QST

July 1970
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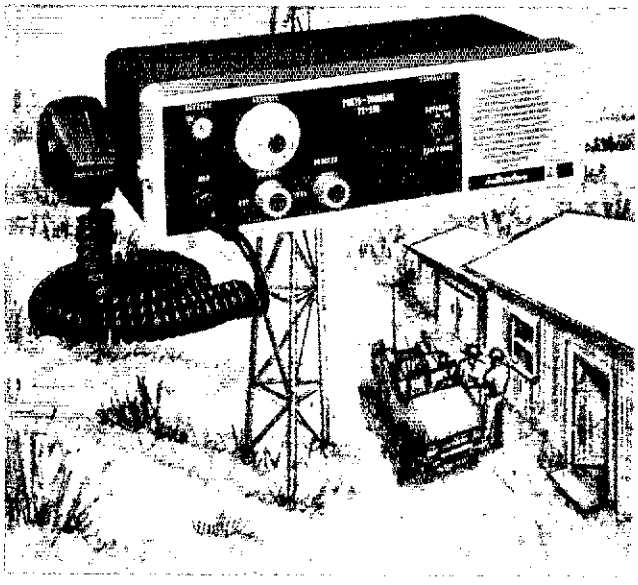

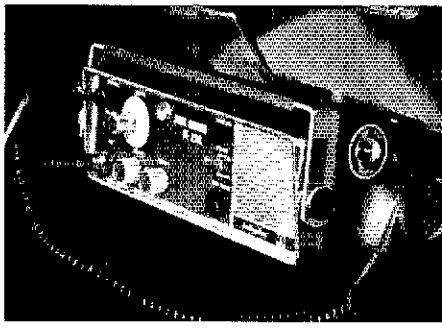

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JULY 1970

VOLUME LIV NUMBER 7

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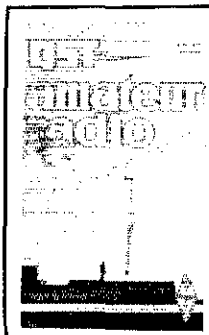

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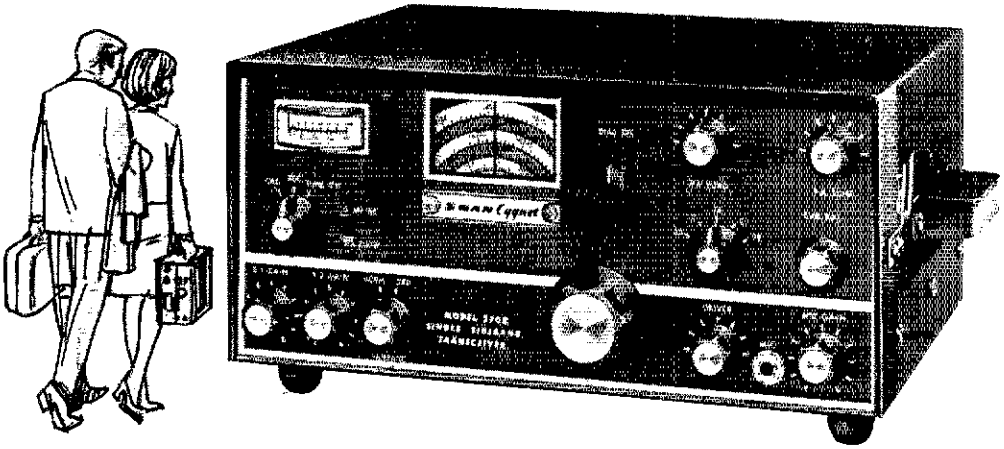

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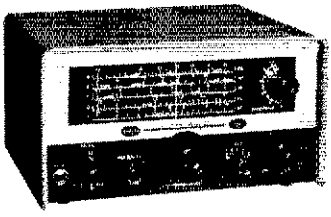

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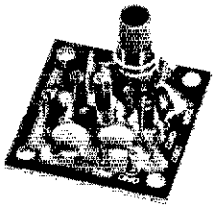

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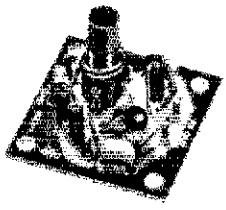

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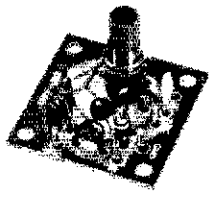

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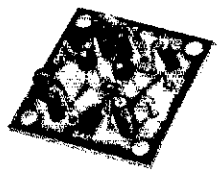

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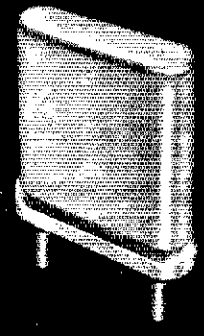

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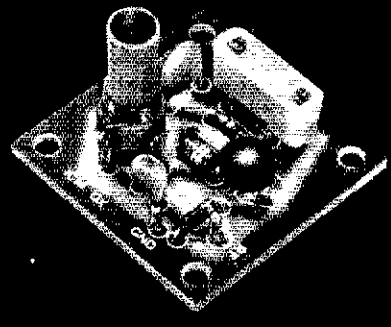

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"It Seems to Us..."

NSIN

IN THE early part of May some political decisions at the national level erupted into protest, largely at colleges and universities. A group of amateur stations calling itself the "National Student Information Network" commenced operations on several voice bands. One aim was to exchange information between campuses as to what was going on. They took pride in achieving faster reporting than the news services, and indeed began to feed news to the wire services. Up to this point, everything was fine.

Then, various individuals in the net began to invite dialog with other amateurs on the goals of the students. Others participated in a sort of broadcast operation, in which they read news bulletins "to each other" (but obviously aware they had by now acquired quite an audience of listeners). Finally, some began to solicit funds for continuation of the student strike activities; some passed traffic urging students to send their draft cards to Washington for a massive bonfire. There were additional activities, but the ones just mentioned set the tone for a reaction from other members of the amateur fraternity. The student net suddenly ran into all sorts of interference – deliberate and malicious. An unhealthy situation had developed.

The use of the amateur bands for heated political discussion or action (and let there be no mistake – this was political action) has long been a self-imposed taboo in amateur radio, at least by most of us. Recent events have not changed the value of this principle one iota. A few young activists among us, banging the drum for complete freedom of speech, have labeled our view reactionary, out-of-touch with reality. We disagree, and suggest that more accurately it is these idealists who are the ones out of touch with reality, perhaps being too young to have learned that Utopia and practicality are not always compatible.

We occupy some choice segments of spectrum, an international resource that is in short supply. Although we earn the privilege (it's not a right) to occupy those bands because of the worthwhile contributions hams have made and are making, it is of course true that we enjoy the opportunity to use the bands for many more personal pleasures. One is casual conversation . . . ragchewing . . . discussions about *almost* every subject under the sun.

But, because everything we do or say is exposed to the whole world, amateur and non-amateur alike, we are obliged to use a bit of discretion in what we say. Most countries of the world believe that the U.S. (plus Canada and a few others) has given amateurs too much freedom, even in allowing the basic public services we perform. It is technically a violation for a mobile amateur in some European countries, for example, to transmit an emergency message for help if he comes across a serious road accident! It is not at the moment a question of whether these philosophies are right or wrong; the fact is they exist. And every one of these countries has one vote at radio conferences. One of these conferences, where our satellite privileges will be under scrutiny, is only eleven months away.

So if you want to argue the war in southeast Asia, or advocate massive resistance to the draft, or speak for a new and permissive morality, that is your privilege. But please – *not on the amateur bands.*

You have the right to speak freely, but do you have the right to jeopardize the existence of the entire fraternity? Do you have the right to engage in such conversations that parents of youngsters forbid them to listen on the amateur bands? Do you have the right to put the use of amateur radio in such a light that support for amateur frequency bands might be in danger at a future conference?

NO VIGILANTES WANTED

NSIN had its shortcomings, and probably strayed through grey areas into actual illegality at times. But there is no question at all that the deliberate QRM (cat-calls, swishing of carriers, cries of "pinko" and worse) caused to the network by some amateurs who did not agree with its aims is completely illegal, certainly cowardly, and perhaps even more destructive of the image of amateur radio. A friendly word of advice would have been one thing; most of what we heard was pure malice.

"Frontier justice," vigilantes, "Joe McCarthyism" have even less place than politics in amateur radio. No matter what the provocation, no amateur has the right to produce malicious interference to the transmissions of another – ever. QST

Field Day fever is everywhere! Down at McMurdo sound in the Antarctic, the fellows at KC4AAE are operating completely portable "in the field" (that is, on Ross Glacier!), in the one-transmitter group. QSL via the Office of Antarctic Programs, National Science Foundation, Washington, DC 20550.

Phone patches are third-party traffic, and on the international level are strictly prohibited unless a special agreement exists between the countries concerned (See page 73, May, for the latest list.) A W6 recently hooked up a phone patch as a "surprise" for a VK6, and nearly lost the Aussie his license! (Needless to say, if the FCC happened to be listening, the W6 would have been in the soup, too.)

As a group, we behaved 16% better in 1969 than in 1968, according to FCC's 1969 annual report. The number of official violation notices was down to 2464, as compared with 2933 the year previous. On the other hand, the Citizens Band service performed nearly 40% better in 1969, and only 2400 official notices of violation were issued.

The morning qualifying runs from W1AW have proved so popular that we have scheduled more of the same for the balance of this year -- September 18 and December 17.

AT&T's filing with FCC in protest of proposed higher fees suggested, among other things, a fee schedule based on bandwidth occupied. Sounds like a phone company in favor of c.w.!

Who says there's nothing new in amateur radio? Amsat has announced plans for Oscar 6 with launch possibly mid- to late-1971. It is to be a long-lived solar-powered communications satellite useful to large numbers of amateurs. And, to increase interest, a complete program of operating activities is being formulated to take place during the satellite's active lifetime. We'll have details as soon as available.

Journeying to Europe later this year? The annual Exhibition of the Radio Society of Great Britain will be held in London during August 19-22, at New Horticultural Hall, SW1. There will be a reception for overseas visitors on the Friday night, August 21 . . . In Geneva, the annual convention of the International Amateur Radio Club will be held at the headquarters of the International Telecommunication Union during October.

As part of its continuing program to solicit more members for the League, the Hq. mails an invitation to names we obtain from the Call Book. Although we check against our membership list, we sometimes mail an invitation to membership to someone who is already a member. If this happens to you, and you're already a member and receiving QST regularly, don't panic. If you'd like to lend a hand, hand the invitation to some acquaintance who is not yet a member.

If you're a National Convention aficionado, better plan on attending the one in Boston during September. There's none scheduled for 1971, so Boston is your last chance for a national until September, 1972, when Long Beach and the "Queen Mary" take over.

Quote-of-the-Month, from "Saturday Review" via K2SJN: "The reason the post office workers went on strike was that if they had just staged a slow-down, nobody at all would have noticed it."

W8JK 5-Band Rotary Beam Antenna

BY JOHN KRAUS, PH.D.,* W8JK

OLDTIMERS will remember the W8JK antenna which made its debut over 30 years ago.[1] This antenna, in its simplest form, consists of two parallel half-wave elements driven in phase opposition. The pattern is bidirectional with 3 to 4 dB gain, depending on the spacing between elements.

A twin W8JK antenna is here described which works as a 5-band rotary beam antenna on 40, 20, 15, 10 and 6 meters. Actually, the antenna can be operated as a rotary beam type at *any* wavelength between 6 and 40 meters. The gain over a half-wave dipole ranges from 3.4 dB on 40 meters to 8.4 dB on 6 meters. No traps or loading coils are used. Element lengths and spacings are entirely non-critical. As added options the antenna may be operated as a rotary dipole on 40 and 80 meters, or the antenna plus feed lines as a top-loaded vertical on 80 and 160 meters.

Theory of Operation

The antenna, as shown in Fig. 1, is basically a broadside array consisting of two vertically-polarized center-fed W8JK units. The two units are mounted at the ends of a 32-foot boom. The vertical elements of each unit have a length, L, of 24 feet.

The antenna can be operated in 4 modes. The current directions for these 4 modes are shown in Fig. 2. Mode I is the basic arrangement and in this mode the antenna is bidirectional, with maximum signal directions perpendicular to the 32-foot boom, as suggested in Fig. 2A. Mode I is used on 6, 10, 15, and 20 meters.

In mode II the elements of the left unit are driven in phase opposition to the elements of the right unit, as suggested in Fig. 2B. In this mode the antenna is bidirectional with maximum signal directions parallel to the 32-foot boom. Mode II is used on 40 meters.

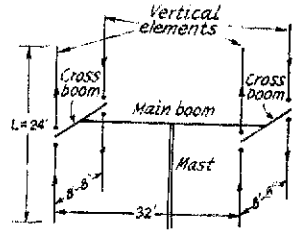


Fig. 1 — Basic arrangement of the antenna.

In mode III the left and right units are connected as end loading for the horizontal transmission lines, as suggested in Fig. 2C. The length from the tip of a left element to the tip of a right element is about one-half wavelength at 40 meters. The antenna now behaves as a horizontal end-loaded rotary dipole for operation on 40 and 80 meters.

In mode IV all elements are connected together to act as top loading for the vertical transmission line as in Fig. 4D. Under these conditions the antenna may be operated as a top-loaded vertical radiator on 80 and 160 meters. In Figs. 2C and 2D the elements are shown connected in mode I, but when operating in modes III and IV it is immaterial whether the elements are connected for modes I or II.

Gains and beamwidths for the antenna are given in Table I. The gains are with respect to a half-wave dipole, both antenna and dipole in free space. For the gain over an isotropic antenna 2.15 dB should be added to the values in Table I. The beamwidths are given in both the vertical and horizontal planes and are between the half-power points of the main lobes. Minor lobes are not significant except on 6 and 10 meters. The gains and beamwidths are

*Director, The Ohio State University Radio Observatory, 1854 Home Road, Delaware, Ohio 43015.

[1] J. Kraus, "Directional Antennas with closely-spaced elements," *QST*, Jan. 1938, pp. 21-23.

Just "W8JK" in the by-line of an antenna article will assure its close scrutiny by veteran observers of the directive antenna scene, but some newer readers may not know the full extent to which Dr. Krause has infulenced amateur antenna techniques. His beam antennas made history as far back as the late 1930s in QST, *the old West Coast* Radio, *and in* IRE Proceedings. *The W8JK Flat-Top Beam was widely used on 10 and 20, before and after World War II. Vhf enthusiasts of long standing know W8JK for his pioneering of the corner reflector. Basic information on this popular vhf and uhf array, taken from a* QST *article of 1940, appears substantially unchanged in ARRL publications of 1970.* Antennas *(John D. Kraus, McGraw-Hill Book Company, 1950) is still regarded as one of the most comprehensive and useful works in antenna literature.*

Dr. Kraus is equally well-known to workers in the allied field of radio astronomy, as long-time Director of the Radio Astronomy Observatory of Ohio State University.

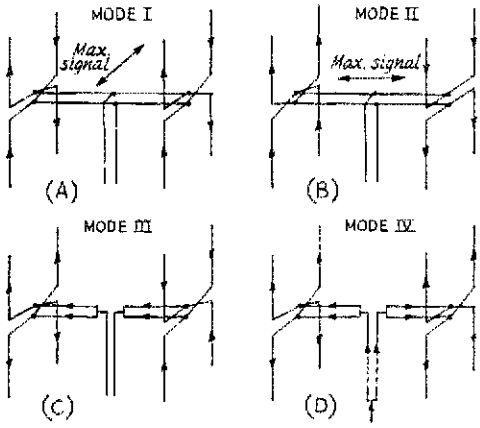


Fig. 2 — Four modes of operation. Arrows show the current directions.

calculated values. The gains should be closely approached in practice, provided the elements are fed with equal power, and the losses are small.

The gain over the wavelength range from 3 to 60 MHz is shown in Fig. 3, by the solid curves, for the case of the element length, L, equal to 24 feet. The dashed curves give the gain for cases where L is increased to 28, 32, and 40 feet. The curves indicate that increased length only affects the gain at the shorter wavelengths, and that although some gain improvement can be achieved on 10 and 15 meters it is at the expense of a sharp drop in gain at 6 meters. The curves also indicate that the improvement at 10 and 15 meters is trivial unless the increase is to 40 feet.

I am indebted to Professor Jack Richmond of the Electroscience Laboratory, Department of Electrical Engineering, of the Ohio State University, for calculating the gain and beamwidth data, elements.2 culating the gain and beamwidth data, using a high-speed computer program he has developed for analyzing antenna arrays with parallel, perpendicular, or skew-oriented elements.[2] The calculations take into consideration not only the length, spacing, and orientation of the elements, but also their diameter or thickness. Professor Richmond's program is an extension of the standard gain calculation method using self and mutual impedance.[3] The gains in Table I are round-offs from computer-generated values which are printed out to 6 significant figures. The gains are probably as accurate as can be obtained by modern technology.

Antenna Feed

Fig. 4 is a photograph of the experimental model of the antenna with 24-foot vertical elements. The antenna is fed with an open 2-conductor transmission line made of one-half-inch-diameter aluminum tubing spaced about 3 inches. A flexible section of line, a few feet long, connects the rotating horizontal transmission line to the fixed vertical transmission line supported by the tower. The flexible section has as conductors the inner wires of RG-8/U cable, spaced 1 inch. The foam insulation is left in place on the stranded wires. Matching and conversion to coaxial line can be done at the transceiver end with a tank coil and coaxial-line link. Mode changing can be accomplished with switches or relays.

Flexible twin-line can be used as transmission line, throughout, instead of the aluminum tubing with the flexible-section arrangement described above. The high-power TV-type 300-ohm twin-line, or the high-power RG-86/U 200-ohm twin-line are suitable, although the small receiving TV-type 300-ohm twin-line can be used if the greater loss is acceptable.

Another method of feeding, which is simple and efficient, is to install a 2-conductor-to-coaxial-line (balance-to-unbalance) converter at a convenient location near the base of the tower. An arrangement which has proven effective is sketched in Fig. 5. A 6-foot trombone section, with shorted lower end, is made to slide over the end of the aluminum 2-conductor line. Adjustment of the trombone position and tap height (H) result in a very low SWR on the coaxial line and provides complete balance-to-unbalance conversion. This trombone feed is convenient on 6, 10, and 15 meters. In mode III, on 40 and 80 meters, the short-circuit on the trombone may be omitted, resulting in very broadband response, but with the possibility of some unbalance. In mode IV on, 80 and 160 meters, the antenna can be fed by grounding the outer conductor of the coaxial line at the tower base, and connecting the inner

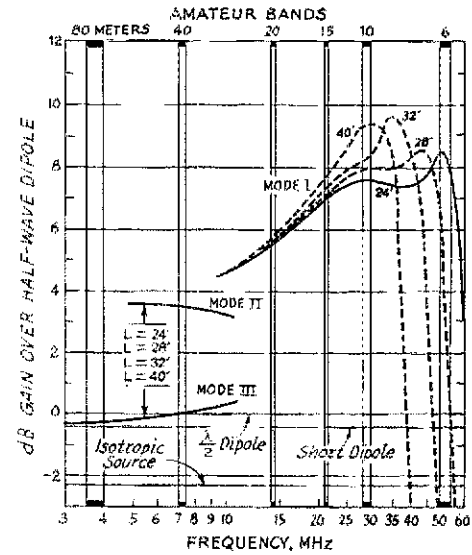


Fig. 3 — Gain of antenna over half-wave dipole, both antenna and reference in free space.

[2] J. H. Richmond, "Coupled Linear Antennas with Skew Orientation," I.E.E.E. Transactions on Antennas and Propagation, Sept. 1970.

[3] Kraus, "Antennas," McGraw-Hill Book Co., New York, 1950, Chap. 11.

conductor to the vertical transmission line. If the tower is grounded a matching network will be required. However, if the tower is insulated, and the guys are non-metallic, or are of steel and are broken up with insulators, the tower can also be connected to the inner conductor without a network, although a reactance in series with the inner conductor may be required, depending on the tower height.

The impedance bandwidth of the antenna depends on the type of feed used. The shorted trombone arrangement results in the smallest bandwidth, but provides the best balance and highest efficiency. On 6, 10, and 15 meters the bandwidth is adequate for most amateur applications. When using the tank coil and link type of feed the bandwidth is of less importance since the antenna can be retuned at the transceiver location.

On 40 meters one has the option of using the antenna in modes II or III. Mode II provides more gain, but mode III has a much greater bandwidth. On 80 meters one has the option of using modes III or IV. In mode III the rotatable dipole may give little or no directional effect if communication is by high-angle radiation.

When operating the antenna in mode I, it is a completely balanced system. The driving-point impedances of all elements are identical. Hence, if the transmission lines are symmetrical and of equal length, each element will radiate the same power and will contribute equally to the antenna gain. This is not the case in an array with parasitic elements, nor would it be true for this driven array if it were turned so that the 32-foot boom were vertical, and the elements were horizontal. The antenna is also a completely balanced system in modes II and III. Ohmic loss on the transmission line is minimized by using large-diameter conductors and only a few insulators. Radiation loss will be small if the line is balanced, which will be the case if symmetry is achieved. If the nulls to the side (90 degrees from the main lobes) are sharp and deep it is an indication that there is good balance. Such nulls should be present on modes I, II, and III.

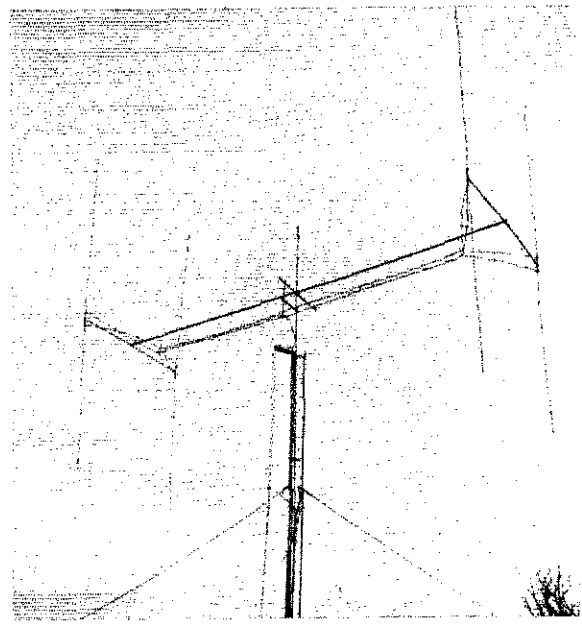


Fig. 4 — Experimental antenna at W8JK. Photograph retouched to show detail.

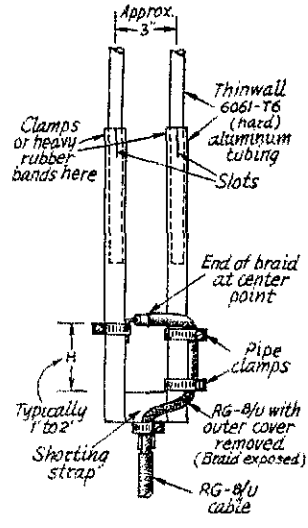


Fig. 5 — Trombone arrangement for converting from coaxial cable to balanced 2-conductor line. (Drawing not to scale.)

TABLE I

Gain and Beamwidth Data*
L = 24 ft.

Band (Mtrs.)	*Mode*	*Gain (dB)*	*Vert.*	*Horiz.*
6	I	8.4	29	18
10	I	7.6	56	30
15	I	7.0	60	39
20	I	5.4	62	54
40	II	3.4	70	95
40	III	-0.1	360	85
80	III	-0.3	360	88

*Gains are with respect to a half-wave dipole, both antenna and reference in free space. Beamwidths are between half-power points of the main lobes with the antenna in free space.

Gain and Front-to-Back Ratio

Regarding forward gain and front-to-back ratio, it should be noted that the two are not necessarily related, and for the W8JK antenna it would be more appropriate to speak of the front-to-side ratio. To achieve gain, the response of an antenna is enhanced in a given direction-or directions-at the expense of its response in all other directions. Therefore, an antenna with a given gain and a high front-to-back ratio, and another antenna with the same gain, but unity (zero dB) front-to-back ratio, must have low responses over a similar angular extent (solid angle in the 3-dimensional sense), although not necessarily in the same directions. This means that the antenna described here will provide good signal rejection over about the same number of degrees as a unidirectional antenna with the same gain, although not in the back direction. This is illustrated in Fig. 6.

The unity front-to-back ratio of the antenna makes it ideal for observing around-the-world echoes of your own signals. For example, these are observed frequently on 15 meters at certain times of the day, and for certain paths. These short-delay echoes provide a simple, quick way of checking to see if your signals are getting out, and for finding what paths are open. The measured delay time is close to 0.14 seconds.

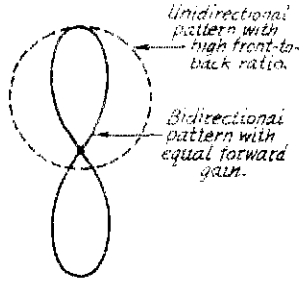


Fig. 6 — Pattern of unidirectional antenna compared with pattern of bidirectional antenna of same gain.

Constructional Details

The 34-foot vertical elements in the experimental model are made of 3/8-inch-diameter aluminum tubing, although 7/16 or 1/2 inch might be more suitable. The weight of each 2-element unit, with cross boom, is 4 pounds. The 32-foot main boom is made of 1.25-inch-diameter aluminum tubing. The weight of the main boom plus transmission line is 16 pounds, making the total weight of the rotating antenna system 24 pounds.

The purpose of this article is not to give detailed construction data for the antenna, but rather to describe an experimental model which gives promise of providing another approach to the design of multiband rotary antennas.

Performance

The antenna has been operated in all modes, and on all bands mentioned, except 160 meters. The performance as a DX antenna on 10, 15, 20 and 40 meters is excellent. I am indebted to many amateurs on all continents for their help and cooperation in giving me critical signal reports and performance comparisons. The information from Professor Jack Blackwell, W5RGP, regarding RG-86/U 2-conductor line, is much appreciated. I am also indebted to Dr. Bob Dixon, W8ERD, and Gene Hartquist, W8JTZ, for providing station equipment and assistance for testing the antenna on 6 meters. QST

NEW BOOKS

Amateur Radio Circuits Book, published by the Radio Society of Great Britain, 35 Doughty Street, London, W.C. 1, 5½ X 8¾ inches, 120 pages, soft cover. Price: $2. From Comtec, Box 592, Amherst, NH 03031.

Need a circuit for a transmatch, preamp, or power supply? The RSGB's handy little book of simple circuits may have just the one you are looking for. Over 200 circuit ideas, most of them the "tried-and-true" favorites of hams around the world, have been compiled by G6JP. Some of the designs use tubes while other circuits are transistorized. Comtec, the U.S. distributor of RSGB publications, includes a conversion chart that lists American equivalents for the European types of tubes and semiconductors shown in many of the circuits.

It would be impossible in a short review to list all the different designs contained in this book. In the section on receivers alone, there are schematic diagrams for five preamplifiers, fourteen converters, fifteen ideas for improving i-f selectivity, four S-meter circuits, fourteen detector designs, and eight noise-limiter suggestions. The format is the same in each case — a schematic diagram, parts list, and, in some cases, a layout sketch. No written text is included on the construction or alignment of these projects. Obviously, this book is intended for the experienced builder who needs only a schematic diagram to get under way in his workshop. Most of the circuits in this book have been published before; unfortunately, no references are given to help the reader find the original articles for additional information.

Other subjects covered include test equipment, transmitters, transmitting accessories, linear amplifiers, keyers, and T-R switches. Most of the designs are for the hf amateur bands, but a sprinkling of vhf and uhf "goodies" are included. The book has no table of contents, but the index will help the reader to locate any particular circuit quickly. *WIKLK.*

Strays

Stolen Equipment

Sometime on May 11 someone stole my Swan 500C, Serial No. 1491940 from my 1964 Chevrolet hardtop. Also taken was the microphone. Anyone with information is requested to contact Patrick A. O'Bryan, 4541 W. 163rd St., Lawndale, CA 90260, Tel.: 213 370 5234 (home), 213 354 6348 (work).

The '70 Communicator

Updating a Popular VHF Transceiver

BY DOUGLAS A. BLAKESLEE, *WIKLK

THE Gonset Communicator was one of the most-popular commercially-built vhf rigs ever sold. It was a good combination of size and weight that could be operated as a home station, or used portable and mobile. Gonsets were the workhorses for many a Civil Defense outfit, and they even had their effect on ham lingo with expressions such as "you're closing the eye here OM." Today the Communicators are available at many used-equipment outlets at attractive prices. However, many have been beaten up by years of mobile or other heavy use. The following article describes the rehabilitation and modernization of a 2-meter Communicator II. The same ideas can be applied to models I and III, as well as the 6-meter units and other equipment of similiar vintage.

The author obtained his unit for a next-to-nothing price. The cabinet was missing and the sub-chassis were reportedly not working. Yet, these three heaps of dust (they were black with many years' accumulation of dirt) were the basis of the transceiver shown in the accompanying photographs.

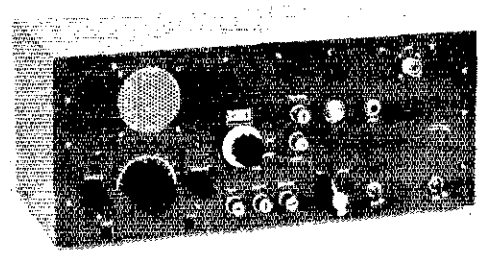
The first order of business was a general cleaning. During this process one cracked, burned resistor was found and replaced, which proved to be the reason why the unit wasn't working. The controls and variable capacitors were each given a shot of contact cleaner. The sub-chassis were then connected together and tried. The transmitter put out less than one watt, and the receiver produced only barely-audible results on a 100-uV test signal. But, it was working! Testing tubes by substitution turned up three week ones in the receiver and one bad in the transmitter. Then, the actual modifications were started.

The Receiver

Aligning the receiver brought the sensitivity up to a useable level with the new tubes. The receiver section must be turned up on its side to be aligned, as the i-f transformers have slug adjustments on both the top and bottom of the cans. The front end alignment and oscillator tracking should be set carefully. After peaking, a 0.3-uV signal was audible – not bad in the Communicator's day, but a long way from what can be accomplished today using modern transistors.

A small FET "preamp" was built from a design in the 1970 ARRL *Handbook*.[1] This preamp was intended for use with converted commerical fm gear, but it is just the right size to mount on the rear panel of the receiver. A low-cost plastic JFET is used in a neutralized, grounded-source circuit. The unit is built on a 2-3/8 X 1 X 3/8-inch etched circuit board.[2] Input and output connections to the preamp are made with RG-174/U subminature coaxial cable.

The input and output coils, L1 and L3, (Fig. 1) are adjusted for maximum gain. L1 should be set at 144.5 MHz and L3 at 146 MHz for equal gain across the band. The neutralizing coil, L2, should be adjusted for best signal-to-noise ratio, consistent with stability. The preamp has but moderate gain, so it does not detract from the receiver's strong-signal-handling capability. However, with the preamp in the circuit signals of 0.1 uV or less can be copied, and stations that were barely audible before, become comfortable copy.



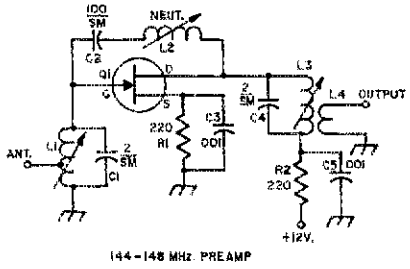
A homemade cabinet replaces the orignal Gonset enclosure. The front panel was spray painted dark blue, while the rest of the cabinet was given a coat of light gray, thus giving a modern appearance. The mike and antenna connections were brought out to the front panel for easy access.

In the late '50s and early '60s several vhf transceivers popularized the 6- and 2-meter bands. The Gonset Communicator and the SCR-522 were the most celebrated of these rigs. This article describes improvements to the modulation, power output, and sensitivity of an old Gonset II.

* Assistant Technical Editor, *QST*.

[1] *Radio Amateur's Handbook*, 1970 ed., chapter 19, p. 504.

[2] Etched boards for the preamp and speech clipper are available from Stafford Electronics, 427 S. Benbow Rd., Greensboro, NC 24701. The speech clipper board, No. 6-70A, is priced at $2.00, and the preamp, 1970-3, $1.50. Stafford also offers kits of parts (including the etched board) at $26.00 for the speech clipper and $7.50 (less coil forms) for the preamp.



1A

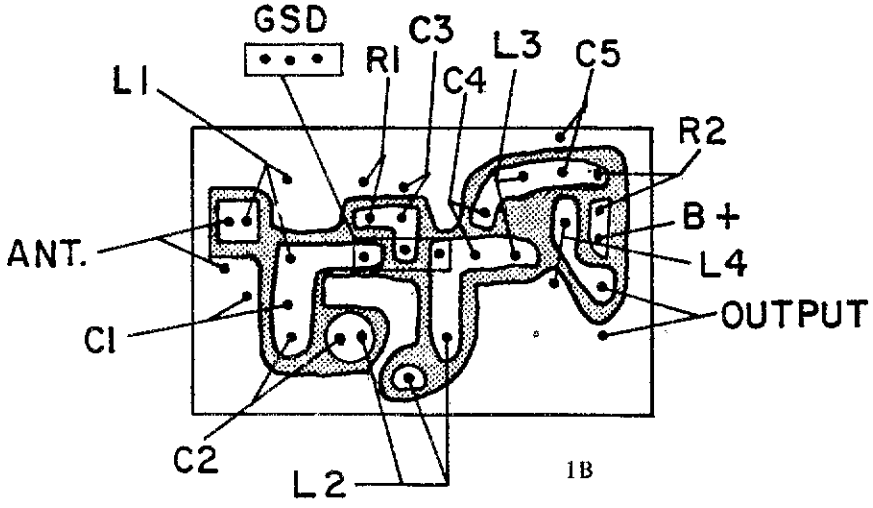
Fig. 1 — (A) 2-meter FET preamp. Resistors are ½ or ¼ watt. Capacitors marked SM are silver mica, others are disc ceramic. Parts not listed below are labeled for circuit-board reference. (B) Etched-circuit-board layout showing parts placement.

L1, L3 — 5 turns, No. 26 enam. wire, close-wound on J. W. Miller form 27A013-5. L1 tapped 1¼ turns from the ground end.

L2 — 9 turns, No. 30 enam. wire, close-wound on Miller 27A013-2 form.

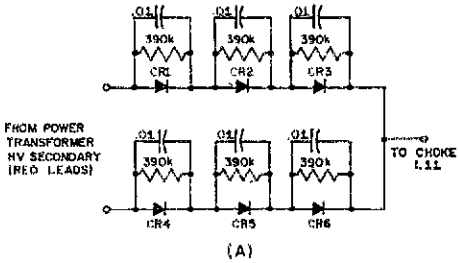
L4 — 1½ turns of No. 30 enam. wound over the bottom end of L3.

Q1 — MPF102, 2N5486 (MPF107).

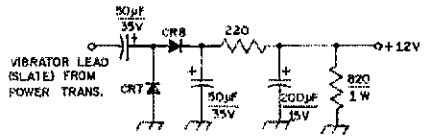


1B

Fig. 2 — Power-supply modifications to add solid-state rectifiers (A), and a 12-volt dc supply (B). Resistors are ½ watt. Capacitors with polarity markes are electrolytic, others are ceramic. Diodes CR1 through CR6 are 600-volt PRV, 400 mA; CR7 and CR8 are 100-volt PRV, 400 mA.



(A)



(B)

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=1000 000.

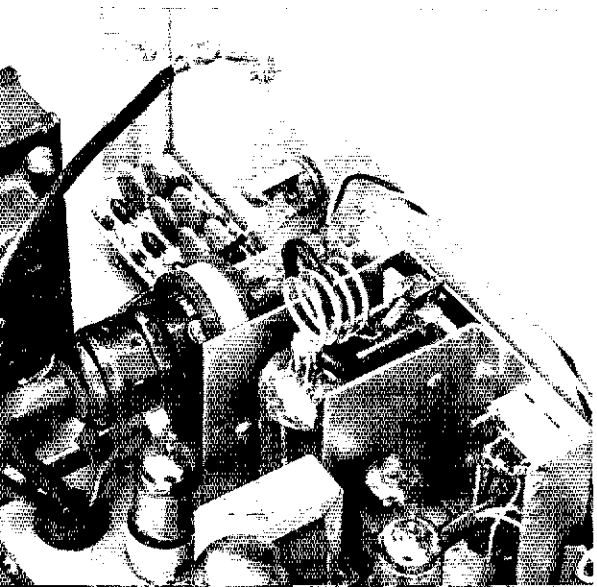


Fig. 3 — The new tank coil is visibl e just above the final tube. The output link is made from hookup wire, covered by a piece of spaghetti to insure the heat of the tank coil does not melt through the wire's insulation. The etched board containing the new solid-state rectifier assembly is at the top left, behind the "eye" tube.

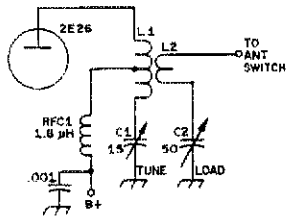


Fig. 4 — Modifications to the tank circuit. C1 is a Hammarlund HF15B, and C2 is a Hammerlund MAPC50B. L1 consists of 4 turns of No. 10 tinned wire, 3/4-inch dia., 5/8-inch long, with the B-plus tapped at 2 turns. The output link, L2, is a single turn of hookup wire with extra insulation added. RFC1 is a Millen 34300-2.7 two-meter choke.

The receiver selectivity isn't too good, and no simple modification is going to improve it much. One trick used by many vhf operators is to push a piece of hookup wire down inside one of the i-f tube's shields. The wire is connected to a general-coverage communications receiver. This receiver than can be tuned around 6 MHz, the Gonset's i-f frequency, spreading out stations that were QRM-ing each other on the Gonset receiver.

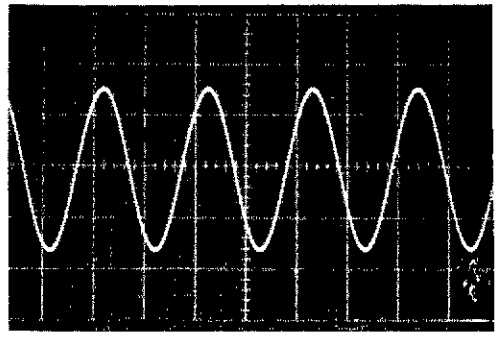
Power Supply

Several changes were made in the power supply, as shown in Fig. 2. Higher voltage was desired for the transmitter, and 12 volts dc was required for the receiver preamp and speech clipper. The 6X4 rectifiers originally used were replaced with silicon diodes. These rectifiers, with paralleled resistors and capacitors for transient protection, were mounted on a small etched-circuit board. The high voltage was raised some 50 volts, which was desirable for the transmitter, but not on the receiver, which already ran hot. A 1500-ohm, 5-watt resistor was added in series with the B-plus lead feeding the receiver, to reduce the voltage. This resistor is mounted on the rear deck of the transmitter, next to the receiver power socket.

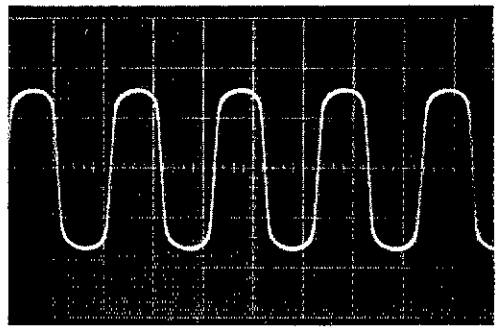
This Gonset had a 6-volt vibrator supply for mobile use. As 6-volt automobiles are now about as obsolete as the horse and buggy (and the unit doesn't lend itself to a 12-volt conversion) the vibrator section was removed. The vibrator winding on the power transformer is used with a voltage-doubler rectifier to provide the required 12 volts dc. For appearance sake, an aluminum plate was bolted over the holes left in the chassis by the removal of the rectifier and vibrator sockets.

The transformer slate-colored lead, which was connected to the vibrator (be careful not to confuse it with the high voltage leads), is run to the input of the doubler. The output filtering on the high voltage wasn't sufficient, resulting in some hum on the carrier, and in the receiver. An additional 40-uF, 450-volt electrolytic capacitor was added across the B plus, reducing the ripple to an acceptable level.

An inverter is used to power the completed Communicator '70 when operating mobile.



(A)



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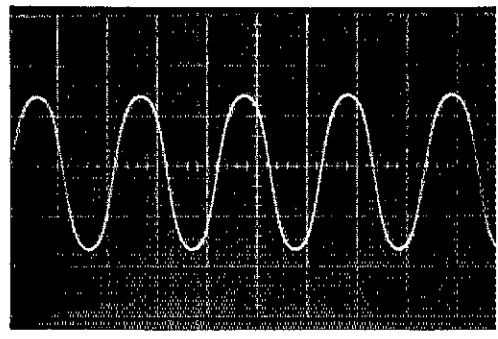


(C)

Fig. 5 — Waveforms obtained with the speech clipper using a 1100-Hz test signal. (A) Input signal, (B) output of the clipper showing moderate clipping, and (C) output after filtering.

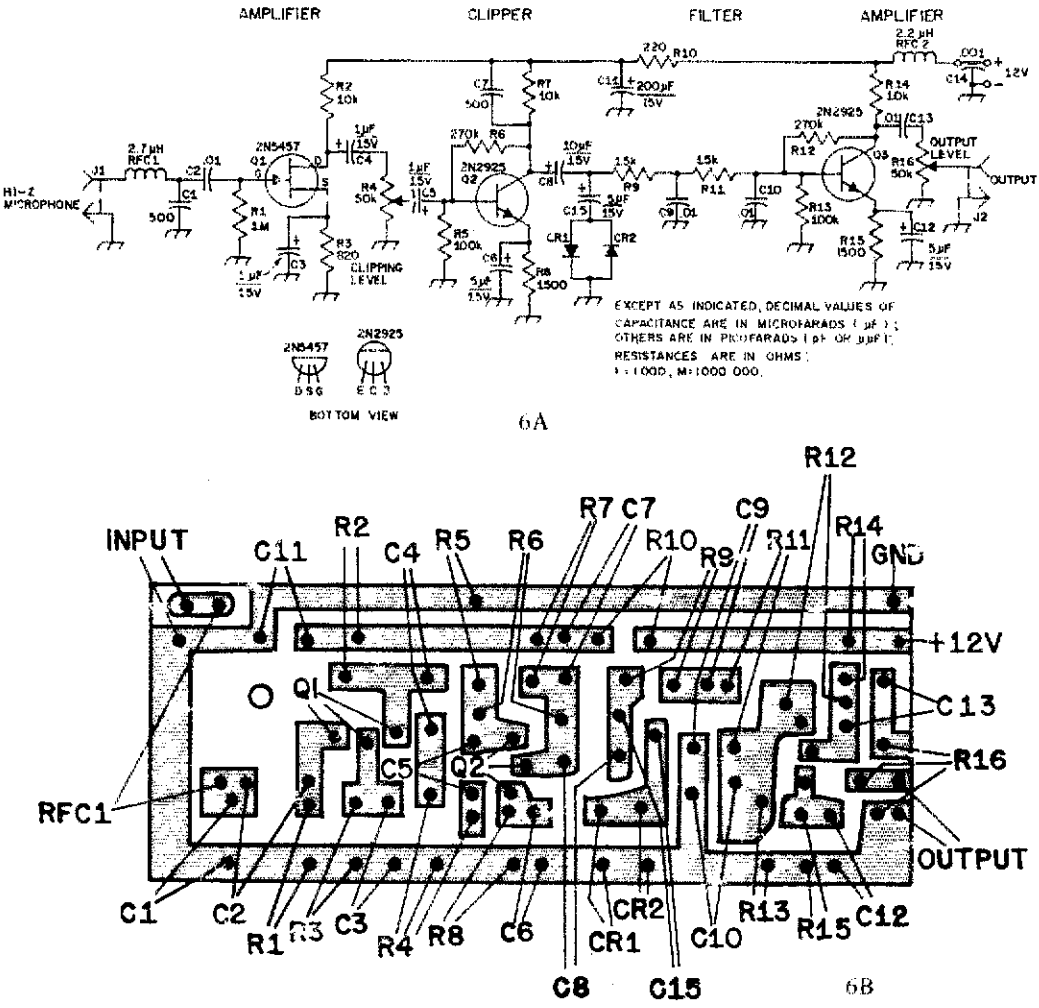
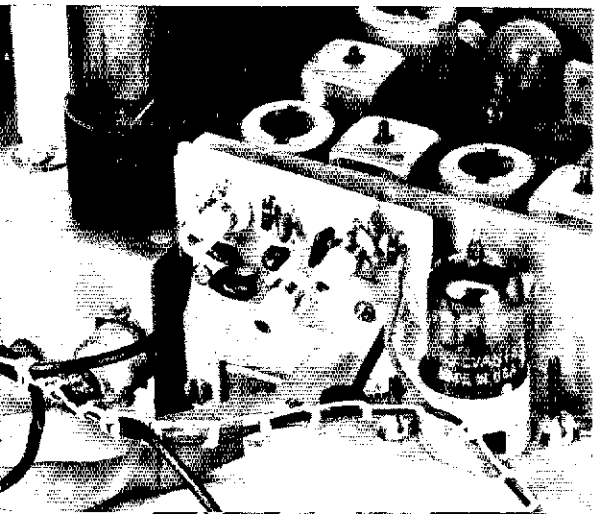
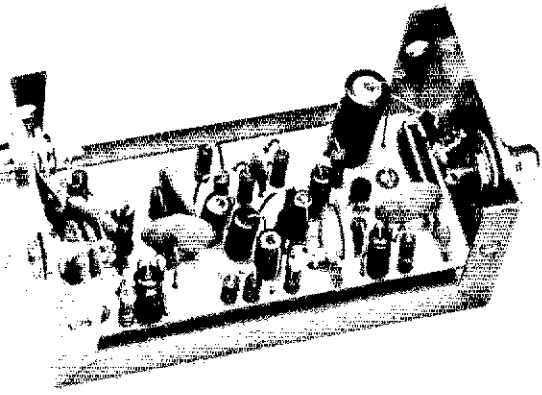


Fig. 6 — Speech-clipper diagram (A), and board layout, (B). Resistors are ½-watt. Capacitors with polarity marks are electrolytic, others are ceramic. Parts not listed below are labeled for circuit-board reference.

C14 — Feedthrough type.
CR1, CR2 — Silicon, 50-volts PRV or more.
J1, J2 — Phono type.
R4, R16 — Linear-taper control (Mallory MTC54L1).
RFC1 — Two-meter choke (Millen 34300-2.7).
RFC2 — Subminiature choke (Miller 70F226A1).



The FET "preamp" assembly is mounted on the rear deck of the receiver, just above the original front-end stage. A cable harness connects up the various modifications made to the Communicator.



The speech clipper is mounted in a Minibox. Complete shielding is necessary to keep rf out of the low-level audio circuits. The completed clipper assembly is mounted on the rear of the new cabinet.

The Transmitter

A number of troubles plagued the transmitter. The strangest was that, when first switched on, the transmitter had no output. Slowly the output would come up to about 4 watts. A coupling capacitor – C5 on the Gonset diagram – that connects the oscillator to the first doubler proved to be the gremlin. Replacing this capacitor resulted in full output the minute the transmitter was turned on.

Several of the tuning capacitors were intermittent, and one had a frozen shaft. No amount of cleaning improved the situation, so the faulty components were replaced. Hammarlund type MAPC were used. The original tank circuit was anything but efficient, and it didn't provide sufficient attenuation of harmonics. The harmonic problem was apparent when viewing a nearby television set. The output circuit was removed and replaced with the components shown in Fig. 4. A series-tuned, link-coupled tank is employed, providing easier tuning and better efficiency.

Tuning capacitor C1 must be modified slightly to fit in. The nut holding the mounting foot is loosened, the mounting foot rotated 180 degrees, and the bolt tightened again. The foot then provides a mount for the tie strip that holds the B-plus connection to the final tank. The coil is a good deal larger than the original, which is not a problem with the new cabinet. It could be a problem if the old Gonset case were used, however. Check this coil's position after the transmitter is mounted inside the cabinet to insure it is not touching the top of the housing.

The changes to the tank circuit, plus the additional plate voltage picked up in the changes to the power supply brought the transmitter output up to 10 watts, and eliminated the TVI problem.

Speech Clipper

The Gonset was designed for use with a carbon microphone. Although a high-impedance input was provided, most microphones don't have enough output to fully drive the modulator. A speech amplifier, with a clipping feature, was added to provide additional gain, plus clipping the speech to provide a higher average level of modulation. A well-modulated signal is necessary if the other fellow is going to be able to copy you when your signal is weak, and speech clipping helps.

The speech amplifier uses an FET as the first amplifier providing a high-impedance input that allows the use of any of the popular crystal, dynamic, or ceramic microphones. A second stage of amplification is used to drive the clipper, which consists of two back-to-back silicon diodes. The audio harmonics produced in the clipping process are filtered out by a double *RC* section. A third amplifier stage, Q3 is used to bring up the output of the clipper. The gain before the clipper is quite high, and may be higher than necessary for some microphones. If this proves to be the case, C3 and C6 may be left out of the circuit, reducing the gain of Q1 and Q2. Operation of the clipper is not affected by these changes.

The action of the clipper is shown in Fig. 5. The unit is assembled on an etched-circuit board, and is mounted in a small Minibox to shield the circuit from the output tank. RFC1, RFC2, C1, C7, and C14 are all filtering to insure rf does not get into the amplifier, and they are *necessary*. If the speech clipper is to be used with a transmitter on some other band, appropriate values for filtering should be chosen for the frequency of operation.

Adjustment of the clipper is best done with a scope connected to monitor the modulation envelope of the Gonset, although this is not absolutely necessary. The modulator in the Communicator does not permit 100-percent modulation – about 85 percent is the best you can get. To adjust the clipper, the audio gain control on the rear of the transmitter deck should be set for about half gain. With a test signal fed into the speech clipper, R4 should be turned up until a further increase produces no additional output. Then adjust R16 for maximum modulation on the Communicator. Be sure not to overdrive the modulator, as this will produce distortion and splatter – not additional audio. Then set R4, with the microphone you are going to use, for moderate clipping. The advantage of the clipping circuit is that once you have set the transmitter modulation level, increases in input produce more clipping, not splatter.

As mentioned before, the Gonset cabinet was "long gone." A simple housing was made up with the front and back panels being L-shaped bends of sheet aluminum, with a U-shaped piece for the top. The subchassis were mounted in a row, giving a low-silhouette appearance. A microphone jack was added to the front panel for easy access. A set of modern knobs completed the job.

The finished unit works far better than the orignal Gonset, and is a pleasure to use. With the modifications described, it should be possible to get another decade of use from the old rig before considering a replacement. QST

A Silicon-Diode PIV Checker

BY WILSON DOTY, *WA4DID

BECAUSE surplus silicon diodes can be purchased at a very low price, they are a very good buy even if a high percentage of them are defective. The dealer from whom I purchase diodes is very reliable, but occasionally I receive defective or substandard units. The time to spot these diodes is *before* they are assembled into a rectifier string, not after voltage is applied and the string breaks down.

Fig. 1 is the circuit diagram of the diode checker. R12, a rheostat in the primary circuit of T1, is used to control the output of a voltage doubler. M1, a 0-1-mA meter in series with the output of the power supply and the diode to be tested, indicates reverse current through the diode. An external voltmeter is used to measure the voltage at which the diode reverse current starts to avalanche. The accuracy of the measurement is determined primarily by the accuracy of the voltmeter used with the gadget. Because T1 has a 600-volt secondary, PIV ratings up to about 1700 volts can be checked with the tester.

Since no more than a milliampere or so of current is ever demanded from T1, this transformer can be the smallest 600-volt job you can find. Although your junk box may not contain the oil-filled capacitors suggested for C7 and C8, I do not recommend the substitution of strings of electrolytics for these two capacitors. A voltage-equalizing resistor is required across each electrolytic when several capacitors are connected in series, and additional current is drawn from the transformer. In R12 this current increase is multiplied approximately by the turns ratio of the transformer and might tax the current-handling

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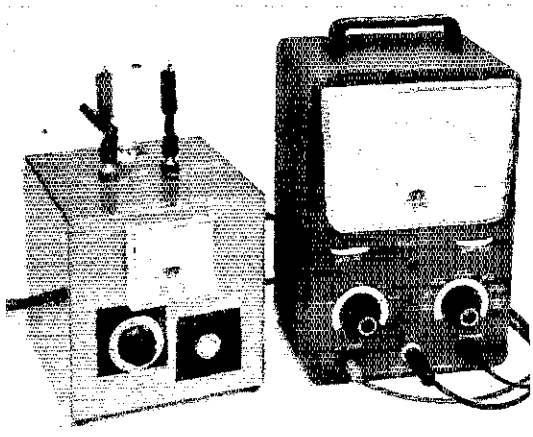


Diode tester and VTVM setup to check the PIV rating of a silicon diode.

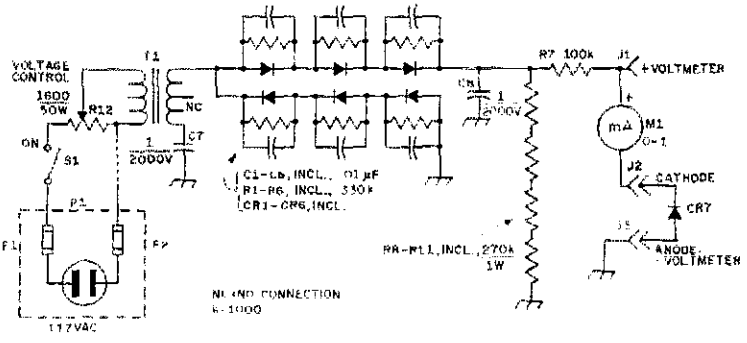
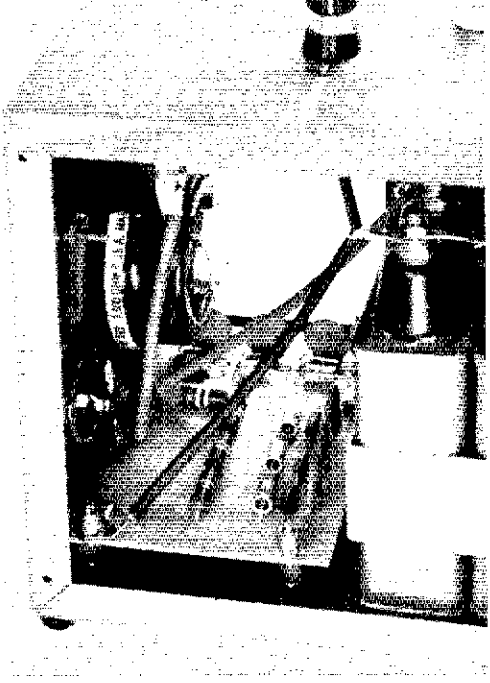
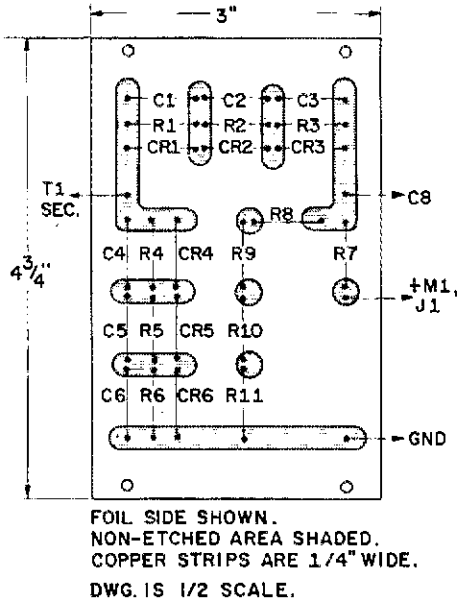


Fig. 1 — Schematic diagram of the silicon-diode PIV checker. Except as indicated, fixed resistors are ½-watt composition. Capacitance values are in uF.

C1-C6, inc. — 1000-volt disk ceramic.
C7, C8 — 2000-volt oil-filled capacitor (Fair Radio Sales Co.).
CR1-CR6, inc. — 800-PIV silicon diode (1N3196).
CR7 — Silicon diode to be checked.
F1, F2 — ¼-ampere fuse.
J1 — White binding post (E. F. Johnson 111-301).
J2 — Red binding post (E. F. Johnson 111-302).
J3 — Back binding post (E. F. Johnson 111-303).
M1 — 0-1 dc milliammeter.
P1 — fused plug.
R12 — 50-watt rheostat (Ohmite 0327).
S1 — Spst toggle.
T1 — Power transformer: 600 volts, center-tapped, current rating unimportant (Knight: Allied Radio 54 A 3704).



A side view of the silicon-diode PIV checker. The bracket used to mount the capacitors at the right is homemade from a piece of scrap aluminum.

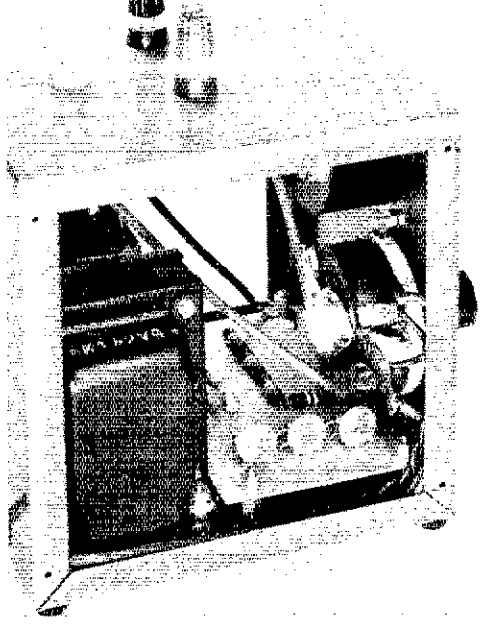


FOIL SIDE SHOWN.
NON-ETCHED AREA SHADED.
COPPER STRIPS ARE 1/4" WIDE.
DWG. IS 1/2 SCALE.

Fig. 2 — Circuit board layout. See Fig. 1 for component values.

capabilities of the potentiometer. However, the capacitance ratings of C7 and C8 may be reduced considerably without a serious sacrifice of output voltage, since the normal load on the supply is quite light.

The bleeder resistors, R8 through R11, may be omitted if a 1000-ohms-per-volt voltmeter is used.



A look at some of the innards of the diode tester. The rheostat at the right may seem to have a much higher wattage rating than the checker circuit requires. It doesn't though; R12 is the lowest-wattage unit that can be used without having its power rating exceeded when the control arm is near the maximum output setting of the rheostat.

These resistors are included only to quickly discharge C7 and C8 when R12 is turned to zero output. In any event, when employing the PIV checker, it is wise to use caution when connecting or disconnecting a diode. A 1-mF capacitor, charged up to a thousand volts or more, can be dangerous.

Construction

Referring to the photographs, the silicon diode PIV checker is built in a 6 x 6 x 6-inch aluminum utility cabinet (Bud AU1039HG). As shown in Fig. 2, most of the smaller components used in the tester are mounted on a 3 x 4 3/4-inch etched circuit board. One-half-inch threaded spacers are used to raise T1 and the circuit board above the floor of the cabinet. T1 is mounted in this fashion because the leads of the transformer used exit from the bottom of the transformer case. A homemade bracket is used to hold C7 and C8 in place. A sheet of spongy material between the capacitor nearest the back of the cabinet and the rear wall of the cabinet insures a snug mounting.

Operation

To use the checker, turn R12 to its zero voltage position and connect a voltmeter as indicated in Fig. 1. Of course, the voltage range of the voltmeter should be greater than the assumed PIV rating of the diode to be checked. When connecting the diode (CR7) to the checker, be sure the anode of the diode goes to the *negative* (chassis)

(Continued on page 90)

Power-Line Interference

Its Causes and Methods of Location

BY ROBERT G. HOLLOWAY,* W4USQ

NOTHING can be more exasperating to the amateur than to be plagued with persistent power-line interference. Severe cases may completely blanket the radio spectrum with a racket best described as a high-pitched buzz saw.

When this happens to you don't wring your hands in despair and "give up the ship." Power companies have learned a great deal in recent years about the techniques of locating and eliminating undesired radiation from their lines. Since one of the author's primary duties as a power-company field engineer is the location and elimination of line noise, he can assure the distraught amateur that the power company is most willing to cooperate and to promptly cure cases of power-line interference.

So, when you have a problem and have determined that it is probably a line problem, place a call to the engineering department of your local power company. Detailed information on your particular case of interference can be most helpful to the engineer who will try to locate it. Be sure to include the frequency on which the noise is strongest, time of day the noise occurs, and a description of the interference — high pitched, tearing, buzzing, popping, etc. If you have a beam antenna and can determine from which direction the noise is strongest, this will be most helpful, also. This information is used by the engineer much in the same way that a patient's symptoms are used by a physician to diagnose a patient's ailments. The more detailed and complete the information, the better.

At this point it might be well to point out some of the various causes of power-line interference. The high-voltage (or primary) conductors are separated from the pole or cross arm by an insulator. This insulator acts as the dielectric material between the conductor and crossarm or pole, forming a capacitive network. Because of this capacitive effect, a potential is coupled to the pole's metallic hardware. If this potential discharges through the air or some contaminant on the insulator, severe power-line interference results.

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Interfering electrical noises are generated by many sources — among them, the power line. This article reviews the causes and characteristics of power-line noise. But since the line is only one of many possible culprits, the amateur also should review Nelson's articles on electrical noise that appeared in QST, April and May, 1966, before calling the power company.

Each piece of hardware on the pole — crossarm braces, steel pins, guy wires, etc. — has a natural resonant frequency. If a potential discharges to or from these metallic components, a signal is generated consisting of fundamental and harmonic frequencies.

Power-line noise normally arises from one or more or five major factors:

1) Loose connections in the primary or neutral circuit.

2) Loose tie wires (they hold the conductor to the insulator) on the primary.

3) Defective primary insulators.

4) Defective lightning arresters.

5) Loose hardware on the pole or ungrounded hardware in close proximity to a grounded item.

Loose connections on the primary allow corrosion and oxidation between the joints. The current flow in the primary must then arc through this oxide path. Severe electrical noise results.

Tie wires are also a major cause of line noise. Since this wire is wrapped around the primary conductor in a series of loops, a coil is formed and a voltage is induced in the tie wire. Loose tie wires result in an oxide buildup which discharges between the conductor and the tie wire. Unfortunately, many times the tie wire is insulated wire while the primary conductor is bare, or vice versa. Occasionally both tie wire and primary conductor are insulated. As time passes, the insulation deteriorates, and a small air gap is established through which voltage buildup on the tie wire may discharge. The tie wire and primary conductor should be mechanically and electrically bonded in order to prevent power-line noise. Oxide-discharge sources normally will not produce noise during rainy weather or when line components are wet. This is because the moisture alters the resistance of the wood involved and bridges the discharge gap.

Interference because of faulty insulators can occur in several ways: by a crack in the insulator, leakage paths caused by a contaminant such as dirt, salt, or moisture on the insulator, or by an insulator which is loose on its pin.

Lightning arresters are a common source of interference. Moisture or other contaminants in the arrester cause a spark discharge. Many times this type of interference is intermittent and quite difficult to trace.

"Hardware" noise also is quite common, and is perhaps the greatest cause of power-line interference. It is also the most difficult noise to pin down. Hardware consists of any metal items on the pole, such as nuts, bolts, crossarms, braces, washers, and staples. The hardware is located in the midst of intense electric and magnetic fields. The noise is usually intermittent and is caused by a corrosion film or a small air gap between two pieces of hardware. Abrupt arc-overs occur one or more times per half cycle. This results in a pulse with a great many harmonics, covering large portions of the radio spectrum. While locating the pole with the noise source might be comparatively simple, the location of the piece of hardware causing the noise is usually a tedious task. It might well be compared with looking for the proverbial needle in the haystack. It is usually only found after a great deal of prodding, prying and shaking of the source pole. This leads to a special word of advice: Be patient with the power company and the engineer seeking the source of your interference. Location of power-line noise sources is a painstaking task often requiring many days or perhaps weeks.

There are three means by which this energy travels to your receiver: radiation, conduction, and induction. Radiation occurs when the power lines act as transmitting antennas and send a husky signal into space. This energy also flows *along* the power lines, sometimes for many miles, through the transformer and into the receiver power supply. This is known as conduction. Induction is when the power lines carrying the interference are close enough to the antenna to couple the noise directly into the antenna system.

Each type of interference has its own characteristic sound. Familiarity with these sounds will be helpful in locating the source of noise. Some of the common sources of interference and their sounds are:

1) Corona: hissing.

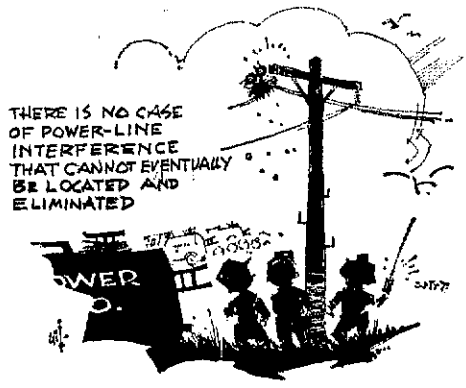
2) Faulty insulators: buzzing or raspy noise.

3) Hardware noise: popping, staccato, irregular.

4) Loose connections: frying, low-pitched static.

Most power companies' interference-locating equipment consists of a receiver with coverage from 550 kHz to 220 MHz. The receiver is equipped with a loop antenna and a field-strength meter. A calibrated field- or signal-strength meter is essential since the amplitude of one noise peak cannot readily be distinguished from another by ear.

As the source of interference is approached, the amplitude of the noise will increase. However, sharp nulls will be observed, and after each null the next peak will be greater. In the source area, the nulls will disappear, and a broad-amplitude peak will be apparent. The broad peak area will normally cover a hundred yards or more. As this broad peak or source area is passed, the nulls become apparent once again. Each peak then diminishes until normal background noise level alone is heard.



In the immediate source area, amplitude measurements of the fundamental frequency would be impractical. However, within this area the amplitude of the harmonic radiation increases as the source of interference is approached. The higher the order of harmonic, the lower its level of signal strength. Thus, to narrow the search to a specific location in the broad peak area, you determine the spot at which the highest harmonic can be heard. This frequency usually falls between 180 and 250 MHz.

However, no piece of equipment now commercially manufactured will *exactly* pinpoint sources of noise radiation. Once the field has been narrowed, the components on each pole must be checked by the power-company lineman to find the culprit.

Although the normal procedure for locating power-line noise is to locate the area of greatest amplitude, the results can be misleading. Noise standing waves are established on the line. Sharp peaks followed by nulls will be found along the power line because of these standing-wave characteristics. Changes in line impedance change the standing-wave pattern which, in turn, can increase or decrease the interference voltage at any one spot. Impedance changes may be caused by the junction of an extension or lateral line with the main line, varying height of conductors above ground, taps on transformer primaries, and similar discontinuities. In other words, the pole which seems to transmit the greatest noise is not necessarily the pole from which the interference is radiating. Power-line interference is tricky, and no one procedure or theory can be relied upon 100 percent of the time. However, persistence pays off, and there is no case of power-line interference that cannot eventually be located and eliminated.

Your assistance and cooperation will prove to be an invaluable aid to the power-company engineer in locating the noise. However, one word of caution in closing. Often sources of line noise are hazardous. *Stay off the pole!* Leave the elimination of the noise to the power company, which has the equipment and know-how to cure power-line noise. Remember, they also want their lines clear! QST

• *Beginner and Novice*

The Ultimate Transmatch

BY LEWIS G. MCCOY, *W1ICP

SOME amateurs assume that because they use coaxial feed lines they don't need a Transmatch. This can be an incorrect assumption, and we'll try to show why in this article.

The Harmonic Problem

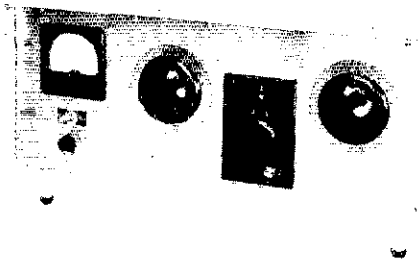
A large number of hams have found to their sorrow that the harmonic suppression in their transmitters may leave much to be desired. The FCC issues many citations to Novices each year for second-harmonic violations.

A typical Novice station might consist of a transmitter and receiver, with direct coax feed to a trap dipole or vertical antenna. In a properly adjusted transmitter of typical design, often there is insufficient attenuation of the second-harmonic energy. This can mean that the second harmonic of the signal can reach the antenna and be radiated. What is required to eliminate or reduce the second harmonic, and higher-order harmonics, is more selectivity between the transmitter and the antenna. A Transmatch is an excellent aid in taking care of the harmonic problem.

The 50-Ohm-Load Problem

Still another reason for using a Transmatch is because nearly all manufacturers of transmitters design their rigs to work into a nonreactive, 50-ohm load. Any departure from this load impedance causes difficulty in tuning and loading the final-amplifier stage. It might be pertinent to point out that simply because a ham uses 50-ohm coax, it doesn't necessarily follow that he will have a 50-ohm load. Basically, in order to have a 50-ohm load when using 50-ohm coax, the coax must be terminated in a 50-ohm *resistive* impedance. In other words, the antenna impedance must be 50 ohms.

Most hams would like to own a Transmatch that could cover 80 through 10 meters, and work during coax-to-coax or balanced-lines conditions. Here is just such a unit. It will match the proverbial bedsprings, or any other nonresonant or resonant antenna, and without plug-in coils or band switching — even on 160 meters.



The kW version of the Ultimate Transmatch. The knobs and dial counter are standard Millen components. The front bottom of the cabinet is tilted by means of two 2-inch standoff insulators used as feet.

When the terminating impedance of the coaxial cable is other than 50 ohms, then the transmitter will be "looking" at some value other than 50 ohms. It is practically impossible to design a single antenna that will have an impedance of 50 ohms on all of the bands a ham might want to use. One answer to the problem is to employ a device that will "match" the unknown load to the 50-ohm impedance required by the transmitter. One such circuit or device is a Transmatch. A Transmatch is simply an adjustable rf transformer that can match the unknown load presented by the transmitter end of the feed line to the required 50-ohm transmitter impedance.

Receiver Cross-Modulation

In addition to taking care of the problems just outlined, a Transmatch can serve another very useful function at the receiver. Some receivers are susceptible to what is known as cross-modulation, or front-end overloading, by strong nearby radio stations. This is particularly true on 160 or 80 meters when a broadcast station is nearby. The bc station overloads the front end of the communications receiver, causing "birdies" and other unwanted responses across the band. A Transmatch will eliminate or greatly reduce this problem in nearly all iinstances.

The Ultimate Transmatch

We shall describe two Transmatches – one for the Novice power limit, and another for the legal 2-kW PEP limit. We have found that many amateurs on the verge of taking their General, or higher-class licenses, would rather invest initially in a unit that will take care of all of their future needs.

* Novice Editor

Some years ago, [1] a Transmatch was described that was designed for use with coaxial feed lines. It was called "the 50-Ohm Transmatch." This particular unit handles mismatches on the order of 4 to 1. It can transform a load of about 200 ohms, or 12 ohms, to a 50-ohm impedance. The circuit of the Transmatch described in this article, Fig. 1, is similar, but with two notable exceptions. In place of a tapped, switched inductor, a variable inductor is used, the idea for this innovation coming from Al LaPlaca, K2DDK. The variable inductor is a coil wound on an insulated form that can be rotated so that a movable wheel shorts out and grounds the unused portion of the coil. Using the roller inductor, along with the two variable capacitors, the Transmatch provides an almost unlimited matching range, plus the feature of 80- through 10-meter coverage without band switching. With the values shown in the units, it is even possible to add one fixed capacitor to obtain 160-meter coverage.

The other exception is the use of a 1-to-4 (unbalanced-to-balanced) balun transformer on the output side of the Transmatch, which permits the use of balanced feed lines. This means that a Transmatch can cover 160 through 10 meters (including the MARS frequencies). It can be used to match into coaxial lines, random-length end-fed wires, or balanced feeders, and can do the job without using switches.

The two units shown in the photographs underwent extensive tests as to efficiency, power-handling capabilities, and methods of adjustment. In coax-to-coax tests, power inputs and outputs through the Transmatch were carefully measured while using Bird Thruline wattmeters and an adjustable dummy load. As carefully as could be measured, and with indicated mismatches of up to 15 to 1, the Transmatches showed an efficiency of over 95 percent. This small loss in efficiency more than outweighs the usefulness of the device.

Many tests were made with the high-power version to check heating of the roller inductor and the balun. Under a key-down condition, with 1200

[1] "The 50-Ohmer Transmatch," July 1961 *QST*.

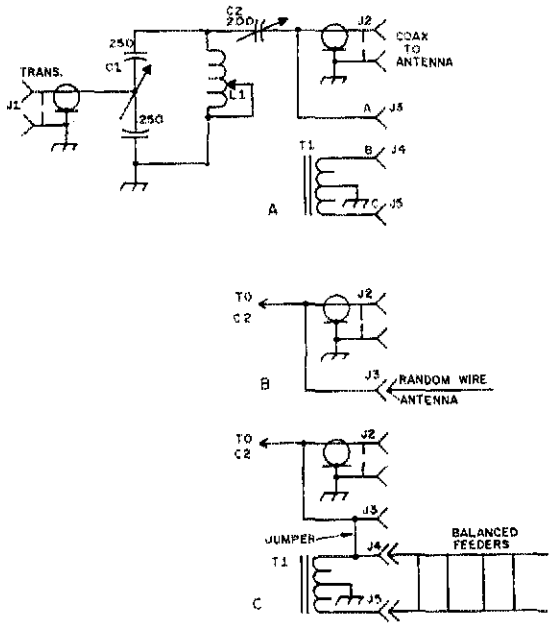
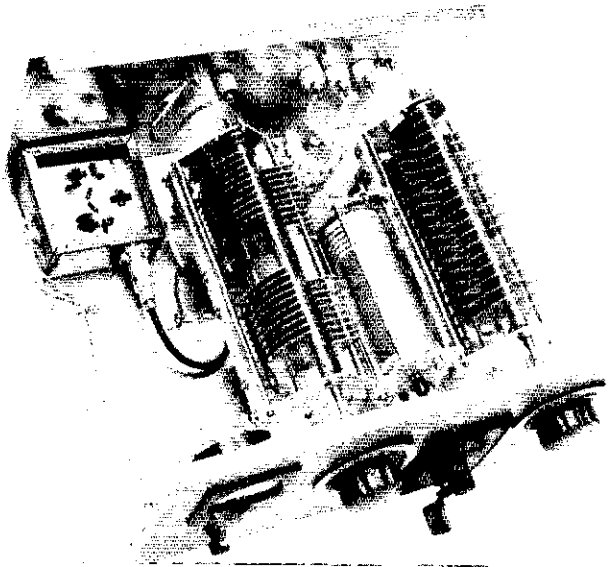


Fig. 1 — Circuit diagram of the Ultimate Transmatch.
C1 — Split-stator variable, 250 pF per section; see text. For low-power version, E.F. Johnson type 16250; or similar, for high-power version, Millen type 16250, or similar.
C2 — 200-pF variable, for low power, E.F. Johnson type 167-12 or similar, for high power, Millen type 16520, .171-inch spacing, 16520A, .077-inch spacing, or similar.
J1, J2 — Coax chassis fitting, type SO-239.
J3,J4,J5 — Feed through insulators.
L1 — Roller inductor, see text. If 160-meter operation is desired, total inductance should be 28 uH, E.F. Johnson type 229-203; otherwise, 18 uH is adequate, E.F. Johnson type 229-202.
T1 — 1-to-4 balun; see text for details, cores are Amidon type T-200-2.



At the rear of the roller inductor is the 1-to-4 balun. The balun is set on top of a standoff insulator and is held in place with a piece of insulated board and a screw. The fixed capacitor mounted on the rear wall is the 160-meter unit. Both the variable capacitors and inductor are mounted on 1-inch high standoff insulators.

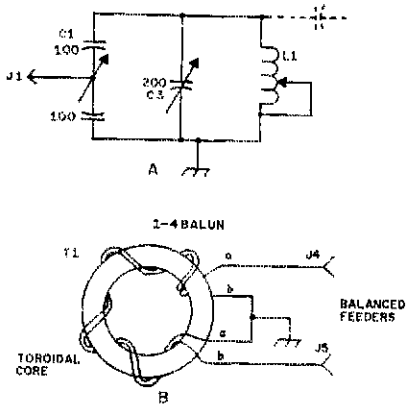


Fig. 2 – At A, details for padding a low-value variable for C1 by installing a second variable, C3, the same value as the low-power unit C2. In the case of tuning 160 meters, using an inductor of 28 uH for L1, and 250 pF per section for C1, a fixed capacitor of 100 pF can be used at C3, Centralab type 850-100N, or similar. At B, details for connecting the bifilar windings on the balun are given. The ungrounded leads a and b are connected to J3 and J4, the feed through insulator terminals.

watts indicated power through the Transmatch, the transmitter was kept on for 15-minute periods. In one test, the measured rf current through the coil was in excess of 15 amperes. The roller inductor used in the unit is rated at 5 amperes, so this was considered a fairly rugged test. The coil did get warm, but not enough to be a cause for concern. Keep in mind that in regular amateur work, 15 minutes would be a ridiculous figure for continuous operation.[2] In cw and ssb operation, the duty cycle would be in terms of seconds or even fractions of seconds.

The balun used for balanced operation in the high-power unit was made up from three Amidon 1-kW cores – more about that in a moment.

[2]Ed. Note: However, teletype operation would be continuous (to say nothing of those long-winded a-m operators!).

WIKLK, on our staff, has made extensive checks on a single-core balun, for use in an upcoming Transmatch article. It was found that a single core would easily handle 500 watts of power during severe mismatch conditions. Failure of the core, most likely due to saturation and heating, took place at the 700-watt level. In the high-power Transmatch shown here, three cores are used. They are wrapped with glass insulating tape and then wound with Teflon covered wire. Wire insulation material can be important because of the extremely high rf voltages that may be developed with some load conditions. In many tests of long duration, using up to 1400-watts output into a dummy load, it was almost impossible to detect any heating of the balun.

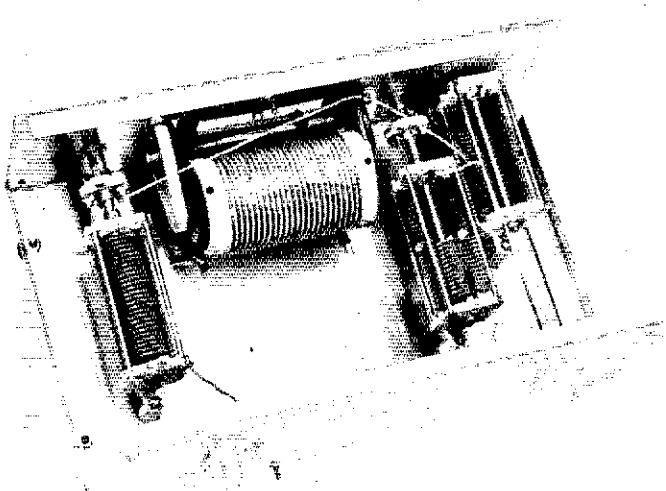
Bear in mind that the balun would only be needed if balanced-line operation were desired. For coax-to-coax or random-wire feed, the balun can be omitted.

Construction Information

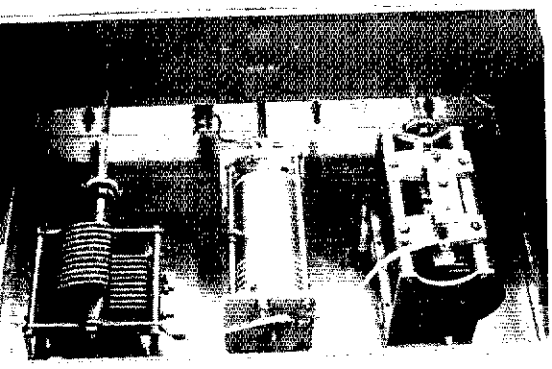
A look at Fig. 1, at A, will show that the circuit is a very simple one. The input line from the transmitter is connected to the rotor of C1, a split-stator capacitor. This means that the capacitor must be insulated from the chassis, using standoff pillars, and from the panel by means of an insulated shaft coupler. The same is true for C2. In the kW unit shown, we have installed a power bridge. Construction details are not given here for the bridge because such a unit was described in detail in a recent issue of *QST*[3] Also, many amateurs already have a Monimatch[4] or some other type of SWR indicator. An SWR bridge or matching indicator is needed in the 50-ohm line between the rig and the Transmatch to show when the Transmatch is correctly adjusted.

Layout of the components should follow the same arrangement shown in the photographs, C1 at the input side, the roller inductor at the center, and then C2. If a balun is going to be installed, allow enough room behind the roller coil for mounting the balun. In the two units shown, the

[3]"In-Line RF Power Metering," Dec. 1969 *QST*.
[4]*Understanding Amateur Radio*, page 209.



This is the low-power Transmatch. The salvaged roller inductor is mounted on the front panel, making use of the original mounting brackets.



Here is an inside view of the Ultimate Transmatch as made by Al LaPlaca, K2DDK, who came up the idea of using the roller inductor. The installation on top the right-hand capacitor is the home made 160-meter switch and fixed loading capacitor.

cabinets are made up from aluminum sheet stock. If desired, a commercial chassis and cabinet can be used. In the low-power Transmatch, leave at least 1/2-inch spacing between the edges of the capacitors and any part of the chassis and cabinet. Allow 1-inch spacing in the kW unit.

Balun Details

For the low-power Transmatch, a single toroid core will more than handle the power. Incidentally, the low-power unit was tested under all conditions at about 100 watts through the Transmatch. The power-handling capabilities of the units depend primarily on the plate spacing used for C1 and C2, aside from the balun requirements mentioned earlier. At the 100-watt level, a plate spacing of .03 inch is adequate. A .045-inch spacing should handle 500 watts. In the kW unit shown, C1 has a .077-inch spacing. While a .077-inch spacing capacitor wasn't tried at C2, such plate spacing should work at the kW level.

In making the low-power balun, wind two layers of Scotch brand electrical tape around the core before putting on the wire. This will provide extra insulation, and will protect the edges of the wire to prevent the enamel from being scraped away. Fig. 2, at B, shows a sketch of the winding. The winding consists of 10 bifilar turns of No. 14 Formvar insulated wire. Connected as shown, this will provide a 1-to-4, unbalanced-to-balanced configuration.

Three cores are needed in the high-power balun. Each core is covered with two layers of 3-M type 27 glass-cloth insulating tape. Next, the three cores are stacked, then covered with two more layers of the tape. The winding consists of 15 bifilar turns of either No. 12 or 14 insulated wire. The insulation should have a minimum rating of 1000 volts and can be either Teflon or vinyl-nylon (or any other suitable covering with a minimum voltage rating of 1000 volts).

In making the low-power Transmatch, a roller coil from a junked 40-meter ARC-5 transmitter was salvaged and installed in the unit. Many amateurs know other hams who have old ARC-5 gear, and these units are a good source for the roller coils. However, some hams may not be able to locate used ARC-5 transmitters, so we have included some information on sources of surplus and new roller inductors. There may be surplus outlets in your area worth investigating. Look for a roller coil that has a minimum inductance of 10 uH when used with C1 having a value of 200 pF per section. Such a combination will cover a low frequency of 3500 kHz. In the unit shown, in addition to the ARC-5 roller, we used a value of 100 pF per section for C1 and padded that capacitor with another of 200 pF (single section) in order to provide the required coverage. This added capacitor is shown in Fig. 2 at A. By using this approach, it is sometimes easier to save money then when trying to locate a 200-pF-per-section variable for C1. (Incidentally, you can use a variable at C1 of *more* than 200 pF per section for good coverage with the roller inductance specified aabove.)

