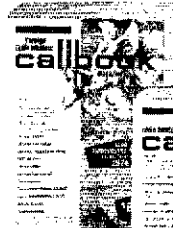
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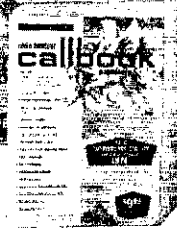


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lossy earth before reaching a good conductive path. Thus, with sufficient radials, we have a nearly perfect ground system which adds only a negligible amount of resistance to the true antenna impedance measurable between the radiator base and ground terminals (refs. 20; 50; 51 and 57, pp. 115-124). From this we can see why the lightning-type ground system, although in prevalent use, is unsatisfactory for an efficient antenna system (ref. 57, p. 82).

Now we are not suggesting that  $\lambda/4$  antennas with less than ideal ground systems should not be used, nor that fair results cannot be obtained without their use. But the difference between no or few radials (3 or 4), compared to 100, can amount to over 3 dB. This is far in excess of the loss resulting from an SWR of 4:1 or 5:1 on the average coaxial feed line used by amateurs. The point being emphasized here is that the value of ground resistance is unknown and unpredictable in systems using less than an adequate number of radials. This makes the resulting SWR readings unpredictable and therefore useless for the purpose of evaluating the *absolute* quality of the system, unless some means is available for determining what the change in SWR would be if the loss resistance could be switched in or out.

In practical amateur installations, the ground resistance will be sufficiently low if only 40 to 50 radials are used with a  $\lambda/4$  radiator. The small improvement in radiated power for the addition of still another 40 or 50 radials with the  $\lambda/4$  radiator will probably not justify the extra cost and effort. However, if a *short* vertical antenna (from  $\lambda/8$  or less to  $\lambda/4$ ) is contemplated, it should be remembered that the radiation and terminal resistances decrease as the radiator is shortened. The ground resistance now becomes a larger part of the total resistance, decreasing the efficiency. Thus the ground resistance should be kept as low as possible for the full capability of the short antenna to be realized (refs. 51; 56; 57, pp. 18-29). There is practically no difference between the radiation capabilities of the  $\lambda/4$  antenna and a radiator even shorter than  $\lambda/8$ , except for the effect of ground resistance and the loss in the resistance of the coil used to cancel the capacitive reactance in the terminal impedance of the shortened antenna. The professional literature is replete with references confirming this point (refs. 20, 24, 52, and 53).

#### Resistive Losses and SWR

In this section we will see how *any* additional resistive losses that are separable from the true antenna load impedance affect the true load SWR. By separable are meant such losses as ground-loss resistance, corroded connectors and other poor connections, cold-solder joints, and so on. These all contribute loss resistances that we can control or reduce. In contrast is the resistive component of the antenna terminal impedance, which comprises both the radiation resistance and the inherent conductor-loss resistance in the radiating element. In most cases the conductor-loss resistance in

practical radiating elements is negligible, unless excessively small wire is used.

There are several useful relationships between load impedance  $Z = R + jX$ , line impedance,  $Z_c$ , and SWR. For example, it is well known that when the load impedance is a pure resistance  $R$ , equal to the line impedance  $Z_c$ , the reflection coefficient  $\rho$  is zero, and the standing-wave ratio is thus one to one. But the reflection is no longer zero and the SWR becomes equal to the ratio  $R/Z_c$  when the resistance is larger than  $Z_c$ , or  $Z_c/R$  when the resistance is smaller than  $Z_c$ . It is also well known that  $\rho$  and SWR increase with the addition of any reactance component in the load impedance that increases the total reactance, whatever the resistive component may be (see Eq. 1, Part III of this series). And as noted previously, any combination of  $R + jX$  yields an exact value of SWR, when terminating a line of given impedance  $Z_c$ . We also know that the reactance,  $X$ , appearing in the impedance at the terminals of an antenna contributes more to the rise in SWR at frequencies away from the antenna resonant frequency than does the change in resistance. This is because the reactance changes more rapidly than the resistance during the change in frequency (ref. 58, p. 3-1).

There is, however, an interesting relationship which is not generally well known between the resistance and reactance components of a load impedance. This relationship sheds light on how the two components affect mismatch reflection and SWR, and also explains why the unknown ground resistance and other losses mentioned above reduce the usefulness of SWR readings. When reactance is present in the load impedance, the minimum possible SWR occurs when the resistance  $R$  is greater than  $Z_c$ . The value of the resistance that yields the lowest SWR in combination with a given value of reactance in the load (which we will call the *minimum-SWR resistance*) is dependent solely on the reactance present. This value may be obtained from the relationship:

$$r = \sqrt{x^2 + 1} \quad (\text{Eq. 11})$$

where  $r$  is the minimum-SWR resistance and  $x$  is the reactance present in the load, with both values normalized to the system  $Z_c$ . (See footnote 22, Part IV of this series\* regarding normalized impedances.) It can be seen from Eq. 11 that when  $x$  becomes zero,  $r = 1$ , for an SWR of 1:1, but it is interesting to know that the resulting SWR *always equals exactly* the arithmetic sum of the minimum-SWR resistance value  $r$ , and the reactance value,  $x$ . This latter relationship will help us to understand how unwanted loss resistance, separable from the true antenna-load impedance, affects SWR. In the case of the vertical radiator over earth, these unpredictable losses change the SWR from a predictable value, based on known available antenna impedance data (ref. 57, p. 82), to some unpredictable and usually lower value. A general application of the relationship is presented in the following statements. When the resistance com-

\* Also see Feedback, p. 46 of QST for Nov., 1973.

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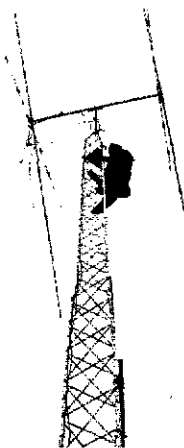
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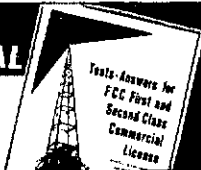
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ponent of the true load impedance is lower than the minimum-SWR resistance, as determined for any reactance component also present in the true load, adding of resistance separate from the true load impedance will cause the SWR to decrease from the value obtained with the true load. This is true until the total resistance is equal to the minimum-SWR resistance. Further addition of resistance will cause the SWR to rise again. These statements apply especially to the vertical antenna of  $\lambda/4$  heights or less in proving why ground resistance which reduces the efficiency also reduces the SWR. This is because the true antenna resistance component,  $R$ , is generally less than the impedance,  $Z_c$ , of normally used feed lines, while the minimum-SWR resistance  $R$  is always equal to or greater than  $Z_c$ .

The effect of reactance in the antenna impedance raises an additional factor of importance in understanding the relationship between SWR values and antenna performance. As stated earlier, the rate at which SWR rises as the operating frequency departs from the resonant frequency of the antenna depends on the resulting change in the impedance at the antenna terminals, which in turn is dependent on the  $Q$  of the antenna. One factor that has a primary influence on antenna  $Q$  is the amount of capacitance between the opposite halves of the dipole. (Although it is more commonly called a monopole, a vertical antenna over ground can also be considered as a dipole, because the lower half is simply the image of the upper half with the opposite polarity.) This dipole capacitance is determined by the ratio of the radiating length,  $L$ , to its diameter,  $D$ .

