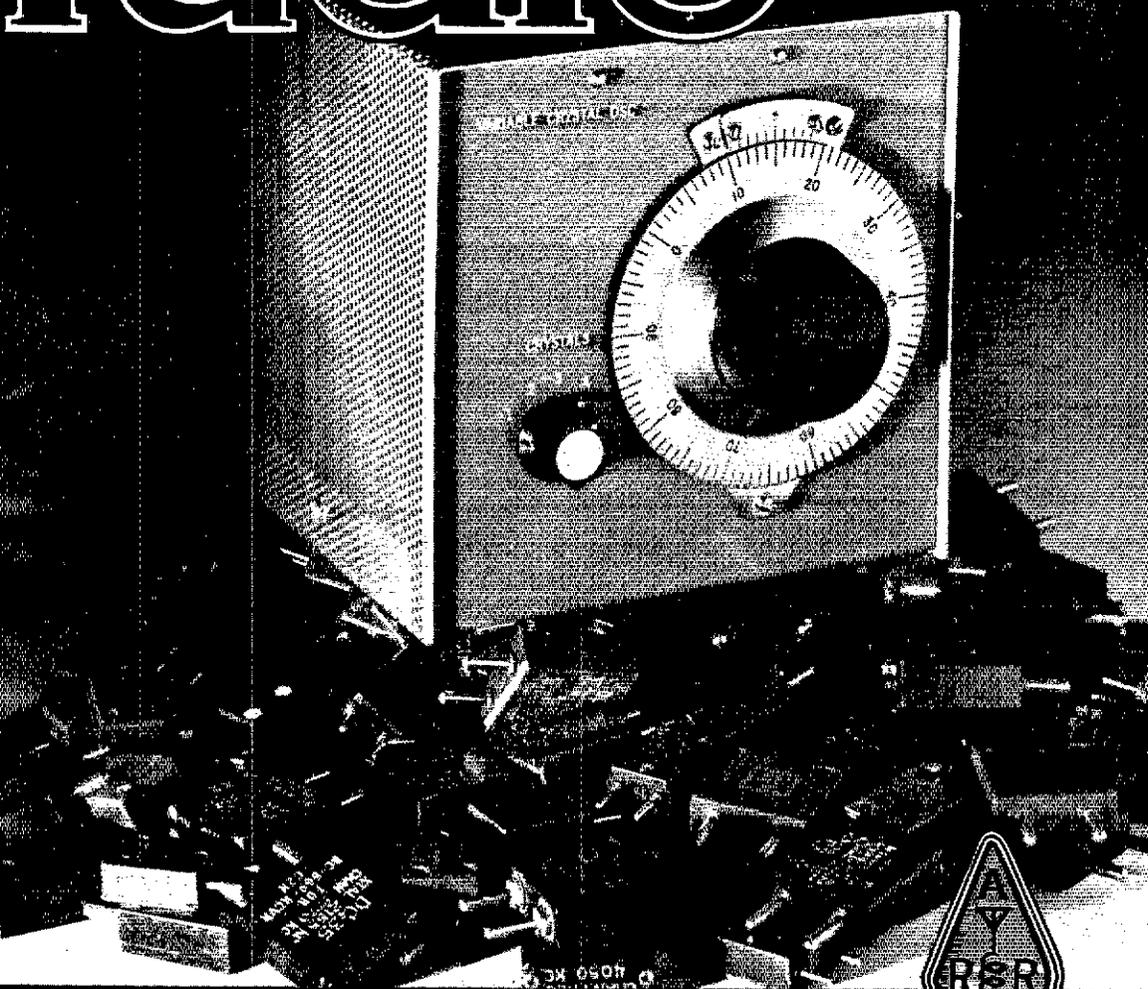


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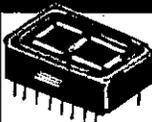
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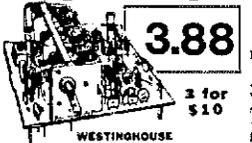
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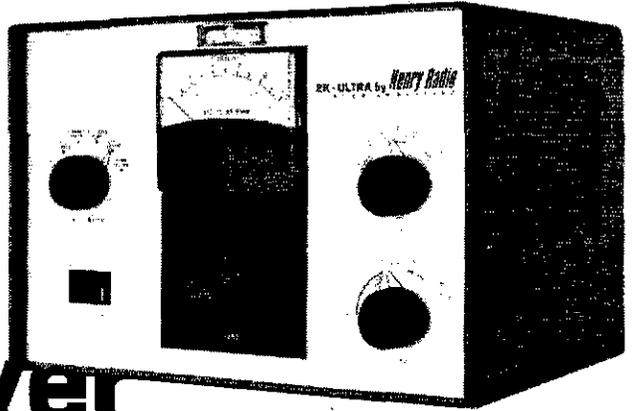
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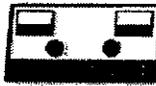
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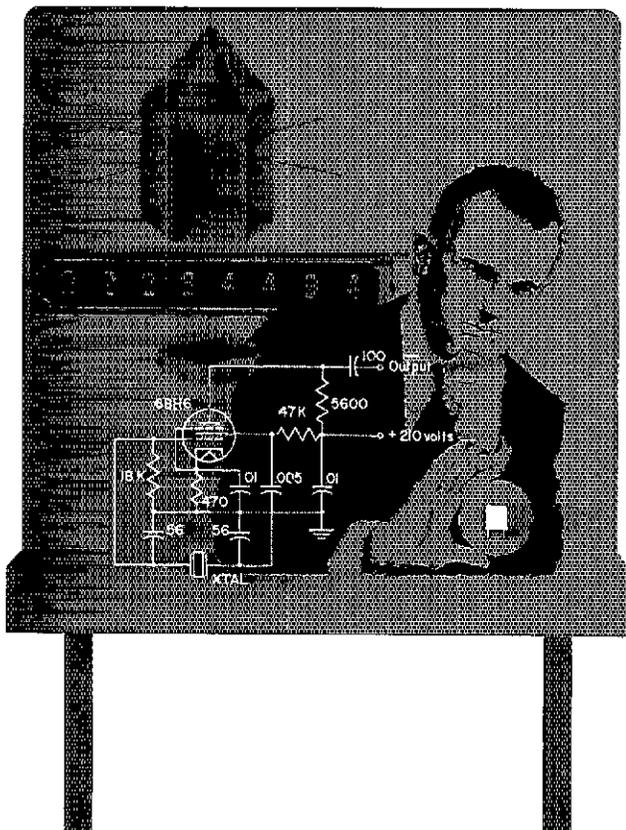
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THE AMERICAN RADIO RELAY LEAGUE, INC.,

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

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

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

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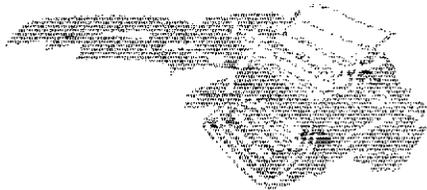
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"It Seems to Us..."



P. R. — AND AMATEUR RADIO

WHATEVER YOU DO these days, everyone says "you must have good public relations." And, of course, everyone *knows* what public relations is. Yet when you ask, you find the ideas of "good public relations" almost as varied as the number of people questioned: Hollywood press agency, news of a garden club meeting, Washington influence peddling, a Madison Avenue plug for a new breakfast cereal, a press conference staged by a political candidate — all fit loosely into someone's concept of PR.

For amateur radio, good public relations means, very simply, effectively spreading the word of our accomplishments, our skills and especially our useful services. We want to make them well-known, well-understood and as favorably regarded as possible — by the public at large, yes, but more particularly by the leaders and officials whose decisions are important to us. Some key points to convey: Who are we? What do we do? Who benefits?

How do we get this information before the public? It's an effort which should involve all of us at least occasionally. For many activities in ham radio are of most interest to the layman when they involve a friend, a neighbor . . . someone in the home town. And virtually every community in Canada and the United States has at least one of us. Our townsmen will enjoy learning about QSL cards from out-of-the-way places, about the Mayor getting patched to his nephew aboard the U.S.S. *Sanctuary*, about our calling the police to an accident with autopatch on an fm rig.

The list of "what we do" gets longer every day: establishing people-to-people friendships; experimenting with lasers, ICs; building and using satellites; operating ham television; using teleprinters; keeping the art of Morse code alive; bouncing signals off the moon; chatting through a repeater as we drive our cars. All these, if properly presented, can be of interest to the man in the street. But two of our activities stand out above all others in the eyes of the public: communications in time of disaster; phone patches from the men of the armed forces overseas. And these two require no explanation on "who benefits."

The tools of communication have been developed, with coordination at League Hq. — yet to really count, they must be used on the local level. What are these tools? Most glamorous perhaps are the two W6BVN

movies, "This Is Ham Radio" for young people, and "Ham's Wide World" for general audiences. Demand is heavy, so book through the film distributors as far in advance as possible. The offices of Association-Sterling throughout the U.S. and Canada handle the youth film; Modern Talking Picture Service distribute the longer flick.

Newspapers and wire services get releases from ARRL Hq. on Field Day and other events of widespread interest, but local clubs use the ARRL *Publicity Handbook* as an aid to writing and placing their own stories. If your club secretary can't find his copy, send for another.

Broadcasting? Hams on the scene can nudge TV stations to book the films mentioned. Another opportunity is in the talk or panel shows which most stations run frequently. Radio interviews, too, are possible. Hq. has a sample script and other raw material for you. And a few stations have even run courses leading to amateur licenses.

A strictly-local opportunity arises whenever there is a county or state fair in your vicinity. A well-set-up ham station will always stop the crowds. A modern variant is the public space in shopping malls, where thousands can see you in action on a single weekend. Hobby shows, science fairs and Scout-O-Ramas, too, are worthwhile. Libraries and banks often make space available for exhibits. The service clubs are actively searching for interesting programs (you usually get a free lunch or dinner besides!). Social studies in schools can be made far more meaningful to children when a ham demonstration puts them in touch with another part of the world. This can lead as well to the formation of an amateur radio club and some new recruits. (Yes, we even have a kit to help start a club and to set up training courses.)

Disaster communications provide some of our finest hours, but let's hope your community doesn't have to learn of ham radio's attributes that hard way. A local parade, boat race, marathon or road tour provides an opportunity to show the public and the government how you use your equipment, your skills, and your time in their interest. And this is what public relations is all about. QST

League Lines . . .

A common response from amateurs caught out-of-band by FCC is to blame the transceiver or VFO dial mechanism (or calibration). A good amateur himself (WØAP), John McKinney, Engineer-in-Charge of the Grand Island monitoring station, points out that Sec. 97.75 of the rules requires us to have a measurement capability independent of the means used to control the transmitter frequency. Ergo, an amateur operating a station consisting of only a transceiver is in non-compliance with the rules. Solution? A marker-generator with 100 kHz bar, like that on page 521 of the new Handbook -- a few bucks and a few hours will do the job.

Another monitoring station is sending out notices for violation of third-party traffic restrictions -- e.g., letting your wife say hello and then yak a bit at a foreign ham. A stricter standard than usual, admittedly, but still technically a quite correct application of the rules. Play safe; watch it!

K2VUI wonders why we haven't stressed that contributions to ARRL are deductible from income for tax purposes. Good question. We did highlight the point during our Building Fund campaign in the early 60s, but have not pushed it since. Yet several amateurs have contributed substantial amounts, principally to further amateur interests internationally. Another has made the ARRL beneficiary of a very large life insurance policy. Dozens of members have added smaller amounts to their dues or other remittances to Hq., asking us to use the excess any way we see fit (most such money is used for memberships of handicapped hams or those in financial straits).

Who says hams aren't building gear any more? We have filled orders for about 1,700 templates for the Pip-Squeak 2-meter fm rig.

Eight months until Christmas -- but only two more to the date of rise in membership dues. Until July 1 you can pay dues at current rates for any number of years in advance; or outsmart this and certain future inflation by a Life Membership -- \$130 all at once, or eight quarterly payments of \$16.25 (\$150 and up after July 1).

The Office of Civil Defense, Department of the Army, has contracted for an extensive study and evaluation of the RACES (Radio Amateur Civil Emergency Service) program. While all aspects of effectiveness are to be covered, a main purpose is to determine whether present frequency subbands are adequate for needs.

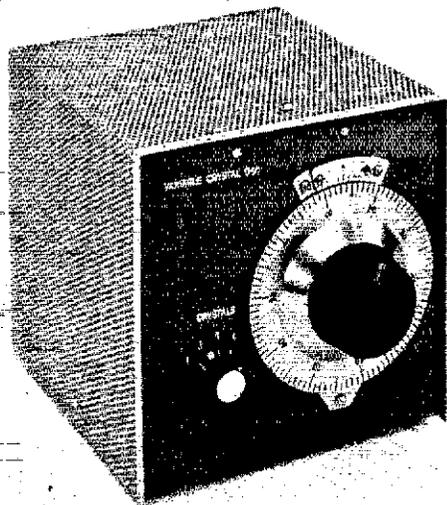
At least one member-company of the Electronics Industries Association is again urging its distributors to write Congressmen seeking support for their proposal to take a hunk of our 220-MHz band. Might be a good idea if more of us sat down to write a few letters of our own to show there is another side to the question. How about it?

In common with a growing trend, Hq. is undertaking a trial of the four-day week. Half our crew will be on duty Monday-Thursday, the other half Tuesday-Friday. But the workday will be nearly two hours longer than now; thus the office facilities will be open about 50 hours per week instead of the present 40. If after a few months' trial it seems satisfactory, from both the standpoint of management (adequate performance, service to members, etc.) and staff (more leisure time), it will become standard procedure.

Quote-of-the-Month, from a solicitation flyer: "CQ is now read by more active hams than any other magazine."

Some Practical Aspects of VXO Design

BY DOUG DeMAW,* WICER



A VXO IS A variable-frequency crystal oscillator. The principle of operation is well known to many amateurs, but some of the tricks in getting one to function well are not so widely known. But before we get into a discussion concerning how the job is done, let's examine some of the practical applications of VXOs in amateur radio.

One of the most common uses for VXOs is that of frequency control in amateur transmitters and receivers, and principally in vhf and uhf equipment. One might say that a well-designed VXO is a poor-man's synthesizer. The former requires fewer parts, is continuously variable from one end of its frequency range to the other, is practically as stable as a fixed-frequency crystal oscillator, and requires a relatively simple power supply. The synthesizer, on the other hand, is very complex. It requires numerous integrated circuits, transistors, and discrete components of other kinds. It must have a crystal-controlled time-base circuit, and a power supply that is exceptionally clean and stable. Furthermore, the power supply must handle considerable current because of the large number of solid-state components required in the circuit. Synthesizers do not provide continuously variable frequency output, but rather must be designed for outputs in specific increments of 100 kHz, 10 kHz, 1 kHz, or whatever the need calls for. Another design problem which is common to frequency synthesizers is that of wide-band noise and spurious output. To date, few amateurs have been able to produce a quality unit for this purpose. Finally,

*Technical Editor, QST.

The solid-state VXO is built in a homemade aluminum cabinet. The outer cover is made of perforated stock, but can be fashioned from solid aluminum sheeting if the builder prefers the latter. Gray spray-can paint was used to finish the front and rear panels of the VXO. White press-on decals are used for labeling.

the difference in cost and complexity between a VXO and a synthesizer is considerable . . . the former being the less expensive by far. So, until a truly practical synthesizer comes along, and one which can be easily duplicated by amateurs, the reader may wish to consider (or reconsider) using a VXO for some of his frequency-control needs.

The fm and repeater crush is really on at this time. Some areas have numerous repeaters in operation, and many fm operators want to have channel capability for working through all of the local systems. Also, simplex operation (both stations on the same frequency and not operating through a repeater) is becoming more popular as conditions become more crowded on the repeater frequencies. It is very expensive to purchase high-quality crystals for all of the channel combinations one might wish to have at the home station. Therefore, some amateurs are realizing the practicality of changing to variable-frequency control of both the receiver and transmitter. Hetero-

A great many applications exist for a stable variable-frequency source which can be used in amateur test and communications equipment. Past QST articles have treated the design philosophy of tube-type VXOs, but little has been said about solid-state equivalents. This article provides practical data on VXOs — trial-and-error information, and tips on construction that can be understood by those who have not worked with VXOs.

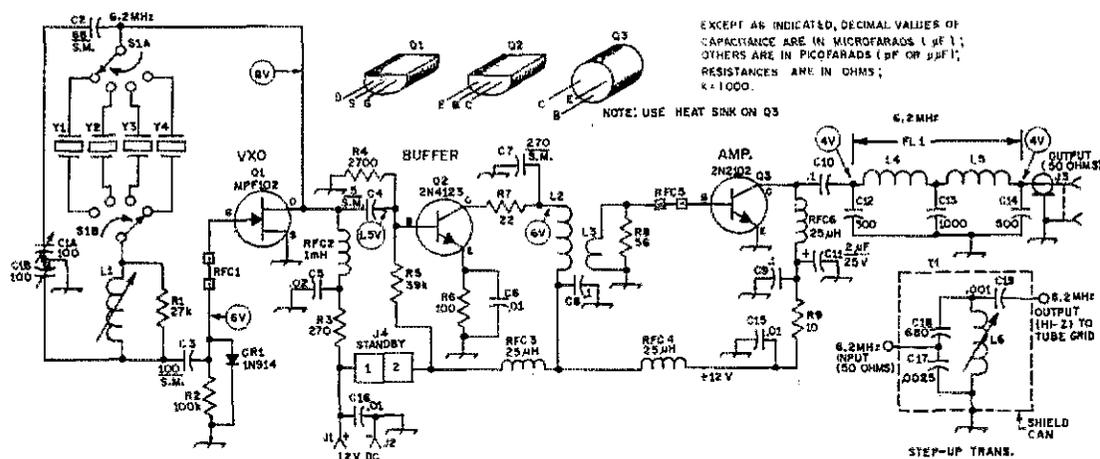
dyne-style VFOs are sometimes stable enough for vhf operation, but few direct-frequency VFOs are satisfactory because of drift problems which are magnified in the frequency-multiplication process from, say, 6 MHz to 146 MHz. (If there is 1 kHz of drift at 6 MHz, the 2-meter signal will drift by a factor of 24, or 24 kHz.) VXOs can be very stable, and are preferred by many operators.

Other applications for VXOs are seen in ham-shack signal generators, and tunable weak-signal sources. VXOs are also useful as heterodyne frequency meters, and for frequency control of solid-state hf-band QRP rigs.

How Much Frequency Shift?

A typical circuit for a solid-state VXO is given in Fig. 1. It can be seen that two elements (other

than the crystal) are used to control the operating frequency. Coil L1 and capacitor C1 are used to "rubber" the crystal across the tuning range. The amount of swing is dependent to a greater extent upon the characteristics of the crystal, and by the amount of unwanted stray capacitance in the oscillator circuit. The latter condition regulates the maximum upper frequency to which the VXO can be tuned. The value of minimum capacitance exhibited by variable capacitor C1 should be the first consideration. How much capacitance exists when the plates are unmeshed will be dependent upon how the capacitor is built. Units with metal end and bottom frameworks should be avoided. Considerable unwanted capacitance will exist between the stator-plate sections and the frame in this type of component. Capacitors with ceramic



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

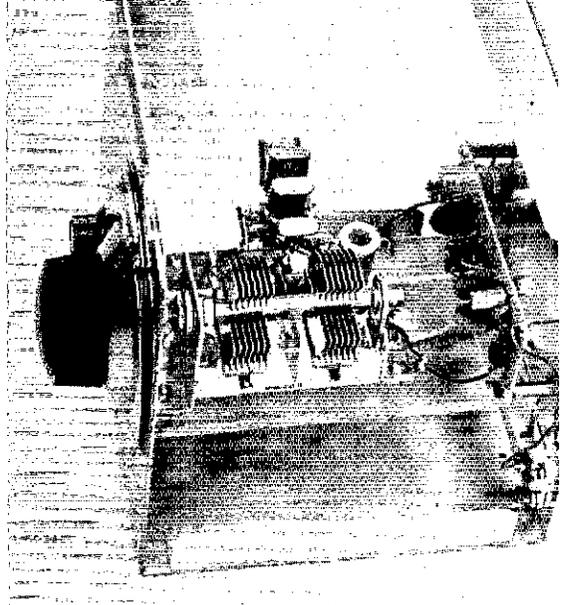
NOTE: USE HEAT SINK ON Q3

Fig. 1 — Schematic diagram of the 6.1 MHz VXO. Fixed-value capacitors are disk ceramic unless noted differently. Polarized capacitors are electrolytic. Resistors are 0.5-watt composition types. Voltage readings inside the circles are rms, measured with a Heath VTVM and rf probe, with J3 terminated by a 56-ohm resistor, and with C1 set for minimum capacitance. Numbered components not appearing in the parts list are so designated for pc-board layout purposes (Fig. 3).

- C1 — Dual-section air variable. Hammarlund MCD-100-S shown in photo. (See text.)
- CR1 — High-speed silicon switching diode.
- J1, J2 — E. F. Johnson nylon binding post.
- J3 — SO-239 style coax connector.
- J4 — Three-circuit phone jack (collar connection not used).
- L1 — Variable inductor, 38-85 μH, slug tuned. (J. W. Miller Co., 43A685CBI or equivalent, J. W. Miller Co., P.O. Box 5825, Compton, CA 90224, Catalog No. 72.)
- L2 — Toroidal inductor, 2.5 μH. 22 turns No. 22 enam. wire to occupy entire circumference of Amidon T-50-2 core (Amidon Assoc., 12033 Otsego St., N. Hollywood, CA 91607).
- L3 — 6 turns small-diameter insulated hookup wire over 1/3 of L2.