An even better approach to get the required capacitance for C1, because it is better to maintain the symmetry of the circuit as shown in Fig. 1 at A, would be to gang two 200-pF variables to make up your own split-stator capacitor, with the desired plate spacing. (There may be some around, but we couldn't find any manufactured split-stator with the required plate spacing and capacitance). Still another approach would be to clip fixed transmitting-type mica capacitors across each section of C1 to obtain the required capacitance for use on 160 and 80.

Finding the Parts

As most hams are finding out, it is becoming more and more difficult to buy, or find, components for construction projects. Some searching was done, and the following information is worth passing on. Barry Electronics of New York City has informed us that they will fill any order for any amateur component at the manufacturer's current amateur net price. The parts specified in Fig. 1 are currently-manufactured items. Also, Fair Radio Sales in Lima, Ohio has some surplus roller inductors and counter dials in stock. The roller-inductor catalog number is 5950-199-6469, and the counter dial is listed as RT-45. Also, Millen components can be purchased directly from Millen (write to Wade Caywood, W1KRD).

Using the Transmatch

One of the first considerations in using a setup for "coax-to-coax" is exactly how much, or how high an SWR can be tolerated. As has been pointed out, this Transmatch will handle *any* mismatch on the line. Without getting into a lot of details, a few observations about coaxial lines are in order. First, the higher the SWR, the greater the losses in coaxial lines. The amount of losses depends on the line construction and the *frequency* at which the line is used – the lower the frequency, the less will be the losses. For example, RG-8/U has a loss per 100 feet of line of only 3/10 of a dB at 3.5 MHz with an SWR of 1 (a matched condition). At 28

(Continued on page 58)

Let's Talk Transistors

Part 9—Operating Transistor Circuits

ROBERT E. STOFFELS*

No discussion of transistors would be complete without giving some examples of actual operating circuits. Therefore in this, our final chapter of this series, we shall discuss several such circuits.

As you will recall, we spent considerable time working our way up to the configuration of a single transistor stage operating Class A. We located the operating point on the load line, determined the resistors necessary to bias the transistor at this point, and learned what would happen when we fed into this circuit an a.c. signal. Therefore, our first example of an operating circuit will be an audio amplifier, consisting of two cascaded transistor stages.

Our second example will deal with what is known as push-pull Class B. Brief mention has been made of such operation previously, and in concept it is so similar to Class A operation that we need not dwell on it for very long.

These two circuits will then be combined to produce a four-transistor phono amplifier. This circuit is taken directly from the Sixth Edition of the *G.E. Transistor Manual*.

The final circuit we shall discuss is a transistor flip-flop. Circuits similar to this are used by the thousands in digital computers. As we will see, it also is quite similar to the standard transistor circuit we have been studying.

Two-Transistor Audio Amplifier

Fig. 9-1 shows a two-stage audio amplifier. This is approximately the front end of the composite circuit shown in Fig. 9-3. Note that the two stages are essentially alike; in both cases the transistors are biased as discussed in Part 7. That is, a single battery (in this case, 9 volts) is used, and resistors R_2 and R_4 for the first stage, and R_8 and R_9 for the second stage form a voltage divider for the base voltage.

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Some practical audio-amplifier circuits and a flip-flop are studied from the standpoint of overall circuit operation.

In both cases an emitter resistor (R_6 for the first stage and R_{10} for the second stage) is employed to work with the base resistors. The load resistor in both cases is located in the collector circuit.

Note, furthermore, that capacitors are used to couple the two stages, as well as for coupling the input volume control to the first stage. The means of doing this was discussed in Part 5. These "coupling" capacitors are normally made quite large, so as to keep from attenuating the ac signal as it passes from one stage to another.

Capacitors C_2 and C_6 are used as bypass capacitors for the first and second stages respectively. Each of these capacitors is 50 μF, thus effectively bypassing most of the a.c. signal appearing across the emitter resistors. These capacitors were discussed in Part 8.

Notice for one moment, the input in the circuit. The signal from the phono cartridge is fed to the volume control, resistor R_1. By revolving this volume control arm in the upward direction more of the input signal is permitted to appear at capacitor C_1. By the same token, revolving the volume control in the opposite direction decreases the input to this capacitor until, at the extreme, virtually no signal is fed to the circuit.

In this figure the power switch actually controls "ground." It could just as easily have controlled the "minus" side of the battery.

Class B Amplifier

Fig. 9-2 shows two transistors operating in Class B push-pull. The most obvious difference between this circuit and all others we have treated is that transformers are used to couple the ac signal from one stage to another. Another difference which can be seen in this circuit is that the transistors are apparently being operated in "parallel" — that is, from the same input signal — rather than in "series," or cascade. This is true, with the exception that they are connected in reverse (i.e., one is a mirror image of the other). And herein lies the beauty of Class B. These transistors are biased so that in the absence of an ac signal neither transistor is conducting. (Recall from Part 7 how we normally biased a transistor half-way up the load line, so that the transistor would be turned on if

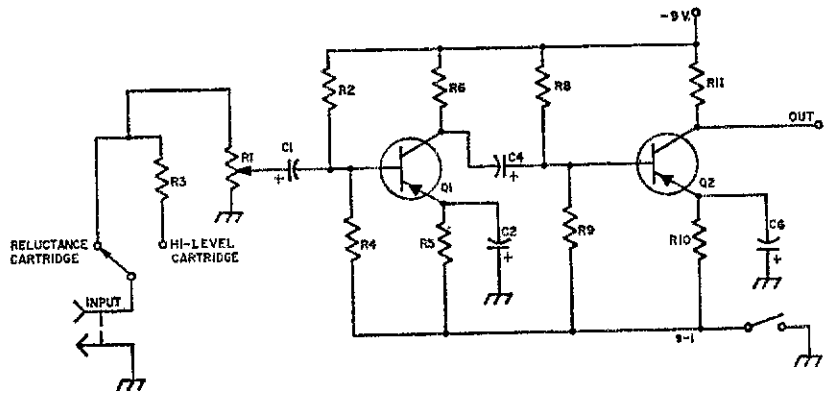


Fig. 9-1—Circuit for two-stage audio amplifier.

forced in one direction, and turned off if forced in the other direction. Also recall from Part 8 that the power dissipation at this point, midway up the load line, was greater than at any other point on the load line.)

As an ac signal is received at this stage, one transistor conducts for one half of the cycle, and the other transistor conducts for the other half of the cycle. That is, on the positive swing the ac signal is transmitted from the primary of transformer T_1 to the top half of the secondary of transformer T_1, where it appears as a negative swing which causes transistor Q_2 to conduct. The bottom half of this secondary cannot conduct, since, being positive at this instant, it is pushing *against* transistor Q_4, and this is essentially a diode facing the wrong direction. Transistor Q_2 amplifies this half of the cycle, and sends the signal to the top half of the primary of transformer T_2. Thus, this top half is actually the load of transistor Q_2. The ac signal is then coupled to the secondary of the transformer, and thus energizes a loud speaker.

On the other half of the ac signal the bottom half of the secondary of transformer T_1 is utilized, and the signal is amplified in transistor Q_4. This amplified ac signal then appears across the bottom half of the primary of transformer T_2, and again is coupled to the secondary of transformer T_2, and thus to the loud speaker.

Thus each transistor is utilized only half the time, and when no signal is being received in the circuit neither transistor is conducting at all. Such a configuration is normally used in audio output or power amplifier stages. Not only does it save power, but it cuts down on the heat being developed.

These transistors are biased almost to cutoff by selecting resistors R_{14}, R_{15}, and R_{17} to be quite small. Thus any ac signal arriving at the circuit will drive the operating point *up* the load line for the particular half cycle.

Fig. 9-3 shows a modified composite of Figs. 9-1 and 9-2. This is an actual operating circuit, taken from the G.E. transistor manual. We should perhaps discuss several of the differences between this circuit and the circuits of Figs. 9-1 and 9-2. It should be pointed out that none of the differences (important though they may be) are of a basic nature. For instance, note that the negative side of the 9-volt battery is grounded, rather than the positive side. This is simply a matter of concept, and should not cause undue alarm.

Note also that capacitors C_2 and C_6 are not connected across the emitter resistors directly, but rather are connected across the resistor plus the battery. This again is a small matter.

Fig. 9-1 showed the load of transistor Q_2 to be a simple resistor. Actually, as seen in Fig. 9-3, the load is the primary of transformer T_1. This transformer must be wound with the proper d.c. resistance, since this and the input characteristics of the Class B stage determine the load line for transistor Q_2.

The one additional difference in the biasing of the transistors is the use of resistors R_7, R_{12}, and R_{13}. These are all used to provide additional stability, and unfortunately their presence makes quantitative circuit analysis more difficult.

There will always be slight modifications to transistor circuits. An engineer is never satisfied with his circuit, and every person connected with laboratory management knows that the

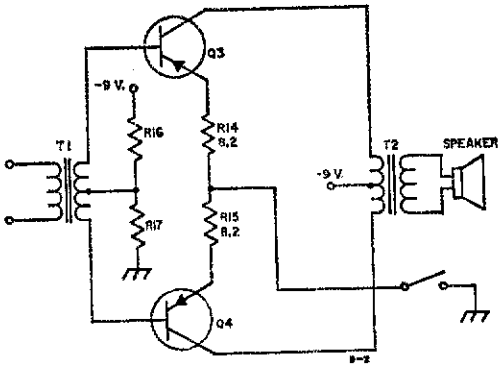


Fig. 9-2—Circuit with two transistors operating in Class B or push-pull.

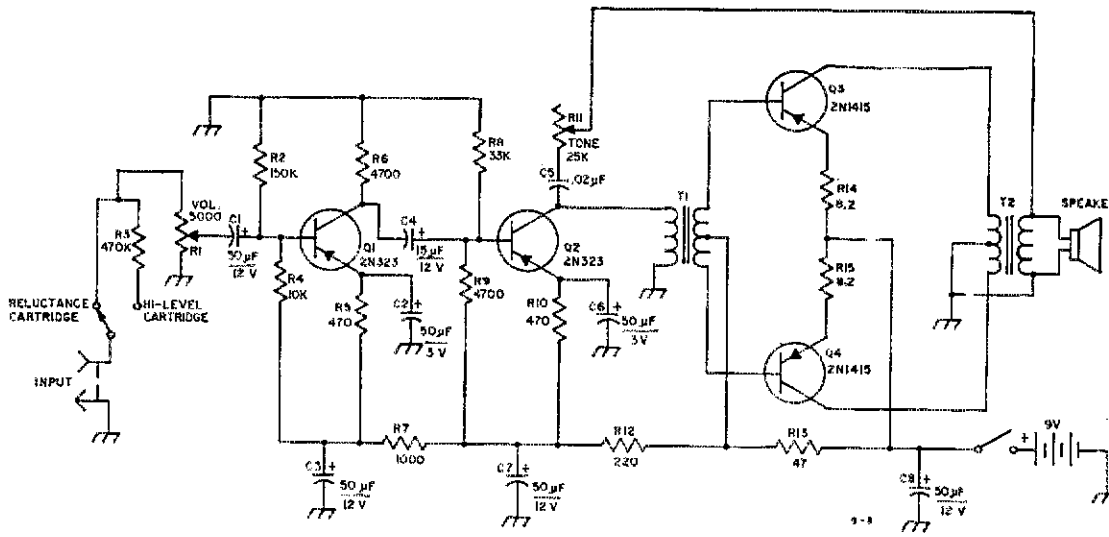


Fig. 9-3—A complete audio amplifier circuit using class B push-pull transistor output stage.

only way to get a completed circuit from an engineer is to take it away from him! Nevertheless, it can be seen from these brief examples that most transistor circuits used to amplify audio signals employ the same basic techniques. In the final analysis, a transistor stage consists of a transistor, an emitter resistor, a collector resistor, and two base resistors forming a voltage-divider.

Flip-Flop Circuit

The great similarity between various circuits is not specifically confined to audio circuits. As we shall see in the following example, a transistor flip-flop is derived from the same basic configuration mentioned above.

Fig. 9-4 shows two transistors, connected in exactly the same way, and not interconnected in any way. Note that each has the emitter resistor, the collector resistor, and a voltage divider connected to the base.

Note also that the emitter resistor is 1/10 of the collector resistor. Therefore if the transistor were in saturation the voltage at the emitter would be about −2.5 volts. Since the voltage across the transistor when it is in saturation is very low, the collector voltage would also be about −2.5 volts.

If, on the other hand, the transistor were operating at cut-off (driven there by means not shown), the collector voltage would be identical to the supply voltage — namely, −25 volts — since no current is flowing in the collector resistor.

Suppose, for a moment, that I were able to control the voltage at the top end of resistor R_2. That is, suppose I were able to make this voltage −25 volts at one moment, and then at the next moment switch this voltage to −2.5 volts. It is obvious that when this voltage is −25 volts, more current flows in the voltage-divider formed by resistors R_2 and R_3, and that the voltage at the base of transistor Q_1 would be more negative, and that the transistor would operate closer to saturation.

Likewise, when the voltage at the top of resistor R_2 is made to be −2.5 volts, very little current flows in the voltage divider, the potential at the base of transistor Q_1 is only slightly negative, and the transistor conducts only slightly. If we were to go one step further, and make the emitter of transistor Q_1 a constant −2.5 volts (the means of doing this will be discussed next), then the base of the transistor would actually be slightly more positive than the emitter, and the transistor would most certainly be cut off.

We accomplish exactly this in the circuit of Fig. 9-5. Note that we have connected the emitters of the two transistors to the same common emitter resistor, and that we have taken the top point of resistor R_2 and of resistor R_6 and connected them to the collector of the *opposite* transistor. Now let's watch what happens.

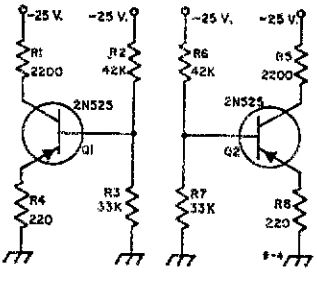


Fig. 9-4—Two transistors connected in same way but not interconnected in any way.

Suppose transistor Q_1 is conducting. If this is the case, the voltage at the emitter of the transistor is about -2.5 volts, and the voltage at the collector is also about -2.5 volts. Consequently the top of resistor R_6 is about -2.5 volts, and the voltage divider consisting of resistors R_6 and R_7 draws little current. The base of transistor Q_2 is therefore at a potential somewhere between ground and -2.5 volts. Now, the emitter of transistor Q_2 is still at a potential of -2.5 volts, since it is common with transistor Q_1. Thus transistor Q_2 is cut off.

Since transistor Q_2 is not conducting, its collector voltage is -25 volts. Therefore the top of resistor R_2 is also at -25 volts, the voltage-divider consisting of resistors R_2 and R_3 is drawing heavily, and the base of transistor Q_1 is about half-way between ground and -25 volts. Thus transistor Q_1 is truly in saturation.

So we are "flipped;" one transistor is in saturation and the other is in cutoff.

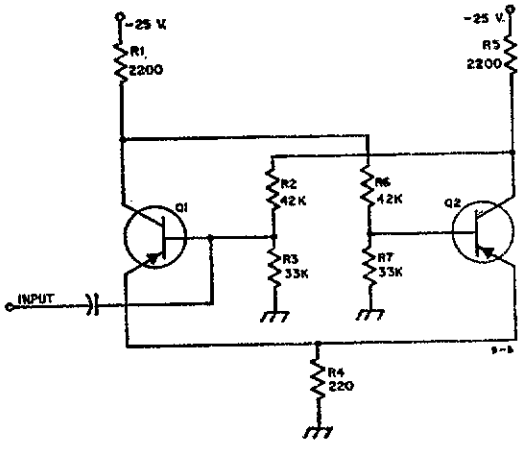


Fig. 9-5—Emitters of two transistors are connected to common emitter resistor.

Suppose, now, that we insert a positive-going voltage at the lead labeled INPUT. The sudden rise of this voltage is sent through the capacitor, and arrives at the base of transistor Q_1. This momentarily drives transistor Q_1 into cutoff (a positive-going voltage at the base turns off a pnp transistor). Because this transistor suddenly turns off, its collector voltage goes from -2.5 volts to -25 volts. This voltage is received at resistor R_6, and the voltage at the base of transistor Q_2 suddenly goes from about -1 volt to something more negative than -10 volts. This, of course, suddenly turns on transistor Q_2. As it goes into saturation, its collector voltage goes from -25 volts to about -2.5 volts. Thus, the voltage at the top of resistor R_2 goes to -2.5 volts, the R_2, R_3 voltage divider stops drawing heavy current, and the base of transistor Q_1 is now more nearly -1 volt, and the transistor is biased off. This is a stable situation, even if the signal on the INPUT lead were very short.

So we are "flopped;" the first transistor is in cutoff, and the second transistor is in saturation. The collector of the first transistor is at about -25 volts and the collector of the second transistor is at about -2.5 volts.

Note the similarity between this and a relay; both are either in one condition or another. If a relay is driving a second relay, the driving contact either has ground on it (with the contacts closed) or resistance battery (with the contacts open, from the succeeding coil). In the case of the flip-flop, the output of a particular transistor is either -2.5 volts (not very far from ground) or -25 volts (equal to supply voltage).

So we see that all these circuits are generally pretty much alike. As mentioned above, engineers will forever make circuit changes, and improvements, but basically the circuits will remain.

In Conclusion

Through this series we have slowly studied the transistor; we have learned of its theory and construction, its advantages and its shortcomings.

We have used it with dc and with ac, and have learned how to bias it in its own, self-sufficient circuit. We have sent voice frequency signals through it, and have amplified these signals to be sent through another transistor and amplified again.

We have analyzed the mathematics of the circuitry, and learned to use a load line.

We have briefly discussed such things as power dissipation, leakage current, and bypass capacitors.

And finally we have seen how a transistor is used in an actual operating circuit.

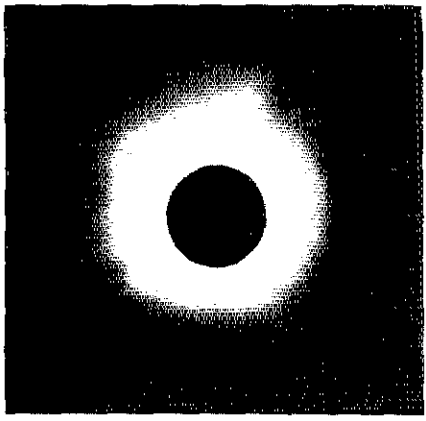
The subject of transistors is only one in the ever-expanding field of electricity and electronics. Exotic devices are appearing on the market every day; new principles are being expounded; and operating speeds so high that new words have to be coined are becoming quite commonplace.

Who knows what tomorrow will bring!

Questions:

1. *In the circuit of Fig. 9-1, which plate of capacitor C_2 should be the positive plate?*
2. *In the circuit of Fig. 9-3, which plate of capacitor C_2 should be the positive plate?*
3. *In a push-pull Class B circuit, are both transistors in complete saturation in the absence of a signal?*
4. *Are we concerned about the dc resistance of transformers used in transistor amplifiers?*
5. *How fast can a flip-flop change states?*
6. *Why is a common-emitter resistor used in the flip-flop?*
7. *If a flip-flop is flipped one way by the insertion of a positive pulse at the base of the first transistor, how could one cause the circuit to flop?*
8. *Can the flip-flop be used for memory?*

(Continued on page 43)



Eclipse Experiment-1970

Instant Night-Time Conditions

BY R. R. SCHELLENBACH, *W1JF

The total eclipse as seen at Nantucket, Mass., at 1845 GMT. (*WICIE photo*)

ON MARCH 7, 1970, astrophysicists, scientists and astronomers were afforded an unusual opportunity to observe and study the effects of a total solar eclipse on the earth and its surroundings. Since the occurrence of such phenomena is considered a rarity, it was believed that every advantage should be taken to conduct additional experiments in the field of radio communications. From such experiments, we might better understand the mechanisms involved, and the influence of solar activity upon radio communications.

It was this thought that prompted the author to enlist the aid of cooperative amateurs in establishing an experimental network on the 7-MHz amateur band for Eclipse Day. The purpose of the net was to exchange signal reports,and make observations of the effects of the eclipse on radio transmissions.

Fortunately, many of the observers were located within or close to the 85-mile-wide corridor of eclipse totality, reaching from Florida to the northern tip of Canada. These locations provided good observation points for making signal comparisons between stations along the path and those outside the corridor. According to the local observatory, the solar eclipse would begin at dawn in the South Pacific, and race northeastward at 1500 mph through Mexico, and on into the Gulf of Mexico. Entering the United States (see Fig. 1), the totality corridor would pass over Tallahassee and Jacksonville, Florida, on up the eastern seaboard past Savannah, Georgia, then Charleston, South Carolina, and Norfolk, Virginia, making a straight line across water to Nantucket Island, just offshore from Cape Cod, Massachusetts. From here the eclipse would continue its northerly track, touching Sydney, Nova Scotia, and Argentia and Gander, Newfoundland, thence outwards into the North Atlantic Ocean, disappearing at dusk.

From what we know of the ionospheric layers surrounding earth and their influence on radio communications, it was expected that the eclipse would provide a disturbance of some duration and magnitude from which we may subsequently draw conclusions. The major radio-propagation effects from the eclipse were expected to be immediately indicated by the sensitive *D* region, because it provides a high degree of absorption to radio waves on the frequencies of interest during daylight hours. Hopefully, the other layers, *E* and possibly *F* would, if sufficiently deionized through lack of solar radiation, yield instant night-time conditions and make long-path DX communications possible. These correlations were borne out in the experimental data obtained during the two hours of observations on the lower portion of the 7-MHz amateur band at my location.

Wave-Transmission Principles

Before describing the data taken, a review of significant radio-wave transmission principles through the ionosphere should be made. It is because of natural effects and their consequences on radio communication that experiments and further study was deemed worthwhile. A brief synopsis of wave-transmission principles governing ionospheric propagation is furnished in order that the reader will have an understanding of sky-wave propagation, which will be related to our experimental results.

- Radio reception of frequencies between 3 and 30 MHz, at distances greater than local ground wave, depends entirely on sky waves reflected by the ionospheric layers.
- There are essentially four layers; *D*, *E*, *F*1 and *F*2, extending respectively from about 60 to 800 km in height. The layers are formed through the combined effects of an exponential decrease in atmospheric density with height, and an exponential increase in electron density with height, brought about by solar ionization.
- The return to earth of transmitted radio waves is caused by the increasing refraction index provided by increased electron density with height. This results in scattering and bending of the wave through the higher-density layers, a combination that ultimately provides what is termed sky-wave reflection.
- The lowest layer, termed the *D* region, is the weakest ionized portion of the ionosphere, and exists only during daylight hours. This layer does not refract or bend an hf wave by an amount sufficient to return the wave to earth. The layer does, however, absorb a large amount

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of energy contained in the wave. All sky waves must enter and pass through an existing *D* region during daylight hours, and it is for this reason that sky waves are stronger at night, after this layer disappears. The region is also subject to sudden disturbances, such as those caused by solar flares, and, therefore, should quickly indicate anomalies brought about by a solar eclipse.

- The *E* layer is a clearly defined region in the ionosphere, extending from about 85 to 130 km in height. The layer exists throughout the night, although the electron density is decreased. This layer, like the *D* region, is notable in that it, too, will quickly exhibit ionization changes caused by solar radiation.
- The *F* layers are the heaviest-ionized region of the ionosphere. The region has two layers, *F*1 and *F*2. The *F*1 layer extends between 150 and 200 km, and usually merges with the *F*2 layer after local nightfall. The *F*2 layer is also highly ionized, and has boundaries ranging between 250 and 400 km. Its ionization does not change significantly between night and day. Since this is the highest layer with the thinnest atmosphere, the ions and electrons are much slower in reacting with each other during variations of solar radiation.
- Antennas capable of low-angle radiation will provide the greatest skip distance when reflection occurs predominantly from a specific layer.[1] If a layer such as *E* or *F*1 should dissipate or merge into the next higher layer, the skip distance would also increase. This is because the incident angle at which the wave enters the new layer does not change, but the point of entry only moves upward and outward, increasing the distance from where the wave was originally reflected. The angle of wave incidence closely equals the angle of reflection from the effective layer back to earth. (Oblique-incident waves actually follow a slightly curved path through the ionosphere, because of gradual refraction or bending of its wave front, so that actual calculations of skip distance versus incidence angle are only approximate.)
- Because of the effective layer heights and the fact that practical antennas do not radiate efficiently below angles of about 3 to 5 degrees, single-hop transmissions cannot be obtained for distances in excess of about 2500 miles (4000 km) via the *F*2 layer, or in excess of about half that distance (2000 km) via the *E* layer. Multiple-hop propagation must occur to obtain distances greater than 2500 miles. Even at somewhat shorter distances, most received signals usually arrive over a path of two or more hops. (Refer to Fig. 2.)

The Experiment

For the purpose of the experiment, a horizontally-polarized one-wavelength antenna was used for both transmission and reception. This antenna, having four major lobes at 54 degrees from the ends, was oriented approximately north and south. The height was adjusted to $1/2\ d$ in order to produce a vertical pattern with a maxima at 30 degrees and a null at 90 degrees. It was believed that a moderately-high wave angle would be useful

[1] See Technical Correspondence, "Antenna Height Versus Performance," *QST*, June, 1970.

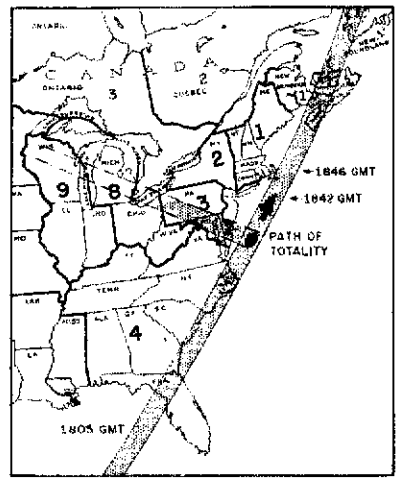


Fig. 1 — Path of eclipse totality, March 7, 1970.

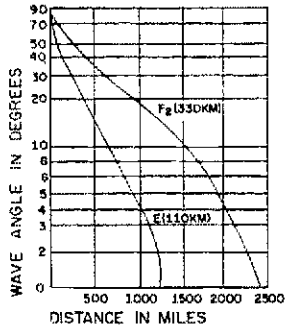


Fig. 2 — Distance plotted against wave angle (single-hop transmission) for average virtual heights of the *E* and *F*2 layers. (This chart is taken from the Wave Propagation chapter of *The ARRL Antenna Book*.)

in the determination of D-region absorption effects between domestic stations. At the same time, this wave angle would simplify calculations of path hops via the various reflecting layers that may come into play. Another advantage of selecting this wave angle would be to demonstrate multihop propagation for those distances unsuited for long-path single-hop transmissions, and to provide measurements of attenuation under conditions of two or more hops.

The radiated power during the tests was provided by a grounded-grid linear amplifier operating at 900 watts input. Reception was furnished by a National HR0500 receiver, which is capable of providing meaningful signal measurements while being used in the cw-reception mode.

A continuous log was maintained over the eclipse period, between 1730 and 2030 GMT, recording all stations heard or worked over the lower 25 kHz of the 7-Mhz band. The observation data taken, i.e., time, eclipse totality position,

station location, and signal report, is extracted and compiled in Fig. 3 for stations located along or near the eclipse corridor. An explanation is in order for the observation data presented. From this information, the reader may easily see the degree of influence that solar radiation has on our communication media.

At the top of Fig. 3, the four dots denote local-eclipse totality times in GMT at primary observation points. Lines intersecting these points cross over to the right-hand column, in order to coordinate these times with each observed signal report. All signal reports are recorded in S units. The numerals distributed throughout the chart represent signal strengths of stations worked, or, in the case of a single number, heard. The upper numbers of a group represent the strength of the received signal, and the lower numbers represent this station's report at the other locality. Along the bottom of the chart is a profile depiction of the eastern coastline, indicating both the geographical location and the straight-line distance between observation points relative to Boston, Massachusetts.

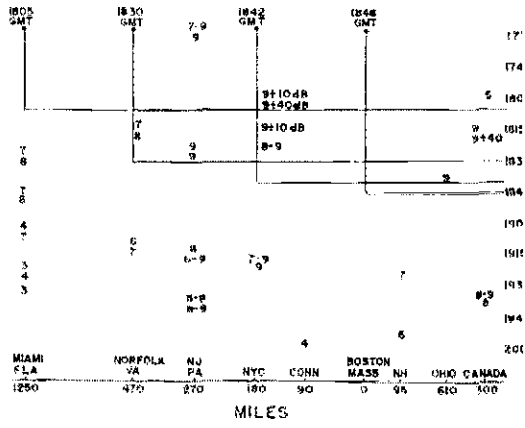


Fig. 3 — Observational data centered on Boston, Mass., for the eclipse of March 7, 1970, for 7 MHz.

Eclipse Correlation

A running account of events is given here to show correlation between the solar eclipse, the most probable mechanism of reflection (based on Fig. 2), and significant developments as they occurred chronologically. Observations of great-circle longer-path transmissions and results will be discussed in small detail, since, in the majority of instances, they were "heard" reports. (Most of the stations were competing in the RSGB British Empire Radio Union cw contest scheduled for that same weekend.)

The first station contacted was W3ST at 1726 GMT, who was 270 miles SSW of my location. His signal strength was S7 to S9 and mine was S9 through the ionized *D* region, with reflection most likely occurring off the *E* layer.[2] Next, at 1758 GMT, VE2BIM (310 miles) was copied at S5, and a few minutes later, W2YM (150 miles) was contacted. His signals were S9 + 10 dB and mine were S9 + 40 dB, both signals via the *D* region and single hop off the *E* layer. At 1814 GMT, W4TA (465 miles) was contacted, fifteen minutes prior to his totality. His signals were S7 and mine were S8, indicating the *D* region was beginning to dissipate and communication was via two hops ooff the *E* layer. Ten minutes later, at 1825 GMT, W2YM was heard (150 miles) at S8 to S9 with fading, and K2DNW (270 miles) was contacted; his signals were S9 and mine were the same. At this time, the *D* region was gone, and single hop to these stations via the *E* layer was predominant.

Then at 1827 GMT, W4BYB (1250 miles) was contacted; his signals were S7 and mine were S8, indicating that the *D* region had gone, the *E* layer was disappearing, and the mechanism of reflection was via the *F* layer. Eight minutes later, W8AQ in Akron, Ohio, was heard at S9 since my *D* region was beginning to diminish rapidly, and propagation was by two-hop *E* layer.

Between 1836 GMT and 1854 GMT, an 18-minute period, seven European stations were copied with signal strengths between S5 and S7. Locally, the *D* and *E* regions had dissipated, and I was receiving them by two hops off the *F* layer over the great-circle path. At the moment of totality nearest my location, W4BYB (1250 miles) was again contacted, his signals were still S7 and mine S8. The mechanism of propagation was obviously two-hop off the *F* layer, with steady signals at both ends. At 1857 GMT, I contacted F6AJM (2200 miles); his signals were S6 and mine were S5. Since totality had occurred near me at 1846, my signals were not being attenuated at this end of the path through the *D* or *F* layer, but propagated over the great-circle route from the *F* layer.[3]

Again at 1903 GMT, W4BYB was contacted. This time his signal strength had dropped by 15 dB to only S4, and mine by 5 dB to S7. It became obvious that the lower *D* and *E* layers had begun to affect the southern path again, even though the skip was most likely still off the *F* layer using two hops. A few minutes later at 1906 GMT, K4IX in Norfolk, Virginia (471 miles) was contacted. His signals were S6 and mine were S7. There was no doubt now that the lower regions had reionized and our skip was a single hop off the *E* layer. Even at 1914 GMT when K2DNW was again contacted, his signals had dropped somewhat and mine were fading between S6 and S9. The *E* layer between us was unstable, although supporting the reflection to earth.

(Continued on page 49)

[2] ESSA propagation prediction forecasts for undisturbed or normal conditions for the period of the eclipse indicate that, at wave angles above from 18 to 25 degrees, depending on the exact time and on the direction from the author's location, 7-MHz signals would penetrate, rather than reflect from, the *E* layer. The reason is that the layer would be insufficiently ionized to bend the wave at a sharp enough angle to return the signals to earth. Thus, for distances less than from 280 to 400 miles, according to the forecast, hf communications would be conducted primarily via one-hop *F*-layer signals, at relatively high wave angles. However, the occurrence of unusual solar activity on the eclipse date would tend to increase the ionization intensity at the lower layers, making the forecasts not totally reliable. — *Editor.*

[3] Intermediate hopping of signals between the *E* and the *F* layers could also have been occurring. — *Editor*

The Solid-State Receiver

Design Problems and their Solutions for High Performance

BY WILLIAM SABIN,* WØIYH

THE day of the high-performance hf solid-state receiver has arrived. There are enough examples now in the realm of military and commercial hardware to justify this conclusion. Recent advances in semiconductor devices and circuit and system design techniques have made it possible. We will discuss some of these techniques as they would apply to an amateur band receiver of medium cost. We will find that advanced performance is achieved only through meticulous engineering and careful measurements.

Performance

This article will not try to philosophize on all of the complex problems and tradeoffs which the receiver designer faces. Rather, we are interested in developing, as an example, one specific rationale for a "competition-grade" receiver, suitable for the most demanding amateur applications. We will concentrate on such things as sensitivity, selectivity, distortion, noise and spurious responses. We will not achieve the current state of the art in any of these departments, because of problems of cost and complexity. We will be well ahead of the currently popular vacuum-tube techniques, however, in most respects.

Fig. 1 shows that the receiver is basically a triple-conversion superhet. A careful study of the gain, signal levels, noise figures and bandwidths shown in this diagram will provide considerable insight regarding the system design of a receiver, where we put together basic circuits to achieve an end result.

The First Mixer

The first mixer (Fig. 2) is a balanced, junction FET circuit. Its noise figure is 3 dB. This number is degraded to 4 dB by all of the circuitry following the first mixer. Ahead of this mixer is a triple-tuned, high-Q filter which is connected to the antenna. There is no rf amplifier stage. The injection for the first mixer is crystal controlled.

What we are up to is this: 1) Build a very quiet mixer which will handle big signals without overloading. 2) Keep the gain between the first and second mixers to an absolute minimum to reduce overloading of the second mixer. 3) Make the loss in the antenna filter as large as we can tolerate in order to: a) Improve selectivity and b) minimize the amplitude of all undesired signals, even on closely-adjacent frequencies. 4) Put all of the signal-frequency selectivity ahead of the first semiconductor device. This gives us a tremendous immunity to nearby transmitters on other bands. We will now expand and explain these arguments.

The 2N4416 junction FET satisfies part one. We select a matched pair having a high pinch-off voltage. The high pinch-off units will handle bigger signals. It is important that the lowest-noise FETs be used. At the present time, the junction FET is indicated.

Injection-Source Noise

In order to achieve the low noise figure it is absolutely essential to minimize the noise which comes from the injection source. The crystal oscillator and buffer amplifier are carefully designed (see Appendix) to maximize voltage-to-noise ratio. In addition to this, we find that the use of a carefully-balanced mixer reduces the influence of this noise by 25 dB. By this we mean that the injection-noise components occurring at the signal, i-f and image frequencies (these produce the loss of sensitivity) tend to be cancelled at the output. A calculation shows that if we assume a 2.5-volt injection, a 2-kHz bandwidth and 25 dB of balance, then a 2.5-dB noise figure will be degraded only to 3 dB if each of these noise components is below one microvolt. Fig. 3 shows a typical noise spectrum of an injection oscillator-amplifier circuit.

To satisfy part two, we adjust the network between the first and second mixers so that the signal at the gate of the second mixer is about twice that at the gate of the first mixer. Inspection of Fig. 1 shows that this value of gain degrades the noise figure at the first mixer by 1 dB. A smaller gain will make it difficult to achieve the desired receiver noise figure. Larger gain will increase the tendency for signals on adjacent channels to overdrive the second mixer.

* Collins Radio Company, Cedar Rapids, Iowa.

Although the more obvious features of receiver design — gain, noise figure, adjacent-channel selectivity, and so on — are reasonably familiar to most amateurs, there are some subtler aspects that aren't so well known. Because of them, one receiver may be an outstanding performer while another, superficially equivalent, may be mediocre.

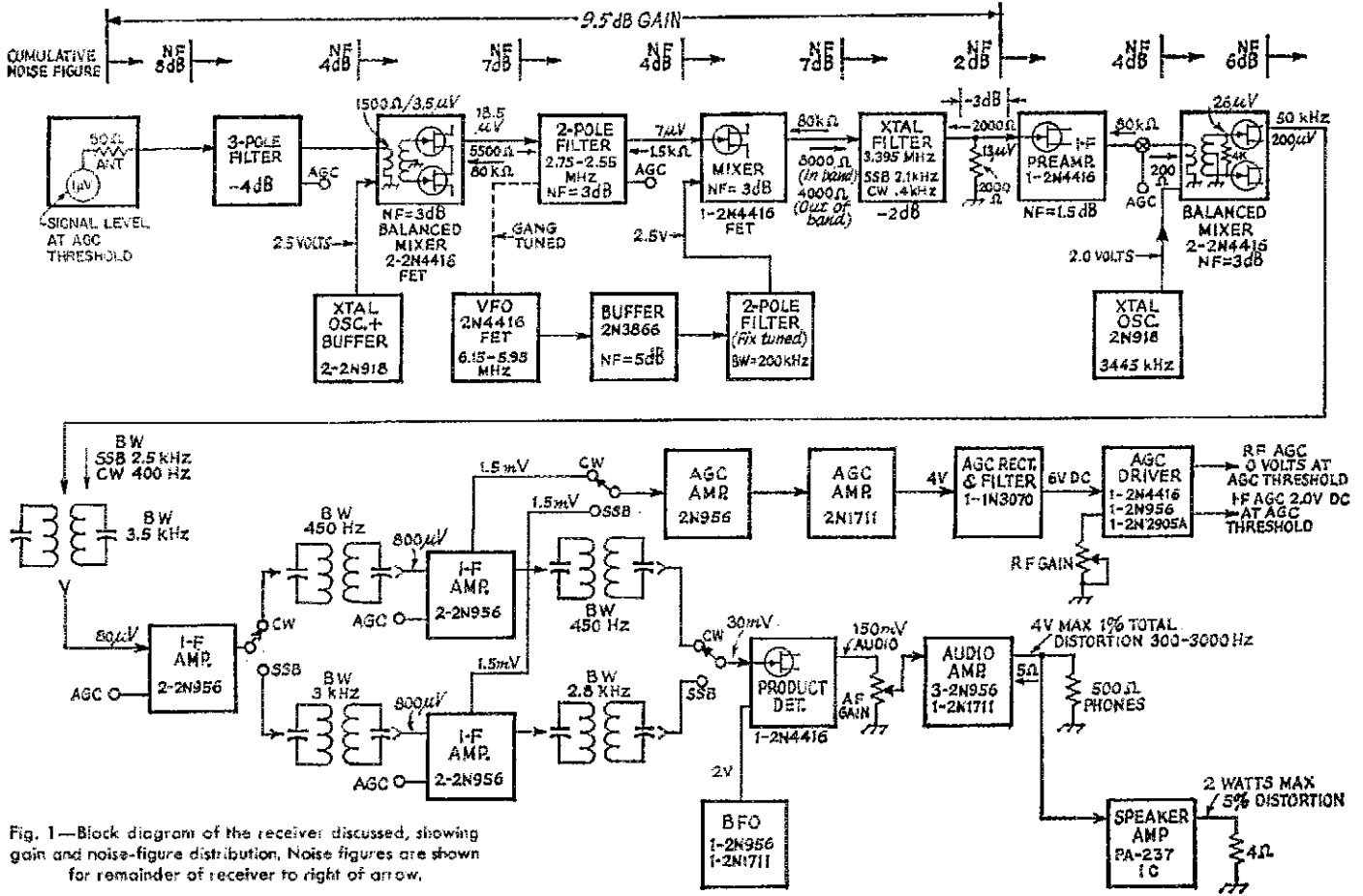


Fig. 1—Block diagram of the receiver discussed, showing gain and noise-figure distribution. Noise figures are shown for remainder of receiver to right of arrow.

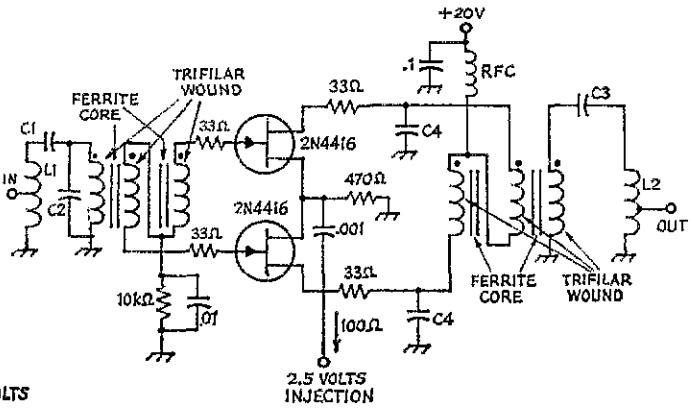


Fig. 2—First-mixer circuit, showing the balancing transformers at input and output. L_1, C_1 and C_2 form the input tank circuit tuned to the signal frequency. L_2, C_3 and C_4 are the output tank circuit tuned to the intermediate frequency.

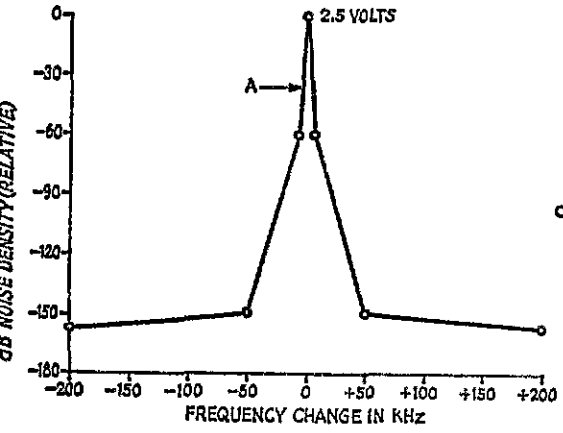


Fig. 3—Injection-voltage noise spectrum. This is a straight-line approximation of noise density per Hz vs. frequency change.

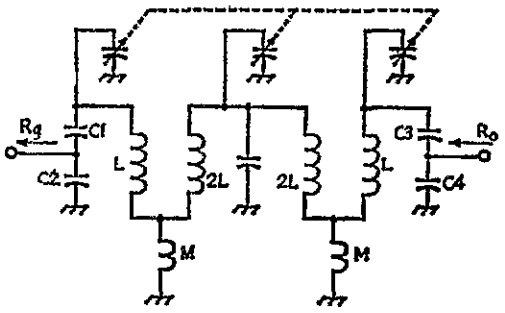


Fig. 4—Three-pole minimum-loss bandpass filter suitable for narrow-band frequency coverage. The ratio of C_1 to C_2 should be adjusted for proper coupling to the antenna. The ratio of C_3 to C_4 provides the desired output impedance.

Antenna Filter

Fig. 4 is a schematic of the antenna filter. It is a triple-tuned, bottom-coupled array using high-Q toroid inductors and is known as a *minimum-loss*, or Cohn, filter.[1] When properly designed, this filter has the property that for a specified number of tuned circuits, unloaded coil Q, and filter noise figure (see Appendix) it will provide the best possible rejection outside its passband. In our application the output is unloaded because of the high impedance of the mixer input. This causes the selectivity to be improved a little. Basically, the Cohn filter is a bandpass filter derived from a low-pass prototype having *equal* elements.

One of the tradeoffs is between filter noise figure and selectivity. Fig. 5 compares a 4-dB, filter with a 1-dB filter. We see that if we can afford to let the *receiver* noise figure be 8 dB (by using a 4-dB filter) rather than 5 dB (by using a 1-dB filter) a large improvement in selectivity can be obtained. Moreover, the additional filter loss reduces the level of all undesired signals at the gates of the front-end mixers. So, we are also trading between sensitivity and signal-handling capability.

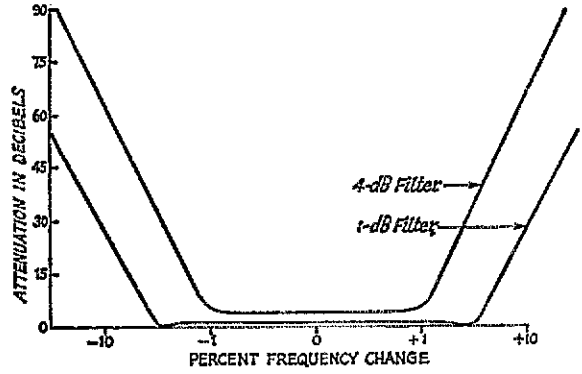
[1] Cohn, S. B. "Dissipation Loss in Coupled Resonator Filters," *Proc. IRE*, August, 1959, pp. 1342–1348.

With respect to these tradeoffs the following opinions can be stated: Extensive personal observations lead me to believe that an 8-dB noise figure is adequate for sky-wave DXing below 30 MHz nearly all the time. Occasionally we may find very quiet conditions at certain beam headings which might justify a 5-dB noise figure. Man-made noise can modify these conclusions, of course. Also, the proliferation of high-power transmitters and high-gain antennas (both transmitting and receiving) in the high-frequency spectrum makes interference immunity very important, indeed, at the receiver. For these reasons we will go with the 8-dB receiver noise figure and we will perhaps switch in a low-noise (2-dB *NF*), low-gain (8-dB) preamp to take care of the marginal situations, with the understanding that the large-signal handling ability of the receiver will be impaired. (See Appendix.)

First-Mixer Coupling

We wish to continue our discussion of the first mixer by considering the voltage step-up, or transformation, between the antenna and the gate of the first mixer. Fig. 6A shows how the mixer sensitivity varies with the impedance which the gate sees. We see that there is an optimum value. Now, the mixer gate can handle a signal level of about 0.8 volt; beyond this level,

Fig. 5—Attenuation vs. percentage change of frequency of a 3-pole minimum-loss filter. Unloaded resonator Q = 200. Curves shown compare a filter having 1 dB loss at the center frequency with one having 4 dB loss, with no load on the output side of the filters.



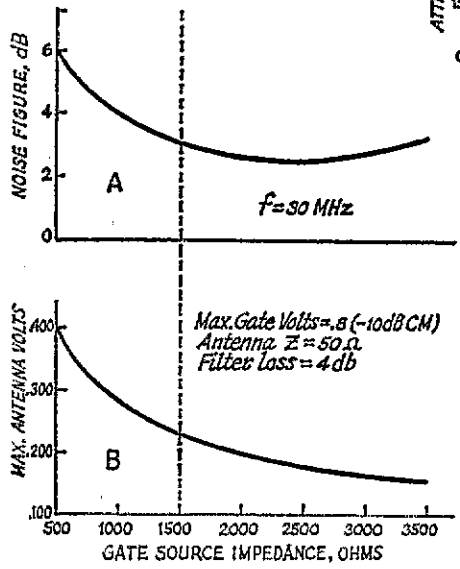


Fig. 6—Noise figure and maximum allowable antenna voltage, for the first mixer only, as a function of gate source impedance. The dashed line indicates the value of impedance actually used.

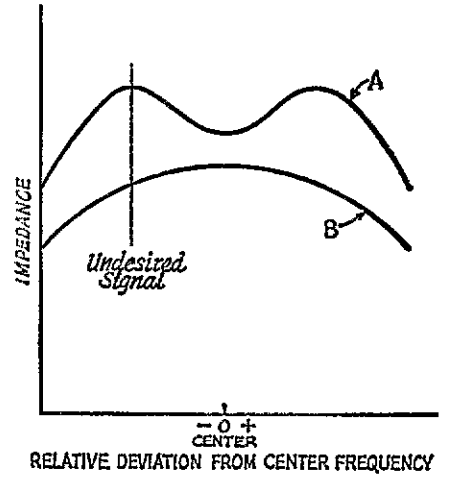


Fig. 7—Mixer drain load impedance vs. frequency. In both curves the drain circuit is tuned to the center frequency, but in A the coupling is such that an undesired signal sees a load impedance which may be too high, causing overload. The curve which droops off uniformly from center, B, is more desirable.

cross modulation and desensitization increase rapidly. This maximum voltage at the gate transforms to some value of maximum antenna voltage, as Fig. 1 shows. Fig. 6B shows how this maximum allowable antenna voltage increases as we move the gate to a lower-impedance tap on the filter. We will assume a fixed value of filter noise figure in order to meet selectivity requirements. Comparing 6A and 6B we see that our 1500-ohm impedance is below that for optimum sensitivity in order to improve signal-handling ability.

When the signal at the gate is at its maximum value we must consider what's going on at the drain of the mixer. In the first place, if the signal at the drain is larger than about 6 or 7 volts rms severe cross modulation occurs due to drain nonlinearity. This means that if the load impedance is too large the drain becomes overloaded prior to gate overload. If we have a conversion transconductance of 1000 μmhos then the maximum allowable drain load is

$$R_L = \frac{E_o}{E_{ig}c} \frac{6}{0.8 \times 10^{-3}} = 7500 \text{ ohms. (Eq 1)}$$

The higher the transconductance the smaller the maximum drain load. In addition, it is necessary to see how this impedance varies with frequency. Curve A in Fig. 7 shows an undesirable situation. As the frequency of the large undesired signal moves away from center, the load impedance gets larger and overload occurs. The impedance characteristic shown by curve B is more desirable.

Finally we consider a phenomenon called *noise modulation*. Refer to the injection noise spectrum of Fig. 3. The noise density drops rapidly until the "noise shelf" is reached. Suppose a strong, off-frequency signal is arriving at the gate. This signal actually assumes the role of an injection voltage which mixes with the noise from the injection, say at frequency A in Fig. 3, to produce a mixer output at the i-f frequency which is essentially a noise-type signal. This effect drops off rapidly and one of our design objectives is to

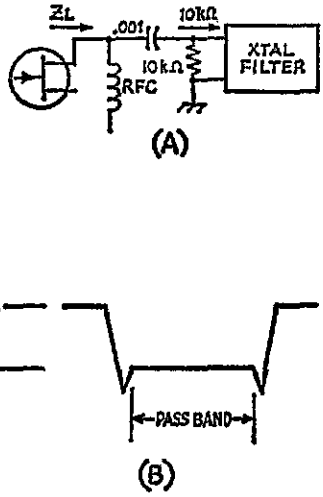


Fig. 8—A, filter coupled to drain; B, how the load impedance increases outside the passband of the crystal filter.

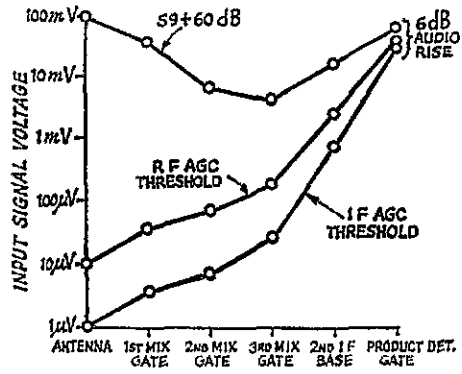


Fig. 10—Plot of gain distribution showing how the automatic gain control restricts signal levels to optimum values at various stages in the receiver. The agc compression is 94 dB.

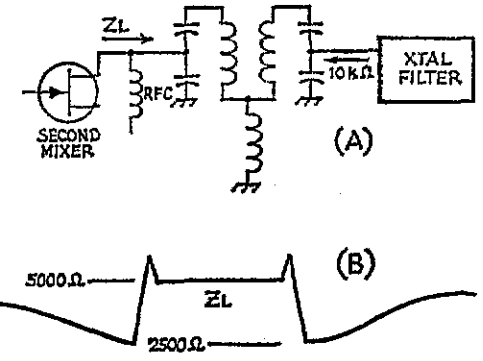


Fig. 9—An impedance-inverting network, A, improves the mixer load characteristic, as shown by the impedance vs. frequency curve, B.

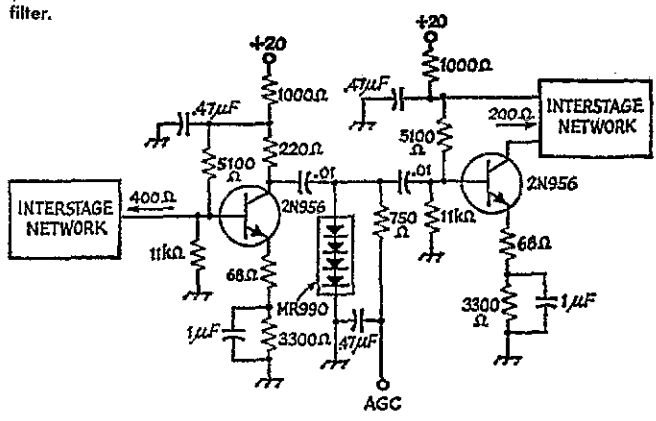


Fig. 11—A 50-kHz i-f amplifier stage showing the agc circuitry. Gain reduction of 20 dB is obtained with 8 volts of agc.

make the slope in Fig. 3 as steep as possible. It turns out that for "close-in" signals noise modulation is usually the dominant interference since it usually occurs at lower levels than cross modulation or blocking. Also, the use of a balanced mixer does not improve this situation. The effect can be minimized by keeping the gain ahead of the mixer gates as low as possible. In all of this discussion we assume that broad-band noise from the interfering transmitter is not the limiting factor. This may not always be true, of course. Further notes on noise modulation are in the Appendix.

The Second Mixer

Having dealt with the first mixer at considerable length we can now cover the second mixer more rapidly. The double-tuned filter is tracked with the VFO and is razor sharp. We have said that the voltage step-up from the first-mixer gate to the second-mixer gate is about twice. This means that a strong adjacent-channel signal will overload the second mixer. If the signal is more than 25 kHz away the first mixer will overload first. The two-pole filter "protects" the second mixer to a large extent.

The FET VFO is very quiet, as is the buffer amplifier. A double-tuned transformer, 200 kHz wide, attenuates noise at the signal, i-f, and image frequencies to such a low level that a balanced mixer is not required for low noise figure.[2]

We consider now the drain of the second mixer (see Fig. 8A). There is a problem with the crystal filter. Inside the passband its input impedance is 10,000 ohms but outside the passband it becomes very high. The result is that the drain of the FET sees a larger impedance outside the passband (see Fig. 8B). We have seen that this is undesirable. The solution (Fig. 9A) is to insert a network which makes the impedance characteristic look like Fig. 9B. The coupling between the two

[2] It is not always practical to "clean up" with selectivity. Our first mixer is an example.

halves of the tuned transformer must be less than critical.

The crystal filter should have as low an insertion loss as possible so that the front-end gain, even though it is very small, will deliver enough signal to the i-f to completely swamp out the i-f noise level.

Passive-Element Nonlinearity

One final note about the front end. It is very important to check the filters and tuned circuits used in a receiver front end for intermodulation and cross modulation caused by nonlinearities in the iron or ferrite materials. The author has been astounded more than once to find that receiver linearity was being limited by innocent-looking cores rather than by semiconductors. Flux levels should be kept well below the point where saturation effects begin to appear.

The I-F Amplifier

The crystal filter has either a 0.4-kHz bandwidth for cw or 2.1 kHz for ssb. A six-pole, steep-sided filter is used. We wanted to do the best possible job of eliminating undesired signals from the circuitry following the filter. Automatic gain control will then prevent overloading any of this circuitry. In cw especially, the narrow filter close to the antenna helps to clean up signals which are only a couple of kHz away.

We have mentioned that the crystal filters should have low loss. It is also important that the i-f amplifier should be very quiet. An FET preamp having a 1.5-dB noise figure follows the filter. Moreover, we go to a lot of trouble and expense to make the noise bandwidth of the i-f chain only slightly wider than the crystal filters. This costly, deluxe approach requires some explanation.

The overall receiver gain has to be a certain amount so that a weak signal will rattle the headphones. (See Fig. 1). We have made the front-end gain as small as possible to squeeze out the last drop of interference immunity. This means that a large amount of i-f/af gain is required. Even though we make the audio amplifier as quiet as possible we still need a lot of i-f amplification. If the i-f is not quiet (meaning low noise figure and *narrow bandwidth*) then we will need to increase the front-end gain (thereby degrading its performance) in order to override sufficiently the i-f noise level. This problem is especially serious in cw because the narrow-band noise coming through the filter is less able to compete with a broad, noisy i-f. The result is a high "hiss" level and poor sensitivity.

We can also justify the narrow-band i-f on other grounds. Although the crystal filters are dominant in determining i-f frequency response they are often not quite good enough in a receiver because their response below the 60- or 70-dB level may become erratic and uncertain due to stray leakage, humps in the stop-band response and "bottoming out." Because the tremendous amount of gain compression due to agc action makes these imperfections more prominent, especially in cw, it is desirable to augment the filters with additional selectivity. We can also improve the overall "shape factor" in case the filters are not really good in this respect. In cw, using agc, an ultimate attenuation of at least 100 dB is desirable.

Why not use audio selectivity to augment the crystal filter? In the first place, the i-f selectivity cleans up the audio signal and noise which are on the image side of the desired signal (the product detector delivers both of these as undesired outputs). Secondly, with i-f selectivity, as we tune away from a strong signal the agc drops off more quickly, restoring full sensitivity. Third, the i-f selectivity reduces the accumulation of noise at the product detector and agc detector; certain types of minor problems can result from this. Audio selectivity is clearly unable to do any of these things.[3]

Finally, it is desirable to get the required i-f gain at two different frequencies, for stability reasons (see Fig. 1).

Automatic Gain Control

We will consider briefly one of the sore spots in receiver design: the agc. Over the years a lot of strange-looking transistor agc circuitry has appeared, to replace the very simple remote-cutoff pentode that we remember so well. However, when you start talking about a high-quality ssb/cw receiver, it seems that you invariably find yourself looking for something better.

These are some of the requirements:

1) The desired signal must be controlled accurately. That is, the signal level at each point must be well defined, regardless of input amplitude, so that none of the stages will become overdriven and the distortion and audio rise will be within the desired limits. This accuracy must be maintained over a reasonable temperature range; some agc circuits are too temperature sensitive. Also, an audio level increase of 6 dB (from 1 μV to 0.1 volt antenna signal) is desirable for a ham receiver and should be designed into the agc circuit. Fig. 10 shows the signal-level distribution at i-f-agc threshold, rf-agc threshold, and for 0.1 volt (60 dB over S9).

2) The front-end agc must not degrade the interference immunity to such an extent that the desired signal is degraded by cross modulation, etc.

3) The transient response (in ssb/cw there is no steady state, really) must be extremely good. Several factors contribute to good transient response.

a) The curve of agc level versus decibels of gain reduction should be fairly linear. Otherwise the agc loop gain can vary erratically, making transient stability very difficult. Bipolar and FET transistor biasing schemes are often poor in this respect. Amplitude-modulation receivers are not so critical.

b) All agc controls should act in unison, unless we need to deliberately speed up in certain places

[3] Audio selectivity has its legitimate place, when properly used. But, by itself is not adequate in our "competition" receiver.

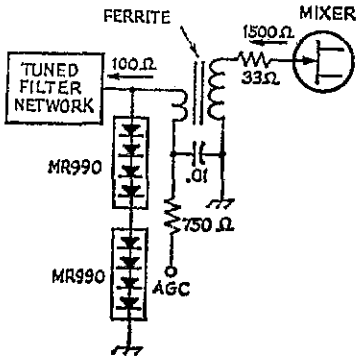


Fig. 12—Automatic gain control applied between an FET mixer gate and its input network. The operating bias of the mixer is held at its optimum value. The voltage and impedance levels are such that the FET generates distortion before distortion occurs in the diodes or in the ferrite core.

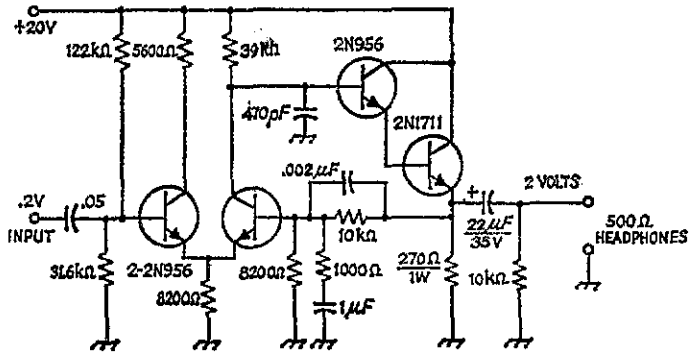


Fig. 14—Headphone driver following the product detector of Fig. 13. This circuit has extremely low distortion, low output impedance for damping of dynamic headphones, and accurately-controlled frequency response (300-3000 Hz). An integrated-circuit package can be used for similar performance. For example, consider a Fairchid μ A716IC.

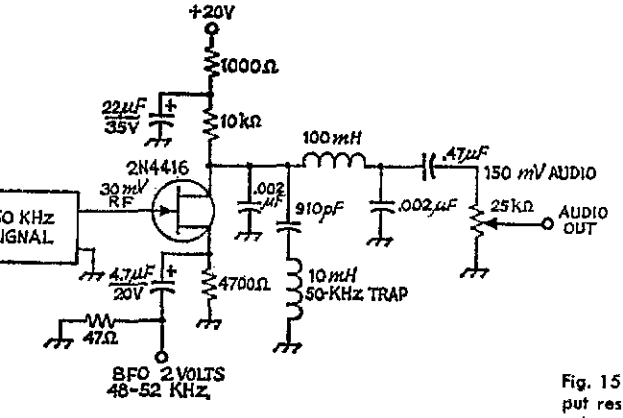


Fig. 13—Product detector circuit, with trap and filtering for 50-kHz i-f signal. See text for performance data.

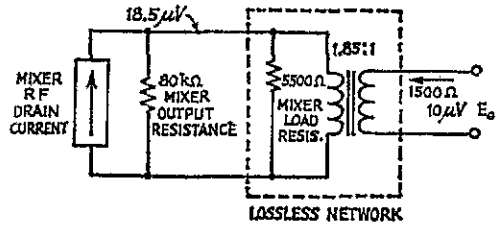


Fig. 15—Lossless network having the same input and output resistances as the 2-pole filter in Fig. 1. The output voltage is 3 dB higher than that of the 2-pole filter; thus the loss of the filter is 3 dB.

to improve stability. Otherwise a sudden input signal can seriously upset the gain distribution during transient periods.

c) If some element, such as a crystal filter, introduces a time delay in the signal path a potential stability problem exists which we must correct.

The best age arrangement the author has seen so far is illustrated in Figs. 11 and 12. In Fig. 11 a 50-kHz i-f amplifier stage is shown. The bipolar transistors are biased at their most linear point and they remain there. The diode is a low-frequency rectifier type having a high charge storage characteristic. The Motorola MR990 contains four junctions in series in one package. When we forward-bias the diode it acts just like an attenuator. To minimize distortion effects, the signal level across the diodes should be limited to about 30 milli-volts PEV (peak-envelope voltage) per diode junction.

Fig. 12 shows a front-end mixer with age added. The diode is at a 100-ohm impedance level and a ferrite transformer changes this to the 1500-ohm level that the mixer gate requires. The amount of detuning of the tuned circuit by the diode attenuator is quite small. The transformer design is optimized for the appropriate frequency range and is changed from band to band.

Detector and Audio

A single FET product detector is used. The circuit is shown in Fig. 13. Careful filtering of the 50-kHz injection voltage from the drain circuit is necessary to prevent nonlinearity due to excessive drain-voltage excursions. It was found that for a two-tone signal at the gate, 30 millivolts per tone, third-order intermodulation products were less than −50 dB, the second harmonic was less than −50 dB, and the second-order difference product was −38 dB. This last item is not to important in our receiver because it is much smaller than the acoustical beats generated by the headphones.

It is seen in Fig. 13 that a considerable amount of audio amplification takes place in the product detector. This audio output drives a feedback amplifier having low distortion (less than 1 percent) and a controlled frequency response (300

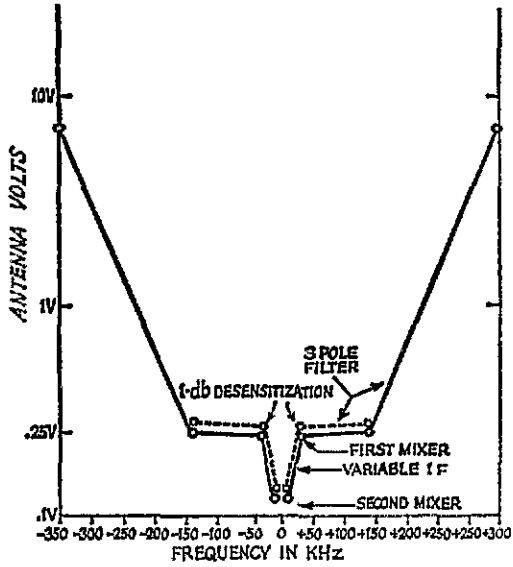


Fig. 16—Antenna input voltage for −10 dB cross modulation at 14 MHz. The curve applies under the following conditions: 1) voltage is open-circuit antenna signal, 2) receiver noise figure is 8 dB, 3) desired signal is 5 μV, 4) no front-end agc, 5) noise modulation effects are not included, 6) cross modulation occurs prior to desensitization.

to 3000 Hz at −1 dB). The overall audio, including the product detector, has a 12-dB per octave roll-off rate. See Fig. 14. For loudspeaker operation, an integrated-circuit power amplifier, a GE type PA-237, is used.

Power Supply

A single supply voltage, +20 at about 300 mA, is required for everything but the speaker amplifier. This supply is a very well regulated circuit having a carefully-minimized ripple and noise output. Rectifier diode noise is suppressed. As a result, all signal path circuits are free of hum and ripple-frequency sidebands to a remarkable degree. The receiver may be operated on headphones using a heavy-duty 22-volt battery. The speaker amplifier and its own unregulated supply are built into the speaker cabinet.

Conclusion

The receiver described here in broad outline has been developed as a breadboard assembly in my spare time over a two-year interval, under laboratory conditions. I have tried to touch base on a few of the design considerations with the realization that none of them can receive all the detailed attention it deserves in such a brief space. Rather, it is hoped that future efforts by the author (and hopefully by the readers!) will appear in print to help answer the many unanswered questions.

One final comment: The receiver described in this article is purely a hobby project and is not related in any way, directly or indirectly, with any Company product, past, present or future.

Appendix

The following miscellaneous data is presented to augment the previous discussion.

1) *Noise Figure of the Antenna Filter*

Refer to Fig. 1. We disconnect the three-pole filter from the antenna. We look back into the antenna and see a 1-microvolt open circuit signal and a 50-ohm resistance. Now reconnect the filter. The FET mixer gate input resistance is very high below 30 MHz and does not load down the output of the three-pole filter, so the voltage measured at this point is the open-circuit output voltage. The resistance looking back into the filter is 1500 ohms. The noise figure of the filter is:

$$NF(\text{dB}) = 10 \log_{10} \left[\frac{(1\ \mu\text{V})^2}{50} \cdot \frac{1500}{(3.5\ \mu\text{V})^2} \right] = 4\ \text{dB} \qquad \text{(Eq. 2)}$$

Equation 2 is seen to be the ratio of the power available from the antenna to the power available from the filter, which is numerically the same as its noise figure.

2) *Noise Figure of the Interstage Filter*

The reasoning of section 1 presents some difficulty in calculating the noise figure of the two-pole filter. The input impedance of this filter determines the gain of the first mixer. So this input impedance belongs to the mixer circuit and the filter should be evaluated independently of it. Fig. 15 illustrates a lossless network which has the same input and output impedance as the actual filter. The output voltage of this network is seen to be 3 dB greater than that indicated in Fig. 1. Therefore, the filter has 3-dB loss. Its noise figure is 3 dB.

3) *Design of the Minimum-Loss Antenna Filter*

We cannot do justice to this complex subject here, but a few simple formulas will improve the understanding. Refer to Fig. 4. Define a number r such that

$$r = \frac{NF\ (\text{dB})}{4.34\ n} \qquad \text{(Eq. 3)}$$

where n is the number of tuned circuits (3). Each tuned circuit, measured alone (not connected to any other circuit) has a Q which we call Q_u. All three tuned circuits are assumed to have the same Q_u. The coefficient of coupling k between coils, as determined by M in Fig. 4 is

$$k = \frac{1}{rQ_u} \qquad \text{(Eq. 4)}$$

The input resonator is externally loaded by the antenna. The ratio of Q_L (loaded Q) to Q_u is

$$\frac{Q_L}{Q_u} = \frac{r}{1+r} \qquad \text{(Eq. 5)}$$

Q_L is the Q of the first resonator when it is loaded by the antenna and by itself, but not by the rest of the filter. The capacitor divider C_1C_2 is adjusted to provide this loading (see *ARRL Handbook*).

The divider C_3C_4 is adjusted to provide the desired output resistance, R_o. The output resonator, of course, is not loaded by the mixer.

4) *Two-Pole Tracked Filter*

The design method of the previous section requires that Equation 5 be satisfied. Because of the high output resistance of the mixer and the simultaneous need for a certain filter input resistance (5500 ohms), this cannot be done unless we put a resistor across the first circuit. Preferably, this filter should be

treated as a conventional double-tuned transformer with a kQ product of about 0.4, as discussed in Chapter 2 of the ARRL *Handbook*. In this case, the response will be sharper and more rounded on top (and more difficult to track).

In either case, the input and output are tapped to provide the desired input and output resistance.

5) *Cumulative Noise Figure*

The formula for the noise figure of cascaded networks is well known. However, if the noise bandwidth *increases* along the line, the formula must be modified.

$$F_t = F_1 + \left(\frac{F_2 - 1}{G_1}\right)\left(\frac{B_2}{B_1}\right)\frac{B_2}{B_1} \geqq 1 \qquad \text{(Eq. 6)}$$

where B_1 is the noise bandwidth which the first stage sees and B_2 is the noise bandwidth which the second stage sees. Ordinarily B_1 and B_2 are the same, but if not, we see that the overall noise figure can become very poor. An example is a cw filter working into a broad-band i-f/audio amplifier.

6) *Oscillator Noise*

Just a few passing remarks on the subject. In order to make the noise spectrum (Fig. 3) drop off quickly, it is desirable to use a very high-C, high-Q oscillator tank. Transistors should be biased in such a way that their internal noise is minimized and their signal-handling ability is maximized. Amplifier stages should be "noise matched." The ac voltage levels should be kept as large as possible without overdriving the semiconductors, to maximize voltage-to-noise ratio.

7) *Noise Modulation*

The output of a mixer is proportional (subject to certain limitations) to the product of the two signals which are fed into it. In other words,

$$E_{out} = KE_{sig}\,E_{osc} \qquad \text{(Eq. 7)}$$

For example, in Fig. 1, to produce age threshold

$$19\ \mu\text{V} = (K)\ (3.5\ \mu\text{V})\ (2.5\ \text{V}) \qquad \text{(Eq. 8)}$$

$$K = 2.18\ \text{volts}^{-1} \qquad \text{(Eq. 9)}$$

Now suppose that the oscillator noise at frequency A, Fig. 3, over a 2-kHz bandwidth, is 10 microvolts. The value of undesired signal at the gate which will produce a 19-microvolt noise output at the i-f frequency is

$$E_{sig} = \frac{E}{KE_{osc}} = \frac{19\ \mu\text{V}}{(2.18\text{V}^{-1})\ (10\mu\text{V})} = 0.87\ \text{volt (Eq. 10)}$$

This is equivalent to 0.25 volt at the antenna. So this undesired signal will produce as much output (noise) as a one-microvolt desired signal. In this particular example, a desired signal would probably encounter some cross modulation from the undesired signal along with a noise increase.

8) *Noise Override*

According to Fig. 1, in cw the front-end noise (not including atmospheric noise) overrides i-f noise by 15 dB. This is a substantial amount. However, if the i-f noise is wide band, the high-pitched noise components have an annoying psychological effect which is very prominent.

9) *Distortion*

For a two-tone signal in the passband, 50-μV/tone, the distortion products for the entire receiver are the same as those for the product detector, as previously stated.

10) *Receiver Gain and Noise Figure*

The remarks in this article indicate that a noise figure less than 8 dB may be occasionally desirable. Experience with the receiver described here has given me some doubts on this. If the receiver has plenty of gain, a low value of age threshold (1 μV for ssb and 0.5-μV for cw), and a very low *hiss* level, along with a good antenna, 8 dB is more than good enough. It is commonly found that the real receiver problem is *gain* and *noise* rather than noise figure. Vhf operators have known this for years.

Bibliography

Belrose, "Ferroxcube Cores and a High Selectivity I.F. Amplifier", *QST*, April 1955.

Andrade, "Recent Trends in Receiver Front Ends," *QST* June 1962.

Texas Instruments, *Field Effect Transistor*, McGraw Hill Book Co.

Vogel, "Nonlinear Distortion and Mixing Processes in Field Effect Transistors," *Proceedings IEEE*, Dec. 1967.

Goldberg, "Some Notes on Noise Figure," *Proceedings IRE*, October, 1948.

Friis, "Noise Figure of Radio Receivers," *Proceedings IRE*, July, 1944.

Grove, "Don't Just Fight Semiconductor Noise," *Electronic Design*, Aug. 16, 1969.

Edson, "Noise in Oscillators," *Proceedings IRE*, Aug. 1960.

McKeon, "Cross Modulation Effects in MOSFETS," *RCA Publication ST 3520*.

Horn, "Carrier Suppression Gives 120 db. SNR Measurements," *Comm. Designers Digest*, June 1969.

Pappenfus, Bruene, Schoenike, *Single Sideband Principles and Circuits*, McGraw Hill Book Co.

Rheinfelder, *Design of Low Noise Transistor Input Circuits*, Hayden Press.

ARRL, *Radio Amateur's Handbook*, Chapter 2, Any Year.

QST

Let's Talk Transistors

(Continued from page 81)

Answers:

1. As shown here the bottom plate should be positive, since the top plate is connected to the emitter, which is slightly negative with respect to ground.
2. In this case the top plate should be positive, since the emitter is only slightly negative, and the bottom plate of the capacitor is tied to −9 volts.
3. On the contrary; both transistors are almost in complete cut off. (Actually, the fact that they are very slightly turned on cuts down on what is known as "crossover distortion.")
4. Yes, we are, for it is the dc resistance that is used in determining the load line.
5. This depends upon the design, but usually a flip-flop can change states in microseconds or less.
6. This establishes the emitter potential of the "off" transistor slightly negative, and thus the more positive base can keep the transistor cut off.
7. One way is to insert a positive pulse at the base of the second transistor. Another way is to connect the transistors or the battery backwards; this will definitely cause the circuit to flop!
8. Certainly; it is ideally suited as a short-term memory device, since it will remain in its most recent state.

QST

Some Basics On Solid-State Design

Definitions and Design Hints for Bipolar Transistors

BY DOUG DEMAW, *WICER

THE NEWCOMER to solid-state circuit work is frequently baffled by the terms and symbols used in application notes and technical articles. Such expressions as f_T, beta, and V_{CEO} are among the long list of terms that comprise the engineer's jargon. However, the terms represent but one area of confusion to some amateurs. Many of the practical problems faced by the builder of home-constructed equipment are the oft-time unhappy experiences caused by the characteristics the symbols represent. A better understanding of the transistor's frequency characteristics can enable the builder to head off many performance problems before they have a chance to occur. Also, it is much easier to select the right transistor for the job if the designer understands the vernacular of the semiconductor world. This discussion will focus on those ratings and terms that are of immediate significance to the first-time designer of solid-state circuits. Emphasis will be placed on frequency characteristics, or *parameters*.

Understanding the Jargon

Step 1 in making the terms palatable is to not regard them as "word ogres." Actually, the engineering expressions we are about to discuss are very straightforward, so let the author blast away and be done with the quinine-flavored portion of the prescription so that we can get into the more interesting part of the story. The following glossary of symbols and terms will be of practical value to the beginning designer:

1) f_T – Upper useful frequency of operation, *common-emitter* connection (grounded emitter). This is the frequency at which the transistor ceases to amplify current, and where the gain drops to unity, or 1. The f_T is also called the *gain-bandwidth product*.

2) f_α – The upper useful frequency of operation, *common-base* connection (grounded base). At this frequency the transistor's gain drops to 0.707 (1/2 2) of its value at 100 Hz. This characteristic is also symbolized by f_{hfb} or *alpha cutoff*.

3) h_{fe} – The current gain, or *small-signal forward-current transfer ratio*, (common-emitter connection), or *beta*. E.g., if a 1 mA base current causes the collector current to be 100 mA, the beta is 100. The higher the beta rating, the greater is the transistor's gain capability.

4) V_{CEO} – The voltage measured between the collector and emitter terminals while there is no connection to the base element (base open).

5) V_{CBO} – The voltage measured between the collector and base terminals when the emitter terminal is disconnected, or open.

6) P_T – Power capability with relation to the case temperature (T_C) at values up to 25 degrees C. The power is expressed in watts.

7) I_C – Collector current in mA or amperes.

These ratings are normally expressed as maximum values in the list of specifications and should be studied carefully when choosing a transistor for a particular application. Here are some additional terms that are of interest to the ham designer:

1) C_{ibo} – Input capacitance at the emitter terminal of a common-base stage, emitter not connected to the circuit.

2) C_{ieo} – Input capacitance at the base terminal of a common-emitter stage, base not connected to the circuit.

3) C_{obo} – Transistor output capacitance, common-base, collector disconnected from circuit.

4) C_{oeo} – Transistor output capacitance, common-emitter, collector disconnected from circuit.

5) P_{OE} – Power output of a large-signal amplifier, common-emitter connection.

Familiarization with these terms and symbols will enable most beginners to make a suitable device selection for a particular circuit application. The glossary relates to both types of bipolar transistor, pnp and npn. There are many more symbols that can be taken into account when selecting a transistor, but they are somewhat beyond the scope of this article, and will not be treated here.

Putting the Expressions to Work

Now that we have built a foundation for our discussion let's see what some of the terms mean to the designer. Starting with f_T, and assuming that we plan to construct a common-emitter rf amplifier stage, what would be an appropriate f_T for operation at 14MHz? Some of us prefer to work with rules of thumb, and this is quite practical where frequency ratings are concerned. To allow ample leeway in assuring stage gain, select a transistor whose f_T is 5 to 10 times higher than the proposed operating frequency. Using this rule, the

*Technical Editor.

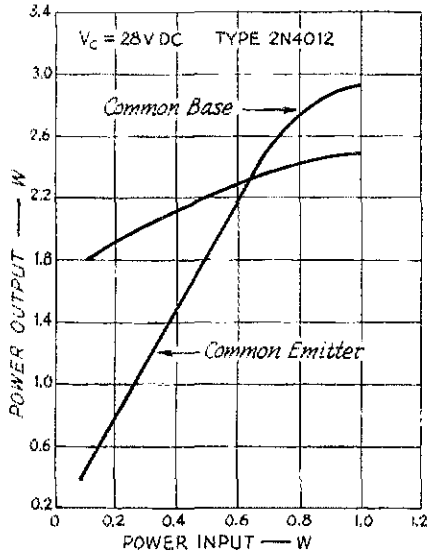


Fig. 1 — Curves showing the characteristics of common-emitter and common-base amplifiers using an RCA 2N4012. The curves were drawn for a frequency multiplier, but similar results are had when operating "straight through."

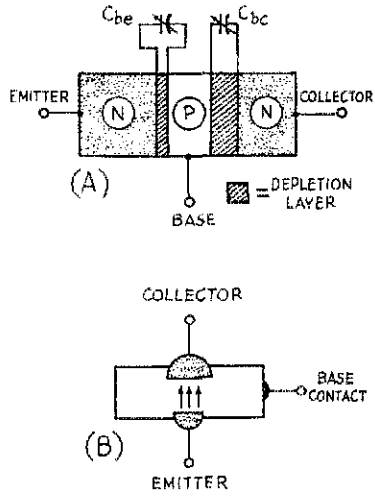


Fig. 2 — At A, an illustration of the variable-capacitance effects of the depletion layers in an npn transistor. The capacitance changes as the voltages change. Depletion layer C_{bc} has the most profound effect on circuit performance. At B, a representation of an alloy-junction transistor showing the current flow from emitter to collector through the base material. The time period for the current flow establishes the transit time of the transistor.

f_T for 14-MHz operation would be 70 MHz or higher. This is a good practice when designing oscillators and audio amplifiers as well. If common-base operation is planned one should follow the same rule, but with regard to f_α or alpha cutoff. The common-emitter hookup is used by most amateurs, and provides greater power gain at high drive levels than does the common-base arrangement. On the other hand, the common-base approach is somewhat more efficient at low driving levels, but is more unstable than the common-emitter amplifier. A comparison between the two modes (Fig. 1) shows the power output versus driving power.

The transistor's beta (h_{fe}) establishes how much gain a stage will have. This current gain, base to collector, varies inversely with the emitter current during operation, becoming lower as the emitter current increases. It is wise, therefore, to select a transistor whose beta is based on an operating power somewhat higher than that proposed, thus assuring ample gain *at* the operating frequency. High-beta transistors are especially useful in oscillator circuits to enable the transistor to start quickly when keyed. The high beta makes it less difficult to secure the feedback needed for oscillation. In the case of VFOs, high-gain transistors permit the builder to use larger-than-normal values of parallel capacitance in the tuned circuit – an aid to frequency stability – while still enabling the oscillator to start easily. It is important to realize, however, that high-gain circuits can break into oscillation at some unwanted frequency, and more often than not are prone to do so. For this reason it is necessary to employ effective bypassing and parasitic suppression.[1]

There are breakdown-voltage requirements to be considered when choosing a transistor. Most amateurs use the V_{CEO} rating with respect to the available supply voltage. For audio amplifiers, oscillators, and rf amplifiers for fm, cw, and ssb the V_{CEO} maximum should be at least twice the supply voltage. That is, if we are operating from a 12-volt source the collector-to emitter voltage rating should be at least twice that value, or 24 volts. Amplitude-modulated rf amplifiers should be rated four times higher than the supply voltage – a V_{CEO} of 48 volts or more when using a 12-volt supply. These twice and four-times ratings are necessary to allow for the collector swing during the driven period. Transistors with high V_{CEO} ratings afford safer operation than is obtainable with those having marginal ratings. Junction damage can occur instantly if the maximum ratings are

1 "Some Tips on Solid-State VFO Design," *QST*, May 1970.

Some builders shy away from transistor circuits because they don't understand what the symbols and terms mean. Here is some practical advice on transistor selection and application, plus an explanation of the symbols and terms that the beginner can use as design tools. Some common circuit faults are also discussed, and their cures are prescribed.

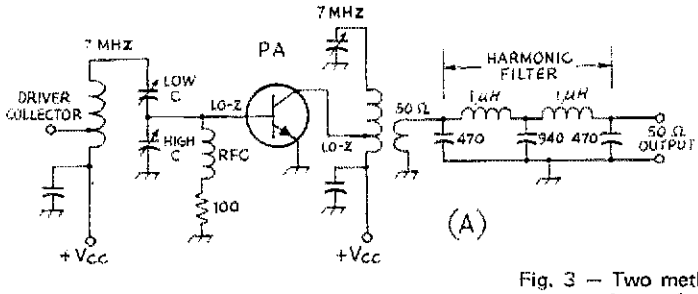
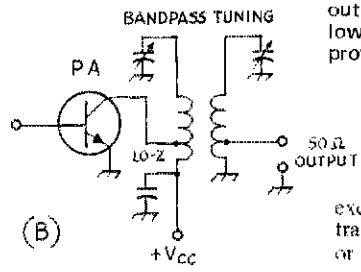


Fig. 3 — Two methods for reducing the harmonic output of an rf amplifier. At A, a two-section low-pass filter is used. At B, bandpass tuning provides the selectivity needed.