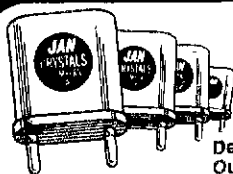
The  $L/D$  ratio (refs. 1, 58, p. 3-1) found in the usual simple thin-wire dipole is very high, resulting in a low dipole capacitance and high  $Q$ , causing rapid change in impedance, reflection, and SWR as frequency changes. This is why a thin-wire dipole is considered a narrow-band device. However, specific broad-banding steps may be taken to increase the dipole capacitance and thus reduce the  $Q$  and thereby the rate of change of SWR. One such step, for example, is decreasing the  $L/D$  ratio by using a multiwire cage configuration for each dipole half or by fanning out multiple wires from the feed point. SWR curves vs. frequency are valid here in comparing bandwidths obtained while experimenting with different radiator configurations. However, any separable loss resistance must now be either minimized or held constant to prevent it from introducing unknown variables. Otherwise, the unknown variables can cause differing errors in the SWR readings obtained with different configurations, and thus render the results of the experiment invalid. But unless actual broad-banding steps have been taken to reduce the  $Q$ , the rate of change in SWR as frequency changes will not differ dramatically between various types of dipoles having roughly equivalent  $Q$  values. (These types include the so-called inverted V.) If a dramatic difference is noted with no valid broad-banding steps taken, troubleshooting is called for to determine the cause. More than likely some unwanted loss resistance will be flushed out, if that is the case.

The writer has seen SWR curves published, along with descriptions of quite simple antennas, where it would have been impossible for the SWR to remain as low as indicated over the frequency range shown; the antenna  $Q$  of the configuration presented would have simply been too high. Two possible explanations for this sort of contradiction are that (1) perhaps the readings were obtained using an inaccurate SWR indicator — many read on the very low side (refs. 40, 54), or (2) as suggested above, an unrecognized trouble existed somewhere in the antenna system which was lowering the  $Q$  by means of a separable loss resistance. Yet these articles were published because the antennas they described were purported to have "improved SWR characteristics." How many times have you heard someone praise his newly hung skywire by simply telling how low the SWR indicator reads across an entire band? It should now be clear that it cannot be emphasized too strongly that an unrecognized and unwanted loss resistance is an antenna system can *cause* a low SWR reading *when it should not be low!* So in a later section we will explore the relationship between antenna impedance and SWR in detail so that we may determine what is a proper SWR for given conditions.

### Reflected Power and SWR

Let us now return to the subject of why we worship low SWR for a wrong and invalid reason. As stated earlier, the misunderstanding of this aspect of reflected power is based primarily on the prevalent, but erroneous, idea that any reduction in SWR or reflected power effected on a line feeding an antenna results in a direct one-for-one increase in radiated power. The erroneous reasoning in this idea is in the assumption that if the power is being reflected, it therefore cannot be absorbed in the load or radiated, and that the power which is reflected returns to be lost by dissipation in the transmitter. The assumption is false on both points, for the truth is, because of the reflective conditions in the circuitry used in coupling the transmitter to the line, *all power that enters the line* is absorbed by the load (except that dissipated in the line itself due to attenuation). This is true *even when the load is not matched to the line impedance* (ref. 55). Complete absorption in the mismatched load (and line) of all the power *delivered* by the transmitter is obtained, because the power reflected from the mismatch is conserved and returned to the load by rereflection from the line-coupling or matching circuitry, in accordance with the principles discussed in Part IV.

Let us consider a lossless line for a moment, in light of the above statement; here it is axiomatic that if all power delivered to the line is already being absorbed in the load (because none can be absorbed in a lossless line), a reduction of the reflected power cannot have any effect whatever on the amount of power taken by the load. And obviously, there is no power left over to be dissipated in the transmitter. Following this same reasoning in a real line having attenuation, *all losses in power* must be attributed to the basic  $I^2R$  and



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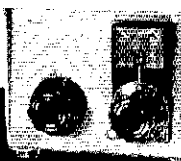
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$E^2/R$  losses arising from the line resistance or attenuation. These losses are unavoidable, even when the load is perfectly matched. The only *additional power losses* which can be attributed to SWR or reflection occur because the same resistive attenuation is encountered by the reflected power wave as it travels along the line from the load to the input. The amount of power lost in this manner is very small, indeed, at frequencies in the hf range when good-quality low-loss line is used because, during its return to the input, the reflected power suffers only the same *rate* of line-attenuation loss (in dB) as the incident power suffers in its forward travel toward the load. And as previously stated, all the reflected power which arrives back at the input now becomes part of the incident power. Another way of explaining the relation between SWR and lost power is to recall from Parts III and IV that because the incident power is the sum of the source and reflected powers, the incident power is greater than the source power wherever the SWR is greater than 1.0. Thus for a given source power, the resistive losses are somewhat higher in the portion of line where the incident power is higher than the source power, simply because the *average* line current  $I$  and voltage  $E$  are higher in that portion.

So from this discussion concerning improper usage of SWR we learn that from the viewpoint of efficiency, our concern for SWR involves only the loss due to line attenuation. Thus we can tolerate a higher SWR when the attenuation is low, but when attenuation is high the SWR limit must be lower for the same amount of additional power lost from SWR. The exact relation between SWR and the power loss caused by SWR for different values of line attenuation is shown graphically in Fig. 1, Part I, taken from the ARRL *Handbook* and the *Antenna Book*. From this figure we can easily see that the amount of power actually lost is in sharp contrast to the amount mistakenly assumed to be lost in the improper concept of SWR, where it is thought that a reduction in SWR or reflected power results in a direct equivalent decrease in the amount of power lost in the system.

There is a great deal of irony behind these various misunderstandings of reflections that have engendered the wrong interpretation or usage of SWR. The irony is that the *correct* reasons why SWR should be considered, as previously recited, are frequently overlooked in the wrong usage, while the basis so generally accepted in support of the wrong usage doesn't even exist in the coupling methods used by amateurs to transfer power from the transmitter to the antenna. A part of this obtuse logic originated from the confusion among both amateurs and engineers in the meaning of a "matched generator" — to some it implies being matched in *only one direction*, and to others it means being matched in *both directions*. In transmitter operation, where conjugate coupling is usually used to deliver optimum power to a load through a line, the match is in one direction only — forward. This subject will be treated in detail in Part VI of this series, which will appear in a subsequent issue of *QST*.

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WE BUY electron tubes, diodes, transistors, integrated circuits, semiconductors. Astral Electronics, 150 Miller St., Elizabeth NJ 07207. (201) 354-2420.

MOBILE ops - Write for info on shielded ignition systems and noise suppression components. Summit Enterprises, 36 Winchip Road, Summit NJ 07901.

CRYSTALS airmailed: general purpose, MARS - Novice, active FT-243, all frequencies minimum five, 40 m 15 m, 10 m 99c each; 40 m - \$1.59. Cover bands inexpensive - rock solid. Less than five, 80 m - \$1.75 other \$1.50. Novice - with VFO or no - four bands - eight crystal package just inside bands for QSO or band limits - \$9.95. General purpose: FT-243 .01% 32 pf. 3500-8600 kilocycles \$1.90, (five \$1.75), (nets, ten same \$1.45). 1700-3499, 8601-13000 fundamentals, 10,000-30,000 overtones \$2.95. Add 50c each for .005%, 75c for HC-9/u above 2000. Annual 15c/crystal, 35c-1 0c. Free listing. Bob Woods, W0LFS, "Since 1933" C-W Crystals, Marshfield MO 65706.