- L4, L5 — 1.3-μH inductor. 21 turns No. 26 enam. wire to occupy total circumference of Amidon T-37-10 toroid core.
- L6 — Slug-tuned inductor, nominal inductance of 1.2 μH. (J. W. Miller 20A156RBI suitable).
- Q1 — Vhf JFET (Motorola MPF102 or HEP802).
- Q2 — Motorola 2N4123, or any npn with beta of 100 or greater, f_T of 100 MHz or higher.
- Q3 — RCA 2N2102 or equivalent. Substitute type should have 2-watt minimum rating, minimum f_T of 120 MHz, and minimum beta of 50 at 1 kHz. Use crown-type heat sink. Do not operate without load connected at J3.
- RFC1, RFC5 — Vhf parasitic choke made from two Amidon miniature ferrite beads on 1/2-inch length of No. 22 bus wire.
- RFC2 — 1-mH rf choke (James Millen Co., 34300-1000. James Millen Co., 150 Exchange St., Malden, MA).
- RFC3-RFC5, incl. — 25-μH miniature rf choke (James Millen J300-25).
- S1 — Low-capacitance double-pole four-position rotary switch. See text. (IRC epoxy two-section rotary wafer No. T315 recommended).
- T1 — See text.
- Y1-Y4, incl. — 6.1-MHz-range crystal, selected to provide desired coverage at 146 MHz. (International Crystal Co. type GP-05 in F-605 (HC-6/U) holder. See text.)

The tuning capacitor and the oscillator components are assembled on a Plexiglas platform to reduce stray capacitance in that part of the circuit. A phenolic terminal strip is located on the Plexiglas sheet on the far side of the tuning capacitor. The oscillator circuit is wired on that strip. The four crystals are mounted on the selector switch (far center) by soldering their pins directly to the switch tabs. The broad-band solid-state 6-MHz amplifier is mounted by means of four standoff posts (rear wall of the VXO cabinet). L brackets are used as a means to attach the top cover. No. 6 sheet-metal screws are used to secure the cover to the brackets.



or steatite ends are preferred in VXO circuits. Furthermore, it is best to mount the capacitor so that its stator sections are spaced well away from the chassis and cabinet walls (at least an inch or more) to minimize capacitance effects.

Reactance coil L1 should be mounted well above the chassis, and with its end bushing secured to a nonmetallic support bracket such as phenolic or plastic. If this is not done, unwanted capacitance will exist between the slug assembly and any metal support bracket that might be employed. Since a medium- Q inductor is required for good VXO performance, the builder may prefer to use a toroidal coil. However, the slug is handy for setting the inductance to the precise value needed for the desired circuit operation. The J. W. Miller coil (L1) used in the circuit of Fig. 1 has an unloaded Q of 150 at 6 MHz. During the development of this circuit it was learned that coils whose unloaded Q s were less than 100 provided miserable, inefficient performance. It's better to pay a little more money for a high- Q inductor and be assured of good results.

Before continuing, it should be said that the lower the crystal frequency (fundamental-type crystals) the less swing can be had. A 160-meter crystal tried in the circuit of Fig. 1 (no parts values changed) could be shifted 600 Hz. A 3500-kHz crystal was pulled 3.5 kHz. A 12-kHz swing was obtained with a 6222-kHz crystal, and a 23-kHz change was noted when using an 11-MHz crystal. In an earlier *QST* article¹ Shall stated that an "A" cut crystal has a maximum theoretical shift capability of the crystal frequency divided by 500 (using optimum component values). This writer concurs with that claim. It is possible, however, to make the VXO operate over a much greater frequency range, but the crystal is no longer giving solid control. The circuit performs more like a straight VFO, thereby defeating the purpose of the VXO — stable frequency control. The crystal "swings" mentioned earlier in this paragraph would have been greater had the value of L1 been tailored to the frequency of operation.

¹ Shall, "VXO — A Variable Crystal Oscillator," *QST*, Jan. 1958, p. 11. Also, "VXO-II," *QST*, July 1959.

Concerning VXO Crystals

The author has tried a number of crystal types in VXO circuits. Surplus FT-243 style crystals are the poorest of performers in a VXO. The holder capacitance is very high, thus limiting the frequency shift. As other VXO designers have noted, plated crystals in HC-6/U holders seem to work best. Overtone crystals which are operated at their fundamental frequencies will often provide remarkable swings in frequency when compared to fundamental-type crystals.

Some designers have elected to use several crystals in an effort to provide a large amount of frequency coverage in a particular part of the spectrum. This is done with the circuit of Fig. 1. However, a few important rules should be observed. The switch used for changing crystals should be of the low-capacitance variety,² and should be isolated from the chassis as is suggested for coil L1. Though some builders have used crystal sockets on the selector switch, the writer finds that any socket he has tried will introduce additional unwanted capacitance. It's better to solder the crystal pins directly to the lugs on the switch. If possible, eliminate the switch altogether. Mount a crystal socket on plastic as was done by Tilton³ and change crystals at the front panel of the VXO.

The Circuit of Fig. 1

Tubes, in this writer's opinion, are strange and troublesome objects when used in small-signal applications. Therefore, solid-state components were selected for the VXO of Fig. 1. Tubes generate great amounts of heat — one natural enemy of frequency-control circuits. Furthermore, they're bulky and require more than one operating

² Noble, "Building a Simple Crystal VFO," *QST*, Nov. 1966, p. 18.

³ "A VXO for 50 Through 450 MHz," *The Radio Amateur's V.H.F. Manual* all editions.

voltage. Frequency stability problems are compounded by the possible variation in filament voltage. Unless dc voltage is used for supplying the filaments, the VXO output energy may be modulated by 60-Hz hum. Nobody needs or wants that kind of trouble!

Oscillator Q1 is a junction FET. It employs two ferrite beads at the gate terminal to prevent vhf parasitic oscillations. The crystal frequency for this circuit is roughly 6.1 MHz. This, multiplied 24 times, provides a signal in the 146-MHz part of the 2-meter band. This particular VXO was designed to operate in combination with a surplus G.E. Progress Line transmitter. It can serve as a frequency-control element for other tube-type transmitters that require 6-MHz crystals. The circuit can be used for controlling the frequency of solid-state transmitters that use 6-MHz crystals, but the rf output voltage from the VXO will have to be reduced to a value suitable for the oscillator in the transmitter. One might put a drive control in the emitter return of Q2 (5000 ohms) if the circuit is to be used with more than one transmitter, each of which may require a different amount of driving voltage.

CR1 is used as a gate clamp to reduce harmonic output from Q1 and to limit the FET's junction capacitance during positive excursions of the rf sine-wave. The diode clips positive peaks above approximately 0.6 volt. This action limits the transconductance of Q1 during positive half cycles, thereby preventing large changes in junction capacitance which would otherwise occur. Installation of CR1 provided an additional 1.5 kHz at the upper end of the VXO tuning range at 6.1 MHz (or an additional 36 kHz at 146 MHz).

Other designers of VXOs have stated that the design rules followed for VFO construction should be applied when building a VXO. This implies that the mechanical stability of C1 should be superb, and that it should rotate smoothly. Also, the coil used for L1 should be wound on a mechanically stable form, and the coil turns must be secure on the coil form.

Still observing VFO design criteria, one should use the lightest possible coupling between the VXO and the succeeding stages. In Fig. 1, capacitor C4 is a 5-pF silver mica type. This small value of capacitance is ample for supplying sufficient rf

voltage to the base of Class A amplifier Q2. Early during the design period it was noted that the output from Q1 fell off rapidly as the tuning capacitor, C1, was brought toward a fully meshed state. With the plates of C1 open an rms voltage of 8 was obtained at the junction of RFC2 and C4. With the plates of C1 closed the rms voltage dropped to 1.25. A direct connection existed where C2 is now shown. The problem was resolved by opening that leg of the circuit and inserting C2. The upper section of C1 (Fig. 1) was acting as a capacitive shunt across the output of the oscillator, thus bypassing some of the 6-MHz energy to ground. Insertion of C2 diminished the effect without impairing circuit performance. The rf output with the circuit shown is about 8 volts rms across the entire tuning range.

The remainder of the circuit shown in Fig. 1 is pretty conventional. Generally, the design follows that of some of the QRP rigs described earlier.⁴ The objective here is to provide buffering and amplification, but with good stability. Most small vacuum-tube crystal oscillators require between 15 and 40 grid No. 1 volts from a VFO or VXO to make them drive the succeeding stages in the transmitter. Q2 and Q3 provide ample power to do the job. Vhf parasitic suppression is afforded by R7 and RFC5. The stages are rf-decoupled by means of R3, R9, RFC3, RFC4, and the associated bypass capacitors. Low-frequency instability is discouraged by the employment of C8, C9, and C11.

Harmonic output from the last stage of the VXO, Q3, is suppressed by FL1, a half-wave 6-MHz low-pass filter. FL1 is designed for a Q of 1, 50 ohms in and out. The collector load impedance of Q3 is on the order of 60 ohms. The slight mismatch is not of consequence. Power output, after the filter, is approximately 0.5 watt. The pure sine wave of Fig. 2 was obtained across a 50-ohm termination at the output of FL1.

Matching to the Load

The VXO was designed to operate outboard from the transmitter, mainly to keep the operating temperature of the VXO low and constant. A connecting cable made of RG-58/U is used between the VXO output and the transmitter input. The cable can be any convenient length since it sees 50 ohms at each end. A step-up transformer (inset of Fig. 1) is used to match the 50-ohm line to 10,000 ohms. The latter impedance is high enough to provide ample rf voltage at the tube grid - approximately 35 volts rms. The transformer was designed for a Q of 5 so that the response would be broad enough to eliminate any need for readjustment over the VXO tuning range.

⁴ DeMaw, "The QRP 80-40 CW Transmitter," *QST*, June 1969, p. 11. Also, see recent editions of *The ARRL Radio Amateur's Handbook*.

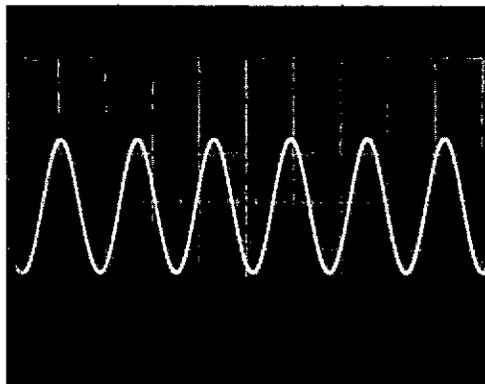


Fig. 2 - Output waveform taken across 56-ohm termination at J3 of Fig. 1. The pure sine wave output was observed on a Tektronix Model 453 scope.

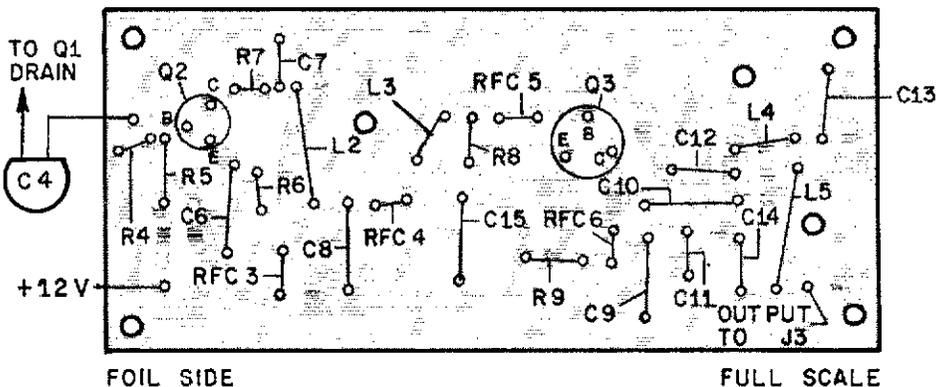


Fig. 3 — Scale drawing of the pc-board pattern for the buffer and amplifier stages of the VXO.

If this VXO is to be used for exciting a bipolar-transistor oscillator stage it is suggested that the output of FL1 be terminated with a 56-ohm 1-watt carbon resistor, and (as mentioned earlier) a drive control be installed in the emitter of Q2. Alternatively, the coupling capacitor between Q1 and Q2 (C4) can be changed to a 1- to 5-pF variable and used to set the drive level required. Since most small-signal bipolar stages have a base impedance of a few hundred ohms or less, output from terminated FL1 can be taken through a small-value coupling capacitor. No more than 3 volts rms should be needed from base to ground when exciting a transistorized oscillator stage (crystal removed, of course).

A word of caution: Make certain that the feedback components of the transmitter oscillator stage have been disabled when using a VFO or VXO. This will prevent self-oscillation of the stage when T1 is connected to the grid or base. Triode oscillators may break into self-oscillation despite these measures. It is suggested that a low value of resistance be bridged from grid to ground in triode-tube stages, as was done with the tunable receiver crystal oscillator in an earlier *QST* article.⁵ Use no less resistance than is required to assure stability. Transistorized oscillator stages may not need modification for use with VXOs because the circuit impedances are relatively low in value. However, one should check for proper stability before deciding that the feedback components can be left in the circuit.

Construction Information

The text photos show that a relatively large aluminum enclosure contains the VXO. This is a case of tail wagging the dog, so to speak, because the large National Radio vernier dial needed a specific amount of panel space. Though the dial is somewhat of a relic, it does provide good numerical readout without noticeable backlash. A J. W. Miller type MD dial mechanism would be suitable

⁵ DeMaw and Wilson, "A High-Performance Tunable FM Receiver," *QST*, April 1972.

for this project, or the builder may wish to economize by using the vernier assembly from a war surplus TU-6 tuning unit (part of the BC-375E or BC-191 transmitter).⁶ An old HRO dial and gear box would be superb for the VXO main-tuning assembly.

Heavy-gauge aluminum sheeting, 1/16 inch thick, was used to form the homemade 6-1/2, x 6-1/2 x 6-1/2-inch VXO box. The oscillator components are assembled on a 3-inch-wide sheet of 1/4-inch-thick Plexiglas. This technique minimizes the effects of unwanted stray capacitance between the parts and the enclosure walls. Since the Plexiglas is anchored to the front and back walls of the box it enhances the rigidity of the assembly. The crystal switch is mounted on a sheet of phenolic for the reasons outlined above. Almost any kind of rigid insulating material can be used in place of the Plexiglas and phenolic used by the writer.

The buffer/amplifier section of Fig. 1 is assembled on a small pc board. The pattern and parts layout are given in Fig. 3. The builder need not use a pc board for that part of the circuit. Point-to-point wiring (using terminal strips) can also be used.

Variable capacitors smaller than the one shown here can be used if the constructor so desires. A James Millen 26100-RM was tried in an earlier circuit and was found to be quite satisfactory. Alternatively, a pair of single-section 100-pF capacitors can be ganged for use at C1, or a 50- and a 100-pF pair can be ganged. If the latter approach is used, eliminate C2 and connect the stator of the 50-pF variable directly to the drain of Q1, and to the crystal.

Some Final Comments

Some builders, in the interest of experimentation, may wish to try a dual-gate MOSFET at Q1. An RCA 40673, with a bias of +3 volts on gate 2, should be a good performer with its high transcon-

(Continued on page 39)

⁶ Fair Radio Sales, Lima, Ohio 45802.

A Frequency Calibrator for Uhf Using an Avalanche Transistor*

BY JAMES R. ANDREWS,** WA0NHD

AMATEURS HAVE long been accustomed to using 100-kHz crystal oscillators as a source of frequency markers for the calibration of their hf receivers. This frequency calibration of vhf and especially uhf narrow-band receivers has not been as easy. This is because the vhf spectral intensity of the output from ordinary 100-kHz crystal calibrators has rolled off into the noise level. This article describes a simple frequency calibrator that provides usable 10-kHz markers to beyond the 1296-MHz band. The calibrator uses a transistor operating in the avalanche mode to generate a 14-volt, 420-picosecond (10^{-12} second) wide impulse into a 50-ohm termination.

Avalanche Transistors

Avalanche multiplication in reverse-biased pn junctions is a result of impact ionization produced by mobile charge carriers. If the electric field in the depletion region of the pn junction is large enough, an electron moving through the crystal lattice gains sufficient energy to release an additional electron and hole when it collides with an atom in the lattice. The two free electrons may then cause additional ionizations and an ever-growing cascade, or an avalanche of ionization occurs.

In transistors the avalanche breakdown¹ may be controlled through the injection of carriers by the base current, Fig. 1. Normal transistor operation lies in the region of collector-emitter voltages between 0 and BV_{CEO} and forward base currents. BV_{CEO} is the breakdown voltage from the collector to the emitter with the base open circuited. If a reverse base current is applied, then the collector-emitter voltage may be increased above BV_{CEO} before an avalanche breakdown is reached. The upper voltage limit BV_{CBO} is reached when $I_b = I_c$. BV_{CBO} is the breakdown voltage from the collector to the base with the emitter open circuited. The avalanche region of the transistor lies between BV_{CEO} and BV_{CBO} . An important item to notice in Fig. 1 is the negative slope of the constant I_b curves in the avalanche region. The negative slope means that the small-signal resistance, $r_a = \Delta V / \Delta i$, is negative. A negative resistance implies unstable operation. Thus the avalanche transistor is useful as an oscillator or

* Contribution of the National Bureau of Standards.

** National Bureau of Standards, Electromagnetics Division, Pulse and Time Domain Section, Boulder, CO 80302.

¹ GE Transistor Manual, 7th Edition, 1964, pp. 516-520.

switching element. The switching speeds that can be obtained are quite fast because of the multiplying effect of the avalanche breakdown. Transition times of 500 picoseconds have been obtained.

A typical avalanche transistor switching circuit is shown in Fig. 2. The large supply voltage, V_{cc} , and dc load resistor R_{dc} of Fig. 2 place the transistor at the stable operating point A, Fig. 1. The positive trigger pulse injects an additional quantity of base current causing the collector current to move along the ac load line, R_{ac} , to operating point B. Point B is in the negative resistance region and is an unstable point. Thus the operating point rapidly switches along the ac load line to the next stable location, point C.

Many transistors are capable of avalanche operation although very few are actually specified as avalanche transistors. If the specification sheet for a given transistor says that BV_{CBO} is greater than BV_{CEO} , it is a good bet that the transistor will avalanche, although the switching characteristic may not be fast. The author has found very few pnp transistors that will avalanche. As an example, the author has obtained peak collector currents of 4 amperes using a 200-mW upn transistor, type 2N3904.

Impulse-Frequency Spectrum

A study of various wave forms reveals that extremely fast transition times are required to generate strong high-order harmonics. For the same transition times, a pulse of short duration will generate a more uniform spectrum than a pulse of longer duration as shown in Fig. 3 by the difference between the triangular and trapezoidal pulses.

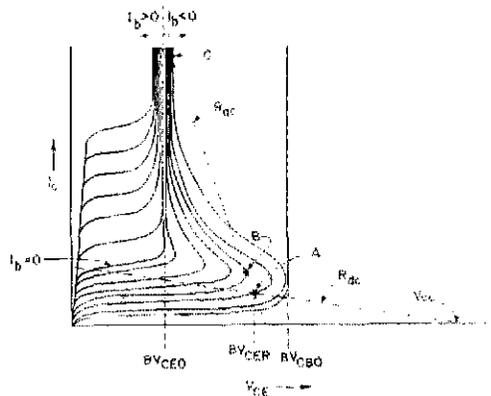


Fig. 1 — Transistor V-I characteristic curves including the avalanche region.

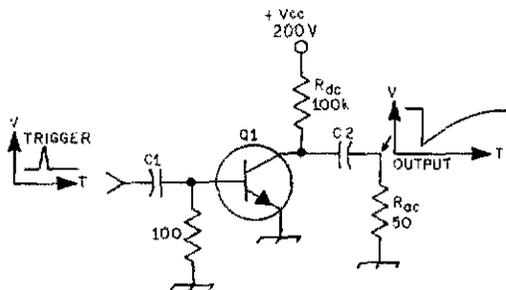


Fig. 2 — Typical avalanche-transistor switching circuit.

The ITT Handbook² shows the frequency spectrum for various time-domain wave forms. An impulse similar to the cosine-squared wave form is realizable. The spectrum of the cosine-squared wave form is 6 dB down for $t_d \cdot f = 0.5$ and when $t_d \cdot f = 1.0$ the spectral intensity has dropped to zero. The impulse duration t_d is measured at the 50-percent amplitude level. Thus, for a frequency marker spectrum that is less than 6 dB down at 1 GHz, a cosine-squared impulse duration of less than 500 picoseconds is required.

Impulse Generator

An impulse generator that will produce a usable frequency spectrum to beyond 1 GHz is shown in Fig. 4. The circuit is an avalanche transistor adaption of the classical mercury switch — charged transmission-line pulse generator.³ Charge line, DL1, is charged through R4 to BV_{CER} of Q1. When a positive trigger pulse is coupled through C1 and R1 into the base of Q1, avalanche breakdown is initiated. Q1 rapidly switches to its lower breakdown voltage BV_{CEO} and allows the charge line, DL1, to discharge into R3 and the external 50-ohm load. A square pulse is generated with transition times of the order of 500 picoseconds. The pulse duration is fixed at twice the electrical transit time of the charge line, DL1. An impulse can be formed by shortening the charge line until the desired impulse width is obtained. As soon as the charge line is discharged Q1 reverts to a low current state. The output delay line, DL2, is included so that reflections from the external load do not arrive back at Q1 until it has switched off. R3 is included to provide a 50-ohm reverse termination for reflections.

This impulse generator is designed to be driven directly by TTL ICs. U1 is included to demonstrate this fact. It can be driven at repetition rates up to 1.5 MHz. A 10-MHz crystal oscillator and a chain of N8280A BCD decade-counter integrated circuits

² Reference Data for Radio Engineers, 5th Edition, ITT Corp., New York, 1968, pp. 42-5, 42-7.

³ J. Millman and H. Taub, *Pulse, Digital, and Switching Waveforms*, McGraw-Hill, Inc., New York, 1965, pp. 101-104, 510-512.