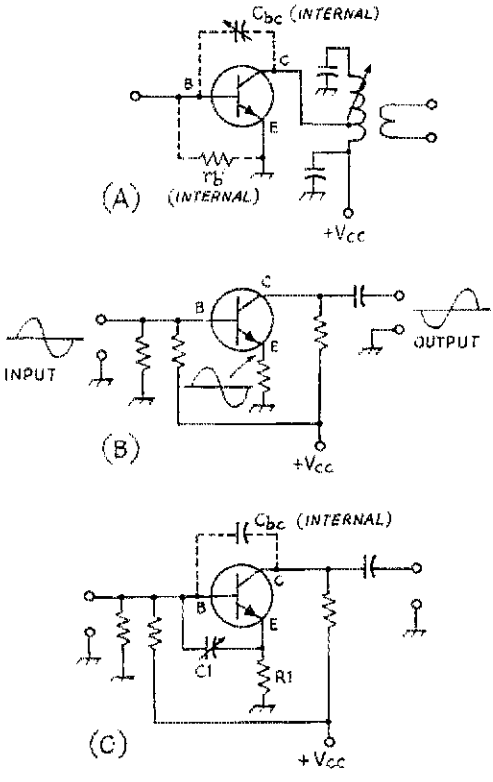


Fig. 4 — At A, the internal base resistance of a transistor is represented as rb'. Cbc is the collector-base junction capacitance caused by the depletion layer illustrated in Fig. 2A. The normal phase relationships for a common-emitter amplifier are shown at B. The circuit at C shows a method for correcting negative feedback caused by Cbc.

exceeded, and this can easily happen if the transistor is put into operation during no-load or high-SWR periods. Similarly, high peak voltages can develop when an amplifier stage breaks into oscillation. Therefore, a transistor whose V_{CEO} is, say, 100 volts is relatively immune to over-voltage damage during the foregoing conditions.

Symbol P_T is used by the manufacturers of transistors to set a safe limit of power dissipation so that all parts of the device are kept at a temperature which is below the value that will result in detrimental performance. The heat is caused by the dissipation of electrical power within the semiconductor materials and their junctions. Excessive heat will destroy the transistor by causing a short-circuited junction. Also, high operating temperatures degrade the efficiency of the transistor. It is prudent, therefore, to use a device whose P_T is sufficiently high to assure safe, efficient operation. In this regard one might choose a transistor whose P_T rating is 15 watts or greater when contemplating a dc input of 8 or 10 watts to the stage. Of course the use of a *heat sink* is mandatory when operating high-power transistors.[2]

The term I_C relates to the collector current of the transistor. The maximum stated I_C should not be exceeded. This will assure the user that junction damage will not occur from excessive heating caused by too much collector current. Since the gain of the transistor is affected by the current flowing through the device, exceeding the recommended values of current will cause low gain as well as damage. A good rule of thumb here is to pick a transistor whose I_C maximum is at least twice the maximum anticipated collector current during operation. For example, if operating a PA stage with a V_{CE} of 12 volts, and with a peak collector current of 200 mA (2.4 watts dc input), the transistor's I_C maximum should be rated at 0.5 ampere or more. An RCA 2N2102 satisfies the requirement, and under these conditions meets the P_T specifications mentioned earlier.

[2] Information on thermal considerations and heat sinking is given in *RCA Power Circuits*, Tech. Series SP-51. Available from most electronics wholesale outlets.

The second part of the glossary lists some symbols for input and output capacitance. The manufacturers publish specific values of capacitance for each transistor type under some static condition. The absolute value of capacitance, however, varies in accordance with the supply-voltage swing and the amount of power the transistor is dissipating, as we will see later. Input capacitances for most transistors range from less than a pF to as much as 100 pF. The usual range of output capacitance is between a few pF and more than 200 pF. It is important to know these values of capacitance when designing the input and output matching networks.[3] The lower in value these capacitances are the higher the transistor's f_T will be.

Junction Capacitance and its Effects

Those who have worked with tubes are aware of *the effects of input capacitance, output capacitance*, and grid-plate capacitance. These capacitances affect the tube's operation to some extent at any frequency, but more so as the operating frequency is increased. Transistors have similar capacitances which must be taken into account when designing the circuit. The most profound effect on a transistor's performance is caused by the collector-base capacitance. (C_{bc}). Depending upon the transistor's internal structure and operating voltage, this capacitance can be anything from 1 to 100 pF. Referring to Fig. 2A it can be seen that a *depletion layer*, or *transition region* exists between the collector and base layers of the transistor. This area acts as a dielectric to separate the two plates of the collector-base capacitor. As the operating voltage is raised and lowered, purposely, or because of the sine-wave excursion, the width of the depletion channel widens and nar-

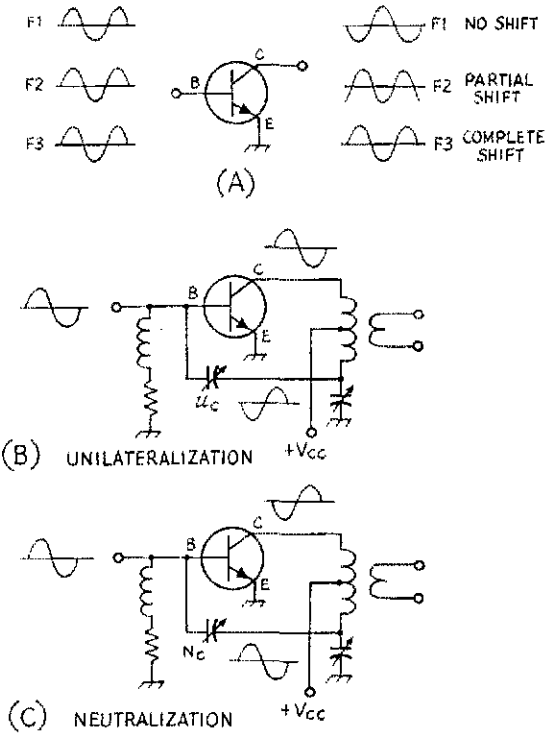


Fig. 5 — Base-layer thickness can cause complete or partial phase shift as the transistor's f_T is approached. F1 is well below f_T, F2 is close to f_T, and F3 may be near, at, or above f_T, giving rise to positive feedback and circuit instability. Examples of unilateralization and neutralization are shown at B and C.

[3] Impedance-calculation charts and equations for designing input and output networks are given in the RCA booklet listed in footnote 2.

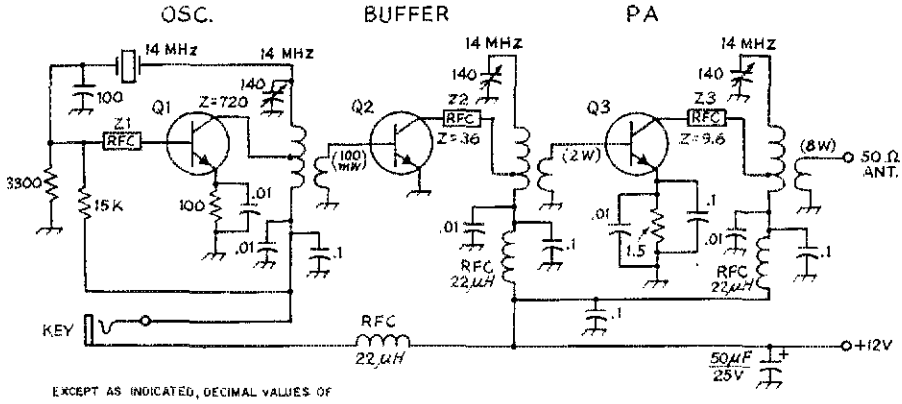


Fig. 6 — Representative circuit for an 8-watt-output, 20-meter cw transmitter. Q1, Q2, and Q3 are discussed in the text, and are listed in Table I according to their characteristics. Z1 through Z3 are ferrite-bead rf chokes for stopping vhf and uhf oscillations.

rows, thus changing the value of capacitance in a nonlinear fashion. This condition can be equated to that of a varactor-diode multiplier, causing the harmonic currents in the collector to be as great as those of the fundamental signal. It is not unusual to find that the second and third harmonic outputs from an rf amplifier (using a simple tuned circuit) are only 10 or 15 dB below the fundamental signal. Transistors that are operated at low signal levels are less prone to harmonic generation, but as the signal level increases so do the harmonic currents. The most practical cures for this problem are the use of a highly-selective collector tuned circuit, or the addition of a harmonic filter (Fig.3).

Junction capacitance C_{bc} causes another undesirable effect in some amplifiers – *negative feedback*. Normally the collector signal of a common-emitter stage is the inverse of the base signal as shown in Fig. 4B. However, C_{bc} allows some of the collector signal to be fed back to the base to reduce the amplifier's gain. One method of correcting the problem is shown in Fig. 4C. The emitter is lifted above ac ground by means of a resistance, R1, to provide a takeoff point for some *positive feedback* which can be fed back to the base through C1, thus neutralizing the effects of C_{bc} to prevent the output signal from opposing the input signal.

Frequency and Transit-Time Effects

As is true of tubes, transistors have a characteristic known as the *transit time*. To a greater extent the transit time sets the upper-frequency limit of the device (f_T or f_α). The time period required for the current to pass from emitter to collector, across the base region, is finite (Fig.2B). The length of time necessary for this passage of current is the transit time. The time period is determined by the thickness of the base material in the transistor. Germanium devices have base thicknesses that are greater than those of silicon transistors. For this reason most vhf and uhf transistors are of the silicon type, providing better frequency response than the former.

The transit time, if long enough in duration, can cause some undesirable effects over and above the frequency-response limiting just discussed. As the input signal passes through the base material a phase shift can occur (Fig. 2B). At frequencies well below f_T no problems result, but as the operating frequency is increased phase shift can become a serious consideration. Fig. 5A illustrates partial and complete phase shift of the signal. At an intermediate frequency, F2, partial shift is evident. At F3 the shift in phase is complete, placing the collector and base signals in the same phase. This effect, because of C_{bc} discussed earlier, causes *positive feedback*, and can send the circuit into oscillation. When the input and output signals are in the same phase, or nearly so, the input and output circuits tend to interlock, and any change in operating conditions at one of the ports will be reflected to the other port. In the case of a tuned rf amplifier it will be nearly impossible to tune the tanks to resonance without interaction occuring. To correct for positive feedback one must apply an equal amount of negative feedback from output to input. This technique is known as *unilateralization* and should not be confused with the more conventional *neutralization* process. Though the effects are similar, neutralization corrects for *negative* feedback while unilateralization cures *positive* feedback. Examples of both methods are given in Fig. 5, at Band C.

Another Frequency-Determining Factor

The actual size of the collector layer determines how much collector capacitance will exist. The collector capacitance per cm^2 is the parallel plate (layer) capacitance of the collector depletion layer:

$$C_{ca} = \frac{\epsilon}{xm}$$

where ϵ is the dielectric constant of the semiconductor, and xm is the depletion-layer thickness. This indicates that the output capacitance is dependent upon the collector area, hence the smaller the area the higher the transistor's f_T. Transistors have a characteristic ohmic base resistance, rb', which is the resistance of the base layer. This base resistance and collector capacitance establish a time constant which sets the upper frequency limit of the transistor.

A Design Example

Let's suppose the designer wants to build a three-stage 20-meter cw transmitter that will operate from a 12-volt dc supply. Power output is to be 8 watts. A representative circuit for such a transmitter is given in Fig. 6. Transistor Q1 serves as a crystal-controlled oscillator, and should deliver approximately 100 mW output. Buffer stage Q2 will operate Class C and have an output of approximately 2 watts. Q3 should develop sufficient power to provide the required 8 watts output. It also operates Class C. Following the recommendations set forth earlier we find that the transistors listed in Table I will do the job we have in mind. Examination of the various specifications will show that we have based our choice on the text discussion. Other transistor types could satisfy our requirements, and those listed are used only as examples.

TABLE I

Maximum Rating	*Q1*	*Q2*	*Q3*
Type	2N4124	2N2102	2N3632
V_{CEO}	30	65	40
I_C	200 mA	1 A	3 A
f_T	300 MHz	100 MHz	400 MHz
P_T	310 mW	5 W	23 W
P_O	100 mW	2 W	13.5 W
Beta or Gain	360	190	5.9 dB

The collector load impedance (*RL*) of a transistorized rf amplifier is determined by:

$$RL = \frac{V_{cc}^2}{2\ P_o}$$

where Vcc is the collector supply voltage, and P_o is the desired power output from the stage. Therefore, the collector load impedance of Q1 is 720 ohms, Q2's load impedance is 36 ohms, and Q3 works out to be 9.6 ohms. It is because of these relatively low impedances that the collectors are tapped down on the tuned circuits.

The input impedance (base) of common-emitter power stages is normally quite low – 3 to 10 ohms – requiring careful matching in that part of the circuit for proper power transfer. It is not difficult to wind an output link on the collector coil that enables the tuned circuit to serve as an impedance transformer. At frequencies above 30 MHz the job becomes a bit more difficult because the secondary winding may require but one turn or less, and adequate coupling may be impossible. It is better to use a capacitive divider across the collector tuned circuit at vhf, Fig. 3A. This will provide a practical impedance transformation from collector to base, and will shunt the harmonic currents to ground through the normally-large value of capacitance in the lower half of the divider.

Some Final Comments

The information offered here should help to dispel some of the doubts that may have prevailed in the minds of would-be solid-state experimenters. At least we may have provided a starting point for getting involved with transistors. Subsequent *QST* articles will treat some additional terms and symbols, and will cover more typical design problems faced by experimenters. Meanwhile, why not try your hand at some simple solid-state project? If you haven't worked with transistors you have missed one of the finest experiences in amateur radio.

References

1. Linvill and Gibbons, *Transistors and Active Circuits* (McGraw-Hill).
2. Watson, *Microwave Semiconductor Devices and Their Circuit Applications* (McGraw-Hill).
3. *RCA Transistor Manual* (RCA).
4. "Varactor Diodes in Theory and Practice," *QST*, March 1966.
5. Johnson, "Physical Limitations on Frequency and Power Parameters of Transistors," *RCA Review*, p. 163, 1965.
6. Hunter, *Handbook of Semiconductor Electronics* (McGraw-Hill).
7. Pritchard, "High-Frequency Power Gain of Junction Transistors," *Proc. IRE*, p. 1075, 1955.
8. *RCA POWER CIRCUITS*, Technical Series SP-51 (RCA).
9. Early, "Structure-Determined Gain-Band Product of Junction Triode Transistors," *Proc. IRE*, p. 1924, 1958. QST

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Eclipse Experiment 1970

(Continued from p. 34)

At 1924 GMT, I heard W1OB in New Hampshire (95 miles) and his signal was S7, just before I again contacted W4BYB in Miami, Florida. W4BYB's signal had now dropped to S3 and mine to S4 using the now-predominant *E* layer with four hops. Five minutes later, his signals were again copied at the same signal strength.

The last readable European station heard until actual nighttime conditions arrived was DJ3GG at 1936 GMT. His signal was only S5 and was fading. From then on, the European stations were too weak for identification, and had all but faded out over the great-circle path which, before, had supported good signal strengths over a one-hour period during my local eclipse.

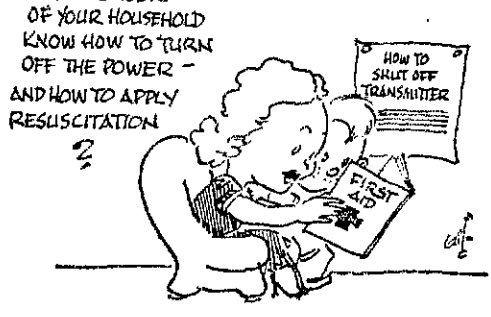
Conclusions – 7 MHz

1) When the radio-communication distance is fixed and the same antenna and power are used, the differences between daytime and nighttime conditions could well mean signal-strength differences of 20 dB or more. At night, not only is the absorption from the *D* layer removed, but, quite likely, reflection will take place from the higher *F* layer, requiring less hops to cover the same distance. (A signal-strength difference of 20 dB is equivalent to changing the power input by a factor of 100:1.)

2) A majority of our communication occurs over a multihop propagation path, and quite frequently the signal undergoes dynamic changes during unsettled conditions, such as just before dawn and after dusk.

The principles of wave propagation at such frequencies during various natural conditions were quickly proven in practice, and the findings should make one aware of communication limitations and what may be expected of our equipment.

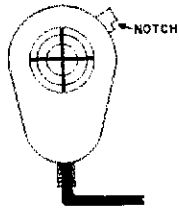
The conclusions presented are not really startling, but do represent what was proven by the eclipse experiment undertaken through the cooperation of amateurs who spent a few hours exchanging signals to make the study possible. It is this sort of cooperative effort and typical experimentation that makes our hobby useful as well as interesting. My thanks go to those who made it possible. QST



Hints and Kinks For the Experimenter

LOCKING ACTION FOR MOBILE MIKES

A simple modification to my mobile mike has made long-winded QSOs a bit easier. By carefully filing a notch in the push-to-talk button, a locking

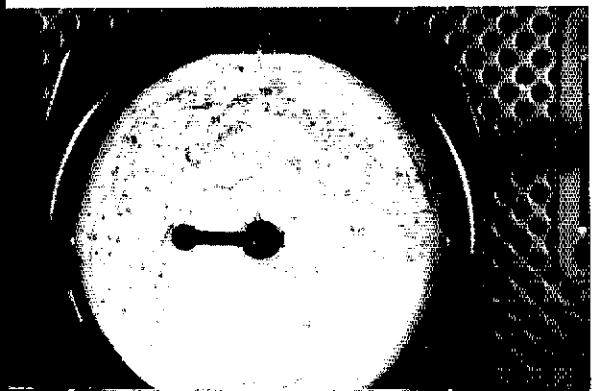


action can be added to almost any mobile mike. The sketch shows the placement of the notch. Care should be taken to keep filings from falling into the mike case. With my mike, it wasn't necessary to remove any more than 1/16 inch from the control button. Be sure to check frequently for locking action. – *Gene Kusluski, WA8YIT*

BEAM INDICATOR

For years I have considered various methods of establishing easily the correct beam direction for a given point in the world. I have had an ARRL Radio Map of the world on the wall above my equipment and have experimented with systems of projecting the selsyn pointer onto the map. This proved too cumbersome and complicated. The various methods of using globes took more space than I liked. Recently it occurred to me to try a different approach and the result is shown in the photograph.

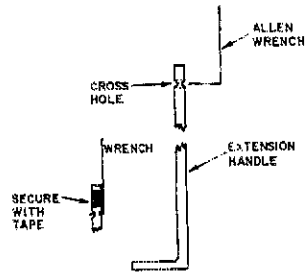
First, I photographed the ARRL map on Kodacolor film. A color print was then made of the correct size to fit my 3-inch surplus selsyn indicator. This print was cut to the correct diameter and a hole was put in the middle. The selsyn glass was removed, the pointer pulled off and the print affixed by double-backed tape to the face of the selsyn. The pointer was replaced. I then drew an outline map of North America (with states) and had a positive transparency made to my size specifications. This was cut in a circle centered on Indiana and placed behind the selsyn glass. This makes it easy to spot North American locations and, by looking through the transparency, do the same for the rest of the world. Although the world map is small, a quick look at the wall map establishes the location of small countries relative to larger features and makes antenna aiming easy. *Robert Shoemaker, Jr., W9MTU.*



ALLEN WRENCH EXTENDER

As a one-time designer of military electronics gear, I became adept at secreting setscrews in locations not accessible to the ordinary Allen wrench. Recently I found that habits are hard to break. While trying for a few moon echoes on 2304 MHz, I couldn't seem to get the beam pointed at the target. The motors and selsyns were grinding, but no echoes came back. Investigation by spotlight (3 A.M., sleet all around) showed the feed horn not traversing its track.

Later investigation showed this was nothing more serious than a loose setscrew on the drive sprocket. However, I had designed the monster so that to see the screw, I had to stand on a sixteen-foot ladder and use a mirror and a flashlight to look down a six-inch-deep tunnel! None of my long-handled wrenches seemed to fit the screw. After fifteen minutes deliberation and five minutes work, the matter was solved with a home-made extension handle, per the sketch. – *William L. Smith, W3GKP*



The Allen-wrench extender is made from a short piece of tubing, or welding rod.

TRANSISTOR HEAT SINKS

Anyone interested in solid-state projects knows that any time a transistor must handle a relatively large amount of power, it will probably need a heat sink. Many fm, TV, and other commercial broadcast stations use tubes such as the 4CX250. These and similiar types are usually not worth rebuilding and may be available for the asking when they go bad. I found by cutting the metal top section off and doing some filing, these tube anode can be readily adapted for heat-sink applications. The fact that the heat sink is around the transistor and not spread all over the back of the cabinet can be quite convenient. – *Greg Larson, WAØWOZ*

FOLLOWING are high *claimed* scores of entries received by May 20. Read (left to right): total score, multiplier, contacts. Final results will appear in (or near) October *QST*; please don't ask for DXCC credit based on log confirmations until the adjusted scores make the scene!

W4AJA QM

W/VE -- CW

Single Operator

K1DIR	2,101,020-388-1805
W1BGD/2	2,031,300-366-1850
W9IOP	2,024,490-327-1790
K1NQL	1,997,372-359-1836
W4YHD	1,965,120-368-1780
K2KJR	1,894,635-355-1779
K4GSU	1,811,596-353-1712
W8VSK	1,802,150-375-1602
W2DXL	1,717,428-334-1735
WB2CKS	1,702,458-339-1693
W1YK	1,700,328-349-1624
W3GRF	1,660,648-334-1654
K4PQL	1,650,564-306-1768
W2GGE	1,621,641-329-1647
W3NU	1,619,568-368-1475
K2KNV	1,611,015-335-1603
W9LKJ	1,609,830-310-1731
W8QXQ	1,601,910-349-1530
W5JAW	1,579,014-361-1458
W1BPW	1,568,418-346-1511
W4JDR	1,549,080-331-1560
K4THA	1,520,207-337-1504
W4ETO	1,518,480-360-1406
W3MFW	1,497,888-336-1486
WA1IRG	1,491,720-316-1605
W4KFC	1,484,535-331-1497
W3WPG	1,475,910-310-1587
W6RR	1,462,239-279-1747
W1FBY	1,444,200-290-1660
W7IR	1,442,808-348-1384
W3VT	1,439,949-359-1337
WA1FHU	1,412,532-319-1476
W1BIH	1,391,208-338-1372
K4BAI	1,390,932-324-1431
K1THQ	1,373,730-290-1579
K1JHX	1,352,660-293-1540
W2PCJ	1,350,720-320-1407
K2DJD	1,348,518-317-1418
K3HTZ	1,348,095-347-1295
W3MVB	1,334,880-309-1440
W4KYV	1,313,025-305-1435
VE2DCW/2	1,300,830-331-1310
W1FTU	1,285,065-285-1503
W5WZQ	1,275,192-356-1194
W0HP	1,268,820-288-1484
K1VTM	1,252,080-282-1482
WA1DJG	1,243,352-284-1462
K6UYC (W6DQX, opr.)	1,233,549-291-1413
W7DI	1,213,443-309-1309
W2BQF	1,189,656-328-1209
W5IOU	1,171,734-358-1091
K8EHU	1,152,153-313-1227
K4II	1,125,422-344-1091
W6CYX	1,122,816-272-1376
W1WAI	1,114,289-281-1327
W2WD	1,046,865-303-1153
K8RMK	1,034,652-330-1142
WA8LYF	1,025,418-298-1147
W2WZ	1,010,590-302-1115
W5WMU/5	1,010,394-297-1134
K6AHV	1,009,680-280-1202

Multioperator

W4BVY	6,879,815-493-4653
W3NPZ	6,595,675-497-4464
W7RM	5,918,022-451-4599
W3GM	5,546,520-465-3976
W6VSS	4,623,804-426-3620
K8UOJ	4,146,066-449-3078
K6EBB	3,917,745-405-3223
W4ZXI	3,821,658-433-2942
W3WJD	3,483,402-426-2741
K3IYZ	3,060,090-363-2810
W9YT	2,670,055-379-2349
W3TV	2,655,192-349-2536
W6ANN	2,256,240-357-2110
W3MWC	1,931,654-341-1898
W6ITY	1,603,920-328-1630
WA8ZDT	1,504,260-305-1644
WA6IVN	1,343,598-302-1483
W3OV	1,318,746-286-1537
W3KT	1,296,873-309-1399
W0AIH	1,241,220-302-1374
WA2IZS	1,226,550-325-1258
WB6TOJ	1,165,024-271-1433
K2JVB/3	1,063,584-288-1231
WA1JUY	1,062,934-262-1354

W/VE -- PHONE

Single Operator

W6RR	2,085,900-340-2045
W4RVV	1,587,924-351-1508
W4ZCY	1,553,448-338-1536
K6UYC (K9ZMS, opr.)	1,534,680-294-1740
W1BGD/2	1,508,454-362-1389
K6AHV	1,504,914-307-1634
K1THQ	1,398,600-333-1400
W5JAW	1,389,756-358-1294
W4QBK	1,356,678-339-1334
K8UDJ (K1ZND, opr.)	1,323,024-344-1284
W5IOU	1,238,706-339-1218
W2DXL	1,188,690-330-1217
K1UHV	1,112,832-336-1104
W1YK (WA1ABW, opr.)	1,033,032-308-1118
K2DJD	1,022,325-317-1075
K1JHX	1,019,592-294-1156
W0HP	1,005,372-321-1044
W5WMU/5	976,800-296-1100
WA3KEG	969,108-332- 973
W3VT	954,504-324- 982
WB2SQN	936,814-277-1129
K6NA	897,840-232-1290
WB6WIT	887,502-238-1243
K1VTM	835,155-277-1007
W5QWE	823,521,277- 991
K1KNQ	822,528-288- 954
W4NBV	778,674-298- 870
W3NU	770,523-299- 859
K6PUR	755,616-272- 926
W2MB	739,344-292- 844
WA1DJG	717,880-274- 874
W8LXU	707,130-291- 810
VE7BDI	701,784-228-1026
K9CUY	699,840-288- 815
W9BZW	687,690-270- 849
W2YT	687,219-263- 871
WA6EPO	677,250-215-1050
WB6UDC	665,940-220-1009
VE3WQ	646,921-253- 853
WA4UXU	631,338-278- 757
WA1JHQ	621,753-227- 913
W1EBY	607,200-253- 800
K3HZL	601,314-278- 721
W7RS	593,892-282- 702
W3DHM	587,334-242- 809
W9QQN	575,420-260- 739
K4TTA	570,900-275- 692
K4EZ	567,365-265- 715
K6SXA	558,828-228- 817
W6DGH	546,315-215- 847
VE3BS	544,260-235- 772
W3NX	539,550-275- 654
K7YWZ	524,892-204- 858
K9BGL	523,107-263- 663
WA3HRV/2	516,384-264- 652
VE2YU	510,498-237- 718
W3AXW	510,048-253- 672
VE2AYU	507,360-224- 755
K4BAI	507,033-211- 801
W1FIJ	503,475-245- 685
W4LBP	500,379-257- 649

Multioperator

W3ZKH/3	5,793,177-533-3676
W3GM	3,618,024-466-2588
K8HLR	2,741,244-418-2186
W5KUC	1,514,034-361-1398
W9LKJ	1,321,704-348-1266
W3MWC	1,296-864-342-1254
W3ADO	1,248,813-327-1273
K2UOJ/2	1,017,420-310-1094
WA2HSX	1,014,039-321-1053
WA3AFP	980,583-311-1051
WA5RXT	883,884-292-1009
K9PPJ	878,163-299- 979
WA2IZS	877,440-320- 914
W6YRA/7	865,287-237-1219
K3HTZ	848,820-301- 940
WB6UKO	819,591-229-1193
W3OV	792,396-253-1044
W8NGO	758,862-282- 897
K7RAI/7	746,808-232-1073
WA3FXJ	745,141-279- 893
W8ICS/8	736,588-271- 906
K4LK	662,991- 63- 238
WB2UDQ	651,000-250- 868
K6AN	614,685-215- 953
WA5VPZ	580,170-233- 830
W5EQT	560,268-237- 810
WA2CFA	530,472-248- 713
WA0CPX	523,647-249- 701
W3SS	511,056-252- 676

DX -- CW

Single Operator

PJ2VD	3,160,524-268-3931
KH6IJ	3,110,433-277-3763
LA9AD	2,786,616-252-3689
YV5KL	2,493,702-246-3379
OZ1LO	2,440,848-241-3376
DL4QQ	2,399,358-247-3238
OH5SE	2,397,600-222-3601
G2RO	2,189,075-245-2981
G3EXB	2,174,784-241-3008
DL6WD	1,950,648-238-2861
PA0LOU	1,944,152-233-2861
EL2CB	1,929,240-230-2796
LA1QA	1,866,936-214-2909
G3TXF	1,702,665-234-2483
JA1AEA	1,591,920-220-2413
DL7AA	1,573,200-228-2300
EI9J	1,562,232-238-2197
HA5BA	1,555,300-206-2517
OZ1W	1,327,664-208-2192
DJ4ZR	1,284,114-202-2119
ON4XG	1,117,314-209-1782
ZC1AMO	1,054,680-188-1870
GW3JI	1,009,113-203-1657
JH1GNL	987,083-181-1781
F8TQ	935,830-203-1550
E8VJ	928,584-216-1433
G3KMA	828,036-198-1494
DJ4UF	751,288-174-1161
LZ2DC	720,780-164-1465
OK2BOB	689,544-183-1256
G3KSF	687,416-202-1136
OX3WQ	671,520-160-1399
SM5CMP	653,082-178-1230
TI1AW	648,284-169-1279
VK3QI	617,550-179-1150
KZ5NR	602,040-173-1160
HB9AGH	599,400-150-1401
HL9VQ	590,976-152-1342
HS5ABD	576,600-155-1240
F8IC	565,593-161-1171
G2QT	556,686-169-1098
F8ZF	547,308-165-1127
HB9DX	526,338-171-1026

Multioperator

SK6CF	3,678,336-248-4944
TF2WKF	2,769,870-284-3664
LZ1KPG	2,152,332-234-3066
DL0JR	1,524,640-208-1443
OK1APV	1,470,644-212-2320
DL0ER	1,412,550-219-2150
KR6VX	1,369,044-204-2237
HB0XGR	1,062,666-198-1789
9I2XZ	1,045,093-173-2016
OK1KTL	1,032,427-187-1844

Multioperator

KH6SP	4,035,324-262-5134
PJ9GE	4,030,641-243-5585
CR6GA	2,548,800-180-4710
KA2RS	1,655,478-198-2787
KH6UL	1,591,266-226-2347
I1AJ	1,198,548-195-2047
DL4RM	1,002,852-178-1878
TI2WKF	962,925-185-1737
HB9QD	826,488-156-1817
LA1H	632,786-154-1384
KR6VX	589,176-147-1336
OH2AA	915,656-166-1838
HA1KSA	772,200-165-1560
LZ1KVP	697,404-178-1306
PA0GN	578,920-164-1176
KZ5KN	545,889-187-1159

DX -- PHONE

Single Operator

KP4AST	6,779,598-302-7483
HG1P	5,615,314-263-7117
HC1TH	4,062,600-244-5545
KH6IJ	3,965,350-247-5350
XE1KS	3,533,220-270-4362
KZ5NR	3,321,678-259-4278
XE1LUS	3,262,239-261-4166
YV4UA	2,701,327-187-3510
VK2FU	2,319,840-216-3580
WA9KAI/HR2	2,296,875-225-3404
CT2AT	2,199,120-238-3159
LA9AD	2,144,142-234-3055
KP4CQB	2,072,703-213-3253
LU8DKA	2,024,868-182-3798
CT1BH	1,815,780-212-2855
ZS6DW	1,681,852-188-2943
EA4LH	1,485,390-201-2465
F3KW	1,474,308-219-2244
EI2BD	1,434,916-196-2441
JA1AEA	1,354,368-192-2350
I1BAF	1,305,639-199-2187
K4MUP/YV1	1,201,575-185-2165
XE1J	1,158,894-198-1951
VP9RY	1,071,984-184-2942
ZP5CS	1,041,852-157-2212
SH3LV	1,030,440-154-2230
4M7AV	1,019,502-209-1626
EL2BZ	1,010,256-166-2035
KV4AM	992,358-207-1608
I1MQL	974,400-175-1856
DL4AP	916,320-160-1909
OZ1LO	883,788-188-1567
HT1MG	834,534-142-1959
OE2EGL	821,400-148-1850
CE3OE	815,332-148-1837
ZS3S	810,066-158-1709
KS6DH	797,220-180-1478
VP9GE	760,594-178-1425
CE3CF	711,189-171-1393
VK3QI	696,762-187-1242
LU2FAQ	694,467-153-1513
VP9MI	681,408-156-1456
OH5SE	653,450-150-1409
PY3APH	626,340-143-1460
G2QT	623,128-172-1208
SM5EAC	613,695-163-1255
GW4NWV	611,886-146-1397
CX2CN	597,480-130-1532
TG9GE	542,241-133-1359
DU1FH	537,840-155-1156
EA3QW	515,700-150-1146
DL6WD	507,312-156-1139
EA8GK	505,134-133-1260

Strays

Feedback

Those *QST* abbreviations listed in the June issue contained an error. OBS is the abbreviation for Official Bulletin Station, not Official Experimental Station. *(Thanks W9DZG)*

Hamfest Calendar

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Alberta – Hamfest '70 will take place in Calgary on July 11 and 12 at the Westgate Motor Hotel. The Hamfest will coincide with the world famous Calgary Exhibition and Stampede. Further details from W. F. (Bill) Williams, VE6AWF, Hamfest '70, P.O. Box 592, Calgary, Alberta, Canada.

Alberta – The Glacier Waterton Peace Park Hamfest will be held in Apgar on July 17, 18 and 19.

Arizona – The Ft. Tuthill Hamfest will be held at the Coconino County Fairgrounds, five miles south of Flagstaff on July 24, 25, and 26. Camping on the grounds will be permitted that weekend. Talk-in on 146.94 MHz fm, and 3,878 MHz ssb. There will be a potluck lunch on Sunday as well as 75- and 2-meter transmitter hunts. For more information write to WA7LPR, ARCA, or the SCM.

British Columbia - The North Island Hamfest is Sunday, August 2. For information and a map write Gordon Burleson, VE7BAV, Box 218, Port McNeil, B.C., Canada.

California – The Tri-Counties ARA has a Hamfest-Picnic planned for 10:00 A.M. July 26 at Westmont Park in Pomona.

District of Columbia – See Maryland

Idaho – The WIMU Hamfest is scheduled for August 7,8, and 9 at Mack's Inn, Idaho.

Illinois – The 13th Annual Hamfest of the Six Meter Club of Chicago Inc. will be held Sunday August 2 at the Picnic Grove on U.S. 45, 1 mile north of U.S. 30, 5 miles south of U.S. 6, Frankfort, Ill. Food and drinks will be available. Swap and shop section. Advance registration $1.50, admission at the gate $2.00. For tickets and further information contact Mike Corbett, K9ENZ, 5215 West 73rd Court, Argo P. O., Illinois 60501.

Illinois – The Quad-Co. ARC will sponsor the 13th Annual Hamfest of the "Breakfast Club" on July 18 and 19 at Terry Park, 3/4 mile east of Palmyra, Illinois. All other groups are invited to meet at the Hamfest, giving prior notice to the Hamfest Committee. There will be dancing and movies Saturday night. Bring your own basket lunch. Sandwiches and soft drinks available on the grounds. Mobile talk-in on 3973 kHz from noon Saturday to 11:00 A.M. Sunday. Games, contests, golfing and fishing. Bring your swap gear. Camping facilities open from Friday afternoon until Monday morning. Pre-registration until July 7 is $1.00, $1.50 at the gate. Write "Hamfest," c/o Quad-Co. ARC, Box 323, Chatham, IL 62629.

Illinois – The Hamfesters Radio Club is holding their 36th Hamfest Sunday August 9 in Santa Fe Park at 91st and Wolf Rd., Willow Springs, near Chicago. Games and clowns for the kids, TV for the ladies. Advance donation $1.50, $2.00 at the gate. For information contact Joseph W. Poradyla, WA9IWU, Hamfesters Radio Club, Inc., 5701 S. California Ave., Chicago, IL 60629.

Indiana – The Madison County ARC will hold its annual Hamboree on Sunday, July 12. Doors will open at 11:00 A.M. at the county Civil Defense Control Center located 4 miles north of Anderson at Linwood. Activities include a general get-together and flea market. Refreshments will be available. Talk-in on 50.4, 145.35, and 146.940 MHz.

Indiana – The FWRA of Fort Wayne is sponsoring an annual FM Picnic at Crooked Lake near Angola, Indiana. Activities will begin at 8:00 A.M. Sunday August 2. For entertainment there will be boating, fishing, swimming, camping facilities, and excellent picnic grounds. The event will also feature a free flea market. More information from FWRA, Box 6022, Fort Wayne, IN 46806.

Indiana – Indiana Radio Club Council's Annual picnic is Sunday, July 12 at Memorial Park, Michigan City, Indiana. Write William Cannon, W9ILS, for information, tickets, and reservations: 205 North Roeske, Michigan City, IN 46360.

Indiana – The Tri-State ARS announces its 23rd Annual Hamfest Sunday, July 12 at the 4-H Rural Youth Center on Highway 41, north of Evansville, Indiana. Large air conditioned auditorium. Ladies bingo, swappers's row, overnight camping. Advance registration $1.50, at the door $2.00. Contact Jack Young, K9LAU, P.O. Box 492, Evansville, IN 47703.

Iowa – The Mt. Pleasant ARC cordially invites you to attend the Southeastern Iowa VHFers Picnic to be held at McMillen Park in Mt. Pleasant on Sunday, July 12. Open at 9:00 A.M. Potluck lunch, free coffee, trunk sales. All hams welcome. No charge. Rain or shine, shelter provided. Talk-in on 50.480 and 3,950 MHz.

Iowa – The Iowa 75-Meter Phone Net Annual Picnic will be held on the second Sunday in August, August 9, at Anson Park in Marshalltown. All amateurs and their families are cordially invited. Each should bring a covered dish and his own service. Festivities will begin around noon. A swap table will be available.

Kansas – The 19th Annual Hamfest sponsored by the Kansas-Nebraska Radio Club will be held on Sunday, August 2 at the Moose building, 113 West 5th, Concordia, Kansas. The program will include a hidden transmitter hunt, games, contests, and an auction. Write WØFDJ for more information.

Maryland – Shelter 301 in Patapsco State Park (near Route 40 Exit) is the place for the MDC Traffic Net Picnic on July 26.

Michigan – The 17th Annual South Western Michigan VHF Picnic will be at the Allegan County Park, August 2.

Minnesota – The Annual PICONET/HandiHam Picnic will be in Austin, July 19.

Missouri – The Zero-Beaters ARC Hamfest will be held on Sunday, August 2 at Washington, Missouri City Park. For further information write or contact Zero-Beaters ARC, Box 24, Dutzow, MO 63342.

Montana – The Glacier-Waterton International Peace Park Hamfest is July 18 and 19 at Apgar Village Campground. Write K7IMZ for pre-registration information.

Nebraska – The Central Nebraska ARC will hold its annual Hamfest and Steak Fry on Sunday, July 26 at Victoria Springs State Park. This is an outdoor picnic with charcoal steaks. Bring a covered dish and your own service. For the early birds there will be a get-together Saturday evening at the park.

Nebraska – See Kansas.

New York – The Annual Hamfest of the Champlain Valley ARC will be held July 19 starting at 10:30 A.M. at the club shack on the Akey Rd., Cadyville, N.Y. (7.2 miles west of Plattsburgh on Route 3). Food and beverages available on the grounds, talk-in on 146.34, 146.94 MHz fm and 3.925 MHz ssb. Send advance registrations ($1.50) to CVARC, Box 241, Cadyville, NY 12918.

Ohio – The Mahoning Valley ARA will sponsor a Hamfest Sunday, August 2 at Lions Park in New Bedford, Pennsylvania. This is located 9 miles east of Youngstown, Ohio off U.S. 422 and 1/2 mile north of U.S. 422. Signs will be posted on U.S. 422. Flea market, call-in on 146.94 and 146.34 to 146.76 to repeater W8IOO. For further information write Frank Dodd, K8UYF, 323 Bedford Rd., Lowellville, Ohio 44436.

Ohio – The Van Wert ARC will hold their Annual Picnic on Sunday July 26 at Jubilee Park, Van Wert (at the north end of Market St.). Swap table, auction, flea market, potluck lunch (bring table service and covered dish) coffee and cold drinks furnished.

Ohio – The 3rd Annual Ohio Traffic Nets Picnic will be held on August 1 at the Olentangy Caverns, 7 miles north of Worthington just off Route 23.

Ontario – The Annual Picnic of the Amateur Radio Sideband Association will be held at Flora Gorge Park, Elora, Ontario on July 11 and 12.

Pennsylvania – The Mt. Airy V.H.F. Radio Club (The Pack Rats) will hold its 15th Annual Family Day and Picnic on Sunday, August 9 (rain date August 16) at Fort Washington State Park, Flourtown, Pa. The Delaware Valley Chapter of the QCWA will again join us this year. Games for all ages. Bring your lunch and your family. Free soda for all.

Talk-in on 50.2 and 145.2 MHz. Follow the Pack Rat Signs on Route 309. No reservations required. $2.00 per family.

Pennsylvania – The South Hills Brass Pounders & Modulators, Inc. Hamfest will be held August 2 from noon until dusk at St. Clair Beach, McMurry, Pa. Registration forms available from Brian Alsop, WA3KOS, 5073 Grove Rd., Pittsburgh, PA 15236. Fun for all, cw contest, QRP contest, flea market, rolling pin throwing contest (XYLs only), and many other events.

Quebec – Le congres annuel de l'Association Provinciale du Quebec (RAQI) aura lieu dans la ville de Quebec les 10-11 et 12 juillet prochain. Conferences, banquet, danse, activites pour toute la famille; voila ce qui vous attend au Congres de cette annee. Tous les gars du monde a Quebec! Bienvenue a tous! Doug Blakeslee, W1KLK, assistant technical editor of *QST*, will be representing ARRL. Don't forget that the RAQI Convention will be held in Quebec City, July 10-11 and 12. Welcome to all of you!

Tennessee – The Oak Ridge Radio Operators Club will sponsor the 21st Annual Crossville Hamfest. There will be a banquet at the Crossville Holiday Inn Saturday, July 18 at 6:30. Mr. H. James Kittle, Project Engineer for Drake will give a discourse on Transceiver Design. On Sunday there will be a dutch-treat picnic. For more information contact Oak Ridge Radio Operators Club, Inc., P.O. Box 291, Oak Ridge, TN 37830.

Texas – Ham and CB Swapfest and Picnic, Sunday, August 9 at the City Park in Levelland. Sponsored by the Northwest Texas Emergency Net and Levelland Communications Club, this event is for the entire family. Bring your own picnic basket. Registration begins at 9:00 A.M. Lunch at 1300. Mobile talk-in on 3.950 kHz and channel 11.

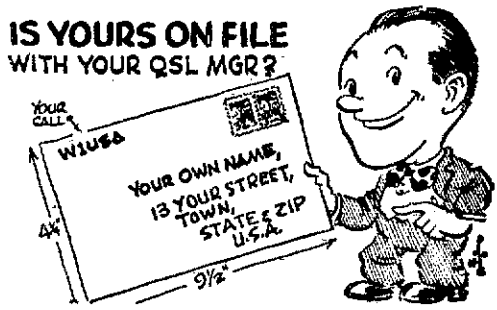
Virginia – The Shenandoah Valley ARC will sponsor their Hamfest-Swapfest on August 1 and 2 at the National Guard Armory, Winchester, Va. There will be a banquet on Saturday evening with a speaker and the film, Ham's Wide World. For more information contact George Ritter, W4UGX, RFD 5, Winchester, VA 22601.

Washington – The Washington State Hamfest will be July 11 and 12 at the Sportsmen's Chateau, 164th and Canyon Rd., south of Tacoma. Activities include CW Awards Program, QLF and WAS contests, mobile judging and mobile efficiency contests, technical meetings, technical displays, QCWA display, manufacturers' displays, 75-and 10-meter mobile hunts, swap shop, hole-in-one contest, activities for the ladies and children, after dinner program, etc. Camping space available on the grounds at $1.00 per night with free electrical hookup. Talk-in on 3.970, 50.5, and 146.76 MHz. $5.00 includes Saturday evening dinner and registration. Children under 12 $1.50 for dinner only. Logger's breakfast served by the club Sunday for only $1.25. Snack bar open both days. All dinner reservations must be made in advance. For information, Hamfest tickets or motel reservations, contact John Austin, K7CZF, 8478 Eastside Dr., N.E., Tacoma, WA 98422.

Wisconsin – The Wisconsin Amateur Radio Picnic, sponsored by the Wisconsin Nets Asso. will be held at Oschner Park in Baraboo on July 12. Activities will include code receiving contests, softball game, ladies activities and eye-ball QSOs. Refreshments are included with registration but bring your own lunch. Registration begins at 10:00 A.M. Registration is $1.50 single, or $2.50 for family.

COMING A.R.R.L. CONVENTIONS

July 4-5 – West Virginia State, Jackson Mills.
July 18-19 – West Gulf Division, Orange, Texas.
September 19-20 – Georgia State, Augusta.
September 25-27 – NATIONAL, Boston, Mass.
October 17-18 – Hudson Division, Tarrytown, N.Y.
Oct.31/Nov.1 – Roanoke Division, Raleigh, N.C.



A.R.R.L. 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 4¼ by 9½ 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[1] – Hampden County Radio Association, Box 216, Forest Park Station, Springfield, Mass. 01108.
W2,K2,WA2,WB2,WN2 – North Jersey DX Assn., PO Box 505, Ridgewood, New Jersey 07451.
W3,K3,WA3,WN3 – Jesse Bieberman, W3KT, RD 1, Valley Hill Rd., Malvern, Pennsylvania 19355.
W4,K4 – H. L. Parrish, K4HXP, RFD 5, Box 804, Hickory, North Carolina 28601.
WA4,WB4,WN4[1] – J. R. Baker, W4LR, 1402 Orange St., Melbourne Beach, Florida 32951.
W5,K5,WA5,WN5 – Kenneth F. Isbell, W5QM1, 306 Kesterfield Blvd., Enid, Oklahoma 73701.
W6,K6,WA6,WB6,WN6[1] – No. California DX Club, Box 11, Los Altos, California 94022.
W7,K7,WA7,WN7 – Willamette Valley DX Club, Inc., PO Box 555, Portland, Oregon 97207.
W8,K8,WA8,WN8[1] – Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, Ohio. 43215.
W9,K9,WA9,WN9 – Ray P. Birren, W9MSG, Box 519, Elmhurst, Illinois 60126.
WØ,KØ,WAØ,WNØ[1] – Des Moines Radio Amateur Assn., PO Box 88, Des Moines, Iowa 50301.
KP4 – Alicia Rodriguez, KP4CL, PO Box 1061, San Juan, P.R. 00902.
KZ5 – Gloria M. Spears, KZ5GS, Box 407, Balboa, Canal Zone.
KH6,WH6 – John H. Oka, KH6DQ, PO Box 101, Aiea, Oahu, Hawaii 96701.
KL7,WL7 – Alaska QSL Bureau, Star Route C, Wasilla, Alaska 99687.
VE1 – L.J. Fader, VE1FQ, PO Box 663, Halifax, N.S.
VE2 – John Ravenscroft, VE2NV, 353 Thorncrest Ave., Montreal 780, Quebec.
VE3 – R.H. Buckley, VE3UW, 20 Almont Road, Downview, Ontario.
VE4 – D.E. McVittie, VE4QX, 647 Academy Road, Winnipeg 9, Manitoba.
VE5 – A. Lloyd Jones, VE5JI, 2328 Grant Rd., Regina, Saskatchewan.
VE6 – Karel Tettelaar, VE6AAV, Sub. Po 55, N. Edmonton, Alberta.
VE7 – H.R. Hough, VE7HR, 1291 Simon Road, Victoria, British Columbia.
VE8 – George T. Kondo, VE8 ARRL QSL Bureau of Department of Transport, Norman Wells, N.W.T.
VO1 – Ernest Ash, VO1AA, PO Box 6, St. John's Newfoundland.
VO2 – Goose Bay Amateur Radio Club, PO Box 232, Goose Bay, Labrador.
SWL – Leroy Waite, 39 Hannum St., Ballston Spa, New York 12020.

[1]These bureaus prefer 5x8 inch or #50 manila envelopes.

QSL Bureaus for other U.S.Possessions and for other countries appear in the June and December issues of *QST*.

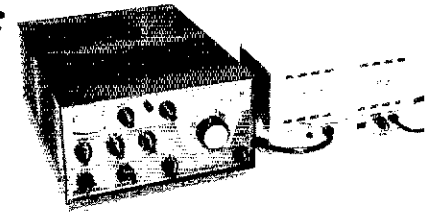
Changes of Address

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.

Recent Equipment

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

Drake TR-6 50-MHz Transceiver



WE TEND to think of a sideband transceiver as an isolated piece of ham gear useful mainly on its own, or perhaps as a driver for a linear amplifier. The Drake TR-6 has just about every imaginable operating feature, either built-in or available as an extra-cost option, and it also makes provision for use with other units of a multiband amateur station. Thus, the vhf-oriented amateur can use this major item of his station as the nucleus of a plan for the future, adding accessories and optional operating conveniences as his needs and personal finances dictate. Of course Drake has its own gear in mind for much of this, but the fellow who likes to do some of his own building will find attractions in the TR-6 versatility, as well.

He can start with the "basic" TR-6, with or without its power supply, speaker, and other primary operating accessories. For home-station work he will probably want the Drake AC-4 Power Supply. He may already have it, as it is used with other Drake items. For mobile operation he can add the DC-4 supply, to work from the car battery. (Drake's AC-3, DC-3 and DC-24 supplies, the last for 24-volt service, are also suitable with the TR-6.)

At this point our hero has a 50-MHz transceiver capable of 300 watts PEP input on ssb or a-m, and 260 watts on cw or fsk. His receiver sensitivity is all he could ask for, and the selectivity is optimum for 50-MHz ssb. If he expects to work a-m or cw extensively, his next step will probably be plug-in filters for optimum selectivity for these modes, 6 kHz for a-m, 2.4 kHz for ssb, and 0.3 kHz for cw. A special filter is needed for lower-sideband operation, but since nearly all 6-meter work is upper-sideband, this is a lower-priority option.

Frequency coverage of the TR-6 in this form is 49.9 to 51.0 MHz. Other overlapping 600-kHz tuning ranges can be provided for a total of nine 500-kHz segments from 49.5 to 54 MHz, with plug-in crystals available as extra-cost options. Activity is concentrated mainly near the low end of the band, so these can wait for more urgent acquisitions, to be described later.

One difficulty with most ssb transceivers, for vhf operation at least, is being limited to working stations on one's own frequency. The transceiver has been a major cause of QRM problems in the vhf bands. These bands are wide enough to support an enormous amount of activity without serious interference, were it not for the channelization that the transceiver encourages. The TR-6 system offers a way out of this. With the Drake RV-6, or your own remote VFO, you can control either the transmitting or receiving frequency, or you can switch the VFO off and go over to normal transceiver operation, when it is desirable. Similarly, the Drake Model FF-1 Fixed-Frequency Adapter allows crystal-controlled operation of either the transmitter or receiver.

A 14-MHz input-output jack on the TR-6 opens up options such as external vhf or uhf receiving converters, external receivers, and heterodyning units for using the TR-6 features on other bands, from ht to uhf. The equipment can be used with 2-meter transverters, Drake- designed or otherwise.

If mobile operation with the TR-6 is planned, the Drake Model 9-NB Noise Blanker is a must. This mounts inside the cabinet by merely plugging in, and its operation is provided for on the front panel. The MMK-3 Mobile Mount will very likely be needed, as well. A simple but handy option for the home-station operator is an assortment of mounting feet, permitting horizontal positioning, or two settings of upward tilt.

How It Works

In this writer's opinion the TR-6 is a complex piece of equipment, and the purchaser may have some difficulty understanding its basic functions when reading the instruction book. Its 57 pages of text are not readily digested, even by the experienced reader, and its block and schematic diagrams are understandable only after intensive study. To the uninitiated, the complex schematic presentation is likely to remain a mass of long parallel lines, and innumerable cross-overs.

Admittedly a simple description of this sort of equipment is not easy, and the block-diagram approach may leave its user open to charges of over-simplification. The TR-6 book does have the information, which is more than can be said from some manuals, even if it is not in the most easily-read form. In our block diagram, Fig. 1, we have tried to clarify stage functions and signal paths by separating the transmitting and receiving elements, insofar as possible. When the same stage or component is used for both purposes, it is shown twice in our diagram, or drawn in broken lines, or both. We have deliberately left off type numbers of tubes and transistors, since they tend to be of minor importance to the casual reader.

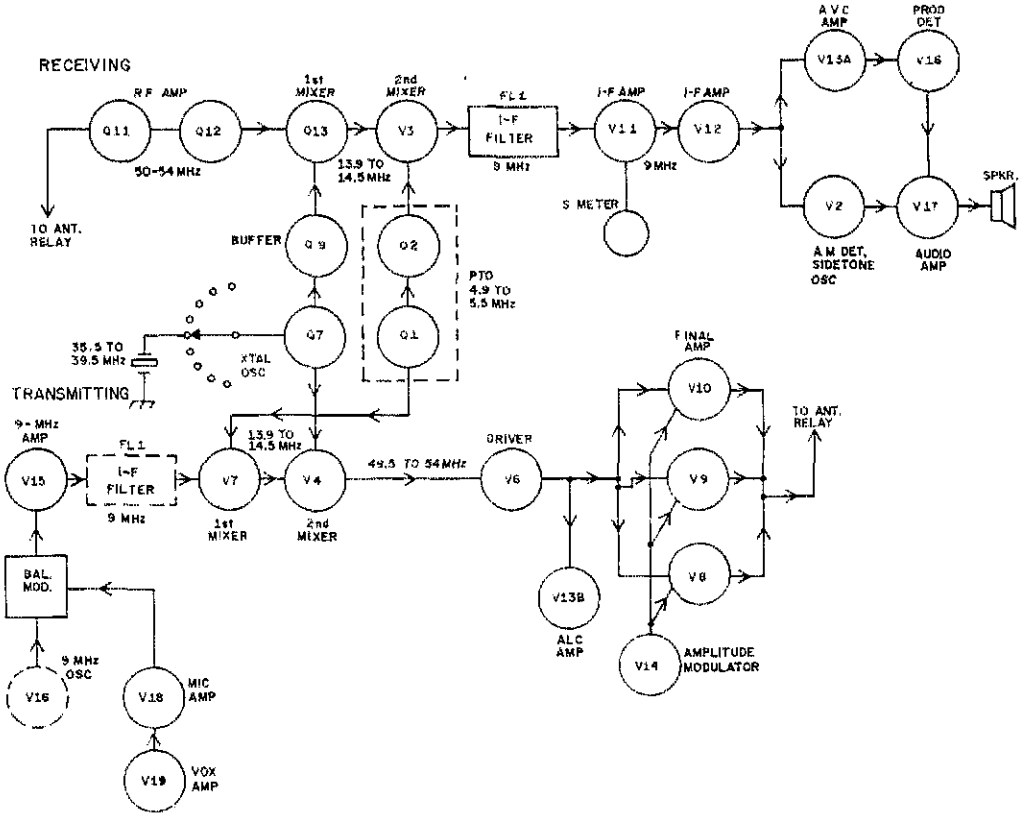


Fig. 1 — Block diagram of the Drake TR-6 transceiver, showing principal receiving and transmitting functions. Several of the 19 vacuum tubes, 13 transistors and 12 diodes are not shown herein, in the interest of clarity for major functions. Similarly, the component type numbers are omitted from the drawing.

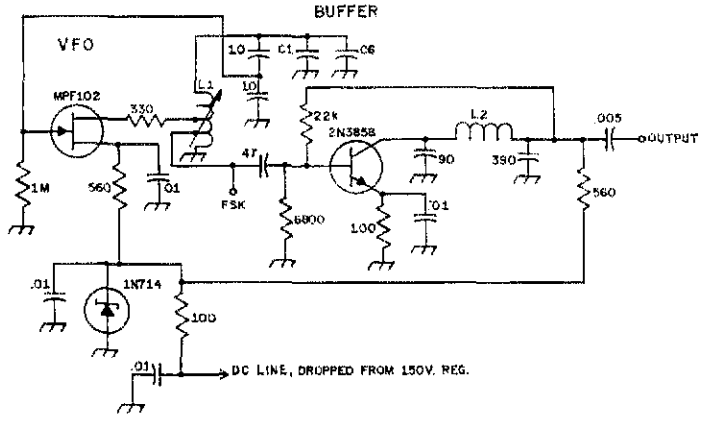


Fig. 2 — Principal details of the PTO and buffer on the Drake TR-6. Values of C1 and C6 are selected during production, to achieve the best possible dial calibration with a given tuning assembly. The PTO covers 4.9 to 5.5 MHz, and is driven by the main dial. Its frequency is shifted automatically in changing modes, with external circuitry not shown here. An fsk voltage can be fed into the jack so marked, for transmission of RTTY information. Note the low-pass filter in the buffer collector circuit, to keep harmonics out of the following circuits.

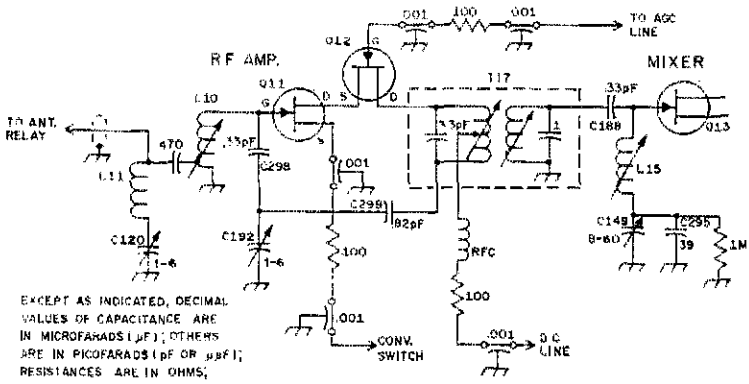


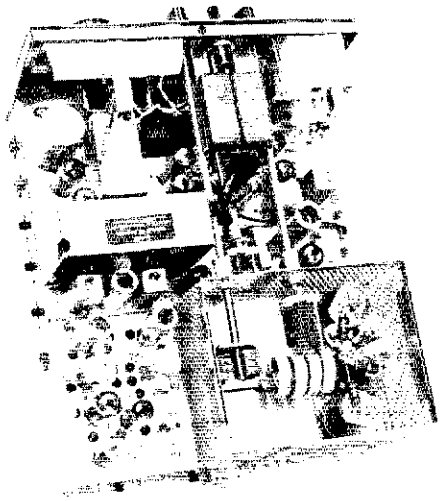
Fig. 3 — The receiver front end of the TR-6 uses a cascode rf amplifier circuit. Parts labelling is the same as in the Drake manual. Note the impedance matching in the input circuit, the fixed capacitive-bridge neutralization, and the bandpass interstage coupling. External control and power circuits were omitted in the interest of clarity.

The TR-6 can be thought of as a 14-MHz ssb rig, with transverting circuitry to make it work on the 50-MHz band. To generate a 14-MHz ssb signal it uses the popular 5 + 9 system, the central element of which is the transistorized permeability-tuned oscillator (PTO) covering 4.9 to 5.5 MHz. This is driven by a smooth-working and well-calibrated main dial. Permeability tuning has advantages, but it has not been used extensively by home-builders of ham gear. A look at the simple schematic of the PTO in the TR-6, Fig. 2, may encourage gadgeteers to attack the not-too-formidable problem of moving a core into and out of a coil.

If you decide to try it, use this hookup, not the one shown in the TR-6 manual. The draftsman responsible for theirs made the classic error of grounding the high side of the dc supply for the PTO.

The cascode rf circuits of the receiver front end are shown in Fig. 3. It has elements of interest to the vhf converter builder. Note particularly the impedance-matching front end, L10, L11 and C120, and the neutralization by means of the fixed capacitive-bridge network, C299, C192 and C298. Details of the age and switching circuits are omitted in this diagram in the interest of clarity. The interstage coupling circuit consists of T17, a shielded rf assembly, C188, L15, and its series capacitors, C149 and C295.

The injection oscillator, Q7, has nine crystal positions (two crystals supplied) for frequencies in 500-kHz increments, from 35.5 to 39.5 MHz. (13.9 MHz below the low ends of the nine overlapping tuning ranges, each covering 600 kHz.) The first-intermediate-frequency signal, 13.9 to 14.5 Mhz, is then fed to a second mixer, V3, which is the first vacuum tube in the receiver lineup. The tunable-oscillator energy beats with the signal to produce a 9-MHz output, which then goes through the i-f filter, labelled FL1 in Fig. 1. The actual frequency of this filter depends on whether it is to be for a-m, usb, lsb, or cw. Two 9-MHz i-f amplifier stages, V11 and V12, feed either a product detector, V16, or the a-m detector, V2. The audio output of either is then amplified in V17. The PTO is the primary frequency-control element of the transmitter portion as well, the heterodyning operations taking place in reverse order when transmitting. At the lower left of Fig. 1, we start with the VOX system and the speech amplifier. The audio voltage and the energy from the 9-MHz oscillator, V16, are combined in the balanced modulator (4 diodes). The resulting double-sideband signal is amplified in V15 and then fed through the previously-mentioned i-f filter. Output of the filter is in the final form that



Interior of the TR-6, with the Noise Blanker installed. Transmitter output stage, with three 6JB6 sweep tubes in parallel, is at the lower right. The PTO, driven by the vernier dial, is in the upper left corner, with the noise blanker directly below it. The plug-in filters for a-m and cw bandwidths are in the upper center.

the on-the-air signal will take, except that it is on 9 MHz. The PTO, the 9-frequency crystal oscillator, and two mixers, V7 and V4, convert the signal to the 50-MHz band, whereupon it passes to the driver, V6, and final amplifier. The output stage uses three sweep tubes, V8, V9 and V10, in parallel. Amplitude modulation, when used, is supplied to the screens of the sweep tubes from V14, resulting in controlled-carrier operation.

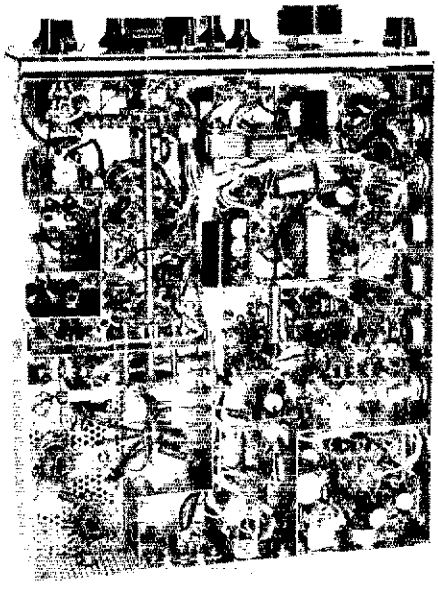
Operation

For all its complexity, and to some extent because of it, the TR-6 is surprisingly easy to operate. Adjustments usually made in sideband rigs when changing modes are taken care of automatically. The operator can easily switch between ssb, cw and a-m, and be tuned up for optimum results on each mode. This is a far cry from the procedure that must be followed with some ssb layouts, including the writer's. If the initial tuneup is done according to the very simple step-by-step procedure given in the manual, signal quality will be good in all positions, and voice levels will be close to optimum for best readability.

In considerable operating experience with the TR-6, we have found only two points which require careful attention. One is that the load the transmitter "sees" must be close to 50 ohms, or you can run into trouble quickly with final-tube deterioration. Sweep tubes are relatively inexpensive, and they work well in linear-amplifier service, but they are not tolerant, if operated near their maximum ratings for extended periods of time. With the TR-6, you watch your SWR – or else. And you don't just run to the nearest radio or TV store and buy three new tubes if you damage the originals. With three in parallel, the tubes must be of nearly identical characteristics, or you're in for troubles.

The other point concerns carrier suppression. The manual says "The carrier balance control is factory adjusted, and should not require resetting under most conditions." At least two TR-6s we've encountered make this statement seem a bit on the optimistic side. A little carrier is not important in weak-signal ssb work, and it may even help some fellows you work to tune the signal in properly, but appreciable deterioration in carrier balance can bring on undesirable signal characteristics with the TR-6. Especially if you're working locals, your carrier becomes very obvious in the form of a hummy background on your signal, if the balancing adjustment is not "right on." The automatic level control in the TR-6 is effective in holding peaks down, and average level of audio up, but with appreciable carrier the modulation caused by noise and hum can be objectionable, over high-signal paths.

The cure is careful attention to the carrier-balance adjustments, not only the control so labelled (R185, at the rear of the chassis) but also C127, alongside it. The book cautions against pulling the carrier before at least a half-hour warmup. We found this point to be deserving of emphasis. Though the TR-6 is very stable as to frequency, there is a marked change in carrier rejection in the early minutes after turn-on. We'd recommend the half-hour warmup before *operating*, wherever possible, as well as before adjustment.



Bottom of the TR-6, with the final amplifier stage in the lower left corner. Jacks for phones, key and microphone are along the right side of the chassis, as are controls for vox, antivox and S-meter zero adjustment. The power source plugs onto a fitting on the rear wall. The socket in the upper right-center is for connecting the remote vfo, if used. Plug-in crystals and their range-selector switch are in the upper left-center.

From the standpoint of operating convenience and effectiveness in making contacts, using the TR-6 is a very pleasant business. The quick and easy mode switching is especially nice, and the cw performance should do much to encourage the newcomer to the 50-MHz band to make use of this much-neglected mode. The shaped keying results in a fine cw signal on the air, and the automatic sidetone gives the inexperienced cw operator great assurance and helps mightily to improve his fist. This is a feature long overdue in 50-MHz stations!

The writer used the TR-6 extensively in various kinds of operating, and found its versatility and almost foolproof adjustment provided a new measure of satisfaction and pleasure in 50-MHz multi-mode work. Its effectiveness in the heat of the 1970 ARRL VHF Sweepstakes was particularly noteworthy.

There's always at least one "but," it seems. The writer's one gripe regarding operational aspects of the TR-6 is that in going from sideband to a-m, you have to go through the cw position on the mode switch. In order for the TR-6 to operate in the other modes the keying jack must be closed, either by its own normally-closed contacts, or by those of a key plugged into the jack. With the

mode switch in the cw position, the signal goes on the air when the jack is closed. Thus you cannot switch from ssb to a-m, or back again, without putting a burst of cw on the frequency. During the VHF SS, for some hours we wondered about the beeps we often heard when we snagged some of the more difficult Sections, until we suddenly realized that they were produced by some of our TR-6-using competitors, moving in for a shot at the new multiplier, and switching modes!

The description of the TR-6 given here is by no means complete. Rather, we have mentioned mainly those items in which this equipment is unusual or unique. Just about every other feature normally found in hf sideband gear is included in the TR-6. Operators who have had experience with other Drake equipment will find much of the TR-6 familiar. — *W1HDQ*

Drake TR-6 50-MHz Transceiver

Height: 5 7/16 inches.
Width: 10 3/4 inches.
Depth: 14 1/4 inches.
Weight: 15 3/4 pounds.
Power Requirements: 650 volts dc at 500 mA, 250 volts dc at 175 mA, -60 volts adjsutable into 30,000-ohm load, 12.6 volts at 5.5 A. These voltages are furnished by the Drake AC-3, AC-4, DC-3, DC-4 and DC-24 power supplies.
Price Class: $600, less power supply, speaker and other optional accessories.
Manufacturer: R. L. Drake Co., Miamisburg Ohio 45324.

The Ultimate Transmatch

(Continued from p. 27)

MHz, this same line would have a loss of slightly less than 1 dB. However, as the SWR rises, so do the losses. With an SWR of 10 to 1, for example, the additional losses at 3.5 MHz would amount to about 0.6dB, or an overall loss of about 1 dB. For the same SWR at 28 MHz, the losses would be about 2.5 dB, or a total loss of about 3.5 dB. For the benefit of the Novice, a loss of 3 dB would mean half of the output power from the rig would be dissipated in 100 feet of line. Therefore, one could easily tolerate the condition at 80 meters, but the losses would be prohibitive at 28 MHz. Following this reasoning, it would mean that the amateur would be wise to keep the match at the antenna feed point as close to 50 ohms as possible, and thereby keep the SWR low.

With trap or multiple dipoles, the SWR should be less than 5 to 1, and with such a system the Transmatch would be ideal. Keep in mind that you must provide a load for a transceiver or amplifier that is close to 50 ohms. The Transmatch will provide a means.

In a coax-to-coax system, set both C1 and C2 at maximum capacitance (plates fully meshed), then feed enough power through the Transmatch to get a full-scale forward reading on your SWR indicator. It is always important to use low power when adjusting a Transmatch. Next, switch the SWR bridge to read reflected power, then run the roller inductor slowly through its range. At some point you will notice a sharp dip in the reflected-power reading. Once this point is reached you should adjust C1 and C2, with possibly a slight adjustment of the roller coil, to get a perfect match. Power can then be increased to the desired level. You'll find that several different settings of the Transmatch may provide a perfect match. The one to shoot for is the condition that requires the most capacitance at C1 and C2 for a matched condition.

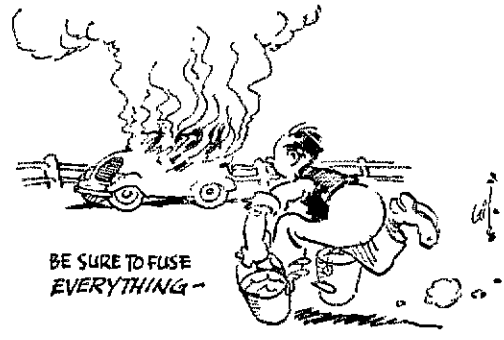
If a random-length, end-fed antenna is used, merely connect the end of the antenna to terminal J3, Fig. 1B, and go through the adjustment procedures outlined above. It is helpful to have an earth ground connection on the Transmatch. Also, if possible, use an antenna length that comes out to a quarter wavelength, or odd multiple thereof. Such an antenna will be of low impedance, and will reduce the chances of high rf voltages appearing on the Transmatch or associated equipment.

If balanced feeders are used, the feeders should be connected to terminals J4 and J5 with a short jumper connected between terminals J3 and J4. Again, the previously-discussed tune-up and adjustment procedures should be followed in setting up the Transmatch.

Some Other Thoughts

Some amateurs might be concerned about the amount of voltage that can be developed in a mismatched coaxial line. In a matched condition, with 1000 watts in a 50-ohm line, the rf voltage would be about 220 volts. With a standing-wave ratio of 20 to 1 (!), the increase in voltage would be 4 1/2 times, or approximately 990 volts. This, however, is well within the rating of the RG-8/U cable.

This Transmatch should satisfy the needs of those hams who desire a multiband unit without switches or plug-in coils. Once the settings for the controls are determined, a chart can be made up for any given installation. Band changing is then quickly done. QST



AMATEUR RADIO PUBLIC SERVICE

NTS RACES AREC

In the Public Interest, Convenience, Necessity HRH

CONDUCTED BY GEORGE HART,* W1NJM

ARRL and MARS

ON APRIL 16, representatives of the three MARS services (Army, Navy-Marine Corps and Air Force) and ARRL got together in a conference room in the Forrestal Building in Washington to spend a full day discussing the relationship between the MARS and ARRL programs for public service and in general to seek accord in all operations. This is a brief report on what was discussed and accomplished.

First, a bit of background. ARRL first came into contact with the military services back in the twenties, when both the Army and Navy (no separate Air Force then) contacted ARRL to seek assistance in organizing reserves of amateur operators to train in military procedures. The Army program evolved into the Army Amateur Radio System with nets operating in the amateur bands *using regular amateur calls, and the Navy program* became the Volunteer Communications Reserve with nets operating outside the amateur bands using N instead of W for the prefix (no K's or WA's or WB's then). Stations outside the amateur bands (3497.5 and 6990 kc.) in the Army circuits were assigned calls in the WL block – usually three-letter calls for national and Corps Area headquarters (WLM, WLG, WLN, WLQ, WLR, WLJ, WLT, WLU, WLH and WLV) and four-letter calls for amateur stations. In the thirties, AARS operation was quite prominent, and WL calls were even listed in the BPL. However, amateurs operating in AARS were not reservists and had no reserve status. They were just amateurs taking part in a program sponsored by the U.S. Army Signal Corps.

The Navy program was somewhat different. Those signing up in the Navy's VCR were required to pass a physical exam and actually were part of the U.S. Naval Reserve. All operations were conducted on Navy frequencies, using N call letters. Naturally, from the standpoint both of numbers and ubiquitousness, the Army program was much the more prominent of the two as far as we amateurs were concerned. The unpleasantness with Germany and Japan in the early forties put an end to AARS, which was reorganized after the war into the Military Amateur Radio Service by the Army and Air Force, renamed Military Affiliate Radio Service very shortly afterward. The Navy continued its communications reserve plan for a time, then organized its own MARS program and is now as deeply embroiled in it as are either the Army or Air Force.

ARRL has always maintained a close working relationship with the armed services and it has never been the intention to allow such a relationship to deteriorate. Partly because of preoccupation with internal problems both in MARS and the ARRL programs in recent years the amount of "interface" between the League and the military has seemed to have diminished. In order to get back on the firm cordial footing that has characterized the relationship in previous years, at the behest of ARRL, representatives of the three *MARS services and the League got together for*, as they say in international diplomatic circles, "talks."

Who were present? The following: Ed Liscombe, K4KNV, Chief Army MARS and Master-of-Ceremonies; Joe Ziglinski, W4DIN, Deputy Chief Army MARS; Lt. Jim Fagan, Chief Navy-Marine Corps MARS; Chris Walker, W4SSN, Deputy Chief Navy-Marine Corps MARS; Lt. Clyde Chappell, MARS Liaison officer-Marine Corps; Capt. Jan P. Huggins, WB4ONK, Chief Air Force MARS; Herman Philbeck, W4LWG, Deputy Chief Air Force MARS; TSgt. John Husar, WA2OKP, Air Force MARS observer; Don Meserve, WØHG, NIAC observer. And, of course, your reporter W1NJM.

The conference, kept at a very informal and man-to-man level throughout, started out with a vigorous discussion of the status of MARS as an amateur service. This was kicked off by the ARRL representative reading an excerpt from an amateur publication in which the status of MARS as an entity quite apart from the amateur service was expounded at some length. All three MARS chiefs expressed firm disagreement with this philosophy,

* Communications Manager, ARRL.

At the Pacific Division Director's meeting on April 4, W6DEF, left, EC of Redwood City, was presented with a certificate of appreciation for eleven years of continuous monthly reporting to the SEC. *Presenting the award is W6ZRJ*, center, while W6YHM, who also received a vote of thanks for his past services as Vice Director, looks on.

Public Service Honor Roll April, 1970

This listing is available to amateurs whose public service performance during the month indicated qualifies for 30 or more total in the nine categories below. Use CD-190 or submit equivalent information through your SCM. See page 75, Nov. '69 *QST* for details. Please note maximum points for each category.

Category / *Max. Pts.*	*(1)* 10	*(2)* 5	*(3)* 16	*(4)* 12	*(5)* 12	*(6)* 20	*(7)* 3	*(8)*	*(9)* 5	Totals
K∅LVB	10	5	12	12	12	20			5	76
K7CTP	10	5	16	12	12	20				75
W6BNX	10	5	16		12	20		1	5	69
WA8EOW	10	5	16		12	20			5	68
WA2BAN	10	5	16	12	12	3	3		5	66
WA2CAL	10	5	16	12	12	3			5	63
K3ZNP	10	5	16	12	9	3			5	60
WA8ETX	10	5	16	12	12				5	60
WB8BBG	10	5	16	9	12				5	57
WA1HOL	10	5	16	12	12					55
WA7KIU	10	5	16	12	12					55
W7HQ	10	5	16	9	9				5	54
WA3FMI	10	5	16	12		7	3			53
WA8UPI	10	5	4	12	12	4			5	52
W3MPX	10	5	16		12		3		5	51
WB4CVY	5	5	16	8	12				5	51
W7AXT	10	5	16		12		3		5	51
K7NHI	10	5	16	3	12				5	51
W8IMI	10	5	16	3	12				5	51
W∅LCX	10	5	16		12		3		5	51
WA2HMO	10	5	16	6	12					49
WA∅VAS		5		12	9	20	3			49
WB2FEH	10	5	16		12				5	48
WA2VYS	10	5	16	12					5	48
WA3AKH	10	5	16		12				5	48
WB3HJW	10	5	16		12				5	48
W6HGF	10	5	16		12				5	48
K7KSA	10	5	16		12				5	48
W9HRY	10	5	16		12				5	48
WB2DRG	10	5	16	3	12					46
W3EML	10		16		12		3		5	46
WB4HKP	10	5	16		12		3			46
WA∅OEJ	10	5	12	9		4			5	45
8RIY/W4	10	5	16		12	2				45
WA1JYY	10	5	16	3	9	1				44
W2FR	10	1	16		12				5	44
WA2FRZ	10	5	8	6	12		3		5	44
W7JWJ	10	5		12		12			5	44
W7LBK	5	5	12	10	12					44
W7OCX	10	5		12	12				5	44
WA8VNU	10	1	16		12				5	44
W1EFW	10		16		12				5	43
WA1HSN	10		16		12				5	43
WA2ICU	10	5	16		12					43
K2KIR	10		16		12				5	43
W2RUF	10		16		12				5	43
W3LOS	10		16		12				5	43
W6QAE	10	5	16		12					43
WA7KOB	10	5	16		12					43
K8NCV		5		12	12	9			5	43
K∅AEM	10		16		12				5	43
K∅MRI	10		16		12				5	43
WA∅OTQ	10	5	16		12					43
WA∅WEZ	10	5	16		12					43
VE4EQ	10		16		12				5	43
K3MVQ	10	4	16		12					42
W4UQ	10	4	16		12					42
WA3HBT		5		12		20	3	1		41
W5JSM	10	5	12		9				5	41
WA6KOF	10	2	12	3	9				5	41
W8LT*	10	5	16	6		4				41
W6BVR	10	2	16		12					40
W1ZPB	10	2	16		12					40
WA1BMO	10	5		12	12					39
WA2EPI	10	5		12	12					39
W7PI	10	5	12		12					39
W1HKJ	10		16		12					38
WA1IRY	10		16		12					38
K1PQV	10		16		12					38
K1SSH	10		16		12					38
W2MTA	10	4	16		3				5	38
W2QC	10		16		12					38
WA3CKA	10	3	16		9					38
WA3IPO	10		16		12					38
WA3LYC	10		16		12					38
W3KUN	10		16		12					38
K4KNP	10		16		12					38
W7GHT	10		16		12					38
W7GMT	10		16		12					38
K7QFG	10		16		12					38
WA8MHO	8	5	4	9		12				38
W8VDA/6	10		16		12					38
WA9GKY	10		16		12					38
W9QLW	10		16		12					38
W∅BV	10		16		12					38
K∅ECR	10		16		12					38
W∅HI	10		16		12					38
K∅MNO	10		16		12					38
K2KDQ		5		12	12		3		5	37
W4SHJ	2	2	16		12				5	37
W6LRU	10	5	4		12				5	36
WA8ZNC	10	5	4		12				5	36
WA∅KUH	2	6		3		20			5	36
WA∅UIT	10	5	8	12						35
K1SXE		5		12	12				5	34
W7HLA	10	5	16		3					34
WA8ZTV	10	3	16	3		2				34
WA1LLB	10	5		12	6					33
WB∅ZVC	10	5	4	6		8				33
WA1LNE	10	3	16		3					32
W3EZT	10	3	4		12	3				32
WB6GHH	10	5	6			1				32
W6EJT		5		6		20				31
K7OJF	10		16						5	31
W7UU	6	5				20				31
K7WWR	10	5	16							31
K2KTK	10	4	16							30
K2OQJ	10	5		12	3					30
K∅BXF	10	5	12		3					30

W6EJT with a total of 31 PSHR points in categories (2) 5, (4) 6 and (6) 20, was inadvertantly omitted from the November listing.

*Denotes multioperator station.

Category Key. (1) Checking into cw nets; (2) Checking into phone/RTTY nets; (3) NCS cw nets; (4) NCS phone/RTTY nets; (5) Performing liaison; (6) Legal phone patches; (7) Making BPL; (8) Handling emergency traffic; (9) Serving as net manager.

Ed Liscombe especially saying that this has always been a sore point with him, and that although MARS does operate outside the amateur bands and does not use amateur call prefixes, its personnel are licensed radio amateurs with the same kind of "amateur spirit" and fraternalism that are found among those amateurs who operate only in the amateur bands. That some amateurs choose to confine their operation exclusively to MARS is of their own choice, but not through any urging on the part of MARS policy; quite the contrary, the policy has always been to encourage amateur-band activity and ARRL affiliation.

This basic point thus disposed of, the discussion went on to cover other points, one of which was coverage of MARS in *QST*. At one time there was a MARS column, but this dwindled away as suitable material for it failed to be forthcoming for various reasons. No arrangements were made for regular MARS coverage in *QST*, but agreement was reached in principle that items submitted would receive coverage if considered suitable from an editorial standpoint. In that connection it was made plain that *QST* ordinarily does not print "canned" material.

The next item was the routing of Vietnam and other APO-FPO traffic. Naturally, the subject of phone patches with Vietnam came into the discussion. The MARS people are very proud of their morale phone patching record, and rightfully so. Nevertheless, for more than an hour the discussion centered around the various methods used by the

three separate MARS programs in handling written message traffic. It was tacitly agreed among all concerned that the present method being used within NTS to handle SEA traffic (via RN6 and a specially-staffed corps at that level to make the MARS transfer) is satisfactory, that a similar staff might be set up in the Eastern Area (3RN) if feasible, in order to get the traffic into MARS more quickly, and that no special arrangements need be made for handling APO/FPO-NY traffic since there is a comparatively small amound of it.

During the course of the day, the theme of non-interference with any ARRL-sponsored or any other amateur-sponsored activity was oft repeated. Claims of any such interference or usurpation are purely myths, said the MARS chiefs. The policy is to lend assistance to civilian projects only if or when specifically requested to do so, otherwise sticking to military-type activities. When operating in the amateur bands, stations licensed to military posts are amateur stations, not military stations, and are supposed to conduct themselves as such, including the procedure used. Occasionally a military-post station or a local MARS unit violates this policy, but this is exceptional and not to be condoned by MARS headquarters or taken as an attempt to become involved in traditional amateur prerogatives.

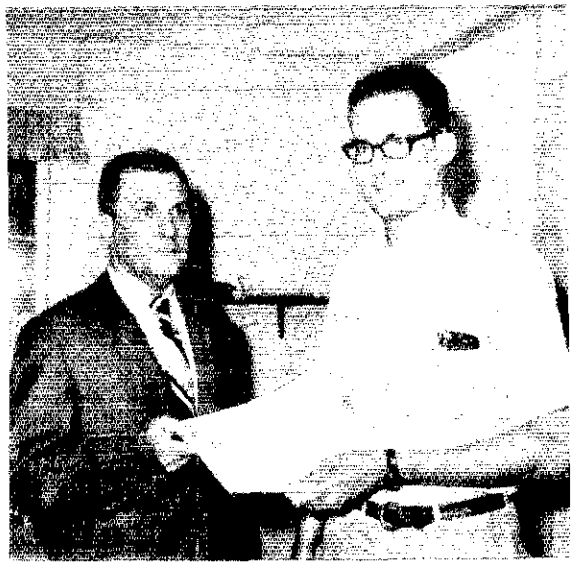
This get-together presented an opportunity to "clear the air," and much was cleared in its one-day duration. Such was the degree of rapport between the various interests involved that it was determined to hold such get-togethers more frequently, say every six months or so, in Washington. So if you have matters you would like us to take up with the MARS chiefs next trip, drop us a line. – *WINJM.*

Traffic Talk

K4KNP points out the benefits of keeping tabs of the traffic in a net, while participating, by "doodling" on the NCS's instructions. If net members follow the progress of the net by taking an active interest in what the NCS is doing, they can receive a number of training and efficiency benefits, such as: (1) Each station will, in effect, be "making like the NCS"; that is, he'll be training *himself* to be NCS by knowing what the problems are and how to cope with them. (2) NCS's instructions will need less explanation, since the situation of the net, who has traffic for whom, etc., will be known at all times; this will greatly increase efficiency. (3) The general spirit and responsiveness of net stations will increase. If everyone knows the exact net situation, it stands to reason that most of them will be able to predict the NCS's next move and be ready for it.