MONITOR police/fire dispatchers in connection with CD, MARS, RACES work. Official directories show channels, nationwide. Catalog +10 sase. Communications, Box 56-AR, Comack NY 11725.

WANTED: QSTs 1920 and before. Also ARRL Handbook before 1940. W6ISQ, 32 Belbrook Way, Atherton CA 94025.

QSTs of 1916, March through July, wanted for any unreasonable price. Also, any tubes purchased at 5% over prevailing market price. Ted Dames, 308 Hickory St., Arlington NJ 07032.

FAX PAPER: For Desk-Fax, new (not surplus), precut (not rolls), \$15 per thousand sheets, postpaid worldwide. Bill Johnston, 1808 Pomona Drive, Las Cruces NM 88001.

HALLICRAFTERS SR400A (560 Watts) W/Mitch Supply, C.W. Filter and built-in Noise Blanker. (Rete \$135.54) Limited Special: \$795.00 Ham-M Rotors, \$399.95. prepaid from L.A. Electronic Sales, 23044 Crenshaw Blvd., Torrance CA 90505 (213) 534 4402 (closed Sundays and Mondays).

TOROIDS - 44 & 88 mhy 5/ \$2.75 Postpaid. M.L. Buchanan, P.O. Box 74, Soquel CA 95073.

SPEECH Amplifier for Heath SB400-SB401 plug in model AU3 - no wiring necessary - just plugs in. \$14.50 plus postage. American Sales Co., 6306 Kings Knoll Road, Grand Blanc MI 48439. Phone: (313) 694-1129.

CLEAN R390A receiver, \$450 prepaid or trade for transceiver. Stamp for pictures and specs. W6MPE, 4178 Chasin St., Oceanside CA 92054.

WANTED - Collins 30S1, K3FB Wilkes, Bella Vista Acres, Bethlehem PA 18017.

WANTED: Plastic tuning knob for a Collins 75A4 or KWS1. Also interested in a 75A4, not working but complete and repairable. Also interested in 51J3-4, State price and condition. Deaf Pollock, WA3NSU, R.D.3, Box 402, Greensburg PA 15601. PH (412) 837-7411 after 6 PM.

WANTED: Johnson Viking II transceiver, good condition, K4DNO, Box 248, Waxhaw NC 28173.

JEHOVAH's witness who are amateurs write Bob Ellis WA4UQQ, 160 Lagoon Rd SE Winter Haven FL 33880 or call (813) 293-3595.

ATTENTION Heathkit owners! Service and modification manual for the SB and HW series transceivers and transmitters. Over 125 troubles and their possible causes. RF voltage charts, resistance charts, and trouble shooting procedures that are easy to follow. Transmitter and receiver modifications that will improve your system in minutes. Act now and become your own expert, send \$7 for prepaid manual to U.S.A. & elsewhere. Info: Data Service 9460 Wilshire Blvd., Beverly Hills CA 90212.

TTY C Size Schematic - \$1.50. 33 Schematics, PO Box 4057, Alexandria VA 22303.

CAPACITORS wanted: Computer grades, tantalums, mylars, discs. Write for top cash offer. National Electronic Supply, Dept. Q1, 7231-B Garden Grove Blvd., Garden Grove AA 92641. Phone (213) 597-7010 or (714) 893-2900.

NCX5 \$270. NCXA supply \$70. National 200 transceiver \$179. Galaxy V-MKII \$215. AC35 \$53. Cal35 \$9. SC35 speaker \$10. Turbine 454c mike \$12.50. All clean and like new. W9HF, 505 Roxbury Ct., Ft. Wayne IN 46807.

WANTED: Early wireless/radio sets, books, magazines, tubes, etc. Western Electric loudspeakers, phones, amplifiers. Early telephone apparatus and books. Will Nangle, 761 No. 29th St., Milwaukee WI 53208.

STANDARD 146A (1-2) 238.7 0, (3-11) \$212.30. Nicad batteries \$1.58. Stubby antenna \$5. Standard 826MA (1-2) \$324.50. (3-11) \$306.90. Standard 851T-25 watt mobile \$420.20. Standard RPT-1 repeater \$600. HM157 antenna \$16. Base station antenna HM191 3-25dB (list 169.50) net 119.95. Send check and we'll pay postage or we'll ship COD. Electronics Communication Co., PO Box 17222, Nashville TN 37217. 24 Hr (615) 834-8999.

KWMI excellent condition. Mobile supply, mount, DX adapter, 2.4 c filters, Frank McJanet, 1157 Evanston N, Seattle WA 98133.

WANTED: Heathkit SB110A or HX30. WA1DEE, James Montes, 16 Curve St., Springfield MA 01104.

WANT Drake SFR-4 All band recvr. T.G.M. 2225 Miller St., Lakewood CO 80215.

SWAN 350C, 117 V, test equip, extras, mint cond - \$425. Wiedinger, 183 Washington Ave., Rutherford NJ 07070. (201) 939-3655.

MOBILE time is coming. Increase your operating pleasure and range with a shielded ignition system. Summit Enterprises, 36 Winchip Road, Summit NJ 07901.

WANTED: Bird 5315. Eimac SK-406. Jennings UCSXF 1500. Johnson 226-1. Simpson 4-1/2" rectangular panel meters. UTC CG-1C, CG-100, CG-101, CG-102, CG-103, CG-109. Specify condition and price in first letter. F. Budavari, 286 Summit Ave., St. Paul MN 55102.

TX-1 transmitter and SB-10 adapter for capability including RTTY - \$145. HQ-170C receiver - \$145. Want kevz 1 1401 Palo Verde, Carson City NV 89701.

COLLINS 2 complete S-line stations, 32S-1 75S-1, 30 L-1 - \$1,250; 32S-3, 75S-3, 30L-1 - \$1,700. excellent condition will consider selling pieces separately. C. Cummings, 159 Ketcham Ave., Amityville, NY 11701 (516) AM-41314.

MOTOROLA Channel Elements 28/88, 04/64, 26/85, 34/94, 94 transmit, 1 spare. All for \$125, postpaid. W4UW. (919) 765-4697.

HEATHKIT SB-101, HP-23, SB-600, antennas; Knight P2 SWR meter; EV619 mike - \$275. No shipping. E. Vignali, WB2AEO, 150 Eyland Ave., Succasunna NJ 07876. (201) 584-3519.

WANTED: FTDX570, 560 or SR-150, 2WV01, 5 Paul Holly Dr., Loudonville NY 12211.

FOR SALE: Package deal: TR6 transceiver along with noise blanker, a/c power supply, MS-4 matching speaker cabinet with a-m crystal filter and upper side band filter. Machine under two years old and never used in mobile. Thomas S. Jacobsen, 3371 Decatur Ave., Bronx NY 10467.

YAESU FT-101 with FV101 external VFO - \$658; FT-101 alone - \$559. All absolutely unused. Ernest Dilger, 2287 Ingalls, Denver CO 80214.

HEATHKIT TX-1 "Apache" - \$75; HQ-110a - \$90, both excellent. Terry Harvey, 13826 Apple, Fruitport MI. (616) 846-4865.