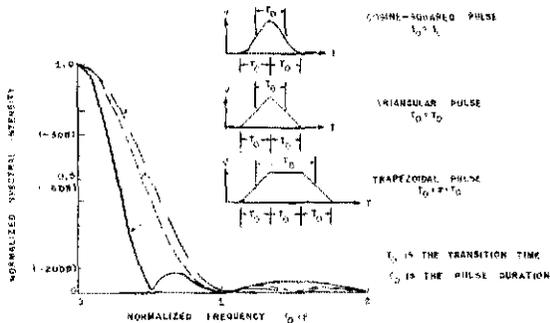


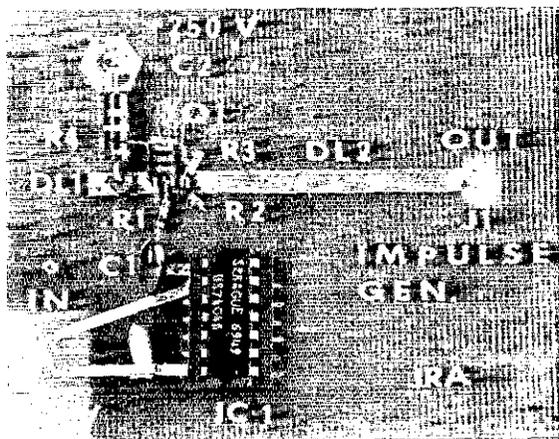
Fig. 3 — Spectral intensity of cosine-squared, triangular, and trapezoidal pulses.

were used to provide drive square waves of 1.0 MHz, 100 kHz, 10 kHz and 1 kHz.

Fig. 5 shows the impulse output measured with a 50-ohm sampling oscilloscope with a 10- to 90-percent transition time of approximately 28 picoseconds. The impulse has a peak amplitude of 14 volts and an impulse duration of 420 picoseconds. Fig. 6 shows the impulse spectrum as measured on a spectrum analyzer over the frequency range of 500 kHz to 1250 MHz. The spectrum is approximately 10 dB down at 1250 MHz. Usable 10-kHz markers were measured up to 1250 MHz. The intensity of the 10-kHz markers was approximately 80 microvolts at 150 MHz, 64 microvolts at 450 MHz, and 30 microvolts at 1250 MHz.

Construction

The photograph of the assembled impulse generator shows the important details of component layout. The circuit is assembled on 1/16-inch, G-10, copper-clad circuit board. The 50-ohm microstrip transmission lines, DL1 and DL2, consist of 1/8-inch-wide strips of copper over the ground plane. Good uhf circuit-construction techniques are required for all component layout. A portion of the circuit board is hollowed out to allow the epoxy-package transistor to lie directly on the 50-ohm lines. The impulse output is



Impulse generator circuit-board layout.

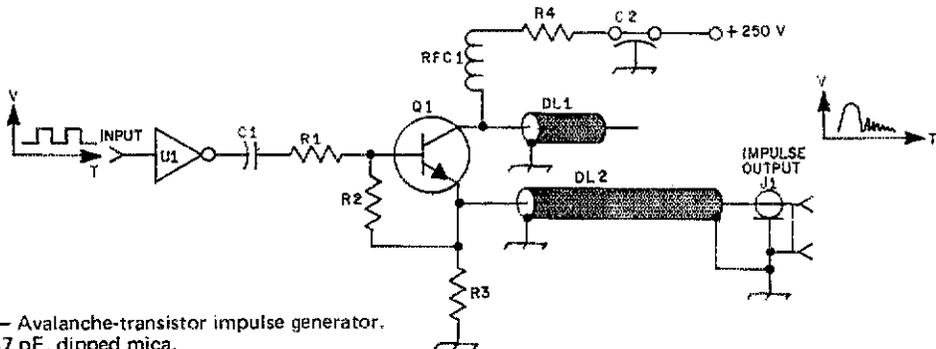


Fig. 4 — Avalanche-transistor impulse generator.
 C1 — 47 pF, dipped mica.
 C2 — 1500 pF, 500 V feedthrough.
 DL1 — 0.4-inch 50-ohm microstrip transmission line; see text.
 DL2 — 1.7-inch 50-ohm microstrip transmission line; see text.
 J1 — Modified UG-1094/U BNC bulkhead receptacle; see text.
 Q1 — 2N3904. Selected transistor; see text.
 R1, R2 — 100 ohms, 1/8 W.
 R3 — Two 100-ohm, 1/8-W resistors in parallel.
 R4 — 100,000 ohms, 1/2 W.
 RFC1 — Ferrite bead on R4 lead.
 U1 — TTL inverter, 7404; see text.

through a modified BNC bulkhead receptacle. The Teflon insulation of the receptacle is cut back flush with the shell. A 1/4-inch diameter disk of copper is removed from the ground plane and a .086-inch hole is drilled through the board to pass the receptacle center pin for connection to DL2. The receptacle shell is soldered to the ground plane.

The avalanche transistor is a 2N3904. An American-made 2N3904 should be used as the author has found that some imported, off-brand 2N3904s do not avalanche. To obtain the largest possible impulse amplitude, the transistor used for Q1 should be selected for the largest BV_{CEr} as measured in the circuit of Fig. 2. The author has measured BV_{CEr} for 100 2N3904s from one domestic manufacturer and found the voltage for individual units to fall in the range of 105 to 170 volts. The transistor used in this example had a BV_{CEr} of 158 volts.

A final note of caution: It is possible to destroy the front end of a receiver if the large voltage impulse from this generator is applied directly to the rf-amplifier transistor or mixer diodes. The receiver will be protected if a tuned circuit is placed between the antenna input and the first semiconductor. The selectivity of a single tuned circuit is sufficient to eliminate the unwanted out-of-band energy.

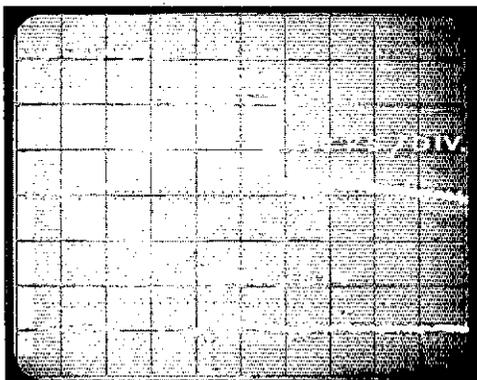


Fig. 5 — Impulse time-domain wave form.

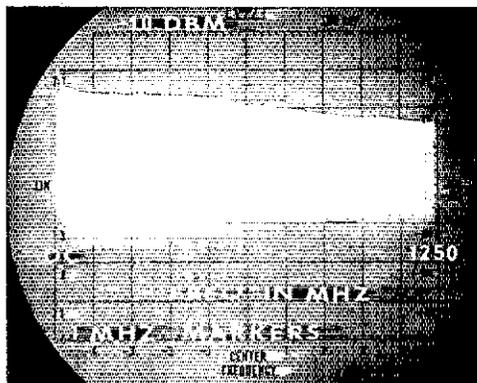


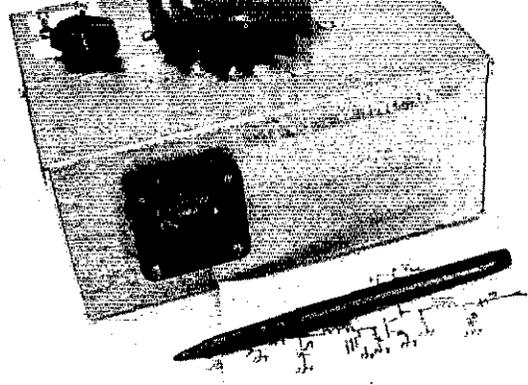
Fig. 6 — Impulse frequency-domain spectrum.

Strays

A week before the New Year, W6MHD's 2-meter transceiver was stolen from his auto. It showed up on the JPU repeater on New Year's eve, with an XYL op, and no call. WA6WXP held her on the air with sweet talk; W6DPD got a bearing on the signal, in the Sanger area; W6QPE drove to Sanger, got invited to her party, drove up to the house, alerted the officers, and recovered the transceiver. The XYL's boyfriend had bought it from another person for \$20. The person who stole the rig thought it was a CB radio. — W6JPU, SCM, San Joaquin Valley.

Last August W4NAP, in Reidsville, NC, had a FB QSO with WB5BED in Houston, Texas, on 20-meter cw. They had no trouble saying good-nite to each other!

The W7ZOI solid-state amplifier is housed in a gray-hammertone Minibox. A large heat sink is used to keep the transistor at a safe operating temperature (top center).



Increased Power for the Solid-State Transmitter

WES HAYWARD,* W7ZOI

ALTHOUGH OUR present affluence has made the totally homemade station a rarity, the past few years have shown some increase in building among the amateur fraternity. This activity has been concentrated in areas which complement rather than replace the commercially built station. In this vein, the solid-state QRP station, often suitable for portable as well as home use, is a popular pursuit among today's experimentally minded amateurs. While the pragmatic objectives of portability and emergency utility are the usual motivations for QRP work, those who have gone this route will readily attest to the thrill of being able to say, "the rig here is all solid state."

A review of the literature shows a proliferation of information on solid-state transmitters in the one- or two-watt output category. In a recent paper, DeMaw reviewed the design of such rigs with emphasis on the problems of keeping the rigs "clean."¹ Some workers have built transmitters which deliver higher powers, the most significant recent example being the unit described by VU2JN.² In spite of this work, there still exists a mystique or fear associated with the use of high-power rf transistors. The purpose of this paper is to present a generalized approach to the design and taming of higher powered transistor rf amplifiers with the constraint of limited test equipment available to the builder. While the author's experience is limited to the Class C amplifier for cw applications, the techniques should be applicable to the more difficult linear ssb amplifier.

Test Equipment

Before attacking the design problem, some mention should be made of the test equipment required. Construction would be quite trivial if one had a large collection of sophisticated test gear available. This dream collection would in-

clude a 500-MHz oscilloscope and a well calibrated spectrum analyzer. Fortunately, the job can be accomplished without this high-class lab equipment. Test gear which this writer does consider absolutely essential includes a suitable 50-ohm load, a regulated power supply with current limiting, means for measuring rf voltages, and a simple impedance bridge. The 50-ohm load consists of thirty 1500-ohm 2-watt resistors in parallel. The power supply used is variable from 9 to 28 volts and is current-limited at 2 amperes. Rf voltages are measured either with a Heath VTVM and rf probe, or with a Tektronix Type 647 oscilloscope with a X10 probe. A simple bridge suitable for the project is shown in Fig. 1. The two 27-ohm resistors on the input insure that the impedance seen by the drive signal is always between 45 and 54 ohms for all output terminations. Hence, the bridge always presents a proper load to the QRP exciter which is the typical driving source used. A more versatile bridge is realized if the two 470-ohm resistors are replaced by a 1000-ohm linear pot. The bridge may then be calibrated with external resistors for resistive loads of 5 to 1000 ohms.

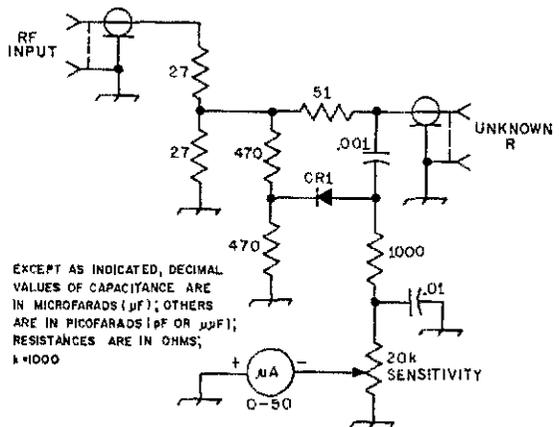
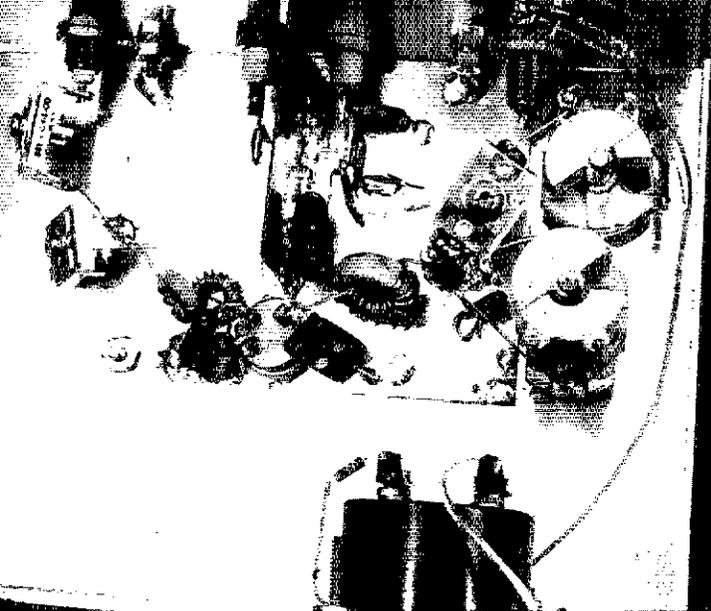


Fig. 1 — Circuit of the simple 50-ohm bridge. Resistors are 1-watt, 5-percent composition. Capacitance is in μ F. CR1 is a germanium point-contact or silicon hot-carrier diode. Resistance is in ohms; k = 1000.

* 7700 S. W. Danielle Ave., Beaverton, OR 97005.

¹ DeMaw, "How to Tame a Solid-State Transmitter," *QST*, Nov., 1971.

² Jayaraman, "The Transistor Giant," *QST*, Oct., 1969.



Inside view of the solid-state amplifier showing the toroidal components, air variables, and compression trimmers.

Amplifier Design

Before considering the design of a power amplifier, the builder should take special precautions to insure that the exciter to be used is quite clean. The DeMaw paper should be reviewed carefully and be applied to the "barefoot machine," with special attention given to output frequencies other than the desired one. Harmonics are easily suppressed with a suitable half-wave filter.³ The exciter should also contain minimal energy below its output frequency. These subharmonics arise all too often from poorly designed frequency multiplier stages in the exciter. In the author's exciter, frequency multiplication is done with low pinch-off JFETs which are followed by tuned JFET buffers.⁴ The drain tuned circuits use fairly low L/C ratios to maintain high loaded Q . The builder should be careful with bipolar frequency multipliers of the type used by DeMaw in that fundamental-frequency suppression is sometimes lacking. This writer has found that a parallel tuned trap at the fundamental frequency is sometimes necessary with such multipliers. The trap is inserted in series with the multiplier's output link.

Once the test gear is assembled and the exciter is suitably clean, the design of the amplifier can begin. There are a number of problems which must be considered in this design. The output device must be selected and then impedances

³ A half wave filter consists of two cascaded symmetrical pi networks, each with a Q of unity. The components for a symmetrical pi network with $Q=1$ are related to the terminating resistance R by $X_L = X_C = R$. The term "half-wave filter" rises from a transmission-line analogy in that, at its cutoff frequency, it behaves like a half wavelength of transmission line. That is, the resistance seen at one end of the network equals the termination at the other end, irrespective of the design resistance (i.e., characteristic impedance.)

⁴ Hayward, "Transmitting with FETs," Technical Correspondence, *QST*, April, 1970.

matched in order to realize the desired output power with a reasonable level of power gain. Along with this, the designer must suppress parasitic oscillations at vhf and at frequencies near and below the operating frequency of the amplifier. Failure to meet these objectives not only yields less than optimum performance, but can often destroy the output transistor!

The choice of an output transistor is usually a matter of availability rather than actual design criteria when building an amateur rig. In general, however, the output device would have a collector dissipation roughly equivalent to the desired power output, a collector breakdown voltage of 2-1/2 or 3 times the supply voltage and an f_T of 10 or more times the desired operating frequency. For example, the 2N3632 which is available for a few bucks on the surplus market⁵ should provide 15 to 20 watts of output (with a 28-volt supply) on any amateur band up through 6 meters.

As a design example, a 14-MHz amplifier (Fig. 2) built by the author will be discussed. This amplifier used a junk-box transistor similar to the 2N3950. The input and output impedances were not specified; this however, is often typical even of so called "well-specified" devices. This lack of detailed specification is a result of the extreme difficulty in performing the measurements on the part of the manufacturer.⁶ Most modern rf power transistors are designed for vhf application and the manufacturer does specify input and output impedances for the design frequency. Rarely are these measurements extended down into the hf region. As will be shown, this lack of specification is rarely a problem. The transistor is operated in the common-emitter configuration in the circuit of Fig. 2.

⁵ Poly Paks, P. O. Box 942 M, Lynnfield, MA 01940.

⁶ Hejhall, "Systemizing RF Power Amplifier Design," *Motorola Applications Note AN-282*.

EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF); OTHERS ARE IN PICOFARADS (pF OR $\mu\mu\text{F}$); RESISTANCES ARE IN OHMS; $k = 1000$.

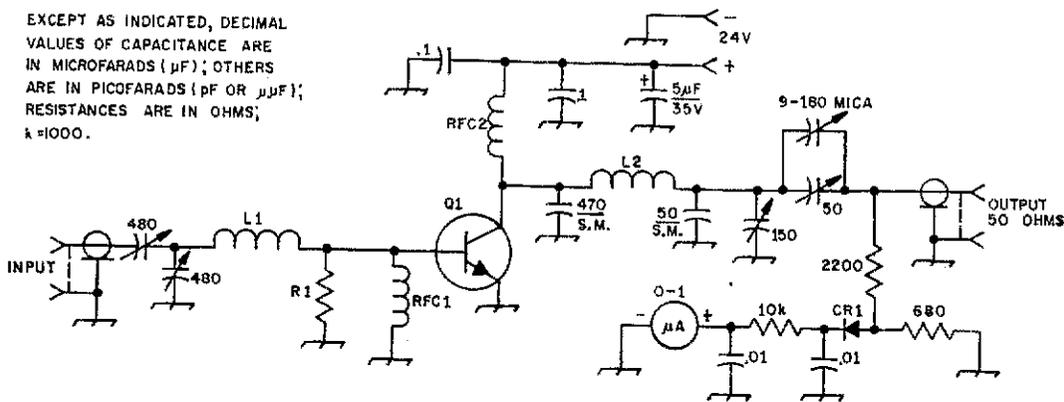


Fig. 2 - Schematic diagram of the 25-watt amplifier. Resistance is in ohms; $k = 1000$. Polarized capacitors are electrolytic. CR1 is a small-signal germanium or silicon diode. $L1 = 0.17 \mu\text{H}$ and $L2 = 0.68 \mu\text{H}$ (see text). $R = 1.65$ ohms, 2 watts (see text). RFC1 and RFC2 are discussed in the text.

The initial step in the design is to arrive at suitable transistor input and output impedances. These are then matched to 50 ohms at the amplifier terminals. One can usually assume that the common-emitter base impedance is quite low and is capacitive. Although the base resistance may increase at lower frequencies, e.g., at 14 MHz with a vhf transistor, this increase is generally a result of higher power gain. Hence, if we assume a fairly low input resistance for our design and then use a resistor of similar value in the external circuit, a reasonable starting point will be realized. The data for the 2N3950 shows an input of only 5 ohms at 50 MHz. For the author's 14-MHz amplifier, a 3-ohm input was assumed and the networks were designed accordingly. The input capacitance was neglected in the design. The output load resistance (the resistance that should be presented to the collector) is usually approximated by $R_L = V_{cc}^2 / 2P_{out}$. In the case of the author's amplifier, an output of 24 watts was desired (within the capabilities of the transistor) with a supply voltage of 24 volts, hence $R_L = 12$ ohms.

There are a number of networks which can be used to match the transistor impedances to 50 ohms.⁷ Of the networks in common use, the author prefers the simple T network shown in Fig. 3A. Although this network is restricted to load resistances below 50 ohms, it has several advantages. The component values typically encountered are usually quite practical, which is not true with the pi network. With mica compression trimmers used in the network, resistances of 1/2 to 2 times the design center can usually be accommodated. Shown in Fig. 3B are reactance values for a T network with a Q of 5. Load resistances from 2 to 35 ohms may be accom-

modated. Network Q s much greater than 5 should be avoided, both for reasons of stability and component limitations (e.g., voltage breakdown across capacitors and saturation of toroid cores).

The design of the base circuit is completed with an rf choke to provide a dc return path and with suitable swamping resistance. Due to the low values of swamping resistance typically used, the base rf choke is not especially critical in a hf amplifier. In the amplifier of Fig. 2, a small toroid core is used for the base choke. A reactance of about 25 ohms is used and the core is similar to an Amidon T-50-2.⁸ The inductor for the base network is wound on a core similar to an Amidon T-50-6. The base swamping resistor is roughly equal to the assumed base input resistance. In the amplifier of Fig. 2, a 3.3-ohm, one-watt resistor was initially used.

The collector circuit contains a T network to match the 12-ohm output resistance to a 50-ohm load. Also required is an rf choke to supply dc to the collector. Some external collector capacitance is also needed. The external capacitor is picked to have a reactance approximately two times the load resistance (470 pF is 24 ohms at 14 MHz) and aids the vhf stability of the amplifier. The reactance is high enough, however, that it is easily absorbed in the output network with no special design precautions taken. Care should be exercised in selecting the collector rf choke. The inductance should be low enough that the choke resonates with circuit capacitances in the hf spectrum, yet large enough that this resonance is well below the design frequency of the amplifier. In the 20-meter amplifier, the rf choke was about 10 μH , thus resonating with other circuit capacitances at about 2 MHz. At this frequency the two 0.1- μF bypass capacitors are still effective. The choke was wound with No. 24 enameled wire on an Amidon T-68-2 core. The inductor for the output T network was wound with No. 20 enameled wire on a core similar to an Amidon T-68-6. The relatively low value of collector choke, plus the electrolytic bypass capacitor, stabilizes the amplifier at low frequencies. The fact that low-frequency resonances are present in the

⁷ Davis, "Matching Network Designs with Computer Solutions," *Motorola Applications Note AN-267*.

⁸ Amidon Associates, 12033 Otsego St., North Hollywood, CA 91607.

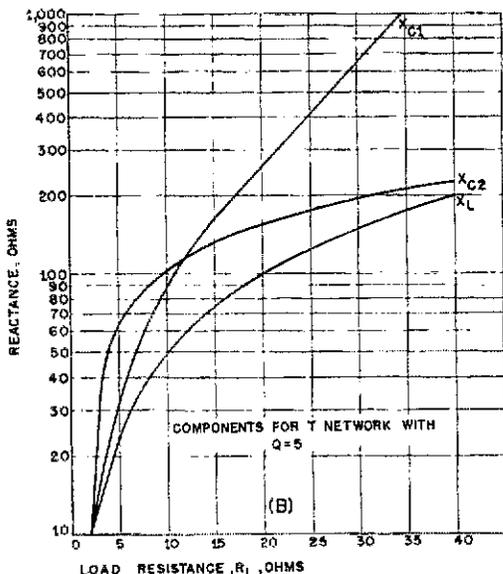
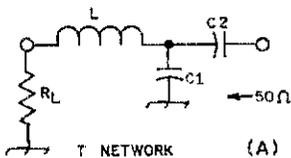


Fig. 3 -- Details of the T-network design (see text).

amplifier output is the reason for our earlier insistence that the exciter contain minimal sub-harmonic content.