In other words, a net whose members are all NCS's is a sharp net, even though only one of its members is going through the motions.

New subject: An article in *Zero Beat*, bulletin of the Southern California Net (NTS), discusses the use of telephone numbers on messages. This is highly desirable, of course, but attention is called to the attitude of some traffickers that messages without telephone numbers cannot be delivered, or that messages should not be originated unless a telephone number is available. SCN Manager W6LCP cannot go along with this. Says he: "I don't quite understand the aversion to mailing a message or, if it's to a nearby neighbor, to hand-delivering it. I have in the past checked into nets and altho I was 200 miles from a delivery point and another station in the net was just 15 miles away, he would refuse to accept the message if he could not telephone the addressee. Some have even copied and acknowledged receipt of the message and then later told me the phone was not in service and asked me to find another way to get it delivered. I have even seen service messages coming all the way across the country explaining to the originating station that it was impossible to deliver because (the addressee) did not have a telephone! Please deliver me from that kind of public service. My policy has been and always will be: If I'm the station closest to the delivery point, route it to me and I will deliver. (Let's) DELIVER A FULL MEASURE OF PUBLIC SERVICE TO ALL and not just to those who can afford to have a telephone," Well said, Seth.



Kentucky SCM W4OYI presents a certificate to newly appointed Emergency Coordinator WA4ZSJ at a meeting of the Murray State College Amateur Radio Club in May.

Third subject: W6WLV suggests using the traffic nets to notify DX-interested operators that their QSL bureau has cards for them. This is being accomplished in the San Francisco area by the Northern California DX Club (handling the W6 QSL Bureau) in conjunction with nets and traffic men in the area. The NCDXC furnishes them with lists of calls of people with cards in the bureau and they originate messages accordingly. Those receiving the messages seem to be happy, and the nets are happy to get the traffic. Sound like a good idea? Try it on your QSL Bureau, see p. 66, June *QST*. – *WINJM.*

National Traffic System. W2ER says April was one of those months that managers don't like to talk about. W3NEM reports about the same thing from 3RN, but goes on to say things have stabilized for the moment. W7BQ says that the time change and the onslaught of summer months is beginning to create problems with Saskatchewan and Alberta representation. W9HRY has issued 9RN certificates to K4DZM, *WB4s* FDK, HQW, *W9s* ELF FHJ, *WA9s* KAG and ZKX.

April Reports

Net	Sessions	Traffic	Rate	Avg.	Rep.(%)
1RN	59	655	.372	11.1	90.7
2RN	61	394	.607	6.5	97.4
3RN	61	436	.423	7.2	97.9
4RN	50	394	.388	7.9	79.5
RN5	60	621	.425	10.4	93.0
RN6	60	771	.629	12.9	99.3
RN7	60	320	.287	5.3	49.8
8RN	61	602	.405	9.9	94.1
9RN	60	587	.507	9.8	97.1
TEN	58	463	.455	9.9	80.4
ECN	60	464	.426	7.7	86.6
TWN	58	304	.257	5.2	71.3
EAN	30	1532	1.225	51.1	96.7
CAN	30	984	.962	32.8	100.0
PAN	30	1131	1.059	37.0	100.0
Sections[1]	1476	8248			
TCC Eastern	119[2]	663			
TCC Central	90[2]	599			
TCC Pacific	120[2]	231			
Summary	2274	19,899	FAN	12.0	
Record	2699	28,426	1.421	19.1	

[1]Section and Local nets reporting (43): AENB (Ala.); KYN, FCATN (Ky.); NCS, SCN (Cal.); EPA, PTTN, 40 Novice, EPAEPTN (Pa.); QKS (Kans.); PVTEN (N.J.); GSN, GTN (Ga.); BUN (Utah); OZK (Ark.); VEN, FMTN (Fla.); CN, CPN (Conn.); RISPN (R.I.); VSBN, VN (Va.); WSSB, QMN (Mich.); ILN (Ill.); OSSB, BN (Ohio); BSN (Ore.); W. Que. VHF; WSN (Wash.); OLZ, SSZ (Okla.); NYS (N.Y.); QIN (Ind.); WSBN, WIN, WSSN, BEN (Wisc.); CN (N. and S. Car.); CGN (Colo.); MSPN, MSN, MJN (Minn.).

[2]TCC functions, not counted as net sessions. Transcontinental Corps. . . . . April Reports.

Area	Functions	% Successful	Traffic	Out-of-Net Traffic
Eastern	119	93.3	1688	663
Central	90	93.3	1296	599
Pacific	120	95.8	1862	931
Summary	329	94.1	4846	2193

The TCC Roster: Eastern Area (W3EML, Dir.) – W1s BJG NJM YKQ, K1ESG, WA1JTM, W2s FR GKZ PU QC, K2s KIR KTK RYH, WA2s CAL HMO UWA, WB2SMD, W3EML, K3MVO, W4s NLC SQO UQ, K4KNP, W8UM, K8s KMQ QKY, WA8YVR. Central Area (WØLCX, Dir.) – W4OGG, K4s AT DPO, W5MI, W9s CXY VAY, WA9s RAK VZM, WAØs HI INH LCX UCE ZHN, KØAEM, WAØs DOU IAW RVR. Pacific Area (W6VNQ, Dir.) – W5RE, W6s BGF BNX EOT IPW MLF VNQ VZT, K6DYX, WA6s BRG EFA ROF, W7s DZX EM GHT KZ, WA7CLF, KØJSP.

Public Service Diary

We have a late report on the tornado which struck the heavily populated vacation resort area surrounding Bethany Fellowship, Minnesota, on August 6, 1969. More than 500 persons were injured, about 150 of which were serious enough for hospitalization, and six were killed. More than fifty amateurs took part in communicating to and from the disaster area, many of which drove many miles to be of assistance. WØAA/Ø was used at the outgoing traffic and control station for the six days of the operation and KØZZR handled some 500 messages from the Minneapolis Red Cross, both going into and coming from the disaster area.

Minnesota SEC, WAØMZW, said about the operation, "Amateur radio and the operators that were active in this operation demonstrated the willingness to help, the skill of operation, and the stamina to get the job done right. They replaced all normal means of communications in the area without a hitch. They gained the acceptance of civil defense and enhanced their position with the Red Cross and the general public. It was a smooth operation with none that I have seen to equal it." – *WAØMZW, SEC Minnesota.*

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While operating mobile in downtown Montreal on April 4, VE2APT discovered an accident at the intersection of University Street and the Bonaventure Expressway. Using the VE2RM repeater, VE2AKM was called and the police were summoned. – *VE2ALE, SEC Quebec.*

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While returning from work on April 22, VE2BHH came upon an accident at the 55th Avenue underpass of Highway 20 in Lachine, Que. Again VE2AKM was summoned through the repeater and the police were notified. – *VE2ALE, SEC Quebec.*

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On April 26 a large number of Garfield County, Okla., amateurs took part in a tornado watch using 2-meter fm and the Enid repeater. K5CAY operated mobile from Vance Air Force Base at the radar operations center and relayed tracking information to those stations within the repeater's range. WA5ZOO acted as liaison to the 75-meter state net which had been activated by WA5GJU. Eventually QRN became so bad that WA5FSN took over the NCS of the 3915 net and WA5GJU established a liaison with the weather bureau in Oklahoma City through WA5SOD/5. Two tornados were tracked into the Enid area and touched down in outlying sections of city. A number of rural homes were damaged but there were no deaths or injuries. – *WA5FSN, SEC Oklahoma.*

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At about 2115Z on May 9, K8WLP was mobiling on 160 meters five miles southwest of

On April 5, a 32 year old man stepped from his jeep and plunged down an abandoned mine shaft. Nine members of the Rocky Mountain Radio League provided communications for the rescue operations. K8YYZ, center, uses a two meter fm unit to relay messages to and from the accident site while KØAUZ, left, and Norman Blake, Colorado Deputy Commissioner of Mines discuss the best way to effect a rescue. The man had been killed in drop of 220 feet and the operation was secured the following morning with the recovery of the body. *(Photo by K1WYS.)*

BRASS POUNDERS LEAGUE

Winners of BPL Certificates for April Traffic

Call ..... Orig.	Recd.	Rel.	Del.	Total
W3CUL/4 235	1841	1793	27	3896
K6BPI 2649	480	470	10	3609
WA9VAS 111	1248	67	1201	2607
W7BA 7	584	533	47	1171
K9ONK 182	523	445	11	1161
W9LCX 62	507	441	25	1035
W9JYO 492	203	199	4	898
W8UPH 2	429	359	66	856
W9JBQ 10	385	360	16	771
W1PEX 44	379	309	10	742
K4EZX 7	330	325	2	664
W4VNQ 13	329	313	1	656
WA2FRZ 73	310	224	18	625
W86BBD 38	314	242	29	623
W3FML 50	321	222	1	594
W1UYY 45	264	248	23	580
WB4HKF 239	177	118	46	580
WA2BAN 22	281	263	12	578
W3YR/4 126	198	179	6	509

More-Than-One Operator Station

W4PKS 0	631	13	618	1262

BPL for 100 or more originations-plus-deliveries

K1BCS 335	W9YH 135	K2KDQ 104
W4MQQ 235	WA1EYY 127	WA3FMI 104
K8ONA 220	WA9VYV 125	WA6BYZ 104
W9EQO 188	WA3HBT 123	WA9QOQ 103
WN3LEI 176	W4OYI 121	W2OF 101
VE3ERU 170	WB8DSV 121	W3MPX 101
WA4MKH 151	W6MLF 112	Late Reports:
W7AXT 144	WA7LDZ 105	WA6DIL (Mar.) 125
	WA1GCE 104	

More-Than-One Operator Station W4IYT 322

BPL Medallions (see July, 1968 *QST*, p. 99) have been awarded to the following amateurs since last month's listings: WA2BAN, WA2BHI, WA2CWU, WA2HMO, WA3FMI, W4EVN, WB6PKA, K7ITH, K8ONA, W8QCU, W9JYO, WA9YXA.

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 origination 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.

Fremont, Ohio, when he witnessed an accident involving two cars in which several persons were injured. K8WLP was in contact with K8KYB at the time and after passing the necessary information the state police were notified. A cruiser arrived at the scene within minutes.

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On April 16, 36 members of the Franklin County, Ohio, AREC/RACES aided officials of the American Cancer Society in the "Bank Night" of their annual fund raising drive. Mobiles using ten and six meters and two meter fm were sent to 73 different collection points to pick up packets of contributions and return them to a central receiving point. W8KJM operated a station from the Society's offices and obtained information on the various pickups as they were made. W8CRX, WA8ZTV and W8BTW were net controls on the three bands used. *W8ERD EC/RO Franklin County, Ohio.*

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On May 2 and 3, 17 members of the Glens Falls Area (N.Y.) AREC, under the direction of K2AYQ, provided communications for the White Water Canoe and Kayak Races. One station was set up at the starting line for the first day's events, which included a race for the inexperienced canoers and a giant slalom over a two mile course. This station was used to notify judges at the finish lines which boats were leaving and whether or not that boat had cleared the starting gate without difficulty. On the second day of the races, the down river race is held over a seven mile course. AREC units were again used to provide starting and timing information between the starting and finish lines. — *K2AYQ, EC Glens Falls, N. Y.*

We slipped just a little bit again: *forty* reports were received from SECs for the month of March, with 14,293 AREC members indicated as active. This is still three reports greater than for March of last year but is about 200 fewer AREC members than were reported for the same period. You SECs who aren't reporting better keep one eye peeking over your shoulder. The wouff-hong is gaining on you. Sections reporting: Ala, Alta, Ariz, Ark, Colo, Conn, EFla, EMass, EPa, Ga, Ind, Iowa, Mar, Mich, Mont, Nebr, Nev, NMex, NLI, NNJ, NTex, Ohio, Okla, Ont, Org, Oreg, Que, SF, Sask, SDak, SNJ, STex, Tenn, Utah, VA, Wash, WFla, WMass, WNY, WPa.

Independent Net Reports

Net ..... Sessions	Check-ins	Traffic
Hit & Bounce 30	289	375
ECTTN 22	305	84
All Service 4	67	49
20 Meter ISSB 22	266	694
North American SSB 26	678	286
North East Traffic 30	427	250
Clearing House 26	380	220
7290 44	2032	618

QEP

Strays

Amateurs are invited by the Becket Festival committee to participate in the Canterbury Becket Festival commemorating the 800th anniversary of the death of Thomas Becket, Archbiship of Canterbury. GB2CF will be active from Canterbury, England from July 19-26. Contacts are particularly desired with Canadian towns named Canterbury and towns which are namesakes of the various towns and villages surrounding Canterbury, England.

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The annual Independence of Columbia contest sponsored by the *Liga Colombina de Radioaficionados* will be held from July 18 at 0001 GMT to July 19 at 2359 GMT. Details are available from LCRA, Apartado Postal 584, Bogota, Colombia.

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The *Japan Amateur Radio League* will again sponsor the All Asian DX Contest. This years contest period will be from 1000 GMT August 22, to 1600 GMT August 23. Complete information is available from *JARL*, Box 377, Tokyo, Japan.

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Feedback

Feedback The RCA audio mixer kit described on page 21 of *QST* for May, 1970, is called a KC-2001; it should be KC-4001.

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Regarding Part 7 of Stoffels "Let's Talk Transistors," May 1970 *QST*, we somehow published the wrong answer for question No. 4 at the end of the article. Here is the correct answer.

Using these values the cutoff point on the load line will be at 10 volts, the saturation point will be at 34.5 mA (that is, 10 volts divided by the sum of 220 and 68 ohms), and the operating point will be chosen at 17 mA (approximately one-half 34.5 mA). The voltage across the transistor (i.e., between collector and emitter) will therefore be 5 volts. Then, assuming that R2 is 10 times R3,

$$R1 = \frac{10V \times 680\Omega}{0.017A \times 68\Omega} - 680\Omega = 5200 \text{ ohms.}$$

Correspondence From Members-

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

SIN – SINNER OR SINNED AGAINST?

● The National Student Information Net was set-up here during the week of May 4 at Brandeis University to provide information regarding the status of other schools during the National Student Strike to any college or university ham station requesting it. (The strike was a spontaneous response to the escalation of the war into Cambodia and the murders at Kent State University.) Brandeis is acting as National Strike Information Center, so accurate up-dated info has been available upon request through the net.

The net and its operation has been non-political. The net has provided information in response to specific requests. The ready availability of accurate information has facilitated understanding, good-will, and prevented false rumors. Typical of the requests answered were questions dealing with specific strike action by schools, telephone numbers of campus fm broadcasting stations, confirmation of demonstrations planned, etc.

We students and the local hams who came down to assist us at K1WGM operated almost around the clock the first few days. The amount of deliberate interference and jamming (whistling, telephone beeps, music, etc.) was unbelievable. Often we were attacked as, "Commie b------, the FCC will hear about this." They did – we called them.

Serious violations such as obscenity, deliberate QRM, not identifying, etc. – is this how amateurs respond to a situation which they dislike? It seems as though many amateurs are unaware also that third party traffic in the states is legal! By the way, we understand that the FCC has responded to our complaints by apprehending several of the jamming stations. I hope their prosecution will serve to remind any other amateur engaged in such blatantly illegal operations which may jeopardise amateur privileges for our whole fraternity.

As a league member and participant in NTS, I only regret that all the operations weren't on cw! *Ralph Katz, K2AJA, Brandeis University Waltham, MA*

● On Monday, 11 May, from approximately 2100z-2150z I was listening to 7260 kc and heard the following stations: W2UC, W1VPY, WA3FXJ, W3EAX and others identifying themselves as the "National Student Information Net". W2UC, acting as net control, made the statement several times that the net was sanctioned by the FCC and American Radio Relay League. He also mentioned the fact that FCC was taping their conversations and they (FCC) were issuing citations to other stations for "deliberate interference" to their net operations. Other topics brought up were – boycott Coca Cola and substitute another brand; a demonstration to be held at Fort Dix at 1230 on 16 May; trying to solicit students to don female attire this time to agitate the construction workers in New York City like they did the latter part of the week of 4 May. W2UC also asked for a estimate of the crowd and number of police cars at the demonstration near the University of Maryland where they were attempting to block route No. 1. W3EAX was his contact on this. W2UC was forwarding any info to some "clearing center" although no mention was made as to its location. Since this, in my opinion, is a national security matter I notified the Baltimore FBI office.

Somewhere along the line it strikes me as odd that this is a "public service" of any nature or "PICON" if you prefer. It is very amusing, I'm sure, to some countries. *Walter O. Carr, W3LDD, Havre de Grace, MD*

● I am sure that you will receive some letters from other amateurs claiming that the operation of that net was somehow "unAmerican", and boasting that they did their "patriotic duty" by intentionally throwing carriers onto the net frequency, calling the net operators loyalty to their country and their parentage into question, etc. I cannot subscribe to that point of view.

First of all, let me state that I am *not* a college student, but rather a middle-class working citizen who believes that this is a nation of laws; laws which should be enforced by the duly constituted authorities, not vigilantes! I had occasion to monitor both of the net frequencies for about 4 to 5 hours on Sunday. In that time I heard nothing going on within the net which would justify the vicious attacks made by the "brave" amateurs who refused to identify themselves! I heard only an exchange of factual information concerning what was happening at various campuses. This information would very probably have been available to anyone who had access to an AP or UPI machine. At no time did I hear anyone connected with the net voice any sort of political opinion.

I heard the net operators accused of burning buildings, etc. I do not believe that these persons are the ones who have burned buildings; those persons have no time for amateur radio, they are too busy destroying. I do believe that the great majority of our college students wish to work for change by peaceful means. It is only the radical fringe which get the publicity. I can understand, however, their frustration. We tell them to be peaceful, and when they are, they are vilified as happened over the past weekend.

I urge the League to take a firm stand against intentional interference of this sort! In the future, if the interfering parties are so convinced that they are right and that the net (or whatever) is operating illegally, let them give their calls (as they did not do this weekend) and let the FCC decide to whom to send the citations! *Richard W. Steinfeldt, K2UCJ, Dunkirk, NY*

● I protest the use of amateur radio for coordinating student activities between U.S. Universities and Colleges. In my opinion the operation of the National Student Information network violates the intent of part 97.1 of the Communications Act of 1934 and the basic philosophy of amateur radio. I do not consider this activity to be in the best interest of the United States or Amateur Radio. If action is not initiated to curtail this or similar activities a dangerous precedent will be established and the future of

bona fide amateur operations could be jeopardized. *Thomas E. Furrey Jr., WA7HAG/6, San Jose, CA*

● A resident in surgery at Boston City Hospital, I am presently studying for my Novice ticket. On May 9 and 10 I was listening on my receiver to the National College Information Net which was operating from Brandeis University here in Waltham. A moderate Conservative, I was skeptical *about the legality of their operation, and I was* puzzled by the enormous number of ham amateurs who were trying to jam them. Accordingly I got in my car and went to Brandeis where I watched them run their net. I can truthfully say that theirs was in fact a completely non-political, legal operation. I became increasingly appalled by the language and persistence of the illegal interference, much of which I have recorded on tape. Mine was always the impression that the Ham radio operators were a dignified fraternity, yet as I listen to my tape to those incorrugable, flagrant violators who were jamming the network, I get so disgusted and disappointed that I am honestly thinking about abandoning Ham Radio. *Ronald Ripps, M.D., Watertown, MA.*

● These students justify this little "net" by saying that they are not a political group, merely a public service, an information central. Who are they kidding? Who are they supposed to be providing a public service to? They are just using an amateur frequency for the relaying of political information to the heads of the national strike. Information relayed included the number of students who are handing in their draft cards and telephone numbers of the various strike centrals.

I urge that the American Radio Relay League reprimand these "public servants" in accordance with the editorial in the February, 1969, issue of *QST. Paul J. Schaefer WA3LCC, Baltimore, MD*

● How valuable a service could have been performed by the net had it been allowed to operate by the jammers and self-styled "Guardians of America"!

The fellows and gals running the net deserve a lot of credit for staying cool under all kinds of undeserved abuse. I don't know how they did it; a few hours of listening to misdirected comments from the lunatic fringe of the Silent Majority (they claim to be a majority, anyway) made me a nervous wreck. *Dave Sumner, K1ZND, Michigan State University, East Lansing, MI*

● I noticed a tremendous silence around 14.294MHz, where the National Student Information Network was trying to pass traffic across the nation via this clear channel frequency.

This should clearly demonstrate that polite and considerate amateurs with an open mind shall always prevail and that the ham bands will never degenerate to the deplorable condition of CB *Richard A. Peterson, WAØJNC, Denver, CO*

[Editor's Note: The letters above were selected to present a cross-section of views on the National Student Information Net; most have been shortened considerably. Of the letters not chosen for the column, the majority (12 to 6) opposed the use of amateur radio for what the writers considered were political purposes, but there were additional letters dealing with intentional interference to what *these* writers in their turn thought was legitimate third-party traffic. The editor's views were expressed in the editorial, "Conversation Discipline," February, 1969, and are reiterated on page 9 of this issue.]

HAM SPIRIT

● Please turn off the bubble-machine— the usual "Ham Spirit" came thru again!

I asked you to mention in Strays that I needed some Taylor TZ-40 tubes, and you ran it in the *April issue, page 50.*

I received about 20 replies and a donation of 4 tubes — which I have shipped on to OZ7UU, who needed them. I think it is really wonderful how the hams come forward with an assist on something like this. *George S. Maxey, W6BIL, Redding, CA*

OLDEST NOVICE?

● I claim to be the oldest Novice in the state. I was 69 years old on April 5, 1970. *Thomas L. Fitzmaurice, Norwich CT*

[Editor's Note: Any counterclaims?]

GETTING THERE, HALF THE FUN?

● *QST* is welcomed *when it gets here.* Anticipated, yes, but if it shows a trifle late, the contents are still fresh. Should the 'trifle late' stretch a bit so that two issues arrive together — perhaps there IS difficulty with the — 'and snow and dark of night' — who forgets how to read so quickly? *W. P. Gearhiser, W5EPW, State College, MS*

● I look forward to receiving my *QST* every month and go back through them quite often referring to old articles on antennas, rigs and even advertisments. My *QSTs* usually don't arrive until about the 10 or 12 of the month but they do come every 30 days right on schedule and there's not another Ham magazine going that can compete *with the quality or quantity of current information* found in each *QST*. Please keep the good work coming. *Sim Oefinger Jr., WN5YOA, Austin, TX*

● Finally received April *QST*, it was worth waiting for. *Tom Mangels, WA1JVV, Danbury, CT*

● The April issue arrived at my QTH on April 4th! I saw the wrapper sticking out of the mailbox and thought, "Now that looks like *QST* but, no, it can't be. This is only the 4th and *QST* usually arrives around the 20th". You can imagine my surprise and shock when I found that it really was *QST*. Maybe the local post office employees read your April editorial and had guilty thoughts! *Dwight W. Sorensen, WAØITU, Kansas City, MO*

● With an editorial deploring the poor mail situation and letter upon letter airing gripes about poor deliveries, I thought you might like to hear from the "other side of the fence". In short, my May issue of *QST* arrived at home on April twenty-ninth! Since my May copy of *QST* did arrive on time (and it is a rare exception here when they are late). . .I was ready to defend you to the hilt. . .among other hams with whom I work.

Then came a rebuttal. One fellow who lives in a rural area southwest of Detroit said: "I can't fully fault the post office. Griping there isn't the answer. Why is it that my two other ham publications from New England are *never* late. . .but *QST* is?"

That one. . .I couldn't answer. *Ed Bruening, W8IDTY, Ann Arbor, MI*

[Editor's Note: *QST* still mails at the same time we have used for years. The other two, to the best of our knowledge, some months ago decided to move their deadlines and thus their mailing dates a week or so earlier.]

TURN THE KNOB!

● Happy to renew membership for another year; I've been on the records for the past 30 years. To the guys who work sideband like W6DGT and I do, why not try the cw bands for a change? QRM on phone is bad. The cw bands are wide and lots of room, so let's turn the knob! *Mervin R. Critchlow, W7GIJ, Bothell, WA*

Happenings of the Month

New Repeater Deadline

New ARRL Officers

National Convention Sept. 25 - 27

Board Meeting Minutes

REPEATER DEADLINE EXTENDED

At the separate requests of ARRL and Neil W. Murphy, the deadline for comment in FCC Docket 18803, proposed rules for repeater stations, was extended to June 15; replies to the comments of others may be filed now until July 7. The original deadlines were May 15 and June 1, respectively.

ARRL's filing will follow the outline of Minute 32, ARRL 1970 Board Meeting, which may be found toward the end of this department. The subject was also discussed in last month's editorial.

SOUPY GROVES, W5NW – A TRIBUTE

Wayland M. Groves, W5NW, of Odessa, Texas – much better known as "Soupy" because his friend Felix, W5LS, thought his lanky frame resembled a soupbone – has been elected an Honorary Vice President of ARRL, in recognition of thirty-five years service to the League, the past twenty as First Vice President of ARRL and of IARU. Soupy came on the Board in 1935 as director from the West Gulf Division. In the days when "phone vs. cw" was the principle controversy in amateur radio, he achieved a reputation as the phone-man's champion because he believed his division wanted this – though his personal preference was for code.

Soupy was first licensed in 1923 as 5NW, and has been a League member ever since. He signed up as a "Charter Life Member" immediately after a Board motion made it possible in 1967. Twice he's obtained the Extra Class by examination – in 1924 and again in 1967, just before incentive licensing was restored. His career with Humble Oil Company, from which he's now retired, took him all over the world as seismographer, clerk, telegraph operator and you-name-it. He still has "itchy feet,"; since retirement he's "shipped out" several times as a shipboard radio operator, and just got back from a three-month trip to Australia, New Zealand and other Pacific points where he looked up a large number of on-the-air friends, some going back more than forty years.

Soupy's enthusiasm for ham radio is evidently contagious: his wife Beth (who went with him on his Pacific trip) is W5DUR; his sons Grantland and Bertron are W5QMZ and W5QNA respectively.

COMPTON NEW VEEP

Charles G. Compton, WØBUO, of South St. Paul, Minnesota, has been elected to a two-year term as First Vice President of the League. He'll also serve as vice president of the International Amateur Radio Union automatically, under the terms of its constitution, and continues on the ARRL Executive Committee as provided for in the Articles of Association and Bylaws.

Charlie, a systems engineer for data processing, has been director from the Dakota Division since 1960; has been a member of the Executive Committee since 1963; was an additional vice president for the 1966-1968 term; and earlier served as vice director, Dakota Division, 1958-1959. He's a past president of the St. Paul Radio Club, and was civil defense radio officer for more than two years. While a director, WØBUO has been on the Membership and Publication, Housing, Planning and Finance Committees, and served two terms as chairman of the Public Relations Committee. He holds appointment as official phone station, is a member of the A-1 Operator Club, holds the Extra Class license, and is a Charter Life Member of ARRL.

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Carl L. Smith, WØBWJ, of Denver, director from the Rocky Mountain Division since 1961, has been elected an additional vice president (filling the position which has been vacant since the resignation of P. Lanier Anderson, W4MWH, several months ago) for a two-year term. Carl served on the Executive Committee from 1966 to 1969; as vice director, 1957-1958; assistant director, 1955-1956 and section communications manager for Colorado, 1959-1960. His occupation: captain, Western Air Lines, Inc., flying jets.

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Gilbert L. Crossley, W3YA, of State College, Pennsylvania was newly elected as an Honorary Vice President. Gil served the Atlantic Division as director from 1954 to 1970, was an additional vice president in 1966-1968, and was a member of the Executive Committee during those same years. First licensed in 1915, Gil has been a member of the League since 1923 and is now a Charter Life Member.

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President Robert W. Denniston, WØDX; Vice-President R. O. Best, W5QKF; Secretary John Huntoon, W1LVQ; Treasurer David H. Houghton and Honorary Vice President Francis E. Handy, W1BDI, were all unanimously reelected for another two-year term.

SHIMA NEW DAKOTA DIRECTOR

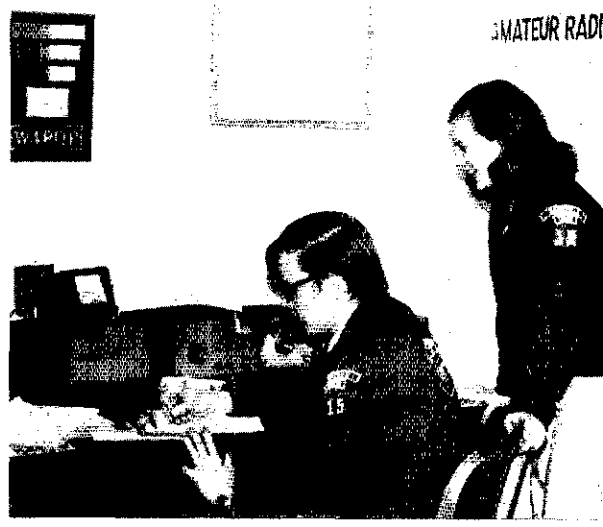
With the resignation of First Vice President Compton as director from the Dakota Division on May 13, Larry J. Shima, WØPAN becomes director for the balance of Charlie's term, until noon January 1, 1972. In turn, Larry has resigned as

section communications manager of Minnesota, to which he was elected in 1969. The vice directorship, which Larry has held since the first of the year, remains vacant until the next regular election in 1971.

Larry works as an accountant/systems analyst for Honeywell, Inc. and lives in Bloomington, Minnesota. He's a past secretary treasurer, Northern Iowa Amateur Radio Club, past phone activities manager for Hawaii, and he holds DXCC under two calls. He's an OPS, and a member of AREC, RACES, the A-1 Operator club, and the active Navy Reserve, where he's a lieutenant commander. His ham activities encompass traffic work, contests and DX chasing.

PHOTO FEEDBACK

In a last-minute reorganization of "Happenings" copy last month, a photo of VE3CO receiving the ARRL Certificate of Merit from VE3UU ended up next to a caption about Explorer Post 15 of Nashville, Tennessee. Our apologies to all! We're trying again this month.



The Boy Scouts of America have a relatively-new program for high school boys and girls: specialty Explorer Posts. The Radio Amateur Transmitting Society of Nashville, Tennessee, sponsors Explorer Post 15, specializing in ham radio. Here David Rogers tries to copy a transmission while Beth Guinn heckles. Post Advisor is ARRL Delta Division Director Max Arnold, W4WHN. If your club is suffering from "tired blood" or could use an interesting project, you might contact your local Scout office about the possibility of sponsoring an Explorer Post in radio.

EXPIRATION OF STATION LICENSES

FCC has amended its rules for the amateur service to reflect the current practice. An additional-station license, regardless of when issued, will expire on the same date as the licensee's operator license; section 97.59 (b) has been amended by the addition of a sentence to that effect.

CB INFORMATION

FCC has adopted a new policy under which it will fine licensees in the Class D Citizens Radio Service for first-time violations in four instances – use of pseudonyms instead of calls, use of overheight antennas, operation on unauthorized frequencies and use of linear amplifiers for excessive increase of station power.

Also on the CB scene, FCC has set aside Channel 9, 27,065 kHz, for emergency communications involving the immediate safety of life or the immediate protection of property or communications necessary to render assistance to a motorist – only when immediate action is required. Other alterations have been made in the rules to further limit and define use of CB for emergencies. Those having need for the complete story should write to FCC requesting "Report and Order in Docket 18705," released April 27, 1970.

MORE AMATEUR RADIO WEEKS

July 11-17 is being observed in North Dakota as amateur radio week, coinciding with the International Peace Garden hamfest on July 11-12 under the joint sponsorship of North Dakota and Manitoba radio clubs. Governor William L. Guy mentions scientific development of electronics and radio: military communications during World War II and Korea; emergency work during the blizzards of March, 1966 and communications during the 1969 and 1970 floods as accomplishments of amateur radio deserving of the honor.

Cleveland, Ohio, picked the week of April 19-25, based on the Dayton Hamfest the end of that week, for its proclamation by Mayor Carl B. Stokes. Free messages for servicemen and international good will were among the reasons for the citation, requested by the Apricot Net.

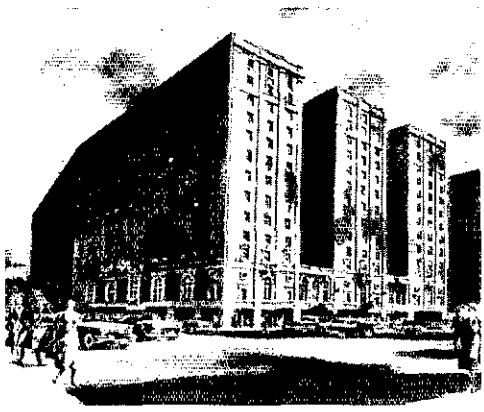
And Englewood, New Jersey, continued its long string of consecutive amateur radio weeks, picking the National Amateur Radio Week, June 21-27, which culminates in ARRL Field Day. Mayor Ned Feldman quoted FCC's Basis and Purpose of the amateur service (Section 97.1 of our rules) and mentioned specifically the FD exercise, Englewood Civil Defense – Disaster Control, and the Englewood Amateur Radio Association in his proclamation.

COMING: NATIONAL CONVENTION

This year the ARRL National Convention returns to Boston where the Federation of Eastern Massachusetts Amateur Radio Associations is completing plans for a big three-day affair. The Statler-Hilton Hotel will be headquarters for an international gathering of radio enthusiasts and their families September 25, 26 and 27. As of press time plans have been announced for FCC examinations all day Friday, a special old time radio show by Bruce Kelley, presentations by AMSAT (Amateur Satellite Programs will be presented all

three days) and a fun nite (dinner, drinks and show) at the Playboy Club of Boston.

Saturday's programs include exhibits from all major ham equipment manufacturers, a bus trip to ARRL headquarters in Newington for a tour and luncheon returning to Boston in time for the big banquet and show in the evening with keynote speaker FCC commissioner Robert Lee. Sunday's programs again will include technical sessions and will wind up with the prize awards. Both days special features will be in progress including a YL and OM bus tour of historic Boston, YL luncheon at a famous restaurant, the ARRL forum, computer demonstrations, RTTY, FAX and TV displays, a CW receiving contest, and a flea market (bring your old gear or some money or both!). The New England DXCC will incorporate their topnotch DX programs for 1970 into the National Convention. The vhf boys will be presiding over an international confab and will also feature programs on fm repeaters. The talk-in station will be operated by the Honeywell radio club from the top of the Prudential center.



The YL programs have been expanded considerably and will include features from two directions — the YL ham and the YL non-ham. OMs should have no qualms about bringing the boss to this one for there'll be plenty for her to do – and unless she gets away, into some of Boston's fancier shops, it won't be expensive, either! Registration will be $3 early bird, $4 at the door and will be required of all OMs 12 years old and up. Registration of YLs is encouraged but is optional. The Saturday banquet will be befitting the occasion – steak preceded by lobster bisque! Tickets for the Saturday night steak banquet, dance (10 piece orchestra) and show are $12 per person including all taxes and gratuity. The Friday night steak (again!) dinner including two cocktails and a show are $10 per person. Unfortunately, the Playboy club can only seat 200 persons so Friday's affair will be first-come first served on tickets – when they're gone, they're gone! Prices on the bus trip to Newington will be announced later but will be modest. Ticket requests should be sent to: FEMARA, c/o John McCormick, 572 Berkley Street, Taunton, Mass. 02780.

1970 BOARD MEETING MINUTES

MINUTES OF THE 1970 ANNUAL MEETING OF THE BOARD OF DIRECTORS

The American Radio Relay League, Inc.

May 1-2, 1970

1) Pursuant to due notice, the Board of Directors of The American Radio Relay League, Inc., met in annual session at the Shoreham Motor Hotel, Hartford, Connecticut, on May 1, 1970. The meeting was called to order at 10:00 a.m., with President Robert W. Denniston, W@ DX, in the Chair, and the following directors present:

Roy L. Albright, W5EYB, West Gulf Division
Max Arnold, W4WHN, Delta Division
Robert York Chapman, W1QV, New England Div.
Victor C. Clark, W4KFC, Roanoke Division
Charles G. Compton, W@ BUO, Dakota Division
Harry J. Dannals, W2TUK, Hudson Division
Noel B. Eaton, VE3CJ, Canadian Division
Sumner H. Foster, W@GQ, Midwest Division
J.A. Gmelin, W6ZRJ, Pacific Division
John R. Griggs, W6KW, Southwestern Division
Philip E. Haller, W9HPG, Central Division
Harry A. McConaghy, W3EPC, Atlantic Division
Alban A. Michel, W8WC, Great Lakes Division
Carl L. Smith, W@BWJ, Rocky Mountain Div.
H. Dale Strieter, W4DQS, Southeastern Division
Robert B. Thurston, W7PGY, NorthwesternDiv.

Also in attendance, as members of the Board without vote, were Wayland M. Groves, W5NW, First Vice President; R. O. Best, W5QKF, Vice President; and John Huntoon, W1LVQ, General Manager. Also in attendance, at the invitation of the Board as non-participating observers, were Atlantic Division Vice Director Jesse Bieberman, W3KT; Central Division Vice Director Edmund A. Metzger, W9PRN; Dakota Division Vice Director Larry J. Shima, W@PAN; Delta Division Vice Director Franklin Cassen, W4WBK; Great Lakes Division Vice Director Currin L. Skutt, W8ESZ; Midwest Division Vice Director Ralph V. Anderson, K@NL; Roanoke Division Vice Director L. Phil Wicker, W4ACY; Southeastern Vice Director Charles J. Bolvin, K4KQ and Southwestern Division Vice Director Arnold Dahlman, W6UEL. There were also present Honorary Vice President F. E. Handy, W1BDI; Treasurer David H. Houghton; General Counsel Robert M. Booth, Jr., W3PS; Canadian Associate Counsel Arthur K. Meen, VE3RX; Assistant General Manager Richard L. Baldwin, W1IKE; Communications Manager George Hart, W1NJM; Senior Assistant Secretary Perry F. Williams, W1UED; *QST* Acting Technical Editor Doug DeMaw, W1CER; VHF Editor Edward P. Tilton, W1HDQ; and Public Relations Consultant Don Waters.

2) Moved, by Mr. Chapman, that the Board adopt the published agenda after addition of Item 13 for a second round of director motions; but there was no second, so the motion was lost. On motion of Mr. Compton, after discussion, unanimously VOTED to amend the agenda by providing an additional Item 13 for a second round of director motions, an additional Item 14 for the appointment of committees, and an additional Item 15, transferred from earlier in the agenda, covering expenses of committees. Whereupon, on motion of Mr. Gmelin, unanimously VOTED to adopt the agenda as amended.

3) On motion of Mr. Thurston, unanimously VOTED that the minutes of the 1969 Annual Meeting, and the 1969 Special Meeting, of the Board of Directors are approved in the form in which they were issued by the Secretary.

4) Moved, by Mr. McConaghy, to correct the minutes of the 1969 Special Meeting to provide that only vice-director travel expenses to a Board Meeting are allocated to the division allotments; but the Chair ruled the motion out of order at this time.

5) On motion of Mr. Chapman, unanimously VOTED that the annual reports of the officers to the Board of Directors are accepted and the same placed on file.

6) Mr. Eaton, as chairman, presented the report of the Finance Committee; Mr. Thurston, as chairman, presented the report of the Planning Committee; Mr. Albright reported for the Membership & Publications Committee; Mr. Haller, as chairman, presented the report of the Public Relations Committee; Mr. Groves, as chairman, reported for the Merit & Awards Committee; Mr. Clark presented the report of the Special Committee on a form of League field organization; Mr. Gmelin presented the report of a Special Committee on a Joint Oscar/ARRL Amateur Station; Mr. Chapman presented the report of a Special Committee on Establishment of an ARRL Foundation; Mr. Dannals presented the report of a Special Committee on Evaluation of Board Meeting Procedures. During the course of the above, Technical Consultant George Grammer, W1DF, entered the meeting.

7) On motion of Mr. Haller, unanimously VOTED that the annual reports of the directors to the Board of Directors are accepted and the same placed on file.

8) At this point, supplementary oral reports were offered by the officers of the League and the General Counsel.

9) The Board was in recess for luncheon from 12:30 p.m. to 1:25 p.m.

10) Moved, by Mr. McConaghy, to amend bylaw 18, in the fifth and the ninth lines of the edition of August 1, 1967, to add after the word, "director," the words, "and a vice-director." But, after discussion, further clarification being needed, on motion of Mr. Chapman, unanimously VOTED that the matter is laid on the table.

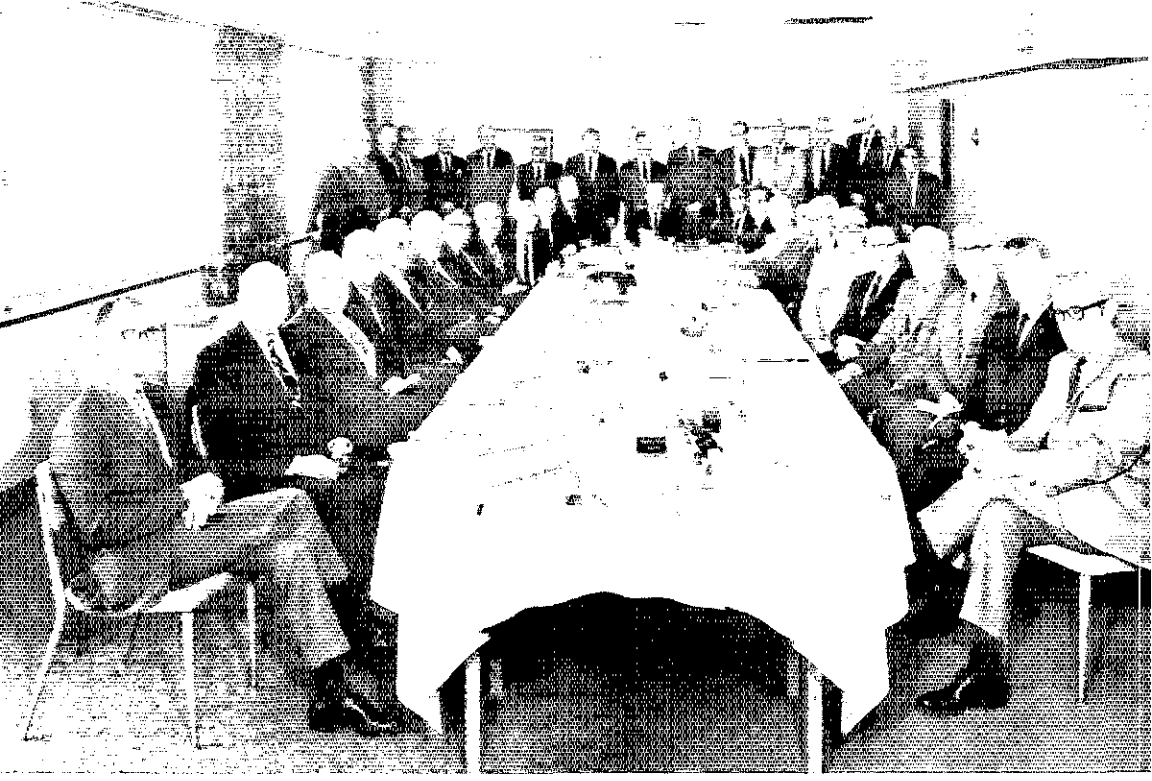
11) Moved, by Mr. Arnold, that all licensed amateurs fifteen years of age or younger shall initially become a full member for a membership fee of five dollars ($5.00) to be paid in full to the League; application of these memberships to be made only through affiliated clubs, which must attest to the eligibility of the applicants. After discussion, on motion of Mr. Gmelin, VOTED to amend the motion to provide that it be referred to the Membership and Publications Committee for study. The question then being on the original motion as amended, the same was unanimously ADOPTED.

12) Moved, by Mr. Michel, that we expand the day-time code practice operation of W1AW to include the transmission of ARRL bulletins. After discussion, on motion of Mr. Clark, unanimously VOTED to amend the motion to provide that it be referred to the staff to investigate the feasibility of such expansion. After further discussion, the question then being on the original motion as amended, the same was unanimously ADOPTED.

13) Moved, by Mr. Dannals, that the Federal Communications Commission be petitioned to change the lower limit of the 3.8 MHz voice band from 3800 to 3750 kHz, moving the 3800-3900 kHz restricted segments, as presently apportioned, to 3750-3850 kHz, and permitting General/Conditional Class use of the remainder of the voice segment. After extended discussion, moved, by Mr. Foster, to amend the motion by striking the text and substituting therefor the following: That the General Counsel be instructed to petition the Federal Communications Commission that radiotelephony frequencies available to the General and Conditional Class licensees be changed to read 3850-4000 kHz, with no change in the Extra and Advanced Class segments that now prevail. After further extended discussion, moved, by Mr. Clark, that to permit further discussion in committee, the matter should be laid on the table; but the motion was rejected. On the motion to amend, a rollcall vote was requested; the result was 13 in favor, 3 opposed, so the motion was amended. All the directors voted in favor of the amendment except Messrs. Dannals, Griggs and Strieter, who voted opposed. On motion of Mr. Chapman, VOTED to reconsider the vote on the amendment. On a second rollcall vote, there were 12 in favor and 4 opposed, so the amendment to the motion was confirmed; on the second rollcall all the directors voted in favor except Messrs. Clark, Dannals, Griggs and Smith. The question then being on the motion as amended, the same was REJECTED, 6 votes in favor to 9 opposed; those voting in favor were Messrs. Albright, Clark, Foster, Gmelin, Michel and Thurston; those voting opposed were Messrs. Arnold, Chapman, Compton, Dannals, Griggs, Haller, McConaghy, Smith and Strieter; (Canadian Director Eaton abstained).

14) The Board was in recess from 4:05 p.m. to 4:25 p.m.

How old can kids be when you first introduce them to amateur radio? Well, Dorothy Bush, WNØVNE (extreme right of picture), had a unit in communications for her second grade class in Lincoln, Nebraska. Russell Ritzman, WAØLGR, (at rig) put the class in touch with another at Merritt Island, Florida after much preliminary classroom work at both ends. The southern half of the contact was upheld by Roy Durso, K4DJN and Ace Goodwin, W4WEU. The adult just visible behind WAØLGR is Dorothy's OM, Gene. *(Photo by Winfield Howland).*



Time out for "Look at the birdie." From the left, seated: W4DQS, WØBUO, W5EYB, W5QKF, W4WHN, W6KW, W6ZRJ, W5NW, WØGQ, W7PGY, W3PS, WØDX, W1LVQ, W1UED, Treasurer Houghton, VE3RX, VE3CJ, W1QV, WØBWJ, W8WC, W9HPG, W2TUK, W3EPC. Standing, from left: W1IKE, W9PRN, W6UEI, PR Consultant Waters, W4ACY, W1DF, W4WBK, WØPAN, K4KQ, W1CER, W1NJM, W8FSZ, W1BDI, W4KFC, KØNL, W3KT.

15) Moved, by Mr. Foster, that the General Manager be authorized to offer a one-year half-price membership to new Novices when they obtain initial license; but there was no second, so the motion was lost.

16) On motion of Mr. Chapman, after discussion, unanimously VOTED that the ARRL Communications Department initiate a 160-meter band contest oriented to promote activity in this band of frequencies.

17) On motion of Mr. Thurston, unanimously VOTED that the regular members, Board and staff liaison members of the VHF Repeater Committee, and other groups and individuals, be commended for their outstanding contribution in preparing advice to the Board in connection with the current FCC Repeater Proposal.

18) On motion of Mr. Gmelin, unanimously VOTED that the President is instructed to continue, for a one year period, the special committee to study the possible establishment of a joint Oscar/ARRL West Coast station at Foothill College, Los Altos, California.

19) On motion of Mr. Clark, after discussion, unanimously VOTED that the following rules and regulations concerning ARRL membership advisory committees be adopted and incorporated as a separate section in the publication "Articles of Association and By-laws of the American Radio Relay League" and that the two existing committees, the Contest Advisory Committee and the VHF Repeater Advisory Committee, be enabled to function in accordance with them:

RULES AND REGULATIONS CONCERNING ADVISORY COMMITTEES

The following rules and regulations provide for the establishment of national advisory committees, composed of qualified amateurs, to undertake studies, review proposals, and to communicate advice, recommendations and expertise from the League's membership to its management in various specialty areas of amateur radio:

1. The creation of any Advisory Committee shall be the determination of the Board of Directors.
2. The petition for establishment of an Advisory Committee shall outline the purpose of the Committee, the proposed scope of its activities, and the means by which the Committee proposes to communicate among its membership for the purpose of discussion, debate, and to reach a consensus on matters under study. This petition is to be presented to the Board by the sponsoring Director.
3. The initial membership of the Advisory Committee shall be selected by the President of the League, employing consulting assistance of the sponsoring Director and others as he may deem desirable to secure the services of those best able to provide the expertise sought. Committee members shall be chosen from A. R. R. L. members nominated by the membership-at-large in response to appropriate notices published in *QST*.
4. Committee membership, for practical reasons, should be limited to fewer than ten, and the exact number and any geographical or other

proposed limitations on committee make-up shall be outlined in the original petition for creation of the Committee. A member's initial term of office will be either for one or two years, as designated by the President, with approximately one-half the initial members having one year terms and the remainder having two-year terms. Members may be reappointed for no more than two consecutive two-year terms, but are again eligible for appointment to committee membership after a lapse of one year.

5. A method shall be proposed by the petition for selection of the initial Chairman. On or about May 1 of each year the President, in consultation with the committee members and liaison members, will select the Chairman to serve for the ensuing year. Chairmen will serve for no more than two consecutive one-year terms. The Chairman shall designate and identify one of the committee members as Vice Chairman, to assist with and provide continuity in direction of committee affairs.

6. Candidates for committee membership may be nominated at any time, and require three sponsors, each of whom is a full member of A.R.R.L. A call for nominees will be made in September *QST* each year. A file of eligible nominees will be maintained at Headquarters for use as a source of replacements. The President, in consultation with the committee Chairman and liaison members, on or about November 1 of each year, shall select replacements for members whose terms are expiring, or shall reappoint them for a subsequent term, as appropriate.

7. Advisory Committee authority shall be limited to the preparation of recommendations within its specialty area, based upon consultation with segments of the membership and upon Committee studies; these are to be presented to the Staff and/or Board as appropriate to the situation.

8. One member of the Board of Directors or an elected officer of the League shall be designated by the President as a consultant and ex-officio member of the Advisory Committee, acting as a point of contact between the Committee and the Board.

9. One member of the Headquarters staff shall be designated by the President as a coordinator and ex-officio member of the Advisory Committee, to provide Staff assistance, where required to assure viability of the Committee through adequate communication of information pertinent to the activities of the Committee, to initiate action to replace members who resign, to secure the resignation of those who become inactive, and to assist in any way possible to improve Committee effectiveness in providing a link to the membership and performing as a sounding board for management reference.

10. Headquarters Staff personnel, wherever appropriate, shall refer membership inquires and proposals to the Chairman of the cognizant Advisory Committee for consideration and comment, routinely informing Advisory Committee members of substantive matters impinging upon the Committee's specialty area and soliciting the Committee's views, although these need not be binding. Items requiring Committee action should be so identified.

11. The identify and addresses of the Advisory Committee members shall be routinely carried in *QST*, to facilitate direct member contact. Space shall be allocated in *QST*, as appropriate, to report upon the activities of Advisory Committees.

12. An Advisory Committee which is no longer active or serving a useful purpose may be discontinued by action of the Board of Directors.

20) On motion of Mr. Smith, unanimously VOTED that the ARRL National Convention in 1976 be scheduled for Colorado at a specific date and city to be designated later.

21) On motion of Mr. Griggs, after extensive discussion, unanimously VOTED that the Board of Directors does hereby direct the General Manager to effect the periodic publication of names and addresses of television set manufacturers who furnish free to their customers high-pass filters or other interference rejection devices.

22) Moved, by Mr. Albright, that the General Manager be authorized to expend a sum, not greater than twenty-five thousand dollars ($25,000), for preparation, printing and distribution of one hundred thousand (100,000) copies of the new ARRL teen-ager booklet currently scheduled for publication during this calendar year. After extended discussion, on motion of Mr. Gmelin, unanimously VOTED that the matter is laid on the table. During the course of the above, Canadian Counsel Arthur K. Meen, VE3RX, under the necessity of returning to his home, departed the meeting.

23) On motion of Mr. McConaghy, unanimously VOTED to take from the table his motion concerning the amendment of By-Law 18. On a rollcall vote, the by-law was amended, by unanimous action, 16 votes in favor to none opposed.

24) On motion of Mr. McConaghy, after discussion, unanimously VOTED that the General Counsel prepare appropriate language for inclusion in the Articles of Association and By-Laws which will clarify and set forth the role and functions of Assistant Directors.

25) The Board was in recess for dinner from 6:15 p.m. until 8:30 p.m.

26) On motion of Mr. Dannals, after discussion, unanimously VOTED that the General Manager study the feasibility of paying for technical articles contributed to our official journal *QST* by League members. The results of this study are to be submitted at the next meeting of the Board.

27) On motion of Mr. Foster, after discussion, VOTED that the General Manager be authorized to discontinue the insertion of a post-paid return membership application card annually in *QST*, but to continue insertion of same at his discretion in other booklets.

28) Moved, by Mr. Chapman, that during one calendar month of any one year, to be determined by League management, DXCC members will be permitted to submit less than 5 QSL cards for credit standing in the DXCC listing; non-members may be charged processing costs for this service, to be prorated by League management. After discussion, the motion was rejected, 4 votes in favor to 9 opposed. Messrs. Arnold, Chapman, Griggs and Haller requested to be recorded as voting in favor.

29) On motion of Mr. Thurston, unanimously VOTED that the creation of an Advisory Committee for DX matters be approved as recommended in the Planning Committee report, and in accordance with rules and regulations concerning the establishment of Advisory Committees.

30) On motion of Mr. Gmelin, after discussion, VOTED, 14 in favor to 2 opposed, the the Acting Technical Editor is instructed to study the possibility of establishing an on-going informational service program to assist amateurs in solving interference problems to solid state hi-fi equipment and report back to the Board on this matter at the

next Board meeting. Mr. Chapman requested to be recorded as voting opposed.

31) On motion of Mr. Clark, unanimously VOTED that the General Manager, with the assistance of the General Counsel, review the series of recent Commission opinions relating to amateur participation in civic activities, including the Eye Bank Network, leading to a request to the Commission for a declarative ruling or, if necessary, to petition for appropriate changes in Part 97 of the Commission's rules in order to enable continued contribution by the amateur radio service to worthy civic enterprises.

32) Director Griggs reported upon the work and recommendations of the VHF Repeater Advisory Committee, and on his motion, after discussion, unanimously VOTED (Canadian Director Eaton abstaining) that the General Counsel include the following recommendations in the comments to be submitted to the Federal Communications Commission in Docket No. 18803:

a) That any rules adopted on amateur repeaters provide for the maximum of flexibility and the minimum of restrictions and regulations:

b) That repeater linking and multiple hops be permitted;

c) That coded access ("whistle on") not be mandatory but may be provided at the option of the repeater licensee;

d) That cross-band operation of repeaters be permitted;

e) That subbands for repeater operation not be specified by the Commission at this time except that, in the 144 MHz band, repeater operation be conducted only above 146 MHz so as to permit the greatest flexibility for development of space communications in the world-wide exclusively amateur portion of that band;

f) That the licensee or another operator with an appropriate class of license designated by the licensee be capable of deactivating the repeater from a fixed, portable or mobile central point in case of malfunction or improper or unauthorized use of the repeater;

g) That the 1 kilowatt power limit applicable generally to the amateur service be applicable to repeaters;

h) That fixed, portable and mobile operation of repeaters be permitted;

i) That automatic means to limit the length of a single transmission of a repeater, or a series of transmissions, not be required but may be provided at the option of the licensee; and

j) That identification of a repeater be given at least every ten minutes of operation by automatic or manual means and by cw, mcw, or voice at the option of the licensee, with cw or mcw, if used, not to exceed a rate of twenty words per minute.

k) The League concurs with FCC's proposal regarding relaxation of logging requirements.

33) Moved, by Mr. Albright, that W1AW shift its operating frequency for code practice and official bulletins outside the Extra Class segment of the amateur bands. After discussion, moved, by Mr. Clark, to amend the motion to provide that only the 80-meter cw frequency be moved. On motion of Mr. Gmelin, VOTED to call for the question; whereupon the motion to amend was rejected. Moved, by Mr. McConaghy, to amend the motion to provide that the new frequencies be 3525, 7025 and 14,025. After discussion, on motion of Mr. Gmelin, VOTED to call for the question; whereupon the second motion to amend was also rejected. On motion of Mr. Gmelin, VOTED to call for the question on the original motion; whereupon the same was REJECTED, 6 votes in favor to 9 opposed.

34) Moved, by Mr. McConaghy, that the W1AW code practice schedule be modified as follows: (a) Code practice daily 10 - 13 - 15 wpm 2330 GMT Change to: 10-13-15 wpm STTS 5-7 1/2-10 MWF (b) Code practice MTWTF 1300 GMT Change to: STTS 35-15 wpm. MWF 5-25 wpm 1300 GMT. After discussion, on motion of Mr Chapman, VOTED to call for the question, whereupon the motion was REJECTED.

35) On motion of Mr. Haller, unanimously VOTED that the General Counsel be requested to file a petition with the FCC for extension of time for comments on Docket 18803.

36) On motion of Mr. Dannals, unanimously VOTED that the Board extends its thanks to the members of the Intruder Watch for their work on special assignment assisting the Planning Committee in its recent band study and the Board heartily endorses the continued work of this dedicated group.

37) On motion of Mr. Chapman, after extensive discussion, unanimously VOTED that the provision of By-Law 2 be applied to applications for renewal of membership. During the course of the above, Canadian Division Vice Director A. George Spencer, VE2MS, joined the meeting.

38) Moved, by Mr. Gmelin, that the General Manager is instructed to institute a radio propagation prediction column in *QST* on a six-months trial basis. But, after discussion, the motion was rejected, 4 votes in favor to 12 opposed. Messrs. Arnold, Chapman and Gmelin requested to be recorded as voting in favor.

39) On motion of Mr. Clark, unanimously VOTED that a special committee including Board and staff representatives be appointed by the President to study and make recommendations regarding any desirable changes in (a) the existing system employed for recording and distributing mail to affiliated clubs, (b) present membership requirements for affiliated clubs, and (c) format of the annual questionnaire sent to affiliated clubs, with the objective of strengthening liaison with such groups.

Bob Chapman, W1QV; Vic Clark, W4KFC.

40) On motion of Mr. Griggs, after discussion, unanimously VOTED that the General Manager is hereby directed to provide funds not exceeding three thousand dollars for the production by Dave Bell Associates of Hollywood, Calif. of a motion picture film featuring amateur radio, intended for sale and distribution only to high schools or similar educational institutions with the conditional provision that the proceeds received over cost be applied towards the retirement of the League investment.

41) Moved, by Mr. Albright, to take from the table his motion concerning the production of a teen-age booklet; but the motion was lost, 6 votes in favor to 9 opposed.

42) The Board recessed at 11:20 p.m., reconvening at 9:15 a.m. on May 2, with all directors and other persons hereinbefore mentioned in attendance except Messrs. DeMaw, Grammer, Meen, Tilton, and Wicker.

43) On motion of Mr. Thurston, unanimously VOTED that the General Manager is hereby authorized to reimburse the division directors for actual expenses incurred by them during the year 1970, in the proper administration of ARRL affairs in their respective divisions, up to amounts as follows:

Canadian Division Director	$ 1750
Atlantic Division Director	3000
Central Division Director	2400
Dakota Division Director	1200
Delta Division Director	2800
Great Lakes Division Director	2500
Hudson Division Director	2500
Midwest Division Director	2200
New England Division Director	2700
Northwestern Division Director	2500
Pacific Division Director	3500
Roanoke Division Director	2000
Rocky Mountain Division Director	1600
Southeastern Division Director	2500
Southwestern Division Director	3500
West Gulf Division Director	2900

44) On motion of Mr. Gmelin, unanimously VOTED that to continue the Board's policy of reimbursing Section Communications Managers and QSL Managers of the League for certain travel in furthering ARRL organizational activities, the General Manager is hereby authorized to pay during the year 1970 a total amount not to exceed $13,500 under terms prescribed by the Communications Manager for SCMs, and the General Manager for QSL Managers, following the general pattern established by the Board.

45) On motion of Mr. Gmelin, unanimously VOTED that, to continue the Board's policy of reimbursing Section Emergency Coordinators for certain travel in furthering ARRL organizational activities, the General Manager is hereby authorized to pay during the year 1970 a total amount not to exceed $8,000 under terms prescribed by the Communications Manager following the general pattern established by the Board.

46) On motion of Mr. Griggs, unanimously VOTED that, to continue the Board's policy of reimbursing National Traffic System officials above the section level for certain approved travel in furthering ARRL organizational activities, the General Manager is hereby authorized to pay during the year 1970 a total amount not to exceed $6,000 under terms prescribed by the Communications Manager following the general pattern established by the Board.

47) On motion of Mr. Arnold, unanimously VOTED that the General Manager is hereby authorized to pay during the period between January 1, 1971 and the 1971 annual meeting of the Board, expenses against usual authorizations for administrative and committee operations in no greater amount than 1970 authorized amounts.

48) On motion of Mr. Foster, unanimously VOTED that the amounts of $313.90 for the West Gulf Division, $125.35 for the Dakota Division, and $116.73 for the Canadian Division be authorized as additional reimbursed expenditures for 1969.

49) On motion of Mr. Eaton, unanimously VOTED that the Finance Committee be authorized to invest the proceeds of the insurance policy on the life of the late K. B. Warner in accordance with the general policy followed for other League funds.

50) Moved, by Mr. Chapman, that By-Law 5 be amended, at line 8 of the August 1, 1967 edition, effective July 1, 1970, to read, "at his request pay dues of $2 per year,". After discussion, the motion was unanimously ADOPTED, 16 votes in favor to none opposed. So the By-Law was amended.

51) On motion of Mr. Chapman, unanimously VOTED that this Board approve and appoint the firm of Ernst & Ernst as auditors of the League for the calendar and fiscal year 1971.

52) On motion of Mr. Compton, after discussion, unanimously VOTED that the Finance Committee undertake a study of the present level of pensions being paid to retired employees of the League, investigating particularly their adequacy in view of the present and continuing increase in the cost of living; this study to include the cost of funding any increase recommended, and the cost of extending such an increase to present employees; the results of such study to be reported to the Board as early as possible.

53) On motion of Mr. Groves, unanimously VOTED that in recognition of their skill and perseverence in the field of 2300 MHz moon-bounce experimentation and their contributions to the growth of earth-moon-earth communication, the League presents the 1969 Technical Merit Award to William L. Smith, W3GKP, of Spencerville, Maryland, and Paul M. Wilson, W4HHK, of Collierville, Tennessee.

54) The Chair announced the opening of nominations for the office of President. Mr. Foster nominated Mr. Denniston. On motion of Mr. Chapman, unanimously VOTED that the nominations are closed and that the Secretary cast one ballot naming Robert W. Denniston, WØDX as President of the League for the ensuing term. (Applause).

55) The Chair announced the opening of nominations for the office of First Vice President. Mr. Gmelin nominated Mr. Eaton; Mr. Eaton stated he appreciated the honor, but for many practical reasons could not accept, and therefore, withdrew his name. Mr. Albright nominated Mr. Groves. Mr. Smith nominated Mr. Compton. On motion of Mr. Chapman, unanimously VOTED that the nominations are closed. The Chair appointed Messrs. Bolvin, Cassen and Metzger as Tellers. The Tellers announced the result of the balloting as follows:

Mr. Groves 6
Mr. Compton 10

Whereupon Charles G. Compton, WØBUO was declared elected First Vice President of the League for the ensuing term. (Applause).

56) A standing ovation was given to retiring First Vice President Wayland M. Groves, W5NW,

The Board at work.

for more than thirty-five years of outstanding and devoted service to the American Radio Relay League, including 20 as Vice President.

57) The Chair announced the opening of nominations for an additional Vice President. Mr. Foster nominated Mr. Groves; Mr. Groves expressed appreciation but withdrew his name from nomination. Mr. Thurston nominated Mr. Best. On motion of Mr. Chapman, unanimously VOTED that the nominations are closed and that the Secretary cast one ballot naming Roemer O. Best, W5QKF, as a Vice President of the League for the ensuing term. (Applause).

58) The Chair requested any other nominations for an additional Vice President. Mr. Dannals nominated Mr. Smith. On motion of Mr. Thurston, unanimously VOTED that the nominations are closed and that the Secretary cast one ballot naming Carl L. Smith, WØBWJ, as a Vice President of the League for the ensuing term. (Applause).

59) The Board was in recess from 10:55 a.m. to 11:05 a.m.

60) The Chair announced the opening of nominations for Honorary Vice Presidents. Mr. Albright nominated Mr. Groves. On motion of Mr. Gmelin, unanimously VOTED that the nominations are closed and that the Secretary cast one ballot electing Wayland M. Groves, W5NW, an Honorary Vice President of the League for the ensuing term. (Applause).

61) The Chair requested any other nominations for Honorary Vice President. Mr. Chapman nominated Mr. Handy. On motion of Mr. Haller, unanimously VOTED that the nominations are closed and that the Secretary cast one ballot electing Francis E. Handy, W1BDI, an Honorary Vice President of the League for the ensuing term. (Applause).

62) The Chair requested any other nominations for Honorary Vice President. Mr. McConaghy nominated Mr. Crossley. On motion of Mr. Smith, unanimously VOTED that the nominations are closed and that the Secretary cast one ballot electing Gilbert L. Crossley, W3YA, an Honorary Vice President of the League for the ensuing term. (Applause).

63) The Chair announced the opening of nominations for Secretary. Mr Dannals nominated Mr. Huntoon. On motion of Mr. Michel, unanimously VOTED that the nominations are closed and that the President cast one ballot electing John Huntoon, W1LVQ, as Secretary of the League for the ensuing term. (Applause).

64) The Chair announced the opening of nominations for the office of Treasurer. Mr. Chapman nominated Mr. Houghton. On the motion of Mr. Foster, unanimously VOTED that the nominations are closed and that the Secretary cast one ballot electing David H. Houghton as Treasurer of the League for the ensuing term. (Applause).

65) The Chair amounced that the Board would now proceed to the election of four directors to the Executive Committee for the ensuing year. On motion of Mr. Gmelin, unanimously VOTED to adopt procedures for the election of the Executive Committee requiring reballoting when the plurality of an apparent winning candidate is less than a majority of the total votes cast. Nominations then being in order, Mr. Clark nominated Mr. Dannals. Mr. Michel nominated Mr. Eaton. Mr. Thurston nominated Mr. Clark. Mr. Foster nominated Mr. Thurston. Mr. Chapman nominated Mr. Gmelin. Mr. McConaghy nominated Mr. Griggs; but Mr. Griggs withdrew his name. Mr. Compton nominated Mr. Foster. On motion of Mr. Smith, unanimously VOTED that the nominations are closed. The Tellers announced the results of the balloting as follows:

Mr. Dannals	14
Mr. Eaton	14
Mr. Clark	12
Mr. Thurston	12
Mr. Gmelin	7
Mr. Foster	8

Whereupon Harry J. Dannals, W2TUK, Noel B. Eaton, VE3CJ, Victor C. Clark, W4KFC, and Robert B. Thurston, W7PGY were declared elected as members of the Executive Committee for the ensuing term. (Applause).

66) On motion of Mr. Gmelin, unanimously VOTED that the General Manager is instructed to study the possibility of publishing a series of technical articles in *QST* which outline simple portable and emergency hand-held radio equipment, suitable for emergency communications operation.

67) Moved, by Mr. Gmelin, that the Communications Manager is instructed to change the present 100-mile limit rule for club aggregate contest scores, to be set at 175 miles. After discussion, moved, by Mr. Chapman, that the motion is laid on the table; but there was no second, so the motion to table was lost. After further discussion, the motion was adopted, 10 votes in favor to 4 opposed. Mr. McConaghy requested to be recorded as voting opposed.

68) On motion of Mr. Griggs, unanimously VOTED that the Board of Directors does hereby approve, in lieu of the approval for 1971, the request of the Associated Radio Amateurs of Long Beach (Calif.) for the presentation of a national convention of the ARRL in 1972 aboard the Queen Mary in Long Beach, Calif., during the period September 1st through 4th (Labor Day week-end).

69) On motion of Mr. Griggs, after discussion, unanimously VOTED that the Board of Directors does hereby direct the General Manager to request the various consumer oriented rating magazines to include in their reviews of TV receivers and related home entertainment equipments the radio frequency interference rejection characteristics of such units.

70) Moved, by Mr. Griggs, that the Board of Directors does hereby direct the General Counsel to petition the Federal Communications Commission for the establishment of element type examinations for amateur license applicants, including code requirements for the Extra Class license, with applicants receiving credit for ele-

ments passed for any given class of amateur license over a period of time not to exceed ninety days. Moved, by Mr. Gmelin, to change the motion to change the credit term to one year; but, after discussion, with the consent of his second, Mr. Gmelin withdrew the motion. On further motion of Mr. Gmelin, after discussion, unanimously VOTED (Canadian Director Eaton abstaining) to amend the motion by striking the text and substituting therefor the following: that the Board instructs the General Counsel to continue his efforts toward the establishment of examination credits in amateur examinations. The question then being on the motion as amended, the same was unanimously ADOPTED (Canadian Director Eaton again abstaining).

71) On motion of Mr. Griggs, after discussion, unanimously VOTED that the Planning Committee be authorized by the Board of Directors to study ways and means of setting up a pilot program to provide VHF and UHF coverage of major metropolitan areas with services comparable to those given over W1AW, such as bulletins and code practice, with such stations to be located at high elevations and controlled from a remote point. First Vice President Groves occupied the Chair during a portion of the above discussion.

72) The Board was in recess for lunch from 12:45 p.m. to 1:15 p.m.

73) On motion of Mr. Griggs, unanimously VOTED to reimburse $100.78 additional costs of operation of the VHF Repeater Advisory Committee, and to allocate an additional sum of $200 for the remainder of this year.

74) On motion of Mr. Albright, VOTED, 9 votes in favor to 6 opposed, to take from the table his motion concerning funds for the production of a teen-age promotional book. Moved, by Mr. Gmelin, to call for the question, but, with the consent of his second, Mr. Gmelin withdrew the call. Moved, by Mr. Albright, to amend the motion to provide that the General Manager be authorized to expend up to $1,000 for preparation, printing and study of a small number of copies of a new ARRL promotional booklet for teen-agers scheduled for appearance later this year. After further discussion,

Max Arnold, W4WHN.

New "Veep" Charlie Compton, WØBUO (center); President Bob Denniston, WØDX; Secretary John Huntoon, W1LVQ, (right).

on motion of Mr. Clark, unanimously VOTED to amend the amendment to provide that the subject be referred to the Membership and Publications Committee. The question then being on the motion to amend, as amended, the same was unanimously ADOPTED. The question then being on the main motion as amended, the same was unanimously ADOPTED.

75) On motion of Mr. Albright, unanimously VOTED that the Board express its sincere thanks for the untiring work and devotion to the League and to amateur radio by the vice directors, assistant directors, SCMs, SECs, QSL Managers, and all members of the League. It is the sense of the Board that their contribution to amateur radio has done much to enhance amateur radio, particularly in the fields of technical development and public service.

76) On motion of Mr. Clark, unanimously VOTED that the Board of Directors of the American Radio Relay League express its most sincere appreciation to the Honorable Senator Barry M. Goldwater, K7UGA, Arthur Godfrey, K4LIB, and Bill Leonard, W2SKE, for their invaluable, expert and voluntary contribution to the preparation of the "Ham's Wide World." This documentary film, now being shown throughout the world, receives much of its thrust from the generous endorsement implicit in their participation.

77) Moved by Mr. Clark, that the Articles of Association and By-Laws be amended as necessary to enable holding two regularly-scheduled Board meetings per year (commencing in 1971) and that, insofar as possible, committee meetings be scheduled so as to coincide with these in order to conserve time and travel funds. After discussion, on a rollcall vote, the motion was rejected, 4 votes in favor to 9 opposed, with 3 abstentions. Those voting in favor were Messrs. Albright, Clark, Compton, and Dannals; those voting opposed were Messrs. Arnold, Chapman, Eaton, Foster, Gmelin,

Griggs, Haller, McConaghy and Strieter; Messrs. Michel, Smith and Thurston abstained.

78) On motion of Mr. Clark, after discussion, unanimously VOTED that an annual report be prepared by the Public Relations Consultant, to include his views and recommendations regarding public relations, membership relations, and other matters of management concern, based upon his assessment of events and developments during the preceding year.

79) At this point Mr. Clark presented reports from the Contest Advisory Committee, and from the Radio Amateur Satellite Corporation (AMSAT).

80) On motion of Mr. Clark, unanimously VOTED that funding not to exceed $200 per committee be authorized as administrative expenses for the Contest Advisory Committee and the DX Advisory Committee.

81) On motion of Mr. McConaghy, unanimously VOTED that the Board of Directors express its most sincere appreciation to A. Prose Walker, W4BW, for his contribution of "Mandatory considerations relative to expansion of American phone bands" dated April 27, 1970.

82) Moved by Mr. McConaghy, that the following correction be made to By-Law 12 in the Articles of Association and By-Laws, edition of January 1, 1970, page 5, 6th line, after the words "such members," to add the following statement: "He is authorized to appoint assistant directors as personal appointees, throughout his division. Those appointees assist the director by keeping him advised of conditions and requirements for their respective areas in respect to League requirements." But there was no second, so the motion was lost.

83) Moved by Mr. McConaghy, that the following correction should be made to Article 5 of the Articles of Association, edition of January 1, 1970, page 3, 7th line, after the word "director," to add the following statement: "The duties of the vice-director, in addition to that specified, will be to assist the director in the performance of his specified duties, when he so desires, and/or represent him when necessary as the situation or occasion warrants." But there was no second, so the motion was lost.

84) On motion of Mr. Haller, unanimously VOTED that the Board extends its appreciation to the Field Engineering Bureau and the Amateur and Citizens Radio Division of the Federal Communications Commission and to the Canadian Department of Communications for their continued assistance and cooperation in administering affairs of the amateur body during the past year.

85) On motion of Mr. Smith, the following resolution was unanimously ADOPTED:

WHEREAS, Miss Lillian Salter, W1ZJE, has served the American Radio Relay League faithfully and well as Communications Department Administrative Assistant for 40 years, and, WHEREAS, she has been throughout that time an example of utmost devotion to duty and thereby has contributed to the growth and stature of the League and Amateur Radio and, WHEREAS, she retires from the League's active staff on October 31, 1970,

NOW THEREFORE BE IT RESOLVED that the Board of Directors of the American Radio Relay League, in annual meeting assembled, do hereby express to Lillian M. Salter, W1ZJE, their deep appreciation for her long, diligent and faithful service to the League and amateur radio.

86) On motion of Mr. Gmelin, unanimously VOTED that the section of the Planning Committee report concerning election procedures is referred to the General Counsel for advice and further report to the Planning Committee.

87) On motion of Mr. Chapman, the following resolution was unanimously ADOPTED:

WHEREAS, George Grammer, W1DF, has served the American Radio Relay League for more than 40 years with outstanding skill and devotion, for most of the time as Technical Editor of our journal *QST* as well as Technical Director of the League, during which time he has made outstanding contributions to the growth and stature of the League, and WHEREAS, he retired from the Headquarters active staff on January 31, 1970,

NOW THEREFORE BE IT RESOLVED that we, the Board of Directors of the American Radio Relay League, in annual meeting assembled, do hereby express to George Grammer, W1DF, our deep appreciation for his long and diligent service to the League and amateur radio, and our best wishes for many happy years in a well-deserved retirement.

88) Moved, by Mr. Chapman, that this Board hold a special meeting on November 7, 1970 to act upon the holding of bi-annual meetings and to conduct any other legal business. After discussion, the motion was REJECTED, 5 votes in favor to 10 opposed. Mr. Griggs requested to be recorded as voting in favor.

89) At this point, the President announced the following committee appointments:

Finance Committee	Mr. Eaton, Chmn Mr. Compton Mr. Chapman
Planning Committee	Mr. Gmelin, Chmn Mr. Michel Mr. Foster
Membership and Publications Committee	Mr. Albright, Chmn Mr. Clark Mr. Arnold
Public Relations Committee	Mr. Haller, Chmn Mr. Griggs Mr. Strieter
Merit & Awards Committee	Mr. Groves, Chmn Mr. McConaghy Mr. Dannals (Mr. Thurston, alt.)

Don Waters; Phil Haller, W9HPG.

90) On motion of Mr. Compton, after discussion, unanimously VOTED that the comments to be submitted in Docket 18803 deal with the proposed Section 97.87 (f) on identification of stations and specifically recommend that the interpretation of rules governing which call to sign effective almost since the beginning of amateur radio be reinstated; that Section 97.67, concerning the power limit, be clarified; and that Section 97.89 be altered as necessary to insure continuance of amateur privileges of experimental one-way transmissions.

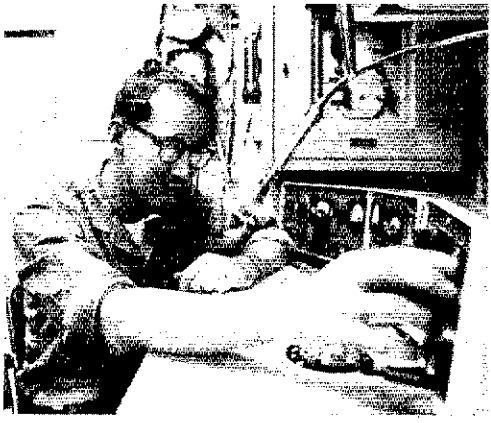
91) On motion of Mr. Foster, unanimously VOTED that the General Manager is hereby authorized to pay expenses for the operation of ARRL committees during the year 1970, but not to exceed amounts as follows:

Finance Committee	$ 2000
Planning Committee	1500
Membership & Publications Committee	900
Public Relations Committee	1500
Merit & Awards Committee	600

92) Whereupon, on motion of Mr. Groves, the Board adjourned, *sine die*, at 2:55 p.m.

93) (Time in session as a Board 14 hours, 50 minutes; total direct authorizations, $77,706.76)

John Huntoon
Secretary



The other end of many, many phone patches — Thomas M. Stock, K2GQJ maritime mobile Region 3, aboard the hospital ship USS Sanctuary (AH-17). The crew says "Thanks" to these ops: K6CM, W6AOR, W7BA, W7KWQ, W6KVH, W6ERC, KH6AX, WB6GJJ, W2AFQ, WB6DIU, W6VHR, WØFEE, W6BIG, K6FR, WA7CYF, W7GGK, W6FDG, WA6ESQ, W9YXB, W8CUT, W2PCG, W6BJ, W6MBD.

EXECUTIVE COMMITTEE MINUTES

MINUTES OF

EXECUTIVE COMMITTEE MEETING

No. 330 *April 30, 1970*

Pursuant to due notice, the Executive Committee of The American Radio Relay League, Inc., met at the Shoreham Motor Hotel, Hartford, Conn., at 2:10 p.m. April 30, 1970. Present: President Robert W. Denniston, WØDX, in the Chair; First Vice President Wayland M. Groves, W5NW; Directors Victor C. Clark, W4KFC, Charles G. Compton, WØBUO, Harry J. Dannals, W2TUK, and Noel B. Eaton, VE3CJ; and General Manager John Huntoon, W1LVQ. Also present were General Counsel Robert M. Booth, Jr., W3PS, and several directors preliminary to attendance at the annual meeting of the Board of Directors.

Observing — Midwest vice R. V. Anderson, KØNL, (left) and Larry Shima, WØPAN, now director from Dakota.

On motion of Mr. Dannals, affiliation was unanimously GRANTED to the following societies: Aberdeen Amateur Radio Club, Aberdeen, Miss.; Amateur Radio Club of Fridley Sr. High, Fridley, Minn.; Anaheim High School Electronics Club, Anaheim, Calif.; ARE-CO Radio Club, Youngstown, Ohio; Austin Area Amateur Radio Club, Austin, Minn.; Battelle-Columbus Radio Club, Columbus, Ohio; Camelback High School Electronics Club, Phoenix, Ariz.; Cherry Hill High School West Amateur Radio Club, Cherry Hill, N.J.; Clinton County Amateur Radio Association, Wilmington, Ohio; Colorado DX Association, Denver, Colo.; Euclid High School Radio Club, Euclid, Ohio; Farragut High Amateur Radio Club, Concord, Tenn.; Henry County Amateur Radio Club, Napoleon, Ohio; Hollywood Amateur Radio Club, Hollywood, Fla.; Honolulu DX Club, Aiea, Hawaii; Horace Mann School Radio Club, Bronx, N.Y.; Jamesville-DeWitt High School Amateur Radio Club, DeWitt, N.Y.; K-W Society, Brook Park, Ohio; Middlesex Amateur Radio Society, Cromwell, Conn.; Monticello High School Ham Radio Club, Monticello, N.Y.; Mount Baker Amateur Radio Club, Inc., Bellingham, Wash.; New Carrollton Amateur Radio Association, Lanham, Md.; Nightly Absurdities for the Sleepy Amateur Net Association, Morton Grove, Ill.; Northwest Arkansas Amateur Radio Club, Springdale, Ark.; Robert E. Lee High School Amateur Radio Club, Montgomery, Ala.; St. John's University Amateur Radio Club, Collegeville, Minn.; San Antonio Repeater Organization, San Antonio, Texas.; San Carlos Civil Defense Amateur Radio Club, San Carlos, Calif.; Shamrock High Amateur Radio Club, Decatur, Ga.; Sharon Amateur Radio Association, Sharon, Mass.; Smoky Mountain Amateur Radio Transmitting Society, Kingsport, Tenn.; Southern Peninsula Amateur Radio Klub, Hampton, Va.; 3 M Amateur

Behind the Diamond

Number 25 in a Series

At the U.S. Navy's submarine base in Groton, Conn., there's an Acoustical Research and Development Division whose job it is to "keep the Silent Service silent." And at the head of that division is an articulate amateur, Robert York Chapman, W1QV, who since January 1, 1965 has been director from the New England Division of ARRL.

Bob first joined the League in 1923 and the next year acquired the call 1QV which he has held ever since. He's trustee, life member, past president and past activities manager of the Tri-City Radio Club, Inc., of New London, Connecticut, and served as chairman for 21 consecutive hamfests held by the club. He's also a past civil defense director for the town of Groton. Bob is a Charter Life Member of the League, member of QCWA, OOTC, IEEE and the A-1 Operator Club and holds appointment as an official phone station, official bulletin station and official observer. He's been on the League's Finance Committee since his first Board meeting, and currently heads a special committee to draft a charter for an ARRL Foundation.