MICROWAVE gear to trade for good ham transceiver. Sarkes Tazian transmitter MT1A modulator, receiver model 108, power supplies. 2033 MHz. WRKB/6, Box 645 Loma Linda CA. (714) 796-0047.

HT-32 Hallcrafters srb, cw, a-m transmitter, mike, extras - \$125. Richard Ball, WA2ZPX. (212) 584-0316.

FOR SALE: QST's January 1944 to date. No separates. Best offer by May first takes. George Field, 1835 Quincey NE, Minneapolis MN 55418.

FOR SALE: Thunderbolt amplifier - \$250; Ranger I - \$80; Johnson Matchbox w/dlr coupler - \$100; FRDX 400 & PLDX 400 - \$450; SX-100 - \$125; Johnson Adventurer - \$25; Globe Scout - \$25; An/PRC 6, 8, 9, 10 - \$15 ea; Howard M. Mills, 2243 Rosier Rd., Apt. 17-F, Augusta GA 30906.

WANTED: Heathkit HC-10B, VFO, good condition. R. L. Davis, WB4DRV, P.O. Box 369, Darlington SC 29532.

KENWOOD six-meter converter (10 m i-f) - \$22; Unique company longwave tuner - \$50; B & W kilowatt low-pass - \$20. All perfect, no calls. Write Tom Skelton, Mountain View Lane, Clemson SC 29631.

VACUUM Variables wanted 0-250 pF to 0-2500 pF and sizes in between such as 0-600 pF etc. Prefer higher working voltages 9.5 kV and up. State manufacturer wide and whether or not with driver. Also desire Verna Clark 56-260 MdZ receiver, prefer solid state but will consider tube. W. R. Smitherman, Rt. 4, East Bend NC 27018.

FOR SALE: 50 ft. Rohn antenna tower, TA-33 beam, Telerec 8-eil, 2 m beam, 75 & 40 m inverted V's EG-8/U coax, cdr rotor, offer. Pick up only. Hank Jordan, WB2TVO, 1 Laurel Hill Road, Cragers NY 10521.

COLLECTORS: Selling 7" Hallcrafters' 3" pilot TVs, old tubes - 199s, 100s, O1As, etc. "QST", "Radio", "CQs" from 30s and 40s - s.a.s.e. for info. W0RQD, 1328 E. Bennett, Springfield MO 65804.

FOR SALE: Drake T4XC, AC-4, MS-4 and R-4C with crystals for SWL and 10 meters. Excellent condition - \$850 and 1 ship. W. J. Johnson, 1119 Lady Elaine Dr., Valrico FL 33594.

NEW Hallcrafters Cyclone III with matching ac power supply. 560 for \$795 (was \$1124). New Standard 146A with 34/94, 94/94, and 29/83 - \$229 (was \$289). Accessories at cost. Will they last. All above with full-factory warranty. FOR Tulsa. COD. Roland Radio, 5923 E. 31, Tulsa OK 74135.

HALLICRAFTERS SX-101A receiver, new (checked on air and returned to original cartn), manual - \$210 FOB Richmond, VA 2380 delivered locally. W4AX, RFD 4, Box 71, Glen Allen VA 23060.

SEL: Drake 2B, 2BQ, 2BC - \$197; National 1-10A - \$78; PB-7XA - \$79; SW-3 - \$69. W0KC 10 Taylor Ests. Kirkwood MO 63122.

NEEDED: instructions and schematics for fm modulation monitor, model 267, New London instrument Co. Frank Stifter, 171 S. Main, Natick MA 01760.

KILOWATT pp, 810 final and power supply, DX-100, make other Los Angeles Area. W6UQQ, 2630 Jefferson, Long Beach CA 90810.

DIGITAL frequency display for your receiver and transmitter. Detailed plans \$3. Communications Electronics Specialties, 814 Orwell Ave., Orlando FL 32809.

FOR SALE: Good Hallcrafters SX-111 and S-107. Leonard Weber, WN9KXH, Box 134, Irvington IL 62848.

BEAUTIFUL Collins 30L1 linear, wired for 220-volts perfect - \$350, or best offer. Joel, WA2KZD. (516) 485-5103.

FOR SALE: Drake 2C with 2CQ speaker and Q-multiplier, ZNB noise blander, 2AC crystal calibrator and crystal for WWV - \$210. Johnson Viking Invader 200 - \$125. You pay shipping. Keith Famluener, WB6GYT, 2340 Waverley, Palo Alto CA 94301.

SALE: Innova IC22, new mod 22 ch 2 m fm xcvr inc 12 xtals - \$180. J. Bright, 131 Nugent St., New Hyde Park LI NY 11040. Tel. (516) FL20088.

SELL: Heathkit HW-101 with mobile mic, mobil and fixed power supplies, and in fine condition - \$275 or offer. Call Bill. (603) 432-8273 nights, 79 Hillside Ave., Derry NH 03038. WAILNH, gone Yaesu.

RCA CSU-15B 450-MHz base - \$50; AR-22 rotator - \$110; DuMont 304AR scope - \$20; Deluxe 2-meter Nuvistor converter - \$20; 10-foot commercial dish antenna (no ship) - \$35; dual 3-element Telrex 6-meter beam - \$25; 6-meter amplifier 4-125A (with exciter) - \$50; Franklin 410 digital voltmeter - \$10; BC-603 - \$15; MF-91 S-band test set - \$20; 432 MHz KW ring hybrid - \$20. Shipping extra. Full list and details available. W2CUL, R. Landin, RD 1, Box 281, Flanders NJ 07838.

SELL: HW16 mint - \$85; HR10B - \$50; Ten-Tec KR20 keyer - \$40; Ten-Tec RHF-1 watt/SWR meter - \$25. You ship. Guy Shipley, RT 1, Box 378, Hallsville MO 65255. (314) 696-4286.

SELL: DX100 - \$55; WIPCO, 208 Valley Rd., Needham MA 02192. 444-3568.

NEW Heath SB-303, 80-10 meter receiver, expertly wired by electrical engineer. Included sbs & a-m vtac filter. Warranty in effect - \$300 or best offer. Will send. J. Dickover, Box 157 Pound Ridge NY 10576. (914) 764-5004.

SELL: HW-101 and HP-23A in mint condx - \$250. Midland SWR and Field strength meter - \$5; AR-22R rotor, needs a couple clamps - \$14. Tom Dietz, WB9FIA, I-301 Road, Bloomington IN 47401. (812) 337-1265.

QRP station for sale. Perfect condition. Ten-Tec PM-3A transceiver, 5 watts cw - \$50; Millen 9220J transmatch w/SWR meter - \$50; Telex 610-02 headphones - \$6. Mike Ryder, WB9CQH, 2014 Depot St. Oregon IL 61061.

WANTED: High-voltage transformer, Collins KWS-L. Julie Gordon, Box G, Moundsville WV 26041.

ESTATE - Heath receiver SW717 - \$30; Code oscillator and key \$8; Heath code teaching records - \$6. WIQP, Dr. Crosby Chatham MA 02633. (617) 432-1157.

RADIO Control, three chan. rec. 3 servos excellent condx; Heath GD-57 freq. 53.4 MHz - \$80; Heath SB-10 - \$35; RME prescaler - \$10, no ship. Bob Grull, W6NGA, 2464 N. Strathmore Ave., Rosemead CA 91770. Tel. (213) 2800945.