Construction Details

Construction of the amplifier is not especially critical, although the input and output halves should be well isolated and leads should be fairly short. It is important that the emitter be grounded with a short, large-diameter wire (No. 16) since any inductance here can cause serious stability problems. Some workers have used low-value resistance in the emitter for thermal stabilization. The author, however, has encountered stability problems whenever he has tried any emitter degeneration, occasionally even in one-watt stages.

Adjustment

Tuning the amplifier is straightforward, although it should be approached with care. Due to the relatively wide tuning range of the T networks, some prealignment is necessary. This is where the bridge comes into play. When using the bridge with the exciter as an rf source, the base network is adjusted for 50 ohms at the input port of the amplifier. Then, the bridge is connected to the output terminal. A carbon resistor equal in value to R_L (12 ohms) is tacked from the collector to ground, and the output network is adjusted until 50 ohms is "seen." Then the

resistor is removed! (Note: 2 amperes flowing in a 12-ohm, one-watt resistor produces a distinct odor in less than 10 seconds.) After prealignment, a reduced collector voltage and reduced drive are applied to the amplifier (12 volts and 0.5 watt of drive). The input and output networks are adjusted for maximum power delivered to a 50-ohm output load. In the writer's amplifier, at 12 volts nearly 10 watts could be obtained at less than one watt of drive. Although the stability was apparently adequate, the power gain was more than desired. The power gain was reduced by soldering a second 3.3-ohm resistor from the base to ground. The base network was again aligned with the bridge; power and drive were applied, and the networks adjusted. Then the collector voltage and drive level were increased in small steps (3 volts and 1 dB, respectively) while maintaining the tuning of the networks for maximum output. The output should increase smoothly during the procedure; any sudden change indicates some sort of parasitic oscillation. The builder should not rotate the tuning capacitors through their full ranges to look for weird effects. This could unload the amplifier drastically and destroy any but the most modern transistor. Using these techniques, the amplifier of Fig. 2 provided 25 watts of output with 2 watts of drive. The efficiency is a little over 60 percent, and no instabilities are present.

Even though the output T network used will accommodate load impedances other than the 50-ohm design center (about 35 to 100 ohms in the author's amplifier), the unit is always terminated in 50 ohms. This is realized with a modified T-network-type Transmatch⁹ and the bridge of Fig. 1. Transmatch adjustments are always done with the exciter rather than ever allowing the final amplifier to operate with an improper termination.

Summary

The foregoing method of design and adjustment is clearly conservative. Also, it should be apparent that hand switching such an amplifier would be a major chore if the same protection were to be maintained. The future is, nonetheless, bright for rf-power-transistor use by the amateur. Recent circuit design developments^{10,11} have led the way to broadband amplifiers, making band switching redundant. Modern transistors are sufficiently tolerant of gross mismatches that this writer's conservative methods will not be necessary. The linearity of some of these newer devices is good enough that their IMD specifications equal or surpass typical tube amplifiers, even at the 100-watt output level. Finally, every indication suggests that device prices will soon be low enough to warrant the consideration of even the most miserly amateur.

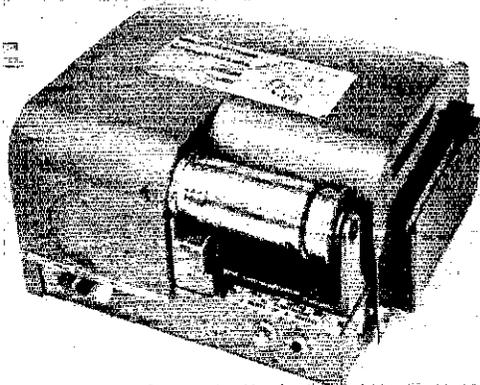
⁹ Johnson, "Band-Switching Transmatches," *QST*, Oct., 1967.

¹⁰ Lowe, "A 15-watt Output Solid-State Linear Amplifier for 3.5 to 30 MHz," *QST*, Dec., 1971.

¹¹ Pitzalis, Horn and Bavanello, "Broad Band 60-W Hf Linear Amplifier," *IEEE Journal of Solid State Circuits*, June, 1971.

Conversion of Telefax Transceivers to Amateur Service

BY HAP KING,* W7QCV



THE USE OF the Western Union Telefax facsimile machine is legal in certain amateur bands, and the conversion is easy to make. A4 emission is permitted on six meters in the frequency range between 50.1 and 54 MHz, on two meters between 144.1 and 148 MHz, and on all amateur frequencies above 220 MHz. F4 emission is permitted on all frequencies above 220 MHz. This all means that you can send FAX on 6 and 2 meters if you have an a-m rig, and you can use either an a-m or an fm rig on the 220-MHz band and up.

Conversion

First, remove the cover and check the tubes in a tube tester. Check to see if you have a stylus. If necessary, replace the stylus with carbon-steel wire only. A wire brush is a common source of stylus wire.

Remove the exciter lamp, clean its opening, and set it aside in a safe place. These lamps are hard to obtain. Carefully remove the lamp telescope, then remove the lenses, and clean them. Be sure to replace the lenses in the same direction as they came out. Replace the telescope and exciter lamp. Plug in the 117-V line cord and push the white OUTGOING button to turn on the lamp. Focus the light spot on the drum by moving the telescope back and forth.

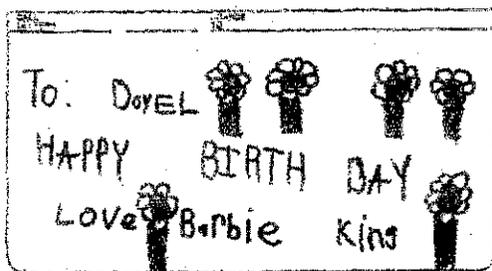
Remove the photo-tube telescope and clean both lenses, then reassemble. Turn on the lamp and focus the telescope image on the pinhole at the back of the telescope tube assembly. Put a paper with typed letters on the cylinder. Focus the edge of a letter on the pin hole. This is very important if you are to send sharp pictures.

Remove the bottom plate and solder a .01- μ F disk capacitor from the junction of the 2000-ohm and 2700-ohm resistors in the cathode circuits of the 12AX7 tube to ground. This keeps rf out of the video amplifier. Clip one of the leads of the 51-ohm 2-watt resistor on the INCOMING push-button switch. The other two leads can also be clipped and the switch can be used to switch the line between your mic and the receiver's audio output.

* 451 145th Place N.E., Bellevue, WA 98007.

Clip the wire coming from relay LR, the normally closed contact, and going to relay HR, the moving contact. Clip the wire on the rear of the OUTGOING push button, the normally open contact. Run a wire from this contact to the moving contact of relay HR just made available. See Fig. 1. These changes assure proper operation of the transmit-receive relay.

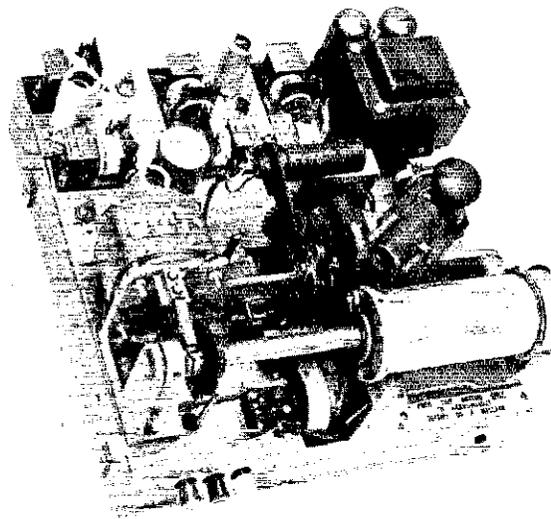
Remove the ACKNOWLEDGE push button, solder the leads together, and insulate them with spaghetti or tape. In the push-button hole, mount a spdt toggle switch. Disconnect the leads going to the contacts of relay LR (line relay). Run three wires from the spdt switch to the three leads at relay LR, replacing the relay function with the switch. Now, when you close this switch, the



A new form of third-party traffic. On the occasion of WA7HKD's birthday, the author's 6-year-old daughter took this means of expressing birthday wishes to Doyel via amateur radio facsimile transmissions.

Western Union Telefax machines are beginning to show up in quantity at surplus dealers and are selling in the price range of \$20. Here is just the information needed to convert them for amateur use.

The Telefax transceiver with cover removed, before conversion. The shaft along which the drum traverses is visible at the left of the drum. The lamp and lamp telescope may be seen on the right-hand side of the chassis just behind the drum. The photo tube, in its black tube shield, lies in a horizontal plane, and is visible in the approximate center of the chassis.



carriage mechanism for the drum will feed. If your transmitter is keyed with a push-to-talk switch, you may use a dpdt switch, with the second pole to key the PTT line. This will key the transmitter automatically at the start of the scan.

Carefully remove the line transformer and remount it on the rear apron of the chassis in a vertical position behind relay L.R. In the original position, the "gray motor" on the chassis above the line transformer will induce hum into the video signal. Solder the shield leads at the old line-transformer location, red to red and black to black. Run two shielded leads from the secondary of the line transformer through the nearby hole in the rear apron and to the LINE terminal strip. Hook a shielded lead to the LINE terminals of the line transformer for connection to your rig's mic jack and speaker leads.

It may be necessary to replace the stylus shielded lead. The old rubber-insulated shield may have become very leaky. Also it's a good idea to replace the lead from the 6V6 tube to the plate choke.

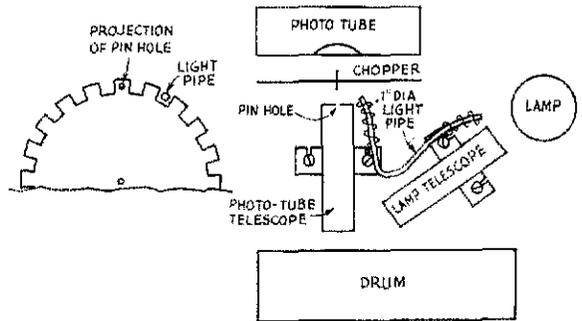


Fig. 2 - Addition of a fiber-optics light pipe for transmission of positive pictures.

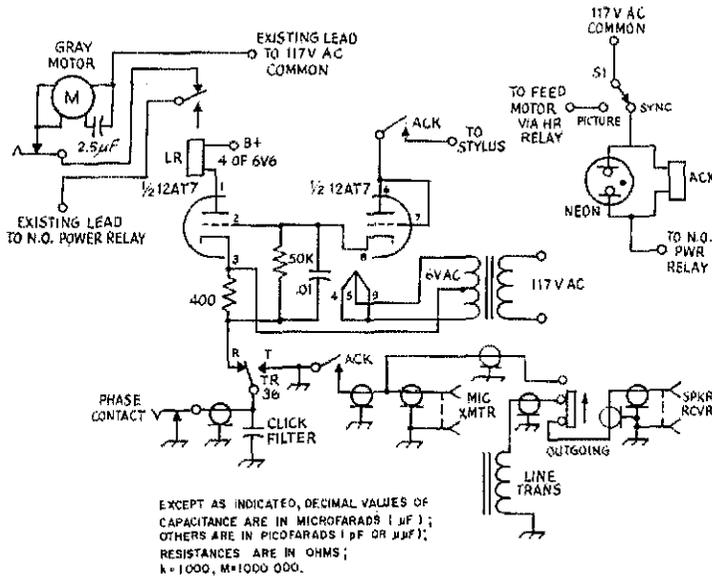
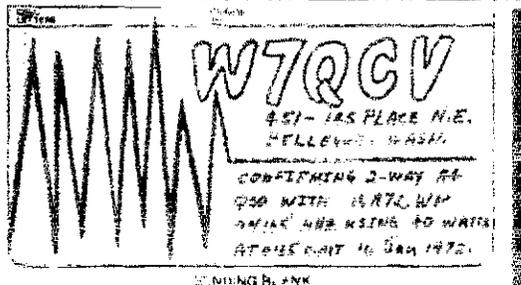


Fig. 3 - Circuit modification for sending or receiving sync information before picture scan begins.



A W7QCV "QSL" card sent via FAX. To be valid for an operating award, however, it must bear an original (not a reproduced) signature of the sending operator.

Positive Pictures

Fig. 2 shows a modification for sending positive pictures. Mount a short piece of fiber-optics light pipe between the exciter lamp and the chopper wheel. The light pipe is easily held in place by wrapping it with No. 14 wire, placing the wire under the two telescope screws, as shown in Fig. 2. Carefully position the light pipe so it shines through a slot in the chopper wheel when the pin-hole light is cut off by the chopper. Connect an oscilloscope or ac voltmeter to the LINE leads and move the light pipe nearer to or farther from the exciter lamp until the scope or meter shows a null.

I have experimentally derived a circuit which will send sync pulses when in the OUTGOING mode before picture scanning begins, and will receive sync pulses before scan to synchronize the drum angle. This circuit is shown in Fig. 3.

There are several stations in the Seattle area that are operating FAX on two meters, and good copy is received. I have been transmitting W1AW bulletins on FAX each Monday night at 9:00 P.M. local time.



Strays

W3ZNF has started a newsheet for hams in lower Delaware, mostly FMers. He calls it "Squelch" -- no news, no bulletin!

Stolen Equipment

My entire station was stolen from my home in February. Included was a Swan 350, SN C-682059 (this had modifications that I can identify); Swan power supply model 117XC, SN 0-11683; Heathkit phone patch HD-15, SN 7339122-A; and an Astatic microphone 10-D. Jim Nachbar, WB8BEG, 24126 Martha Washington, Southfield, MI 48075, telephone 313-353-2543.

From the Museum of Amateur Radio



LIMA, PERU
OA4AE

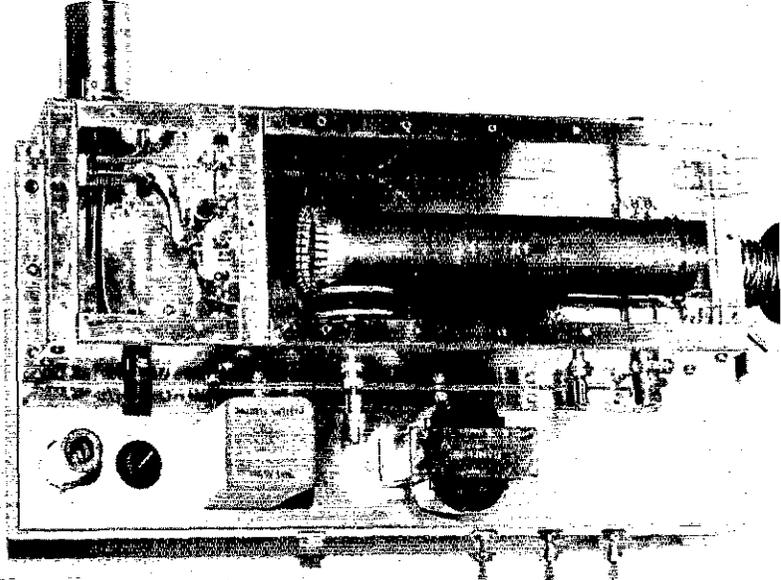
The 25th anniversary of a historic event in vhf annals was recognized when this cup and QSL were offered to the ARRL Museum. They tell their own story.

The cup: "In honor of the first inter-continental 50-Megacycle QSO (by a U.S. amateur) — Glenn G. Harman, W4IJJ, and Carol S. Busby, OA4AE, Lima, Peru, March 23, 1947."

The QSL: "Believe this to be the first South America-USA contact on 6 meters — Buz, OA4AE."

The award was set up originally by the Milwaukee Radio Amateurs Club, as a 56-Mc. trophy, in 1936. It remained in ARRL hands for eleven years, before being won by W4IJJ. Glenn sent it back to the museum just recently. The anniversary was also recognized by Carol Busby, now (as then) W5AGG. Buz recently moved to a country home, where he will soon be working old 6-meter friends again. — W1HDQ

The coaxial-line amplifier for 220 MHz is shown here before the front panel was installed. The small compartment at the left contains the input and grid circuits. On the right is the plate line. A coupler for extending the plate-tuning-capacitor shaft can be seen between the two transformers.



A Coaxial-Line Amplifier for 220 MHz

Using the 4CX250B in a Simple Circuit

BY DON V. WATTERS,* VE2HW

A DESIRE TO try 220-MHz operation with a power level useful for long-haul work motivated the author to construct the amplifier described in this article. It is essentially a 220-MHz version of the two-meter amplifier designed by W6LSB.¹ The circuit is quite simple, as can be seen in Fig. 1. A 4CX250B is used with a half-wave line for the grid circuit and a quarter-wave coaxial tank for the plate.

Although this is not meant to be a nuts-and-bolts construction article, the details may be of help to anyone who is thinking of building an amplifier for 220 MHz. The photographs were taken during the construction of the amplifier.

* 427 Hampton Court Road, Dollard-des-Ormeaux, PQ, Canada

¹ Edinger, "A 4X250B Amplifier for 144 Mc.," *QST*, October, 1956, p. 40.

They show the chassis before the 7 × 9-inch panel was installed and before the control shafts were extended.

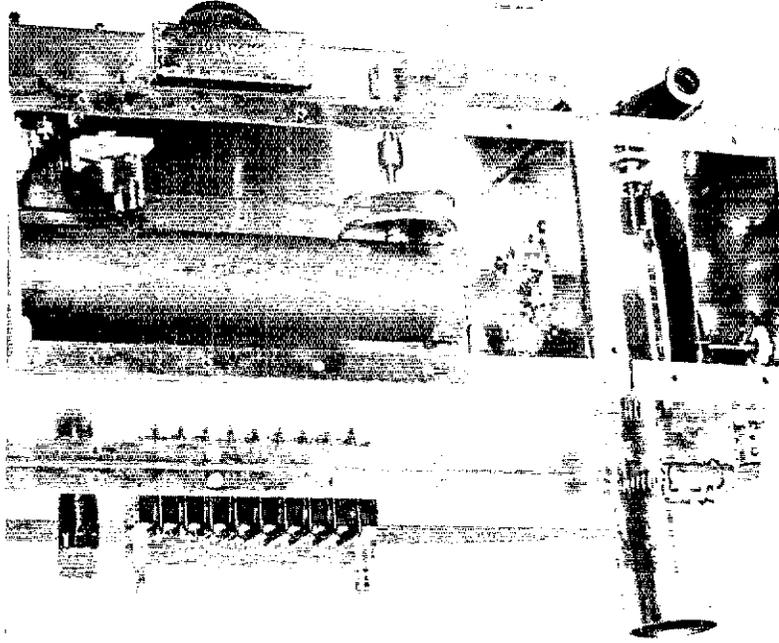
Mechanical Details

The internal portions of the amplifier are inside a sheet-brass box which is mounted on a 10 × 17 × 2-inch chassis. Each side of the box is 14 inches long and 4-5/8 inches high with 1/2-inch lips on the top and bottom. The two ends and the partition are 4-5/8 inches square with 1/2-inch lips on all four sides. The partition is mounted 3-1/2 inches from one end to form a compartment for the grid circuit. Brass was used for the housing, because it happened to be available. The possibility of silver plating was also a factor in choosing this material, although sheet aluminum could be used for the box with little difference in performance.

The box is fastened together with 6-32 screws and nuts of plated brass. The bent-over edges at the top have tapped holes for convenience in removing

"An Ssb and Cw Transmitting Converter for 220 MHz" was described in March, 1972 QST. A final amplifier, to give the signal some punch, is described here. It uses the ubiquitous 4CX250, or its little brother, the 4X150, in a design that should be easy to duplicate and a pleasure to use.

Voltages are connected to the amplifier through the barrier strip mounted on the rear apron of the chassis. Cooling air is fed into the grid compartment through the tubing extension. The disk-type plate-tuning capacitor is visible near the center of the plate compartment. Note that the screen bypass assembly was not in place when the photograph was taken.



the cover. A piece of sheet brass, 14 inches long and 5-1/2-inches wide, is placed between the bottom of the box and the chassis. This avoids a possible rectifying contact between dissimilar metals in an rf field.

A piece of copper pipe, 1-5/8 inch OD, is used for the plate line. Contact with the tube anode is provided by Eimac finger stock. It is easier to solder the finger stock to the plate line if the stock is held in place with three small screws. Soldering is done with the heat from a propane torch (with plenty of flux).

A 4-inch square brass plate is soldered to the cold end of the plate line to form one half of a bypass capacitor. The other half of this capacitor is the end of the box. Insulation is provided by a 4-1/2-inch square piece of Teflon, 20 mils (.020 inch) thick. All three parts of the bypass capacitor (the end of the box, the insulator, and the plate soldered to the center conductor) must have large holes in them to allow cooling air to flow out of the compartment. The assembly is held together by four screws in ceramic feed through insulators. The high voltage connects to one of the screws, which is, in turn, connected to the capacitor plate with a short copper strap.

Plate-circuit tuning is accomplished by means of two aluminum disks 1-1/2 inches in diameter. One disk is fastened to the inner conductor as close as possible to the tube anode. The other disk is mounted on the end of a threaded shaft assembly which passes through the amplifier wall. Spacing between the capacitor plates (at resonance) is approximately 3/8 inch.

The tube socket is mounted in the center of the partition, on the grid-circuit side. The bypass assembly for the screen mounts on the plate-circuit side of the partition.

A strip of brass 5/8-inch wide and 6-1/4 inches long is bent into a U shape to form the half-wave

grid circuit. One end is supported by the connection to the socket and the other is fastened to the tuning capacitor, C1. The correct point for connection of RFC1 to the grid line is found by applying drive and touching a pencil to the line to locate the point of minimum detuning. This point will be an electrical quarter-wavelength from the grid, and should be cold at rf. The input coupling loop, L2, is a U-shaped piece of No. 14 enameled wire which is positioned parallel to the grid line. This loop is supported at one end by the BNC connector and at the opposite end by C2. Since the input tuning capacitor does not require frequent adjustment, it is mounted on the end of the compartment. The position of L2 can be adjusted for maximum coupling to L1.