Bob and his wife Marge live in Groton, Connecticut, and have three sons, a daughter and 13 grandchildren. Bob is an active member of the Poquonnock Bridge Baptist Church and of the Order of Nobles of the Mystic Shrine.

Radio Club, Maplewood, Minn.; Three Rivers Radio Club, Breckenridge, Minn.; Westinghouse Amateur Radio Club, Mountain View, Calif.; Yellow Thunder Amateur Radio Club, Inc., Baraboo, Wisc.

On motion of Mr. Groves, Life Membership was unanimously GRANTED to the following applicants:

Peter G. Adely, Sr., K2MHP/WB2AFT; Robert P. Arnold, WA7EEB; Bruce N. Becker, W3ATW; Francis S. Brien, VE3GMD; Sam P. Carroll, W7JLF; F. E. Coates, K4RQE/6; Lee William Cook, WA8WNK; N. H. Davidson, K5JVF; Ray Day, WA4LFP; Elias Etheridge, Jr., K4IX; J. Bradley Flippin, K6HPR; Mathew G. Gibbons, K6PV; Bruce F. Hagemeister, WØMGV; Francis S. Harris, W1FZJ; Everett M. Hawley, Jr., K8JTT; Harry D. Helfrich, W3ZM; Waldemar Horizny, W2KVL; Lee D. Hovey, KØFKX; Erling R. Jacobsen, W9KBE/K4OJY; Victor B. Johnson, Jr., K4GXV; William D. Koch, WA5LBQ/WB2DWS; Thomas M. Kulas, WAØIAW; Donald L. Liste, K6IPV; Gloria H. McDaniel, W9GHO; Leo A. Miller, WB4FUO; David H. Morgan, WB4BPA/WB4JIN; Donald J. Myslewski, K3CHD; Stirling M. Olberg, W1SNN; Peter Radding, W2DIQ; Clayton N. Schlenker, W4AZU; Dwight W. Smith, KØCER; David W. Stamps, W8CWF; E. Stanley Stoops, Jr., K7ZJS; Charles S. Weller, Sr., K4MRZ; Ernest L. White, Jr., K4AAB; Lee Wical, KH6BZF; George F. Young, W5KQD.

On motion of Mr. Clark, the Committee confirmed earlier approval of a Georgia State Convention in Augusta on September 19-20, 1970, and a Roanoke Division Convention in Raleigh, North Carolina, on October 31-November 1, 1970; and newly granted approval for the holding of a Southeastern Division Convention in Miami, Florida, on January 23-24, 1971, a Great Lakes Division Convention in Grand Rapids, Michigan, April 16-17, 1971, and a Southwestern Division Convention in Anaheim, California, on September 4-6, 1971.

New England Division Director Robert York Chapman, W1QV, reported to the Committee on plans and progress of the 1970 National Convention in Boston.

On motion of Mr. Clark, unanimously VOTED that the sum of $1500 is made available to the Radio Amateur Satellite Corporation (AMSAT) to help underwrite administrative expenses.

There being no further business, the Committee adjourned, at 2:35 p.m.

JOHN HUNTOON
W1LVQ — Secretary

OFFICERS' REPORTS AVAILABLE TO MEMBERS

Each year the offices of the League make comprehensive written reports to the directors. The Board has made these reports available to interested members, in a volume which also includes reports of the directors. The cost price is $1.00 per copy, postpaid. A copy of the financial statement only is available without charge. Address the General Manager, ARRL, Newington, Conn. 06111.

Strays

KJ6CF and KJ6BZ on Johnston Island jointly announced the 24 hour "Marathon" QSO party primary for U.S. operators on ssb only. Take this opportunity to add new country to your DXCC credit. 0001Z to 2359Z July 4th 1970. Suggested freq. 28.6, 21.4, 14.3, 7.18 MHz. For this event only send QSL with s.a.s.e. to WA6ENF for prompt confirmation.

How's DX?

CONDUCTED BY ROD NEWKIRK,* W9BRD

How:

Apple polishing in reverse, as we insisted last month, really does nothin' for nobody nohow. It's more subjective than objective, more emotional than promotional, more destructive than constructive. Pshaw, anyone can throw a weepy tantrum over something they don't dig. We're born with that talent; fortunately most of us outgrow it.

The ancient phooey-with-phone and nuts-to-cw polarization that lay dormant during ham radio's recent carefree and careless years has crept out of the woodwork again. No ham likes being shoved around in his favorite bands. If his habits are hardened the pushing is all the more irksome. Now, after years of contented oblivion to each other, voice and code specialists are urged by FCC to sample each other's bag or lose a few select kHz. Tain't generally a joyous prospect for either.

Well, maybe it's time more of us played the game, DX and otherwise, with broader perspective. Any phone hater who thinks all mikes belong on 11 meters evidently doesn't grab the masterful job done by sideband DX and traffic nets day in and day out on hf bands. He who hollers, "Aw, *anyone* can yak-yak" has never sweated as NCS for a fast-moving umpty-station phone group. In such activity properly VOXed ssb now provides remarkably effective voice flexibility. *This* apple polishes easily.

As for anticode characters noisily waiting for cw to go away, the laws of physics are stacked heavily against 'em. Any given number of watts precisely piled on a single frequency, like sirens on emergency vehicles, have an awful lot going for them, including possible fantastic selectivity at the receiving end. The value to amateur radio of its cw tool obviously will increase directly as band occupancy, rf noise pollution and other propagation adversities. Not hard to polish *that* apple.

Then we have our various vhf, RTTY, fm, etc., apples to shine. Too big a job for this little corner, so you're exhorted to help. No need to smudge another's pet winesap, OM; just pretty up your own. The sport will be the brighter all around.

* * *

What:

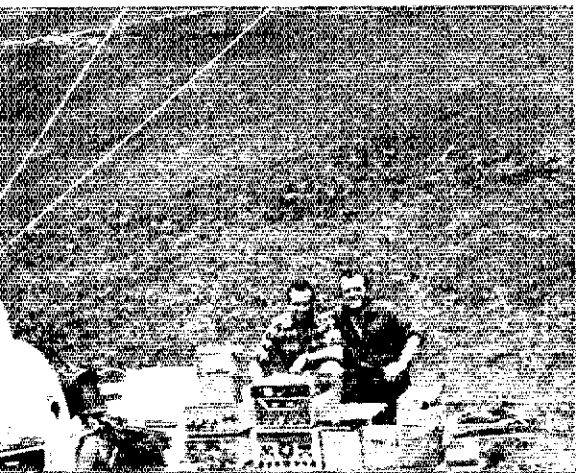
Many of the gang will be down at the beach or deep in the woods these warm lazy days. Others prefer vacationing at home on the ham bands. Not a bad idea, that. Just haul your station into the back yard and soak up some sun while you pick off a few new ones, OM. Overcast and rainy? Just plug in a shack sun lamp, peel down, lean back and twirl your beam. If it's a 20-meter design you'll be hobnobbin' with some of the guys and gals listed in the 14-MHz voice DX catalog to follow. Frequencies, in kHz above the 14,000-kHz band edge, appear parenthesized; digits outside parens go for Greenwich Mean Time whole hours. By continent, then, . . .

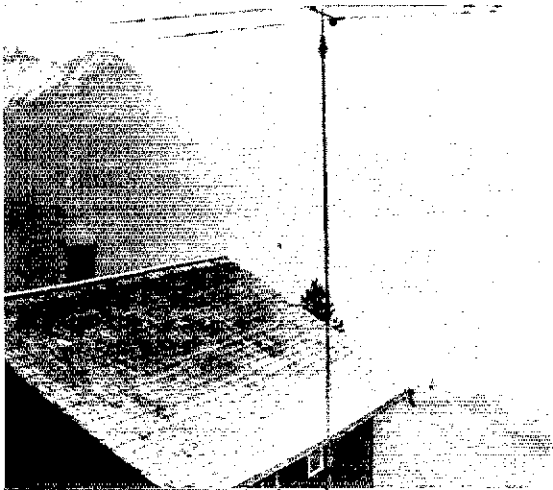
20 **phone,** according to word from the clubs hereafter mentioned. **Ws** 2KXK 3HNK 4YOK 6YRA 8YGR 9LNQ. **Ks** 4TWJ 6RF 8PYD. **WAs** 1FHU 1HAA 1JMR 2BCT 2BHJ 2BPL 2HDZ 3GVP 3JHB 4ZZU 6FQW. **WB4s** JYR and KZG, abounds with interesting and varied accents from

A **SIA AC3**PT (200) 18, **AP2s** AD (340) 3, KS (187) 18, MR 12, **FP2s** BI BQ DA (223) 15, DX (223) 15, SW TW (185) 4. **HL9s** DU (175) 12, VV (216) 12. WI WW (250) 11. **HM1**BB (195) 14, **HS**s 1ABO (240) 16, 1ABS 17, 1ABU 14, 1ACH (240) 11, 1CB 13, 2JR 2PD 3ACY (210) 9, 4ACE (218) 15, 4ADB (242), 5ABD (211) 14, **HZ1**AB (245) 13, **JAs** 1AF 1FNA 1GMZ 1WVK 1NMM 3CZY 3IG 3XPO (204) 13, 4FM 5BXK 6AE 6FX 6HRN 6IFX 8AA 8RMK 8CAU 9BF 9BS, **JD1**YAA, **JH1s** FLR HKQ, **JR1**FGW (197) 17, **JT1**AG (202) 16, **JY**1 (240) 17, **JY1**APG (202) 14, **KAs** 2KE 2QW 9AG (230) 16, 9MF (270) 12-13, **KR6s** DA JV KG (160) 18, MY (210) 14, NH NR RH 13, ZB, **MP4s** BBA (125) 18, BBW (209) 21, BBY (235) 3, BGY BHH (331) 2, MBG TDA, **OD5s** AD (205) 22, AU BZ (209) 3-4, CL FB (220) 14-15, **TAs** (and TCs) IKC (229) 1, INC

* 7862-B West Lawrence Ave., Chicago, Ill. 60656.

HBØs AFM and GJ, left and right, join this year's DX-peditionary parade through ruggedly beautiful Liechtenstein. Such vantages overlooking the Rhein are perennial candidates of "How's" QTH of the Month photography. Oscar and Fritz are HB9s AFM and GJ back home in Zurich. (Photos via W1CW)





(233) 20, INF (155) 6, 2E (202) 2, 2EA 2IC 2SC (217), 3HD (203) 6, ØDDT 2, **UAs** 9AB 3, 9DN 5, 9KAX (230) 13-11, 9KOG 9RB 9VH/**JT1** (221) 22, 9VX (220) 3, ØAL ØDG (120) 13, ØIW ØLU ØYE (250) 12, **UD6s** DR (160) 4, HB (160) 21, **UF6s** AG (233) 14-15, CA (190) 20, CR (204) 3, HE (259) 17, KPE, **UG6s** AU SG, **UI8s** CD (190) 12, MF (230) 3, **UJ8AC** (233) 14, **UKs** 6GAA (210) 15, 9AAH 0, 9AAN (188) 4, 9ABA (193) 16, 9HAD, **UL7SG** (175) 4, **UM8s** FM FV FZ (206) 4, **UV9s** OP (260) 13-14, OR (205) 3, UT, **UWs** 9AE 9AF 13, 9EA 9OU (210) 3, 9WA 4, ØAA ØAZ ØIE (150) 14, **VSs** 6AA (243) 15, 6AL (210), 6DA (180) 13, 6DR (230) 12, 9MB (210) 21, **VU2s** BA BEO (182) 19, BX (218) 13, CK DK (140) 6, GE (205) 16, KV 18-19, NEW OLK (140) 22, TG (220) 6-7, VAE (120) 16, **XW8s** BP (297) 17, CK (242) 18, CS (240) 15, CT CY (250) 15, DK (120) 20, DO (281) 14, **YAs** 1DLC (207) 2-3, 1EXZ (240) 17, 1HD 1RG 2DD 5RG/1 ØCDRC (204) 18-19, **YK1s** AA AM (247) 21, **ZC4s** CB 6, MT (230) 5, RS 14-15, **4LØCR**, **4S7s** BR (230) 13, PB (257) 16-17, **4X4s** BU 4, DK 13-14, IF 15, VG (204) 14, **4Z4HF** (240) 19, **7Z3AB** (203) 20, **8QAYL** (266) 18, **9K2s** AM (258) 18-19, BF CF (305) 17, **9M2s** AA (210) 13-14, CP CR DW DX (218) 0, GV (236) 14, KR LN (173) 12, RH RI (203) 16, VI, **9N1MM** (215) 1-2, **9V1s** CN NR OE OI PA (155) 19, PC PI and PM (237) 16.

AFRICA—A2s CAF CAH (200) 14, CAQ (190) 13, CAZ 0, **CN8s** DI (196) 0, HL (222) 23, MJ (132) 9, **CRs** 3KD (300) 22, 4BB (150) 10, 4BC (332) 21, 4BK 2, 6AK 6FR (189) 20, 6GA 6, 6GO 2, 6IK (230) 2, 6IV (132) 20, 6JT 6JS (300) 20, 6MK (172) 19, 6MX (121) 21, 7BC 1, 7CH (222) 13, 7CI 5, 7DB 7LE (205) 15, 8AG (162) 12, 8AJ 12, **CT3AW** (210) 6, **EAs** 8BB 4, 8EN 1, 8FB (260) 8, 8FS (258), 8HZ (247) 17, 9AA 9AQ, **EL2s** AT (332) 19, AW BA BU (215) 1, BZ 2, **ET3s** DS (185) 20, USA (132) 20, XL ZU 17, **FB8s** WW (120) 17-18, XX (257) 15, YY (275) 12, ZZ (130) 17, **FL8s** DG (215) 16, MB (246) 14, 8R, **FR7s** ZD (202) 4, ZG (210) 3, ZJ 17, ZP ZW (247) 14, **SU1**MA (295) 17, **TJ1s** AU AW (205) 22, **TN8**BK, **TR8**MC (117) 21, **TT8AF** (290) 8, **TU2s** AW O, BB (207) 22, BX CS 17, **VQs** 8AH 8CI 20, 8CR (212) 14, 8CS 16, 9CD (248) 16, **XT2**AA 21 **ZDs** 3K (246) 22, 5S 5R 4, 5X (203) 14, 7SD (235) 21, 8BB 17, 8CS (255) 22, 8DB (262) 22, 8H 2, 8OE 9BN, (246) 18-19, **ZEs** ICQ ICY IJE 2JE 3JC 3JL (233) 15, 4JG 0, 5JU **ZSs** 2MI (255) 5-6 of Marion isle, 3HT 3LU 20, 3S (258) 4-5 and two dozen others, **3V8AL** (132) 20, **5A1**TL, **5H3s** JL LV, **5N2s** AAE AAF (250) 21, ABG (252) 8, **5R8s** AP 4, AH (215) 15, AR AS AU 16, AX BC (300) 16, RL, **5T5s** AD (253) 0, BG (176) 7, **5VZDB** (290) 5-7, **5X5FS**, **5Z4s** KC (268) 13, KL (200) 21, KM LY, **6W8s** BD DY (130) 22, **7Q7s** BC (216) 18, GB 15, JG (182) 18, JO 15, **7Xs** AL (287) 21, 2MD ØLOU (139) 10, **9E3**USA (202) 14, **9G1s** GD (152) 20, GT 7, **9J2s** OZ PV 15, **9L1**RP (223) 23, **9Q5s** CO (258) 22, DG 21, EB LF LO O, RD RH, **9U5s** BB (210) 7, CR, **9X5s** AA (168) 12-15, SP VI and WJ 15.

OCEANIA—C21JW (245) 9, **DUs** 1 BEN 1BSP 1DBT (104) 15, IFB (226) 15, 1FH (201) 15, IZAF 7ER (216) 16, 9FB (207) 15, 9VVL (205) 14, **DX1**HMI, **FK8s** AC (332) 4, AH 8, BH BO (260) 11, **FO8s** AA AB AH 17, BH (251) 16, BK (150) 6, BO (105) 8, BQ BU (178) 3, BV (332) 4, BX (246) 9, BY 4, CN 17, CS (250) 8, **KC6s** AQ BY (230) 14-15, CT 13, EJ (210) 7, ES (210) 16, JC (259) 12, RS (205) 12, WS (240) 15, **KG6s** AAY AED 1, AKR AQV 14, NAC SM (265) 15, **KH6s** EDR GDR 6, IJ NR, **KJ6s** BZ (295) 11, CD CF (265) 8-9, **KM6s** BI CE (248) 2, DQ, **KS6s** BX BY (332) 8, CY (261) 5, DH (245) 12-14, DJ, **KX6s** BC BQ (232) 12, DC DR FJ GX, **VKs** (and AXs) galore including 1BC 1CR 7AZ 7CL 7GC 7IL 7KJ 7KW 7RM 8KK 8NE (299) 10, 9BM (240) 12, 9BN (250) 12, 9EP (320) 12, 9GA (251) 10, 9GN (240) 6-7, 9KA (213) 12, 9KJ 9KS 9KY 9LB 9MM (250) 12, 9NI 9NS (219) 12, 9RA 9WD (230) 13, 9XI (220) 9, ØKW (249) 15, ØLD (248) 6-7, **VRs** IL (263) 12, IO 2CC (134) 6, 2DI (215) 13, 2EK 2EQ 2FT (265) 8-10, 4BC (237) 7, 4CD (234) 11-12, 4CG (230) 12, 4EZ (262) 9-10, 5LT (204) 5, 6TC (220) 6-7, **VS5**PH (250) 14-15, **VBs** 1AAK (310) 13, 6AAH 16, 6IA 6IAH (237) 18, 7AAH 9AAJ (300) 12, ØAAB 13, ØAAC ØAAE ØAAL (212) 14, ØBD ØBS (236) 14, **ZK1s** AJ (268) 9, HA 5, two dozen **ZLs** (and ZMs) including 1AAT/k 13, 3PO/c (135) 6, **9Ms** 6HM (204) 14 and 8FMF (175) 13.

EUROPE—CTs 1AU 1BF 7, 1EL 20, 1OF 21, 1UD 10, 2AK 7, 2AP (200) 16-17, 2AT (298) 9, **DMs** 2CDL (135) 4, 3RML, **EAs** IFI) IIY 3SA 4CX 4LH 6BC 23, 6BN 0, 7KC 7KE, **EIs**s AI (247) 21, BX BY 8, H, Fs 2CD/**FC** 6AJR/**FC** (180) 18, 9UC/**FC**, **GB2**DX, **GC3**DVC, **GDs** 3FWN (256) 7, 3GMH 9, 3TXF 7, 5APJ (230) 0, **GI3**RNY (160) 1, **GM8**NW (170) 23, **GWs** 3BOC 3XRZ 4NZ, **HAs** 5AM 5ML 7LF (185) 4, **HB9**LL, **HV3**SJ (158) 16-19, ten IIs, **IS1**LIO 19-23, ITIs AF FIB 6, JT TTH (235) 6, **JWs** CI (195) 0, 3XK 22, 3MN 7UH (180) 20, 8MI, **JXs** 3MN 4GN (332) 22, 8IL 1, **LAIs** H UH 22, **LF4**G (185) 17, **LG5**LG 18, **LXs** IYL 8, 2CQ 1, **LZ1s** KRD KSZ (216) 15, **M1s** B (343) 4, 1 (202) 0, plenty of **OHs** (OGs and OIs) with **ØRJ** (150) 7-8, **OEs** 1SN 2EGL 20, 6TT 18, **OKs** 1APB 2BGT 22, 2RZ 6, **ON5**RW, **OYs** IR 1X 2R 8, 5N8 0-1, 9LV (290) 18, **OZ8s** KW SS (215) 22, **SK7**BK, **SMs** 2BJQ 2ZI 5AZH 5CUW 5CZY 6AFR 6CFX, **SPs** 3CKM (163) 7, 8AJK 9VU, **SVs** 1BV 23, ØWB ØWI (348) 19, ØWDD 7, ØWP ØWU (232) 4, **TFs** 2WKP (196) 20, **2WLS** 3MA 17, **UAs** 1CK 6, 1KAE 12, 3YK 4IF, **UB5s** KAW 15, KKM 6, **UC2s** AC 16, BF (160) 21, **UKs** 1NAD 1ZAA 2BBB (173) 2, 2GAA (203) 4, 4CAA 4FAD (230) 2, 4HAW 5BBM 6LAZ (207) 3, **UO5s** BM (227) 6, BZ (214) 16, PK 6, WS, **UP2s** AY (174) 7, PA, **UQ2**KAA (130) 16-22, **UR2**LH (218) 7, **UT5s** AD KKM 5, KTH OF OZ, **UV3**ACF, **UWs** 3AO 21, 3HY (232) 3, 3WR 4IK, **UY5s** LK XS, **YOs** 2BB (210) 5, 2BN (210) 23, 7DD 7, 9VI (209) 5, **YUs** (and YTs) 1BCD 6, 2AOD 2GE 5, 2NFY 2RBO 19, 3UNO (270) 20, 3EJ 21, 3EM 7, 3FVP, **ZB2**BT 20, **3A2s** CL (220) 17, EE (150) 7, NX (258) 22, **4U1**ITU (258) 7-9, **9H1s** BE (232) 23, BG (241) 6, BX 1 and CD (252) 0-1.

SOUTH AMERICA—CEs (and XQs) 2AT 18, 3TR 3ZN (195) 22, 6GB 6CA (150) 22, 8AE **9AZ** ØAE (216) 5-6 **ØTS** (235) 5, **CPs** 1ER 1GT (130) 23, 1JD 5DX (183) 22, **CX1**CE, **FY7s** AA YI YM (188) 20, **HCs** 1BM 5, 1HE 1RF 1TH 5, 2FG 2GG/1 2HM (140) 6, 2SO 6AB (109) 7, 8GS (104) 8, **HKs** 3AK 3BED 3VA 4, 4CAV **ØBIS ØBKX** (225) 2-3, **KC4s** AAD (240) 5, AAF USB USD USG 3, USH 3, USN (324) 4, USQ 12-13, USV (290) 11, USY, **LUs** 1BS 2WAU 3DUX 3FA 3FAN 3KW 5AH 6RL 8CZ, **OAs** 3ZP 4LW (286) 1, 4UM 7, **PYs** (and variants) 1MBC 1NAX 2PE 4BR 6YA (225) 2, 7AWD/Ø (110) 20, 7TS 5, 8QQ, **PZ1s** AK 3, BU 23-0, BF 10, BW CI (181) 21, CZ (204) 22, DA (240) 23, DF, VPs 1RC (237) 3, 8FL 8HZ 8KD (128) 22, **YVs** 1PP 1UA (160) 0, 5CKR (274) 23, 6GG, **ZP5s** CE GS (230) 1, JN OJ (240) 6-7, **4Ms** 1A (225) 1, 7AV, 8RIU (180) 11, **9Y4s** AA BW (193) 7, LF PL 3, US (347) 3, VT (176) 23 and VV. Do South America's phones prefer 15 and 40?

HEADABOUTS—**CO2**FA (135) 1, **FG7s** TH (115) 21, XL (156) 23, XT (196) 6, XX (215) 11, **FM7**WW, **FP8s** AP (260) 12-19, **HH9**DL (235) 0, **HI8s** LA UD XBA XEW 0, **HPs** (and HOs) 1DF 1, 1JC 2AF 3, 2EF 2ER 6, **HRs** 1KAS (192) 22, 1RSP (332) 19, 2BS 2HHP 2JJC 22, 2PU 2WTA (195) 2, **KG4**AL (299) 23, **KL7s** AIZ BJV BZO DKH/**KJ6** (215) 12, DRZ ERK EEY FNH 3-4, FRU GAG, **KP4s** AST CQB 4, DFH 5, DIA 2, LC 7, **KV4s** AM 17, DC GK GP (332) 22-23, **KZ5s** DA (225) 1, DF EK 11 (260) 12, NS, **OXs** 3AA 3AB 21, 3BE 17, 3BL (210) 17, 5RC (200) 23, 5BG (210) 0, 5BL (190) 10, 5BN, **PJs** 2CA 2CC 2CW 2HR 2HT (146) 22-23, 3AS (180) 0, 3AV (200) 19-20, **TGs** 81A 9EP 20, 9F8 9GF (178) 22, 9OK 6, 9RV 9XX (281) 2, **TI2s** AD 6, BW (180) 23, CAP EGW FCD MV, **VPs** 2AA (195) 20, 2AASL 2AL 2AN (188) 6, 2AT 15, 2EQ 2EX (167) 8, 2GLE (275) 19, 2KC (240) 3, 2KM (220) 1, 2LX 2MI 23, 2MY 2SAB 12, 2VI (190) 0, 2VV 23, 2VY (201) 5, 5AA (198) 13, 5MB (215) 15, 5NB (135) 0, 5TH (130) 7, 7CG 4, 7DL 7FA (173) 7, 7FX 7NO 9BK (117) 23, 9FX 1, 9L, numerous **XEs** including 3AF (160) 0, 3EB 3LK, **YNs** (and HTs) ICI 1DW 1JW 1NT 1RDH 1SN 2DX 2JS 3KM 4JPR, **YSs** (and HUs) 1AG (167) 7, 1UN 1P 1MG (150) 8, 3FH, **ZF1**GC (215) 30, **6Y5s** AH 17, AK AN GA GB 8R UC, **8P6s** AE (283) 11-12, AZ BC (139) 10 and CC (170) 23.

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Twenty-cw developments get our attention next month thanks to **Ws** 1BV 1DAL 1FCC 2KXK 4CZM 4YOK 4ZYT 5BZK 5GB 5KKW 6BAY 7YTN 8KZO 8YGR 9DY 9LNQ, **Ks** 3CUI 4TWJ 5MHG/6 8PYD 8TRF 9GXV, **WAs** 1FHU 1JKZ 1JMR 2BHJ 2FOS 2HDZ 2KEA 2YWR 3GVP 3JHB 3KSQ 4CZM 5UAX 5YMW 8SQY, **WBs** 2DRS 4GAH 4JYR 4KZG 9AVY, **HER** and **VE7**BAF. Then we'll turn the "How's" Bandwagon over to (40 cw) **Ws** 1BMR 1BV 4YOK 5GB 5KKW 7YTN 8YGR 9EV, **K8**TRF, **WAs** 1FHU 1IRY 1JKZ 1JMR 2BCT 2FOS 2HDZ 2YWR 3GVP 4CZM 5UAX 9SQY, **WB4**GAH, **HER**, **VE3**GHO; (40 phone) **WA1s** FHU JKZ JMR; (80 cw) **Ws** 1SWX 8YGR 9EV, **WAs** 1FHU 1IRY 2YWR 4CZM; (75 phone) **Wls** BMR WQC, **WA1s** FHU JMR, **VE3**GHO; (10 cw) **Ws** 4YOK 8KZO 8YGR, **K5**MHG/6, **WAs** 1FHU 2HZR 2KEA 5YMW 8SQY, **HER**, **VE7**BAF; (10 phone) **Ws** 3HNK 4YOK 5GB 5KKW 8YGR 9LNQ, **WAs** 1FHU 2FOS 5YMW 8SQY; (15 cw) **Ws** 1BV 4ZYT 5BZK 8KZO 8YGR 9LNQ, **K5**MHG/6, **WAs** 1FHU 1IRY 1JKZ 1JMR 2BCT 2BHT 2BHJ 2DFD 2FOS 2HDZ 2KEA 2YWR 3GVP 3IGY 5UAX 5YMW 5ZEH 9SQY 0PXT, **WBs** 2DRS 4KZG 5YMW 9AVY 0CJ8, **WNs** 2JNA 2JQL 4OFO 9CDR, **HER**, **VEs** 3GHO 7BAF; (15 phone) **Ws** 3HNK 4YOK 5GB 5KKW 8YGR 9LNQ, **Ks** 4TWJ PYD, **WAs** 1FHU 1JKZ 3JHB, **WBs** 4KZG 9AVY and 8SQY. Climb aboard, OM!

Where:

AFRICA—Dahomey dilemma solved—there really were two TY6ATEs. No. 1, W4KIL, wasn't aware of No. 2's legitimacy until research by WA6AUD clarified things. W4KIL used the call from May, 1967, through May '69, and missionary Ted Schultz was authorized to sign it at Natitingou from November, 1968, into May of '69. If you're not in Fred's TY6ATE log try a note with QSL to Mr. Schultz at 605 Melba St., Hattiesburg, Miss., 39401 . . . . . Although he may already have one or more by the time this gets around, FL8HM seeks a Stateside QSL helper . . . . . CR6GO, who assists with CR7DB and TR8AG QSLing, wants his own cards via England's RSGB bureau. George stresses, however, that G2MI only relays his QSLs and holds no CR6GO logs. Same with CT3AS. Angolans, by the way, are reported using their XXØ prefix now and then . . . . . WA4WTG disclaims connection with CR4BC QSLing . . . . . "After a three-year lapse I'm once again QSL manager for EL2AT," affirms W4NJF, specifying the customary s.a.s.e. (self-addressed stamped envelopes) from W/K applicants, s.a.e. plus IRCs (International Reply Coupons) from others . . . . . 9X5RD's XYL tells W3TV that the OM has been off the air for years. Scratch another . . . . . Knock 9U5TD off W2GHK's DXpedition of the Month QSL managerial list, too.

ASIA—"I've taken on QSL chores for AP2KS as of March 27, 1970," announces K6TWT. "Khalid is a 14-MHz ssb buff who seems to be working the world with his homemade 60-watter," . . . . . "9K2AM QSLs 100 per cent," finds WA2BPL, chumming with Mohammad via 20 voice . . . . . West Coast *DX Bulletin* learns that 4S7PB now handles his own QSLing . . . . . ISWL's *Monitor* points out that W9VZP does not do QSL chores for the present HL9KH, currently the call of Osan A.R.C. Boles performed for a previous HL9KH circa 1962-'63 . . . . . W3HNK's tour as HM1EJ QSL rep commences with QSOs of this April. Joe's duties in EP2DX's behalf start with May contacts . . . . . "All QSLs will be answered after my return to the States," promises KR6JV who left Okie in late May.

EUROPE—G2MI informs us that the RSGB QSL Bureau will be closed from October 10 to November 6, 1970. No mailings timed to arrive between those dates, if you please, while Arthur takes the sun as G2MI/VP9 . . . . . UA3FF, not UA1FF, is assisted QSLwise by W3HNK . . . . . Everybody is afflicted by a QSL jinx or two (ours is ew HRs). After QSOs with 43 Italians WA1JKZ still yearns for his first II QSL. WA8SQY's hang-up is U.S.S.R. pasteboards, or rather the lack thereof. Both regions usually come through slowly but surely via the bureaus route, OMs.

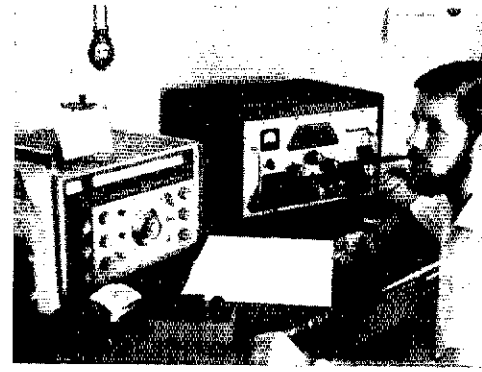
SOUTH AMERICA—"My QSL manager is W2CTN," affirms PZ1AV, "but those who wish to obtain QSLs direct may do so." . . . . . "No planes are expected to fly into McMurdo sound until October," Bill and Smitty of KC4USV tell WB4GAH. Which probably means that QSL agent K2BPP will have no logs to work with till then . . . . . WB9AVY is told by HC2JR that W/Ks may receive faster mail service by writing him *c/o* Department of State, Washington, D.C., 20521, although the *Callbook* QTH will do . . . . . Colombia's 5J prefix gets a contest workout on occasion as does Chile's XQ label . . . . . W2GHK & Co. hold the April 11th-12th logs of ZX2s PA and PE.

HEREABOUTS—"All QSLs received have been answered," states WA2GQT referring to springtime Antigua sport as WA2GQT/VP2 and VP2AAMW . . . . . "Had a great time in February as ZF1MF," recounts W8QQW, "working hundreds of stations without even trying. I had expected to receive a great many requests for QSLs as indicated by remarks on the air. Much to my surprise, by mid-April I had received only forty cards. All contacts were told to QSL to my W8QQW address. This was changed a few years back. Could the boys be using old *Callbooks*?" Or is ZF1-land all worked dry? Gene welcomes s.a.s.e. . . . . W8KZO observes, "Certain QSLs have been slow arriving but I'm appreciative of a very high percentage. Many DX stations and their managers surely must have a lot of patience to sit down and handle QSLs in the heavy quantity required." K9YRA, with fresh DXCC No. 10,446 on his wall, agrees and adds, "I couldn't have confirmed 108 countries out of 108 worked without the mint foreign postage facility of W2SAW. The art of QSLing is every bit as much fun as working 'em." . . . . . WA8SQY, frustrated recipient of misprinted QSLs for WA9s "SKY SYQ" etc., pleads for greater care and accuracy in QSOing and QSLing. Omission of signal reports, QSO modes and dates can turn a DX man's hair grey or greyer . . . . . W9IGW indicates that Surinam is rigging a system for assigning calls to visitors in the fashion of PJ-land. Wayne's PZ5WW label was the first "Z" issued down there . . . . . West Coast *DX Bulletin* has it that CO2FA's log shipments to XE1AE have petered out (try Box 6966, Havana), also that TI2J takes over TI2CMF's Cocos QSLing task . . . . . VP2MI tells LIDXA's *Bulletin* that all s.a.s.e. QSL requests have been cleared . . . . . W2GHK advises that WØVXO/KV4 logs for September 29 through October 29, 1968, are to hand, also that VP2AC is deleted from the DXo,M QSLing roster . . . . . "QSLers of the Month" cheered for DXceptionally fast card comebacks are EAs LID 3OH, FB8XX, FL8MB, GI03AIM, HB9AGH, KC6CT, TI2AP, WS2JRA, XE1DDM, YS1XEE, YV7AV, ZMs 1AAT/k ITB 3PO/c, 4S7DA, 9K2AM and 9Y4VV, plus QSLadies Ws IBPM 2CTN, Ks 4ZCP 9GZK, WB6KBK, VE3BYN and ZL2AFZ. Electors to this list are "How's" correspondents Ws 4DQ 8YGR, WA2s BPL GMD HJU, WBs 4GAH 9AVY 9CJs and VE7BAF. Any worthies out your way? . . . . . *Alp!* These italicized colleagues covet QTH clews regarding hot'ams mentioned: *W2KXK*, HBØXGR, TJ1AW; *WA2EOF*, KS4AZ, TG9FD, VP1FR, VS6AF; *WA8NJP*, XZ2DW; *WA9SQY*, CR8A1, GD3TXF, TF2WKF, TG9GF, TJ1AW; and *LU8HC*, OA4CY. Ideers? . . . . . WBs 2HEO and 9AVY, also K6TWT, offer QSL managerial services to DX ops in need . . . . . NCDXC's ARRL QSL Bureau sixland branch pushed 33,000 QSLs in March with only three (unfounded) complaints.

OCEANIA—VK9RM's logs often reach QSL tender K6TWT months after QSOs—patience, please. K6TWT, by the way, will accept foreign mint postage from non-W/K/VEs in lieu of IRCs. How come? Ken's XYL collects . . . . . VK6RU tells NCDXC that Australia's VK6 bureau averages 52,000 inbound QSLs annually . . . . . Now make way for individual postal specifications from this month's mailsack. Be mindful, however, that each recommendation is necessarily neither "official," complete nor accurate. . . .

A2CAZ (via K1JHX)
AP2KS (via K6TWT)
AX9DR (via W2GHK)
CR4BC (see text)
CR6GO (see text)
CR7DB (via G3RGO)
EA8HA (via DL1CF)
EL2AT (via W4NJF)
EP2DX (via W3HNK)
FØRT/FC (via W2CTN)
FØUG (to WA4WME)
FØVG/FC (to DK3PO)
FP9LK (via WB2WOU)
HC1RF (via WB2ADO)
HI7CAF (via HK3WO)
HM1EJ (via W3HNK)
HS1ABO (via K5QHS)
HS1ABU (via W5ZG)
HS1ACF (via WA4UOE)
HS1ACW (via WIHZ)
HS3ACP (via W9VNE)
HS3ACV (via W8BVJ)
HT4CI (to WB9RDV)
HT4IM (to W5QPX)
JW8MI (via LA8KO)
KC4USV (via K2BPP)
KH6HEC (via KH6BIJ)
PA9HOS (to W4HOS)
PJ8WW (to W9IGW)
PZ1AV (via W2CTN)
PZ5WW (to W9IGW)
PZ1AV (via W2CTN)
ST2SA (via WA5REU)
TI2AP (to WB8FUO)
TY6ATE (see text)
UA3FF (via W3HNK)
VP2AAMW (to WA2GQT)
VP2KN (via WB8AFP)
VS5PH (via DL3RK)
WF3IEC (via W3ZA)
XQ3ZN (to CE3ZN)
YB1AAK (via K9EYZ)
YBØAAL (to W6NW)
ZD9BO (via ZS2RM)
ZF1ME (via W8QQW)
ZS3CJ (via W3HNK)
3A2ARM (via 3A2CN)
3A2CL (via F9RM)
3X1SJ (via W4SPX)
5J3WO (to HK3WO)
7O7LZ (to G3LLZ)
9H1BL (via G3VPS)
9H1CB (via G3LQP)
9V1PA (via G3LQP)

AX9AC, P.O. Box 204, Port Moresby, P.T., Australia
FL8RR, R. Rambaud, SP 850 14 Trans., Fr. Somaliland
HO2EF, P.O. Box 470, Colon, R.P.
HT2DX, Box 75, Grenada, Nicaragua
IS1SBP, P.O. Box 25, Cagliari, Sardinia, Italy



PJ2PS is a DX regular from sunny Curacao on several bands. Paul recently qualified for ARRL's Worked All States certification. (Photo via W1YYM)

KC6CP, R. Boucher, Koror, Palaus, W. Carolines, 96940
KL7DTH/KG6, RCA Loran Comm. System, Box EH, Agana, Guam
KM6DQ/KH6, P. Kraus, Box 100, FPO, San Francisco, Calif., 96614
ex-KR6JV (to WB2INT)
KS6DJ, P.O. Box 283, Pago Pago, U.S. Samoa, 96920
TF2WKF, U.S. NavSta, FPO, New York, N.Y., 09571
TF2WKI, Box 21, US NavSta, FPO, New York, N.Y. 09571
TI2LIT, Box 10240, San Jose, C.R.
TT5JR, W. Meinecke, Post, Fianga, Tchad
VE8NWT, P.O. Box 1944, Yellowknife, N.W.T., Canada
VK9GN (via DL7FT or K7YDO)
VP2AN, P.O. Box 394, Antigua, W.I.
VP2MB, P.O. Box 16, Plymouth, Montserrat, W.I.
VR4BC, B. Chaterly, P.O. Box 9, Honiara, Solomons
VR4CD, P.O. Box 310, Honiara, Solomons
W9IGW/VP2G (to W9IGW)
WA2GQT/VP2 (to WA2GQT)
WA5TDW/VO2, J. Lawson, GBARC, c/o DOT, Goose Bay, Labrador, Canada
WB4CIQ/mm, R. Bernard, FPO, New York, N.Y., 09571
WS6DI, Box 788, Pago Pago, U.S. Samoa, 96920
XW8CS, R. Price, c/o U.S. Embassy, APO, San Francisco, Calif., 96352
ZD3K, P.O. Box 504, Bathurst, Gambia
ZX2s PA PE (via W2GHK)
3ZØL, Box 298, Warsaw 1, Poland (or via SP5PWK)
9Q5CO, P.O. Box 99, Isiro, R.C.

This month's QTH committee: **Ws** 1EFU 2KXK 2MLO 3HNK 4KIL 4YOK 5BZK 6GSV 8YGR 9DY 9LNQ, **WAs** 1JKZ 2GQT 2HIU 2HZR 9SQY, **WBs** 4GAH 9AVY 9CJS, Columbus Amateur Radio Association *CARAscope* (W8ZCQ), DARC's *DX-MB* (DL3RK), *DX News-Sheet* (G. Watts, 62 Bellmore rd., Norwich, Nor. 72 T, England), Far East Auxiliary Radio League (M) *News* (KA2LL), Florida DX Club *DX Report* (W4FRO), International Short Wave League *Monitor* (A. Miller, 62 Warward Ln., Selly Oak, Birmingham 29, England), Japan DX Radio Club *Bulletin* (JA3UI), Long Island *DX* Association *DX Bulletin* (W2GKZ), Newark News Radio Club *Bulletin* (J. Heien, 3822 Marshall ct., Bellwood, Ill., 60104), North Eastern DX Association *DX Bulletin* (K1MP), Northern California DX Club *DXer* (Box 608, Menlo Park, Calif., 94025), Southern California DX Club *Bulletin* (WA6GLD), UBA's *On the Air* (ONs 4AH 5VA), VERON's *DXpress* (PAØs FX LOU TO VDV WWP), Utah DX Association *Bulletin* (K7DEQ) and West Coast *DX Bulletin* (WA6AUD). Thanks!

Whence:

SOUTH AMERICA—RCV welcomes your indulgence in its annual Venezuelan Independence DX Contest on 3.5 through 28 MHz from 0000 GMT, July 4th, to 2400 the 5th, a voice-only proposition. Trade the customary RS001, RS002, etc., serials. Stations in our hemisphere may work any station outside their own countries at one point per contact (two points per Venezuelan QSO on 80, 20, 15 and 10 meters), this total to be multiplied by the number of band-countries worked (each Venezuela and U.S. call area goes as a country) for final multiband score. Single-op and single-band entries are accepted, all log summaries to be postmarked on or before this September 15th to Radio Club Venezolano, P.O. Box 2285, Caracas, for consideration of possible merit certifications . . . . . KIHFJ relays old-timer CX1FB's request for unwanted radio literature, a commodity always scarce in too much of the world . . . . . The West Coast *DX Bulletin* weighs YV0AI in at seven May kiloQSOs with nearly 100 countries from Aves isle . . . . . SCDXC's *Bulletin* learns that PZ1AH may try a DXpeditionary vacation in FY7-land next month or next. Andre especially enjoys 40- and 80-meter DXing with 160 watts and dipoles.

ASIA—The generation gap narrows in the orient. WIHZ's son WA1HCX fires up a KWM-2 as HS1ACW these days, and W4YOK hears that VU2NBN, offspring of VU2NEW, prepares a ew-styled DX layout in Delhi . . . . . XW8CS, according to W2MLO, shuts down for return to W3DBT. XW8AX is also closing but XW8BS may be back on in September after summer leave. Meanwhile a 4-element quad produces huge sigs from XW8DK . . . . . Ex-KR6JV should be signing WB2INT/4 from Ft. Bragg about now, 80 through 2 meters on voice and key. "I'll apply for an Okinawa DXCC but no WAS—never even *heard* Vermont." . . . . . VE3MR annually signs VE3MR/4X from Netanya and the DX QTH tends to spoil him. "In Israel my 60-foot tower is mounted on a 16-story building atop a 150-foot cliff just 25 yards from the sea," says Martin. "Perhaps next year I'll arrange to operate the ARRL DX Contest from that location." . . . . . "My past year as W3JZJ/5 was great—DXCC, WAC, WAS, etc.—and I want to thank all contacts for it." Ed now heads for military landwire duties in Vietnam and can be reached via Hq. JUSA-SAM, APO, San Francisco, Calif., 96307 . . . . . "AP2KS constructs his own sideband gear as an electronics student in Lahore," comments K6TWT. . . . . WA2PBL learns, "9K2AM, very active on 20 ssb, awaits a license for 9K2AM/YI work in August or September." . . . . . Far East Auxiliary Radio League officers are KA2s QW pres., SF v.p., UR secy., SK treas., EB gen. mgr., BD and UR QSL mgrs., WM awards mgr., ZO activities mgr., and LL *News* editor . . . . . WA3HUP and OM W3GE dropped in on King Hussein in May for JY1-type sideband sport . . . . . HS3ACP gives 5B-DXCC hustlers a break around 3505 and 7005 kHz near midnight GMT.

AFRICA—FL8HM expects to replace his venerable AR-88 with better receiving facilities shortly. Hassan writes, "My FL-501B runs about 75 watts cw on 14,026 or 14,060 kHz, sideband on 14,182 or 21,180. I've been staying on 20 meters because my receiver is almost QRT on other bands." . . . . . After a few years Statesde WB4JFQ resumes DXing in Monrovia as EL2AT. W4NJF notes that Paul runs Liberian Broadcasting Corporation's TV department . . . . . African oddments courtesy literature of aforementioned clubs and groups: 3X1SJ would be ON5SJ on Guinea assignment . . . 5T5AD should be back at his dials by now after French leave. . . . FH8 FR7 VQ8 VQ9 TZ AC3 and AC5 are only a few of W4BPD's targets on his current DXpeditionary swing. Dig Gus's cw near the low band edges, his ssb around 3795, 7065, 14,105, 21,245 and 28,495 kHz. . . . ZS6BT tries to oblige Five-Band DXCC artists on low cw edges of 10 through 80 meters when requested. . . . There's a growing group of African delicacies frequenting 14,290 kHz around 0430-0600 GMT on Saturdays. . . . ZS1ANT hopes to join a Bouvet isle weather team before year's end. . . . VQ8CV lost some skyhooks in an Easter blow. . . . FP8CV may move to the Comoros come '71. . . . Somalia's silence is said to be shattered by 6O2PF around 28,620 kHz.

OCEANIA—"Anyone who wants to work the Carolines, Guam, Saipan, etc., will find KG6SV and friends in the Micronesia Net, 14,330 kHz at 0800-0900 GMT on week ends, Tuesdays and Thursdays," tips K6SE . . . . . W4NJF says YJ8BW's inactivity is broken by rare cw appearances . . . . . K6TWT welcomed VK9BM back to 20 after generator troubles. Ft. Ben shows around 1200 GMT when New Guinea bush hospital duties permit . . . . . W8KZO alerted ZM1AAT/k to Apollo 13's imminent splashdown near the Kermadecs. "Roy said the spot was only 70 miles distant. He saw Apollo 13 for ten seconds, glowing and fragmenting." . . . . . By late April W8YGR had collected eighty AXs toward WIA's Captain Cook certification. W8KZO says it's no cinch to find fifty ZMs for the NZART version . . . . . W9CVQ and ZL1AH, who scored the first U.S.-New Zealand 160-meter QSO back in '51, got together at Tauranga in May . . . . . Pacificisms via the clubs press: YB1AAK expects to keep his linear and beam audible from Bogor for a year or two. John works with Java's agricultural program. . . . VK2ABL now signs AX2ABL/8 in Darwin and reports lightning a vicious threat to N.T. radio installations with the scorching heat a close second. . . . VK6RU has logged more than 65,000 QSOs since 1945. Attending a recent NCDXC meeting, Jim painted Willis island activity prospects dark indeed. . . . Pacific DX Net offers plenty of juicies in expanded Tuesday and Friday 14,265-kHz sessions at 0300-1000 GMT, and a Saturday 14,295-kHz meeting, same times. The lads move up to 21,370 kHz on Sundays, 0500-0700 GMT.

EUROPE YO3RF of Roumania's RARF invites your pleasure in this year's YO DX Contest, voice and code on 80 through 10 meters, from 1800 GMT, August 1st, to 2400 the 2nd. Non-YOs will transmit the usual RST001, RST002, etc., serials (no "T" on phone, natch), receiving from Roumanian stations the same plus two-letter county designators (forty of them possible). For final score multiply completed contacts by 2, then by the number of YO band-counties accumulated. Log entries to qualify for possible certificate awards must be postmarked on or before September 1st to Roumanian Amateur Radio Federation, P.O. Box 1395, Bucharest 5. Include full station and contest details plus a signed statement that necessary rules and regulations were duly observed, and indicate single- or multioperator, single- or multiband category . . . . . F9RM says 3A2CL anxiously seeks Yank ssb frequencies for Wyoming at 0400-0600 GMT each week end . . . . . K1OTA hopes to use his TR3-RV3 outfit in Monaco and Andorra late this month, then in LX 9H1 and 3V8 environments come August . . . . . 11AFF, combining results of several 1969

(Continued on page 138)

YL news and views

CONDUCTED BY LOUISE RAMSEY MOREAU,* WB6BBO

1970 YL — OM Results

FOR THE twenty years February and March have been the months when the masks come off and YL and OM pair off in this annual contest where there is no anonymity of the call to conceal identity as the YLs hunt OMs, and vice versa, in the YL-OM contest, with the coveted Gold Cup prize, and the "fringe benefits" of adding contacts for the many certificates available, as the incentive.

Audrey Beyer, K5PFF, YLRL Vice president, and the contest chairman has announced the following winners. In YL Phone, first place went to KP4CL; K7LPZ/VE7; and WA3HUP, was third. In OM Phone, K5MDX took top honors; with W9LNQ, and WA1CJR in second and third place. The YL cw, K7LPZ, first place; WA3HUP, second, and AX3KS third. OM cw, W9LNQ, first, W5WZQ, second, and K2EIU/6 in third place.

YL News and Views congratulates the winners of this year's contest. The 1971 dates have been set for February 27-28, 1971, Phone, and March 13-14, 1971 for the cw portion.

Soapbox

The girls just didn't have their beams this way I worked as many as I could in the amount of time available — EL2BZ. . .Tnx for sponsoring the contest it is appreciated here — W2RUK. . .Why this mania for QSL to confirm reception? R used to be good enough, and it's shorter. What are we supposed to send when we ask for a QSL card? — G3IDG. . .Some of the gals are sure speed merchants. Vy fb too — W6BIL. . .Where were all those W6 gals? As usual fine operating — W9LNQ. . .At the same time Vermont QSO party. Very bad condx, and European YLs scarce IT1AGA. . .Activity seemed good except for W5,6,7, where were the western YLs? — K5MDX. . .Sure enjoyed the contest, thanks for having it — W3IRY. . .Had antenna trouble, but the highlight was hearing Jinny, 9N1RA calling CQ OM. To work DX over the long path with 100 watts you have to be first in line — K4RSM. . .One of my favorite activities in amateur radio, thanks for the fun — W2AAU. . .I didn't intend to go in the contest but can never resist this one — VE3BBO.

*YL Editor, *QST*. Please send all news notes to WB6BBO's home address: 1036 East Boston St., Altadena, Calif. 91001.

The Winners

YL Phone

KP4CL	88,308
K7LPZ/VE7	78,234
WA3HUP	44,833

OM Phone

K5MDX	5,562.50*
W9LNQ	2,993*
WA1CJR	2,897.50*

YL Cw

KK7LPZ/VE7	28,188
WA3HUP	25,370
AX3KS	24,832.50*

OM Cw

W9LNQ	2,682.50*
W5WZQ	2,565*
K2EIU/6	2,205*

YL Phone results

W1YPH	1,872
K1QFD	1,812.50*
WA1MGC	356.25*
WA2FGS	11,275*
WB2JCE	4,284
W2EEO	684
WA3HUP	44,833
W3TNP	33,731
WA3BLZ	16,640*
WA3FWI	4,023
WA3LEQ	971.25*
WB4COP	10,146
K4RHU	7,938
K4YAK	5,328
W4BIL	3,655*
WA4UWK	3,500
W4UMN	3,262.50*
K4LMB	658.75
WA5TYH	6,786.
K5BJU	1,207
K6DLL	2,223*
WA8ESX	18,012.50*
WA8ENW	11,628
K9LUI	15,980*
WA9TVM	14,883.75*
WB9DBA	5,340*
WB9AZF	1,995*
WØJUV	9,800*
WØZWL	2,800
KØEPE	1,404
AX3KS	27,735*
DL3LS	14,140
DJ2MB	9,487*
WA1MEA/HK3	27,368
KP4CL	88,308
KP4DGP	2,294
ON4QP	17,040*
UV3GL	918
VE3BBO	29,067.50*
VE3GTI	13,464
VE4ST	26,133.75*
VE4PE	5,499
VE5FK	4,995
K7LPZ/VE7	78,234

OM Phone

WA1CJR	2,897.50*
W1BHV	2,829
W1BAB	2,520*
K1JAX	600
WA2BXK	1,584
W2QKJ	594
WA2FUA	460*

KØEPE Marte Wessel, at the YLRL booth at SAROC. The Banner was made by K8ITF, Marge.

Northwest YL Luncheon. K7ADI, K7AMJ, WA7DGM, WA7DXF, WA7DXI, W7EIU, WA7GMX, W7HHH, WA7HKB, K7KHU, WA7KMC, W7LCS, W7LXQ, W7NJS, K7NKZ, K7NQR, K7NXO, K7NZO, W7OGP, W7QME, and daughter Darlene, K7RNE, W7RVM, W7WHV, W7WLX, W7WMS.

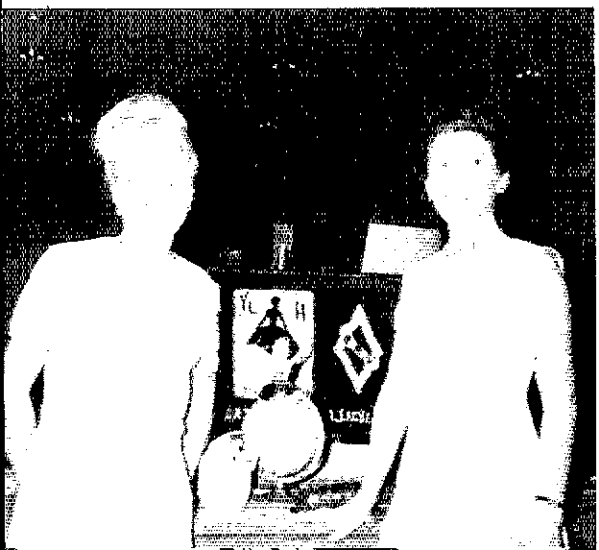
WA3HGV 1,920*
WA3IXF 1,120
WA3EXX 1,020*
W3QLW ..... .763
WA3KCP ..... .525
W3IRY ..... .393*
WA3LER ..... .280*
K4GSX 1,898.75*
W4AVY 1,650
W4JUJ ..... .735*
W4GZD ..... .720
W4RSM ..... .525*
W4PWB ..... .432
W4KMS ..... .513
W4CSZ 393.75*
W4ZTW/4 ... 318.75*
W4MEA ..... .90*
W4EEO ..... .16
K5MDX 5,562.50*
WA5QBO 948.75
K3NDO/5 ..... .440*
W5VWF ..... .25*
K2EIU/6 ..... .650*
W6QFU ..... .713
W6BIL ..... .110*
W6CLM ..... .20
W7ULC ..... .935*
W7RI ..... .893
K7WWR 1.25*
W8MXO 1,940*
WA8PWZ ..... .420
W8BTW ..... .356*
WB8CIE ..... .280*
W8TDY ..... .207*
W8NAN ..... .130*
WB8CWD ..... .45*
W9LNQ 2,993*
W9NLF 2,362.50*
W9KAA ..... .900
WB9DFD 427.50*
WA9DZL 393.75*
W9UTQ 355.25*
WA9SVZ ..... .340*
WA9YZX 276.25*
WAØOBG 1,140*
WAOGZA ..... .782
WAØTDQ ..... .609
AX3XB ..... .11*
DL9XN ..... .300
EL2BZ ..... .266
HS5ABD ..... .36
JH1OGX 1.25*
LA5QK 4
VO2GD 1,551
VP2IZ 831.25*
VE3EIJ 948.75*
VE5FO ..... .912
VE5TA 756.25*
VE7AAT ..... .315
3Z8KAF 9
3Z9BLF 37.50*
OZ3KE 31.25*

YL Cw

K1IJV 15,356.25*
K1NEI 15,120
K1QFD 15,120*
W1YPH 6,721
WA2EGS 11,745*
WA2WHE ... 11,082*
WA2OQU .10,687.50*
WA2CUZ 9,520*
WB2JCE ...5,912.50*
WB2PYI 5,336
W2EBW 2,142
WA3HUP 25,370
W3SLS 4,290*
K3SQX 1,281.25*
K4BWQ 9,555*
K4VDO 7,208
K4RHU 6,780*
K4LMB 5,499
W4BIL 3,700*
WB4JJH ..... .761*
WA5VJW 14,632
K5MXO 6,076
WA5SKI 3,277*
K6DLL ..... .165*
WWA8USU .. 19,380*
WA8ESX 14,630
K8ONV 13,930
WA8OFW 12,180
WA8EKQ ...8,337.50*
WA8YPY 2,736
WA8WHC ..... .936
WA9TVM 12,610
WAØKVL 16,725*
KØZSQ 5,885
WAØESM 3,360
AX3KS 24,832.50
DJ9SB 12,176.25*
SP8PS ..... .200*
GM3NYG 1,470*
OH5RZ 786.25*
VE1AMB ...4,321.25*
VE3GTI 7,896
VE3DZ 8,640
K7LPZ/VE7 .. 28,188
YV5CKR ...2,433.75*
ZL2JO 16,240*

OM Cw

W1HOZ ..... .864
W1DMD ..... .518*
W1MRW ..... .96*
W2AAU 1,551
K2LEG 1,365*
W2RUK 787.50*
W2FLW 682.50*
W2EUX ..... .594
WA2EIQ 178.75*
W3HQU 1,700
W3RYV 1,537.50*
WA3EXX 1,384*
WA3HGV 1,350*
W3QLW 1,333
W3QMX 1,181*
WA3KCP ..... .864
WA3MQJ 593.75*
WA3IXF ..... .288
W3ADE 243.75*
K4GSX 1,540*
W4ZOK 1,377.50*
W4WS ..... .962
K6QPH/4 ..... .720
W4JUJ ..... .720
WB4IBF ..... .690
WB4OGW ..... .621
K4TKN ..... .594
K4CAX 517.50*
K4BAI ..... .378
W4ILE ..... .319*
W5WZQ 2,565*
WA5VDH ..2,167.50*
K2EIU/6 ..... 2,205*
WA6DEI 1,155*
K6OT 1,113.75*
W6QFU ..... .910
W6CLM ..... .638
W6ISO ..... .625*
WB6OYJ ..... .525
W6BIL ..... .475
W6GBY ..... .378
W6YFV 61.25
W7ULC 1,750
K7KHA 1,064
W7VSE ..... .456
K7WL ..... .80
K7WWR 9
W8NAN 1,092



VE3DXZ, Dot Abel, and VE3EZI, Ivy Smythe, YLRL 1970 President, at the YLRL booth at SAROC.

QST for

WB8CEE	1,062.50*	OK1DVK	1.25*
WA8RDW	787.50	UA1ZX	682
W8MXO	244*	VE1AE	1,666*
W8BTW	61*	VO2GD	1,333
W9LNQ	2,682.50*	VE2IL	150*
W9DYG	1,880*	VE3FDP	1,202.50*
W9NLF	1,743*	VE6UP	682
W9DU	1,365*	VE7AAT	45*
W9AEM	715*	XE1KD	500*
W9QWM	688.*	YU1SF	31.25*
W9RKP	551.25*	YU1NOL	80*
W9TCU	320*	3Z8MJ	81
WA9YBA	135*	3Z8HR	10*
WAØKDS	1,248.75*	3Z9ABE	16
WØKCG	920*		
KØWNV/Ø	927.50*		
KØOAL	245*		
EA2HR	1.25*		
G3IDG	180*		
HP1BR	832		
HS5ABD	1		
IT1AGA	300*		
JA1SR	125*		
JA7AMK	9		
JA7HQP	4		
OH3MF	125.*		
OH5OD	1		
OH5NB	1		
OH5OZ	1		
OK3CIR	300*		
OK2BJJ	20*		

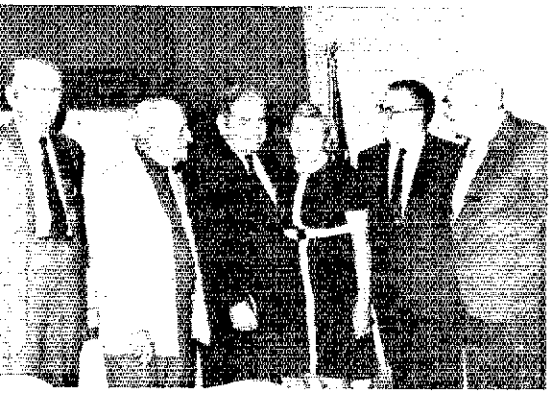
Confirmation logs submitted by: K5PFF, W9GHO, KL7FPM, VE7AJ, W3CDQ, WA6ZRA, 3Z9PT.

*after a call means that a low-power multiplier was claimed. High score from each section, or country received a certificate. Where only one log was sent in from a DX country, or Canadian District, a certificate was awarded to the sender. If a call is not listed, it was disqualified.

YLRL at SAROC

There has always been planned entertainment for women at the annual SAROC event, but this year was the first time that the YL operators were officially invited to be represented with a booth. YLRL, the oldest of all organizations for women amateur radio operators, sponsored the booth-showing their world wide scope, with KØEPE, Marte Wessel, in charge, with VE3EZI, Ivy Smythe, the 1970 President assisting.

YLs from all over the country were represented in the visitors book, and plans were made to have a YLRL booth in 1971, to augment the activities that are always scheduled for this affair.



The Desert RATS held a dinner meeting to honor Marie de Forest, in Palm Springs on April 28. Left to right Burt Langley, W6AOC; Roy Butler, K6FS; Ray Meyers, W6MLZ; Marie de Forest, WB6ZJR; Col. Fred Elser, W6FB, and Wally Francisco, K6KT.

W5APC, Kit.

Mary Dosland W5DEW/KØWKS

Mary was licensed in 1932 and has been known as the "Dew Drop of Texas." One of the early members of YLRL, Mary was very active in YL affairs. Prior to World War 2, she spent all of her time on 20 meters. During the war she taught at Port Arthur College, worked with the Signal Corps, and later with a BC station. After the war she spent much time on 75 meters where she was a member of MARS and the Tumblebug Net.

In 1959 she married G.L. Dosland, WØTSN, then president of ARRL, and moved to Moorehead, Minnesota, where she has been active on the air ever since. In addition to her call, W5DEW, which she still retains, she is also known as KØWKS.

Mary checks into the Inter-Continental Net and the Handicapped Net. She is also active on the Halo Net where she handles medical and missionary traffic. Also, is most involved with phone patches from Central and South America to various doctors and clinics in Minnesota, and North Dakota. She is also active on MIDCARS.

In October 1959, at the International Telecommunications Conference, in Geneva, Switzerland, Mary was awarded a trophy by DARC of Germany as an outstanding woman amateur radio operator. She is a member of QCWA.

She is active on ssb on all bands operating four stations to facilitate the work on the many nets. Mary talks to her daughter, Kit, W5APC, in Houston Texas, every morning on 20 meters. In addition to radio, her hobbies are her three beagle "girls", and her garden.

Northwest YL Luncheon

Best laid plans are notoriously apt to misfire, while spur-of-the-moment activities are often a bowling success. The Northwest YL Spring Luncheon was held in Seattle, Washington, on March 14, at the Colonial House Restaurant. This was formally an annual affair but was discontinued about five years ago. When W7NJS announced plans to visit in Seattle, plans, telephone calls, on the air invitations hurried into shape so that a "last-minute idea, carried out by veteran planners turned into a very pleasant and successful luncheon.

Twenty-seven gals from Oregon and Washington attended. Tokens of recognition were given to W7EIU, for having held her call the longest; WA7KMC with the newest call, and seven women who held Advanced class license.

A Fall luncheon is in the planning stage. QST

The World Above 50 Mc.

CONDUCTED BY BILL SMITH,* KØCER

Tropo on 50 MHz

TROPOSPHERIC-duct propagation is certainly not uncommon, especially at 144, 220 and 432 MHz, and there is amateur evidence of tropo effects up through 10,000 MHz. But the mode is not common at six meters, so April tropo openings along the Gulf Coast were of unusual interest. The conditions formed when a nearly stationary front developed between Texas and Florida, and then lazily shifted back and forth below a cold front.

The first report came from Joe Muscanere, WA5HNK, at Rosharon, Texas, 30 miles south of Houston. Between 2300 and 0030 CST, April 12 – 13, Joe worked K5CRF, WA5CVA, WA5SNF and WA5HSI, all in New Orleans, some 350 miles from Rosharon. He says the signals were "fantastic – well over S9 with no fade – sounded like locals." Tropo returned the next evening at 2000 CST and Joe began working stations along the Gulf as far east as WA4VUT in Mobile, Alabama, 453 miles. The session lasted until 2230. On April 14 and 15 conditions were normal, but the evening of the 16th brought a 90-minute tropo opening to New Orleans and southern Mississippi.

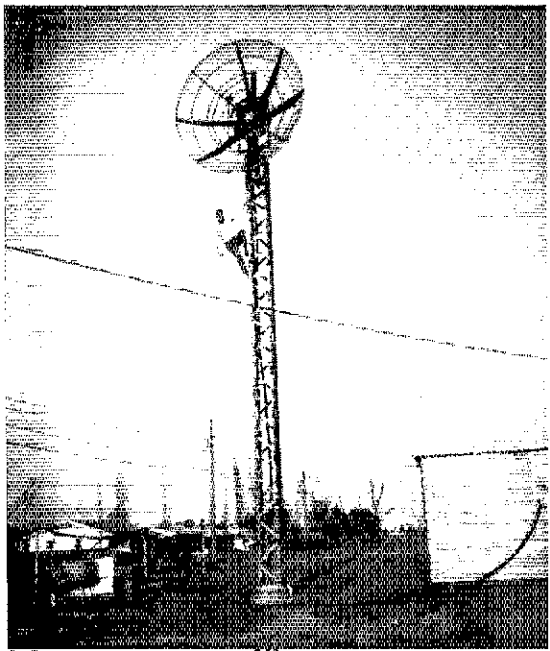
The best opening began about 2030 CST, April 18, WA5HNK's first contacts were over 350-to 400-mile paths to Louisiana and Mississippi. The tropo began stretching to Florida, 510 miles to WB4GZV at Fort Walton Beach, and an 829-mile contact with WB4DJG in Jacksonville. Joe said WB4GZV's signals were solid copy, two S units above the noise. WA5HNK queries if this contact is the longest ever recorded on six-meter tropo. Very likely it is. W1HDQ recalls a similar opening during the 1955 September V.H.F. Party. It began the afternoon of the 17th, much earlier in the day than usually associated with tropo. W1HDQ says the opening might well have been missed, had it not come on a contest weekend. During the evening hours, VE1QY, Nova Scotia, worked W3KX/3, near Scranton, Pa., 525 miles; and W1HDQ/1, Cadillac Mtn, Maine (5 watts and a 2-element portable beam) worked W3OJU, Washington, DC, 575 miles, on 6. (But Ed says that he had stronger signals out to 720 miles on 144 that same night, with similar gear.)

W5IYX/5, San Antonio, reports long-haul 6-meter tropo beginning at midnight April 21. Pat's first indication was TV DX on channels 6 and 12 from New Orleans. At 0142 CST, Pat worked WA5VCA, Metairie, La. followed at 0321 CST by WB5AJM in New Orleans. At 0321 in the morning, it's no wonder others weren't around! Pat's best DX was to W4PIA, Mobile, Alabama at 0800. The distance is 600 miles.

Bob Cooper, W5KHT, reports an excellent 3-day tropo session from Oklahoma City, beginning early April 26. Bob logged numerous low-band TV stations at up to 600 miles, high-band TV to 700 miles, and uhf TV to 800. There were even signals from low-powered translators, as far away as Iowa, coming in at the top end of the uhf TV range. Bob takes his TV DXing seriously, and has, for many years. He uses a high-gain antenna with an antenna-mounted preamp, fed with low-loss coax.

The point of all this is to recognize propagation media for what they are. The late Ross Hull discovered and later explained tropospheric propagation, in work that started in the fall of 1934, over the now seemingly insignificant distance between Hartford and Boston, about 100 miles. When he first spanned this path, he knew he had something unusual, and he spent years finding out just what it was. But it is apparent that many 6-meter men were unimpressed by 500- to 800-mile communication on 6, since they do it

*Send reports and correspondence to Bill Smith KØCER, ARRL, 225 Main St., Newington, Conn. 06111.



Bill Byrd, WA4HGN, has his 2.3 GHz 10-foot dish tower-mounted 35 feet high, for working W4HKK over a 118-mile path. That's Bill on the tower.

routinely by another medium that is much more often encountered. Only four operators reported these apparently rare tropospheric-duct openings on 50-MHz.

OVS and Operating News

50-MHz DXers had their choice of propagation modes during late April and early May – *E*, F_2, *TE*, aurora and tropo – and plenty of DX available for the working. If the usual indicators of a good *E* season can be relied upon again this summer, this could be a banner year. Early southern-latitude openings, high E_s muf, and paths to the Pacific Northwest were present during the period.

WA5IYX, San Antonio, noted E_s the evening of April 15, the first since March 10, during a 30-minute opening to Wyoming and Colorado. The next evening Pat caught spotty E_s into Louisiana, but it wasn't until April 26 that the *E* season began in earnest with four consecutive days of openings.

Reports covering April 26 through 29 were received from WA1DPX, W1MX, WA1HOL, W3BWU, WA3FMI, WA3NVO, W4GDS, WB4BND, K5MDV, WA5TTH, WA5IYX, WA7GFP, K8TUF, WA8VBK, and WØMTK. All agree the 28th was April's best, with strong single-hop signals throughout most of the country. Multihop signals from Puerto Rico were worked or heard in Louisiana, Pennsylvania and South Dakota. W3BWU, K5MDV and WA5TTH worked W1HOY/KP4 and KP4s DEC, DHC and DJE. W1HOY/KP4 was heard briefly at KØCER, South Dakota, at 1831 GMT. WA5IYX says the 28th was one of the best E_s days in three years!

More E_s followed on May 2 and 6-10. WA5IYX worked multi-hop to Oregon and California late the evening of the 6th, but the 9th and 10th were *the* days.

KØCER logged over 17 hours of E_s between the evening of the 9th and the following evening. The band was open everywhere except to New England. VE7ANP and VE7BLF were worked at 2100 CDT on the 9th. VE4MA, VE6AHE and VE6MO were also active the same night. The opening resulted in 2-meter E_s reported later in this column. The intense ionization apparently had its origin over roughly southern Illinois. The area generated numerous E_s clouds during the day as evidenced by the patterns of the openings. From South Dakota, eastern Tennessee, Georgia and Carolina stations were logged, followed by a drift in the *E* cloud and a change of reception area. Then the pattern would repeat itself, and this particular path opened four times May 10th! Mel Wilson, W2BOC, has written an extensive article on the mechanics of sporadic *E*. It will appear soon in *QST* and promises to be most interesting.

F-layer DX continued to be reported through much of April. Reports up to mid month appeared in June's column. On the 15th, WA5IYX, San Antonio, worked LU7DDG and LU3EX between 2200 and 2216 GMT, while WA5TTH was hearing ZK1AA's beacon. The next day, WA5IYX logged F2 to South America and ZK1AA from 1740 until 2145 GMT.

The best period of activity began on the 18th and lasted until the 20th. W5WAX, Oklahoma, worked *F*-layer backscatter from southern California for one hour beginning at 2117 GMT. Other 5th call-area stations reporting similar observations include WA5TTH, W5RAG, W5MDV and WA5IYX. The opening was widely reported in California by W6ABN, W6YKM, WA6HXM, K6RNQ, WB6NMT and by K7ICW, Nevada. W6ABN copied a F_2 fm broadcast signal from New Zealand on 51.75 at 2320. Similar backscatter conditions from the South Pacific existed through the 20th, generally from 2000 until 2330 GMT, with contacts between 5s and 6s fairly common, but signals were weak. The ZK1AA 50.1 beacon was also widely received and W6ABN says Stewart worked numerous stations on ssb in Arizona and California from San Diego to the Bay area. On the 20th, WA5TTH and K5EPR worked Argentina on F_2, while K6QEH was working ZK1AA, all between 2000 and 2200 GMT.

The 21st was quiet, but on the 22nd the band once again opened from Louisiana to ZK1AA. LU3EX worked Los Angeles stations from 1825 to 1852 GMT. On backscatter, WA6HXM worked XE1PY, plus Arizona and southern California. The 23rd was a near repeat of the previous day. WA5TTH again heard ZK1AA on the 24th at 2010. April 25th, WA5IYX worked ZK1AA at 2122 and heard CE3QG at 2345. WA6HXM heard CE3QG also, and XE1PY worked ZK1AA. The solid daylight F_2 of the 25th developed into T_E after dark. K5MDV and WA5TTH in Louisiana heard CE3QG's beacon at 0100 GMT, April 26. WA5IYX again heard ZK1AA at 2110.

W6ABN reports that VK4RO and VK4ZPL copied WB6KAP's kilowatt-and-rhombic beacon, from 0235 to 0500 GMT, April 28. On April 1, W6ABN heard VK8KK, and saw Indonesian TV on approximately 53 MHz! He says that Australian and Japanese 50-MHz DXers made frequent contacts with one another on F_2 and *TE*, beginning April 2. VK8KK told W6ABN he expected similar conditions to exist into June.

On May 9th, W3GV/3 and WA8MCC are reported to have worked LU3EX at 1930 GMT, most likely an E_s-to-F_2 link. At the same time, WØEKB, Omaha, was hearing ZK1AA. WA5IYX says a mixture of E_s and F_2 produced many signals in the 49-MHz range from South America, but the only amateur heard was LU3EX.

Doug Armes, K2ACQ, leads the United States in states worked on 432. This is Doug's operating position. The transmitter is remote controlled by the switching unit beneath the 75A4.

Alan Parrish, K1KKP, thought you might enjoy this Vermont winter scene in July. The two 10-element Yagis were used to work KP4DJZ on 144 EME.

Similar E_S-to-F_2 conditions were reported May 10th when K2RTH and K2MUB, both near New York City, heard ZK1AA at 2232 GMT, an excellent bit of DX! The Cook Island station was buried under dozens of 5s also calling. On the 11th, W8GZ heard ZK1AA from 1839 to 1845 GMT, but Windy wasn't sure he was successful in breaking the beacon before the signal disappeared.

Aurora was widely worked April 21, including rare auroral E_S between K1JRW, Massachusetts and VE5US and VE6MO. Other aurora reports come from WA1DFL, WA3HVR, WA3NVO, W5WAX, WA8VBK, K9DTB, WAØQPA and VE7ANP. The latter and VE7BLF worked a dozen stations in Washington, 3 in Oregon and briefly heard Montana's 6-meter stalwart, W7EGN. VE7ANP says the following Vancouver, B.C., stations are on 50 MHz ssb: VE7AEZ, ANP, BLF, BQ and XF.

In Oklahoma, W5WAX heard no 2-meter aurora, but worked north to South Dakota and east to Michigan on 6. K9DTB, near Chicago, worked and heard many stations including VE2AIO, VE5US and VE6MO. Nice to see so much VE activity! WAØQPA reported similar success from Minneapolis.

The apparent peak of the May Aquarids meteor shower excited the Sunday-morning scatter crowd on the 3rd. The increased number of meteors caused sufficient ionization to support nearly solid signals from the Dakotas to western New York. W2UTH, near Rochester, heard KØCER for 45 minutes around 1400 GMT.

In February *QST* of this year there appeared an article on long-delayed echoes. At that time there was but one report of LDEs at 50 MHz, but now there is another, from K7ICW and WA7IER, Las Vegas, Nevada. They were in contact at 0349 GMT, April 15, when WA7IER heard a one-to-two-second delay on a transmission from K7ICW. A similar delay occurred on the next transmission from K7ICW at 0350, and a one word delay at 0351. K7ICW did not hear the echoes.

Here are some June contest QSL notes. Contacts with ZF1RS may be verified through W4GDS. XE2XN cards for this year and last go to K5HVC *before* August 1. Contacts with KL7ABR may be verified via KØCER, 3900 East 24th Street, Sioux Falls, South Dakota 57103. Stamped, self-addressed envelopes for QSL return will be appreciated by each.

After several years of inactivity due to the military, Ray Clark, K5ZMS, says he is looking for old friends from Security, Colorado while signing K5ZMS/Ø.

We have two net items of interest. A large eastern net under the control of K3NPY is active each Sunday at 1300 GMT on 50.135. Stations from the mid-west to Florida are regular scatter checkins as Nippy calls the net for one hour, looking in all directions. The Tennessee Six-Meter SSB Net meets Wednesdays at 2315 GMT on 50.115, checkins are welcome.

144 MHz began awakening in April from the winter doldrums with signs of renewed tropospheric propagation, but probably of more interest was a rare 2-meter E_S opening the evening of May 10th, tipped by neighbor W5KHT who noted E_S in the fm broadcast band. W5ORH, Oklahoma City, worked his first 2-meter E_S in 22 years on the band. Jay contacted W8IDU, Michigan, K2CEH, New York, VE3BQN and VE3CWT, Ontario, and heard WA4TTG in Virginia, who was apparently having VFO stability problems. W5ORH also heard W3LUL, Maryland, and K8DEO, Ohio. The Virginia station was heard also by K5WXZ, Garland, Texas. The opening began about 2030 CDT and lasted 1½ hours, with signals waxing and waning. W5KHT said the MUF was over 110 MHz from 1000 to 1100 CDT, and again from 1730 until 2100. W5ORH notes indication of 2-meter E_S on May 16, when he heard a W1. W5KHT says late April and May produced a very high percentage of 100-MHz-plus E_S; much higher than normal. Bob says the average opening last year had a 65-to 70-MHz MUF, but this year's is around 90 MHz.

An April 21st aurora was widely worked from the midwest to New England. The most detailed report comes from K2RTH, near New York City. Bruce worked or heard stations from New England to WØBFB in Iowa. Other aurora reports come from W3ZD, Pa., who worked WAØCHK, Missouri, for state number 20 and W1JSM, New Hampshire, who worked stations from VE1AFB, Nova Scotia, to WA9DOT in Wisconsin. In Illinois, W9JGV worked 24 stations from New York to WØZJY, Kansas, which gave Jerry state number 25 with his kilowatt and stacked 14-foot Yagis. The aurora extended south into South Carolina where K4GL worked 2s, 8s and 9s and heard WAØCHK.

The April Lyrids meteor shower apparently peaked on the 22nd, as W1JSM worked KØMQS, Iowa, and WØLER, Minnesota. The contact with Minnesota was Don's 24th state from New Hampshire. WØLER said the contact was made on a 65-second burst. K4GL says the Lyrids were poor. Jack's observed peak was the night of April

18th, but conditions not as good as random meteors in the summer and fall. The May Aquarids shower produced only one reported contact. WØNXF, Nebraska, worked his 45th 2-meter state, W7QX in Utah, on the 2nd. WØLER ran schedules with WA5NOB, Arkansas, and K7ICW, Nevada, with poor results.

There were several periods of enhanced tropo during April and May. One was reported on April 17 by WA1IFE, Mass., who says New Jersey stations were exceptionally strong for 3 hours during the evening. Other tropo periods were reported in this month's column lead.

W6ZBD reports a considerable increase in activity and interest in 2-meter ssb in the Sacramento-Stockton area. Keith says regular Monday, Wednesday and Friday – P.M. schedules on 144.12 are responsible. Keith lists 18 participating stations. Several 500-mile contacts have been made and Keith says many operators are building amplifiers and larger antennas. Thanks, Keith, for the report and let me hear more from you Californians.

VE6MX reports not much doing in the Calgary area, but says the present open repeaters in Alberta are VE6OL, Grand Prairie, VE6WQ, Edmonton, and VE6AUY, Calgary, all operating on 146.46 in and 147.00 out.

And from Madison, Wisconsin, WA9FTH writes he wants schedules on a-m into Milwaukee and Chicago.

220 MHz and Up activity was light during April and May. WB6NMT moved from Vallejo to Dixon, but before doing so Louis ran simultaneous meteor scatter schedules on 50 and 220 MHz with W7FN April 19. They found a S9 50 MHz burst was required before a ping or letter burst could be received at 220. On the 20th, Louis ran similar schedules with W5ORH and W7CNK, hearing only pings. Apparently no schedules were run on the 21st, but on the 22nd pings, letters and short bursts were exchanged with the W7CNK schedule being the most productive. These tests were conducted during the April Lyrids shower and their results on the 22nd correlate with the shower peak noted on 2 meters by W1JSM. WB6NMT's new address is Louis N. Anciaux, NAVRADSTA (T), Box 1000, Route 1, Dixon, California 95620.

The previously reported April 21 aurora allowed work at 432. K8REG, Ohio, worked W9ZIH, Illinois, during the 4 minutes 432 was apparently open at 2333 EDT. Vince, K8REG, says since March 2nd he has logged 7 auroras, with 6 producing 432-MHz returns. He has worked 5 states, 5 call areas and 500 miles on 432 aurora alone! On April 27th, both Vince and Don, K8DEO worked W4VHH in South Carolina on lightning scatter. A thunderstorm was located in eastern Tennessee at the time, and signals peaked S9 on bursts, but averaged S3 to 5 at 5-second intervals.

Doug, K2ACQ, (see the picture elsewhere in this column) wrote to publicly thank W2CLL, the gang at WA2WEB, W4FJ and friend Don Striffler for their assistance on his 432 work. Doug says that without them he wouldn't be leading the country on 432 with 23 states worked. Nice gesture, Doug.

At Kansas City, WAØITU says the Kansas City Amateur Radio Club is about to activate a 440 repeater. What are the frequencies, fellows? Remember, we're happy to run any available repeater information. QST

July 1945

. . . The FCC has been studying proposed post-war frequency allocations, with frequencies above 25 Mc already designated. The lower half of the spectrum is under study; it is expected that they will come up with, the dope in mid-summer. Of course all these frequencies are subject eventually to international ratification. The boys in Washington are already talking about it. No date or time is as yet set. So Warner warns the gang: go a little easy in the matter of designing new apparatus for frequencies we don't know we are going to get.

. . . It does look as though we will probably get our 80-, 40-, and 20- meter bands back with the strong possibility of a new allocation around 15-meters. We might have to give up some of the 160-meter band, however.

. . . McMurdo Silver begins a two-part article on the vacuum tube voltmeter. The first part of this comprehensive writing takes in several pages. The second part will describe a "truly-tamed" VTVM.

. . . Charles A. Service, Jr., W4IE, presents quite a study of postwar Station Calls.

. . . George Grammer, W1DF, writes an easy-to-understand article on "Bass Boost." This is directed to phonograph recordings and the like rather than specifically to the radio amateur.

July 1920

. . . The transition from Spark to cw is under full sail. Says here that 100 watts of cw is just as good as a full gallon rock crusher. Imagine! Tubes are hard to get and expensive. Even T. O.M. threatens to go over to cw and give up "Old Betsy." Incidentally, Maxim's spark station is presently in operating condition at W1AW and will be occasionally fired up for the benefit of old timers who want a whiff of ozone.

. . . The League emblem makes its appearance, the familiar diamond and elementary hookup.

. . . Maxim's station, 1AW is described in this issue. The four point rotary was belt driven at over 7000 rpm. It was believed that this high peripheral speed, around 500 ft/sec, contributed to quick damping and lower decrement in the emmitted wave.

. . . The previously announced fading tests are in full swing and have aroused a great deal of enthusiasm. Don Mix, 1TS, and E.E. House, 8NZ, both report that when a station fades, he can sometimes be brought back in by making a "quick shift to a slightly different tune."