COLLEGE Expenses - Drake R-4C, MS-4 - good clean cartons, mint - \$425; you ship. Tim Goshen, Box 388, Warner UK 74489.

WANTED: Coil or coils for Grebe CR18 receiver, W40C, Felix M. Whitaker, 816 Wilkerson Ave., Durham NC 27701.

NATIONAL NCX-3, 2 available with ac supply, spkr, one 12 V supply. Excellent condition - \$300 ea. W2IBN, G. Treiber, No. 785 Hunt Lane, Manhasset NY 11030.

WANTED: Johnson VFO. J. Magnuson, Box 522, Ames IA 50010.

WANTED: HRO coils JA JC JD JE and matching speaker. Junk SRR-22 or FRR-21 for parts. Panoramic adaptor RBV. Maintenance manuals for R391 and oscilloscopes HP185A, OS-82A/USM-105 (Military HP160) Gibson 2018A Virginia, Berkeley CA 94709.

SELL: Heath DX-60B, HG-10, and HR-10B. Also cad. bk in adapter, key, and manuals, Net. \$145. Good. Eric Edler, Deerfield Road, Boiceville NY 12412.

SELL: Drake RA4, T4X, AC-4, MS4 - good clean condition - \$575. K2PNV, A. B. Buscaglia, 2497 W. River Rd., Grand Island NY 14072.

HAM Package: New completely furnished all electric home including KWM-2 with SB-200, 45' tower, beam, 40 and 75 meter dipoles, garage, large landscaped lot, all wires underground, R. G. Sidnell, W8KS/4, 834 Festivo Court, Port St. Lucie FL 33452. fone (305) 878-1856.

SELL: mint 2-meter Knight TR-108 a-m transceiver, plus Knight VFO. Built-in power supply, speaker - \$100. WB4VAP.

WANTED: Collins 310B transmitter in 1st class condx. Reasonable. A9AL1.

JOHNSON "500" xmt; Johnson "sbs adapter"; HQ145XC revr; 14 AVQ vertical; pjs & 6-meter conv; TR-44 rotor; Eico 460 K scope; Eico 377 K gen. Make offers. WB2FQI, H. Michelson, 73-17 71 St., Glendale NY 11227. (212) 497-2857.

SWAN 270 with Swan in audio filter, best offer gets it. WA2GMD, 8 Hollis Pl., Huntington Station NY 11746.

HRO-60 A B C D H J coils Collins mechanical filter, manual speaker - \$250 and shipping. W4ZBR, 609 Williamsburg Dr., Hilly Hill FL 32017.

BUY, or borrow to copy: Manual/schematic for Radio City Products, VOM model 446, K8JLK, 426 Central Parkway, Warren OH 44483.

HW-100 & HP-23 both excellent \$225; HW-12A new \$90, going into W6RP, Jerry Lorenz, 396 Mayellen Ave., San Jose CA 95126. (408) 938-1880.

WANTED: Commercial built transmitter. Approx. 100 watts output cw, 80-20 meters, No TV QRM with VFO, W5AD, 2805 Pine, New Orleans LA 70125.

COMPLETE station - Heath HW-101, HP23A with HD-10 keyer, homebrew external VFO, HDP21A desk microphone, SWR meter, speaker, switches, coax, etc. Excellent condition. \$350 takes all. Also have separately Ham-M rotor - \$80. T-33 (needs work) - \$20; 40-foot sectioned tower, two Lafayette criterion 4 X 4 w/pea speakers - \$80; two Dynaco A25s & 115 (brand new). WA2ANB, Bill DeLorenzo, 16 Laurel Drive, Port Jefferson NY 11777. (516) 473-2957.

NOVICE: Heath HR-10B with crystal calibrator and Ameco AC-1 transmitter - \$95. Liebold, 3 Morry Rd., Red Hook NY 12571. (914) 768-8613.

SELL: Tempo RMP, NiCad batteries, 62 and 94 simplex, 25-85 146.73-147.73 - \$225. Rich, 1440 E. 52 St., Brooklyn NY 11234. (212) 241-8877.

QSTs, 330 issues Jan 1940, Sept. 1968, complete offer 1945 - \$75. Stamp for list of homebrewers goodies at bargain prices WA2RKW, 1320 Abington, N Tonawanda NY 14120.

MIAMI hams bargain two-element, three-band quad and good Valiant two cheap any decent offer. K2IK/4. Telephone (305) 264-8749.

SELL: Collins KWM-2A, 312B-5, PM-2 want Swan Mark II amp Call (704) 857-9507, WA4HAW.

WANTED: Rotating kit for Triex HZR71N rotating tower, Van Ring-Bas-Tripod-Mounting-Bracket for rotator, Paul Neveu, Jr. WICKA, 60 Northwestern Dr., Bristol CT 06010. (203) 582-4885.

FREE crystals with the purchase of any 2-meter fm radio. Write for our deal on the ring of your choice. Factory-authorized dealers for Kenwood, Drake, Kenwood, Tempo, Genava, Swan, Clegg, Ten-Tec, Standard, Midland, Halberstam, Galaxy, Sony, Yaesu, Icom, Cushcraft, Mosley, and Hustler. For the best deal around on hf or vhf gear, see us first or see us last, but see us before you buy. Write or call us today for our low quote and become one of the many happy and satisfied customers of W8HJG, RR 25, Box 403, Terre Haute IN 37802. (812) 894-2397.

WANTED: inexpensive working Argonaut, W6NSQG.

1946 to date complete bound sets QST, also Radio & TV News 1947 to date. Excellent condition. Best offer. W7KYQ, 915 N 73th, Seattle WA 98103.

WANTED: Excellent condition, Argonaut, linear, 251 ac power supply, microphone, calibrator, Write KP4WF, J. Menoyou, 610 Union St., Sauterex PR 00907.

YAESU FTDX560 transceiver with mike, speaker, cw filter, 2 years old, flawlessly immaculate. Manual and original cartons. Would cost \$687 new, asking \$437. WA1QLK, 15 Greenough St., Brookline MA 02146. (617) 734-0661.

BUILD numerical readout test instruments and unusual gadgets. free catalogue. Green Bank Scientific, Box 100W, Green Bank WV 24944.

SALE: Ten-Tec PM3 - \$40; Heath HM-102 wattmeter - \$25; HM2102 - \$25; Model 15 w/table - \$30. W1KLLK, 114 Shelley Road, S. Meriden CT 06450.

HEATHKIT: Excellent condition, not even scratched. SB100, SB600, HP23 - \$350; SR200 - \$200. Bruce, W7JMS, 4649 West Bryce Lane, Glendale AZ 85301. (602) 934-9055.

DRAKE R-4A, T-4X, MS-4, ps, mint condition. Ten-Tec PM2B P & G 100 W 60 Hz, R-3/10, R-3/10, dummy load, SWR, balun. All in excell. cond. Mark Starkebaum, WB0DHP, Box 297, Gunnison CO 81230. (303) 641-0460.

SELL: Complete parts for linear, pair 260TH commercial supply, 2600V 500 mA - \$100; transformer 1450 V 400 mA several 28 KVA and 700 watt powerstats, Johnson Attenuator excellent output to linear, need good transformer, West, Sycamore Lane, Skillman NJ 08558. (609) 924-0680.