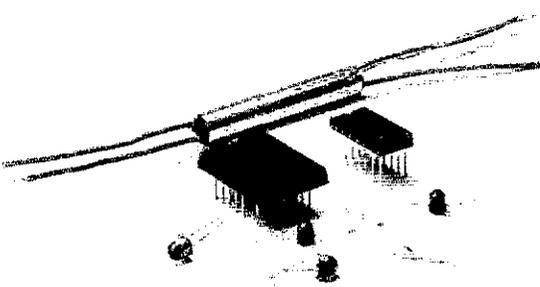
Cooling air enters the grid compartment and flows through the tube socket and the anode cooling fins, then out through the plate line. The blower used by the author is rated at 100 CFM. It has a 3-1/2-inch-diameter wheel.

Adjustment

Neutralization was not necessary for stability, but did help to the extent of making minimum plate current and maximum grid current coincide. The neutralizing capacitor, C12, is a piece of No. 18 wire projecting 1 inch into the plate compartment. It connects to the grid-tuning capacitor, C1, and has a Teflon sleeve for insulation where it goes through a hole in the partition.

The filament and bias supplies are built into the chassis. Switching between the cw and ssh modes is done by selecting the required bias with S1. The switch is mounted on the front panel. Protective bias for cw operation is set at 75 volts. With drive applied, the operating bias rises to 85 or 90 volts. The additional bias is developed across the series resistor, R8. For sideband operation the bias

(Continued on page 47)



By the Light of a Diode

A Short Primer in Optoelectronics

BY DOUGLAS A. BLAKESLEE,* W1K1K

Included in this group of optoelectronic components are a Raysistor (rear), alphanumeric and numeric readout devices, and a group of LED lamps.

TIME WAS WHEN an amateur could make out his station log by the soft glow from the tubes in his rig. TVI shielding ended that era! Gradually solid-state devices have replaced tubes for most functions in amateur equipment. An outgrowth of solid-state technology, called optoelectronics, has generated new interest in the uses of light generated by electronic means. A gaggle of light-emitting, light-activated, and light-controlled devices have been developed which seem destined to put electronic light back into the ham shack.

Optoelectronics came along at a time when business wasn't too good for the semiconductor manufacturers. All types of optoelectronic devices have become the subject of intense competition between the established silicon cutters and new firms formed to produce only opto devices. As it is still a new field, a good deal of confusion exists about the names, definitions and specifications that are used. As the industry matures, better agreement can be expected between various suppliers about what to call and how to specify opto devices.

Get the LED Out

The basic unit of optoelectronics is the light-emitting diode (LED). The LED consists of a pn junction of crystal material which, when forward-bias current is applied, produces luminescence around the junction. (Another example of luminescence is the firefly which gives off light generated by chemical means.) The LED gener-

* Assistant Technical Editor, QST.

ates light by electroluminescence; the flow of current through the diode junction produces visible or infrared light.

The wavelength of the light developed by an LED is determined by the material used for the pn junction and the amount of doping added to the crystal structure during the manufacturing process. Infrared LEDs are made from gallium arsenide crystals (GaAs). Visible light-emitting diodes make use of either gallium phosphide (GaP) or gallium arsenide phosphide (GaAsP). To date the commercially made LEDs produce only red light. Because red means stop in the lexicon of light signaling, a good deal of research has gone into producing green LEDs from GaP crystals. GaP diodes emitting red light have the p region doped with zinc; for diodes to emit green light, a nitrogen dopant is employed. Unfortunately, gallium phosphide is a difficult material to produce, so the first green LEDs are more laboratory models than commercial products, costing five to ten times more than the red units. However, as manufacturing techniques improve, green, yellow, and perhaps other colors, will become commercially feasible.

GaAsP diodes produce light at approximately $0.66 \mu\text{m}$ (6600 angstroms).¹ The new green GaP diodes radiate at $0.56 \mu\text{m}$, and the infrared types have a frequency of approximately $0.9 \mu\text{m}$. See Fig. 1. The light from an LED source is of exceptional purity (coherent light), unlike the broad-band light produced from heated sources

¹The wavelength of light is often given in angstrom units. One angstrom (Å) equals 1×10^{-10} meters or 3.937×10^{-8} inches.

While a term like photon isolator may conjure up thoughts of an engineering joke or NASA space talk, the new field of optoelectronics with all of its strange catch words is one of the rapidly growing segments of electronics. Announcements of new opto devices are a weekly occurrence. To the casual observer it might not seem that light has a place in amateur radio. But, optoelectronic devices can perform a number of unusual tasks in ham gear, as described in this article.

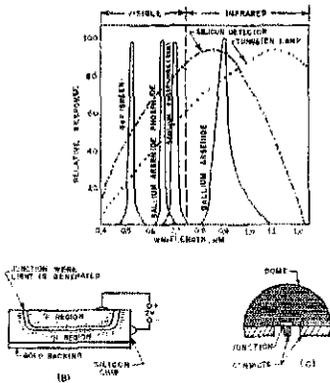


Fig. 1 - (A) Diagram of the light spectrum showing emission frequencies of LEDs and a tungsten lamp, plus the general response curve of a silicon photodetector. (B) Diagram of a light-generating pn junction. (C) Construction of a LED pilot lamp.

such as a tube filament. The narrow-band energy produced by the LED can be modulated using any of the conventional methods for communications purposes.

Getting the light out of an electroluminescent pn junction proved to be a formidable task. The diode chip is fitted with a gold layer to act as a reflecting mirror to help concentrate the light in the desired direction. Also, a chemical compound is added to the diode chip to reduce refraction losses. A dome-shaped lens is placed over the diode to either concentrate or diffuse the light, depending on the application intended for a particular model. Both plastic and metal cases have been developed for LED devices. Highly automated machines now turn out light-emitting diodes "like popcorn," to use the vernacular of the semiconductor industry. Production has reached the point where LEDs are priced well within the budget of a home experimenter.

Some Applications

The first application of LEDs was to replace small incandescent lamps. LEDs make excellent pilot lamps as they have long lifetimes and consume little power (typically .03 W). The average panel lamp is rated for a life of 1000 to 5000 hours; the LED can last as long as 50 years. A forward-bias voltage of about 2 is used at a current of 10 to 30 mA. From a mechanical standpoint, too, the LEDs excel, as they are far more rugged than their glass counterparts. One interesting application of LEDs is that of fault indicators in digital-logic circuits. The light-emitting diodes can be easily interfaced with logic devices as their voltage/current requirements are consistent with the levels available in IC logic circuits.

For most panel-lamp applications the LEDs are used with a series current-limiting resistor. A typical circuit for 5 or 6.3 volts is shown in Fig.

3. For a 5-V supply, a 150-ohm resistor is needed when using a Motorola MLED630. The easiest way to mount an LED in a panel is to drill a hole just large enough so that the LED will fit snugly within and then to apply a dab of epoxy to hold the diode in place.

An important characteristic of light-emitting diodes is the speed at which they respond to voltage changes. Incandescent bulbs can be driven only by dc and low-frequency audio, while LEDs can follow frequencies to above 1 MHz. Another useful characteristic is that the amount of light generated in an LED is proportional to the current applied - the higher the current the more light output, until the diode saturation point is reached. The limiting factor is the maximum power dissipation rating of the device. Typical characteristics of a Motorola MLED630 are shown in Fig. 2.

Gallium-arsenide LEDs can also be made to operate as injection lasers (Light Amplification by Stimulated Emission of Radiation), using a single diode or a diode array. The advantage of the laser type is high power output, up to 60 watts peak for a single diode. While the solid-state laser devices will find many applications, none have been suggested to date for amateur equipment.

LED Readout Devices

One major application of LEDs in arrays is that of readout devices. Because of their long life and low power consumption, light-emitting diodes are an excellent choice for displaying numerals, symbols or letters. LEDs are not as inexpensive as the neon or multifilament readout devices, but they are far more rugged, and last longer. Fig. 5 shows an LED numerical display that is used in the Heath SM-105 counter. A close examination of this photograph will show that each of the individual diodes used to make up the LED display is visible.

LED numerical displays are arranged in seven bar segments, each bar consisting of several individual diodes which make up the numbers 0 to 9 when appropriate segments are turned on. See Fig. 4A. At B a typical TTL IC circuit suitable for use in a frequency counter or digital voltmeter is shown. The input signal is counted and the count information is converted to binary-

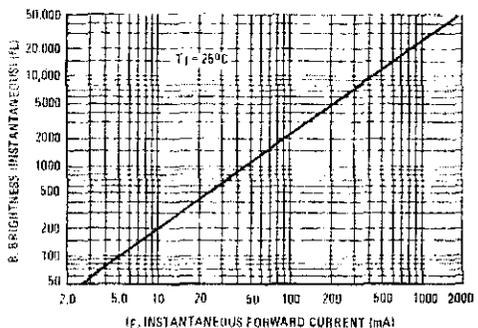


Fig. 2 - Graph of the light output from a Motorola MLED630 for various amounts of forward current.

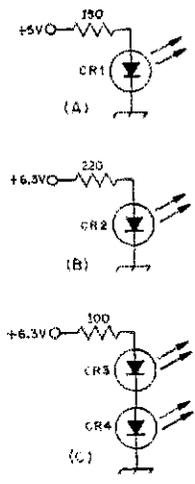


Fig. 3 -- Limiting resistor values needed to establish a 20-mA current through a Motorola MLED630.

coded decimal form (BCD) by the 7490 IC. The BCD information is stored in the 7475 quad-latch IC until, on command, it is passed on to the 7447 decoder/driver which turns on the appropriate LED segments.

One advantage of LED readout devices is that they can be time-division multiplexed. Designers of complex equipment are finding that it is often less expensive to multiplex signals on a few conductors rather than running masses of wires. The development of MOS ICs which can multiplex an LED readout (such as the Mostek 5002P) has made time-division techniques attractive for readouts of four places or more. LEDs appear brighter to the human eye when pulsed, so the multiplex approach actually increases the apparent brightness of the display while reducing power consumption. Manufacturer's literature des-

cribes the circuits needed to multiplex optoelectronic readout devices.²

Hewlett-Packard has recently introduced an LED numerical readout with the memory and decoder driver built in one package. This device, the HP 5082-7300, indicates that an entire multi-digit display can be built on a single chip. Before long we may be able to purchase a complete electronic dial for a transmitter or receiver contained on a single piece of silicon. The first amateur gear with digital readout used neon tubes; LEDs are sure to be along soon.

For some applications it is desirable to display words as well as numbers using LED devices. An ASCII standard has been established for the display of 64 numbers, letters and symbols on a 5 x 7 dot matrix. Representative characters and a typical diagram are shown in Fig. 6. An interesting project for the advanced experimenter would be a device to read out RTTY or cw code on a series of alphanumeric LED devices using a 2240-bit character-generator IC built by Signetics or Motorola.³ Such a project would combine two of the newest electronic technologies - large-scale integration of MOS transistors and optoelectronics.

² Smith, "Multiplexing LED Displays - Appendix 3," Litronix, 19000 Homestead Road, Vallico Park, Cupertino, CA 95014.

³ Several character generators are available for 5 x 7 readout, including the Motorola MCM1131, the Signetics 2500 series, and the Texas Instruments TMS2400, TMS2500, or TMS4100 series. B&F Enterprises, P.O. Box 44, Hathorne, MA 01937, sells 2513 character generators for \$25.

This large Litronix Data-Lit 62 readout uses 10 diodes, divided into two groups of 5, for each of the 7 segment bars. The epoxy case which houses the unit is designed to provide some diffusion of the light, making the bars appear thicker to the viewer.

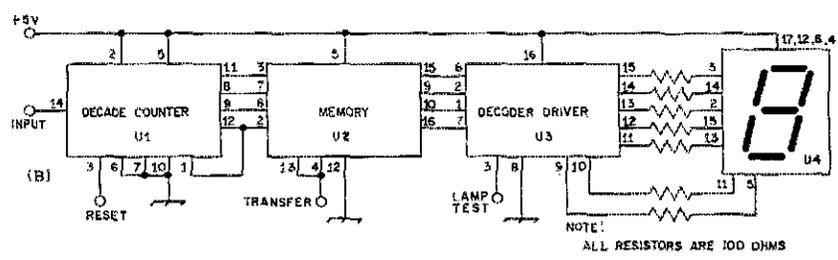
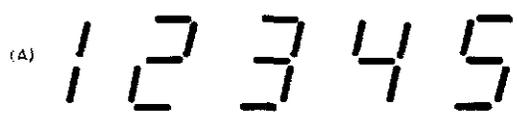
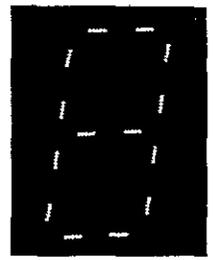


Fig. 4 -- (A) Examples of seven-segment numerical display. (B) Circuit of a counter/LED display module. U1 is an SN7490, U2 an SN7475, U3 an SN7447, and U4 a Litronix Data Lit 62.

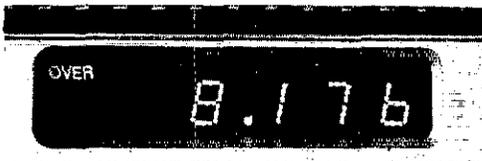


Fig. 5 - An LED display is used in Heath's SM-105 frequency counter.

Liquid-Crystal Devices

While LEDs have held the center stage, another readout device has been gaining attention because it uses almost no power and costs very little to make. Called liquid crystals, the devices produce numerical displays by using an electrical field acting on a liquid organic compound consisting of nematic crystals.⁴ The crystals are clear until the voltage is applied; then they become cloudy showing a milky color. Liquid crystals are poor electrical conductors, so they draw very little power (typically 40 microwatts in the milky state and none when clear).

RCA developed the first practical liquid-crystal display from a nematic material with the impossible name of Anisylidene-Para-Aminophenylacetate. A .0005-inch thick layer of the material with the unpronounceable name between two plates of glass which had been treated so that they were electrical conductors changed from clear to milky when 60 volts was applied between the glass plates. Newer materials (with names running to 64 letters) have been developed for use in liquid-crystal displays which require voltages in the range of 6 to 15.

Unlike LEDs, liquid crystals do not generate light. They either reflect it (called the reflective mode) or transmit it (called the transmissive mode). Some engineers feel that a flat-face TV screen may be developed using liquid crystal techniques, although the technical problems that remain to be solved are formidable. Multicolor displays are now being developed by Bell Labs using laser scanning. The primary difficulty of liquid-crystal displays today is short lifetime, typically 10,000 hours, or less, and poor temperature stability.

Fig. 7A shows the basic transmissive-mode display which uses a light source between the

⁴ Nematic is one of the three possible phases of molecules that arrange themselves in ordered groupings having the characteristics of crystal structures. See reference 12 for additional details.

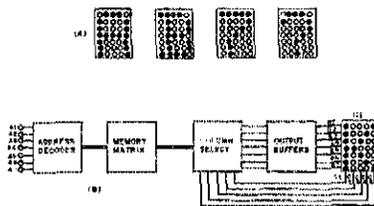


Fig. 6 - (A) Examples of the 5 x 7 dot display. (B) Block diagram of the circuit used to drive a 5 x 7 LED readout.

viewer and the liquid-crystal unit. At B the reflective mode is depicted using a light source on the viewer's side of the display -- usually edge lighting or ambient light is employed. In either case an ac or dc voltage will block light transmission through the display, while zero voltage allows the crystals to pass light freely. Because very little current is needed to operate the display, the liquid-crystal device can be driven directly by MOS logic.⁵ Multiplexing is a popular technique with liquid-crystal displays. The first commercial models are just now being offered for sale.⁶ A typical 4-digit display manufactured by Ilixco is shown in Fig. 8. The seven-segment numerical displays operate from a 7-volt dc supply, providing a digit size of 0.4 or 0.8 inches. The entire Ilixco readout unit plugs into a pc-card connector.

A Crystal Detector

When QST staffer KIPLP was working on his digital message generator,⁷ he rediscovered diode light detection. With one particular batch of diodes the message machine would cease to function properly when the diode matrix was exposed to bright light. A diode which is housed in a glass or clear-plastic case will exhibit a phenomenon known as photoconduction when the junction is exposed to light. The light energy breaks up electron/hole combinations long enough to provide a current flow that increases the conductivity of the diode.

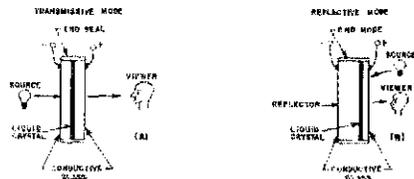


Fig. 7 - (A) The transmissive and (B) the reflective modes of a liquid-crystal display.

Most opto detector diodes, usually called photodiodes, are made from silicon chips. The change of conductivity within the diode will depend on the intensity of the light applied and the area of the junction which is exposed to light. The speed-of-response range of silicon-junction detectors is in the megahertz region. Operating currents are on the order of a few microamperes to a few milliamperes. The light response of silicon photodiodes is quite broad, peaking at approximately 0.8 μm .

The photodiode is the junior member of a family of opto detectors. It is usually constructed

⁵ An MOS LSI decoder/memory/driver for a 4-digit display is available from Environmental Products, Box 406, Lafayette, IN 47902. Price is \$24.95.

⁶ Environmental Products (see footnote 5) also offers a 4-digit liquid-crystal display for \$29.92.

⁷ Hall, "A Digital Morse-Code Message Generator," QST, June, 1970.

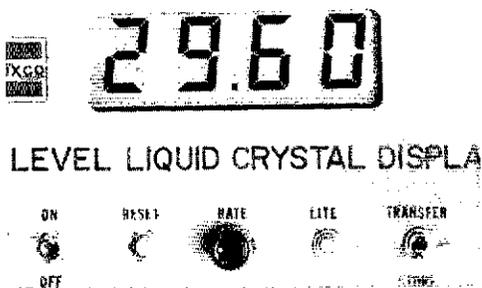


Fig. 8 — An Ilxco liquid-crystal display in operation.

with a glass or plastic lens that focuses the light energy on the diode junction. The diode is back biased when operating as a detector. As with other diodes, the photodiode has some reverse-current leakage which is called "dark current" because it is measured with the diode in the dark. A typical circuit is shown in Fig. 9A.

The development of photodiodes closely parallels that of standard diode devices. Early models were made from germanium crystals. Today, silicon is the favored material because of the lower leakage currents and better temperature stability of silicon devices. For high-speed applications, a PIN photodiode is available.

The Photodetector Family

To increase the sensitivity of opto detectors, light-sensitive transistors have been developed. Similar to the photodiodes, when light falls on the reverse-biased emitter-collector junction of a transistor, the conductivity of the device changes. In this case, however, the current flow is proportional to the radiation intensity of the light multiplied by the beta gain of the transistor. A phototransistor detector circuit is shown in Fig. 9B.

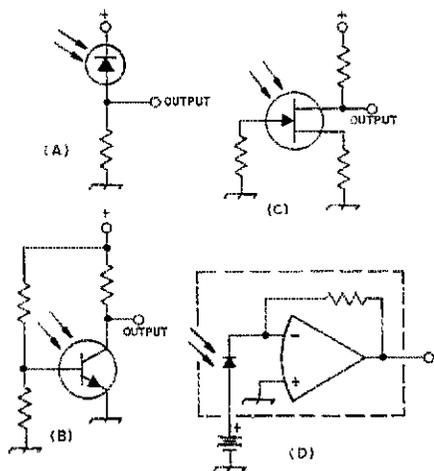


Fig. 9 — Example detector circuit for the (A) photodiode, (B) phototransistor, (C) photo-FET, and (D) photodiode/op amp.

Most phototransistors are bipolar npn silicon devices. Some have base leads brought out while others do not. The base connection can be used to adjust the sensitivity of the device, but any base-bias current will reduce the overall sensitivity of the transistor as a light detector. The operation of phototransistors is similar to that of electrical transistors. Off (dark) currents are only a few nanoamperes while the collector current can be up to 10 mA when the junction is receiving radiation.

In addition to the bipolar phototransistor, FET types are now available. The FET phototransistors offer fast switching times, limited only by the gate-to-source capacitance and resistance of the device. A typical circuit is shown in Fig. 9C. To increase the current output from a transistor, a Darlington connection of a second transistor can be used. RCA and others are fabricating Darlington phototransistors with a maximum collector-current rating of 200 mA. The high gain of the Darlington types is achieved at the expense of frequency response, however.

For super gain, the photodiode has been combined with an operational amplifier in a single package. In addition to high gain, the photodiode/op amp (for which no catch name has yet been thought up) has excellent linearity and long-term stability. All of the sophisticated op-amp techniques such as FET input and chopper stabilization can be used in the opto models to improve performance. The high dc gain of the op amp does make noise generated in the photodiode and dark current (which causes offset-voltage problems in the op amp) factors which limit performance. Because of their superior characteristics, the PIN diodes are preferred in op-amp photodetectors.

The other important member of the photodetector family also has no formal name as yet. Called the light-activated silicon-controlled rectifier, this device uses light to switch large currents. The GE L9B, for example, can switch 1.6 A. The L9B has a triggering lead brought out so that both light and electrical means can be used to turn on the SCR. Other family members include the light-activated programmable unijunction transistor (photo-PUT) and silicon-controlled switch (photo-SCS). The primary use of opto detectors in electronic circuits is in conjunction with LED sources as opto couplers.

Opto Couplers

As electronic systems have become more complex, so have the problems of connecting sections of a system together. Joining dissimilar circuits — called interfacing — and eliminating problems of common ground returns can be difficult tasks for the designer. An excellent interface device, named the opto coupler, has been developed which, when properly used, can get unfriendly circuits to work together. An opto coupler consists of an LED and a photodetector in which isolation of 100,000 megohms can be achieved with fast switching times. Either analog or digital signals can be transmitted via the opto coupler. The only

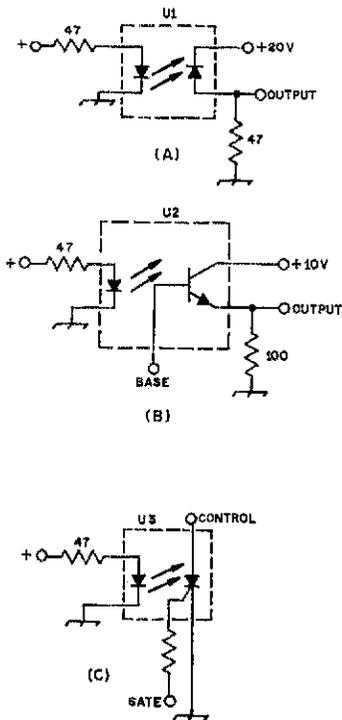


Fig. 10 — Opto couplers using (A) photodiode, (B) phototransistor and (C) photo-SCR detectors. U1 is a Monsanto MCD1, U2 a Monsanto MTC1, and U3 a Monsanto MCS1.

connection is through the light path, so no common ground return is needed.