. . . A box announces that the Old Man's "Rotten Radio Yarns" are going to be published in book form. Been waiting fifty years for that to come to pass and I think it is still a great idea! – *W1ANA*

Silent Keys

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

W1ABG, Albert N. Giddis, Lowell, MA
W1ADE, Adrien Rousseau, Ashburnham, MA
K1AN, Clarence W. Thyberg, N. Berwick, ME
W1CNX, Thomas W. Atherton, Concord, NH
W1HPR, Stephen Jona, Elmwood, CT
W1IC, Howard Gurney, Springfield, MA
W1KRR, William E. Rider, Jr., Foxboro, MA
W1TSI, Antonio P. Markland, Storrs, CT
W1ULH, Lawrence Paul, Pawtucket, RI
W2BHA, Thomas Marullo, Oceanside, NY
WA2DDJ, Archer D. Mayberry, Oceanport, NJ
W2EU, George Eke, Westfield, NJ
W2JJI, George L. Thompson, Asbury Park, NJ
WB2KOB, David Johnson, Garden City, LI, NY
WA2JYA, Henry D. Rohrer, Sr. Pittsford, NY
W2ONE, William Andrews, Albany, NY
W2QAP, Alf O. Carlson, Liverpool, NY
W2VFW, C. E. Pittenger, Milburn, NJ
W2ZQQ, George Willard, Orchard, NY
W3CVA, Conrad Doeflein, Baltimore, MD
K3CYV, Robert E. Peiffer, Annville, PA
WA3DWU, Wiley D. Wenger, McMurray, PA
K3HHJ, William E. Eversole, E. Rochester, PA
W3HUV, E. T. Griffith, Broomall, PA
W3IK, John Specialny, Jr., Hellertown, PA
K3RFR, Leslie F. Settle, Chesapeake Beach, MD
W4COQ, Forest D. Masters, Miami, FL
W4EFY, Maurice L. Cable, Arden, NC
W4JF, Claude G. Hailey, Eden, NC
K4VKQ, William F. Sanders, Badin, NC
K4KJD, William S. Crafts, Athens, AL
W4SHQ, Jack E. Gardner, Jacksonville, FL
W4WN, George Orgera, Ft. Pierce, FL
WA4ZIS, Dorothy Orgera, Ft. Pierce, FL
WA4WUY, Walter W. Alligood, Washington, NC
WA5LEN, Wille H. Waldron, Oil City, LA
W5OF, Daniel A. O'Connor, El Paso, TX
W5QHK, Robert T. Pegue, Albuquerque, NM
W5QIO, E. F. Shaw, Silsbee, TX
K5TMA, Alto L. Coward, Waco, TX
W5YDJ, Willard D. Smith, Albuquerque, NM
K6AUF, Robert Hintze, Burbank, CA
K6BPI, Anthony V. Mozier, San Diego, CA
W6CFH, Clifford C. Hampton, Long Beach, CA
W6CFL, Louis B. Tuckerman, Los Angeles, CA
K6DDP, Richard E. Johnson, Sunland, CA
W6DQQ, Fred G. Miller, Harbor City, CA
K6HQ, Jim Halliday, Bullhead, AZ
W6IEM, Herbert Anderson, Lindsay, CA
W6KPX, George W. Almour, Spring Valley, CA
W6LMS, Russell C. Beattie, Richvale, CA
W6OAQ, Herman Scholtens, Jr., Ben Lomond, CA
K6OV, Willam T. Hodson, San Jose, CA
WA6PYV, Rod E. Williams, Los Angeles, CA
WA6RXM, Roger M. Park, San Quentin, CA
W6TMP, Gerald R. Hobbs, Torrance, CA
W7NI, Grahame Hardy, Silver City, NV
W7EQZ, Arthur Moreen, Tucson, AZ
W7QLZ, Clyde E. Criswell, Phoenix, AZ
W8CRH, Earl J. Cole, Evart, MI
W8EIK, Robert H. Gleason, Van Wert, OH
WA8FHC, Lester L. McGinnis, Lima, OH
K8GBR, Glen Gladwell, Lima, OH
W8HOX, Arnold J. Osborn, Pinconning, MI
W8LTZ, Frank D. Tefft, Jr., Alma, MI
WA8NYZ, Walter Amos, Plymouth, MI
K8YNC, Dwight H. Jones, Van Wert, OH
W8ZJ, Ralph H. Sayles, Clyde, OH
W9AEA, Merrill R. Lindley, Indianapolis, IN
W9CVF, Herman S. Drake, Indianapolis, IN
W9EJP, Jack R. Wells, Indianapolis, IN
W9NAJ, Alfred Schwartz, Waterloo, WI
K9ONY, John B. Wash, Anderson, IN
W9PEZ, Michael Reidy, Elgin, IL
K9PPK, Rudy G. Novak, Logansport, IN
W9QNN, Gene A. Robbins, Berwyn, IL
WØMAX, Charles J. Carter, Flaxton, ND
WØSAI, Claude E. Longstreth, N. Platte, NE
WØVHK, Bill Brubaker, Oskaloosa, IA
WØWGB, Weldon E. Weilage, Manhattan, KS
VE1HD, C. H. L. Baker, Rockingham, NS
VE3OT, Aubrey L. Krafft, Fonthill, ON
VE5PJ, James E. Peterson, Porcupine Plain, SK
VE6AO, George Sargenia, Calgary, AB
VE6RH, Roy Hopkins, Lethbridge, AB
ex-VE6HA, E. J. Taylor, Edmonton, AB
XE2JS, Jesus Ortega Sanders, Guaymas, Sonora, Mexico
G3PCI, S. E. Blomfield, Everton, Lymington, Hants, England
VK3GX, P.R. Gibson, Ringwood, Victoria, Australia

Gimmicks and Gadgets

(Continued from p. 21)

side of the output. Otherwise, the checker will indicate that the diode is a dud.

Now slowly advance R12 until M1 just starts to indicate current flow. You can then read the avalanche voltage of the diode on the voltmeter. The PIV rating of the diode is slightly lower than this value.

The pointed end of the bullet-shaped capsule encasing an epoxy diode usually indicates the cathode terminal. However, these diodes are sometimes supplied with the polarity reversed. Therefore, if the checker should indicate that an epoxy rectifier – or any other type, for that matter – is a dud, reverse the connections to the diode. More often than not, the diode will be found to be good.

The cost-per-volt of diodes rises sharply with PIV ratings greater than 1000 volts. Furthermore, high-voltage diodes require high-voltage shunt capacitors. I have found that the most economical rectifier string can be assembled from diodes having an 800-PIV rating. Therefore, the secondary of T1 can be as low as 450 volts, and you will still be able to check PIV ratings in excess of 1000 volts. This also lowers the required voltage ratings of C7 and C8 to about 1500 volts. QST

Strays

The Employment Information Service Net is now operating MWF on 14,330 kHz, at 1830 PDT. Its function is to provide information on job openings to areas where a high or abnormal unemployment situation exists. Information on such openings will be offered to companies attempting to assist former employees. If you want to participate in this net in any way, please contact Niel E. Classon, W7NYB, 15427 Southeast Ninth St., Bellevue, Washington, 98007, or check into the net, which may eventually be nationwide.

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Operating News

GEORGE HART, W1NJM
Communications Manager

ELLEN WHITE, W1YYM,
Deputy Comms. Mgr.

Administration: LILLIAN M. SALTER, W1ZJE
DXCC: ROBERT L. WHITE, W1CW
Training Aids: GERALD PINARD
Contests: ALBERT M. NOONE, WA1KQM
Public Service: WILLIAM O. REICHERT, WA9HHH

Club Territory Again. The rule associated with the definition of "local club territory" is a contest rule, not an affiliated club rule. That is, the rule defines who may be considered a club member for ARRL contest accrediting purposes (Jan. VHF SS., Nov. SS and DX Competition only), it does not attempt to dictate to clubs whom they might choose for membership. A club may feel free to choose members from the other side of the continent, if it wishes -- but their contest scores cannot be added to the club total unless they comply with the associated contest rule.

The point has been a controversial one. For quite some years, "local club territory" was considered to be within a radius of 50 miles airline of the club affiliation address, although this was an unofficial rule that was nowhere definitely stated. Even so, a survey of clubs made in the fifties indicated that a majority felt this was a fair rule. The matter came up because some contest-oriented clubs started to "sign up" members all over the country for contest purposes -- members sometimes completely unknown personally to the other members, but selected purely because of their proven contest prowess. This didn't seem right, so the 50 mile limit was used as a yardstick.

Later, after a process involving a comparatively small but very representative block of the membership, the headquarters Contest and Awards Committee, and conduct of considerable correspondence on the subject, the rule was liberalized to include any member within a 50 mile radius, plus any member between 50 and 100 miles out provided he attended a required percentage of the club's in-person meetings. This was to assure that such a member was indeed an active club member and not a "ringer."

But there was still some dissatisfaction on the part of some who claimed that 100 miles was nothing and that many of their members attended meetings regularly from distances well over 200 miles; so the matter was referred to the newly-formed Contest Advisory Committee (see Feb. *QST*, p. 62) for a recommendation, along with many other contest matters. In due time, the CAC came up with a recommendation that "local club territory" be extended to a radius of 200 miles airline from the club's affiliation address and that *all* members to be included must attend at least 50% of the club's in-person meetings.

No great emotions about this. However, the headquarters Contest & Awards Committee was opposed to the change. So there was the impasse.

The Rules and Regulations for Affiliated Societies provide for affiliation of "local" clubs. This term is subject to various interpretations, but there seems little doubt that it was originally intended to refer to clubs organized within a community, city, maybe a county but not much beyond this. Distance concepts have changed since then, however.

So much for the background. The matter was sufficiently controversial that it came to the attention of the ARRL Board of Directors at its meeting this past May, with the result that the Board voted to extend the 100-mile limit now imposed to 175 miles. So be it. This compromise should be satisfactory to the majority. It will permit a club in New York City to draw members from Baltimore, Elmira, Providence, Brattleboro (Vt.), Nashua (N.H.) or the suburbs of Boston. Philadelphia can draw from as far away as Winchester, Va., New Haven, Conn. and Elmira, N.Y. Miami can draw from Sarasota or Key West. New Orleans can draw from Mobile, Ala., Pensacola, Fla. or Jackson, Miss. Denver can draw from Scottsbluff, Nebr., Laramie, Wyo. or Alamosa, Colo. Portland, Ore., can draw from Seattle, Yakima or Coos Bay, and Seattle can draw from either Vancouver, B.C. or Vancouver, Wash. The

JULY

2 W6OWP Qual. Run
4-5 YV Contest, p. 103 June
11-12 Open CD Pty., cw, p. 67 June
16 W1AW Qual. Run
18-19 Open CD Pty., phone p. 67 June
HK Contest, IARU News
Bermuda Contest, p. 103 June

AUGUST

1-2 MDC QSO Pty., Sta. Act.
Ill. QSO Pty., Sta. Act.
5 W6OWP Qual. Run
8-9 Ohio QSO Pty., Sta. Act.
14 W1AW Qual. Run
15-16 NJ QSO Pty., Sta. Act.

SEPTEMBER

3 W6OWP Qual. Run
11 W1AW Qual. Run
12 "Open" FMT
12-13 VHF QSO Pty.
18 W1AW Morning Qual. Run
19-20 SAC, cw
26-27 SAC, phone

Los Angeles area in California is fairly compact, but an LA club can draw from San Diego, San Luis Obispo and parts of Mexico. A San Francisco club can draw from as far south as Fresno, as far north as Chico and as far east as the Lake Tahoe area.

This should be liberal enough for anybody, and probably some will consider it *too* liberal. But don't forget that 50%-meeting-attendance rule!

May FMT report. Those ARRL Official Observers who participated in the May 9 FMT (and who reported by May 20!) already know their results. If *you* missed that W1AW special bulletin detailing the umpire readings, note the following. Frequencies for the early run were 3544.452 7046.912 and 14072.175 kHz. The late run measured at 3560.433 7010.969 and 14043.614 kHz. open to all amateurs and will be announced fully in next month's *QST*.

W1AW. We suspect that every bulletin and code practice transmission of W1AW is copied by thousands of amateurs and prospective amateurs. Most of the copiers listen for the station specifically and many of them write in expressing their appreciation for the service. Others happen across the transmissions accidentally in tuning around the band, or while engaged in casual contacts. There has never been a detailed statistical survey made to indicate how many copy W1AW for what purpose on what frequencies and mode. The closest we have ever come to it has been an occasional "keyed" bulletin which requests copiers to advise us whom they copied the bulletin from and on what frequency. Since W1AW is copied far more than other Official Bulletin Stations, this also indicates to some extent the W1AW coverage.

Such a "keyed" bulletin was transmitted in March of this year. There were 216 responses. Considering the probable number of listeners, this is small indeed; whether or not representative is a moot question. Of those who responded, 65 (30%) indicated they copied W1AW, the rest copied the transmissions from 67 Official Bulletin Stations, mostly singly, but K9KJT had 21 responses and W2QFR had 10, the former all on two meters. Perhaps significant is the fact that 23 of the stations other than W1AW who were copied made their transmissions on 6 or 2 meters, in this way perhaps reaching many technicians and v.h.f. enthusiasts who seldom or never listen to the lower frequencies.

Of those who copied W1AW, about 30% used 3520, 23% used 7020 and 15.4% used 14,020 kHz. A surprisingly high number (15.4%) copied the teletype transmissions on 3625 kHz. There were *no* reports of copy made of phone transmissions except three on 3820 kHz, and no reports of anyone copying the transmissions, phone or cw, on 160, 10, 6 or 2 meters. This doesn't mean, of course, that no one uses them; but it does bring up the question of whether or not these transmissions are really needed.

The bulletin is one thing, the code practice quite another. We know from the volume of correspondence received that participation in the code practice program is very high. What we don't know (for certain) is to what extent, if any, use is made of the code practice transmissions on, for example, 160, 10, 6 and 2 meters. One way to find out would be to stop them and see if anybody complains. Another way would be to "key" each code practice transmission with a request that we be notified of the frequency on which it was received. This could take some time at 5 w.p.m., and even then beginners just getting started on code might not be able to copy it and therefore would not respond. Still another way would be to solicit responses in *QST*, which is just what we are working up to now. Possibly if we used all three methods, the response would be sufficiently indicative to justify appropriate action.

What frequencies do *you* copy W1AW bulletins and code practice on? We have in mind the possible desirability of ceasing transmissions on 160, 10, 6 and 2 meters, of both bulletins and code practice. No use having them if no one uses them. The same applies to voice bulletins on all bands. Do you want them, or shall we cease transmitting them, sticking only to certain cw and RTTY transmissions? Should certain W1AW transmissions disappear from certain frequencies, it will be because response was not sufficient to justify their continuance in our crowded bands.

Crow Back in the Oct., 1969, issue of *QST*, this column gave some advice on identification procedures that further investigation and FCC interpretation showed to be not entirely correct. However, since observation of the advice given would not result in anyone's getting into trouble with FCC it was not then felt necessary to use up *QST* space to make correction. But we don't mind eating a little crow if this helps clear up the fine points, so here goes.

Please dig out your copy of last October's *QST*. Change the last sentence of the first paragraph to read: "You have to identify the other guy, too, at least every ten minutes and when you complete your contact with him." OK? Now, refer to the first paragraph *after* quotation of the rule. The word "it" in the third line should refer to the *contact*, not the transmission. That is, you don't have to identify the other guy at the end of every transmission unless that transmission is the end of the contact -- as it usually is in a contest. — *W1NJM*

DXCC Notes

DXpedition Documentation. Back in the September, 1967, issue of *QST*, page 92, a DXCC Note announced the deletion of previously-made credits and the rejection of several DXpedition operations for DXCC crediting. Also included in this announcement were requirements for future DXpedition operations, to deal with any questions as to legality and veracity of such operations. From September, 1967, to May, 1970, confirmations for contacts with over 400 different DXpedition-type operations were submitted for DXCC credits. All these operations were required to comply with the new rules before any DXCC credits were given for their operations. Most submitted the necessary information. Some did not, either by not replying to the request or by out-right refusals to give the necessary information.

DX CENTURY CLUB AWARDS

From April 1, 1970 through April 30, 1970, DXCC certificates based on contacts which 100-or-more countries have been issued by the ARRL Headquarters to the amateurs listed. The three columns at the right show issuances for radiotelephone operation.

New Members

OH5VY	260	W4WRY	110	W4RAL	102	OH5VY	249	WA4FBU	112	W3CKU	102
K1ZYU	233	DJ4AV	109	WA5OYY	102	VE4EU	210	W1ESN	110	W0JFO	102
VE4EU	214	HB9AAH	109	W7JJ	102	II2NG	170	HR2GK	109	K2AKR	101
DL4QQ	209	HR2GK	109	W0INH	102	DL4QQ	167	JH1CJQ	109	K2IEF	101
OH4RH	204	G3VPO	108	W3CY	101	SM5GA	159	K3STU	109	PA0KGS/W2	
W6KFV	195	WA1FBX	108	OJ0MR	101	W7EOI	154	WA3FMO	109		101
WA0PUO	179	WB2QQX	108	SP6BFK	101	CT1BB	149	W4ACY	109	WA1HXY	101
KG4DS	165	WB6ZUO	108	WA9POR	101	W6ISI	147	W4WRY	108	WA5MZW	101
VE1AI	161	K4FN	106	WA0VKE	101	W8IPA	138	W9ARI	108	WA9JXT	101
W7EOI	161	ON4QP	106	DK2RD	100	KG4DS	135	WB4NIN	107	K4RSB	100
ZL1DS	159	WB6GUI	106	GW3TMP	100	W4PLM	135	DL8FX	106	VE3CLX	100
WA8TNO	156	JA8ABH	105	K6HEK	100	WB4IDM	119	WA3JGS	106	WA1FBX	100
PY2PH	156	W2AFM	105	KH6IF	100	VE2DHF/YV1		W0JKM	106	WA5CBT	100
CT1BB	154	G2FMJ	104	VE3AIA	100		114	YN1HF	106	W6QFU	100
IICPD	146	WB2NLM	104	WB4LXF	100	W8PCA	113	K1ZVU	105	W7RI	100
WA9YZV	144	WB4IER	104	W3IZI/5	100	K6IWQ	112	K2KGB	105	WA8AXQ	100
DK3CT	142	W5FGO	104	WA5NOM	100	OZ4IA	112	WB6ZUO	103	W0IF	100
JH1CJQ	140	9H1BE	104	WA5UBV	100						
WA4IVL	140	DJ3IF	103	WB6ZHD	100						
OK3CAN	125	EA8FO	103	WA7MKC	100						
DJ9KM	123	K4HJ1	103	WB8BTS	100						
PY5ATL	144	K5BLV	103	W9CK	100						
W8WIY	114	OH2NM	103	WA9SMM	100						
DL4QF	113	TA2SC	103	WA9TZD	100						
OZ7FP	110	YU4EBL	103	ZL1DS/C	100						
		DJ2KP	102								

Endorsements

330	W3FVZ	VE4SK	LA8SJ	W0IBZ	325	WA5IEV	WA7GHK	W0BA
VE3BWY	280	W1AA	VE3DNR	W0JF	W0MLY	W6DQ	200	160
325	K4IEX	W3HQU	VE3PQ	140	ZS6LW	W6ZBS	JA7JH	K7AXE
OK1FF	SP7HX	W4UF	VE5GF	K2KGB	315	WA6AHF	K1UNO	TF2WLN
W2AEB	VE3AIU	W6MUM	W2BBK	K5LIW	W6VUW	W9HPS	VE3CJ	W2WNW
320	VE3CTX	W9EZ	W6NTQ	K6MG	W6WX	260	VE3ZN	W3IF
W5NMA	VE3EWY	6W8DY	W7BE	VE2DHF	YV5AHR	HB9AHA	VE4BJ	WA8PWF
W6VUW	W1JMT	220	W7RI	VO2GD	310	K4RQZ	W1EJE	WA9SLO
315	W4GTS	OH2BF	WB8ABN	WA2ARM	SM5BCO	KH6BB	WA2VEG	140
K2CPR	WA5REU	WB2RBG	WA9OMR	WA2CFA	W1GKK	SM5FC	W4BOY	DL8OH
VE2WA	270	W2GHK/4	W0BA	WA3DFV	W5NMA	W4ELB	W4JDR	K2JJK
W6DQ	HB9AHA	W7VRO	160	WB4HJN	W9JT	W4HOS	W4RFZ	K4IEX
310	W1IKE	W0MVN	DL8OH	WB4KWT	305	W5OLG	W4UF	K7RDH
DL7AB	WA2CBB	WA0DUB	DL9EM	W5FCX	W6EUF	WB6POP	W9JJV	K9GZS
K1YZW	W8VLK	200	G5CP	W7DVQ	W6MBD	W9ABM	180	K0TYO
VP2ACD	260	K2DSV	HA5DA	W7EE	300	250	DJ3LF	KP4BBK
W1HOS	K5IZY	K2SHU	K2IEF	WA7AHO	W5KC	PY1MB	DL3VX	W2HXF
W5VA	K6GLC	K4MPE	K6TVL	WA8QIY	ZL3NS	WB6OJO	IIDAB	WA2CFA
W6EUF	VE3IR	K6DYQ	K9GZS	120	290	W7LFA	IIRZ	W4IQO
W6KZS	WA4PFD	K6KQN	K0AXU	CX9BT	HK3AFB	W5JFD	K1PVB	W7EE
W8LUZ	WA6DUG	K9YXA	VE3DKE	JA1MUZ	VE3MR	YV1KZ	K4BBE	W9EPM
W9QLD	250	VE2DR	W1CT	K6SSN	280	240	K4OCE	WA0PVW
305	K4CIA	VE3ZN	W1PEG	VP9GD	VE3CTX	K2POA	K6KQN	120
SM0KV	K4OCE	WB2RBG	W3NNX	WA1FBU	W6DZZ	VE4AS	K7PXI	CE3OE
W2PTM	PY1MB	W4EZ	W4DUQ	W2FHY	W6KZS	VP7NH	VE3DNR	CP5ED
300	WA1DJG	W6GC	W4IQO	W2MYK	W6PTS	W1AA	VE4JK	FA3SA
DJ0PN	WB2NYM	W9AE	W4PLM	WA3FQM	W9QLD	W2YYL	VE5GE	K6SSN
K6KA	WA6GFE	WA9VIZ	W4WHK	W6EGX	270	220	W1HGA	OZ5KD
OZ3Y	W7LFA	180	WB6PGK	WB6WQA	VE3AAZ	CT1FL	W2EV	WA1KYW
W2EMW	W9CL	OI5JH	W7ET	W8KTG	W1JMT	W2AEB	W3KVS	WB6KGG
ZL1AV	ZD5R	I8OQ	W7NP	W9HTF	W1QQO	W2GHK/4	W6NTQ	W8KTG
290	240	K1PVB	WA7EFS	WA9YEY		W4EAL	W9LAA	W9AE
W1YRC	K3JLI	K2AHQ	W9GHO	W0AGK				
WA2JBV	K4GLA	K4IE	W9MCR	YU2LA				
		K5MWH	WA9SLO	ZL2ASM				

Endorsements issued for confirmations credited from April 1, 1970 through April 31, 1970 are listed below. Endorsement listings from the 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. The columns below cover radiotelephone.

During the ARRL Board Meeting, held in May, the matter of the DXpedition requirements was informally discussed. As a result, we are glad to announce that as of May 1, 1970, the requirement that *all* DXpedition-type operations be approved before DXCC credits can be given has been lifted and only those about which some question arises will be asked to do so.

For this reason, DXpeditioners are urged to continue to pay close attention to maintaining records so that if documentation becomes necessary they will be able to do so.

ARRL QUALIFYING RUNS

Any person can apply for an ARRL code proficiency award. Neither League membership nor an amateur license is required. Send copies of all qualifying runs to ARRL for grading, stating the call of the station you copied. If you qualify at one of the six speeds transmitted (10-35 wpm) you will receive a certificate. If your initial qualification is for a speed below 35 wpm, you may try later for endorsement stickers. Each month the ARRL Activities Calendar notes the qualifying run dates

DX CENTURY CLUB AWARDS

Honor Roll

The DXCC Honor Roll consists of the top ten numerical totals in the DXCC. Position in the Honor Roll is determined by the first number shown. The first number represents the participant's total countries less any credits given for deleted countries. The second number shown represents the total DXCC credits given including deleted countries. All totals shown represent submissions received through April 30, 1970 and are shown alphabetically by call.

DL1IN	322/340	K6EC	319/335	WA2IZS	318/336	G3HDA	316/330	W6ANN	315/337
G3FKM	322/341	K7GCM	319/329	WA2RAU	318/321	IT1TAI	316/334	W6CHV	315/336
W4VPD	322/341	LU4DMG	319/337	W3GRS	318/332	JA1DM	316/333	W6ZSY	315/321
W5ABY	322/341	LU6DJX	319/348	W3NKM	318/337	K1SHN	316/322	W8ARH	315/320
W6AM	322/349	ON4DM	319/340	W3RNQ	318/338	K6AN	316/339	W8DMD	315/339
W7KH	322/347	W1BAN	319/334	W4ML	318/340	K6OJ	316/339	W9AMU	315/333
W8BF	322/345	W1CLX	319/344	W5KBII	318/338	K6VVA	316/327	W9WYB	315/331
W9IBI	322/343	W1HX	319/341	W6DZ	318/333	K6YRA	316/320	W@NLY	315/333
W@BW	322/345	W1MV	319/338	W6GPB	318/341	K8LSG	316/329	YV5BOA	315/318
G8KS	321/341	W2BQM	319/334	W6ID	318/339	K8ONV	316/327	DL1KB	314/335
HB9J	321/347	W2CP	319/327	W6KUT	318/340	KP4RK	316/328	G3DO	314/338
HB9MQ	321/341	W2DXX	319/327	W6TA	318/334	LA7Y	316/340	GI3JIM	314/328
K2BZT	321/340	W2JVU	319/342	WA6GLD	318/321	V63KB	316/341	K2DCA	314/333
OE1FK	321/345	W2PCI	319/338	WB6OOP	318/325	W1AZY	316/333	K2YLM	314/316
VE2NV	321/340	W2RGV	319/337	W7IG	318/328	W1JNV	316/335	K4JC	314/319
W1GKK	321/348	W2SSC	319/337	W7OE	318/337	W1JYH	316/341	K4PDC	314/330
W2CTO	321/343	W2SUC	319/338	W8EV	318/338	W2GQN	316/319	K4BGM	314/317
W2NUT	321/339	W2TP	319/340	W8QUR	318/337	W2LAX	316/335	K9ECE	314/325
W4GXB	321/344	W3LMA	319/343	W8WZ	318/342	W2MJ	316/330	PY2CQ	314/317
W4OM	321/345	W3LMO	319/334	W9ILW	318/327	W2QHH	316/339	PY2NO	314/317
W4PLL	321/338	W3WGH	319/336	W@CIZ	318/324	W3DJZ	316/326	SM3BIZ	314/333
W5POA	321/341	W4DQS	319/328	W@PNO	318/342	W3EVW	316/340	VE2BV	314/333
W6CYY	321/341	W4MR	319/340	DJ2BW	317/336	W3MWC	316/332	VK4OM	314/339
W6KZL	321/339	W5KC	319/344	K1IXG	317/326	W4AVY	316/340	W1CBZ	314/331
W6PL	321/340	W5UX	319/336	K2OFA	317/335	W5GC	316/327	W2BMK	314/328
W6ZO	321/344	W6OSU	319/333	K@EZH	317/321	W5HE	316/319	W2EZY	314/329
W7AQB	321/335	W6TZD	319/341	W1HFI	317/330	W5OLG	316/339	W2NQ	314/320
W7MB	321/347	W6UOV	319/335	W2BXA	317/343	W6BSY	316/334	WA2OJD	314/330
W8IIN	321/348	W6WX	319/328	W2CR	317/336	W6KOZ	316/336	WB2HXD	314/317
W8MPW	321/341	W7CMO	319/331	W2EXH	317/325	W6LZI	316/323	W3MP	314/339
W8UAS	321/344	W8UAW	319/345	W2EXA	317/322	W6HOC	316/331	W3MQ	314/321
W9BG	321/348	W8EWS	319/345	W2JT	317/338	W6HX	316/341	W4AAU	314/345
W9NDA	321/347	W8KIA	319/345	W2LV	317/338	W6SQP	316/333	W4IC	314/321
K4IJL	320/331	W8NGO	319/338	W2PV	317/321	W7ENW	316/342	W5HDS	314/333
PA@EX	320/342	W8YCP	319/342	W2QM	317/334	W8EVZ	316/321	W6HYG	314/328
PY2CK	320/345	W8ZCQ	319/335	W2WMG	317/330	W8KIT	316/324	WA6UPQ	314/321
W1BIH	320/346	W9IWQ	319/344	W3AEM	317/329	W8KPL	316/336	W8DE	314/317
W1DK	320/339	W9GFE	319/334	W3CGS	317/338	W@AIH	316/333	W9EKC	314/337
W2WZ	320/345	W@ELA	319/344	W4BYU	317/337	W@LWG	316/330	W9IUV	314/336
W3GAU	320/345	W@PGI	319/337	W4NJF	317/322	W@NVZ	316/330	W9MQK	314/328
W3KT	320/346	DL6EN	318/338	W4UM	317/341	ZL1HY	316/342	W@BN	314/322
W4AIT	320/345	DL7AA	318/342	W5AO	317/338	G5VT	315/338	YV5AB	314/335
W4BJ	320/344	DL9OH	318/331	W5GR	317/339	HB9TL	315/333	DJ7ZG	313/316
W4LRN	320/334	GI3IVJ	318/335	W5KTW	317/323	HAMU	315/336	G6TA	313/330
W4OPM	320/347	JA1BK	318/328	WA5EEL	317/321	K2UVU	315/330	K4AIM	313/329
W5MMK	320/343	K2LWR	318/333	W6EL	317/322	K2YXY	315/324	W1DGI	313/321
W5QK	320/333	K4LWF	318/326	W6LN	317/339	K4ICK	315/329	W2PDB	313/326
W6BZE	320/342	K6LGE	318/332	W6MVL	317/330	K6DC	315/333	W2TQC	313/334
W6CUQ	320/347	K8IKB	318/331	W6RFH	317/325	K6EV	315/319	W2ZTV	313/315
W6EPZ	320/343	K@KYF	318/328	W6RKP	317/333	K7ADL	315/322	WB2CKS	313/316
W6NJU	320/336	K9LUI	318/327	W8CUT	317/326	OH2NB	315/338	W4JDR	313/331
W6WWQ	320/339	W1CKA	318/330	W8ONA	317/335	ON4NC	315/338	W4LVV	313/335
W7AU	320/346	W1FZ	318/339	W9GIL	317/336	VE3CFG	315/331	W5AFX	313/340
W7PHO	320/340	W1GYE	318/335	W@HB	317/334	W1GT	315/320	W5FFW	313/333
W8BT	320/339	W1HZ	318/338	W@HUZ	317/339	W2CYS	315/339	W5GO	313/319
W8PHZ	320/337	W2AGW	318/344	W9RCJ	317/331	W2EXN	315/331	W5PWW	313/327
W9LNM	320/345	W2BOK	318/337	W9SER	317/334	W2YTH	315/335	W6IBD	313/336
W@DU	320/344	W2GKZ	318/322	W9YFV	317/343	W2ZGB	315/332	W6ISQ	313/321
W@MLY	320/338	W2HQ	318/336	W@BFB	317/337	WA2EUS	315/321	W6YY	313/335
W@QGI	320/338	W2HTI	318/336	W@BMQ	317/332	W3EUR	315/334	W7ADS	313/342
W@SYK	320/340	W2OKM	318/338	W@KF	317/336	W4RLS	315/321	W8BRA	313/338
CE3AG	319/345	W2RDD	318/334	CR6BX	316/335	W4SSU	315/325	W8CC	313/320
DL3RK	319/338	W2SAW	318/337	DL7BA	316/335	W5OGS	315/333	W8KBT	313/328
G4MJ	319/338	W2YY	318/328	G2BOZ	316/336	W5UKK	315/331	W@GKL	313/340
I1ZL	319/333	W2ZX	318/339	G2RVN	316/336	W5WZQ	315/331	4X4DK	313/333
K4LNM	319/335			G3HCT	316/329				

Radiotelephone

W8BF	322/345	K9LUI	318/327	K1IXG	317/326	G3HVI	315/330	W6RKP	314/325
W6GVM	321/344	LU4DMG	318/336	K8RTW	317/328	HAMU	315/336	W6ZJY	314/320
W8GZ	321/346	ON4DM	318/339	W1ONK	317/335	K6YRA	315/319	WA8AJI	314/317
W6AM	320/346	OI2HP	318/342	W4OM	317/335	PA@HBO	315/330	YV5AB	314/335
W5BT	320/339	W1BAN	318/332	WA5EEL	317/320	W2EXH	315/321	/PSCF	314/332
DL1IN	319/336	W1JFG	318/335	W6FI	317/321	W2JT	315/331	G3DO	313/336
K4IJL	319/330	W2BXA	318/342	W6REH	317/321	W3WGH	315/326	G5VT	313/336
PY2CK	319/344	W2HTI	318/335	W8QIR	317/336	W4ANE	315/332	G6TA	313/329
W2TP	319/327	W2RGV	318/334	W9NZM	317/323	W4NJF	315/320	HB9TL	313/330
W4PDL	319/331	W2YY	318/322	5Z4ERR	317/341	W5KBU	315/334	K2YLM	313/315
W6BAH	319/331	W2ZX	318/339	K6LGE	316/328	W8JIN	315/332	W2ZTV	313/315
W6NDA	319/341	WA2RAU	318/321	W2PV	316/320	W8UAS	315/335	W3KT	313/334
W@BW	319/336	W4RJS	318/345	WA2IZS	316/325	OE1ME	314/329	W5PQA	313/330
W@CM	319/338	W7PHO	318/338	W4NKM	316/334	ON4DH	314/332	W6YY	313/335
G3EKM	318/334	W8MPW	318/329	W5GC	316/327	PY4TK	314/331	W7CMO	313/318
G6KS	318/334	W9UIW	318/327	W9WHM	316/334	VK5MS	314/336	W9DWQ	313/318
K9KYF	318/328	DJ2YI	317/334	W@GAA	316/321	W2BQM	314/329	W9RNX	313/333
		DL9OH	317/330	OL6EN	315/330	W3DJZ	314/320		

W1AW SCHEDULE, JULY

The ARRL Maxim Memorial Station welcomes visitors. Operating-visiting hours are Monday through Friday 1 P.M.-1 A.M. EDST, Saturday 7 P.M.-1:00 A.M. EDST and Sunday 3 P.M.-11:00 P.M. EDST. 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.

	Sunday	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*	*Saturday*
0000	.....	← C.W.-OBS[1] →					
0020-0030[4]	.....	.....	3.700[6]	14.020	14.020	7.150[6]	14.020
0030	.....	.....	3.700[6]	14.100	14.100	7.150[6]	14.100
0100	.....	← Phone-OBS[2] →					
0105-0130[4]	.....	.....	3.820	50.120	145.600	1.820	21.270
0130	← CODE PRACTICE DAILY[1] (35-15 wpm TThSat), (5-25 wpm MWFSn) →						
0230-0300[4]	.....	.....	3.555	.....	1.805	.....	3.555
0300	RTTY-OBS[3]	.....	← RTTY-OBS[3] →				
0310-0330[4]	.....	.....	3.625	14.095	7.095	14.095	3.625
0330	Phone-OBS[2]	.....	← Phone-OBS[2] →				
0335-0400[4]	.....	.....	7.220	3.820	7.220	3.820	7.220
0400	CW-OBS[1]	.....	← C.W.-OBS[1] →				
0420-0430	.....	.....	3.700[6]	7.020	3.945	7.150[6]	3.520
0430-0500	.....	.....	3.700[6]	7.080	3.945	7.150[6]	3.555
1300	.....	← CODE PRACTICE[1] (5-25 wpm MWF), (35-15 wpm TThSat) →					.....
1700-1800	.....	21/28[5]	21/28[5]	21/28[5]	21/28[5]	21/28[5]	.....
1900-2000	.....	14.280	7.255	14.280	7.255	14.280	.....
2000-2100	.....	14.100	14.280	14.095	21/28[5]	7.080	.....
2200-2300	.....	21/28[5]	21.100[6]	21/28[5]	7.255	14.280	.....
2300-2330	.....	.....	.....	RTTY OBS[3,7]	.....	.....	.....
2330	← CODE PRACTICE DAILY[1] 10-13-15 w.p.m. →						

[1] CW OBS (bulletins, 18 wpm) and the code practice on 1.805, 3.52, 7.02, 14.02, 21.02, 28.02, 50.02, and 145.6 MHz.
[2] Phone OBS (bulletins) 1.82, 3.82, 7.22, 14.22, 21.27, 28.52, 50.12, and 145.6 MHz.
[3] RTTY OBS (bulletins) 3.625, 7.095, 14.095, 21.095 and 28.095 MHz.
[4] Starting time approximate. Operating period follows conclusion of bulletin or code practice.
[5] Operation will be on one of the following frequencies: 21.02, 21.08, 21.27, 21.41, 28.02 or 28.52 MHz.
[6] W1AW will listen in the Novice segments for Novices, on the band indicated, transmitting on the frequency shown.
[7] Bulletins sent with 170-Hertz shift, repeated with 850-Hertz shift.
Maintenance Staff; W1s QIS WPR. * Times-days in GMT. Operating frequencies are approximate.

for W1AW and W6OWP (W6ZRJ, alternate) for the coming 3-month period.

W1AW will simultaneously transmit a qualifying run on 1.805 3.52 7.02 14.02 21.02 28.02 50.02 and 146.6 MHz at 0130 GMT July 16. (In converting, 0130 GMT July 16 becomes 2130 EDST July 15.)

W6OWP (W6ZRJ, alternate) will transmit a qualifying run on 3590 and 7129 kHz. 0400 GMT July 2. (In converting, 0400 GMT July 2 becomes 2100 PDST July 1.)

W1AW CODE PRACTICE

W1AW transmits daily code practice according to the following schedule, showing speeds, local times/days and GMT times/days. For practice purposes, the order of words in each line may be reversed during the 5-13 wpm transmissions. (Each tape carries a checking reference.)

Speeds	*Local times/days*	*GMT times/days*
10,13,15	7:30 P.M. EDST daily 4:30 P.M. PDST	2330 daily
5,7½,10, 13,20,25	9:30 P.M. EDST Sn[TTh 6:30 P.M. PDST Sat	0130 MWFSn
"	9:00 A.M. EDST MWF 6:00 A.M. PDST	1300 MWF
35,30,25, 20,15	9:30 P.M. EDST MWF 6:30 P.M. PDST	0130 TThSat
"	9:00 A.M. EDST TTh 6:00 A.M. PDST	1300 TTh

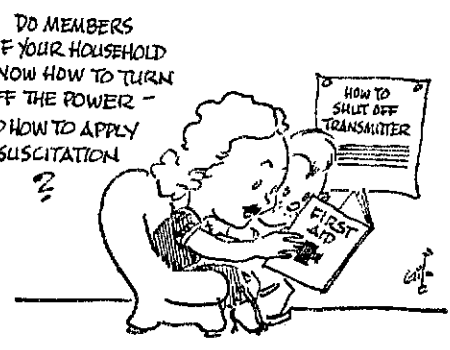
The 0130 GMT practice is omitted four times a year on designated nights when Frequency Measuring Tests are made in this period. To permit improving your first by sending in step with W1AW (but not over the air!), and to allow checking the accuracy of your copy on certain tapes, note the GMT dates and May *QST* practice text to be sent in the 0130 GMT practice on the following dates.

July 10:	It Seems to Us, p.9
July 14:	A Nearly Full Size, Rotatable, Quad for 80 meters, p. 16
July 22:	An Audio Filter for CW, p. 51
July 30:	Amateur Radio Public Service, p. 64

The subject of practice text for the following sessions is *Understanding Amateur Radio, First Edition.*

Aug. 3:	New Equipment, p. 132
Aug. 7:	Forethought, p. 33

QST



Station Activities

• 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, John L. Penrod, K3NYG – SEC: PAM; W3DKX. RM: W3LEB. Delaware Hamfest will be held Aug. 16 at Banning Park. K3GKF visited QEI-Land. W3EPG is back home in Rehoboth Beach. W3BIG worked Missouri on 2 meters for state No. 31. W3BDP has a new 75 SI receiver. W3HKS enjoyed working in the Apr. CD Party. WA3GSM is preparing his rigs for Field Day and promises no upside operation this year. WA3IIS was the winner of the Maverick ARC DX Contest. W3UDR is about to take the wedding vows. K3JLY has a new HW17A on 2 meters. W3DKX is now mobile. WA3BAO has been holding skeds with W3CGV on 432 MHz. WA3DYG is moving his QTH. Traffic: W3DKX 31, WA3DUM 10, K3NYG 4.

EASTERN PENNSYLVANIA – SCM, George S. Van Dyke, Jr., W3HK – SEC: W3ICC. RMs: W3EML, K3MVO, W3MPX. PAMs: K3PSO, WA3GLI. VHF PAM: W3FGQ. OO reports were received from WA3IUV, K3DRT, W3KEK, W3FGQ; OBS reports from WA3AFI, W3CBH, WA3EMI, WA3IKO, WA3NVO, WA3JKB; OVS reports from WA3KQX, WA3EMI, WA3NVO, WA3KFT, W3CL, K3WEU, W3FGQ. 6PLers: WA3HBT, WA3EMI, WN3LEI, W3EML, W3MPX. PSHR: WA3CKA, W3MPX, WA3IYC, W3EML, WA3HBT, WA3EMI, K3MVO.

Net	*Freq.Operates QNI*	*QTC RM PAM*
EPA	3610 kH26:45P Dy312	264 W3MPX
PFTN	3610 kH26:00P Dy193	122 W3MPX
EPAEP&TN	3917 kH26:00P Dy369	165 WA3GLI
PFN	3960 kH25:30P M-F488	150 K3PSO
Novice 40	7170 kH24:00P Dy 86	176 WN3LEI
Novice 80	3726 kH27:30P Dy164	101 WA3QSH

W3EML reports high level nets about normal. W3MPX is working on his HW-12 chasing kinks. WA3AFI reports two new Novices. WA3AFQ and K3YJK were honored guests at the Annual Luncheon of the Delaware Valley Lye Bank for its continued work in their nets. WA3CKA is almost as busy keeping his gear working as he is on nets. WA3JKB has a new TR106 trans. K3OEN is using a new SB-101. The 80-Meter Novice Net now is called the Eastern Area Slow Net. W3EU was busy painting his towers. WA3KFT reports some real DX on recent 6-meter openings; he also drew a blank in the CD Party on 6-meter cw. WA3HSV will be in the Philadelphia area during the summer. Don't forget the Novice and vhf nets. They need your QNI once in a while and, more than that, they need your QTC to keep interest up. WA3MKQ and W3KCM have a chess thing going on 40 meters. If you are interested, check into ECARS anytime and ask for details. WN3OIS is eager to get into traffic. K3LBG wants to compare notes with other QRP operators. WA3JNM is busy chasing after that big 58DXCC. W3PQB is working on a high-power final for 6. WA3OBW, a newcomer to the Philadelphia area, is looking for active clubs so he can get busy. A reminder – the deadline is the 10th of each month so I can mail to ARRL the 11th. W3MPX has been looking for relief from RM duties for PTTN. WA3JWL, WA3AFI, WA3MKQ, WA3EMI and WA3JGN have volunteered for the job. All ORSs will be contacted for their comments on replacement. When you get your ballot let's reply 100%! Traffic: (Apr.) W3EML 594, W3MPX 455, WN3LEI 314, WA3EXW 271, WA3MKQ 188, WA3EMI 177, WA3HBT 166, WA3LMO 133, K3MVO 89, WA3AFI 77, WA3AFQ 69, K3PSO 64, WA3GUK 62, WA3LAK 47, W3HNK 45, W3NNL 36, WA3CKA 34, W3FGQ 28, WA3CFU 26, WA3IYC 25, W3VA 24, W3VAP 23, W3ADE 20, WA3JZB 16, W3CBH 11, W3ISX 11, W3EPG 10, WA3JKB 10, K3KTH 9, W3OY 9, W3YR 9, WA3HGX 8, W3BNR 6, W3HK 6, K3YVG 6, W3KCM 5, K3OEN 5, WA3IUV 4, WA3JKO 4, WA3BJO 3, WA3NVO 3, WA3IAZ 2, W3OML 2, WA3BSV 1, W3EU 1, W3KEK 1, WA3KFT 1, WA3KQX 1. (Mar.) WA3LMO 84.

MARYLAND - DISTRICT OF COLUMBIA – SCM, John Munholland, K3LID – SEC: W3LOY.

Net Schedules

Net	*Freq.*	*Operates* *Wkr.*
MDD	3.643	Dy 7:00 P.M. K3JYZ/RM
MDDS	3.643	DY 8:30 P.M. W3CBG/RM
MDCTN	3.920	STTS 6:00 P.M. WA3GXN/PAM
MEPN	3.920	MWF 6:00 P.M. K3JAG SS 1:00 P.M.
MTMTN	145.206	Tu-Sa 9:00 P.M. W3HW

PSHR (Apr.): W3EZT. New appointment: K3GPN as ORS. Endorsements: W3JPT, K3STU and K2DEB/3 as OOs; W3EWP as ORS. SEC W3LOY reports 303 AREC members in the section with EC K3CMY and his Montgomery County gang well out in front with 62. Welcome to Maryland to WA3OMX(KG6APL). W3JPT is busy getting AMSAT Oscar B ready to be Oscar 6. W3ZNW is operating RTTY on vhf and keeping MDDS on the air while W3CBG does a little overseas flying. W3FCP was ORT for a few days of illness. WA3MMX is convalescing after surgery at Aberdeen Proving Grounds. W3CDQ works DX on an indoor dipole. W3FOV is all set to make the rounds of all hamfests and MARSfests within mobiling range this summer. WA3IJR got his WAS certificate. K3WRH is helping operators at Maryland's School for the Blind with installation and operation of a real fine station on 2 meters under the call WA3NPD, and looking for contacts to QSL. The B&O Banquet was great fun for about 80 members and guests on May 2. W3PVW, WA3HEN, K3TBD and W3LBC put on a really big show of awards, films and slides and K3IOM became the new club pres. The FAR Hamfest is scheduled for Sept. 21 at Gaithersburg Fairgrounds. Congratulations to WN3LLZ and the New Carrollton Amateur Radio Assn. in Riverdale on affiliation with the ARRL. Best wishes for a successful term to the new officers of the Foundation for Amateur Radio: WA4PBG, pres.; W3JPT, vice-pres., W3CDQ, 2nd vice-pres.; W3CPM, treas.; and K4LMB, secy. The Maydale Amateur Radio Club will sponsor the Fifth MD-DC QSO Party from 2200 GMT, Aug. 1 to 2200 GMT Aug. 2, 1970. Contest rules and suggested frequencies appear elsewhere in this issue. Mark your calendar now and don't miss the MDC Traffic Net Picnic on July 26 in Shelter 301 just off U.S. Route 40 in Patapsco State Park. W3EZT is now running a Heathkit SB-301/SB-401 combo. Traffic: WA3JIR 162, W3TN 143, K3LFD 85, W3LZT 82, W3JCS 82, W3EA 66, WA3GXN 27, W3ZNW 24, W3LOY 22, K3GZK 20, WA3IIV 20, W3EOV 18, WA3IHW 16, K3ORW 16, W3LCP 15, WA3LKJ 14, W3ZSR 2, WA3AJR 1, W3GLB 1.

Maryland-D.C. QSO Party

This contest, sponsored by the Maydale Amateur Radio Club (MARC), will take place from 2100 GMT August 1 to 2200 GMT August 2, 1970. It is open to all amateurs. Stations may be worked once on each band/mode. Separate logs must be submitted for each mode. Cross logs should be kept to eliminate duplication of contacts. The exchange will be QSO number, RS(T) and county for Md.-D.C. stations. (Independent cities such as Baltimore and Wash. D.C. count as separate counties.) All other stations send QSO number, RS(T) and ARRL section or country as applicable. A readable copy of the station log must be sent, showing contest station call and location, numbers exchanged, time, date, contacted station call, reports, county and/or section or country. Suggested frequencies: 3575 7075 14075 21075 cw, 3850 7275 14275 21325 phone. 3735 7175 21110 Novices, 50.175 145.175 Techs. Scoring system: Md-D.C. stations one point for each number sent, one point for each number received, multiplied by each different ARRL section or country. Other stations score one point for each number sent, one point for each number received, multiplied by each different Maryland county or independent city (25 total). Awards: Certificates will be awarded to the highest scoring station in each ARRL section or country, separate awards for phone and cw. When more than 6 stations submit logs from one section, second place will be awarded; more than 10 logs, third place will be awarded. The mailing deadline is before Sept. 1. Send your log to Carl E. Andersen, K3IYZ, 14601 Claude Lane, Silver Spring, Maryland 20904. Your name and address must be shown in block

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					Plate Volts	Plate Amperes		
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4CX600F	26.5							
4CW800B	6.0	890	5-PIN SPEC.	Liquid	3000	0.6	750W	WIDEBAND AMPLIFIER SERVICE
4CW800F	26.5							
8CX600J 8809	6.0	150	OCTAL SPEC	Air	3000	0.6	750W	CLASS AB-1 LINEAR SERVICE

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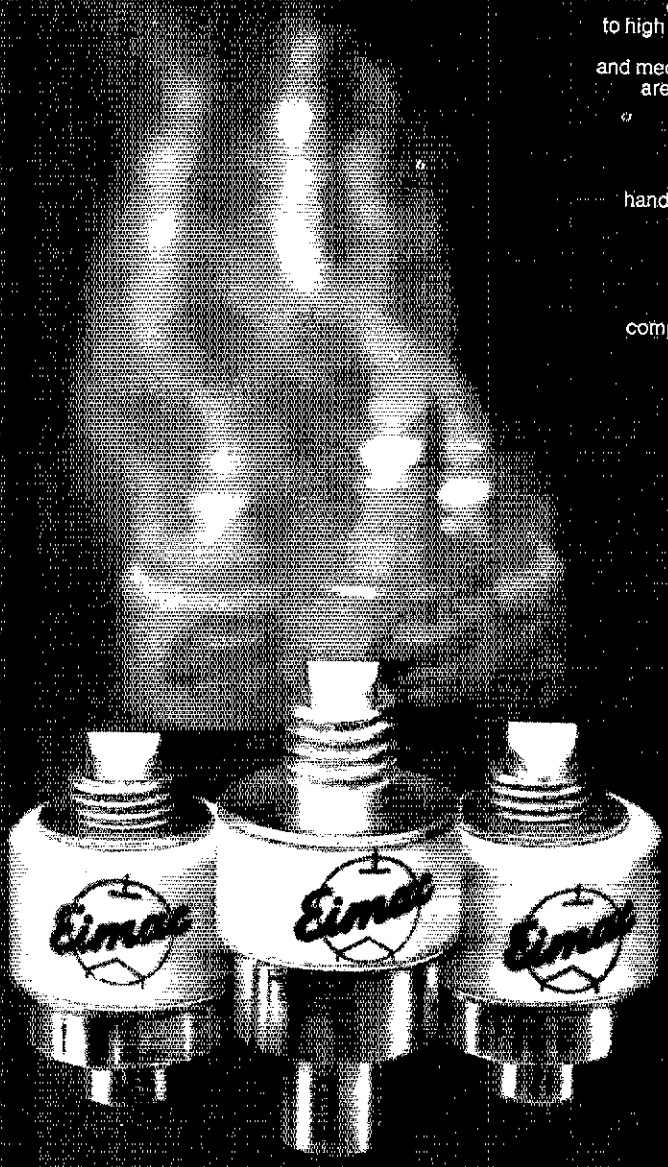

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letters along with a signed statement that the operator observed all regulations of his country and that the decisions of the contest committee will be accepted as final. Logs become the property of the MARC and will not be returned. Enclose an s.a.s.e. if you desire a contest summary.

SOUTHERN NEW JERSEY – SCM, Charles E. Travers, W2YPZ. SEC: W2LVW. RMs: WA2KIP, WA2BLV. PAMs: WB2UVB, W2ZI. The South Jersey Radio Assn. concluded its fiftieth anniversary celebration on Apr. 22 with a very enthusiastic meeting and a very interesting exhibit of "early" radio ham gear. Among the speakers was George Grammer, a member of the ARRL Staff for many years and now retired. George mentioned various interesting experiences in his years of excellent service and many contributions to the ham fraternity. It is hoped that the South Jersey Radio Assn. will enjoy even greater success and progress in the coming fifty years. The NEPTN reports 30 sessions, 567 QNIs and 239 pieces of traffic. WB2DRG is listed on the Public Service Honor Roll with a total score of 46 for the month of Apr. Randy has done excellent work in spite of being confined several times this winter for health reasons. The Penn-Jersey YL Club held its May 20 meeting at the QTH of WA2EGS, who is the only New Jersey member. Rose Ellen is also a valued and active member of the New Jersey State RACES Net, representing the Salem County Unit. This unit can proudly boast 100% check-in to the weekly net which convenes on 3996.5 kHz each Sun. at 1300 local time. This net is controlled from State Headquarters at Trenton, N.J. The program will feature color slides taken by W2QWC on a recent 30,000-mile world trip. Okie is a very dedicated member of the ham fraternity. Some of our previously active members who are still in our thoughts are W2ZI, WA2KIP, WA2KAP, W2DNF, W2ZZ, W2JI. It is hoped that these operators can join us again soon. Regular reports are acknowledged from W2FBF (OO) and K2ARY (OBS). Traffic: W2PU 110, WB2VEJ 96, WB2DRG 62, WB2GDY 48, W2BLM 33, W2YPZ 20, W2IU 7, WB2SFX 3, WA2KIP 2.

WESTERN NEW YORK – SCM, Richard M. Pitzeruse, K2KTK – Asst. SCM: Rudy M. Ehrhardt, W2PVI. SEC: W2RUF. RMs: W2FR, W2MTA, W2RUF, K2KIR. PAMs: WA2CAL, WB2RHJ. Section nets:

Net	*Freq.*	*Local Time*	*Days*	*Mgr.*
NYS	3675	1900/2200	Daily	W2MTA
NYSPTEN	3925	1800	Daily	K2SPO
NYPON	3917	1645	Daily	K2KQC
NYPON (CW)	3790	1830	Daily	WA2CAL
NYSCN	3677	1945	M-Th-F	W2ROF
NYSCN	3677	1000	Sunday	W2RUF
ESS	3590	1800	Daily	WA2VYS

Appointment renewals are W2IDM as EC and OVS, WB2YEE as OPS and WA2BEX as ORS. RAWNY elected W2PLG, pres.; W2WRR, veep; WN2GPO, secy.; W2TAX, treas. W2TGY enjoyed a mobile vacation through 45 states. We understand W2PVI contemplates a maritime-mobile type vacation through New York State waterways. The WNY Emergency Net elected K2HYQ, mgr.; W2JR, asst. mgr.; K2DWI, secy. Sorry to report the passing of W2ZQO. WB2QGK monitors 7255 and 146.94 most of the time during the day down Ithaca way. Dave is looking for a 28ASR teletype for his home station, W2CFP. The entire fm population of Tompkins County attended the Dayton Hamvention (all three of them). W2EMW has reached 300 confirmed and vows to slow down now on the DXCC hunt. K2KBI has also submitted the necessary pasteboards for the 300 country plateau. W2RUT remains active in NYSCD and NYSCN. W2AEB fathered three new Novices into ham radio. W2IDM is busy reorganizing the St. Lawrence County AREC unit. WB2YEE is struggling with his rig as it seems to have a touch of laryngitis. W2RQF has similar problems and is reactivating an old Army set to stay with it. WB2EPG is getting married on Field Day week end. WA2GLA is QRS because of family illness. SIARC had a successful display at the District Scout-O-Rama in Canandaigua. WB2DKA expresses his concern for the dogs at the RARA Hamfest flea market. WA2ICB is a busy boy on ESS. Congratulations to WA2DHS and WA2ICU on taking first and second places in the code contest at the RAGS Hamfest. Traffic totals for April hit an all-time low. W2OE continues adding to his collection of BPL cards. PSHR goes to W2s FR, MTA, RUF, QC, K2s KIR and KTK, WA2s CAL and ICU. Traffic: W2OE 321, W2QC 272, WA2CAL 264, W2FR 244, WA2ICU 114, K2KIR 111, W2RUF 98, WA2DHS 94, WB2SMD 91, W2MTA 89, WA2BEX 58, W2FEB 53, K2RTO 32, W2ROF 27, WA2KAT 22, WB2YEM 19, WA2HJY 16, W2AEB 15, K2OFV 14, W2DBU 13, K2DNN 11, K2KTK 11, K2IMI 9, W2PVI 9, K2BWK 7, WA2IZZ 7, W2PZL 7, WA2ANF 6, WB2EPG 4, W2EMW 3, WB2YEE 2, W2RUT 1. Total 2044. Last Year 3354.

WESTERN PENNSYLVANIA – Acting SCM, George R. Stoneburner, WA3AKH – SEC: W3KPJ. PAMs: W3WFR, K3ZNP. RMs: WA3AKH, W3KUN, W3LOS and W3NEM. Traffic nets: WPA, 2300 GMT 3585 kHz and WPP, 0200 GMT 3955 kHz daily. Both nets need additional coverage and would welcome your participation. WN3ONT and WN3ONU are a father-and-son combination in Conway. K3BSY visited AX3XB and AX3KS while on leave from Vietnam. The Steel City Club reports that 14 of its members are active on 146.94 fm in the Pittsburgh area. Activity on that frequency is gaining in Erie. WA3KFX, WA3GMN and VE5SM are recent recipients of the Erie, Pa. award. Top engineering prize in the Buhl Planetarium Science Fair went to WA3HIS, while younger brother WA3LQE won first place in the junior division. The Uniontown ARC held a dinner in honor of Bill Henzly for his long and devoted service as club treasurer. The new civil defense facilities in Indiana have been completed. The equipment includes a KWM-2 and a 30L-1. The West Able Net of the cd meets each Sun. at 1400 GMT on 3,990 MHz. You do not need a RACES ticket to check in. W3LOD closed a 44-year utility career with the Pennsylvania Electric Co. when he retired at the end of Apr. W3TVW entertained the members of the Etna ARC with slides and movies of his radio-controlled boats. Those of the submarine were particularly interesting. Also from the Etna club we learn that W3VW has new Collins gear, that W3MLY has retired and now has ample time to pursue his favorite pastime, that W3TOC is DXing on 10 and that WA3JER is the newest club member. The Indiana University of Pennsylvania ARC announces the appointment of WA3KSA and W3CFC as co-advisors.

Net	*Sess.*	*QNI*	*Traffic*
WPA	30	356	121
KSSN	18	94	33
WPP	26	89	23

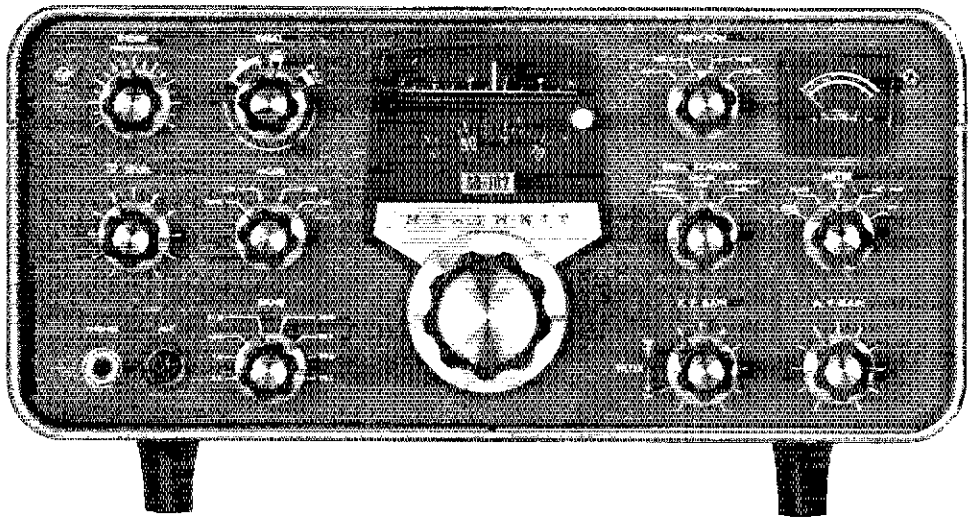
Traffic: (Apr.) WA3IPO 178, W3LOS 102, W3KUN 88, WA3AKH 87, K3ZNP 71, K3SOH 33, K3SMB 25, WA3IBN 24, W3UT 15, WA3EXX 14, W3YA 12, K3ZOB 10, W3A1Q 8, W3UHN 7, K3VQV 6, WA3BLE 5, K3SJN 4, W3SN 4. (Mar.) K3VQV 11, WA3NAZ 3.

CENTRAL DIVISION

ILLINOIS – SCM, Edmond A. Metzger, W9PRN – SEC: W9RYU. RM: WA9ZUE. PAMs: WA9CCP and WA9PDI (v.h.f.). Cook County EC: W9HPG. Net reports:

Net	*Freq.*	*Times/Days*	*Tfc.*
IEN	3940	1400Z Su	18
ILN	3760	0000Z Dy	145
NCPN	3915	1300Z M-Sa	115
NCPN	3915	1800Z M-F	441
Ill. PON	3915	2245Z M-F	
Ill. PON	3915	1430Z M-F	
Ill. PON	145.5	0200Z M,W,F.	12
Ill. PON	50.28	0200Z M.	0
Gt. Lakes	3932	0230Z Dy	109

W9PRN was elected pres. of the Springfield District 186 School Board. W9EBY was also elected pres. of the Riverton School Board. The Starved Rock Radio Club Hamfest was held June 7 with a very EB turnout as usual. K9YST is the first female officer of the York Radio Club, having been elected secy. W9EBD gave some highlights in the field of Electrical Instrumentation at the Apr. meeting of the club. The Ninth Region Net had a traffic count of 682 during Mar. as reported by W9HRY, 9RN Mgr. The Nightly Absurdities for the Sleepy Amateur Net Assn. has been approved by the League's Executive Committee as a duly League affiliated society. W9OFQ is the newly-appointed Civil Defense Director of Mokena, Ill. W9THI, W9OPD, WA9FGP and WA9YQK are the new officers of the Wheaton Community Radio Amateurs. The Interstate Side Band Net members attending the Dayton Hamvention held a small get-together farewell dinner for W9NWK, who is retiring to the west, and a genuine Stetson was presented to him. W9LWI and K9VBK were reelected officers of Amateur Radio News Service, the national association of amateur radio club editors. A new Novice in River Grove is WN9DYY. W9LDU reports that ten Galaxy transceivers are now in operation in the Lee County RACES communications. WA9TNZ received his Advanced Class ticket. New appointees include WA9VVU as OBS and W9HKD and W9KVF as OOs. W9AZP is resting at his QTH after a short hospital seige. K9DOU has a new 4BTV and RM75S to help bring in the tough ones. The Hamfester Picnic will be held Aug. 8 at Santa Fe Park in Chicago. The Mini-Hamfest will be held Aug. 23 at Belvidere. WA9BRH and his XYL are rebuilding their QTH. W9EY is out of the hospital after receiving head injuries in a robbery attempt. W9YH is the only BPL recipient this month. Traffic: (Apr.) K9AVQ 190, W9NXC 182, WA9WNH/9 173, W9YH 154, W9EVJ 151, W9ELP 91, WA9ZUE 69, W9JXV 64, W9HOF 62, K9TXJ 57, WA9TCC 46, W9DOQ 42, W9FUN 34, WA9LDC 30, WA9NZF 30, W9PRN 18, K9RAS 18,



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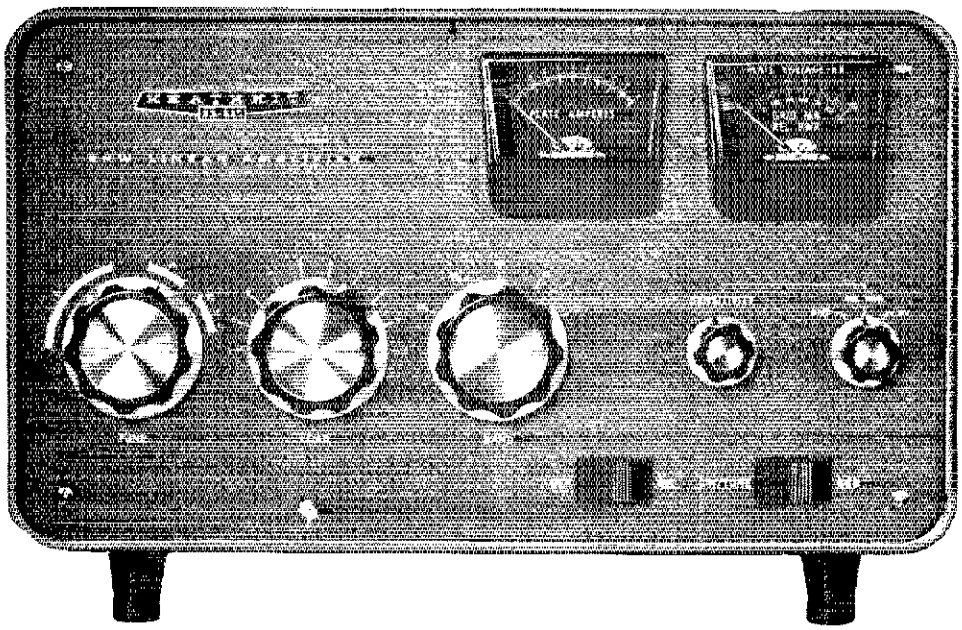

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SB-220 SPECIFICATIONS — Band coverage: 80, 40, 20, 15 and 10 meter amateur bands. **Driving power required:** 100 watts. **Maximum power input:** SSB: 2000 watts P.E.P. CW: 1000 watts. RTTY: 1000 watts. **Duty cycle:** SSB: Continuous voice modulation. CW: Continuous (maximum key-down 10 minutes). RTTY: 50% (maximum transmit time 10 minutes). **Third order distortion:** —30 dB or better. **Input impedance:** 52 ohm unbalanced. **Output impedance:** 50 ohm to 75 ohm unbalanced; SWR 2:1 or less. **Front panel controls:** Tune, Load, Band, Sensitivity, Meter switch, Power CW/Tune — SSB, Plate meter, Multi-meter (Grid mA, Relative Power, and High Voltage). **Rear Panel:** Line cord, Circuit breakers (two 10 A), Antenna Relay (phono), ALC (phono), RF Input (SO-239). Ground post. RF output (SO-239). **Tubes:** Two Eimac 3-500Z. **Power required:** 120 VAC, 50/60 cycles, at 20 amperes maximum. 240 VAC, 50/60 cycles at 10 amperes. **Cabinet size:** 14⅞" W x 8¼" H x 14½" D. **Net weight:** 48 lbs.

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W9LDU 16, WB9DPU 14, K9HSK 6, WB9AJB 2, K9DQU/WB9AIE 2. (Mar.) W9JXV 146.

Eighth Annual Illinois QSO Party

This contest, sponsored by the Radio Amateur Megacycle Society, K9CIU, will take place from 1600 GMT August 1 to 2200 GMT August 2, 1970. It is open to all amateurs. Stations may be worked and counted for a QSO point on each band and each mode. The exchange will be QSO number, RST and county for Illinois stations. Others give QSO number, RST and state, province or country. Logging information: dates, times in GMT, stations worked, exchanges, bands, modes and claimed score. A summary must indicate whether single or multioperator station, name and address of the operator clearly printed plus QSO points, multipliers and score. Suggested frequencies: approximately 3560 3735 3900 7060 7175 7260 14060 14275 21060 21110 21360 28060 28660 kHz and 145.2 MHz. Scoring system: Ill. stations score 1 point per contact with stations in or out of Ill. Stations on county lines count only 1 point per QSO, the same as any other station. Stations outside Ill. score 1 point per QSO with Illinois stations. Ill stations multiply total QSO points by the total number of states, VE provinces and countries worked. All others multiply total QSO points by the total number of different Ill. counties worked. Stations on county lines count as two or more counties. Additional bonus multipliers may be counted for working the same county. Each group of 8 contacts with the same county counts as an extra multiplier. USA, Canada, Hawaii and Alaska count as separate countries. KH6 and KL7 also count as states. Awards: In Ill., single and multiop. stations compete separately with certificates to first three places. Outside Ill., certificates to the top scorer in each state, province and country (with 2 or more valid entries). Other certificates at the discretion of the contest committee whose decisions are final. The postmark deadline is Sept. 1, 1970. Send your log to Radio Amateur Megacycle Society, K9CIU, 3620 N. Oleander Ave., Chicago, Illinois 60634. Enclose a business-sized s.a.s.e. with your entry if a summary of the results is desired.

INDIANA – SCM, William C. Johnson, W9BUO – SEC: W9FC. PAMs: K9CRS, WA9OHX and W9PMT (vhf). RMs: W9FC, W9HRY, WA9WMT.

Nets	*Freq.*	*Time(Z)/Days*	*Tfc.*	*Mgr.*
IFN	3910	1230 Dy 2300 M-F	175	WA9OHX
ISN	3910	0000 T-S 2130 M-S 2300 S-S	339	K9CRS
QIN	3656	0000 Dy	369	WA9WMT
PON	3910	1145 Su	25	WA9YXA
PON VHF	50.7	0100 Su-Th		WB9AMB
Hoosier VHF			99	W9PMT
IPN	3740	0000 Dy	65	WA9WHD

With deep regret I report the following amateurs as Silent Keys: W9AEA, W9CVF, W9EJP and W9HUV. K9DIY is on the air with a DX-100, W9UC and K9WGN sent in reports for the Feb. ARRL Frequency Measuring Test. WB9CEX passed the General Class test and will be on with an HW-100. W9VW, WA9OCO, K9VHF, K9SNQ, W9BUQ and others have all had antenna trouble. EC for Jefferson County is WA9WJA, EC for Fayette County W9BDP. The IRCC Spring Meeting was held at Butler U. Apr. 12. W9HPG, Central Division Director, was one of the speakers. SEC W9FC volunteered to be judge for the Field Day award, to be presented at the IRCC Hamfest. K9HYV, chairman of the IRCC, would like every amateur radio club in Indiana to join IRCC to further promote amateur radio. Was over to the Dayton Hamfest and visited with a few old friends. Don't forget the IRCC Hamfest at Memorial Park, Michigan City July 12. I will see you there. QIN Honor Roll: WA9ZKX 23, W9GGW 21, W9KDP 21, WA9WMT 21, W9JBQ 21, K9VHY 20, W1DRN/9 18, W9NVZ 18, W9QLW 17, W9QXF 17, WA9KAG 16. Amateur radio exists because of the service it renders. BPL certificates went to W9JYO, W9JBQ, K9EZX, W9FQO, WA9QOQ. Traffic: (Apr.) W9JYO 898, W9IBQ 771, K9EZX 664, W9HRY 301, WA9WMT 225, W9FQO 224, W9GGW 208, WA9GKX 207, WA9QOQ 178, WA9OHX 80, WA9OII 76, W9QLW 71, K9CRS 64, W9BUQ 60, W9EWH 51, WA9WJA 51, W9ICU 50, K9CBY 40, WA9VZM 37, WA9QOR 33, K9RPZ 32, W9MZV 28, K9IQY 26, K9YBM 24, W1DRN/9 23, W9YYX 19, W9CMT 18, K9VHY 18, WA9OAD 17, K9ILK 15, W9BHG 14, W9DZU 12, WA9GIZ 12, K9RWQ 11, W9HWR 9, K9KTB 8, WA9AXF 7, WA9BVL 7, WA9CHY 7, W9IC 7, W9BDP 5, K9DEY 4, W9SNQ 3. (Mar.) K9HYV 229.

WISCONSIN – SCM, S.M. Pokorny, W9NRP – SEC: W9NGT.

PAMs: WA9EZT, WA9IZK, WA9OAY, WA9QKP, WA9QNI. RMs: K9KSA, WA9TXN.

Nets	*Freq.*	*Time(Z)/Days*	*QNI*	*QTC*	*Mgr.*
BWN	3985	*1245 M-Sa	390	207	WA9OAY
BEN	3985	*1800 Dy	612	75	WA9QKP
Wi-Pon	3925	*1801 M-F	468	94	W9VCM
WSBN	3985	*2300 Dy	1248	226	WA9QNI
WSSN	3780	†0030 TTSa	94	17	K9KSA
WIN	3662	*0115 Dy	307	122	WA9TXN
WRN	3620	*0130 Su (RTTY)			K9GSC
SW2RN	145.35	*0230 Dy	211	13	WA9IZK
SW6RN	50.4	*0300 M-Sa			WA9EZT
Wi-RACES	3993	*1400 S	42		W9NRP

*All nets one hour earlier during Daylight Saving Time. We need more stations on the nets for outlets around Wisconsin, especially Milwaukee. How about some more activity on the WRN (RTTY)? The Wisconsin Amateur Radio Picnic, sponsored by the WNA and hosted by the Yellow Thunder ARC will be held at Baraboo, Wis., July 12. Certificates were issued to K9RFZ as EC for Manitowoc County and WAØVKI/9 as OPS and ORS. A net certificate was issued to K3OAE/9 for WIN, K9GDF and WA9NBU renewed appointments as OPS. W9ZBD renewed as EC for Dane County, Wis. SCM attended the Greater Beloit ARC Apr. 15 meeting. Wis. SCM and SEC attended the Neenah-Menasha ARC Apr. 25 meeting. How about some OO reports? Club news and other activities are requested for this column. Traffic: (Apr.) WAØVKI/9 314, W9CXY 300, K9CPM 297, WA9QKP 215, W9DND 104, W9ESJ 81, K9TBY 53, K9FHI 52, W9YT 49, W9NRP 47, K9JPS 39, W9OMT 37, W9IHW 36, WA9OAY 36, W9RTP 32, W9KRO 31, K9KSA 28, WB9ABF 24, W9DXV 24, WA9PKM 21, WA9UVS 14, WA9SAB 6, WA9THF 3, WA9EDZ 2, W9ONI 2, (Mar.) WA9RAK 114, WA9ZTY 27, WB9BRF 12, W9OMT 12, WA9EDZ 5.

DAKOTA DIVISION

MINNESOTA – SCM, Larry J. Shima, WØPAN – SEC: WAØMZW. RMs: WAØURW, WAØIAW, WØAAU. PAMs: WAØMMV, WAØHRM, WAØOEJ, KØGYO. VHF PAM: WAØDWM. Minnesota section nets are listed in last month's *QST*. At the recent ARRL Board Meeting WØBUO was elected Vice-President. As a result he has resigned as Dakota Division Director. As Vice-Director I have now moved to the Director position. This will be my last column as SCM as I have submitted my resignation from this position. I have enjoyed serving as SCM and hope you will continue to support League activities in Minnesota under my successor. As of this writing, KØMVF has agreed to run for the SCM position. John has been very active in our Public Service activities. Thank you all for your support. Keep up the good work! Appointments renewed: KØLAV as EC Ramsey County, WAØOVV as EC Winona County, WØKUI as EC Goodhue County, WAØJPR as ORS. The annual PICONET/Handi-Ham picnic will be in Austin July 19. Check the nets for details. WØKNR has a new Drake T4X. Traffic: (Apr.) WAØVAS 2607, WAØVYV 253, WAØIAW 141, WAØWEZ 122, WØZHN 106, WAØOEJ 93, K0s,ZRD 86, WAØWFB 83, KØGYO 67, WAØTQT 61, WØWFA 58, WAØTPC 55, WAØNQH 53, WØAAU 51, WØZND 50, KØMVF 49, WAØRKV 47, WAØMMV 45, WAØVTZ 45, WØPAN 37, WØWAS 33, WAØYGE 33, WAØHRM 32, WØHEN 30, KØCSE 28, WØUMX 26, WAØEZQ 24, WAØUAH 24, WØFHH 22, KØFLT 19, WAØYMU 19, KØIJL 18, WØEQO 17, WNØYVT 14, WØPET 13, KØSRK 12, KØORK 11, WNØYAH 11, WAØJPR 10, WØBUO 8, WØIRJ 6, WØKNR 5, KØZXE 5, WØKLG 4, WAØRKF 4, KØZBI 4, WAØQNT 2, W0s,SZJ 1. (Mar.) KØSRK 21, WAØUTQ 9.

NORTH DAKOTA – SCM, Harold L. Sheets, WØDM– SEC: WAØAYL. ORS: KØSPH. PAM: WØCAQ. RM: WAØRSR. OO: WØBF. The NDSU Amateur Society with the help of the Fargo Club held its hamfest May 3 with the weatherman cooperating for the first time in years. Jorgensons, the ham family, all four of them, received their Worked All County award; KØSPH and WØDM, were presented a plaque and gavel by the Forx Radio Amateur Club for their amateur work; KØPVG received his All-County award also; the hidden transmitter hunt was won by some sharpies from the Twin Cities and as usual WØBF won the code speed contest. WØBUO, Vice-Pres. of the ARRL, gave a very informative talk. Congrats to the WØHSC fellows for the fine gathering and program. WNØBAY, WNØBAU and WNØAUM are new Novices in Dickinson. WNØAUM won a gold medal in the science fair and also one award from NASA. The Theo. Roosevelt ARC will be going to Lake Tachida. WØBHF is working 75-meter mobile now. WØLWJ spent some time at the Masonic Hospital in Mpls. but is back in circulation again. The NDRACES was activated for the Apr. snow storm. WØECX is retiring from active farming and plans to spend the winters in Florida. WAØTBR's XYL spent some time in the hospital in Fargo but is on the mend now. WØBHT is back on after some absence. WAØAAD, WØGFE's son, is back on with about 2 watts on 40 meters. WBØBHJ is a new ham in Grand Forks with a TR3 on the air. Prof helped him with the code and theory while WAØAYL, KØRSA and WAØVMA held an antenna party for him. He is blind and an excellent piano technician, while his XYL is a music teacher in the State School for the Blind. WØDM finished up his instruction in the Jr. High by giving 5 Novice tests the first week of May. The remainder of the year will be spent in studying procedures and the equipment in school station KØPZW.

Net	*kHz*	*CDT/Days*	*Sess.*	*QNI*	*Tfc.*
NDN CW	3640	2100 M-F	21	182	28
Goose R.	1990	0900 S	4	59	
YL WX	3995	0730 M-S	30	927	855
RACES	3996.5	1830 M-F	41	1180	102
	3996.5	0900 S	11	253	15
PON		1730 Sa-S			

Traffic: WØNMV 158, WAØHUD 137, WAØRSR 58, WØWWL 57, WAØAYL 46, WAØELO 37, WØDM 32, KØSPH 30, WAØTBR 30, WØCDO 29, KØPVG 17, WAØJPT 8, WAØSJB 6, WA7IRT/Ø 3, WAØAAD 3, WØBHT 3.

SOUTH DAKOTA – SCM, Ed Gray, WAØCPX – WØNEO and WAØPNB have copies of their South Dakota Ham Book available ($4.50 each). The book consists of some history of South Dakota ham happenings and a list of South Dakota amateurs. The list consists among other things of pictures of many of the amateurs as well as a write-up about them. Deuel County has 13 licensed amateur operators as follows: KØIWF, KØTVK, KØTXW, KØTAM, WNØYIN, WNØAMK, WNØBEP of Clear Lake; WNØAXB of Gary; WAØVQP and WNØAMH of Revillo; WAØESJ of Astoria; KØZMP of Brandt. WAØLYO has worked the 100 countries needed for DXCC. WAØYRH, of Madison, received Advanced Class ticket. A new ticket in Sioux Falls is WBØBHL, Technician. Congratulations to WAØSHA, who has received an appointment to West Point. All nets are very active with good check-ins and traffic count. A thank-you to all who turned in activity reports.

DELTA DIVISION

ARKANSAS – SCM, Robert D. Schaefer, WA5IIS – SEC: W5PBZ. RM: W5NND. PAM: WA5KJT. Welcome to new Russellville Novices WN5BHS and WN5BFH, who is W5AAI's wife. WN5BID, in Ft. Smith, worked 8 countries in his first two weeks on the air. Congratulations to WA5TLD and WA5TIY on passing the Extra; to WA5KAK, WA5VWH and WN5WMC on passing the Advanced and to WA5YHT and WN5TIW on passing the General. WA5KAK was home from Scotland and is now in Guam. WA5VNU has a new TR-4 and WA5BOI has a new HW-100. WA5VWH, K5YCM, W5PBZ and WA5TIY have new linears. WA5TLS and WA5LIO are away at graduate school. W5RIT and XYL W5UGD suffered severe lightning damage to their rig. WH4HNU/5 is now WB5BFG. Net reports for Apr.:

Net	*GMT*	*Freq.*	*Tfc.*	*QNI*	*Mtns.*	*Mgr.*
OZK	0000	3790	28	129	495	WA5TLS
RN	2330	3995	30	480	450	WA5KJT
PON	2130	3925	32	360	477	WA5TJB
APN	1100	3937	8	449	1182	W5VFW
DX	2345 M	3860				WA5EFL
EC	2400 Su	3995				W5PBZ

Traffic: WA5GPO 499, WA5TLS 49, WA5TJB 16.

MISSISSIPPI – SCM, Clifton C. Comfort, WA5KEY – The tornado that hit Ripley and Corinth takes the spotlight for this month's report. WA5JTB mobiled to Corinth to be the first communications from the area. K5KIR, in Ripley, was on the air and lost his beam to the storm and had other damage but was back on the air to handle the reports in less than an hour. WA5OKI and W5NCB were on the air within minutes establishing a net. WA5TBA, WA5TMC, WA5TWI, WA5MKP and WA5CYR mobiled to Corinth to help with the traffic. Local stations K5KIR, in Ripley, and W5TFC, WA5WAJ and W5PAP, in Corinth, were on the air as soon as power was restored in their areas. All communications for the Weather Bureau, Civil Defense, Red Cross and Highway Patrol were handled by amateur radio for several hours. The system used by the MSBN to train NCSs again proved its value in that there were *trained* NCSs on hand and in the right places to handle the situation for over 36 consecutive hours. New net times for Miss. nets are:
GCSBN 1830 CDT on 3925
MSBN 1915 CDT 3995
CGCHN 2000 CDT 3935
MTTN SLO Speed CW 1845 CDT 3665
Traffic: W5SBM 234, W5NCB 49, WA5JWD 32, W5WZ 26.

TENNESSEE — SCM, Harry A. Phillips, K4RCT —

Net	Freq.	Time(Z)/Days	Sess.	QNI	QTC	Mgr.
TSSB	3980	2330 Fr-Su	26	1519	84	K4MQI
FPN	3980	1145 M-Sa	30	1419	56	W4PFP
		1300 Su				
FTPN	3980	1040 M-F	22	625	24	WA4EWW
TPON	3980	2330 M	4	174	9	K4RTA
TTN	7270	2100 Dy	25	140	10	WB4HIH
FN	3645	0000 Dy	30	147	53	K4AMC
ETVHF	145,000		9	64		WB4IOB
ETVHF	50,400		11	124	3	WB4IOB
T6MSN	50,100	1h&Su	5	34		K4LQO
TTMN	28.8	0130 W&F	8	63	7	K4LTA
MTTMN		0200 M&Th	9	74	1	WA4GLS

The Farragut High ARC and the Smoky Mountain Am. Radio Transmitting Society are ARRL-newly affiliated clubs. After 30 hard-working years in service to amateur radio, W4OGG has become a member of the A-1 Operators Club. EC WA4YFG reports that K4BEZ is modifying 30 high-frequency rigs for the Humboldt ARC to be used on a new 2-meter fm net. Our congratulations to W4HHK and W3GKP, who jointly received the ARRL Technical Merit Award for outstanding achievements in Moonbounce Communications. In the R.A.C.K. bulletin WB4FUR has the specs. for a rig with an optional adapter to interfere with neighbor's power tools. The Oak Ridge Radio Ops. Club lost the five-band WAS Contest to the Delta ARC 821 to 661. Traffic: K4AT 215, W4OGG 120, K4DPO 97, W4WBK 96, W4SOE 80, WA4YFG 48, WB4LIE 23, W4PFP 22, WA4CGK 17, WB4ANX 14, WB4DYJ 11, WB4GTW/4 11, WA4GLS 9, WB4FTS 9, WB4EHK 8, K4UMW 7, WB4HSS 6, WA4YFM 6, W4TYV 4, WA4EWW 3, W4VJ 3.