HW-7 QRP with built in CMOS Tambic keyer, excellent cond. New - \$76 FOB Gene Hinkle, 1109 Rutland No. 270, Austin TX 78758. (512) 836-6461.

LIBRARY bound QST 1932-1955, mint condition. 1954-1973 unbound. 4CX1500, socket and chimney, new. Best offer. K6TWT, 105 Tamalpais, Vallejo CA 94590.

NOVICE station: Heath HR-10 xtal cal. ant. switch, manual - \$40; Johnson suit with VFO, no manual but great electrica condition - \$50. Jim Vernon, WA1RGJ, Danvers MA 01923. (617) 774-5653.

WANTED: Globe champion 1947-53; HQ 129X. John Tuggle 1918 W. 5th Coffeyville KS 67337.

FOR SALE: Clean Drake VHF station, TR6NE w Swan ac presently factory overhauled - \$450; TC-2 plus SX-2 & CES-1, mint, used little - \$375; Swan Mark GB rt section only - \$200. Pices collect UPS. WA5CHK, 24 West Oaks Dr., Houston TX 77027. (713) 622-8784.

HEATH SR-102, HP23A, HP13-A, HS-24, GII-12A, SBA100-A. For sale: mint condition - \$500. Pick-up only. W3UB. (215) 947-5905.

WANTED: tubes and semiconductors - highest prices paid. Crown Electronics, 801 Baldwin Avenue, Lodi NJ 07644.

STANDARD 826 m, all 12 ch. xtald, with standard ac supply, FT pad - \$275; Henry-Tempo 7PL -402, 80 w amp - \$115. All absol. mint with manuals, w/ship. Dr. Ritter, 112 Stockton Road, Bryn Mawr PA 19010. (215) 527-1751.

YAESU FTDX 560 scrv, perfect mint condition, with linear power supply & 360 W PEP. Also, mt HD170A act (used less than 18 months since orig. purchase), 4134MK, 2kw, 3 el, tri-band w/AR22 rotor, and HD10 electronic keyer. Best offer. WB2ZCS, 623 No. Wood Ave., Linden NJ 07036.

QSTs 1965 66 67 68 \$6 per year. July-Dec. 1964 \$3. Sept. 37 April 40. June 42 \$2 each. All postpaid. R. McIntyre, 243 Norfolk Drive, Warrenton WA 22186.

WANTED: Autronic keyer paddle, roundish triangular base model. State price and condition. All letters answered, Fred Capossela, BBDO, 5670 Wilshire Blvd., Los Angeles CA 90036.

LARGE prop pitch motor wanted. K3RYL, 2750 Balave Road, Bethlehem PA 18017.

HEATHKIT SB300 - \$180. Three filters. Dave Woodring, WA3QIM, RD 1, Julian PA 16844. Phone (814) 355-2267.

SG-45/URM-26 wanted, complete set of TO/TM's Originals preferred. Xerox acceptable. George Strait, 222 Julian Dalish, Katong, Singapore 15.

FOR SALE: Heathkit six-meter transceiver HW-29, five watt. Buy in one supply and separate 12 volt dc supply - \$45 postpaid. W5OD, 2009 Oak Ave., Port Arthur TX 77640.

SELL Swan 260, excellent, 5 band cw/ssb, 260 watts, ac/mobile supply - \$225. Freq. meter RC-221-F, ac, book - \$25; transistor powered DuMont 101-F low-band fm, custom head, 850 Hz band Avia police motorcycle fm - \$50. Link aircraft rcvr. 12/28 vol. 72 crystals, no control head - \$35. Hallicrafter Skydrier 23 receiver - \$60. Parts for power supply. 1500 V 350 mA - \$35. Need NCX-5. WIAEV, 111 Hillside Road, Farmingdale NY 11735.

WANTED: Viking invader 200, state price and condition. K5JZ7, 1945 Thomas Road, Beaumont TX 77706.

FOR SALE: Heathkit Ultrasonic Intrusion Alarm GD-39, completely wired in streamlined metal cabinet with siren - \$125. WAZDDC, Eugene Perlman, 2410 Barker Ave., Bronx NY 10467.

FOR SALE: Drake R-4B, best offer. Charles Suderger, 9017 Shady Lane, Wonder Lake IL 60097.

QST 1938-1968 in binders. Make KH6LJ reasonable offer.

SWAP: Takuma 50mm/f. 1.4 Pentax lens, new - for Heath 6022 (2) EB217, 100 Hibiscus Dr., Rochester NY 14618. Phone (716) 224-1132.

SWAN 250 - \$195; NS-1 - \$22; bird thruline wattmeter mod. 43 - \$60. New Eimac 4CX1000A factory sealed - \$75. Want: Swan 210 external VFO. Richardson, 1109 Dakota S.E., Albuquerque NM 87108.

HEATHKIT SB-300 receiver SB-600 spkr - \$200; HD-10 keyer 10-60 wpm - \$30; HW-31 cantenna - \$7; HM-15 SWR meter - \$10; WB9FO, David Bohnett, 13350 Blue Mount Road, Elm Grove WI 53122.

DISCOUNT prices plus full warranty. Call or write for fast quote and delivery. All items, new, guaranteed. 2 m Midland - \$135; 15W/12CH - \$219.95; SB460TRC 2m-3/4 m - \$149; Standard 826 mA - \$229.95; CDE new Ham-2 rotor - \$109; CD44 rotor - \$79.95; Rellen 8-wire rotor cable no. 8448 10c/ft; Hy-Gain FH6DX - \$156; TH3MK3 - \$136; 402BA - \$152; DB10-15A - \$104; Mosley Classic 33, C120, M2QB mod, M23, Belden; consolidated R88 foam core 18c/ft; CushCraft A147-23 - \$49; Johnson kW Matchbox - \$219.95; 15% discount Trix Tower; quote Swan, Drake, Ten-Ten, Kenwood. Prices hot Houston. Free flyer. Madison Electronics, 1504 McKinney, Houston TX 77002. (713) 224-2668. Nite (713) 497-5683.

SELL: 7553B - \$550; HT32A - \$175; really clean gear, never moved from operating table since purchased. W6BWA (707) 589-0611.

WANTED: All parts for Motorola HT-200, HT-220, and PT-300 series equipment. Send price list to: Louisville Repeater Assn. c/o Paul, WA4ECE, 180 Brookshire Ct., Fairdale KY 40118.

FOR SALE: Two Novice combinations, DX-60B with GH-10B - \$75 Johnson Adventurer with Rico 722 VFO - \$40; Elco 718 Receiver - \$35. Smith, P.O. Box 132, Oak Ridge TN 37830.

WANTED: Collins SC-101, complete. CX7-A, SR400-A HA-20, PS500 ac cash. Or trade HT-220 (2 ch), charger 2 Nicads, carrying case; on 34/94, 94/94. James Craig, 29 Sherburne Ave., Portsmouth NH 03801.