Low-cost opto couplers are fabricated using monolithic techniques, quite like integrated circuits; the coupler is most often housed in a four- or six-pin plastic package. The LED light source is coupled to the detector directly or via a fiber-optic light pipe. A photodiode, phototransistor or photo-SCR can be used as the detector. Typical circuits for these devices are shown in Fig. 10. Opto couplers are called by many trade names, including photon coupler, photon isolator, opto isolator — each manufacturer has his own pet term which he hopes will catch attention.

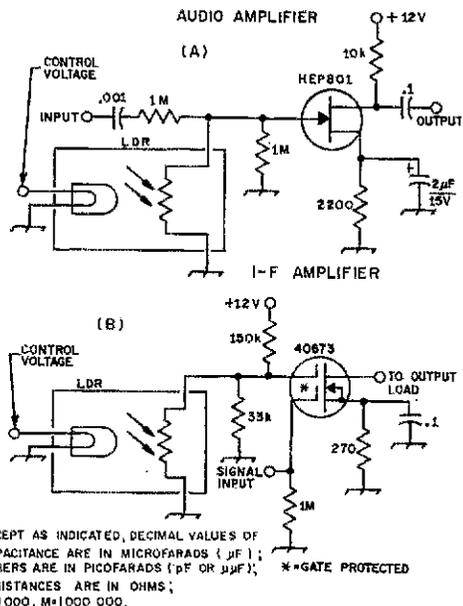
Opto couplers are not a new idea. Raytheon introduced an incandescent lamp and a photocell detector combo some years ago, nicknaming the unit the Raysistor. A change in the voltage applied to the lamp produced a change in the resistance of the photocell as the light level it received varied in intensity. Later the device picked up the name LDR. The limiting factor in signal transmission via an LDR was the slow response of the lamp to voltage changes. Thus, LDRs are usable only for dc and low-frequency audio circuits. However, applications such as a noiseless volume control (Fig. 11A) and a slow-time-constant agc element (Fig. 11B) are useful circuits in amateur gear. Most LDRs do not have high enough speed to be useful as gain-control elements in audio compressors.

Some typical connections for the opto isolator in digital circuits are shown at Figs. 12A and 12B. In both examples it is necessary to provide a current-limiting resistor to hold the on-state current to approximately 10 mA. The LED in the opto isolator has rather high shunt capacitance — approximately 100 pF — which helps to suppress noise. Typical output circuits are given in Figs. 12C and 12D. Opto couplers can also be connected to provide logic functions. The AND and OR connections are shown in Figs. 12E and 12F, respectively. The resistance values shown in Fig. 12 are typical; components used should be chosen to fit the characteristics of the opto coupler used.

For linear applications, the LED must be forward biased to a suitable resting current, usually in the range of 5 to 20 mA. A differential amplifier provides an excellent input circuit. An example is shown at Fig. 13A. The value of R1 is chosen to provide the desired level of bias current. For the best hf response, the phototransistor detector should be operated into a low-impedance load. A grounded-base amplifier (Fig. 13B), a two-stage amplifier with feedback (Fig. 13C), or a high-speed operational amplifier can be employed. In all cases the output can be taken from either the collector or the emitter of the phototransistor, depending on the polarity desired. A good example of the application of an opto isolator, interfacing an RTTY local loop with an afsk generator, was described in *QST* last month.⁸

Commercially manufactured opto couplers are suitable for many applications, but the experimenter may wish to make his own to fit a

⁸ Drake, "An Audio Synthesizer," *QST*, April, 1972.



EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μ F); OTHERS ARE IN PICOFARADS (pF OR μ pF); RESISTANCES ARE IN OHMS; k=1000, M=1000 000. *GATE PROTECTED

Fig. 11 — LDR control for (A) audio and (B) i-f amplifier circuits.

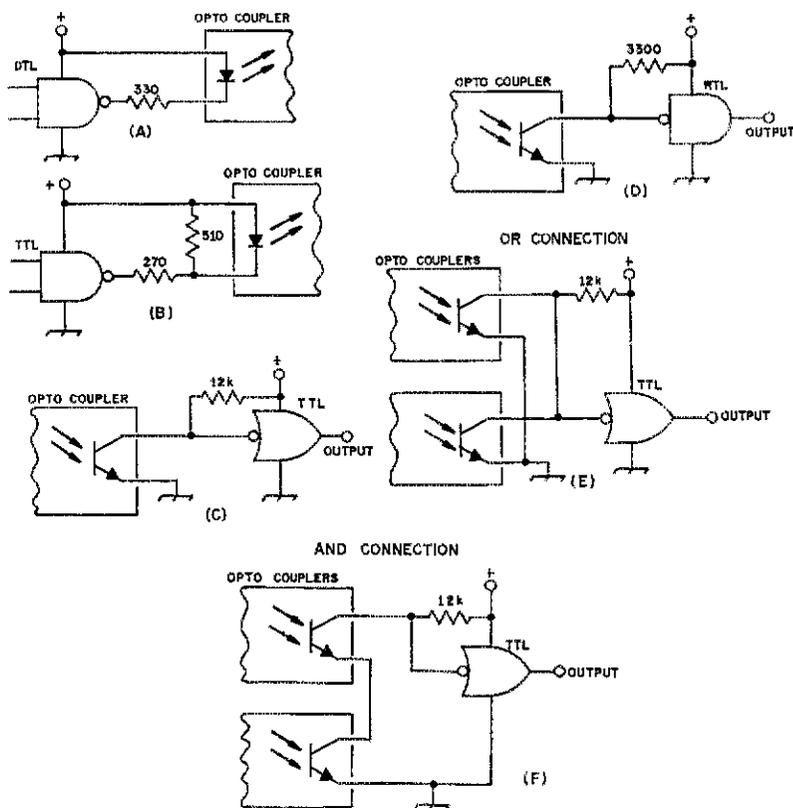


Fig. 12 - (A,B,C,D) Example circuits for connecting opto couplers to digital-logic ICs. (E,F) Logic functions performed by two opto couplers.

particular need. A Motorola MLED610 and a 2N5778 can be coupled together using a fiber-optic pipe to make an opto coupler in which the light signal travels several inches or several feet, as needed. The entire assembly should be covered with heat-shrink tubing to prevent light leakage.

Light Conductors

Electrical conductors of brass, copper and aluminum carry electronic signals. A new transmission medium, called fiber optics, is employed to carry light signals. In 1870 John Tydall demonstrated that light could be guided along the inside of a cylinder by reflection - literally, the light bounces along. The practical use of Tydall's experiment wasn't devised until a few years ago when it was demonstrated that a very thin cylindrical glass tube clad with another glass compound which had a very low refractive index could transmit light over a considerable distance with only moderate attenuation. Pure glass proved difficult to work with, so a fiberglass compound was developed which provided the necessary flexibility. A sketch of a single fiber-optic transmission line is shown in Fig. 14.⁹

⁹ Several types of fiber-optic pipes are available from Poly-Paks, P.O. Box 942M, Lynnfield, MA 01940 (catalog available). The same firm sells 7-segment LED readouts for \$6.50 and LED pilot lamps for \$.79.

Many of the thin fiber-optic threads can be combined into a larger transmission line which can carry TV pictures, as well as color patterns and modulated light signals. The bundles of fibers are often called light pipes. Several numerical readout devices, such as the Master Specialities 908, use LED lamps connected to a display via fiber-optic pipes.

Among the advantages of light transmission via fiber optics over radio signals transmitted using a coaxial cable are: optic cables aren't expensive (glass is much cheaper to produce than copper), light pipes can have a small bending radius, the need for equalization of broad-band signals is eliminated, pickup of stray electrical fields isn't a problem, and there is no need to pressurize the cable for best performance. The disadvantages are electrical power cannot be transmitted along with the signals over light pipes and the handling, installation and repair of light-transmission cables requires some specialized techniques.

In Conclusion

Optoelectronics is perhaps the fastest growing of the solid-state technologies, all of which are moving along at a mind-boggling rate. The solid-

(Continued on page 63)

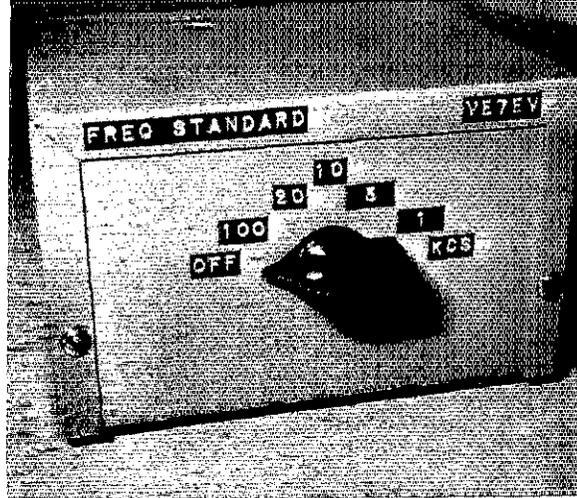
An Inexpensive Secondary Frequency Standard

BY A. C. BERESFORD,* VE7EV

THE UNIT DESCRIBED here, and the alternative less complex circuits, are the result of a search for an inexpensive secondary frequency standard. Many frequency standard circuits have been presented in trade periodicals, but none, to the author's knowledge, has made use of the low-cost Fairchild MSI Integrated Circuits. Most circuits have made use of a multiplicity of *J-K* flip-flops, and in order to obtain a 1-kHz marker something on the order of nine chips usually were required. Compare this with the Fairchild TTNL/MSI 9350 which in one chip gives a choice of a divide by two, divide by five, or a divide by ten counter. Put two units in series and drive them from a 100 kHz multivibrator crystal oscillator, and you have a frequency standard giving 1-kHz markers at an average cost of \$3.30 (Canadian) per decade circuit! Contrast this with the final cost of a similar unit employing individual *J-K* flip-flops and you will soon appreciate the simpler, less expensive approach.

The unit described here provides strong marker signals at 100-, 20-, 10-, 5- and 1-kHz intervals well into the hf range. By a wiring change to the

* 1258 Greenbriar Way, North Vancouver, BC, Canada.

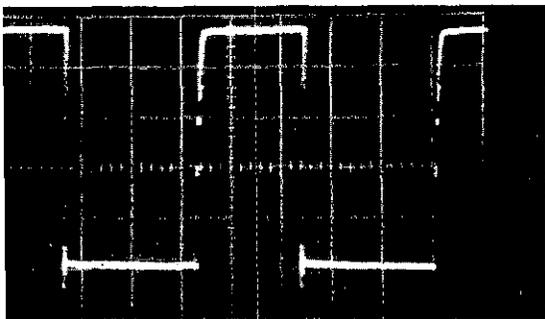


The deluxe frequency standard has the minimum of controls. One switch applies power and selects the desired output. The hole which is just visible at the top of the box is for the adjustment of the crystal to one of the WWV frequencies.

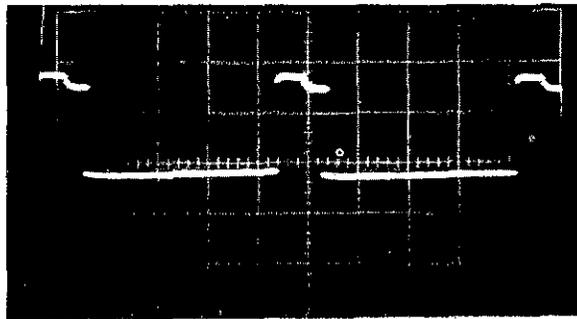
decade connections (see Fig. 2), the unit will easily provide alternative output ranges of 100, 50, 10, 5, 1 or 100, 50, 10, 2 and 1 kHz. Using the divider circuits of Fig. 2, and employing only a single decade divider with a crystal oscillator, one may construct an extremely simple standard. By using a switch in the deluxe unit to select the external decade connections, one could provide an even greater choice of markers, including all points already mentioned.

Circuit Descriptions and Construction

The unit in Fig. 1 employs a pair of Fairchild decade dividers driven by a multivibrator type 100-kHz crystal oscillator using an International Rectifier 2-input quad NOR gate. This oscillator could just as easily have been a Fairchild 9914 two-input gate or a Motorola HEP580. The IR brand IC was already available, therefore it was used. It also offers the advantage of having two



The 100-kHz square-wave output signal from the standard.



The 1-kHz output of the frequency standard.

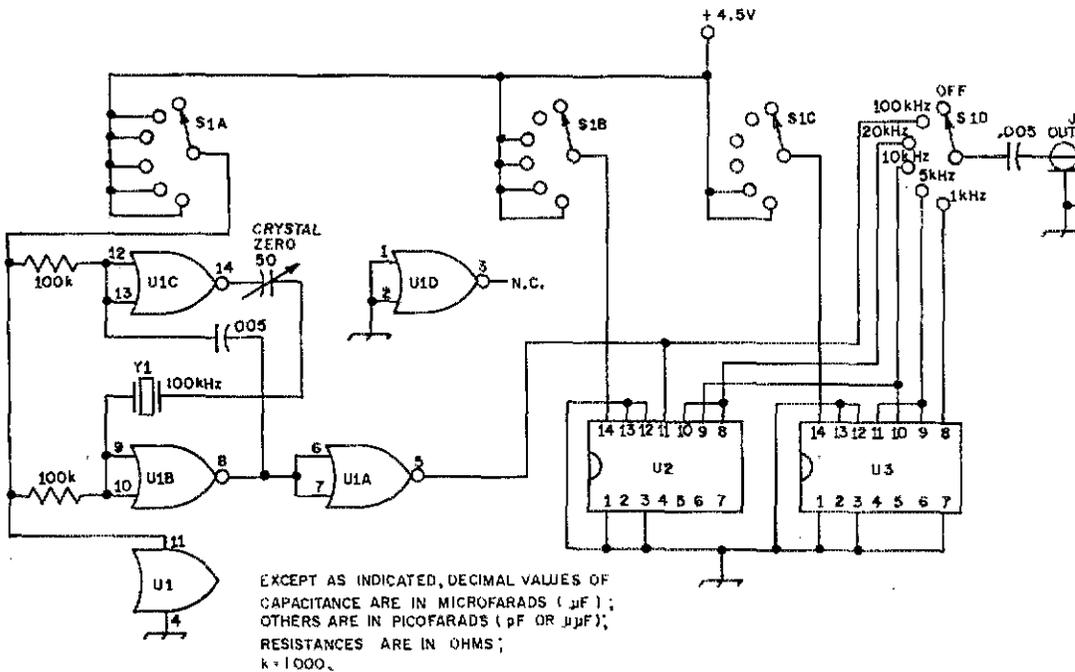


Fig. 1 - The circuit for the deluxe frequency standard shows the advantage of using ICs, which requires a minimum of components. S1 selects the desired output marker while energizing the necessary portions of the dividing chain.

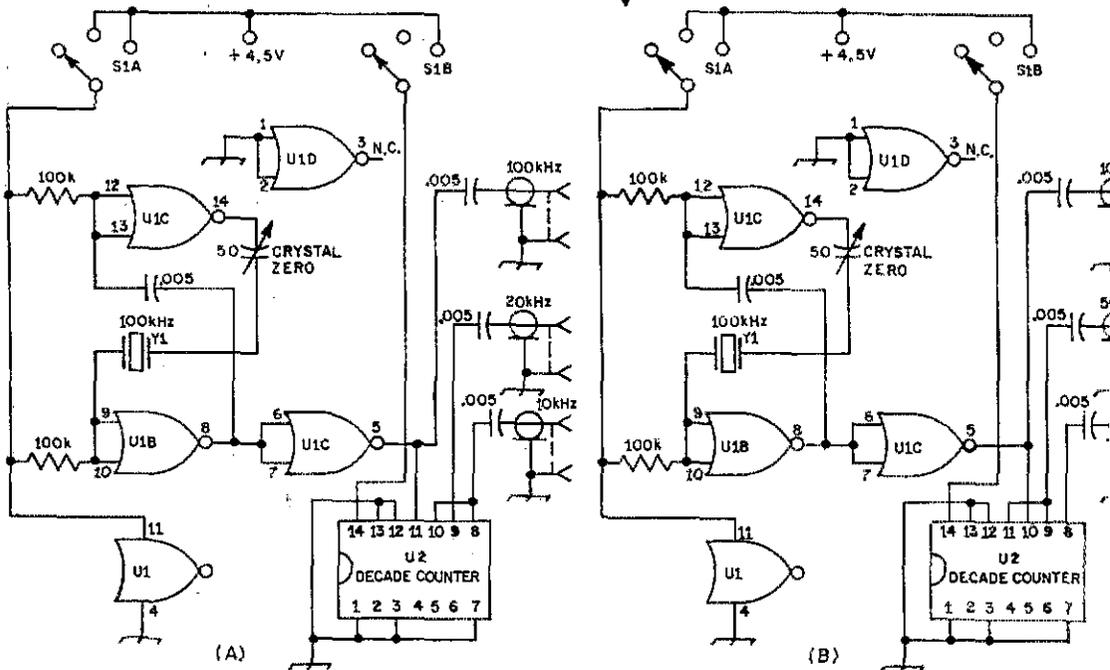
U1 - Quad 2-input NOR gate (International Rectifier IC724-C or equiv.).

U2, U3 - Decade counter (Fairchild MS19350 or equiv.).

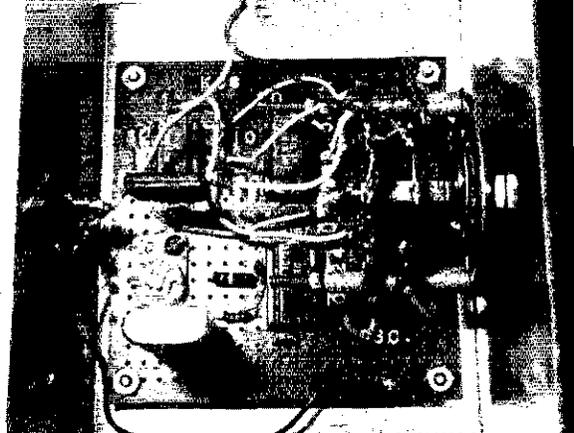
S1 - 4-pole, 6-position rotary, nonshorting (Centralab PSA-211 or equiv.).

Y1 - 100-kHz frequency-standard crystal (Peterson Radio Z-6A or equiv.).

Fig. 2 - Alternative connections for a frequency standard if the 5- and 1-kHz outputs are not desired. One IC has been eliminated, and a 4-pole 6-position switch for S1 is not used, further reducing the cost of the inexpensive standard.



A top view of the frequency standard shows the placement of parts. The 100-kHz crystal and its trimmer are located at the lower left. The frequency selection switch is at the decades, right.



extra gates, one of which has been grounded to provide isolation between the oscillator and the first decade divider. The 4-pole, 6-position switch was made up from spare wafers already on hand. Ready-made units are available, but too expensive to buy. I recommend that a multipole switch be employed to disable the idle decades, as they draw approximately 20 milliamperes each when they are activated, though not used.

The unit was built into a Hammond 1411L Handy Case having the dimensions HWD $5 \times 4 \times 3$ inches. A Bud CU-2105-A is the same size.

The three ICs, the trimmer capacitor, and the crystal socket were mounted on a perforated board, 3×3 inches, with plated holes. IC sockets were mounted on the board by cutting two thin slits with a motor tool and fine cutter. The slits are just wide enough to accept the pins of the IC sockets on a press-fit basis and are anchored firmly in place by the point-to-point wiring. The board is mounted on the bottom of the containing box using 4-40 screws which allows just enough clearance for the wiring. The holder for three penlight cells is mounted in the lid of the box. The general construction should be clear from the photographs. Hammond 1421T3 self-adhesive rubber feet were affixed to the bottom of the box to prevent scratching of the operating

table. An access hole in the top of the box permits adjustment of the standard to WWV frequencies.

Economy Circuits

Figs. 2A and 2B show two economy versions of the standard. Fig. 2A provides 100-, 50-, and 10-kHz markers, while Fig. 2B provides 100-, 20- and 10-kHz calibration points. Construction of either unit should follow the more deluxe model, except that economy in these units is maintained by bringing the output markers to separate jacks, rather than using an expensive multipole switch.

A word of advice: the decades will not switch with less than 3 volts, but no attempt should be made to feed them with a voltage greater than 5 volts. Three penlight cells perform the task admirably.

I would like to acknowledge the assistance of Albert Harskamp and Brian Ounsted of Total Electronics, who assisted in my search for the correct IC units, and to Darrell Greenwood who took the photographs. QST

VXO Design

(Continued from page 15)

ductance and 400-MHz upper-frequency rating. The input capacitance of the 40673 is a bit less than that of most JFETs, thereby making it a good candidate for VXO service.

The circuit of Fig. 1 should be suitable for a variety of applications. Stage Q2 can be called upon to function as a doubler or tripler if some output frequency higher than 6 MHz is desired. However, if Q2 is used as a multiplier its collector circuit should employ a double-tuned band-pass tank to prevent the oscillator energy from appearing at the output of Q3 and its filter. Remember, FL1 will pass any frequency below 6 MHz because it is a low-pass type.

Four crystals are used in the VXO described here. This arrangement permits coverage of 146 to 147 MHz. The crystals are International type GP, series-resonant mode, .01-percent tolerance, 26-degree C, 30-pF load capacitance. With the circuit values given in Fig. 1 the upper frequencies of the VXO come out approximately 3 kHz higher than the frequencies marked on the crystal holders.

Three of the crystals provided swings of 2 meters in excess of 300 kHz. The remaining crystal was somewhat less "rubbery," but could be pulled 260 kHz. No two crystals seem to pull the same amount, so don't expect absolute uniformity of operation. Plan on covering 225 kHz with each crystal (after multiplication to 2 meters) and you will probably be close. There should be some overlap.