GREAT LAKES DIVISION

KENTUCKY — SCM, George S. Wilson, III, W4OYI — SEC: K4YZU. Appointed: K4KZH (Louisville Area), WA4ZSJ (Far West) as ECs. Endorsed: WB4FDK as ORS; WB4EOR, WA4MXD, K4YCB, K4YZU as OPSs; WB4FLA as OPS and OBS. BPL: WA4MKH, W4OYI.

Net	QNI	QTC	Net	QNI	QTC
KRN	447*	27*	KYN	399	367
MKPN	434*	102*	FCATN	147	40
KTN	921*	125	C Ky 6	52*	6*

Louisville CD has an alternate Comm. Center at St. Mathews and is equipping a big bus as a field office and communications center. The DUKW is also on the air. WB4FOT/KP4DUI finds foreign be too tough to get in our nets from Puerto Rico. The Murray SC Club is well on its way with weekly classes and a good membership. You'll be hearing lots from this group soon. Owensboro received some surplus Navy gear for K4HY. Better receivers and test equipment help round out the station. There has been a slump in message originations, but the nets seem very healthy. Let's all try to originate a message a day — and please accept for delivery any traffic when you're closest to the addressee. A 6-cent stamp won't break you if you can't deliver by phone. Traffic: (Apr.) WB4KPE 392, WA4MKH 231, WA4VZZ 206, W4OYI 158, W4BAZ 99, WB4LIL 89, WA4DYL 53, WA4AGH 52, WB4FDK 47, K4MAN 47, W4UK 47, K4TRT 43, WB4EOR 29, K4AVX 25, W4OTP 25, WA4MXD 22, K4UMN 21, K4VDO 20, WA4GHQ 19, WB4LTZ 19, WA4FAF 17, WB4FLA 17, WB4HTN 15, WB4EQY 14, WA4WSW 14, WB4ILF 13, WA4MEX 10, K4UNW 9, W4BIA 8, WB4MQR 7, WB4HFY 6, W4SZB 6, K4FPW 4, W4KJP 4, K4HOE 3, K4YCB 3, (Mar.) W4NBZ 41, WA4MEX 40, WB4HQW 22, WB4KFR 20, WA4MXD 11, W4BTA 8, Total 1936, reports 44.

OHIO — SCM, Richard A. Egbert, W8FTU — SEC: W8OUU, RM: W8IMI, PAM: K8UBK, VHF PAM: WA8ADU. Apr. section net reports:

Net	QNI	QTC	Sess.	Freq.	Time(Z)	Mgr.
OSSBN	2004	815	60	3972.5 2245	1430	K8UBK
BN	631	288	61	3580	2300 0200	W8IMI
OSMtrN	523	51	60	50.61 50.16	2300 0100	WA8ADU
OSN	203	64	30	3580	2225	WA8VNU

BPL in Apr. was earned by W8UPH, K8ONA and WB8DSV. Missed in last month's column was BPL for WA8EOW (Mar.) Net certificates for participation in OSSBN were awarded to WA8EOW and W8GRG. BN certificate recipients were W8LZE, WA8TYF, WB8AKW, WA8UPI, W8UI, WA8ETX, WA8ZNC, W8JD, WB8ALU, WB8CKG, W8JH, W8IO, W8FTU and WA8ZTV. W8IMI advises that the Third Annual Ohio Traffic Nets Picnic will be held Aug. 1, at Olentangy Caverns, 7 miles north of Worthington just off Route 23. More information on any Ohio section net. W8EIK and K8YNC joined Silent Keys. Canton ARC's *Feedline* tells us that the club provided communications for the Canal Fulton Canoe Races. Intercity (Mansfield) RC's home-brew contest attracted twelve entries. Winners were K8ZES and WN8AZP. Westpark Radiops' total DX contest score was over 2 million. Congratulations to new Extra Class WA8SYE and new Advanced WA8BCX and WB8EKA. K8MMH won first place in Ohio in the Louisiana QSO Party. This year's Dayton Hamvention was attended by 4057, representing 37 states and 6 foreign countries. The Ham of the Year Award was presented to West Va. neighbor W8DUV. Congratulations to a very deserving and charming lady. Columbus ARA's Second ARRL Night was attended by about 150. League hierarchy began with W1YYM, Deputy Communications Mgr. Also on the program were W8WC, W8ETU, W8OUU. New officers of the Toledo RC are W8JE, pres.; WA8IJU, vice-pres.; W8UPH, secy.; W8WHA, treas. ORS WA8LVT tells us of his 2½-watt transmitter he uses on occasion in BN. The rig is transistorized, battery-powered and has a matching receiver. OO W8DPW received a response to a cooperative notice from a WN1 — in Braille. Welcome to ssb trafficker W8JXT, who comes to our section from W9-Land. New officers of the Case ARC are WA8RLW, pres.; WA3BGE, vice-pres.; WN3MSZ, secy.; WB5AQA, treas. W8AQ retired after 45 years in the tire industry. EC W8ERD reports that Central Ohio AREC provided communications for the American Cancer Society during a fund drive. WA8STX is a new OVS. W8GRG is now EC of Northeast Ohio, comprising Lorain, Cuyahoga, Lake, Geauga and Ashtabula Cos. WA8TKL has been appointed EC of Knox, Holmes and Coshocton Cos. The following clubs are now affiliated with ARRL: Henry County ARC, Euclid High School RC, Clinton County ARA, Battelle-Columbus RC, AREC-CD RC and K-W Society. K8NYN was third highest OO in the country in notices sent out during 1969. ECs are needed for Harding, Marion, Morrow, Washington, Muskingham, Perry, Morgan, Hocking, Vinton, Athens, Hancock, Wyandot and Seneca Counties. Any takers? Traffic: (Apr.) W8UPH 856, WA8FTX 379, K8ONA 326, WA8UPI 309, W8GRG 204, WB8DSV 191, WA8ETW 179, W8IMI 172, WA8DWL 142, WA8WAK 124, WA8CKY 106, W8QCU 106, W8LT 102, WB8ALU 100, W8GVX 94, WA8VNU 90, W8MOK 87, WA8SED 80, WA8TYF 80, K8UBK 78, WA8SXI 73, WB8AKW 70, W8PMJ 64, W8JD 63, WA8VKF 61, W8OZK 59, WJ AVS/8 59, W8NOQ 55, K8LGA 53, WA8FGD 48, WA8YIB 44, W8UDG 42, K8BYR 41, W8OE 40, WA8ULF 40, WA8ZTV 40, W8ETU 39, WA8EOW 38, WA8ADU 37, W8GNL 37, W8DAE 35, WA8MHO 35, W8JH 32, W8BHY 27, WA8FCO 26, W8ERD 24, K8DHJ 23, W8GOE 23, WA8LAM 23, W8UPD 23, WB8AJC 22, K8QYR 16, WB8BLH 15, K8LEI 15, W8LKY 15, W8UX 14, WA8VWH 14, WB8BZX 13, K8ONV 13, WA8TKM 13, WB8CKG 12, W8DU 11, W8AJW 10, WA8SHP 10, WA8AJZ 9, WB8CFH 7, WA8FSX 7, W8IO 7, WA8ZNC 7, WA8WJR 6, W8WEG 5, WA8MCR 4, WB8CKI 3, W8LZE 3, WB8EHI/8 2, WB8FWX 2, W8GQD 2, W8JBP 2, WA8JSW 2, W8BZX 1, K8CKY 1, (Mar.) WA8ZTV 74, WA8JEH 8, WA8WJR 6, WB8CKI 2.

1970 OHIO Interstate QSO Party

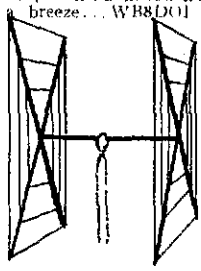
This contest, sponsored by the Columbus Amateur Radio Association, will take place from 1900 GMT August 8 to 0300 GMT August 9 and 1500 GMT August 9 to 2300 GMT August 9. There are no restrictions on operating time, power, number of operators or transmitters. It is open to all amateurs. Stations may be worked twice on each band,: one on phone and once on cw. Ohio stations may contact any other station for credit. Non-Ohio stations may contact Ohio stations only for credit. The exchange will be QSO number, RS(T) and ARRL section or county. Stations operating on county lines may issue more than one multiplier, but not more than one QSO number, to an individual station per band per mode. Logging information: Show time, date, stations contacted, exchanges, band, mode, location. Suggested frequencies: 1805 3575 3975 7075 7275 14075 14285 21075 21375 28075 28575 50.15 and 145.10. Try phone each even GMT hour and cw each odd GMT hour. Try 160 at 0200 GMT August 9. Scoring system: 1 point per complete exchange on 80 through 10 meter, two points on 160 and all frequencies above 50 MHz. Portables operating from any Ohio county EXCEPT Butler, Cuyahoga, Franklin, Hamilton, Lorain, Lucas, Mahoning, Montgomery, Stark, Summit and Trumbull may multiply their final score by 1.5. (Portable is defined as operation outside the county in which you are licensed and signing your call as /8.) Final score for Ohio stations is total QSO points multiplied by the number of ARRL sections worked including Ohio. DX stations may be worked for QSO points but not as additional sections. Non-Ohio stations multiply by the number of Ohio counties worked. Portables changing counties during the contest may repeat contacts for QSO points, but multiple contacts may not be claimed

AHA! YOU THOUGHT GOTHAM

was a giant, automated, mechanized, computerized factory. No, no, no. Just two brothers, making thousands of the best antennas possible at low, low, low prices that reflect the tiny overhead. In QST since '53 without missing an issue!

QUADS

Totally satisfied with quad. Worked DK4VJP, SM7DLH, XE1AB, DM4SEE, FL8SK, F6AUM, HK7VB in few hours. Instructions a breeze... WB8DOI



CUBICAL QUAD ANTENNAS—these two element beams have a full wavelength driven element and a reflector(the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators)—absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount; uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a foolproof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!

10/15/20 CUBICAL QUAD SPECIFICATIONS

Elements: A full wavelength driven element and reflector for each band.

Frequencies: 14-14.4 Mc.; 21-21.45 Mc., 28-29.7 Mc.

Dimensions: About 16' square

Power Rating: 5 KW.

Operation Mode: All.

SWR: 1.05:1 at resonance.

Boom: 10' × 1¼" OD, 18 gauge steel, double plated, gold color.

Beam Mount: Square aluminum alloy plate, with four steel U-bolt assemblies. Will support 100 lbs.; universal polarization.

Radiating elements: Aluminum wire, tempered and plated, .064" diameter.

X Frameworks: Two 12' × 1" OD aluminum 'hi-strength' alloy tubing, with telescoping ⅞" OD tubing and dowel insulator. Plated hose clamps on telescoping sections.

Radiator Terminals: Cinch-Jones two-terminal fittings.

Feedline: (not furnished) Single 52 ohm coaxial cable.

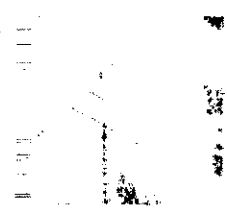
Now check these startling prices—note that they are much lower than even the bamboo-type:

10-15-20 CUBICAL QUAD	$37.00
10-15 CUBICAL QUAD	32.00
15-20 CUBICAL QUAD	34.00
TWENTY METER CUBICAL QUAD	27.00
FIFTEEN METER CUBICAL QUAD	26.00
TEN METER CUBICAL QUAD	25.00

(all use single coax feedline)

BEAMS

"Just a note to let you know that as a Novice, your 3-El, 15 Beam got me R1 Section Winner and New England Division Leader in Novice Round-up. See June QST, p. 57 for picture of ant. (below). Tnx for a fine working piece of gear. 73s, Jay, WA1JFG"



Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history! Each beam is brand new! full size (36' of tubing for each 20 meter element for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅛" and 1" aluminum alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

2 El 20.	$21	4 El 10.	$20
3 El 20.	27*	7 El 10.	34*
4 El 20.	34*	4 El 6.	20
2 El 15.	17	8 El 6.	30*
3 El 15.	21	12 El 2.	27*
4 El 15.	27*	*20-ft. boom	
5 El 15.	30*		

ALL-BAND VERTICALS

"All band vertical!" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, TI2FGS, W5KYJ, W1WOZ, W2ODH, WA3DJT, WB2FCB, W2YHH, VE3FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3KT. Moral: It's the antenna that counts!

FLASH! Switched to 15 c.w. and worked KZ5IKN, KZ5OWN, HC1LC, PY5ASN,FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5CLK, OZ4H, and over a thousand other stations!

V40 vertical for 40, 20, 15, 10, 6 meters.....$14.95

V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters.....$16.95

V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters...$18.95

How to order: Send check or money order. We ship immediately upon receipt of order by railway express, shipping charges collect. *DEALERS WRITE!*

GOTHAM, 1805 Purdy Ave, Miami Beach, Fla. 33139

by operating on a county line. (Stations outside Ohio may claim QSO points AND counties. The log receipt deadline is Sept. 8, 1970. Send your log to Ohio QSO Party, c/o R.S. Dixon, W8ERD, 311 East Kelso Road, Columbus, Ohio 43202. Send an s.a.s.e. for "contest package" and an s.a.s.e. for results. 1st, 2nd and 3rd place awards will be given to the highest scoring stations inside and outside Ohio, and to the winners in each ARRL section and Ohio county provided that at least 10 different stations were contacted. Separate awards to those using above 50 MHz exclusively.

HUDSON DIVISION

EASTERN NEW YORK – SCM, Graham G. Berry, K2SJN – SEC: W2KGC. RM: WA2VYS. PAM: WB2VJB. VHF PAM: WB2YQU. All section nets continue on times/frequencies listed in previous columns. *Appointees Note:* As your ENY team starts its second term in office, thanks for reports from all concerned. Please route requests for renewals to VHF PAM: RM or PAM as indicated. OO renewals should be sent direct to the SCM. Reminder: Regular reports are required to keep any appointment in effect. *On the club circuit:* Schenectady ARA heard K2HYD in Apr. on Telephone Microwave System; Westchester ARA Apr. session on "Laser, the Light that Talks." Albany ARA heard WA2ETB and K2HYD on repeater operations. The New Rochelle Club Apr. speaker was W2YFM. The Poughkeepsie Club reports an attendance of about 30 at each meeting, and plans to set up a special repeater interest section. New calls in the area: K2CE, WB2FXK, WB2NOY, WN2NSP, WN2NSO, WN2NSJ, WN2NSL, WB2FFL. *Individual station activities:* W2APF is trying to set up regular schedules with N. Framingham, Mass., for medical patient phone patches from the Albany area. Any help will be gratefully accepted. Ask Schenectady Cy. EC W2URP for a copy of a very FB public relations article from the *Schenectady Union Star.* It shows what can be done with a little effort. WB2SIH still is racking up contacts on 2 and 6 with the help of ssb and power. WA2VQX is the new editor of *"B+"* of the Albany ARA. Albany Cy RACES Net members signed up for the Red Cross First Aid Course. Appointments and renewals: K2AVP as OBS, WA2BXK as Class I and II OO. Several appointments have been cancelled for failure to report as required by the CD. All stations, please get copies of CD-189 for reporting Honor Roll qualification monthly. More individual reports: WB2PNB is running Friday classes at Albany RedCross; WB2GMN completed testing of Communications Club of New Rochelle students with 23 new or up-graded calls on the way. WA2ETB completed the automatic cw ID unit for the K2CT repeater on 6 meters. Traffic: W2EAF 124, WA2FBI 77, WA2VYT 77, WA2VYS 68, K2SJN 44, W2URP 27, WA2VLS 27, WB2JLR 24, K2UYK 23, WB2VJB 22, K2YCJ 17, WB2EUV 14, WN2MGT 12, WA2GQW 6.

NEW YORK CITY AND LONG ISLAND – SCM, Fred J. Brunjes, K2DGI – SEC: K2OVN. RM: K2UAT. PAM: WB2ROF. The following are major AREC nets. Join one!

Bronx		50.35 MHz	146.17 MHz
Brooklyn	28.64 MHz	50.40 MHz	145.26 MHz
Nassau	28.72 MHz		145.32 MHz
Queens	29.50 MHz	50.20 MHz	145.62 MHz
Richmond			147.12 MHz
Suffolk	29.56 MHz	53.51 MHz	146.82 FM
Huntington	28.73 MHz		145.50 MHz
Brookhaven	28.73 MHz	50.46 MHz	145.50 MHz
New York	28.50 MHz	50.48 MHz	

Note: Nets usually open 8:00 P.M. Mon. Hope you all survived Field Day this year! All of the umbrellas and leaky tents have been retired for another year. W2KWM reports he'll be operating portable and mobile the next couple of months, while gallivanting through W1,2,3,4 and VE1 country. WB2DZZ is going for 5-band WAS and says it's harder than DXCC! His biggest problem? You guessed it! QSL cards. Congratulations go out to W2ZDG on passing the Extra Class exam. W2MT finally made WAZ after receiving a QSL card from that elusive Zone 23. He's also planning to bronze the AVQ when it runs out of those radiations, after he made 210 countries and WAZ without radials. W2BCB says he is forced to modernize in the equipment department. Seems his 30-year-old RME-70 gave up the ghost. (That's what I call service.) W2LGK proposes an all-towns contest for the section. Any ideas you may have, let him know. That young man out Commack way, W2EW, is a 50-year OCWA man, first licensed in June 1920. That's a whole lot of amateur radio! Congratulations! For you Staten Islanders, the Staten Island Amateur Radio Assn. holds meetings the 4th Fri. of each month at 190 Oakdale Street, Staten Island. Drop in and join up! On the subject of radio clubs, I am saddened to hear and read of the apparent demise of a few of our long-standing clubs, and the lack of support in general for all of our clubs. What is the answer to our dilemma? Has the radio club outgrown its need? Do the clubs have to specialize or cater to special interests? Why is there a lack of interest of club members to participate as club officers, and why do so many members attend meetings to be "entertained" instead of participating in club activities. (I have to admit its cheaper than a $3.00 movie for a few hours.) If you have any ideas let me know, let your Director know but, better yet, let your club officers know. Start from the top down not from the bottom up! Remember the radio club needs you to exist, you don't need the radio club to exist, but I am sure at some time you received benefit from the club, so how about the club now receiving some benefit from your support? While I still have control of the soapbox, how about vhf/dc types checking in once in awhile with WB2RQF and K2UAT to relieve them of a message or two. They allow you to QLF and talk into the back of the mike once in a while, so how about checking in! Traffic: WA2HMO 307, K2UBG 128, WB2DZZ 123, WB2WOI 44, W2AEF 39, K2AAS 32, WB2LGA 24, W2LGK 22, K2JFE 16, WB2RQF 14, W2PF 10, WA2LJS 4, WA2BRF 2.

NORTHERN NEW JERSEY – SCM, Louis J. Amoroso, W2ZZ – SEC: K2KDQ. RM: WA2TAF. PAMs: W2PEV, K2KDQ, WA2KZF and WA2TBS.

ARPSC SECTION NET SCHEDULES

NJTTYN	3625	7:30 MWF	10	19	8	WA2TAF
NJN	3695	7:00 Dy	30	362	237	WA2BLV
NJN	3695	10:00 Dy	29	167	41	WA2BLV
NJSN	3740	8:00 Dy	13	27	11	WB2FEH
NJEPTN	3950	6:00 M-Sa	30	567	239	W2PEV
NJPON	3930	6:00 Su	4	79	11	WA2TBS
NJAN	50425	8:00 M-F	20	341	41	WA2KZF
PVETN	145710	7:30 Dy	30	342	136	K2KDQ
ECTN	145800	8:30 M-Sa	24	104	43	WA2TBS
	146700	9:30 Su				

Aps: WA2DRH as ORS, WB2WID as ORS and OPS, K2ZLI as OPS. Endorsements: WB2RXK as EC for Rumson and vicinity; W2JDH as OO Class I; WB2BKC, W2CU, W2CVW, WB2DDQ, W2DRV, K2EQP and W2JDH as ORSs; WA2BAN, W2CVW, WA2EUO, K2JTU, K2MFX, W2PEV, WB2RKK, WA2TBS and WA2UZH as OPSs. The Suburban ARC of Scotch Plains meets the 2nd and 4th Fri. of each month. New club officers for W2BSC are WB2JWB, pres.; WB2ZIA, vice-pres.; WB2UIR, secy.; WB2ZCA, treas. WN2KHQ passed the General Class exam, WA2HDS, WA2CXS, WA2ILM and WA2EOF all passed the Advanced. The group at K2MFF uses a Johnson 6N2 and Valiant for 2 and 6. WA2NIP is club call at Rutgers with WB2OHK as trustee. WN2KLR received his WAS and also joined Navy MARS. The W2FCL group gave a big assist with their fm units during the Englewood Track meet. WA2LDX is looking for a new QTH after the second flooding in Apr. W2NEH operates 2 and ssb on 20. WA2EPI is planning mobile with his Swan 500C. W2CU, W3CU and W6CU had a family eyeball at W2CU's QTH. WB2BBW received his DXCC with 188 confirmed. K2PBP has been appointed the State AF MARS Director. WA2NVL is the new club call for the Passaic High School RC. WN2NLP is operating 80, 40 and 15 meters. WB2AYZ joined Navy MARS. WB2DRJ is now using a TR-4. WA2RIN has a new vfo for 2 meters and is planning 15 elements for that band. WA2BNF reports he is at 800 Top Honors in the CHC. WA2FVH received his General. K2YVI and WA2IGQ are both in the hospital. WA2BAN is on with a Gonset 4 and eleven-element beam. WB2LDW has a new Clegg 22 Mark 2. WA2MER has TDQ on 2 meters. WB2KPD is a radioman on a sub out of San Diego. WB2YXJ is at Tech. School in the Navy. WA2FFY and WB2IHL joined the AREC. WA2JNQ is looking for chess players on 10 meters in the evening. We are looking for ECs in Warren and Hunterdon Counties. Traffic: (Apr.) WA2FRZ 625, WA2BAN 578, K2DFL 398, K2KDQ 285, WA2FPI 158, WB2DDQ 139, WB2FEH 137, K2OQJ 109, WA2EUX 45, WB4PYA/2 40, WA2TBS 38, W2PEV 35, WA2LDX 30, WB2BKC 26, WA2FUI 24, K2ZFI 20, WA2BCT 19, WA2GLI 17, WB2WNZ 16, W2CU 15, W2ZZ 15, WA2TAF 14, WA2FVH 12, WA2YXQ 12, WA2KZF 11, WA2CCF 10, WA2CRF 9, WA2RIN 9, WB2BCS 8, W2CVW 8, WB2LTW 8, WB2WID 8, W2TFM 6, WA2DRH 4, WN4JIM 4, WA2JXE 4, WB2RUM 4, W2JDH 2, W2EWZ 1, WA2JNR 1. (Mar.) WB2BKC 36, W2TFM 6, WA2GOC 1. (Feb.) WB2WID 34, WB2BKC 25.

Eleventh New Jersey QSO Party

This contest, sponsored by the Englewood Amateur Radio Assn. Inc. will take place from 1900 GMT August 15 to 0600 GMT August 16 and from 1200 GMT to 2300 GMT August 16. It is open to all amateurs. Stations may be worked once on phone and once on cw in each band. Phone and cw are considered the same contest. New Jersey stations may work other N.J. stations. The general call is CQ New Jersey or CQ NJ. The exchange will be QSO number, RS(T) and QTH (ARRL Section or country). N.J. stations will send

county for their QTH. Logging information: Date and time (GMT), band, emission. The first contact for each claimed multiplier must be indicated and numbered. If possible, a check list should be attached. Multipos. should be noted and calls of participating operators listed. Suggest frequencies: 1810 3555 3740 3930 7060 7275 14075 14280 21100 21375 28800 kHz, 50-50.5, 144-146 MHz. Suggest phone activity on the even hours. Scoring system: Out-of-state stations multiply number of complete contacts with N.J. stations times the number of New Jersey counties worked (maximum of 21). N.J. stations: W-K-VE-VO QSOs count as 1 point; DX stations count as 3 points. Multiply total number of points times the number of ARRL sections (including NNJ and SNJ, maximum of 74). KP4, KH6, KL7, KZ5 count both as 3-point DX contacts and as section multipliers. Awards: certificates will be awarded to the first place station in each N.J. county, ARRL section and country. A second place certificate will be awarded when four or more logs are received. Novice and Technician certificates will also be awarded. The deadline for receipt of logs is Sept. 12, 1970. Send your log and comments to Englewood Amateur Radio Assn., Inc. 803 Tenafly Road, Englewood, N.J. 07631. A No. 10 s.a.s.e. should be included for results. Stations planning active participation in N.J. are requested to advise the EARA by August 1 so that the club can plan for full coverage from all counties.

MIDWEST DIVISION

IOWA – Acting SCM, Al Culbert, KØYVH – Hope everyone has fully recovered from the effects of Field Day. Circle Sun., Aug. 9, on your calendar. This is the date for the 75-meter picnic. Details later. WØDSP reports 4 new Novices at St. Ansgar, WNØs AIC, ALD, BCD and BHO, and assures that there are more coming. WAØGYB passed both the General and Advanced Class exams in Apr. More on 2. The Creston group recently purchased fourteen 2-meter fm transceivers. WAØNGZ, reports that ham equipment has been installed in the North Iowa Red Cross Headquarters at Mason City. WAØVKF has received his DXCC award, and was pictured in a recent issue of the Japanese publication *CQ Ham Radio*. WAØIRP has a new Signal One. WAØRMK has joined the Marine Corps. WAØMLE and WAØSDC have both moved from Cedar Rapids to Illinois. The Illinois contest bunch had better keep a weather eye on those two! WAØOTF was married on Memorial Day. WAØGVJ is now off the low bands because of moving to a new location. KEJGI reports that he, WØDIA, WAØPSS and WAØJPS made a 45-minute presentation over KTVO-TV. Results of the 75-Meter Net election are as follows: KØLVB, WAØMIT, WAØIRP, WAØKZL, KØKAQ, net control stations; WAØVRJ, WAØVZH, WAØOAO, WAØDYV, WØRJZ, KØHZL, board of directors; WØEFG, secy. Net reports: Iowa 75 (noon), QNI 1485, QTC 164; Iowa 75 (eve), QNI 965, QTC 16; TLCN, QNI 155, QTC 50. Traffic: (Apr.) WØLCX 1035, WAØVZH 35, WAØOTO 32, EØJGI 30, WAØVBG 7, WAØEFN 4, WØMOO 2, WAØOZL 1. (Mar.) WØJAQ 1.

KANSAS– SCM, Robert M. Summers, KØBXF – SEC: KØEMB, RM: KØJMF, PAM: KØJMF, VHF PAM: WAØCCW. KØGZP says he is planning a float trip southerly from Parsons in the near future if the rains don't stop. A more successful type trip was made recently by WØPB and KØNL to the Dayton Hamvention and then on to the ARRL Directors' meeting. New equipment is popping up all over – WØLYC, new SB-620; WAØSWC, new HW-100; WØCHJ, remote 508 rig for his Swan and a HAL 3UB keyer. Three ECs sent in summaries of their month's activity. Zone 1, 75-Meter Net reports 52 QNI and the 2-Meter FM Net 57 QNI. WAØOZP is Zone 1 EC. Zone 10A, WAØLBB EC reports 10 drills or net sessions for the month operating 160, 75 and 2 meters. Zone 6, WØRXD EC had 8 drills with one of them a severe wx Watch. Project Concern's A Walk of 20 miles for Mankind was the highlight of the month and raised funds for medical facilities overseas. Amateurs furnished 8 mobile units on 6 fm and a base station. Hams passed messages of varying nature, from first aid to transportation required of the Red Cross to locating walkers along the 20-mile route. Apr. net reports: QKS: QNI 434, QTC 145. KPN: QNI 167, QTC 38. KSHN: QTC 667, QNI 38. HBN: QNI 645, QTC 92. KPON: QNI 1367, QTC 270. Members of CKARC, Salina, set up a radio station at the annual AMBUC demonstration in the AG Hall Apr. 18 and 19 to explain the legal radio hobby to campers and businessmen. They handled third-party traffic to all parts of the world as a demonstration. Traffic: (Apr.) WØHF 265, WØINH 243, WAØLBB 117, KØJMF 82, KØMRI 77, KØBXF 76, WØNEE 70, WØCCJ 50, WØCHJ 47, WAØTZK 37, KØLPE 32, WAØUTT 28, WAØJFG 27, WBØBFI 14, WAØSRQ 14, WAØSWC 13, WNØYXK 13, WNØAJU 9, WAØOWH 8, WØLYC 4, WAØSHV 4, WAØOZP 3, WØPB 3, WØFDJ 2, WAØSXR 1. (Mar.) WØNEE 56, WØBGX 12, WAØSXR 4.

MISSOURI – SCM, Robert J. Peavler, WØBV – SEC: WAØEMS. New appointments: WAØFMS as SEC, WAØRVR and KØTLM as OVSs. Appointment renewed: KØDFW as EC. New reports:

Net	*Freq.*	*Time(Z)/Days*	*Sess.*	*QNI*	*QTC*	*Mgr.*
MoPON	3933	2200 M-S	26	465	40	WAØTAA
MoSSB	3963	2300 M-S	26	1296	87	WØRTO
3BON	3585	0000 Dy	27	188	108	KØAEM
3MWN	3585	0245 Dy	27	148	52	WAØRVR
PHD	50.45	0030 T	4	126	5	WAØKUH
MoCD/ES	3531.5	1500 Alt Sun	2	10	3	KØRPH

Condolences to KØIQS, whose wife passed away. WAØRCL is home recovering from an eye operation. WØDJ is in England. WAØZLU continues to be very active as OBS. Congratulations to: WAØWPU, who passed Advanced Class; to WAØEMS, who made the highest score ever seen in the Zero District QSO Party. WAØYCN worked in the WPX Contest. KØJPJ has a new hobby – collecting old radio shows on tape. Traffic: KØONK 1161, KØAEM 157, WAØHTN 93, WAØTAA 33, KØRPH 32, WØBV 28, WØOUD 28, WØKUH 12, WAØVRI 8, WØBVL 5, WAØYCN 4, KØJPJ 3.

NEBRASKA – SCM, V.A. Cashon, KØOAL – SEC: KØODF. Nebr. 160-Meter Net has suspended operations through the summer months. KØWPE, Box Butte County EC, advises the 2-Meter AREC Net reports for Apr. QNI 25, QTC 1. The Nebr. QSO Party Apr. 25-26 disclosed fair participation. KØODF is building a linear, WØHQZ is getting the urge to do the same. WAØLRQ has WAS on 20 and 75 meters. Renewed appointments: WAØSOP, WAØQMZ and WØWHY as ECs. Apr. Net reports:

Net	*Freq.*	*GMT/Days*	*QNI*	*QTC*	*Mgr.*
NSN I	3982	0030 Dy	1068	56	WAØLOY
NSN II	3982	0130 Dy	908	24	WAØLOY
Nebr 160	1995	0130 Dy	301	4	WAØCBJ
NEB	3590	0400 Dy	173	36	WAØHWR
EBSN	3982	1230 1st M	3	0	WAØSOP
NMN	3982	1330 Dy	1027	26	WAØIUF
WNN	3950	1400 M-Sa	665	13	WØLRZ
CHN	3982	1830 Dy	1031	58	WAØGHZ

Traffic: (Apr.) WØLOD 164, WAØZUR 159, KØKJP 57, WAØEGV/Ø 56, KØJEN 44, WAØJIH 30, KØUWK 28, WAØHWR 24, WØBFC 20, WAØDCT 15, WAØGHZ 15, KØFRU 14, WØDMY 12, WØAGK 11, WØNIK 11, WAØSOP 10, KØLJT 9, WAØIBB 8, KØODF 8, WAØPII 8, KØMUF 6, WAØVII 6, WØGEO 5, WAØLOY 5, KØDGW 4, WAØLEI 4, WAØJTU 4, KØOAL 4, WAØOQS 4, WAØRPB 4, WAØVIT 4, WAØJKN 3, WAØJUF 3, WØRAM 2, WAØCTM 2, WØWKP 2, WØOUP 1, WAØPCC 1. (Mar.) WAØIBB 16, WAØLRQ 1.

NEW ENGLAND DIVISION

CONNECTICUT: John McNassor, WIGVT – SEC: WIHHR, RM: WA1HSN, PAM: K1YGS, VHF PAM K1SXF. Apr. report.

Net	*Freq.*	*Time/Days*	*Sess.*	*QNI*	*QTC*
CN	3640	1845 Dy	30	294	336
CPN	3965	1800 M-S	30	450	514
		1000 Su			
VHF2	145.98	2200 M-S	22	77	11
VHF6	50.6	2100 M-S	22	151	10

High QNI: CN – WA1GPH, WA1HOL, WA1HSN, WA3JSU/1. CPN – WIGVT and K1SXF 28, K1YGS 27, W1DQJ 26 and W1YBH 24. SEC WIHHR extends thanks to the many ECs who follow his good example in promoting the AREC. Please assist your local EC and request to be one if there is none in your area. This issue of *QST* includes May ARRL Board Meeting Minutes. Our Director W1OV does an outstanding job representing us and our interests. He would appreciate your expression of opinion. Please communicate with him. All appointees get the CD Bulletin. It's good reading and your comments are welcome – in a radiogram they might surprise W1NJM! Contact WA1JQC for information on the AREC Net at 9 P.M. Mon. on 21.41. Danbury Area Traffic Net is on 145.68 at 2130 with CN/CPN connectors – WA1JVV mgr. The 17th Annual CN/CPN Dinner Meeting on Apr. 18 was well attended and enjoyed by all. Sincere thanks to RM WA1HSN for handling all arrangements and details. With deep regret the call of W1ICI is added to the roster of Silent Keys. W1ADW is active operating QRP. K1SRF continues busy with Novice classes. Murphy's Marauders made over 25 million points in the DX Contest! All contest operators should be members. Contact W1EIO for details. The immediate aftermath of Field Day is the ideal time to write down improved plans for next year! Do it *now!* Traffic: W1FFW 309, WA1HOL 254, W1EIO 190, WA1LLB 180, WA1HSN 162, WA1GEH 86, WA1JZC 69, K4CSY/1 69, K1SXF 29, W1MPW 25, W1OV 18, W1BNB 16, WA1JGA 14, WA1HOL 14, W1CTI 13, W8CWE/1 12, WA1KRG 10, W1DOJ 9,

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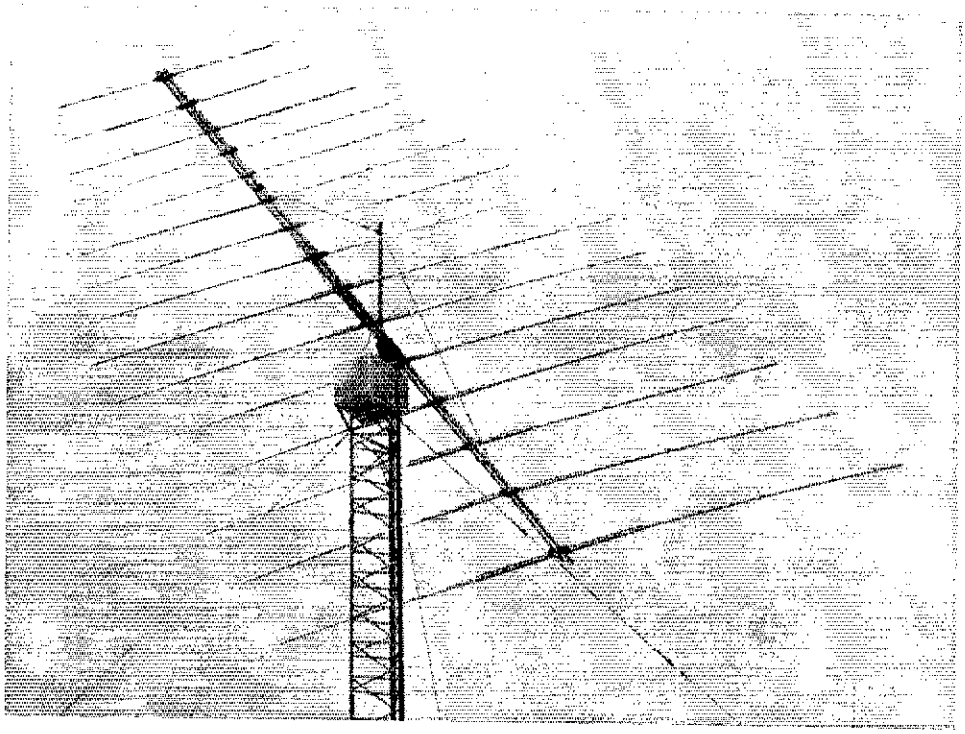

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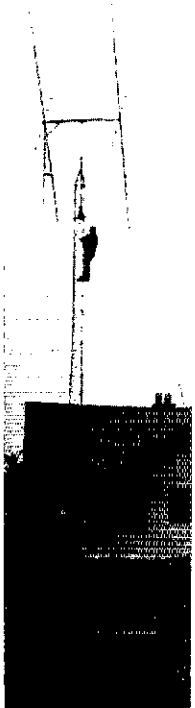
W1YBH 6, W1BDI 4, WA1FXS 4, W1HHR 4, W1KAM 4, WA1JYP 2.

EASTERN MASSACHUSETTS – SCM, Frank L. Baker, Jr., WIALP – WIAOG, our SEC, received reports from WA1s DXI, IRY, K1s DZG, ZUP, NFW. W1AOG is also Net Manager for the New England Emergency Phone Net Sun. at 1230 GMT, 8:30 A.M. EDT, 3945 kHz. He would like to have check-ins from other N.E. states with 4 nets on this spot. We need ECs for towns in this section. WA1DMC is the new Wellesley EC, W1TWG, Hyannis, is a new OBS. W3GCW is ex-W1MPP and W3ZI is ex-W1PS. W1PKV is in the hospital. W1RV visited W1NF, Greater New Bedford Emerg. Net had a drill on 6 with K1s VJP, UID, W1s LE, DIY, WA1s CRA, ESY. W1DES has an NCX-3. G2UF is coming over in Aug. W1NT is ex-WA1BBK, Barnyard Net had 26 sessions, 536 QNIs, 26 traffic, reports W1JKR. W1OW is ex-W1MGL. Ex-K1NWM is now K4DXC. New officers of the T9 Club are WA1IZF, pres.; W1TJP, vice-pres.; W1ISX, treas.; W1MNK, secy. The club held its Annual Ladies night. W1DC, Honeywell RC, is active on the air. K1ZRZ is on 2. WN1MVC is a new YL in Newburyport. W1FRJ is ex-K2CIX. Ex-W3AZV is in Marshfield. W1NJL will graduate from B.C. Law School, then will go to Harvard Business School. K1CZH is in an informal group on 3868-3885 at 5 P.M., hi-fi/am work. W1s QV, AKV and ALP had their pictures in *QTC*, Sweden's *QST*. WA1MTV is a new YL in Cambridge. W1MXE is on several bands. NEFPN had 4 sessions, 86 QNIs, 16 traffic. K1DZG is going to VO1 again. K1SLZ says his son WA1LPV, ex-SZ4ME, is going to West Point. W1BGW and WA1FHU took part in the Feb. FMT. K1PEF says his son K1SMT is over in Vietnam. WA1DEL had a visitor, IIZNG from Venice. W1TWG is secy.-treas. of the Guardian Angel Net. W1AQV moved to another QTH. Massasoit ARA had a talk by Earle Whidden, a former merchant marine RO, also an auction. W1MYF has a new NCX-500. K1DPE and W1ALP were in the same hospital at the same time. Thanks for the many cards and messages. W1CRA is a busy one with TV sets for the patients. W1ANB is new group mgr. of the Capeway RC and will apply for W1ZST's call for the club. W1UOH now is with the Postal Service. W1AKC is back from Fla. W1s PEX and QYY made the BPL. Whitman ARC held a mobile hunt. WA1FNM has a 144-Mc. Yagi and dipole for 15. EM2MN had 22 sessions, 145 QNIs, 126 traffic. 6-Meter Crossband Net had 22 sessions, 87 QNIs, 1 traffic. WA1EYY now is Advanced Class. Ex-WA1FHU is W1PL. WA1DPX worked lots of DX on a 6-meter opening. This information for fm repeaters: WA1KFY, 146.22 in, 146.94 out; K1MNS, 146.25 in, 146.760 out; W1ALE 146.34 in, 146.94 out. WA1IEF was on during the band opening on 2 and worked DX. Waltham RC had an auction. Sharon ARA is now an affiliated ARRL Club. Appointments endorsed: W1s PST, DRY, MOJ, K1s ZUP, DZG, WA1JLX as ECs; W1JNV as OO; W1s NJL, AEC, UIR, AOG as OPSs; W1s NJL, AEC, K1BUF as ORSs; W1UIR as OBS; W1AOG, WA1DEL as OVSs. K1PNB now is working for WFGL in Fitchburg. EMNN: For Mar. 11 sessions, 42 QNIs, 14 traffic; for Apr. 8 sessions, 41 QNIs, 11 traffic. EMN: For Mar. 53 sessions, 329 QNIs, 284 traffic; for Apr. 38 sessions, 175 QNIs, 139 traffic. Traffic: (Apr.) W1PEX 742, W1QYY 580, W1OJM 421, WA1EYY 394, WA1FAD 250, K1ESG 110, WA1IFF 89, K1PRE 86, W1EMG 64, W1PL 64, W1HKJ 59, WA1IRY 46, W1BUF 43, WA1KZE 43, W1AOG 40, W1UX 34, W1CTR 26, WA1AEC 19, W1DOM 16, WA1DPX 15, WA1IUL 9, WA1MFG 7, K1DZG 4, W1AAR 2, W1ALP 1, K1CLM 1. (Mar.) W1ABC 82, WA1JKJ 62, WA1FHU 52, K1PRB 45, W1DKD 12, K1TKI 2.

MAINE – SCM, Peter E. Sterling, K1TEV – SEC: K1CLF. PAM: WA1FCM. RM: W1BJG. K1RSA is presently building a transistorized afsk unit for 2-meter RTTY. New officers for W1YA are WA1BRI, pres.; K1TMK, vice-pres.; WA1JCN, secy.-treas. K1SWG, pub. dir.; WA1BXM, trustee. Sorry to lose WA1ELG as our PAM, but he was tied down with other activities. New hams in the State of Maine are WN1MTT, WN1MVD, WN1MUZ, WN1MUX. Welcome to the fraternity, fellows. Me.-N.H.-Vt. Net meets on 3685 at 2330Z; Sea Gull Net meets on 3940 Mon. through Sat. at 1700. Pine Tree Net meets at 1900 on 3596 Mon. through Sun. We are still looking for news for the column. Any little tidbits will be welcome. K1OYB is on with his new SB-220 linear. We are still looking for Net Control Stations for the PTN. Anyone who would like to help please contact W1BJG. Sorry to report that W1BG is in the Waterville Hospital at this time with a slight ailment but hopes to be out soon. New appointments: WA1FCM as PAM, K1GAX as OO. Interested in an appointment? If so, drop your SCM a line. The Portland Amateur Wireless Assn. meets every Tue. night at 22 Spring St. Code and theory classes are held every week. Traffic: W1YA 118, W1NND 73, WA1FCM 62, WA1JFX 23.

NEW HAMPSHIRE – SCM, Donald Morgan, K1QES – NHARE reports 64 check-ins and 14 traffic. The GSPN reports 65



check-ins and 97 traffic. Welcome to new Novices WN1s MSG MSH, MSI, MSJ, MSP, MSQ, MSR, MTD, MUN and WA1MVG (T Six are from Nashua and one each from Hudson, Suncook Farmington and Manchester. Endorsements are W1SWX as OO W1BXM as OVS, W1RCC and W1BYS as OPSs, W1F1Z has a new job as traffic dispatcher for the State Fish and Game Dept. W1RCC reports the 6-meter walkie-talkies designed by him and built by the club members are working just fine. Now he is designing a solid state, 2-meter fm walkie-talkie which the same club members wil eventually build and use for AREC work. W1UBG is a new ORS and we say welcome to the gang. W1CTW/W1QD reports much 2-mete activity in the Nashua area. He will be speaking again this year at the National Convention in Boston in Sept. See you there" Have a safe vacation. Traffic: K1BCS 404, WA1GCE 211, K1PQV 108, W1UBG 72, WA1KTX 71, W1BYS 6, K1QES 3.

RHODE ISLAND – SCM, John E. Johnson, K1AAV – SEC: W1YNE, RM: W1BTV, PAM: W1TXL. VHF PAM: K1TPK. RISPN report: 30 sessions, 564 QNI, 57 traffic. The Providence Radio Assn., W1OP, recently held an FM Symposium. K1HZN reported that the meeting consisted of a discussion of the change in repeate rules by the FCC, W1HDQ, of the Headquarters staff, gave a tal entitled "FM Repeaters – Where do we go from here?" A invitation was sent to groups in Marlborough, Falmouth an Concord, N.H. The Fidelity ARC K1NQG, reports that the club growing and several budding Novices are ready for the exam WN1MOL, of the club, recently finished a new 21-watt transmitter WN1MPU and WN1MOT worked together on a school science fa project. Using mostly home-built gear, they easily walked away wit first prize. WA1HUM is collecting parts for his new 4-1000 amplifier which has been dubbed by members "The Machine. WA1IWS, the club secy., built and erected a 5-band inverted "V about 30 feet above the ground and it is working out very wel Traffic: K1QFD 32, K1VYC 7, WA1JST 3, W1FLN 1.

VERMONT – SCM, E. Reginald Murray, K1MPN – We wish t thank net managers for being so faithful in reporting. Welcome t new Novices WN1QMZ (Waterbury), WN1MRZ (Essex Jct. WN1MUA (Burlington), WN1MUJ (Moretown) and new Condition WA1MTU (West Haven). Harwood High has club station WA1MP W1OKH has done yeoman service with phone patches from Easte Is. and Managua to families of Vermonters stationed there. We d want to thank all amateurs in Green Up Day – 2-meter f blanketed all 14 counties and gave Vt. CD Hq. a reporting syste like they never dreamed of before. W1ZYZ has been in and out the hospital. Vt. SB Net will celebrate its 5th birthday July 6 so t to check in that evening (or send me a message to be read to th net). Remember, Mon., July 6 at 6:30 EDT on 3.909 MHz. Help c celebrate Anniversary Night. Everybody and all modes will b welcome. International Field Day will be held Aug. 16 at Charlott Vt. Traffic: K1BQB 119, W1FRT 47, K1MPN 16.

WESTERN MASSACHUSETTS – SCM, Percy C. Noble, W1BV – SEC: WA1DNB, CW RM: W1DVW, PAM: – – – –. The Sund Morning Emergency Net is going fine with all five count represented. With deep regret we report the passing of our Hampd County EC, W1IC, Berkshire County EC WA1DVE was on half-hour live program from a Gt. Barrington BC station describi ham activities, especially emergency work. CW RM W1DVW repo that WMN had 208 QNIs and handled 195 messag W1BYH/K1APR renewed as OPS. W1FGJ has moved to Mi WA1GQ is forming a new 6-meter mobile group in and around L (get in touch). W1ZPB has a new quad on a 57-ft. crank-up tow WA1LGU is getting a new Swan Cygnet 270. WA1JYB now has Advanced. HCRA Mar. meeting was held at ed hq. in Belchertow The club has added 16 new members since Feb. Guest speaker VARC was Prof. Joseph Taylor of U. of Mass. WA1LGU has article on her experiences when originally checking into WA (really doesn't sound too frightening at that). CMARA: W1Y gave an interesting talk on DX. WA1KAB served as chairman of activities. MARC: W1QKX did a fine job as auctioneer. WA1MWE a graduate of its code and theory classes. SCM: Members of mob groups or nets would be very valuable additions to our Amate Radio Emergency Corps. Please drop a line to our SEC or to ye county EC. Traffic: (Apr.) W1ZPB 132, K1SSH 110, W1KK 1 W1BVR 95, W1DVW 60, WA1LGU 56, K1IJV 43, W1HH W1PUO 18, WA1DNB 5, WA1MFB 5, W1HRC 1. (Mar.) WA1 10.

NORTHWESTERN DIVISION

ALASKA – SCM, Albert F. Weber, KL7AEQ – KL7DIY is t month's hero of the U. of A. With a typical ham-type flourish a about the hammiest pile of vhf equipment imaginable, he and so

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of his EE students successfully utilized the ATS1 satellite for 149-MHz communication into Cal. They even did a one-hour broadcast. Very impressive from Fairbanks. KL7DG has a traffic count this month -- 1 -- that was a 188-word message to the Gov. of West Virginia, re physical fitness but it was his XYL, Marcie, who walked 31 miles a few days later. KL7ELU and some of the NARCS members are breeding a beauty line of ieeworms from Fay's Aesop. Aesop had the distinction of having traveled all over the U.S. last year with Fay, and requests for his progeny were many. We sure would like one of the furry ones with blue eyes, Fay. KL7FHF says his classes are slowing down now, but just wait 'til the snow flies again. Traffic: KL7CAH 226, KL7DG 1.

IDAHO – SCM, Donald A. Crisp, W7ZNN – The FARM Net meets on 3935 kHz each day at 0200 GMT. The Idaho RACES Net meets week days at 1415 GMT on 3991 kHz. The Gem State Club is sponsoring an "All Idaho County Award." The award will be issued upon receipt of proof of contact with 15 Idaho counties. Additional stickers are available for 30 and for 40 counties. Send confirmation and $1 handling fee to WA7EGL. W7IWU has a new FTDX-550, which he reports works beautifully on phone and cw. K7THX, WA7IHZ and WA7EWV provided communications for a Boy Scout sustained membership drive in Lewiston. WA7BDD received a ORS endorsement. W7GHT qualified for the new Honor Roll Award. FARM Net report: 99 sessions, 639 check-ins, 41 traffic handled. Traffic: K7KBX 211, W7GHT 115, WA7BDD 40, W7ZNN 12, K7CSL 8, WA7EWV 8.

MONTANA – SCM, Joseph A. D'Arcy, W7TYN – SEC: W7RZY. PAM: W7ROE. Appointment: W7BMT as OO. The Glacier Waterton International Peace Park Hamfest will be held at Apgar in Glacier Park Loop 1 July 18 and 19. Preregistration: 1324 Sherwood St. Missoula, Mont. Chairman of the hamfest this year is K7IMZ. New calls in the Missoula area are WN7s OKI, OLN, OLO, OLP, OLQ, OPY. New calls in the Helena area are WN7s OOP, OOQ, OOR, OOL and WA7ONX. W7FIN has gotten a promotion with the telephone company. W7MKB has returned from a trip to the Hawaiian Islands. K7VCA has completed a workshop on disaster recovery assistance with the American Red Cross in Billings. W7LBK came up with a final score of less than 32 p.p.m. in the recent FMT. As your present SCM I am completing my last term in the office. I wish to thank each and every one of you for your help and ideas. I also wish to thank W7RZY for his efforts as your SEC; he has done an outstanding job. The only way the ARRL will grow as an active force in the section is through the activities of the membership of the section. Traffic: W7EKB 146, W7LBK 41, K7FGJ 22, WA7LXM 19, WA7IZR 17, W7FUB 15, WA7MKY 4.

OREGON – SCM, Dale T. Justice, K7WWR – SEC: W7HTF. RM: K7GGO. PAM: K7ROZ. Net reports: K7YOM reports for the AREC Net, sessions 30, traffic 21, check-ins 562, contacts 49, maximum number of counties 16. OSFs and bulletins 7. K7ZQU reports for the BSN, sessions 60, traffic 173, contacts 203, check-ins 1216. WA7FTN reports 1335 phone patches to S.E. Asia during Apr. Al has an SB-310 and 200 plus a 3-band vertical on the air. K7DVK is active on 6-meter ssb. 2-meter fm and 450-MHz fm. New Novices, WN7OQC in Hillsboro, WN7ONC in Salem (formerly WN7DAJ), WN7ODG and WN7ORC in Springfield. WA7LDZ made his first BPL. WA7BOO and WA7CZA are through with college until fall. Emerald ARS participated in the city civil defense drill Apr. 24. WA7KDU, WA7GCE, WA7KPX, WA7KWS and WA7IFS were involved. WA7MOK has an Advanced Class license. EARS Practice Net has moved to 3710 kHz. Traffic: K7ROZ 263, WA7ICX 207, WA7HKV 126, WA7LDZ 110, WA7KIU 87, W7BDU 84, WA7KDU 77, K7OLG 70, W7ZR 70, WA7IIS 55, WA7KRH 28, K7WWR 27, K7YOM 24, W7BUX 22, W7MLJ 15, K7KPT 10, WA7JAW 8, W7HLF 7, W7LT.

WASHINGTON – SCM, Harry W. Lewis, W7JWJ – Washington AREC members now total 269. Seven local emergency nets are active and maintain NTS liaison. W7SAB is very active on slow-scan TV with a new home-brew lineat with a pair of 813s in the monster. W7AXT has a new job as chief engineer of KBRO AM-FM, in Bremerton. W7IFU in Everett, worked 30 new counties during the Nebraska QSO Party. W7BUN has a new jr. operator in the family. Look for W7FQF on 144.0 to 144.3 cw. Up in Canada we hear K7LPZ/VE7 on RCEN and RN7. Her OM is VE7BDL. K7PVF has returned to the Northwest from Kingman, Ariz. W7COG has now returned from Stafford, Ariz. K7PVO now is employed at Hill AFB, Utah, and attending Weber State night courses. K7PVM has been discharged from the U.S. Army and is tinkering with TV and CB and other gear for an electronics store. WA7KOR has joined Navy MARS. K7VNV is in Kenai, Alaska, in the oil fields. WA7CBN keeps a sked on 14 MHz with K7VNV. W7APK/7 set up and operated

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KR40 **Price $89.95**

Keyer, less paddle assembly

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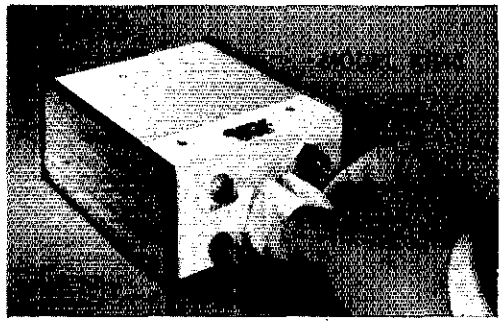

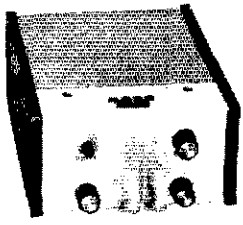

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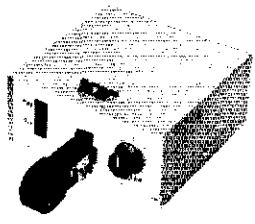

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The KR5 embodies a new principle in paddle construction. It provides action usually associated with higher priced instruments. Operates from 12 volt DC source. Self-completing characters. Fixed factory adjusted paddle return and weight ratio. Ideal for fixed or mobile station.

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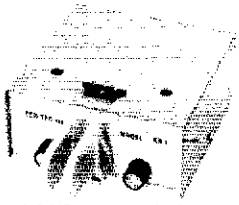

MODEL KR1

The model KR1 assembly is used in the KR40 and KR20. Paddles are mounted on torque bars which actuate the contacts. Return force is magnetically controlled. Each paddle is individually adjustable down to a few grams of force. Best of all, there is a positive "feel" that enhances the enjoyment of CW communication.

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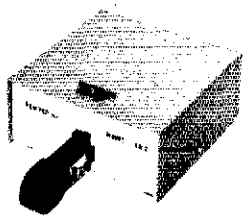

MODEL KR2

The model KR2 assembly is used in the KR5 complete keyer. It uses a unique principle allowing low actuation force, yet retaining excellent "feel". Paddle tension is factory adjusted. Contacts are easily adjusted from the front.

KR2 **Price $12.95**

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from the Benton County Fair Grounds during a Boy Scout Jamboree. W7FL is moving from Reedsport, Ore., to Starbuck, Wash. W7OEB has a brand-new R4B and T4XB. The U. of W. station, W7YD, operated portable during a recent UW Engineering open house. The Puget Sound AREC Net is running bunny hunts on 6 meters twice a month. AREC Net meets every Mon. at 0200Z on 145.35 and at 0300Z on 50.85 MHz. Net reports: AREC QNI 8, QTC 51, 4 Sess. WSN QTC 190, QNI 316, 30 Sess. Traffic: W7BA 1171, W7PI 314, WA7LOQ 226, W7AXT 218, W7IWJ 165, K7CTP 162, W7MCW 87, W7RUN 68, W7RQ 59, WA7KOB 59, WA7ACQ 42, WA7LMO 18, WA7EDQ 17, K7IRD 16, W7EQE 15, W7OEB 14, W7RXH 14, W7UWT 10, K7WTG 10, K7OKC 9, W7AIB 6, K7EFB 4.

PACIFIC DIVISION

EAST BAY – SCM, Paul J. Parker, WB6DHH – It is with deep regret that I inform the section of the loss of Ray Rhone, WA6NFF. Ray was a long-time League member and held various League and club positions in the Diablo Valley area. We will miss him very much. W6RGG/W6TI is doing a bang-up job transmitting the Bulletins on 146.54 MHz daily to the members of the Northern Calif. DX Club. There have been a few misunderstandings on the part of some individuals in the area regarding the primary function of the ARRL QSL Bureau. It is here to serve us and your cooperation will be greatly appreciated by them. We also note the passing of Buck Buchanan recently. W6CBF has been busy building a Heath monitor scope; he amassed 12,240 points in the CD Phone Party. I also had the pleasure of attending a meeting of the SARO recently in Vallejo. W6ZF reports that in Sept. he will have been a ham for 53 years. The Los Lomas Radio Club had an open house recently and in one night originated over one hundred pieces of traffic. K6LRN reports making 3200 points during the recent CD CW Party. W6UZX has not had much time for ham radio lately. W6IPW keeps wishing that someone will come out with a receiver that has everything. WA9FDU/6 has been busy checking into NCN as his traffic total this month will confirm. WA6DIL has found out that girls have the strange power of pulling one away from his radio on Fri. and Sat. nights. There seems to be some news from the Vallejo area as to the possible organization of a new radio club with a focus on public service and inner club activities. Traffic: (Apr.) W6PIW 278, WA9FDU/6 146, W6ZF 7, K6LRN 6, W6UZX 3, W6CBF 2. (Mar.) WA6DIL 334, W6UZX 23.

HAWAII – SCM, Lee R. Wical, KH6BZF – SEC: KH6GQW RM: KH6AD. PAM: KH6GJN. QSL Mgr.: KH6DO. ECs: KH6 GPQ, LP, BAS, GRV/KH6, KH6NO/KH6, KX6FT, KC6EJ an W7UZH/Guam. RACES nets coordinate with KH6AIN, Radi Officer.

Nets	*MHz*	*GMT*	*Day*
Friendly	7.290	2030Z	M-
Boy Scout	21.360	1800Z	
Pacific Interisland	14.335	0830Z	M-W-
Micronesia	14.335	0800Z	Tu-Th-Sa-S
S.E. Asia	14.320	1200Z	Al
Marine Corps	21.430	1900Z	M-
Confusion (Patches)	21.400	0130Z	Al
Pacific Typhoon	14.265		
Gecko (KG6 Islands)	14.315	1000Z	D

Those in town recently: Ex-W3TYY, K4II and family on their wa to VK/ZL; VS6BF visiting with KH6GOW; WØBWJ and his XYL and W5NW, our wandering Honorary vice-pres., and his XYL W5DUR; KH6SP earned 5BWAS certificate No. 7, the first DX station to do it! WH6HCE passed the General Class and now sign KH6HGJ. A note was received from ex-PAM Hawaii, Larry, WØPAI (SCM M. Vice-Dir. Dakota Div.) who was back in D.C. and Del. an at Newington for the Annual Meeting. KH6HDH is visiting i KR6-Land. KH6SP did very well in the recent WPARRL Test an WPX Contest. KH6NS succeeded in 2-meter EME. KP4DJN KH6AK, ex-W4EXM/KH6, celebrated issuance of a two-letter ca by purchasing a new Signal One CX-7 transceiver. KH6GPV passe the Advanced Class exam. KH6BAS writes he's completed four-element tri-band quad and a flying spotscanner for his SSTV effort. KH6LP has a new TH-3 beam and clicked off WAS an DXCC in one year. KH6GPB has been pumping the sigs out of clu station KH6AJF at Camp Smith. KH6DXB, twice retired, is no instructing at Electronics Institute of Hawaii. New Novices WH6 HFW, (KH6IJ's daughter), HBX, HFZ, HGC and HGD. Those o you who wish a copy "Bibliography of Slow Scan TV," drop a S.A.S.E. to WB6ZYE. Congratulation to the Honolulu DX Club whose application for ARRL club affiliation was granted. Traffic KH6BZF 25, KH6GQW 23, KH6AJF 15, KH6BAS 7, KH6AK 1.

NEVADA – SCM, Leonard M. Norman, W7PBV – SEC WA7BLU. Sierra Hamfest Aug. 22, Bowers Mansion, between Carson City and Reno, fenced playground and swimming pool are

for the children, K7ZAU chairman. Nellis AFB ARC, according to WA7BAV, is providing code and theory classes and have assisted about fifty in securing their amateur licenses. Las Vegas RAC members are busy with 2-meter fm repeater projects. SNARS of Reno is conducting code and theory classes and has an active group on 2-meter fm. SNARC, of Boulder City, is active with plans for 1971 SAROC at Flamingo Hotel, Jan. 7-10. SNARA of Reno has some 2-meter fm activity and reports increased interest in its Hamfest planned for Sat., Aug. 22. W7TVF will schedule anyone, cw or ssb, needing a Nevada contact. If mobiling in Nevada, check into WCARS-7255, a Public Service Net. FM 146.34/146.94 MHz is monitored in the Reno and Las Vegas areas with extended coverage.

SACRAMENTO VALLEY – SCM, John F. Minke, III, W6KYA SEC: W6SMU. FC: WA6TOJ. RM: W8VDA/6. WA6TOJ, our Yolo County EC, reports that the activity of the Yolo County CD Net has increased with an average QNI of 18 per week. The net meets at 0200Z Tue. (Mon. evenings) on 145.68 MHz. W6SMU and W6KYA, along with Director W6ZRJ, had the pleasure of attending the Apr. meeting of the Golden Empire ARS at Chico. We are available to attend or speak at your club, too. Let us know. Note comes from WB6AUH that if you would like to have an overseas ham stay at your home for a day or so while visiting the U.S.A., write to Ham Exchange, c/o Fred Thode, DL8VO/W2, 225 Candee Ave., Syracuse, N.Y. 13224. Don't forget to submit your Field Day logs. I still wish to receive news for this column. Those of you who read this, please drop me a card in the mail, with items of interest. Traffic: (Apr.) W8VDA/6 123, (Mar.) WA6TOJ 31.

SAN FRANCISCO – SCM, Kenneth S. McTaggart, K6SRM – Form 1 postcards are available on written request to your SCM. W6KXT, new San Francisco EC, asks that persons interested in AREC contact him at 1040 Masonic Ave., San Francisco 94117. W6WLV, who usually concentrates on NCN and RN6, snagged some new countries in the ARRL DX Test. W6BWV reports that the Humboldt County gang finds Conditional Class country difficult for obtaining the new higher-grade licenses. The distance to San Francisco FCC offices is close to 200 miles. OO W6RQ asks that San Francisco amateurs use caution in accepting any third-party traffic from JA3XPO at Expo '70, as there is no third-party agreement with JA-Land. WB6HZZ is enjoying his new CX-7 transceiver. W6KVQ keeps busy with check-ins to the Mission Trail Net. W6EAJ finds transistors in his experimental 160-meter transmitter short-lived. WN6HSD got a broken arm for his efforts at raising a new antenna. Sea-going operators, W6FCT and K6EBW, keep in touch with thier Sonoma Valley families by frequent 21-MHz schedules. As another ARRL service to the amateur, your SCM is initiating a license renewal-notification system for amateurs in the section. If you are interested, send an S.A.S.E. business-size envelope to me. On the flap write the date 60 days prior to your license expiration date. I will mail your envelope back to you with an FCC Form 610 enclosed as a reminder on that date. Remember, if your renewal is in to FCC *prior* to license expiration, you may continue to operate until FCC acts on the renewal. Traffic: (Apr.) WA6HYZ 218, W6WLV 194, WB6FZN 41, W6BWV 24, WA6AUD 14. (Mar.) W6WLV 123, WB6GVI 29.

SAN JOAQUIN VALLEY – SCM, Ralph Saroyan, W6JPU – At the Mar. meeting of the Tulare County Amateur Radio Club, WB6ITP showed off his homemade antenna swr bridge, WA6CUZ showed off his auto-keyer, K6RGZ showed off his linear amplifier using 4-1V tubes and WA6AGS showed his tr switch and swr bridge. W6BWM got DXCC with 100 watts. WB6LAT has a three-element tri-band beam up 70 feet. W6PSO has a new shack. W6GRV has a new final amplifier using a 500Z. K6QOG is on 75 RTTY. WA6UMU is on 75 ssb. WB6CHQ is heard on 6-meter ssb. W6PPO is recuperating in the hospital. W6DPD reports that ssb activity on 2 meters is increasing, having worked the following stations: W6KD and W6QFD in San Diego, K6IBY in Los Angeles, WA6RLW in Exeter, W6DCP in Corcoran, WB6DPN in Stockton and W6OQA in Carmichael. W6UIK is also active on 2-meter ssb. W6DPD has a Ray-Track amplifier. WB6RGU has a BIT amplifier. W6VMB is working DX. W6SGI is active on the high frequencies. WB6JTH is program chairman for the Kern County Radio Club. W6GRR is on 2-meter fm. K6APE is trustee of fm repeater in Bakersfield. K6OZM and WB6MSM are on 2-meter fm. The Kern County Radio Club is very active teaching Novices code and theory, with 16 in the class. Traffic: WA6SCE 76, WA6JDB 14.

SANTA CLARA VALLEY – SCM, Albert F. Gaetano, W6VZT SEC: W6NVO (acting). RM: WA6LFA. As you can see by this report W6NVO has graciously offered to act as SEC for the section. Acting, huh! Like I was acting for him as SCM while he was sick.

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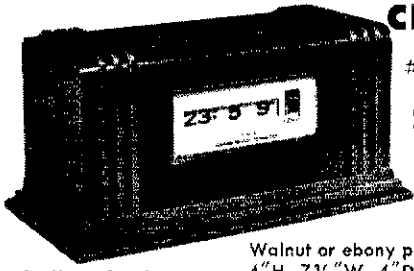

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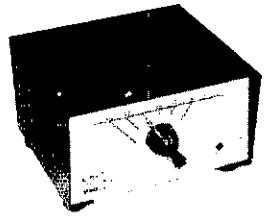

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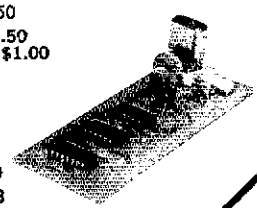

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We'll see, W6REF is busy taking the bugs out of a new linear amplifier. The Live Oak High School in Morgan Hill has set up a club station in the gym temporarily. W6YHM has been troubleshooting a Novice's HW-16. Good luck, Don. Received a landline call from W6YBV the other day. Lee was complaining I missed his Feb. report. His comment was that if I don't get his report, look in the obituary column of the paper. I'll try not to let it happen again, Lee. Yours truly has been very busy trying to get RTTY gear in operation for traffic work. W6ZRJ also has new RTTY gear in operation. W6BPT has taken a liaison spot on RN6 for MARS traffic. WN6AUR is now WA6ARU. Congratulations, Duane. The Santa Clara Valley Two-Meter Section Net is going strong with 67 check-ins during Apr. Remember, the net meets every Tue. at 8:00 P.M. PDT on 146.00 MHz. Traffic: W6RSY 459, WA6LFA 137, W6YBV 137, W6BVB 130, W6DEF 107, W6VZT 96, WA6GTE 84, W6AUC 58, K6DYX 52, W6NW 48, W6BPT 24, W6RFT 12, K2EIU/6 10, W6YHM 8, W6ZRJ 4.

ROANOKE DIVISION

NORTH CAROLINA – SCM, Calvin M. Dempsey, WA4UQC – SEC: W4EVN. PAM: W4AJT. VHF PAM: W4HJZ. WA4ZPF and WA4ASP passed the Advanced Class tests. K4CIA now has his Extra and just received his DXCC-250 endorsement. WB4ILO reports 4 new countries and he worked in the cw DX Test. Steve also has his rotary dipole up twenty more feet and is building a TR switch. W4PKS and W4EVN made the BPI this month. W4OXH, K4VBG and WB4HGS checked into the Tarheel Emergency Net 100 percent during Apr. Our Official Observers, K4MC and K4CIA, are doing a real good job. W4ATC presented "Amateur Radio Servant of Man" at the NCSU Engineer Fair. WB4BGL and WA4NUO handled traffic. WA4NUO has 20 watts fm on 432 MHz.

Net	*Freq. Time/Days/QTC*	*Mgr.*
N.C.SSB	3982330Z Daily49	WA4KWC
EHEN	3923230Z Daily139	WA4UQC
CN(E)	3573224SZ Daily83	WB4MLI
CN(L)	3573020OZ Daily47	WB4GHK

Traffic: W4PKS 1262, W4EVN 340, WB4MLI 209, K5TGA/4 96, W4ATC 82, WB4ICF 75, WA4GMC 63, WA4VNV 57, WA4KWC 48, W4WXZ 48, WB4JMG 43, WA4NUO 34, WA4UQC 31, K4VBG 31, WB4HGT 26, WB4OZL 21, W4ACY 20, WB4HGS 16, W4VTR 11, K4UTN 8, W4EFT 4, K4EO 4, K4MC 4, K4CAX 2.

SOUTH CAROLINA – SCM, Mrs. Elizabeth Y. Miller, WA4EFP
SCPN: 3930 kHz Dy Noon; Sun 0830 and 1530 EST
CN: 3573 kHz Dy 2245Z and 0200Z
SCSSBN: 3915 kHz Dy 2300Z
When you read this W4PED will have been replaced as SCM by Beth Miller, WA4EFP. She will do a fine job and deserves your continued support. In Spartanburg, W4SH is active with an HW-12A. K4JLA resurrected a Viking I for FD. WB4MCT is fixing up an HW-12A for mobile and plans to operate from the N.C. mountains during the summer. W4MTK was honored as Sidebander of the Year at the annual SSB Dinner in Greenville. W4PED QSOed K4JI/KH6, who was working from KH6JJ's station. Bill was on the way to JA-, VS6- and VK-Lands, and had already visited KS6. K4CSZ and W4WQM are continuing their FB performances as OBSs. W4PED also visited the shack of W4JA, who is hoping to rework his antenna system to rejoin CN activities. Traffic: W4MC 29, W4NTO 28, W4PED 16.

VIRGINIA – SCM, Robert J. Slagle, K4GR – Asst. SCM: Albert E. Martin, Jr., W4THV. SEC: WA4PBG. Asst. SEC: WB4CVY. PAM: W4OKN. PAM (VHF): WA4YXK. RMs: WA4EUL, K4MLC, W4SHJ. W4UO was chairman of the LARC's (Lynchburg) FD. WB4FDT received an ARRL Public Service Award for work during and following "Camille," and is reinitiating the Va. Ham Wiecome Wagon. VPN reports 29 sessions, 616 QNI, 71 traffic. Congrats to Southern Peninsula ARC on its ARRL affiliation. W4DM is quiescent. WB4DRB has a 2-watt QRP rig. WA4WQG was appointed Asst. EC for Churchview, Essex and Middlesex by EC W4THV. W4UUJ's counties are at 1563. W4KFC is on 2 with an fm receiver. The Greensboro affair was most worthwhile; thanks to Phil Wicker, W4ACY; passed resolution for Director W4KFC to present to the Board to extend 80 phone to 3750 to relieve the net congestion. The S.E. Va. Wireless Assn. is demonstrating ham radio at store and shopping center openings in Va. Beach; and held FD at Ft. Wood in the middle of Hampton Roads Harbor. Hope you listened for rare one! W4YZC, sponsor of W.T. Woodson High School ARC, has applied for a club license. K4JYM checks into VN with 2.5 watts! W4KAO still is working on the rig. Note that the same faithful report every month. How about hearing from you other thousand? I am sure there are fascinating things happening in DX and on bands

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other than 80 and 2. How about hearing from you who give so generously of your time running overseas fone patches?

VSBN	3935	6:00 P.M. Daily
VSN	3680	6:30 P.M. Daily
VN	3680	7:00 P.M. Daily
VFN	3947	7:30 P.M. Daily
VSBN	3935	10:00 P.M. Daily

Come join us at a time convenient to you. Traffic: (Apr.) W4UQ 209, WB4CVY 187, K4KDJ 173, W4TE 162, K4KNP 141, WB4GTG 122, WA4JJF 83, K4GR 77, WB4JJS/4 71, W4ZM 62, K4MLC 43, W4OKN 42, WB4GTS 39, WA4PBG 37, WB4FJK 32, W4TJF/3 28, WB4KBJ 18, WA4WQG 18, WB4KCM 16, W4DSW 14, W4YZC 12, WB4IRA 11, K4TSJ 10, W4THV 9, W4ZYT 8, W4SHJ 7, KYQX/4 7, K4JM 6, W4MK 6, WB4FDT 5, WB4DRB 4, W4KFC 4, WA4YRH 4, W4KAO 2, WA4NJG 2, WA4BIX 1, W4KX 1, W4OP 1. (Mar.) K4FSS 35, WB4GMC 9, W4KFC 4, K4JYM 1.

WEST VIRGINIA – SCM, Donald B. Morris, W8JM – SEC: WA8NDY. RM: WB8BBG. PAMs: W8DUW, W8IYD, K8CHW. Phone Net Mgr.: WB8AQE. WVN-CW meets on 3570 at 7 P.M. and Phone Net at 6:30 P.M. on 3995. W8DUV was chosen "Amateur of the Year" at the Dayton Hamvention. This is the first time that a YL has won this award. Congratulations. WA8WCK, WA8NDY, WA8PFB, W8DUV, W8DUW and W8JM attended the LO meeting in Greensboro. W8HZA reports another very successful code and theory program completed by the Kanawha Radio Club. WA8NDY assisted by WA8WCK, conducts RACES-CD Training Net every Sun. on 3996.5. WVN Phone Net reports 22 sessions, 249 stations and 38 messages; WVN CW Net 32 sessions, 126 stations and 43 messages. WA8ZNH and WA8TWR report a good year at W.V.U. W8EV plans to make Florida his permanent home. WN8FRZ is a new Novice in Clarksburg. K8CFM is active again on 80 cw. 1970 West Va. State ARRL Convention officers are K8BCF, pres.; W8IYD, vice- pres. K8LSN, secy.; K8NVF, treas. They are to be commended for another outstanding Convention. The Black Diamond ARC Picnic will be held in Bluefield Sun., Aug. 29. Traffic: WB8BBG 127, WA8NDY 48, W8HZA 43, W8JM 15, WA8WCK 10, W8CKX 8, W8SQO 8, WA8LFW 5, W8WEJ 5, WB8AQE 3, WB8EQH 2, K8MND/8 2, WA8YWK 2, WB8AKR 1, WB8AVQ 1, K8QEW 1, WA8RQB 1.

ROCKY MOUNTAIN DIVISION

COLORADO – SCM, Charles M. Cotterell, WØSIN – SEC: WØHLQ. PAMs: WØCXW for CEPN; KØIGA for HNN WØLRW for 160 and WBØAWG as VHF. RM: WØLRN. Asst. SCM KØTTV has been seeing that every Red Cross Chapter in Colorado is aware of the amateurs and their services. Numerous amateurs on the East Slope helped out in several serious emergencies. My personal thanks as well as all other amateurs. Representative Burch has been approached by WØHNC and we have made a great deal of headway in our attempts to return the annual license application fee for auto plates to $1.00, very likely a five-year plate. I have all the dope. WØLLA, a new OO, is already in business. SNCs went to members of CCN last month. W4UDS worked in the CD Party. The 160-Meter Net is in business and those on the air are really doing well. KØIGA has a new GT-550. WØWYX took a trip to New Mexico and found repeater operation along the way. PSHR: KØMNQ for Mar.; KØECR and KØMNQ for Apr. KØGZG is the new EC for District 11. CCN had QNI of 201, QTC of 145, 823 minutes for 30 sessions. Columbine Net reports about the same and HNN had QNI of 1019, QTC of 84 and 971 minutes. AMPS awards are available to all AREC nets. Contact the SEC. Only Denver has requested any; why not the others? Traffic: WØWYX 214, KØJSP 144, KØECR 76, WØLLA 63, WAØMNL 63, KØMNQ 61, WØUAT 47, WØSIN 13, KØSPR 8, KØIGA 6, WØKFH 2, WØLCE 1.

NEW MEXICO – SCM, James R. Prine, W5NUI – The New Mexico QSO Party was a success with the rank order of New Mexico stations as follows: W5QNY, W5RE, K5MAT, W5LT, W5AX, KØQIX/mob./5, W5DO, WA5RBY, W5PDO. Special compliments to KØQIX on providing contacts from five separate New Mexico counties. Out-of-state stations in rank order were WB6LUS, W2EY, W7ULC, K6DS, KØWNV/Ø, WA9TZD, K5PXV, KØGJD, W7CFJ, K8NQP, W1FZ. The Bean Feed Hamfeast sponsored by the Mesilla Valley Radio Club was a most pleasant ham family activity with 164 adults, including many XYLs, and 32 children registered. The excellent chilli prepared by K5ECQ was enjoyed by all. WA5MIY has added a new SB-220 linear to the station. WA5ROW has successfully transmitted 432 TV to W5PNY over a 10-mile path. WA5WYV topped the list with 19 QNI on the New Mexico Net. Traffic: K5MAT 84, WA5TWA 43, W5NUI 24, WA5BLI 8, WA5MIY 7, W5NTG 3, WA5OHI 3.

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UTAH – SCM, Thomas H. Miller, W7QWH – SEC: W7WKF. RM: W7OCX. W7EM has helped give two more hams their start. They are WN7OQE and WN7OQF. W7EM has been instrumental in getting many people interested in amateur radio and has helped them learn the code and theory. He has been especially helpful to the visually handicapped in this way. TWN has moved to 7070 kHz with Daylight Saving Time. W7OCX has again made PSHR. He has been on the PSHR every month since its inception. W7HKC has completed a four-element 2-meter beam and has modified an old SCR-522 receiver for general coverage between 100 and 150 MHz. K7CLO has just received his WAC phone certificate. Please send petitions for SCM with the signatures of at least five ARRL members to League Headquarters. My present term expires this July. If only one valid petition is sent to ARRL that person is appointed SCM for a two-year term. This is the way that you determine what you want the League to do for you and for amateur radio. BUN needs NCSs. Please contact W7OCX or W7OWH. Traffic: W7EM 118, W7OCX 63, K7SOT 52, K7CLO 10, W7OWH 5, WA7NHA 3.

WYOMING – SCM, Wayne M. Moore, W7COL – SEC: K7NQX. RM: K7KSA. PAMs: W7TZK, K7SLM. OBSs: K7SLM, K7NQX, W7SDA, K7TAQ, WA7FHA. Nets: Pony Express, Sun. at 0800 on 3920; YO, daily at 1830 on 3608; Jackalope, Mon. through Sat. at 1215 on 7260; Wx Net, Mon. through Sat. at 0630 on 3920; PO Net, 1900 Mon. through Fri. on 3950. WA7IFX has a new tower and beam and is helping the DX station get its WAS. K7VWA gave a ham radio demonstration in April to the Tensleep Junior High science class which was well received. K7AHO journeyed to Alabama in Apr. to see his new grandchild. WA7EUX was in the hospital in Apr. but, as of this writing, is home, on the air and recovering. W7GMT now has his 30-w.p.m. endorsement. K7ITH has a new trailer home. A new club in the State: WA7EGK has formed the Wyoming Amateur Repeater Society. Anyone interested in 2-meter fm and repeaters, contact Bob. Traffic: W7GMT 284, K7KSA 167, W7TZK 101, W7HLA 94, W7SDA 84, K7VWA 73, W7BHH 42, W7VJI 23, WA7BDI 19, K7WNF 14, K7SLM 8, K7BTE 2, W7NNX 2, WA7AUV 1.

SOUTHEASTERN DIVISION

ALABAMA – SCM, Donald W. Bonner, W4WLG – PAM: W4HDO. RM: W4HFU. W4CUE (HARC) recently rendered a great service to the City of Birmingham during some severe flooding in the area. Those participating include WB4JOY, W4WJX, W4AXL, W4GET, K4DSO, WN4PJU, W4DFZ, WB4JFG, W4WLF, WB4GTM. We regret to announce the passing of K4SIB. WB4KSL announces that he needs the 3725 crystals back when you no longer need them so they can be used by other Novices. WA4WME will be operating as FØUG (visitor to France) soon and will also have calls from Monaco, Andorra, Vatican, San Marino, Liechtenstein, Gibralta and possibly Luxembourg. I hope to have his schedule and itinerary next month. I regret to announce that K4KJD, our SEC, passed away recently. WB4LAL assisted in handling traffic during a recent event in Mississippi. I know all the appointees had a good time in the April CD Party (Communications Department). Traffic: WB4LAL 139, WB4EKJ 109, W4HFU 107, WA4VEK 55, K4AOZ 52, WN4POC 41, WB4LAO 32, WN4OJD 17, WN4OVR 17, WA4AZC 16, K4HJM 12, WB4KSL 12, W4DGH 7, W4WLG 5, WN4PSP 2, K4UMD 2.

EASTERN FLORIDA – SCM, John F. Porter, W4KGJ – Asst. SCM: Albert Hamel, K4SJH. SEC: W4IYT. Asst. SEC: W4SMK. RMs: W4ILE, K4EHY (cw). PAM 75: W4OGX. PAM 40: W4SDR. K4SJH is working on setting up a state-wide RTTY net. This net will be very informal with very few rules. If you have the equipment try to check in. Contact Ham for more details. Dade County ARPSC members handled over 6800 messages from Dade County citizens to their State Senators and Representatives in Tallahassee. Mae and Al are back home in Morton, Pa. Thanks for the help while wintering with us. WB4HKP is contacting radio stations and local newspapers for traffic and publicity. WA4QIM is looking for the GTMO Net to handle PP and Jax traffic for KG4AA. Columbia ARS is conducting a training program using training films and ARRL material. New section appointments are WA4VZF as EC for Duval County, WB4CAP as OO Class III and WB4BDO as OO Class IV. We congratulate the following new hams: WN4PDU, WN4QAL and WN4QON. Let's hurry and get that General. QFN handled 45% more traffic this month over last. The Florida Sidebanders Assn. is sponsoring a ham club and radio station at the Sheriff's Boys Ranch at Live Oak. If you can help, contact WA4RGO. They not only need equipment but help in conducting classes. WA4RGO is the new Fla. Sidebanders Assn. pres. There still appears to be some misunderstanding regarding Section Net certificates. The rules are as

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follows: Ten checkins per month for three months makes you eligible on our regular traffic nets: three per month for three months for our emergency nets and the Novice Hurricane Net; your net manager has to recommend you. We have received word that K4IEX has earned 5BWAS certificate No. 11. Congrats. Traffic: (Apr.) W3CUL/4 3896, WB4HKP 580, W3VR/4 509, W4IYT 328, WA4SCK 284, WA4NBT 278, W4FPC 233, WB4HJW 232, WB4AIW 158, 8R1Y/W4 143, W4SDR 120, W4KRC 94, W4BKC 91, W4LHW 85, WB4FLW 78, W4DVO 77, WB4EPD 77, WB4IHI 75, WB4KUZ 69, W4NGR 69, W4LSR 63, WB4IER 62, K4CVO 60, WA4HED 59, W4YPX 57, WB4GHD 55, W4IA 54, W4KGJ 46, K4DAX 44, W4ILF 38, WA4IJH 35, W4TJM 35, WA4HDH 31, W4SMK 31, W4OGX 30, K4HS 28, WB4HNL 26, K4JWM 26, WA4UOQ 25, W4IAD 24, K4LPS 24, K4SJH 24, W4ZAK 23, K4IEX 21, W4FP 20, WB4ADL 19, W4BNE 19, WB4FJY 19, K4EHY 18, W4GUJ 16, W4VPQ 15, WA4EYU 14, WA4UFO 13, K4EBE 12, W4AKB 10, W4LK 9, WB4HTJ 8, WA4WZZ 8, K4BAK 4. (Mar.) WA4IJH 112, W4ROA 33.