R-390 - \$400; 325A/516F2 - \$375; BW 852 tank - \$40; BC-221 w/cal charts, book 30; 285KR floor - \$250; take 325B; M0D23 typing report - \$50; M0L14 typing report - \$30; TD 115, performer, MCBRW fm MOD19 KYBD - \$15; CE20A - \$40; Handhoper VFO - \$20; OS-8 scope - \$30; CB w/t 1 V 3 chnl - \$50 pr; PL-172 - \$80; 4-1000 - \$35; 4-400A - \$25; 4-250A - \$20; 4-125A - \$15; Eimac Vaevar 20-60 pf - \$15; Johnson Viking mobile - \$30; HMBRW 5-line supply - \$40; NEI color TV course, bound into six hard backed volumes - \$40; DX-40 - \$30; SX-71 - \$30; both need work; add postage. G. L. Hale, K0P1V4, 6334 Edward St., Norfolk VA 23513. (804) 857-1507.

RARE BARGAIN: Proceedings of IRE 1943 to 1958 inc, all excellent condition - \$20 plus shipping costs. G. Flynn, W0MHW, 5504 Kansas, Omaha NE 68104.

ALLIED Radio Shack AX-190 with Collins Mechanical Filter - \$150; Heathkit GR-78 Shortwave rcvr - \$100. Wanted: Hallicrafter SX-133 or SX-122 or Drake SW-4A, Tom Hovey, WB2ML, R02 Coactmen Manor Apts., Lindenwood NJ 08021. (609) 627-3199.

WANTED: Lampkin 205B or 205A deviation meter, Mint condition, W4BIC, 114 Riomar Ct., Port St Lucie FL 33452.

PHILA. area: Heath Apache TX1 & XB10 ssb adapter, HO-18 ham scap. WA3OBW. (215) HO2-9293.

COLLINS KWM-2A transceiver, 399C-a remote VFO, PM-2 ac power supply - \$850, plus shipping. James Jorgensen, K7RA1, 1938 South 424 East, Orem UT 84057. (801) 225-5464.

FCC test answers any class \$5 Dixie Tee, Box 8352, Savannah GA 31402.

WANTED: Ameco pelp 160-6 meters. Frank Scher, 2118 W. 8th, Muncie IN 47302.

WANTED for cash. National NCX5 MKII, VK501, NCXA, NCL2000, Collins 75A4 (4 to 5 G series), Tubex 4CX1000A, 4-1000A, 3-1000Z, 4-400A, 4CX250B, 4-250A, 4-125A, 813, 811. Vacuum variables. Tubes must be new, sealed boxes, or new. Also sockets & chimneys for above. All letters answered, all phone calls answered, Michael D. Harrison, 431 Windsor Pl., Oceanaside LI NY 11972. (516) 536-5320.

SELL: 1200 watt PEP linear in HW-100 cabinet, PR 572 gnded grid 80-40-20 meters. 230 VAC only - \$60. Thomas Cann, 1555 Black Rd., Joliet IL 60435.

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SELL: Hammarlund HQ-180, DX-60, HG-10 VFO, to keyer (10-65 wpm), SWR bridge, mint - \$225. WA3SQ/T4, Ron Stone. (904) 478-1976.

PROG-Line Mobile - 30 watts 34/94, 94/94, T-powered, xmtr, complete - \$100 delivered Wash.-Balto. Old Philco 2-piece base station - 30 W. 34/46/70/94; receive 70/76/88/94 too broad for metro area - \$30. FOR. Van Allen, K3CZ, Woodbine MD 21797.

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FOR SALE: Apache with SB-10, Both perfect - \$150. Earl, W3ZPF, 707 Hunting Place, Baltimore MD 21229. (301) 253-0677.

SELL: Heathkit TX-1 transmitter with SB-10 sideband adapter - \$90; Hammarlund receiver HQ-110 - \$90, both little use mint condition. Also Heathkit DX-40 - \$20; VF-1 - \$5; manuals. Hugh Granberry, 43 Weatherstone, Marietta GA 30062.

HEATH SB-303, SB-600, cw filter - \$300; Gonset GSB-100 - \$125; Collins R-388 with three mechanical filters - \$250; all with manuals. WA1QFP, 31 Derby Street, Pawlucket RI 02860. (401) 722-9338.

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DRAKE TR-22, new condition - \$170. Dave, WA2BVS, 60 Haven Ave., Apt. 13C, New York NY 10032.

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DRAKE 2R, 2BQ - \$160; Heath HM-102 - \$25. WB2PWS, 2 Carteret Ct., Madison NJ 07940.

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FOR SALE: Complete Heathkit station, SB-303 revr, SB-401 x-mtr, SB-60U speaker, Ameco preamp, HM-102 pwr meter, Saurer mike, Vibroplex keyer, trap vertical and 45 ft. 3 sect. tower with rotator. All in excellent condition. Total station - \$650. Gary Glassville, 7111 Windsor Mill Rd., Baltimore MD 21207, 944-2034.

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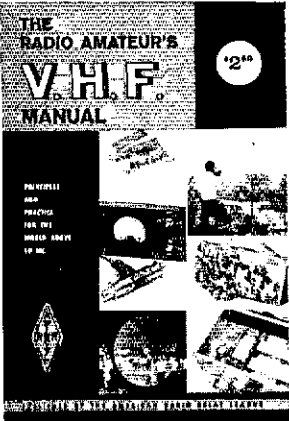
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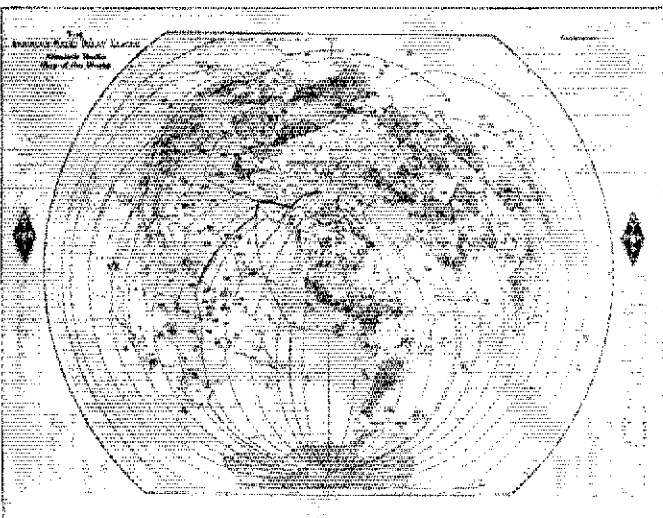
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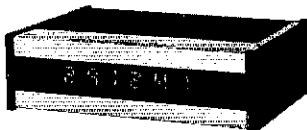


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The features of this unit tell the story of why it's so popular: Auto-start operation, separate input filters for each shift, an antispacer feature, and switch selection of 850 and 170 Hz shifts are standard. An extra discriminator for a 425 Hz shift is available as an option. A space-saving special power transformer is part of the package; it includes windings for low voltage and loop supplies, and a 115/230 VAC primary. Dual-in-line IC's are mounted in sockets for ease of testing and replacement. Seven G10 epoxy glass boards with reliable wiping contacts hold all circuitry. Tuning is read from a 1 ma. panel meter which, at the flick of a switch, serves as a loop current readout. Other visual indicators display AC power on, Mark, and Space conditions. Two other lamps indicate whether the ST-6 is in the receive or standby mode. For maximum safety, a three-wire grounding

cord and grounding outlet for the printer are included. The power supply card contains easy-to-replace clip-in fuses. The ST-6 is available factory assembled and aligned, or in kit form. The PC boards and cabinet only are also available.