Each VXO will have its own personality, so the keynote here is to experiment. Some of the suggestions given in this article should make the job easier. QST

Stays

Attention potential hams in the area west of Chicago: Code and theory classes will be held every Wednesday night at Land of Electronics, 400 South Main St., Lombard, IL 60148. For more information contact Philip Caruso, K9DTB, at the above address.

The Arizona Repeater Association is constructing 50-watt 2-meter amplifiers as a group project. In this article the designer, K7QWR, describes the circuit used, as well as two other units that he has developed. A group construction project can provide the spark to revitalize a club that has slipped into lethargy. How about your club?

Some 2-Meter Solid-State Rf Power-Amplifier Circuits

BY ROY C. HEJHALL,* K7QWR

THE MAJORITY of the commercially made 2-meter fm transceivers available today have rf power-output levels of 1 to 15 watts. There are many occasions when an fm operator would like to have a little more "soup" to be able to work over greater distances. This article describes a 50-watt output amplifier for the 2-meter band which will add more "muscle" to a signal. The amplifier uses a single transistor and operates directly from a 13.6-volt vehicular electrical system.

Circuit Description

The amplifier circuit shown in Fig. 1 utilizes a single 2N6084 transistor operated in a Class-C, zero-bias configuration. This mode of operation has the advantages of high collector efficiency at full output and zero dc current drain when no rf driving signal is applied. The reader should note that zero-bias operation yields an amplifier that is not a "linear." It is designed for fm (or cw) operation only, and would produce objectional distortion and splatter if used to amplify either a-m or ssb signals.

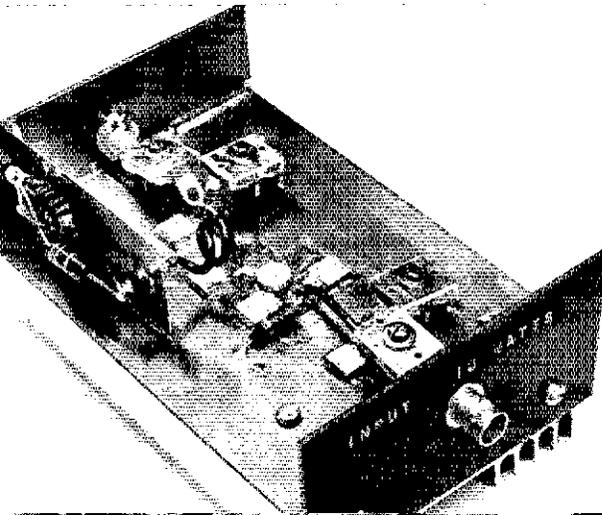
* Section Manager, Communications Applications, Motorola Semiconductor Projects, Inc., P. O. Box 2953, Phoenix, AZ 85036.

The amplifier operates directly from an automobile electrical system, so no additional power supply is required for mobile operation. The input- and output-tuned circuits are designed to match the impedances of the transistor to a 50-ohm driving source and to a 50-ohm antenna system, respectively. Since both the input and output impedances of the transistor are extremely low (in the 1- to 5-ohm region), the matching networks employed are somewhat different than those used with tubes. The networks chosen for the amplifier of Fig. 1 are optimized for low-impedance matching, and they perform their tasks efficiently. Contrary to comments that the author has heard, it is possible to design an input matching network that effectively and efficiently matches the input impedance of the transistor to a 50-ohm driving source. The network designs for this amplifier were done with the aid of a computer.

The elaborate decoupling network used in the collector dc feed is for the purpose of assuring amplifier stability with a wide variety of loads and tuning conditions. Fig. 2 shows a power-output-versus-power-input plot for the amplifier. The 2N6084 transistor is conservatively rated at 40 watts output (approximately 60 watts dc input). The amplifier can readily be driven to power output levels considerably higher than 40 watts, but it is recommended that it be kept "throttled back" to not more than 50 watts output. If your transmitter or transceiver has greater than 10 watts output, an attenuator should be used at the amplifier input to keep the output from the amplifier below 50 watts.

Our discussion of power levels thus far has focused on rf power *output*. This is the practice in commercial service and the custom has come into common usage for 2-meter fm rigs, probably because of the large number of converted commercial rigs in use. When delivering 40 watts rf output, this amplifier has a dc power input of 63 watts — the number which the FCC requires you to enter in your log.

An end view of the breadboard version of the 50-watt 2-meter amplifier. The input circuit is at the lower right, and the output network is at the upper left.



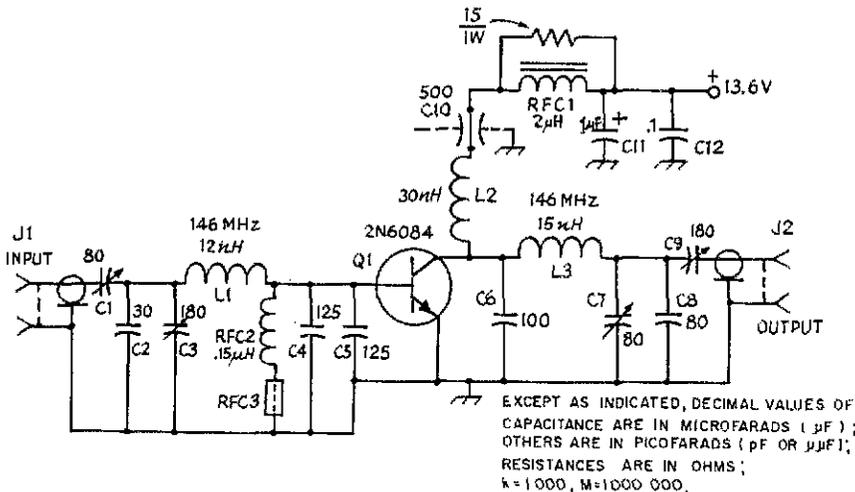


Fig. 1 - Diagram of the amplifier which provides 40 to 50 watts output. Capacitors are mica unless otherwise noted. The resistor is a composition type. The heat sink is a Thermalloy 6169B (Allied Electronics No. 957-2890). C1, C7 - 5- to 80-pF compression trimmer (Alco 462 or equiv.). C2, C4-C6, C8, incl. - Mica button (Underwood J-101). C3, C9 - 9- to 180-pF compression trimmer (Arco 483 or equiv.). C10 - Feedthrough type. C11 - Tantalum. C12 - Ceramic disk.

- J1, J2 - Coaxial connector, panel mount.
- L1 - 12 nH, No. 10 tinned wire, 1-1/4-inch long straight conductor.
- L2 - 30 nH, 1-3/4 turns, No. 10 tinned wire, 3/8 inch ID, 3/4 inch long.
- L3 - 15 nH, No. 14 tinned wire, 3/4-inch long straight conductor.
- Q1 - Motorola silicon power transistor.
- RFC1 - 17 turns, No. 16 enam. wire wound on Amidon T-80-2 toroid core.
- RFC2 - Moided rf choke (J. W. Miller 9250-15).
- RFC3 - Ferrite bead (Ferroxcube 56-590-65/3B or equiv.).

Construction Details

Construction of the amplifier is straightforward. The usual precautions that must be observed when building a solid-state final amplifier are followed. These precautions include proper mechanical mounting of the transistor, emitter grounding, heat sinking, and decoupling of the supply-voltage leads. Most of the components used are conventional items which are readily available, with two exceptions. The fixed mica capacitors, Underwood type J-101, are a special mica unit designed for high-frequency applications. The core for RFC1 and the rf bead used for RFC3 are available only from one source. (See Appendix A.)

The amplifier is constructed on a pc board which is bolted to a heat sink. A few islands can be etched on the board for tie points, at the builder's discretion; a complex foil pattern is not required. In the amplifier shown in the photo, islands were etched only for input and output tie points. Circuit-board islands may also be etched for the transistor base and collector leads. However, an interesting alternative method was used in the author's breadboard amplifier. The base and collector islands were formed by attaching small pieces of pc board to the top of the main board. This procedure added a few tenths of a pF of capacitance at the connection points, so if you

choose to etch islands directly on the main board you may want to increase the value of C6 slightly. (The values of C4 and C5 are not critical.)

A word about the care of a stud-mount rf power transistor: Two of the most important mounting precautions are (1) to assure that there is no upward pressure (in the direction of the ceramic cap) applied to the leads, and (2) that the nut on the mounting stud is not over-tightened. The way to accomplish item 1 is to install the nut *first* and solder the leads to the circuit later. For item 2, the recommended stud torque is 6 inch-pounds. For those who don't have a torque wrench in the shack, remember that it is better to under tighten than to over tighten the mounting nut.

The transistor stud is mounted through a hole drilled in the heat sink. A thermal compound, such as Dow Corning 340 heat-sink grease, should be used to decrease the thermal resistance from transistor case to heat sink. See the excellent article by White in *QST* for April, 1971, for details of heat-sink design.

Series impedance in the emitter circuit can drastically reduce the gain of the amplifier. Both transistor emitter leads should be grounded as close to the transistor body as is practical.

The wiring for the dc voltage feeder to the collector should have extremely low dc resistance.

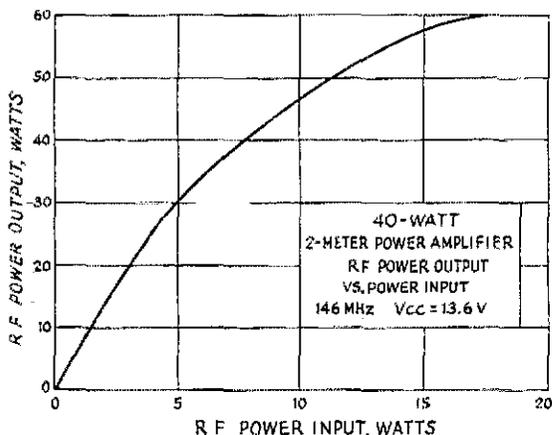


Fig. 2 - Output power obtained from the amplifier shown in Fig. 1.

Even a drop of one volt can significantly reduce the power output of the amplifier. A good goal is less than 0.5 volt drop from the car battery to the transistor collector. With operating currents of several amperes, a total dc resistance of only a fraction of an ohm is needed. A standard commercially made heat sink is used for the 50-watt amplifier, and it is adequate for amateur communications. Forced-air cooling across the heat sink should be used for any application requiring long-term key-down operation at 40 watts or more of output.

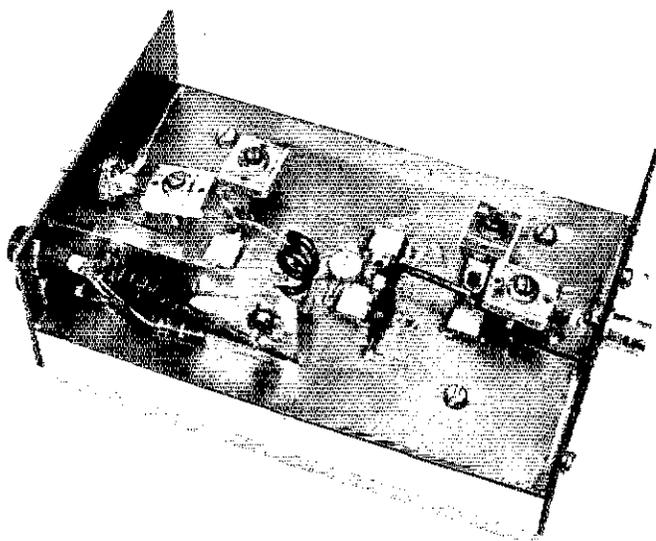
Tune-Up Procedure

There are no convenient dc indicators for tuning the output tank of a transistor final, such as the classic tune-for-a-plate-current-dip instruction popular with the tube circuits. Generally, the best way to tune a transistor final is for maximum rf power output. If this approach results in

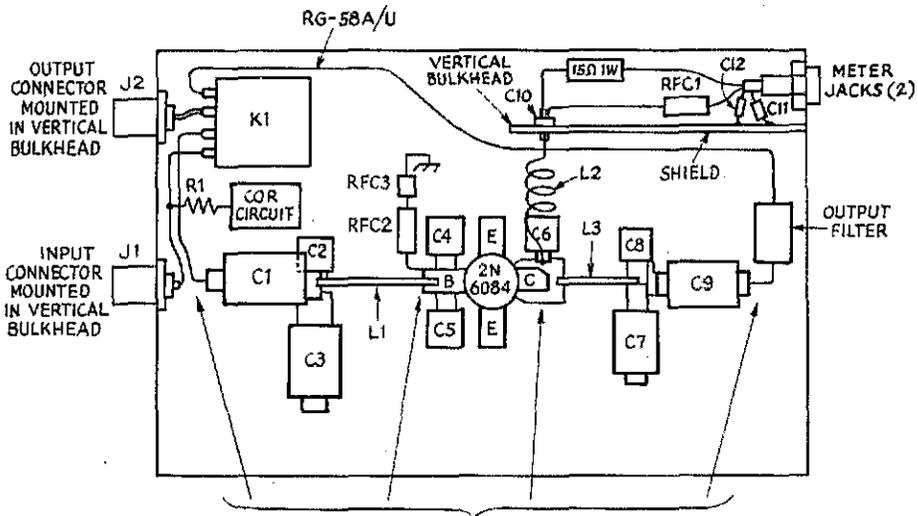
exceeding the power ratings of the transistor, then the power output should be reduced by reducing the drive-level, not by detuning the final. In the case of an outboard PA stage, such as described here, both the input and output networks can be tuned for maximum rf output, if the driving source has an output impedance of approximately 50 ohms. However, a better procedure consists of tuning the output tank circuit for maximum rf output and tuning the input circuit for minimum SWR as measured between the exciter and the final amplifier. This tune-up procedure has the added advantage of assuring that the amplifier presents a 50-ohm load to the exciter. A dc ammeter to check collector current is a useful tune-up aid.

Do not despair if you do not have an expensive vhf wattmeter. Since tuning is for peak output, a Monimatch-type SWR bridge is adequate for the job. Also, the wattmeter described by W1SL in *QST* for April, 1972, would be an excellent choice. The best tuning procedure is to monitor simultaneously both output power (absolute or relative) and input SWR. Perhaps a friend's power or SWR meter can be borrowed for this process, as tuning is a set-it-once-and-forget-it proposition.

First, apply dc voltage with no rf drive. No collector current should flow. Then apply a low level of rf drive - perhaps 25 percent or less of the rated 10 watts maximum drive - and tune the input network for maximum indicated collector current. The networks may not tune to



The decoupling network for the 13.6-volt supply is at the lower left, shielded from the rf circuit. Tip jacks are included for connection of a collector-current meter. Most components are soldered directly to the circuit board. The output filter and COR circuit were not included in this version.



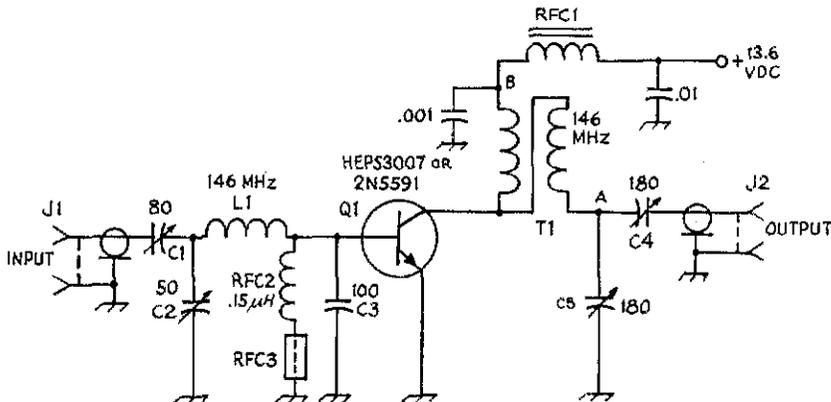
THESE FOUR AREAS REQUIRE AN ISOLATED CONNECTION POINT. THIS CAN BE FORMED BY ETCHING A MOAT IN PC BOARD OR BY ATTACHING A SMALL SQUARE OF PC BOARD ON TOP OF MAIN PC BOARD

Fig. 3 — Parts-layout diagram for the 50-watt amplifier (not to scale). A 4 x 6-inch pc board is used as the base.

resonance at this low drive level, but you should at least get an indication of proper operation by smooth tuning and lack of any erratic behavior in the collector-current reading. Gradually increase the drive, retuning as you go, until the rated 7-10 watts input and 40- to 50-watts output are obtained. As power input is increased, use the

recommended tuning procedure of maximum output from the output tank and minimum input SWR for the input circuit.

There is danger of low-frequency oscillations with most transistor amplifiers. A scope of 5-MHz or more bandwidth connected to the dc feeder at point A makes an excellent indicator of any



EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF); OTHERS ARE IN PICOFARADS (pF OR $\mu\mu\text{F}$); RESISTANCES ARE IN OHMS; k = 1000, M = 1000 000.

Fig. 4 — Circuit diagram of the 25-watt amplifier. Capacitors are disk ceramic unless otherwise noted.

- C1 — 5- to 80-pF compression trimmer (Arco 462 or equiv.).
- C2 — 2- to 50-pF compression trimmer (Arco 461 or equiv.).
- C3 — Button mica (Underwood J-101).
- C4, C5 — 9- to 180-pF compression trimmer (Arco 463 or equiv.).

- J1, J2 — Coaxial connector, panel mount.
- L1 — 1-inch length of No. 14 tinned wire.
- Q1 — Motorola silicon power transistor (2N5591 or HEP S3007 for 25 W output, 2N5590 or HEP S3006 for 10 W output).
- RFC1 — Ferroxcube VK200-19/4B ferrite choke.
- RFC2 — Molded rf choke (J. W. Miller 9250-15).
- RFC3 — Ferrite bead (Ferroxcube 56-590-65/3B or equiv.).
- T1 — See Fig. 5.

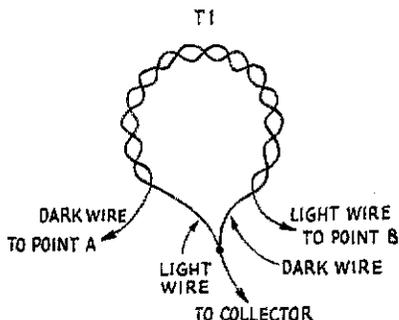


Fig. 5 — Transmission-line output transformer consisting of 2 4-inch long conductors, No. 20 enam. wire, twisted to 16 crests per inch, using an electric drill. The conductors should be color coded, one with one color and one with a second color. Form the twisted pair into a 1/2-inch dia circle. Unwind the leads so that only the portion of the pair forming the circle remains twisted. Connect the leads of each color as shown.

low-frequency oscillation. The author's amplifier was completely stable over a wide range of power levels and tuning conditions, but one should always be looking for signs of instability when adjusting a solid-state stage. It is possible to have signal output on all hf and vhf amateur bands and all TV channels, simultaneously, when a bad case of parasitic oscillation occurs. For those who may have access to one, the best indicator of parasitic oscillation is a wide-band spectrum analyzer.

Parts Procurement

Components for the two-meter amplifier will have to be ordered from several sources. The hard-to-obtain items are listed in Appendix A, along with suggested vendors. The rest of the components needed, including the solid-state devices, can be ordered from Allied Electronics, 2400 W. Washington Blvd., Chicago, IL 60612. Allied has a catalog (Industrial No. 720) available, which is an invaluable aid when ordering. Of course, local dealers and other mail-order houses also can provide many of the parts.

Additional Designs

For those who own a low-power fm transceiver, an intermediate amplifier stage or a final amplifier providing 10 to 25 watts may be desired. The circuit of Fig. 4 is suitable for the 2N5591 or HEP S3007 transistors (25 watts), and the 2N5590 or HEP3006 transistors (10 watts). An unusual feature of this circuit is the use of a transmission-line transformer in the output network. Details of this transformer are given in Fig. 5. A driver stage which delivers up to 3 watts is shown at Fig. 6. A 2N5589 or HEP S3005 can be employed in this driver stage. The construction and tune-up procedures for the amplifiers of Figs. 4 and 6 are similar to those described earlier for the 50-watt amplifier.

Accessories

When an amplifier stage is used with an fm transceiver, a method of automatic transmit/receive switching is needed. A simple carrier-operated relay (COR), such as shown in Fig. 7A, can be employed for the amplifiers described in this article. The level of input rf required to operate the COR is determined by the value of R1. One to two watts of 2-meter energy will operate K1 when a 4700-ohm resistor is employed. The rf signal is rectified by two high-

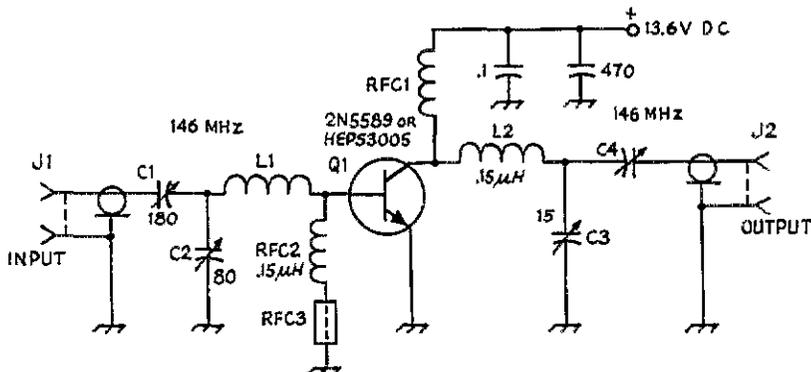


Fig. 6 — Circuit of the 3-watt amplifier. The resistor is 1/2-watt composition and capacitors are disk ceramic, unless otherwise noted.

- C1 — 9- to 180-pF compression trimmer (Arco 463 or equiv.).
- C2 — 5- to 80-pF compression trimmer (Arco 462 or equiv.).
- C3, C4 — 1.5- to 15-pF compression trimmer (Arco 460 or equiv.).
- J1, J2 — Coaxial connector, panel mount.

- L1 — 25 nH, 1 turn, No. 18 tinned wire, 3/16 inch dia.
- L2 — 0.15-μH molded choke (J. W. Miller 9250-15).
- Q1 — Motorola silicon power transistor.
- RFC1 — 10 turns, No. 20 enam. wire wound over a 510-ohm, 1/2-watt composition resistor.
- RFC2 — Molded rf choke (J. W. Miller 9250-15).
- RFC3 — Ferrite bead (Ferroxcube 56-590-65/38 or equiv.).