GEORGIA – SCM, A.J. Garrison, WA4WQU – SEC: W4YDN. RM: K4BAI. PAMs: K4HOI, W4LRR. W4YDN reports that AREC activity and interest is growing. The AREC activities of the Greater Atlanta Area, under the expert guiding hand of EC WA4VWV, is rapidly setting the example for all Georgia. New ECs for Georgia are WB4DMO, Chatham, Effingham and Bryan; *WB4JIB*, Ware; K4HVG, Harris, Talbot, Muscogee, Marion and Chattohoochee; WA4PHY, Lincoln, Wilkes and Taliaferro. W4AQL operated fm from Griffin during the QSO Party. WB6UTC/4 has worked 53 Georgia counties on 3.5 MHz, cw and ssb since Feb. K4BAI reports the largest ONI ever in the Georgia State Net during the month of April as 616. GSN reports 60 sessions, ONI 616, QTC 216 and 69 different stations participating for Apr. GTN reports 12 sessions for Apr. Traffic: WB6UTC/4 196, K4BAI 138, W4PIM 123, W4NSO 117, WA4RAV 94, WA4WQU 93, W4CZN 56, WB4DMO 36, W4YDN 30, W4DDY 21, W4AQL 19, W4AMB 18, W4UVP 18, WB4KVE 8, K4NM 7, W4TYE 6, WB4NOA 1.

WESTERN FLORIDA – SCM, Frank M. Butler, Jr., W4RKH – SEC: W4IKB. PAM: W4MOQ. RM: K4VFY. RM RTTY: W4WEB. Nets:

Net	*Freq.*	*Time(Z)/Days*	*Sess.*	*QNI*	*QTC*
WFPN	3.957	2300 Dy	30	431	526
QFN	*7.095/3.651*	*0000/0300 Dy*	*all*	*710*	*529*
2M-FM	146.940	0030 Thurs.	4	---	---

Pensacola: New appointments: WA4SSB as OBS and ORS; K4CFS as OPS. K4VFY is now net mgr. for QFN. WB4JHQ dropped the "N." About 15 boys from K4FKV's and W4ETE's Novice Class are ready for exams. WA4LZM put up a 40-ft. tower, tri-bander and 2-meter vertical. Thieves broke into his car and took his hf mobile rig and fm control head. WB4PKR/m is active on the 2-meter repeater; he is also on 6-meter ssb with a TR-6. Fort Walton: WB4KJX passed General Class. K9JOO and WA9GZU are new hams at Eglin. Appointments: W4FDJ as OBS and OPS; WA4LBM as ORS. W4ROM departed for duty as a marine radio operator. The Playground ARC changed its meeting dates to the 1st and 3rd Thurs. A 6-db. gain antenna was installed for the fm repeater receiver. The FM Assn. received authorization from FCC for multiple control points. W8HOB is becoming an expert on tone oscillators. Panama City: WB4IXK and K3HLU/4 passed the Advanced Class exam. Apalachicola: WA4VFC is with Fla. Power here. Tallahassee: The TARC is assisting a blind student at FSU in getting his ticket. WA4IBL has a new HW-17A. WB4LOQ lost the finals and rf choke in his rig when his antenna blew down! Traffic: (Apr.) W4MOQ 470, K4VFY/4 244, 8R1Y/W4 143, K6QPH/4 114, WA4LBM 37, WB4DVM 13, W4FDJ 11, W4RKH 8, K4CFS 4, WB4NHH 1. (Mar.) WB4LOQ 29, WA5GTJ/4 8.

SOUTHWESTERN DIVISION

ARIZONA – SCM, Gary M. Hamman, W5CAF – SEC: K7GPZ. RM: K7NHL. PAM: W7UXZ. The Ft. Tuthill Hamfest will be held at the Coconino County Fairgrounds, five miles south of Flagstaff.

July 24, 25, 26. Camping on the grounds will be permitted that week end. Talk-in frequencies are 146.94 MHz fm with WA7CEM/7 and 3.878 MHz ssb with W7IO/7. There will be a pot-luck lunch on Sun. as well as 75- and 2-meter transmitter hunts. For more information write to WA7LPR, ARCA, or the SCM. Our Director, W6KW, advises that Mexico is not issuing any permits for U.S. amateurs to operate in Mexico and it will be fall at the earliest before the Mexican Government will reconsider its policy. The new EC for Pima County is K7NTG, while K7CET continues as CD Pima County Radio Officer for RACES. Pima County RACES/AREC continues to provide communications for numerous search and rescue emergencies. W7IV enjoys operating his Signal One, mostly on cw. He gave good programs about it at the Scottsdale and Arizona ARC meetings in May. K7ZWV and WA7HIT are now operating as Advanced Class licensees. K7HQF is on 2-meter fm in addition to running hundreds of phone patches per month of Okinawa on hf. K7EXF is recovering from eye surgery. K7YAM is stationed at Ft. Ord until Feb. PSHR: K7NHL 51, K7UYW 27, WA7EQC 26, W7CAE 24, W7DLF 17. Traffic: K7NHL 304, K7UYW 96, W7CAE 18, WA7JCK 15, K7NTG 15, K7RDH 12, W7GEP 10, W7JMO 8, W7OUE 8, W7GFT 6, W7UXZ 6, W7DQS 4, WA7EQC 4, WA7MZI 4, K7ZMA 3, WA7NBM 2, W7LLO 1.

LOS ANGELES – SCM, Harvey D.D. Hetland, WA6KZI – Asst. SCM: Dick Norton, W6DGH. The So. Calif. ATV Club remains very active with members WA6EPX and WB6VOD providing fellow members with the latest information on their color TV efforts. WB6FXL joins those on 450 MHz ATV with converted fm gear. The next LERC (Lockheed) ARC General class begins Aug. 17 and last 18 weeks. For info write 2814 Empire, Burbank. How many of you were on ssb in 1952? W6AG was, and he now devides his time between WestCARS, MARS and duties at KHJ-TV. PSHR honors for Apr. were earned by W6FJT, W6QAE, WB6ZVC and WB6GHH for their support of local nets and phone patching activities. W6JBX is on 2-meter RTTY, WA6DZR has a Heath twoer going, WA6BDN is expecting an SB-102, W6ORS finally got a 2-meter QSO, WA6KZI and K6UMV are mobile on 2 and WB6USZ reports good 20-meter DX while mobile. The So. Calif. VHF Club provided 6-meter communications for the Kern River Kayak Races again this year, the ARA of Long Beach provided communications for the Long Beach Marina Boat Races in May, the JPL ARC, along with the East San Gabriel Valley AREC, provided communications for Memorial Day Yacht Races, the TRW System ARC provided the TRW Rallye Club with 7-MHz communications for a sports car rallye and plans to do the same for a yacht race soon, while the W6IN Society provided communications for the Van Nuys Loyality Day Parade. Those helping the TRW Club with the sports car rallye were WA6JHD, K6AWO, WA6LIJ, K6GZF, W6CZL, W6YGV, W6FXZ and W6UMC, and those helping the W6IN Society were WA6NHS, WA6LTO, W6MN, WB6IDZ, K6UMV, WA6ILJ, WB6UZS, WB6NST, WA6KZI, WA6AYM, WA6ULA, W6UKS and WB6EZP. WB6ZTI has an Aneco TX-62, HQ-180 and converters to an antenna up 55 feet, W6LYY moved to L.A. from KØGVA and is active in SCN, W6INH has mobile ssb plans, WA6MCK reports three new countries with new antenna and W6NAA worked parade communications with the Lawndale Parade. The So. Cal. Chapter of OCWA gave W6APD a special certificate for having consistently come from the longest distance for their banquets, and W6CL was given a plaque for extraordinary service to the chapter. Net reports for Apr.: SCN, 3600 kHz, 6:30 P.M., QNI 572, QTC 470, W6LCP, mgr. The need of public relations on the part of amateur radio cannot be lightly taken. To offset the work of a minority of our fraternity who assisted in the maintenance of the recent campus unrest it is important that we do our best to sell the public on the true value of amateur radio. The League has available pamphlets ideal for public consumption where amateur radio is on display to the public. However, the opportunity for such a display often comes with inadequate time to get such items shipped from ARRL Hq. I now have a large supply on hand for distribution to affiliated clubs when the need arises. Activity reports: (BPL/PSHR): (Apr.) WB6BBO 623/3, W6BHG 27/0, WN6BJP 0/2, K6CDW 51/0, K6CL 17/0, W6DGH 3/0, W6DQX 18/0, W6FD 4/0, WA6FJJ 3/6, W6FJT 15/31, WA6FQC 0/5, W7GAQ 27/10, WB6GHH 8/32, W6IN 1/6,

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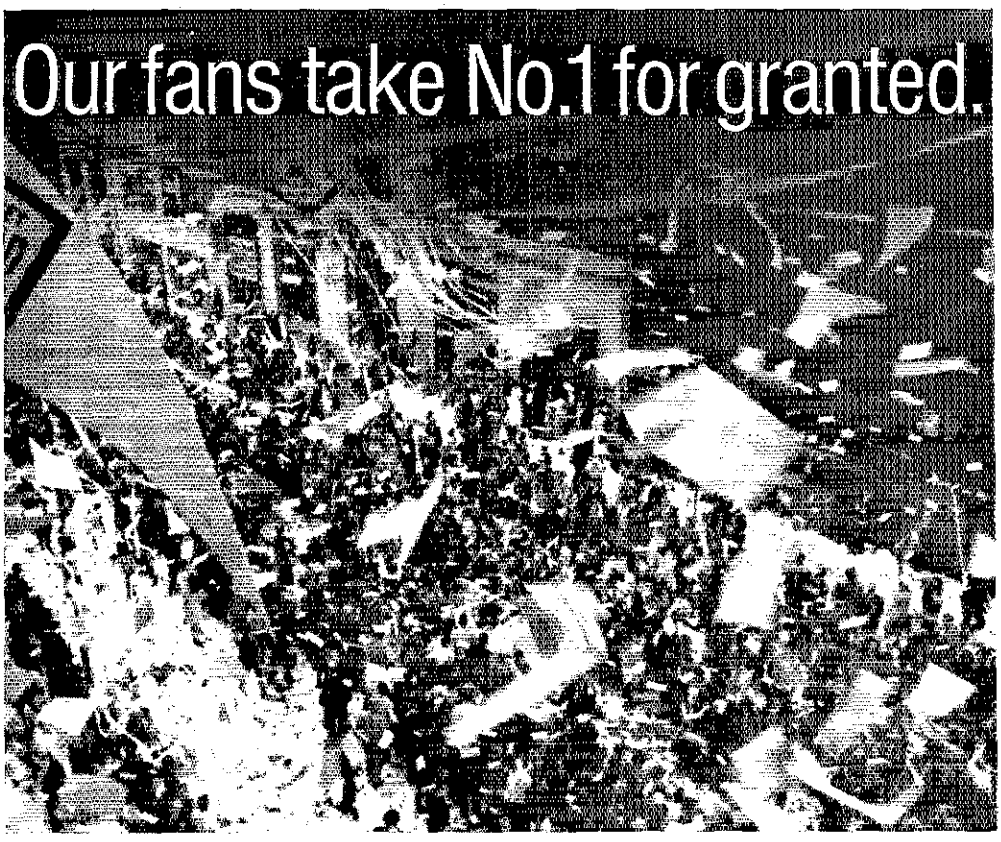

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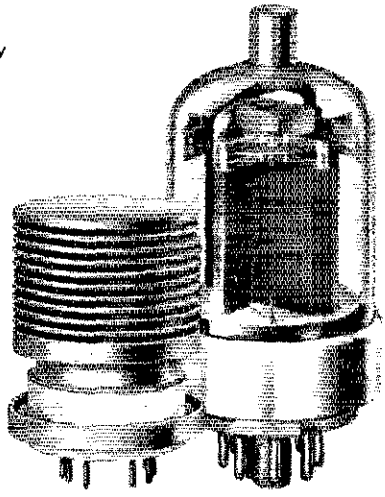

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W6INH 313/0, W6IVC 11/10, W6JBX 0/5, W6JPH 11/0, WB6KGK 10/17, WB6KXI 20/20, WA6KZI 0/5, W6LYY 15/0, WA6MCK 0/19, W6MLF 226/3, W6NKE 1/5, W6OEO 19/10, WB6PAV 1/0, W6USY 1/0, WB6WDS 4/6, WB6WIT 8/11, WB6ZTI 6/0, and WB6ZVC 33/33. (Mar.) W6DQX 7/10, WA6FFJ 0/2, W6HUJ 5/0, W6IUV 4/0, W6JBX 0/5, W6JPH 20/0, W6LPJ 0/32, WB6OLD 16/0.

ORANGE – SCM, Jerry L. Ver Duft, WA6ROF – Asst. SCM: Richard W. Bierbeck, K6CID. W6CPB received a Public Service Award for his communications activity during Hurricane Camille. New OBSs are WA6LGZ and K6DLY. OPS W6BUK vacationed in Ariz. where he attended the Ariz. Chapter of QCWA Picnic and then returned home for the So. Cal. Chapter QCWA Dinner. ORS WA6FOQ received his WAS and CP-25 and sports a new Drake R4B receiver. ORS WB6TYZ qualified for CP-35. ORS WB6ZEC is working on bio-telemetry equipment for small mammals at the Desert Research station. He needs some ideas for design, frequency, etc. WB6NRK passed the Advanced Class exam and his OM, WB6UDC, obtained his WAZ award. The SCM and Asst. SCM visited the Desert RATS Club in Palm Springs, which was also attended by such notables as W6MLZ and Marie DeForest, WB6ZJR. The historic "This Is Your Life" film of the late Dr. Lee DeForest was shown with great enthusiasm. RM W6LCP held an SCN Luncheon in Orange Apr. 25. SCN will continue meeting at 6:30 P.M. on 3600 kHz with an alternate frequency of 3602 kHz as needed. WB6PKA is compiling a new SCN net directory. The Victor Valley ARC conducts Novice code and theory classes each Wed. at 7 P.M. at Fire Station No. 2 on Desert Knolls Road in Victorville. W6JPX, W1HJT/6 and WB6WMC gave amateur radio a boost on KAVR radio Apr. 7 and 8. The Autonetics Club antenna farm was used for background arrangement on page 157 of Apr. *QST*. The Citrus Belt ARC has published a very excellent directory of all Inland Empire Radio Amateurs, listing 1844 hams by call, city, and name. Support your local club and section AREC and NTS nets. PSHR: W6BNX 69, WA6ROF 41, WB6TYZ 29, W6GPR 14. Traffic: W6LCP 166, W6BNX 97, WA6FOQ 89, WA6ROF 75, WB6TYZ 52, W6WRJ 43, K6OT 10, WB6RJX 7, W6GB 4, WA6LGZ 4, WB6ZEC 1.

SAN DIEGO – SCM, Richard E. Leffler, WA6COE – Asst. SCM: Art Smith, W6INI. We welcome, as of May, Howard French to the position of SEC. We are sorry to report the passing of K6BPI on May 8. Tony had given his best amateur service to others in passing countless pieces of traffic for the incoming service personnel to their families. He will be missed by fellow amateurs across the country as well as by those who knew him personally. Field Day is over for another year! Club members from all over the section ran to the hilltops for the annual outing. Club picnics are being held during these summer months. Clubs would like to have you drop around. The meetings and club notices are posted on the ARRL board at Western. WB6UNB (OBS)helped with traffic into Lubbock and got his Advanced. WN6AIF is Gene, new to the Novice ranks. W6FXC has been sailing in Region 2 and keeps in touch through K6PP each morning. Novices are invited by WN6EVJ to try for WAS and WAC through the Novice CHC-FHC Service Net. It meets at 21,140 MHz Sun. at 1800 GMT. Check in if you can. K6CF is pres. of DX Club (instead of K6CS). The DX Club May meeting was held at the home of K6ZMZ in Del Mar. WA6COE spent time in Wash. State in June. Traffic: K6BPI 3609, W6VNQ 656, W6EOT 319, W6LRU 236, W6BGF 165, W6BKZ/6 142, K6KDE 111, K6HAV 83, W6BKZ 50, W6YKF 36, W6INI 11, W6MAR 6, WA6COE 4.

SANTA BARBARA – SCM, Cecil D. Hinson, WA6OKN – RM: W6UJ. The newest club in the area is the Thousand Oaks ARC which meets the 2nd Thurs. of each month at the recreation center. Code practice for the club is provided by WA6WWC. The Thousand Oaks Club had Field Day in the Conejo Valley. K6MK is moving to Washington State. W6HW has completed a TT/L-MKT tone converter and claims it is the world's best. WN6PFY successfully organized a dinner/dance at the Sunset Country Club for the Thousand Oaks ARC. W6KZO just traded his Drake twins for a new Collins S/Line. W6BJM is off the air with KWM-2 problems. New appointments: WA6MGG, of Atascadero, is EC for the San Luis Obispo area. The position of SEC for the Santa Barbara section is open. If you are interested, please contact me at the address shown on page 6. No traffic reports were received.

WEST GULF DIVISION

NORTHERN TEXAS – SCM, L.E. "Gene" Harrison, W5LRR – Asst. SCM: Gene Pool, W5NFO. SEC: W5JSM. PAM: W5BOO. RM: W5GQZ. Asst. SEC ETex/PAM VHF: WA5KHE. Our Director attended the ARRL Board Meeting. We see where K5ILL is interested in OO work. Our RM's family now includes a jr. operator

K5LZA upgraded from Conditional to Extra Class. WA5VJW rec certificate for the YL/OM Contest.W5FCX made his PSHR report, as did W5KYD. Your SCM is in the middle of a newsletter to the No.Tex. membership. Garland ARC has excellent clubroom and station with 35 dues-paying members. K5ABV, 1521 Oak Glen Trail, Dallas is a new OO Class IV. The Richardson NL *Chawed-rag* is issued monthly and covers DX, FD, 160 meters, bio. sketch, 2nd harmonics, net list, plus ads. K5MOT is being transferred. W5QU's report came late. The SCM's term of office expires Sept. 12, 1970. W5QPX reports 215 observations; 6th district calls lead his list. The recent ARRL FMT was participated in by W5ARV, W5KYD, W5MSG and K5PCW. K5ZVZ, DeKalb, expressed strong feelings against the cost of a new license. WA5KHE suggests a new merit certificate open to all hams. W5IZU, Tyler, reports activity in his area. Dallas QCWA crowd Tyler May 24. WN5AQI now is W5AQI, of Chase Field, Beville, Tex., permanent QTH Weatherford, Tex. K5IID is back with us FB. Arlington ARC is very active. Plainview ARC meets the 2nd Tue. monthly in the C of C Bldg. at 8 P.M. K5MTK's OBS appointment has been cancelled. W5NFO advises the NWTEXEMGYNT was activated Apr. 17 with some 50 stations participating. AREC-RACES was fully active in this area on 7255 kHz during the recent tornado. Hero was 87-year old W5TJK, Plainview, with 60 messages. WA5MKV invited the SCM to attend the 3930 Confab at Mother Neff State Park May 24. CenTex-Amateur Radio Club, Waco, moved into a new club building at 12th & Austin Sts. Call W5ZDN. Your SCM wishes to express his personal thanks for the many reports sent in. Sorry if I miss a few now and then. W5QPX is back from a DXpedition to Nicaragua (HT4IM his call). Before he left home he made 39 observations. Traffic: W5QGZ 121, W5HVF 52, K5LZA 49, W5JSM 45, WA5VJW 39, W5FCX 32, W5IZU 21, W5LR 17, K5BDC 10, W5PBN 7, WA5SMI 6.

OKLAHOMA – SCM, Cecil C. Cash, W5PML – Asst. SCM: W.L. Smoky Stover, K5OOV. SEC: WA5FSN. RM and QSL Bureau: W5QMJ. PAM 75: W5MFX. During the past month our emergency plan has been put to the acid test. Several stations in this section put in some long operating hours during the series of tornados that hit the Northwest Texas Panhandle area. On Sun. night Apr. 26 a series of tornados went through the Enid area and the fm repeater got a good workout. The following night Oklahoma City was seriously hit and again the fm repeater came into play along with hf. The Weather Watch and Warning Net has been highly praised by many people. It is believed that countless lives have been saved by the service of the amateur watch and warning system. The Oklahoma City Club's classes for Extra and Advanced Class is going well with about 75 in regular attendance. About the time this goes to press the LFSARC will begin a summer session for Novices through Extra. Congratulations to new Extra Class W5KYP and new Advanced WA5OUU, WA5WDS, WA5WRA and WA5ZOS. W5MFX reports that stations in South Texas worked through the Enid repeater to Illinois. See you in Orange, Tex., July 17, 18 and 19.

Net	*kHz*	*Time(Z)/Days*	*Sess.*	*QNI*	*QTC*
OPEN	3915	0800 Su	4	175	5
OPON	3913	1700 M-F	22	348	49
STN 1	3850	1700 M-S	26	317	45
STN 2	3913	1730 M-S	26	451	35
OWXN	3913	1800 M-S	26	312	--

Traffic: K5TFY 438, WA5YRO 122, WA5JGU 37, W5MFX 37, WA5ZOO 37, W5FKL 32, W2FIR/5 30, W5PML 21, K5WPP 17, WA5WRC 15, WA5FSN 8, WA5NZM 3, W5JJ 2.

SOUTHERN TEXAS – SCM, G.D. Jerry Sears, W5AIR – SEC: K5QQG. PAM:. W5KLV. RM: W5EZY. Congratulations to K5FJZ, new OO in College Station. The San Antonio Radio Club Bulletin lists 16 amateurs in the Police Dept. with a club station, K5SRO. K5ROZ made the PSHR again with 43 points. EC WA5JCJ, of Fort Bend County, has been appointed RO by County Judge Goebbels. The Judge got so interested in amateur radio that he attended the RO meeting. EC K5HMF, Brazoria County, is the proud owner of a new HW-100 operating both fixed and mobile. K5IHK has moved to the Magnolia area. WKWU, Houston-Harris County Red Cross, handled over 400 pieces of traffic following the recent tornado in Lubbock, Tex. K5SUY reports conducting a message-preparing-and-handling class at Beaumont ARC also organizing RACES and Red Cross communications. The amateurs in Orange area are working hard to have a successful and enjoyable West Gulf Convention for all. WA5WFR has been having some rig trouble. K5SBR/5, reports for Texas A & M club station, W5AC. Brian Derx, WB2HEY/5, has been chosen to head the Radio Comm. for next year. EC K5WYN is on an auto trip to St. Louis. Traffic: (Apr.) W5QQ 31, WA5QKE 23, W5BHO 23, K5SUY 13, W5AC 12, W5TFW 10, W5NJH 10, W5KLV 9, K5ROZ 8, K1PKQ/5 6, K5WYN 4. (Mar.) K5SUY 26.

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(Please see the other side of this page for an application for membership in ARRL and 12 issues of QST)

THE AMERICAN RADIO RELAY LEAGUE, INC., NEWINGTON, CONN. 06111

QS 7-70

CANADIAN DIVISION

ALBERTA – SCM, Don Sutherland, VE6FK – SEC: VE6XC. It is with deep regret that I report the passing of VE6AO, one of Canada's best-known amateurs. He will be long honored by the Annual VE6AO Trophy for DX, presented to CARA as custodian by VE6RB. VE6AHE is going to start moonbounce experiments. The fm/vhf groups from various areas of the province have held several meetings to settle repeater frequency problems. The NARC held its Annual Award Night with the following presentations: Technical-VE6RM; Bunny Hunt-VE6ASZ; Boner? Award-VE6ASZ; VE/W phone-VE6JW (no cw entry); Merit Awards-VE6RP, VE6EA, VE6VF; Home Brew-VE6VM, VE6AYV, VE6ATA, VE6LF; *Memorial Award-VE6AQZ. Congratulations to VE6AIK* on obtaining her Advanced Class license. VE6HM still does outstandingly well in the FMT. VE6MJ now has quite a confirmed DX total. Thanks to VE6ASI and CFCN-TV for their presentation of "Hams Wide World." VE6RX and CFRN-TV also are to be congratulated on their use of the same film. VE6TY and VE6AWI would like a few more members on the ATN on 3690 kHz at 0330Z. Traffic: VE6ATG 24, VE6TY 18, VE6HN 16, VE6FK 12, VE6XO 7, VE6ADS 5, VE6HF 5, VE6WN 5, VE6YW 5, VE6BL 4, VE6SS 4, VE6HD 3, VE6VF 2, VE6AD 1.

BRITISH COLUMBIA – SCM, H.E. Savage, VE7FB – B.C. is on Daylight Saving Time. This has a serious effect on our activity amateur-wise as shown by a sharp decline in reports and net check-ins. VE7BWF will be off the air, getting married. VE7VD is back on after a year of sickness. VE7KY is home after a year but is not well; he is still confined to bed and cannot move. A new YL is VE7AIU. VE7SE reports the Trans-Canada Net needs more Interior check-ins on 14,140 kHz. Time 1800Z. VE7BXO has a new boy, now totaling four boys. VE7BYA and VE7BYU both passed the Class "A." East Kootenay ARC's 1970 officers are VE7ADI, pres.; VE7AIT, vice-pres.; VE7BKN, secy. Good club bulletins were received from Fort George, Trail, Beaver Valley, North and West and show healthy activities and club spirit. The Vancouver Island Picnic was held June 14. The North Island Hamfest will be held Sun., Aug. 2, 1970. For information and map write Gordon Burleson, VE7BAV, Box 218, Port McNeil, B.C. TransCan RTTY *Net meets Mon. at 0330Z on 3625. NCS is VE7AFJ, Parksville.* Traffic: (Apr.) VE7KZ 43, VE7AC 38, VE7SE 13, VE7BNK 9. (Mar.) VE7SE 14.

MANITOBA – SCM, Keith Witney, VE4EI – Congratulations to VE4FG on the receipt of his DXCC with 110 countries. VE4RU has moved to VE6-Land. I hope he continues his activities there and keeps in touch. VE4GM is conducting classes in Lundar and trying to sandwich them in between planting and hockey. For those mobiling through the province the fm frequencies are 147.33 primary and 146.94 secondary and the 75-Meter Net meets at 3760 kHz at 7:00 P.M. local time. In case you have lost the cw net it is on a summy accepting volunteers for an OBS position. If interested, please get in touch and I will fill you in. See you at the Sept. Centennial Hamfest. Traffic: VE4FQ 45, VE4RO 28, VE4JA 8, VE4CR 7, VE4QJ 7, VE4NE 6, VE4MK 2, VE4JF 1, VE4PL 1, VE4WT 1.

MARITIME – SCM, William J. Gillis, VE1NR – Asst. SCM Clarence Mitchell, VO1AW. SEC: VE1HJ. Our sympathy to the family of VE1BG. The approach of summer brings reports and increased 2-meter mobile activity. VE1EX reports good DX on 15-meter cw. VE1XG is very active in heading up the CNIB/ARC work. VE1ASR is the new 2nd vice-pres. at HARC. It is hoped that VO1AW will be in gear with Newfoundland items for the next report. VE1AMR is doing an excellent job in supplying traffic totals and net reports. VE1AOH reported working on a device for locating a good Field Day site. APN reports: sessions 60, QNI 265, QTC 75. Traffic: VE1AMR 116, VE1RO 71.

ONTARIO – SCM, Roy A. White, VE3BUX – SEC: VE3EWD. RMs: VE3AKQ, VE3DBG, VE3DPO, VE3BLZ. ARRL appointments are available, to qualified amateurs, from your SCM. If you don't know what is what, let me know and I'll send you a booklet. The rough language by some VE3 boys, just below 7200, leaves something to be desired. Let's cool it, fellers, before the DOC take action! Keep in mind the Convention Oct. 23 and 24 being put on by the Windsor ARC. VE3CLB has been transferred to G-Land. Did you know that VE3RX (ARRL Associate Counsel) is not only lawyer but also an electrical engineer and, on top of that, a member of the Ontario Legislature? VE3NW is in Kingston General but coming along okay. Ex-navy types have a net on Sun. mornings, 10 A.M. local time, on 3795. My thanks to VE3EWD and VE3AUC who picked up traffic for me during my absence in the "Sunny

South." It would help a lot if holders of appointments would send me their certificates for endorsement without being reminded! VE3ERU had a traffic total of 391 in Apr. and made the BPL. A big welcome to VE3DBG, who took over as RM of the Ontario-Quebec CW Net on May 1. By the way, I'd like to see more traffic reports coming in from the various nets each month. Congrats and a happy retirement to VE3FQZ. Jack was E.M. Coordinator for Peel County. Glad to say he remains as our EC. I'm told that VE3TL, who recently passed away, held patent rights on the immersion heaters so generally used in our hot-water tanks. One last word! I'm advised that the DOC is again monitoring the amateur bands, including 2-meter fm, for improper use of call signs. Some of the boys are omitting the "VE" prefix. Watch it, boys! Traffic: (Apr.) VE3ERU 396, VE3GI 247, VE3DPO 97, VE3EXI 95, VE3EHL 29, VE3DV 26, VE3AWE 25, VE3FWD 24, VE3CLB 18, VE3GHO 16, VE3DBG 15, VE3GCE 13, VE3EPX 6, VE3VD 5. (Mar.) VE3GI 175, VE3ERU 172, VE3DPO 104, VE3AWE 35, VE3CLB 26, VE3DV 24, VE3EXI 20, VE3GHO 20, VE3EHL 18, VE3VD 9. (Feb.) VE3ERE 109. (Jan.) VE3EHE 14.

QUEBEC – SCM, J.W. Ibey, VE2OJ – This is my last report as SCM and I must not forget to thank all for the very able help given me over the past few years. The assitance of RM VE2DR and the very punctual and accurate reporting of SEC VE2ALE, the helpfulness of all the ECs, ORSs, OVSs, the untiring struggle of the fellows who are NCSs of some very difficult net situations, all make the lot of the SCM an enjoyable one. There are many things, though that make the office very cumbersome, such as our very large area (amateurs can be as much as fourteen hundred miles apart in VE2-Land.) All appointees have done a very nice job and I cannot thank them enough. For many months we have been struggling with a mail problem, which, if you read *QST* editorials for the past two months and multiply them by one hundred percent you will see why the OBs, *QST*'s CD Bulletins and other mailings to VE2-Land have been very late and in many cases not received at all. It has been a most pleasant tour of duty as SCM. I will be pleased to perform any duty toward amateur radio in the future, as I have done in the past, except that I am not sure of length of stay in VE2-Land. 73. Traffic: VE2DR 71, VE2BVY 23, VE2EC 21, VE2CP 20, VE2APT 8, VE2BTZ 4, VE2OJ 3.

How's DX?

Continued from page 82

contests, rates Ws 2RU1 9HHX 3KV 4YG, WA6WGL, Ws 1BZT 3ILZ, WB6RXM, WA2YVK and W1JKL last year's leading U.S.A. radioteletype competitors in that order . . . . . Germany's rollicking WAE DX frolic kicks off on code the second week end of next month—details due in August's "How's" . . . . . Sailor WN3NLP, stationed in Sicily, wants to hear from buddies via Box 377, FPO, New York, N.Y., 09523 . . . . . A team of OHs itch to radiate from Albania this month. DL7FT and friends likewise later.

HEREABOUTS—Be reminded that the code segment of RSB's Bermuda Contest comes off the 18th-19th of July as detailed in June's "How's" . . . . . Southern California DX Club brass now includes W6s ZJA pres., DGH v.p., K6s SXA serv., GLC treas., W6s A8A Ed/I and WB6UDC directors, with WA6GLD editing the club's monthly *Bulletin* . . . . . "Talked W8PJW into putting up a beam," means W8KZO, "Now he works more DX than I can hear." . . . . . Mysterious neighborhood DX mentioned in the Washington *Post* and noted by K3CUT: A lady in Daytona Beach keeps hearing sporadic recordings with no commercials through her dental work. Probably somebody's wireless phono gear but by but even newspaper pleas fail to identify the source . . . . . W5OJZ is organizing the Universe Radio Master Society with computerized accent on DXpeditions and contesting. Frank invites inquiries . . . . . "Repaid an old visit by YN4JAB and helped turn out some Nicaraguan ex-contacts," reports W5QPX after his HT4IM spring lark. WB8HUV was along signing HT4CL. Uncertain transportation, erratic line voltages and mediocre propagation made things overly hairy at times . . . . . W1FCC, formerly W8CAG, returns to DXing with a brand new kick, simple homespun weapons, "Aly 6146 and attic dipole catch occasional goodies. The receiver, still at breadboard stage, works only on 20 at present." That's real fun gummin' . . . . . WF3IEC was on DXhibit at a May international fete in Washington . . . . . K5QHS wants to beat the hurricanes to Swan Isle . . . . . WB2VAE, Fs 2QO and 5QO may be visiting Clipperton island with F9NH credentials at any time . . . . . Gripe of the Month is filed by W4PGW who scoffs at DX "QSOs" logged with ridiculously excessive assistance by others on frequency. To such operators who claim credit for same Carl would award "DXCC" diplomas colored baby blue and edged with garlands of pink ribbons. QST

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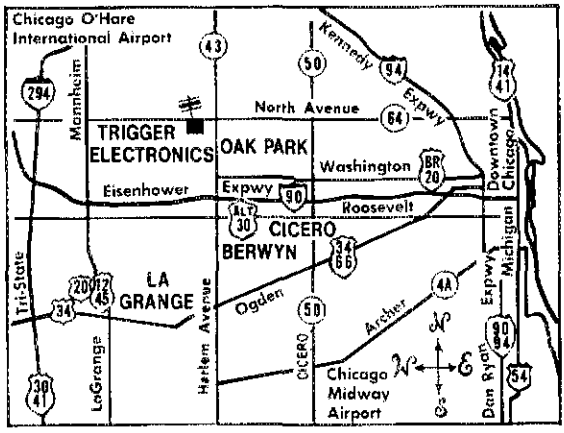

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(3) The Ham-Ad rate is 50 cents per word, except as noted in paragraph (6) below.

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(5) Closing date for Ham-Ads is the 20th of the second month preceding publication date.

(6) A special rate of 15 cents per word will apply to advertising which, in our judgement, is obviously non-commercial in nature. Thus, advertising of bona fide surplus equipment owned, used and for sale by an individual or apparatus offered for exchange or advertising inquiring for special equipment, takes the 15-cent rate. Address and signatures are charged for, except there is no charge for zipcode, which is essential you furnish. An attempt to deal in apparatus in quantity for profit, even if by an individual, is commercial and all advertising so classified takes the 50-cent rate. Provisions of paragraphs (1), (2) and (5) apply to all advertising in this column regardless of which rate may apply.

(7) Because error is more easily avoided, it is requested copy, signature and address be printed plainly on one side of paper only. Typewritten copy preferred but hand-written signature must accompany all authorized insertions. No checking copies can be supplied.

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(9) Due to the tightness of production schedules, cancellation of a Ham-Ad already accepted cannot be guaranteed beyond the deadline noted in paragraph (5) above.

Having made no investigation of the advertisers in the classified columns except those obviously commercial in character, the publishers of QST are unable to vouch for their integrity or for the grade or character of the products or services advertised.

CANCELLATION. The Antique Wireless Assn. regrets to announce that the 1970 Historical Conference at the Ford Museum has been cancelled. L. A. Cundall, W2QY, Treas. AWA.

AN invitation NYC Area Hams and SWLS are invited to attend NY Radio Club Meetings - 2nd Monday of every month. George Washington Hotel, 23rd St. and Lexington Ave at 8 PM.

QCWA Quarter Century Wireless Association is a non-profit organization founded 1947. Any Amateur Radio Operator licensed 25 or more years is eligible for membership. Write for information. A. J. Gironda, W2JE, Box 394, Mamaroneck, NY 10543.

IF you have operated amateur radio 40 years ago you are eligible for the exclusive Old Old Timers' Club, Inc. Write Ray Meyers, W6MLZ, Box B, San Gabriel, CA 91778 for details.

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HAMFESTERS 36th Annual Hamfest and picnic. Sunday, August 9 1970, Santa Fe Park, 91st and Wolf Road, Willow Springs, Illinois, southwest of Chicago. Exhibits for OMs, XYLs. Famous Swappers Row. Information and tickets, Tom Ondriska, WA9YZW, 6609 South Kedvale, Chicago IL 660629.

SOUTHERN California amateur network 14.325 mHz Monday through Friday 0400 GMT. K6YCM.

TOROIDS, 88 mh uncased, 5/$2.50. Postpaid, Humphrey, WA6FKN, Box 34, Dixon, Calif.

SAVE. On all makes of new and used equipment. Write or call Bob Grimes 89 Aspen Road, Swampscott, Mass. 617-598-2530 for the year u want at the prices u want to pay.

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CANADIANS: NCX-5 with NCX-A power supply, $500, never used. On return from National factory overhaul and is in mint condx. George Burnside, RR#1, Angus, Ont. P., Canada.

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WORLD QSL Bureau. See display ad elsewhere in this issue

CASH paid for your unused tubes and good ham and commercial equipment. Send list to Barry, W2LNI, Barry Electronics, 512 Broadway NY 10012. Tel 212-925-7000.

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RTTY gear for sale. List issued monthly. 88 or 44 MHy toroids five for $2.50 postpaid. Elliott Buchanan & Assoc., Inc. Buck W6VPC, 1067 Mandana Blvd. Oakland, Calif. 94601.

NOVICE crystals: 40-15M $1.33, 80M, $1.83. Free flyer. Nat Stinnette, Electronics, Umatilla, Fla. 32784.

SELL swap and buy ancient radio set and parts magazines. Lavery, 118 N. Wycomb, Lansdowne, Pa. 19050.

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WANTED. For personal collection. The Radio Amateur's License Manual, Edition 12, ARRL "Map of Member Stations," 1914, WICUT, 18 Mohawk Drive Unionville, CT 06085.

NOVICES. Need help for General ticket? Complete recorded audio-visual theory instruction. Easy, no electronic background necessary. Write for free information. Amateur License, Box 6015, Norfolk VA 23508.

WE'RE trying to complete our collection of callbooks at Hq. Anyone having extra copies of Government Callbooks 1922-1925 and Radio Amateur Callbooks 1928-1934? ARRL, 225 Main St., Newington CT 06111.

WE BUY all types of tubes for cash, especially Eimac, subject to our test. Maritime International Co. Box 516, Hempstead NY 11551.

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FREE Sample copy Long Island DX Association Bulletin. Latest DX news. Business size s.a.s.e. to K2AFY, Box 74, Massapequa, LI NY 11762.

RAMFEST — Indiana Radio Club Council's annual picnic Sunday July 13, Memorial Park, Michigan City, Ind. Group meetings, contests, ladies' handiwork displays, reserved flea market booths, advance registration, awards, talk-ins 3.910, 50.4 and 146.94. For flyer, write William Cannon, W9ILS, 205 No. Roeske, Michigan City, IN 46360.

GREENE. Center of dipole insulator, with or without balun. Free flier. See our display ad in this issue! O. Watson Greene, Box 423, Wakefield RI 02880.

VERY In-ter-est-ing! Sample copy free. "The Ham Trader", Sycamore IL 60178.

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CAPACITORS. Brand new 140 mfd electrolytics @ 450 vdc, ten for $9.50. K4HFP, Mehaffey, 6835 Sunnybrook Lane, NE, Atlanta, GA 30328.

SATELLITE Amateur Radio Equipment Co. New and used ham gear. Repair service. Ham antennas, supplies. 426 Boston Post Rd., Waterford CT 06385. Tel: 203-443-8841.

COUNTER. 100 kc, Berkley EPVT, Model 715OBDK, excellent condition, $200. John Link, 1081 Aron St., Cocoa, FLA 32922.

COLLINS For sale: KWM-2, †13378 with a.c. and d.c. p/s, $825; 30L1, $390. All real clean. K8LQA, Box 96, Sparta, MI 49345.

160 meter Matchverter resonates any 40 or 80 meter inverted vee/dipole on 160 meters. Handles 250W PEP. $29.95 ppd. Top Band Systems, Dept.4, 5349 Abbeyfield, Lone Beach, Calif. 90815.

HEATHKIT SB300, SB400, SB600, SB630, SB200, all for $550. Must sell. Bob Tribble W6CLD, 11588 Acuna St., N. Hollywood Calif. 91604. Tel. 213-985-1182.

BONUS Specials! +1) Matching AC supply free w/purchase of Galaxy GT550 at $545 (FOB). +2) Free Ham-M Rotor w/purchase of combo Tri-Ex W-51 tower, Hy-Gain TH6DXX at $559. — from "The Best in the West," L. A. Amateur Radio Sales, 24214 Crenshaw, Torrance, Calif. 90503.

TOROIDS! Lowest price anywhere, 40/$10 postpaid. Center tapped 88 or 44 MHy. (5/$2). 32KSR Printer, reconditioned, perfect $200. Lowrox ASR page printer (all 60 speed) $100. Perf tape 11/16" $10/case/40. Facsimile electrosensitive paper $3— 8x/250. Stamp for list. Van W2DLT, 302A Passaic Ave. Stirling NJ 07980.

PREPARE for FCC exams! You need Posi-check. Original, expertly devised, multiple choice questions covering materials used in FCC exams, in the same form as FCC exams, with keyed answers, explanations, IBM sheets for self-testing. Over 300 questions and/or diagrams for each class. Each class complete in itself. Basic questions duplicated where they apply. General Class $3.50. Advanced Class $3.75. Extra Class $4. Third class postage prepaid. Add 3¢ per copy for first class mailing, 64c for airmail. Send check or money order to Posi-Check PO Box 3564, Urbandale Station Des Moines IA 50322.

RECEIVING & Industrial tubes, transistors, all brands — biggest discount. Technicians, hobbyists, experimenters — request free giant catalog and save! Zalytron 469 Jericho Turnpike, Mineola NY 11501.

QST collection — July 1923 to date. All in QST binders — complete and perfect. I move too much. Offers to W7GHU/W6GHU Box 531 Tucson AZ 85702.

DISCOUNT prices! New equipment, factory sealed cartons, full warranty. New Drake TR4 (Reg.$699) $595. New Drake R4B (Reg.$475) $404. New Drake T4XB (Reg.$495) $420. New Galaxy GT550 (Reg.$595) $439. New Galaxy R530 (Reg.$795) $639. New Hy-Gain TH6DXX (Reg.$169) $139. New Hy-Gain TH3MK3 (Reg.$149) $111. New Hy-Gain Quad (Reg.$109) $89. New Mosley Classic 33 (Reg.$147) $119. New Classic 36 (Reg. $171) $136. New Tri-Ex W51 self-supporting Crankup (Reg. $393) $323, shipped prepaid. New Ham-m rotator (Reg. $129.95) $99.95. Send for price quote on all amateur equipment. Discount Radio Sales, Box 6044, Lubbock, Texas 79413.

TOROIDS Unused 88 or 44 MHy 5 for $1.50 ppd. M. Weinschenker, Box 353, Irwin PA 15642.

CIRCUITS for 22 electronic projects, RF, audio and gadgetry, complete plans $1. PM Electronics, Inc., Box 46204, Seattle WSN 98146. Dealer inquiries invited.

DUMMY loads, 1 kw. all-band, $7.95; wired $12.95. Ham Kits PO Box 175, Cranford NJ 07016.

WANT early issues of Radio News, Science & Invention, Electrical Experimenter, Radiocraft, Modern Electronics, Popular Radio, Radio Broadcast, Wireless Age, 1923-25 Callbooks. For historical library. Wayne Nelson, W4AA, Concord NC 28025.

HQ-110 AC $95. Larry, WA2GUA 212-CH1-8855.

ENGRAVED plastic badges, name plates, $1.15 P.P. T. Connor, 75 Edwin Street, Boston, MA 02124.

WANTED: All types of tubes. Highest prices paid for Varian and Eimac. Air Ground Electronics, 64 Grand Place, Kearny NJ 07032.

FOR SALE, KWM-2 blanker, DX, mount, PM-2, CC-2, Hustler $1000? C. C. Carney 4665 Monroe NE Mpls MN 55421.

SELL: Gonset G-50 6 meter transceiver with manual $150 or best cash offer; Motorola 41V 12V front mount, as is, $35; Eldico SSB 1000 Linear covers 3-30 MHz continuous, requires 3 watts drive. Collins KWM2A, with PM2AC supply $850; CC2 carrying case $50; complete CP1 crystal pack $240 — package $1100. All prices firm, no trades. John Fearon 3384 Peachtree Rd. NE Suite 705 Atlanta Ga 30326.

WANTED, Collins KWM2, 516F2, MP1, DL1 136/32, CC2, all must be like new, clean, without scratches, will pay cash against documents. DL6YU, Moldner 896 Kempten, Germany, Box 2027.

"DON and Bob" guaranteed goodies. Monarch dualmeter power/swr bridge, 2 kw $15.95; Galaxy GT-550 $445; new deluxe console Galaxy MK3 $55; Gold=line 100 wattmeter $29.95; Monarch 3" blade fan $2.95; 2" speaker 59c; 4" 95c; Saxton 3000 ohm open wire line $4.95/c; coax RG-22B/U for polygon quad 13c/ft; Motorola HEP170 2.5A/1000PIV epoxy diode 39c; GE 3A/600V epoxy 33c; 6146B $4.45; 3-400Z $31; 572B/T160L $15.95; Telex HMY-2K stethoscope headset $3.95; Used — Collins 75A4 $350; Johnson Invader 2000/Ps $339; Galaxy R530 write. Discount tube prices for ham gear. Write for quotes. Prices FOR Houston. Bankamericard, GECC. Don, K5AAD; Bob, WA5UUK. Madison Electronics, 1508 McKinney Houston Texas 77002. 713-224-2668.

SALE Heathkit Apache transmitter CTX-D $70, Lafayette HE-80 receiver $35. Both excellent condition. John Davis 415 Mountainview AVe. SI NY 10314. Tel, 212-273-6447.

YAESU Munsen FLdx400 transmitter self contained a.c. pwr supply new never used. All ham bands. $265, no swaps and no personal checks, Fob. L. K. Laird W9RLW Mt Prospect IL 60056.

SELLING: Drake 2-C Hamband receiver (factory sealed) $210; Gonset G-50 6M transceiver $165; Gonset Sidewinder 910C 6M transceiver w/matching ac & dc PS many extras $360; Heathkit HA-20 6M transceiver w/matching ac PS, noise blanker $295; Swan dc module 14C $40; Swan 210 6M outboard VFO for 250 or 250C $74; W2AU fiberglass quad (factory sealed) $90; W2AU balun (factory sealed) $11.75. Tom Dittrich, WB2LZD.

WANTED FTdx 560 new or used. Also address of Yaesu manufacturers. O. R. Clements VE4OR Binscarth, Manitoba.

DRAKE 2-C, 2CQ, xtal cal, 2NT, xtals, less than year old, mint condition, cartons, manuals, complete $300. WN6GNP Dick Wilber 5269 University, Santa Barbara, Calif. 93105.

500W linear amplifier exact as in 1961 ARRL Handbook pg. 198. Built 1965. Make offer. Hammarlund HQ160 receiver good cond $120. Steve Pacha Birmingham Iowa 52535. 515-698-4322.

HALLICRAFTERS HT32 transmitter and SX101 mark III receiver both $300. WA1EBJ 40 North Broadway Haverhill Mass 01830.

SELL HW12A, HP13 power supply, Mark "Hellwhip," manuals $150. W2DXE Jeff Peters, 460 Huxley Dr Buffalo NY 14225.

HW12, HP-23, factory overhauled. $105. WA4LBO, U-2255, Columbia SC 29208.

SWAP Heathkit AA-21 transistor stereo amplifier with walnut cabinet for HW-17 or comparable 2 meter rig. WA5GTJ/4 500 Woodbine Dr Pensacola FL 32503.

SELL HQ110 excint condx $125, Knight T-150A $50, Central Electronics 10A/458 $45, Globe LA-1 amp $45, Heath VSWR AM-2 $15, Drake Low pass TV-1000 $12, Ameco 6 meter pre amp PV $12, B&W coax sw 560A2 $5, Mobile mike new $5, Dow Key relay DK-60-62C $15, Spillman key $5, D-104 mic $40, QST magazines 25c each. Bob Henson 525 Trotwood Ridge Rd Pittsburgh, Penn, 15241.

COMPLETE amateur station. Collins 75S-3A, 32S-1, 516F-2, 312-B4. Hallicrafters TO keyer, vibroplex paddles. Shure S455 dynamic mike with flexible arm overhead boom. Telex HTW twin headset. Heathkit Ham-Scan, monitor scope, cantenna. Ameco PT preamp and station power switch, Caslon 24 hour digital clock. All cables. All equipment exceptionally clean. Package deal only, $1775. Desk and executive chair $200 extra. Rotor 40 foot tower, vertical, tri-band quad thrown in free with complete package. All commercial gear, unmodified; all manuals included. W9LPK, Marc Veeneman, 956 Hillcrest Road, Elgin, Ill 60120. 312-695-4520.

SB-200 kw linear $195. Ronald M. Nagata W6RQZ 1330 Curtis St Berkeley Calif 94702. Tel 415-526-7345.

SWAN Cygnet 260 $280, HA-460 6 meter transceiver $95. Both mint. I ship. WA2GMD 8 Hollis Place Huntington Station NY 11746. 516-HA1-9286.

FOR SALE Lampkin 105B $125, Lampkin model 111 PPM $74, Lampkin 205A mod meter $150, (quad scale). TS-497B/URR sig generator $140, RCA oscilloscope WO56A $60, R. Richard Cartledge K4FGX.

FLEXIBLE plastic call letter signs 4" x 11" weatherproof. Specify magnetic for on-off application to cars-trucks; adhesive for permanent application for windows, house siding. Letter colors: red, black, blue, green. $3 each, $5 pair. Leiden Enterprises Inc. 19304 Stafford Ave Cleveland Ohio 44137.

NOVICES: Fine HT-40, manual, $45. I pay shipping. Michael Cole, WA9ZSI, 806 S. Stewart, Freeport, Ill. 61032.

SELL Heath SB610 $70, SB200 $190. Instructograph with 20 tapes, slow to fast $45. RCA Inst sig gen a and rf $20. Will ship prepaid east of Miss WA2ZDT. 41 W James Falconer NY 14733.

HE45B 6 meter transceiver and vfo, Heath tower and mobile power supply, 11 element beam, all for $85. TA33 beam, CDR rotor $50. WB2PAA, Call 516-1V9-4295.

FOR SALe: Heath SB200, SB300, SB400. $600. W4MSO 7908 Juniper St. Miramar Fla 33023.

WANTED, BC348 receivers. State condx and best prices. Lee, Apt. 5, 183 N. Chester Ave Pasadena Calif 91106.

FM PICNIC Sunday August 2 near Angola Ind. Big prizes, free flea market, entertainment for the ladies and kids. Picnic grounds, campsites, bosting food, soft drinks available, rain or shine. Call in freq 146.34/146.76, 146.94, 52.525. For information contact Ft. Wayne Repeater Assn. Box 6022, Fort Wayne Ind. 46806.

FOR SALE 4-400A tube same as new. Give a offer. WA9OUX David Wilhelmus Route 3 Boonville Ind 47601.

SELL Lafayette's HA6506 meter trevers. with AC power supplies. 2 for $170. OA4PQ/w2 33 Washington Sq. W. IOP NY NY 10011. 212-533-9146.

SSB xmtr Heath SB401 with xtal pack, mint condition. Sacrifice for best offer over $200. W4HUI, R. L. Mize, Route 4 Versaille KY 40303.

GONE SSB. Eico 720 transmitter $45, Lafayette HA90 vfo $15. Both good, with manuals. You ship. "Rob" WB4GRT, Georgia Tech, Box 36261, Atlanta, GA 30332.

WANTED: AC coil set for HRO60, W9UYG, F. Galan, 10841 Kingston St. Westchester Ill 60153.

MANUALS — RC639A, R-390/URR, R-390A/URR, $6.50 each. Hundreds more. List 20c. S. Consalvo, 4905 Roanne Dr. Washington, DC 20021.

SAFETY Belt climbing — $15, 8 ft dish $80, 100 kc counter $110, Rotor prop pitch $45, 2 m duplexer $115. FOB Link, 1081 Aron, Cocoa, Fla.

NCL2000 mint condx $395. Walt Stinson, WA9SOE, Knox College, Galesburg, Ill. 61401, Phone 309-343-9931.

GALAXY V Mk 3, ac and dc supplies, vox, calibrator and mobile mount. Excellent condition, in original cartons, $425. WA0EEG, 418 Antelope Trail, Parker, Colo. 80134.

IMPEDANCE bridge, Heath IB-18, brand new wired and checked $99 postpaid. Dale Williams, K3PUR, 807 Walnut St. State College Pa 16801.

SALE: Hammarland HX-50A xmtr, Johnson Ranger II, Hallicrafters SX-100. All good condx. WB4AXQ 305 Caroldale Middletown KY 40243.

KWS-1 Excellent condx, like new, no bugs. All cables and manuals, relays, Ans, all inquiries. WB4IEQ Wayne James 2405 Glynn Dr. Atlanta GA 30316.

NEEDED: 5th ed. ARRL Handbook, Jan. 26 QST, 1924, 1926, 1927, 1939 callbooks for personal collection. Have cash or trading material. K6NA Warren Davis, 780 S. Grand Ave. Pasadena, Calif. 91105.

SELL: Drake T-4 in excellent condition $225. Also the following clean equipment in good operating condition: Viking Valiant $100, Heathkit DX-35 $25, Hammarlund HQ-110 $90. K8DAJ Maury Tepper, 730 Eversole Rd., Cincinnati Ohio 45230.

FOR SALE: Heath twoer $25 plus its mobile power supply $10. Andrew L. Freeman W9GFE 1805 No. 3rd St. Grand Forks NoDak 58201.

RCVR Lafayette HE130, with 6 mtr converter, external bfo, xtal calibrator, all good condition. Heath DX 35 xmttr renuit. Make offer. R. W. Yerbury, 377 W. First Ave. Dugway Ut 84022.

SELL: SWAN 120 p/s mike, ball-spring. $100, plus shipping. Wardell W6GDH, 90505.

FOR SALE: Heathkit HW-12A good condition, crystal calibrator. W1DQJ Norwalk Conn. 203-846-1758.

WANTED: Up-to-date roll chart part. No. 425-0018-6 and manual for Philco tube tester model 9100. Top dollar paid. Gerald Moore, Sidney Mich. 48885.

OLD QSTs — 1933 to 1960 — 7 copies missing. Also Radio 1938 to 1941 complete. Plus miscellaneous old Handbooks and QST. Make offer. Will deliver within 50 miles. E. Knowlton, 292 Walton St. W. Hempstead NY 11552.

YOUR kit professional assembled, wired, tested. Example: Heath SB220, 2 kw linear $50. Also ham equipment calibration and repair service. Tony Maugeri, W2SDO. Tel. 609-854-7927. 117 E. Cedar Ave., Oaklyn NJ 08107.

FM equipment 2 meters GE progress line EI-36N, 60-watt base station. Four channel with xtals for 146.34/.94, .94/.94, and .76/.76. NB receiver with nuvistor preamp. Very good condition. $300 FOB. GE voice commander portable, all transistor receiver, 1-watt transmitter, with xtals for .34/.94, $100 FOB. WA5WGO 4911 Western St. N.O. La. 70122.

OLD gear: Hallicrafters SX-28 receiver, Collins 310B exciter, best offer. Rowe, Box 112, Grand Island NY 14072.

WANTED: A vlf receiver in good condition tuning in 15-500 kc range. Send info and price to Joe Seung c/o O.A.R.C. APO, S.F. 96331.

SELL: N/P560A digital printers — $100. Large quantities Fenwal thermoswitches and teflon at giveaway prices. Trammell, 1507 White Oak Ct. Martinsville VA 24112.

Sale: General station, junkbox, no time to ham. SASE for list. John Grantham, 2005 Bear Ridge Rd., Baltimore MD 21222.

HALLICRAFTERS HT37 with 4-811a grounded grid linear in matching cabinet $350. WA2YTT Hawthorne NJ 07506. 427-3793.

JOHNSON Invader 2000 w/ps cables manual, new PL 175 cond. as new $425. Drake R4A w/MS4 orig cart new $275. Panoramic scanner PUA-2T-200-465 lfs. $35. WB2ZBM Roger Batista 1219 Taylor Ave. Bronx NY 10472.

HAMMARLUND HQ-170 excellent condition with manual $150. Elmac AF-67 xmtr $50. Paul Ruckdeschel, W2ISK, 857 Robinwood Rd., Westwood NJ 07675.

COLLINS KWM2 for sale with ac and mobile power supplies; mobile mount; 30L1 linear, extremely clean. $1050 takes all. K2ENC 60 West Hoffman Ave. Lindenhurst NY 11757.

SELL: QST & CQ 1946 to date, each: $2/yr plus shipping, in 5-year blocks only. Stored flat, in good condition. Also ARC-5 receivers, excellent, mil-used, unconverted. 1.5-3.0; 3-6; (2) 6-9; $14 each. Ned Raub, W1RAN, 207 Thames St., New London CT 06320.

JOHNSON Invader 2000 complete $375. Drake R4 $260. Collins 75A4 $345. Clegg Venus 6 m SSB complete $275. SB200 linear $195. HT32A $325. List available. John Kakstys W2FNT 18 Hillcrest Terr. Linden NJ 07036.

SALE: Heath SB220 completely built, never used. $525. FOR. K7QJZ 2222 W. Anderson Av.Phoenix Aaz 85023. Tel. 602-942-1267.

FOR SALE: 20A ssb exciter F.W. Thunderbolt linear final F.W. Collins 32V3. Collins 75A4 w/2 filters, no modifications. Communicator 3 2 meters. All Perfect working condition. Best offers. K2AK 1115 Willis Ave. Albertson NY 11507. Tel. 516-621-8181.

MINT NC303: National's famous "dream receiver," complete with speaker and XCU303 deluxe calibrator, $250 FOB Seattle. Merlin Walton WA7ACQ 1401 S.W. Cloverdale, Seattle WN 98106.

COLLINS KWM2, 30L1 with extra 81J As, 516F-2, MP-1, Package only $1150, FOB Indianapolis. WA9YPI, 8563 Broadway, Indianapolis Ind. 46240.

WANTED — Johnson TR switch. State condition and price. For sale — National revr NBS-I (similar to NC-183 but has selectible if bandpass). Excellent condition $85. You pay shipping. K0EMS. 80302.

FOR SALE: 1963 HQ-170 w/clock, not used much, good condition $225. 1969 DX-60B transmitter, mint condition, best offer. 1968 R-100A receiver (less original knobs) $50. John Wyncott 1107 W. Main St. N. Manchester Ind. 46962.

ATTENTION DXers! One of the best locations on the entire east coast is for sale. Brick house, slate roof, oil-hot water heat; 4 bedrooms 1½ baths, plus radio room and 2 finished rooms in attic. Situated on a 240 foot hill over looking the ocean. Beautiful 25 mile view. Assessed valuation $11,500. Price for quick sale $9000 which includes 80 foot S.S. tower, 10/20 meter beams, kilowatt sideband station,dining room furniture, electric range and refrigerator. Reason for selling, retiring in Florida. W2MPA, Box 242, Highlands NJ 07732. Phone 201-872-1271.

WORLD Radio's used gear has trial-terms-guarantee! Gonset 910A — $179.95, SR160 — $149.95, Swan 350 — $289.95, Swan 400/420 — $299.95, HT40 — $49.95, Apache — $99.95, DX60 — $49.95, T4X — $319.95, HQ180AC — $349.95, SP600JX (rack) — $269.95, Galaxy R530 — $549.95, 75A3 — $209.95, Drake 2A — $149.95. Free "blue-book" list for more. 3415 West Broadway, Council Bluffs Iowa 61501.

CANADIANS: For sale, Heathkit HW12C with ac and dc power supplies Webster bandspanner antenna and mic. RCA CR91A receiver (same as AR88). Marcom DT45 fm mobile complete with xtals 460/940. All in good condition. With manuals. Other receivers list on request. VO1EC, Box 863, St. John's Newfoundland Canada.

HR-10B with homebrew filter $80. Eico 720 $40. 722 vfo $25. All mint condition. Alan Schneyer, 7454 Ruskin Rd. Phila Penn. 19151.

DRAKE TR4, Power supplies, AC4, DC4 and MS4 speaker. $500. Bob Tabke WA6AQH, 750 Sylvan Av. †43, Mountain View CA 94040.

NATIONAL HRO-60, coils A, B, C, D, F, xtal cal, speaker $200. Knight T-150 xmtr $40. WA1MGJ 188 Grove St, Lexington Mass. 02173.

SALE, 80/40 Cliff dweller antenna with control, excellent condition $45. No shipping. W1SUQ 06516.

WANTED: Low frequency converter Drake 2LF. Rohssler, 1790 Bruckner, Bronx NY 10472.

TUITION raised again, SB-101, HP-23 in SB-600, cw filter $370. SB-300, cw filter and spkr $210. Both mint, outstanding performance, meticulous assembly. Gladly demonstrate. Also Heath HO-10 scope $35, IM-10 VTVM $20, HM-10A tunnel dipper $15, IG-102 sig gen $15. Extras with local deal. WA2RTI. Andrew A. Hock 83-10 118th St. Kew Gardens LI NY 11415. 212-849-3352.

HALLICRAFTER HA-1 tube keyer $60. Brown CIL key, twin paddles straight key on same base $10. Heath SB-610 signal monitor $50. Heath FWOer $25. Eico 950B capacitance/resistance bridge $15. Tymeter 124 GMT digital clock $10. Dow-Key 7Z coaxial relay SP3T 24 vac with remote control $15. Electro-voice 428 SSB mike PTT desk stand/desk boom $20. Heath IT-27 transistor checker $3. TDR-44 rotator used 100 ft cable $25. AR-22R rotator new unused $25. All little used. Kits professionally wired/tested. WA4WAO 1815 Forney Dr. NW. Huntsville Ala 35805.

QSTs before 1927 and amateur teletype publications wanted. Orville Magnon, 1941 Oakdell Dr. Menlo Park Calif. 94025.

COMPLETE Drake station. TR4 AC4 DC4 Swantenna. All-band remote tuned. E. W. Baker 3740B Memorial Dr. Belleville IL 62223.

FOR SALE: NCL2000 $449, TR4 w/RC4 $489. TR33 $109. Ham-M $79. Johnson KW matchbox w/coupler $109. HRO-60 w/R-J coils $219. Electro-voice 664 mike w/stand $39. Heath HO-10 monitor scope $35. Shure 404C mike $12. Paco 5" oscope S-50 $24. R&W low pass filter $10. Ampex stereo recorder model 761 $250. All are excellent. Also SB-400 (dial broken) $149. Dave K2YMK 6321 Mountford San Jose CA 95123.

COMPLETE station, Swan 350 with power supply, mike, antenna and spare finals, $350. Eric Drucker, 2324 Boston Rd. Bronx NY 10467. 212-655-5207.

HEATHKIT DX 100 converted for ssb, with freq spotting control; Heathkit SB10 sideband adapter; Central Electronics MM2 multiphase analyser; all original instruction books. On the air daily until supplanted by higher power rig. Best offer over $140. W9PPH 1104 Wade St Highland Park Ill 60035.

SAVE on all makes of new and used ham equipment. Write or call Bob Grimes 89 Aspen Rd Swampscott Mass 01907. 617-589-9700.

QST and CQ collection some back to 1931. Trade for antique radios. All serious inquiries answered. Sase for list. L. W. Elias W4DBT RFD 8, Winston Salem NC 27106.

WIRELESS sets, parts, catalogs, bought, traded. Lavertv, 118 N. Wycombe, Lansdowne, Pa. 19050.

HAM Ticket— the amateur radio licenses courses for Novice, General, Advanced, Extra Class. "FCC makes it difficult to get a ham license, . . . let Ham Ticket make it easy!" Courses may be leased or purchased. Write for brochure. Clayton Radio Co. 220 Mira Mar Ave Long Beach Calif 90803.

STEAL my Drake TR-3/AC-3 for $325, HT-40 and SX-140 for $110. Teddy Leonard Box 261 Welcome NC 27374.

NOVICE crystals (Texas) 75c each. Alan Schneyer, 7454Ruskin Rd. Phila Penn, 19151.

GALAXY V Mk3, AC-400 power supply, SC-1 console, RV-1 remote vfo, VX35C vox, SB-44 mike, W-4 wattmeter, 18AVQ. Less than 50 hours use. The package $650. CWO2 DeFilippo, WA2VIP, USCG EEC, Wildwood NJ 08260. Tel. 609-884-3106.

DRAKE TR4, RV4, ACS, $600. Excellent condition. Just realigned by factory. Original cartons, manuals. WB2VAE 160-42 85 St. Howard Beach NY 11414.

ANTENNA homebrewers only. No gimmicks. No instructions. Guaranteed premium quality reinforced fiberglass quad spreaders, 13 feet, $7.95 each. FOB. Edocraft 54 Johnson Lane, BayShore NY 11706.

NCX-3 transceiver with HB AC power supply. Excellent condition. $185. K1WVY Bruce Tis 97 St. StephenSt. Apt.40, Boston Mass 02115, 261-3261.

BECKMAN 6146, Transistorized 30 MHz frequency counter. 8 digit electroluminescent display. Includes 0.1% 1DVM plug-in. Stable, accurate. $650. Sundtek, 975 Conger #5, Eugene, Ore. 97402.

COLLINS KWM2 plus matching speaker serial no. 13271. Used very little. Exceptional fine condx. $700. Dan Keefe W2MFJ 37 Highbridge Rd. Hartsdale NY Tel. 914-SC3-5149. Zip 10530.

PEORIA Hamfest — September 20, Peoria, Ill., same place as last year. For details see September issue of QST, hamfest calendar. Advance registration $1.50. Write Ferrel Lytle W9DHE, 419 Stonegate Rd, Peoria Ill 61614.

FOR SALE. Complete six meter ssb system by Swan. 250C xcvr, 117X power supply module, 14-C d.c. module, FP-1 phone patch. Also Electro-Voice 600E mobile mic., 4 ring Ebco (used; good) 3 ring Saturn and xmtr (never opened). 100' Belden RG8-A/u Polytowing, many new spare tubes. First $400 takes all. WA2VWM/2, 302 E. Cherry Hill Apts. Cherry Hill NJ 08034. 609-663-1797 or 609-663-4760.

CANADIANS. Sell SB401 transmitter with HDP21-A mike; SB301 receiver with HS34 speaker and headphones; FL2000 linear; All 1969 series. VE7BZC, 38 Quail, Kitimat, BC.

BTI — Moving to Fla. Also TA33, 65 ft crank up. Ham rotor — all or part. M. Cohen 400 Brookhaven Rd. Wallingford Pa 19086.

ANTIQUE treasure. 1923 Crosley Trirdyn receiver walnut cabinet; Sterling B eliminator; 1923 Radiola loud speaker UZ1325 horn; Brandes headphones. All working. Excellent. As package and pickup. Best offer over $200. WB2HOH 808 Park Ave. Manhasset NY 11030.

DX60B $75, 3 months, mint condx, extras. WB8DSD 506 Grants Tr. Dayton Ohio 45459.

CIRCUIT Board, fiberglass any size 4 cents square inch, minimum $3 postpaid. Frontier Electronics, Orr Minn 55771

SX-101 Mk-III $125, NC-88 $30, QST 1950-1959 $25. W2EGQ 169 Stonybrook Rd, Sommerville NJ 08876.

75A4 serial 4643 slow speed knob, 6.0, 3.1 and 0.5 filters plus two position selectivity xtal filter. Perfect condition, $395. Will not ship. W. R. Schneider Jr 7005 Wake Forest Drive College Park Md 20740.

SELL assorted electronic junk and magazines. Stored in Brooklyn NY. Mark C. Stern W2TCL 70 Polifly Rd. Hackensack NJ 07601. 201-342-0187.

YOUR Heathkit professional wired, debugged and calibrated for 15% of kit price. John C. Allen, WA7OAE 1232 N.W. 201st St. Seattle WSN 98177.

Gonset - Communicator FAA model $85; Collins 51J3/R388 continuous coverage receiver SSB/CW/AM $375; National HFS 27-250 Mc. $65; 432 Mc. converter $25; Bird meter, elements, sig generator, Singer Spectrum analyzer, several years QST-CQ-73, books, trade VHF/UHF gear, tubes. List SASE. W4API, Box 4096, Arlington VA 22204.

SELL Collins 51J4 receiver with 1.4, 3.1, 6.0 mechanical filters, gear reduction dial, cabinet, manual and plug in CE sideband slicer $750. Also RD-92A/UX facsimile recorder with CV172/U frequency shift converter $150, Also Kleinschmidt teletypewriter TT-4A/TG $80. Freight Collect. Auguste Schwab Jr. 560 Woodmere Blvd. Woodmere, LI NY 11598.

FOR SALE. DX60B, 7 crystals, key (all only 10 months old), relay, DX-100 receiver and speaker, code oscillator and cw sidetone, beam filter, 30 ft. RG8-U. All only $160, WN52XW, William Windham, 102 E.S.W., Miami Okla 74354.

FM Transceiver — Solid state, 6 channel dual conversion receiver with mechanical filter. 10 watt transmitter. Includes mike, mobile bracket & 34/94 crystals. $240 FOB Denver. V H F Associates Inc. Box 22135, Denver Colo 80222.

WANTED HP-13 & Hustler mobile ant. (Send info on resonators avail). Also tone patch. WB2ARO 16 Elmira St. Hicks, 11801.

CRYSTALS airmailed: Novice — all frequencies, all bands, accurate, active, FT243 $1.50, MARS, marine, ssb, CD, etc. Fast service from Mid-America. Custom finished etch stabilized FT243 .01% 3500-8600 kilocycles $1.90. (Minimum five, same or mixed $1.75). (Nets, minimum ten same frequency $1.45). 1700-3499 and 8601-13,500 fundamentals and 10,000-30,000 overtones $2.95. Add 50c/crystal for .005%. Add 75c/crystal for HC-6/u hermetics above 2000. Airmail 10c/crystal, surface 6c. Free order-bulletin. Your crystal shop since 1933. C-W Crystals, Marshfield MO 65706.

WRITE, phone or visit us for the best deal on new or reconditioned Collins, Drake, Swan, Galaxy, Hallicrafters, Hamrlund, Hy-Gain, Mosley, Waters, Henry Linear, BTI linear, towers, rotators, other equipment. We try to give you the best service, best price, best terms, best trade-in. Write for price lists. Your inquiries invited. Henry Radio Butler Missouri 64730.

TRANSISTORIZED 6-M a-m transceiver HA-750 & portable battery pack $109 FOB Dennis Dauben WB6WYR, 9340 Monona Dr. La Mesa Calif 92041.

SELL Hallicrafters SX99 receiver, matching R46B speaker, plus Heath Q multiplier in excellent condition $100. New Dow Key DK60 $15. McKinney, Box 178, Freer, Texas 78357.

WANTED HRO-7 with all original coils A to J unmodified and in good order; all areas considered, N.E. preferred. A. H. Glines, 46 Winter St., Quincy Mass. 617-479-5152.

SWAN 500-C, 117XC p/s, $475. Mosley MP-33 triband beam $85, W2AU 4:1 balun $10. Bud 80-10 low pass filter $18. Transmit xtal 146.34 for Galaxy FM-210 $6. Ron Perry, Glen Ave, Fishkill NY 12524.

HOSS Trader Ed Moory says he will not be undersold on cash deals! Shop around for your best cash price and then call or write the "Hoss" before you buy! New Equipment; Factory Warranty: BTI LK-2000HD linear($895) Cash price $685. New early model Swan 260 Cygnet with microphone ($435) cash price $329. Gonset GSB 201 Mk1V linear, 2000 watts($495) cash price $319. New Rohn 50 ft foldover tower prepaid $199.95. New Mosley Classic 33 and demo Ham-M rotor $199. Used equipment R4A $279, HT-37 $169, 75A4 $299, 2B $169, Galaxy 5 $229. Two locations: Moory Electronics, Phone 501-946-2820, Box 506, DeWitt, Ark. 72042, and Moory Electronics, Bill Davaul (W5FQX), 415 W. 33rd. N. Little Rock Ark.

COLLINS 75A-4 3 kc and 2.1 kc filters. In perfect condition. $390. John Morin, WN8BAV 4146 Sonnet Ave., Oscoda, MI 48750.

FOR SALE. SX146 excellent condition with all filters and crystal calibrator $170. RCA WR50-B signal generator $15. Prices FOB QTH. Art Champagne, Pratt & Whitney Aircraft, New Britain Ave. Farmington, Conn. 06032.

AMECO TX-62 w/vfo $135. Lafayette HE-45B w/cables and mike $50. Knight P-2 Swr meter $10. Any reasonable offer considered. Roger DeWitte, WB2PZB/B, Box 475, Milford, Pa. 18337.

2 METER gear: Heath Twoer $25. Motorola 41 V fm ac/dc power, mike xtals, $45. SCR-522 professionally xverted. Receivers: BC799 "Super-Pro" $50, Heath Cheyenne MR-1 80-10 ssb & power supply $40. Misc pwr supplies. Carl WB6RXC, 213-283-5206.

SWAN Cygnet 260, Mint condx. First $375 takes it. Smith 30 Imlay St. Hartford, Conn. 06105.

SWAN 400 external vfo and pwr spy $375. 4-1000 unused $75. OSM-24 triggered sweep scope $65. Going to college please make offer on all above. Mike Bowan WB4SQL 703-820-8600. 3535 Pine Tree Terrace Falls Church VA 22041.

SB101 (cw filter) HP23, HP13, SB600, factory aligned, plus SB200, all $600. WA9LCZ, Fred Arvidson, 2685 Timber Trails, Rockford, Ill. 61107.

COMMERCIAL license tutoring by mail. First and second radiotelephone. Author popular license handbooks. Edward Noll, Box 75B, Chalfont Pa. 18914.

COLLINS 75A3 with 3.1 kc filter, 100 kc. calib, speaker, product det $250. 4-8 Telerex 2m beams $50. Ham M $55. Chas F. Vaughn WIQAK, 50 Harrison Dr. Hamden Conn 06514.

POLYCOM 62B 6-2 meter transceiver; mike, mobile mount, cables, clean $200. National Selectoject $10. Heath Q multiplier $9. Johnson mobile vfo $15. W2QFR 25 Cameron Place New Rochelle NY 10804.

COMPLETE kw transmitter for ssb/cw/am. Heath Apache, SB10, Warrior. Excellent signal quality. With all connecting cables and manuals $195. Joe Naylor K3MNT, 159 Northampton St, Bangor, Pa. 18013.

MODEL 19 complete $90 you pick up or will deliver 100 miles of Hartford $100. Can't ship. WA1LJM 673 DartHill Rd. Rockville Conn. 06066.

DRAKE TR4 with ac and dc supply less than one year old $550. R4A $250. Eico 717 keyer $45. All are like new. I'll pay shipping in U.S. WA8ASV Charles Secrest 1211 Milbourne, Flint Mich 313-239-0025.

COLLINS 32A-1 $375. RME DB-23 80-10 mtr preselector $20. Heavy duty Hallicrafters Loudenboomer rotator/indicator $100. (Cost $225 new). FOB W6DQ, 8 Surrey Lane, Rolling Hills Calif 90274.

SB101, ac supply, Yaesu FLdx 2000 linear, HD-15 patch, SB600 speaker, 454C mike, $500 plus shipping, or best offer. K8LSB, Rick Lederman, 3218 Romaker Rd., Toledo OH, 43615. Tel: 419-841-3747.

SELL COLLINS 30S1 $800, 312B4 $130, CE 10B $40. Heath HO-13 $50, Wagner Xfmr #600-6-3600 at 1 amp 110/220 pri $30. All Fob. W0AIH, Rev. Bittner, Virginia Minn. 55792.

WANTED: Hallicrafter SX117. Paul Queer, RD2 Irwin Pa. — 15642.

CLEANING Shack, excess gear must go. 2 meter fm gear. Aerotron 6N1ss (6-12-110v) — $85. Kaar TR426s (6-12-110v) only $45 each; have one 4-1000a for $25. Swan 400, 12 v supply and vfo $325; SBE-34 $298; Swan 350 $375. FOB Deerfield, serious buyers send deposit. No bull all good equipment. Mel Frankel W9IEF, 803 Deerfield Rd, Deerfield Ill 60015.

SELL, swap, 13 foot Folbot (folding boat) for ham gear or cash. Over $300 value, nearly new. Boat breaks down to two zipper bags, weighs 100 lbs. Want transceiver. W7DI, 6633 E. Palo Verde Lane, Scottsdale Ariz 85253.

SELL: Heath transmitter HX-10 plus linear amplifier, HA-10, manuals, extra crystals. Dowkey coaxial relay, original cartons. $325, package, firm. Mint condition, pro-wired, no modifications, factory-checked. Bill Robinson, 1640 Wandering, Monterey Park Calif 91754.

FOR SALE: Swan 350C transceiver and power supply with Shure microphone. New in original carton. Used six times. $400. E. Price 70 Hillcrest Ave., Larchmont NY 10538. Tel. 914-TE4-0745.

FOR SALE or trade — Remington Rand Univac model 60 computer, complete with all units and extra storage cabinet. W3RXO 357 Saxonburg Rd. Butler Pa. 16001.

LIKE new TR-4, AC-3, and RV-3 with cartons $450. Will deliver within 100 miles. Bob Blaney, RR4, Decatur, Ind. 46733.

HEATHKIT SB101, HP-23 ac power supply, 400 Hz filter $340. Tom Tate 105 Sears Rd, Wayland Mass. 01778. Tel. 617-358-4059.

HQ180AC $325. Ronald M. Nagata, W6RQZ, 1330 Curtis St., Berkeley Calif. 94702. Tel. 415-526-7345.

HENRY 2-K, low time, like new, $400 firm. You pay shipping. K4DBH.

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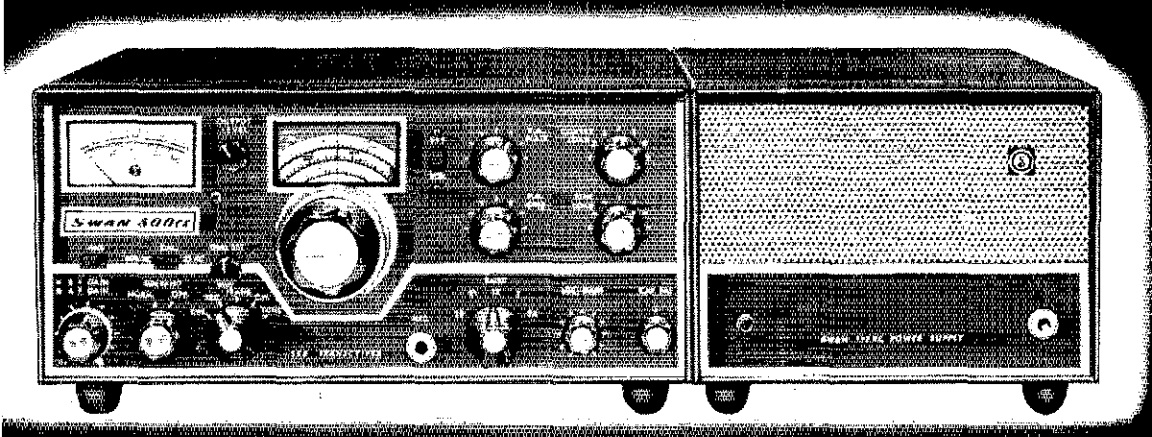

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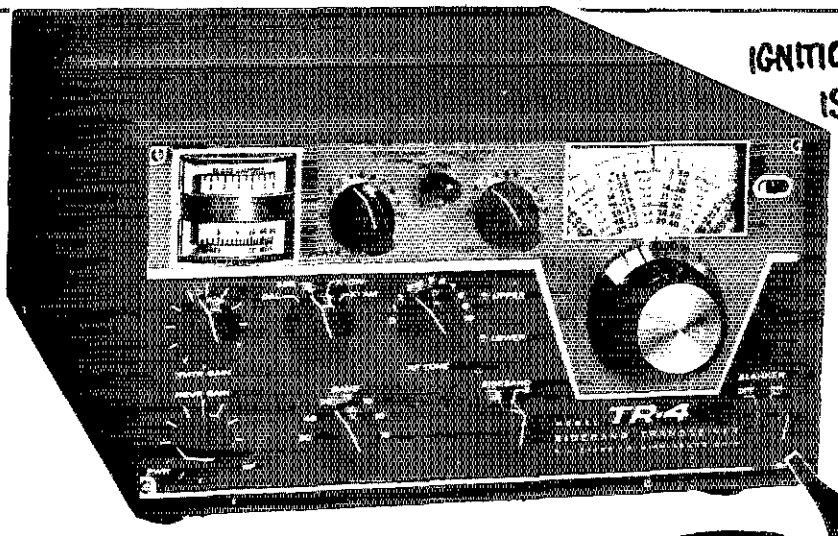

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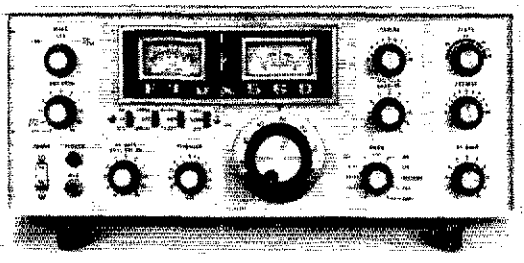

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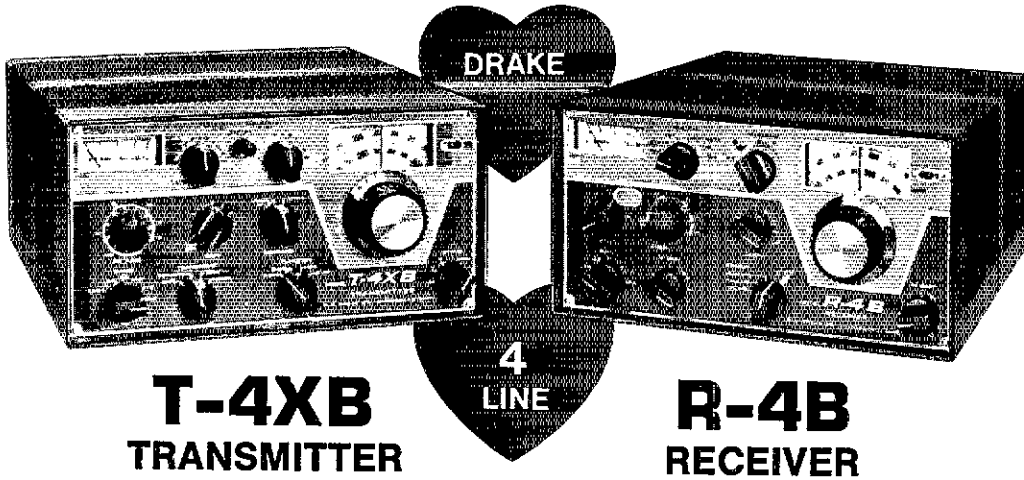

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