A popular option designed to plug right in to the ST-6 is HAL's AK-1 AFSK oscillator. Available assembled or in kit form, the AK-1 is an AFSK oscillator that demonstrates stability and reliability. It provides switch selection of 170 Hz and 850 Hz shift using standard AFSK tones. The AK-1 may also be mounted in its own cabinet for use as an independent unit. Frequencies are set by 15-turn trimmers for ease of accurate tone adjustment. The AK-1 operates on 12 VDC, or directly from the ST-6 power supply.

If you're ready for the very best RTTY at an attractive price, look into the HAL ST-6 TU, the 425 Hz discriminator, and the AK-1 AFSK oscillator. They'll give you all the help you need. Order yours today!

### Prices:

#### Assembled:

- \$310 — ST-6 Terminal Unit
- \$350 — ST-6/425 Hz Disc.
- \$350 — ST-6/AK-1
- \$390 — ST-6/425 Hz Disc/AK-1

### Kit Form:

- \$147.50 — ST-6 Terminal Unit
- \$ 35.00 — ST-6 Table or Rack Cabinet
- \$ 29.00 — 425 Hz Discriminator
- \$ 29.00 — AK-1 AFSK Unit

All prices postpaid, USA. For air shipment add \$4 for the ST-6 kit or cabinet, \$1 each for the 425 Hz kit or the AK-1 kit, \$10 for the assembled ST-6 with any options.



HAL Communications Corp.  
Box 365, Urbana, Ill. 61801  
Telephone: (217) 359-7373

- Enclosed is \$ \_\_\_\_\_ for the following items:  ST-6 Assembled,  With all options;  ST-6/425 Hz Disc;  ST-6/AK-1;  ST-6 kit;  ST-6 Cabinet;  425 Hz Disc kit;  AK-1 kit.
- Charge to my Master Charge

# \_\_\_\_\_  
BankAmericard # \_\_\_\_\_  
Master Charge/Interbank # and  
Exp. date \_\_\_\_\_

- Please send me the HAL catalog.

Name \_\_\_\_\_

Address \_\_\_\_\_

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Thank you QST  
for saying ... the TS-900 ...  
"has to be the pace setter  
for the '70s"

See product review in the July 1973 issue of QST or send to Henry Radio for a complete reprint.

# KENWOOD'S TS-900

NOW THE PROMISE OF THE TRANSISTOR HAS BEEN FULFILLED.  
HERE IS THE TRANSCEIVER YOU WILL WANT TO OWN AND CAN AFFORD.  
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**FEATURES:** Break-in CW with sidetone provided ★ Built-in 100 KHz and 25 KHz crystal oscillator ★ The receiver incremental tuning control can vary the receive frequency  $\pm 2$  KHz or more ★ RTTY — Built-in frequency shift circuit for FSK operation. The frequency shift is factory set at 850 Hz ★ Built-in noise blanker designed to reduce impulse type (ignition) noise ★ Built-in VOX circuit with adjustable VOX gain and delay ★ All major electronic circuits are built on modular (plug-in) circuit boards

**SPECIFICATIONS:** Frequency range: 80 meter band — 3.5 to 4.0 MHz; 40 meter band — 7.0 to 7.5 MHz; 20 meter band — 14.0 to 14.5 MHz; 15 meter band — 21.0 to 21.5 MHz; 10 meter band — 28.0 to 28.5 MHz; 28.5 to 29.0 MHz, 29.0 to 29.5 MHz, 29.5 to 30.0 MHz; WWV — 15.0 MHz (receive only) ★ MODE: SSB, CW, or FSK ★ **POWER OUTPUT:** 150 watts nominal into 50 ohms for FSK, 125 watts nominal into 50 ohms for CW, 50 watts nominal into 50 ohms for SSB, ★ **RF INPUT IMPEDANCE:** 50 ohms ★ **CARRIER SUPPRESSION:** Hz during any 15 minute period after warmup ★ **CARRIER SUPPRESSION:** Carrier better than 45 db down from output signal ★ **SIDEBAND SUPPRESSION:** Unwanted sideband better than 40 db down from output signal ★ **HARMONIC RADIATION:** Better than 10 db signal + noise/noise signal ★ **RECEIVER SENSITIVITY:** SSB and FSK — 2.2 KHz bandwidth (6 db down), 4.4 KHz bandwidth (60 db down) (with optional CW filter installed) ★ **RECEIVER SELECTIVITY:** SSB and FSK — 2.2 KHz bandwidth (6 db down), 1.5 KHz bandwidth (60 db down) (with optional CW filter installed) ★ **TUBE & SEMICONDUCTOR COMPLEMENT:** 3 tubes (6LQ6 x 2 and 6GK6), 3 IC's, 16 FET's, 57 transistors, 70 diodes ★ **SIZE:** 12.6" W x 5.5" H x 12.6" D

The TS-900, unquestionably the best transceiver of its kind ever offered.  
**PRICES:** TS-900 ... \$795.00, PS-900 (AC supply) ... \$120.00, DS-900 (DC supply) ... \$140.00, VFO (External VFO) ... \$195.00  
Also, Kenwood's TS-520 five band SSB & CW transceiver ... a superb value at \$629.00. If you prefer separate units, Kenwood's R-599A solid state receiver at \$439.00 and the T-599A transmitter at \$459.00 are the best available.

Prices subject to change without notice.

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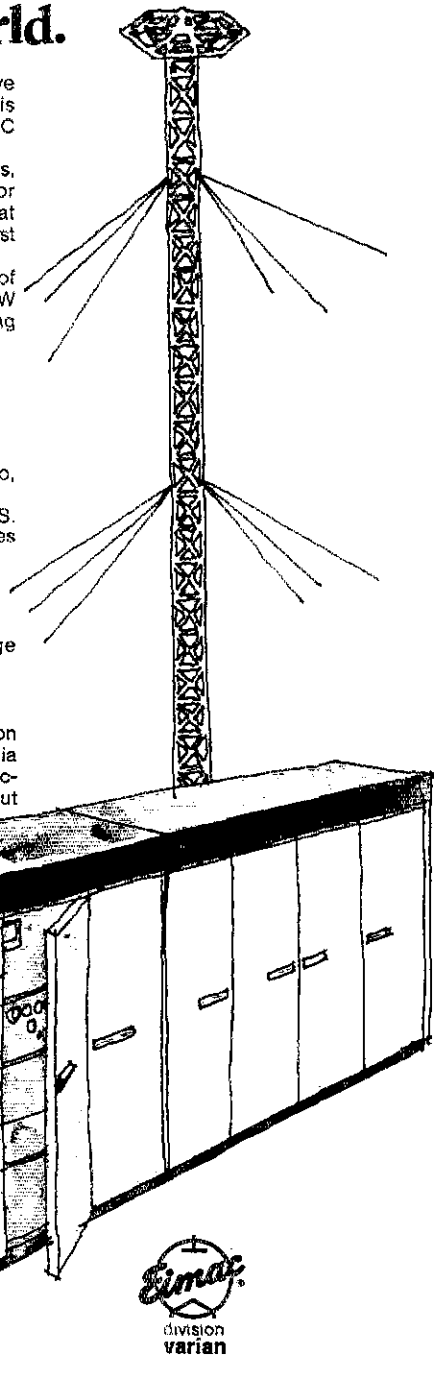
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