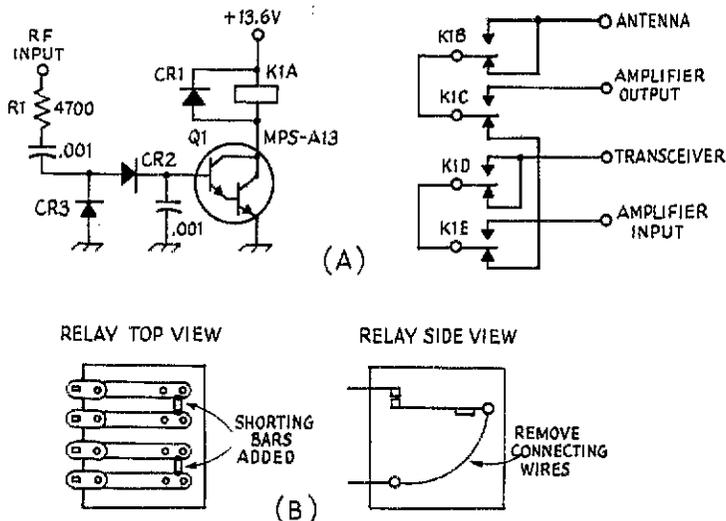


Fig. 7 - (A) COR circuit. Capacitors are disk ceramic.

CR1 - 100-PRV or more, 500-mA or more silicon diode (Motorola 1N4001 or equiv.).

CR2, CR3 - High-speed, low-capacitance 100-PRV silicon diode (Motorola MSD7000 dual package used here).

K1 - 4pdt open-frame relay, 12-V contacts (Comar CRD-1603-4S35 or equiv., Sigma 67R4-12D also suitable), modified as described below.

Q1 - Npn silicon Darlington transistor, h_{FE} of 5000 or more (Motorola MPS-A13 or equiv.).

(B) The COR relay is modified by removing the connecting wires from all four wiper arms and adding two shorting bars, as shown. Only the stationary-contact connections are used.

speed switching diodes; the dc output from the rectifier is applied to Q1, a Darlington-connected transistor pair. When sufficient current is developed in the base circuit, Q1 will turn on, activating K1. A transient-suppression diode is included across the relay coil to prevent voltage-spike damage to Q1.

The switching circuits needed to take the amplifier in and out of the circuit are somewhat complex, as can be seen in Fig. 7A. The cost of four coaxial relays would be prohibitive. But, an open-frame relay can cause sufficient loss at 146 MHz to severely degrade the sensitivity of the associated receiver. To get around this problem, the author modified an inexpensive relay as detailed in Fig. 7B. The long leads to the wiper arms were removed and discarded. Two shorting bars were added, as shown in the drawing. External connections were made only to the stationary contacts. Received signal loss through the modified relay measured 0.4 dB - an insignificant amount.

Second-harmonic output from the 50-watt amplifier measured 34 dB down from the level of the 146-MHz energy. Thus, the computer-design

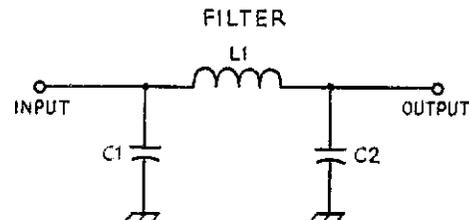


Fig. 8 - Pi-section output filter. C1 and C2 are 39-pF mica capacitors (Elmenco 6ED390J03 or equiv.), and L1 consists of 2 turns of No. 18 tinned wire, 1/4 inch ID, 0.2 inch long (approximately 44 nH).

output network compares favorably with the pi-section tank circuits often used in hf transmitters. To assure that harmonic energy didn't cause a problem to other services, a simple pi-section output filter (Fig. 8) was added. This filter is designed for 50-ohm input and output impedances; it can be used with any two-meter amplifier. The insertion loss of the filter at 146 MHz is 0.2 dB, while it provides 46 dB attenuation at 292 MHz and 25 dB at 438 MHz.

A Club Project

Club construction projects have long been used to heighten group interest. The 50-watt amplifier described here has been selected for construction by the Arizona Repeater Association. Under the direction of Rod O'Connor, W7EKV, 30 members of the group are duplicating the design of Fig. 1. Al Kendall, WA7PPP, has been getting the parts together for the project. The approach used by ARA follows Heath - a kit of parts along with step-by-step instructions are being provided to each interested club

(Continued on page 68)



How to Handle Telephone Interference

BY HARLAN BERCOVI, * W0MYN

RECENTLY the writer was plagued with telephone interference problems, both to his own phones, and to those of neighbors. After several frustrating months, the problem has finally been resolved. It is hoped that this article will save others the aggravation experienced here.

Procedures

The first step was to contact the telephone company repair service. They sent out a repairman and his supervisor. After an entire afternoon of trying to eliminate the interference from a neighbor's phone, the results were nil. The normal (and usually the only) solution the phone company tries is to place a .02- μ F capacitor across the phone line, at the phone. These capacitors have proven effective in solving interference from broadcast stations, but since the capacitors are of paper foil construction, with high internal inductance, they are unsuitable at amateur frequencies. Also, the telephone system uses a water pipe ground, near the service entrance, and the long run from that point to the phone can negate any possible effects of the capacitor.

The previous literature on the subject was reviewed, and it was suggested to the repair

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W0MYN passes along some useful information on the methods for treating stubborn cases of telephone interference. Curing telephone interference is the responsibility of the phone company, not the amateur. However, as W0MYN points out, sometimes the phone company troubleshooters are not aware of the standard procedures for correcting the interference.

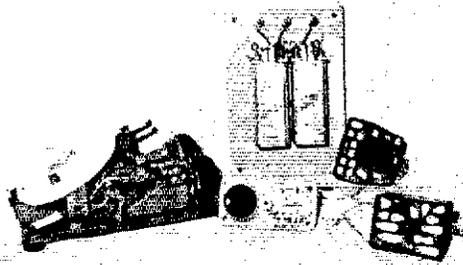
supervisor that the phone company obtain a type 425J interference-suppression network to install in the phone, in place of the existing 425E network.¹ At first, the phone company said there was no such thing as a "425J" network. Deleting the painful details, suffice it to say that a sufficient quantity of 425Js have been installed to eliminate the problem in my neighborhood, including my own phones.

As discussed in Hoff's article² the real villain is usually the compensation network, but it can be other things. A meeting was arranged with the engineering personnel of the local company (Mountain Bell), and the *Bell System Practices* manual was examined. The information on how to eliminate the problem is in the manual, if you can only get the maintenance people to read it. Refer them to: *Bell System Practices - Plant Series*, Issue 6, April, 1970, AT & T Co. Standard, see section 500-150-100. This section discusses causes and cures of telephone interference from radio signals. It points out that interference can come from corroded connections, unterminated loops, and other sources. It correctly points out that the rf can be picked up on the drop wire coming into the house, and also on the wiring within the house, but (usually) the detection of the rf occurs inside the phone. The detection usually takes place at the varistors in the compensation networks, and/or at the receiver noise suppressor and the carbon microphone. But interference suppression should be

¹ The 425J network is the same as the more commonly used 425E, except that resistors are used instead of varistors. The only difference to the telephone user is that if he is close to the exchange, the signals will be louder than normal. If he is far from the exchange, the signals will be somewhat weaker. However, this is a small price to pay for interference-free reception.

² Hoff, "Stopping Telephone Interference," *QST*, March, 1968.

This is a standard Model 500 desk telephone with the cover removed. The 425J network is mounted in the phone, just to the left of the bell. Adjacent to the phone, at the rear, is a 40BA capacitor. To the right of the phone is a 1542A inductor and next to it, to the rear, is a 4010E and at the far right is a 425J network.



QST for

handled two ways: prevent the rf from getting to the phone, and prevent it from being rectified.

The telephone companies (Bell System) have two devices for this purpose. The first is a 40BA capacitor, which is installed at the service entrance protector, and the second is the 1542A inductor, which is installed at the connector block. According to the practices manual, the 40BA bypasses rf picked up on the drop wire coming into the house from the phone, and the 1542A suppresses rf picked up on the inside wiring. These are mentioned because in very stubborn cases they may be necessary. But first, it is suggested that the telephones be modified.

Since there are several different series of phones, they will be discussed separately:

500 series - These are the desk and wall phones most commonly in use. They come in several different configurations, but all use a 425-series compensation network. The letter designation can be A, B, C, D, E, F, G or K, and all these networks contain varistors. The network should be replaced with a 425J, in which the varistors are replaced by resistors. Also, .01- μ F disk-ceramic capacitors should be placed across the receiver suppressor. The suppressor is a diode across the receiver terminals. The carbon microphone in the handset should be bypassed with a .01- μ F ceramic capacitor.

Series 1550, 1600, 1700 - These are the "TouchTone" phones, and the cure is similar to that for the 500 series, except that the network is a 4010B or D, and should be replaced with a 4010E.

Trimline series - These are the "Princess" series phones. The practices manual says that these should be modified by installing bypass capacitors across *all* components in the set that may act as demodulators. This statement is rather vague, but evidently a solution is known to the telephone company for these sets.

At the end of section 500-150-100 is an ordering guide for special components and sets, as follows:

Ordering Guide:

Capacitor, 40BA

Inductor, 1542A

-49 Gray, -50 Ivory

Set, Telephone, -rf Modified

Set, Telephone Hand, 220A, -rf Modified

Set, Telephone Hand, 2220B, -rf Modified

Set, H and G, -rf Modified

Dial - (TouchTone dial only - rf Modified).

The type "G" Handset is the one used with the 500 and TouchTone series phones. Also, Mountain Bell has put out an "Addendum 500-150-100MS, Issue A, January 1971" to the practices manual, which states that items for rf modified phones should be ordered on non-stock Form 3218, as follows:

(Telephone Set type)

Modified BSP 500-150-100

for Radio Signal Suppression

It might be wise to check with your local company to see if they are using a similar addendum.

It should be emphasized here that the telephone companies dislike doing modifications in the customer's home. The proper procedure is to identify the problem, letting the phone company know the correct section in the Bell System Practices, and have them order the modified telephone. Then when they do receive the phone, they simply come out and exchange the old phone for the new, rf modified unit. If that doesn't correct the problem, have them try the 40BA and 1542A units, installed per the manual.

Whatever you do, refuse to accept the answer that "there is no such thing as a 425J," or "the 425J has not been available for 3 years," or "radio signals in the telephone are the fault of the ham operator, since his equipment must be defective." These statements have been heard, and are not correct. The writer had 425J networks installed on the phones in his home in June, 1971. And if you just can't get the job done by the repair service, it is suggested that you contact the engineering manager or the operations manager of your local company. That always seems to produce results.

For those of you not served by the Bell System, it is suggested that you contact the manager of your local company, show him this article, and ask what similar measures they have, so that you may correct your problem. One other thing you will need - *good luck!* 

220-MHz Amplifier

(Continued from page 29)

control, R3, is adjusted to give an idling plate current of 50 mA.

Operation

The tube used in the amplifier at VE2HW is a 7034/4X150A. It is operated with 1200 volts on the plate, and 275 volts on the screen. Grid current is 20 mA. An external panel includes grid, screen, and plate meters for constant monitoring of operating conditions.

The position of the output coupling is critical for maximum efficiency. Spacing between the output link and the plate line should not be less than 1/4-inch in the interest of avoiding flashover. The adjustment should be done with the amplifier running at the expected maximum input level. Safety first! Remove all voltages and ground the plate line before making any adjustment to the output link.

Power output was measured with a Bird model 43 wattmeter and a nonreactive 50-ohm dummy load. At a dc input level of 300 watts, the rf output was 230 watts, indicating an efficiency of over 70 percent for cw. The amplifier tunes as easily as one made for the hf bands and shows no temperamental tendencies whatever. This amplifier has been used on nightly schedules with K9AQP/1 and W1QXX near Boston. Results were excellent over this path, which covers 250 miles and includes two mountain ranges. 

Adding Letter and Word Spacing to ICKEY



BY KENNETH STONE,* K8ORD

TO CONTROL the spacing in a keyer it is necessary to keep the dot generator from starting a character except at the correct intervals of one, three, or seven dot lengths after any previous keying output ends. The circuit of Fig. 1 is a conventional binary counter with its starting time controlled and its outputs fed to gate circuits that control the keyer.

Initial control is accomplished by connecting all flip-flop CD (direct clear) terminals to the same voltage level that causes Q3 to conduct and close the keying relay. After transmitter keying, the counter is free to be driven from the time-base generator through inverter UID which has a negative-going output 1/2-dot length after the

* 2374 Brenthaven Drive, Bloomfield, MI 48013.

Fig. 1 - K8ORD's modification to add word spacing to ICKEY. The run gate was used as the out gate in the original circuit (see text).

U1 - Multifunction IC containing one JK flip-flop, one inverter, and two inverting buffers (Motorola MC787P).

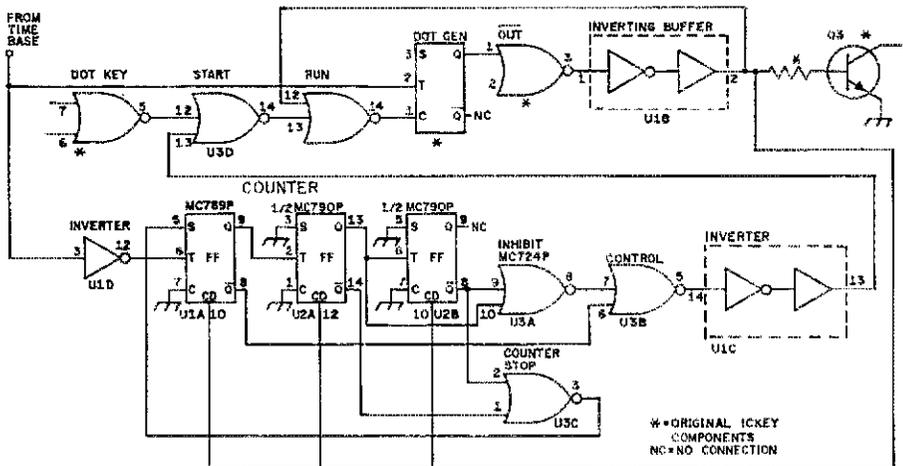
U2 - Dual JK flip-flop (Motorola MC790P).

U3 - Quad two-input gate (Motorola MC724P).

character ends. Examination of the timing diagram, Fig. 2, reveals that output of flip-flop U1A Q terminal is high during possible character starting times with an unwanted high at T5. The unwanted high is eliminated by the action of the inhibit and control gates, U3A and U3B. Only after time T3 and before time T6 are the outputs of U2A Q and U2B Q low; these signals are applied to U3A and a high output at T5 results. The Q signal from flip-flop U1A, and the output of the inhibit gate are fed to the control gate to produce a high level at T1, T3, and T7. This signal is inverted by U1C and fed to the start gate.

In ICKEY,¹ a character is started by making the C input of the dot generator low and allowing the time-base generator to toggle this flip-flop. This action is the result of the dot-key gate being low. When the output from U1C and the dot key are combined in the start gate, the result is a high output if the dot-key gate is operated at T1, T3, or T7. This signal is inverted by the run gate, and controls the dot generator C-input terminal. With ICKEY, the self-completing dot or dash feature is the result of the dot-key gate being held by the memories. This signal is lost when the start and run gates are added, but a replacement signal having the same effect is added to the run-gate input. This

¹ Van Cleef, "ICKEY - An Integrated-Circuit Electronic Keyer with Dot and Dash Memories," *QST*, November, 1968.



* ORIGINAL ICKEY COMPONENTS
NC = NO CONNECTION

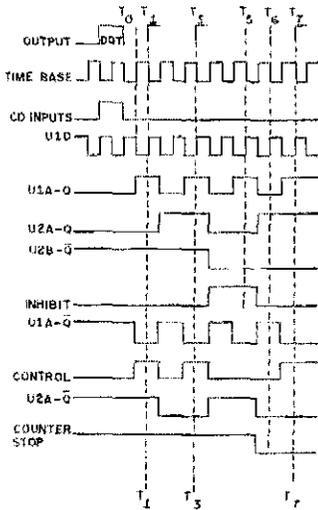


Fig. 2 - Timing diagram of the word-space counter. A new character can only start at T1, T3, or T7.

signal is high during keyer output and assures self-completing dots and dashes.

So far we have a keyer with perfect spacing, but what happens if our key lever is not closed by the "word-space" time, T7? The counter counts on and the result might be a wait of many dot lengths before we can start another character. Because of this, it was decided to stop the counter at T7 with the counter stop gate. One-half dot length after T5, U2A Q and U2B Q outputs are low; these outputs, fed to the counter stop gate, make its output, and the S terminal of flip-flop U1A, high. This means that U1A can only set after T5, and it does so after T6. If U1A does not change state after T6, U2A and U2B can not change state and the counter stops. An incorrect word space could result from this method, but it was found that the long word-space interval was not hard to estimate, and no trouble resulted.

The spacer is constructed using one Motorola MC724P, one MC790P and one multifunction MC787P. The original output gate of ICKEY does not have the driving capability required, and is replaced by an inverting buffer. The old out gate is used as the run gate in this modification. QST

Straits

Dear Sir:

ORA?

Your insert introducing W6WYQ's interesting DRRR article (December 1971 *QST*) high lights that the ring circumference is 1/4 wavelength, and that the thing was originally designed by Boyer for vlf shipboard use. Let's see, the highest vlf is 30 kHz . . . quarter wavelength a little over a mile and a half . . . what ship did you say that was?

- Art Goodnow, W1DM

[EDITOR'S NOTE: A mighty big ship! W1DM is right of course - the adjective "very" should not have been used with "very low frequencies." In fact, it would have been better just to say the DRRR is a small antenna for whatever frequency it is designed for; here is why:

vlf (very low frequencies)	below 30 kHz.
lf (low frequencies)	30 to 300 kHz.
mf (medium frequencies)	300 to 3000 kHz.
hf (high frequencies)	3 to 30 MHz.
vhf (very high frequencies)	30 to 300 MHz.
uhf (ultra high frequencies)	300 to 3000 MHz.
shf (super high frequencies)	3 to 30 GHz.
ehf (extremely high frequencies)	30 to 300 GHz.)

In commemoration of the seventieth anniversary of Marconi's first transatlantic wireless message of December 12, 1901, the Society of Newfoundland Radio Amateurs (SONRA) set up a station in Cabot Tower on Signal Hill, St. John's, Newfoundland. This was the site used by Marconi for reception of that first DX signal. SONRA, using the special call, VB1MSA, made 2169 QSOs during the event. Shown here is President John Tessier, VO1FX, working GB3MSA in Cornwall.

May 1972



Here's the other operating position of KL7MF, Engineer-in-Charge of FCC's Alaska office. Hal is well known on the bands both now and in years past as W6MI from San Diego.





Hints and Kinks

For the Experimenter



COAX SHIELD SEPARATOR

As many may know, preparing the shields of coax cable for soldering to tie points and coax connectors can be a long, tiresome job, particularly if the shield is to be longer than 1/2 inch. However, there is a method that I use to save time, to prevent sore fingers, and to make a neat job.

Instead of using a nail or other pointed object to separate the shield, a file card (a tool used to clean the filings out of the grooves in a file) brushed lengthwise on the coax shield does the job nicely. Rotate the cable while brushing so that the shield combs out evenly. If strands longer than an inch or so are required, a common pocket comb also does a nice job of untangling these fine wires. - *Milton L. Trzaska, WA2QIQ.*

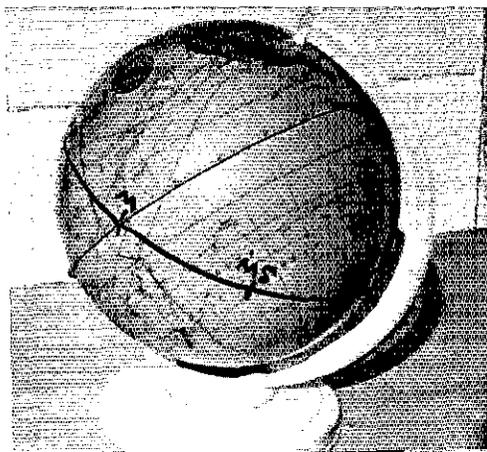
A SIMPLIFIED DIRECTION FINDER

From time to time I have seen articles on globe direction plotters of one kind or another. However, they all seemed somewhat complicated and would take too much time to construct. I like a simplified version that I saw at WA4BYR's shack. It can be put together in about thirty minutes and has been most satisfactory.

Take any suitable-size globe (the one I used was 9 inches in diameter) and remove it from its semicircular support. Drill a hole that will accept the support at your location on the globe, and another directly opposite the first hole. Then place the globe back on the supports. My support was graduated in degrees, with the zero at the equator. Using this zero, I drew in a new equator using a pen and India-ink, then placed approximate direction marks around this line to indicate the compass points.

To use, I place the location that I am interested in directly under the support arm. The approximate direction then is indicated on the new equator. - *Bob Davis, K4BRD*

Here is my simplified direction finder with the new equator and compass directions drawn on the globe. This takes the guess work out of finding the required beam headings.



AUXILIARY SPEAKER FOR REGENCY HR-2

I have found that an auxiliary speaker sounds better than the built-in speaker of my HR-2. However, to connect an auxiliary speaker, disconnect the jumper wire on terminals 1 and 2 and fasten the speaker to the two screws on the rear terminal strip.

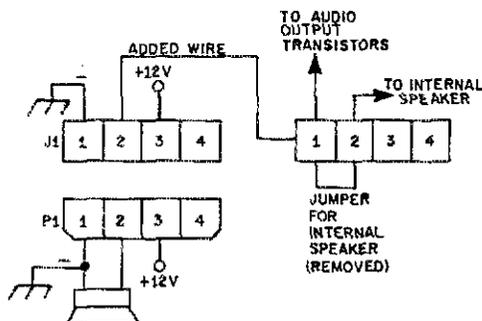


Diagram for the adding of an auxiliary speaker for the HR-2.

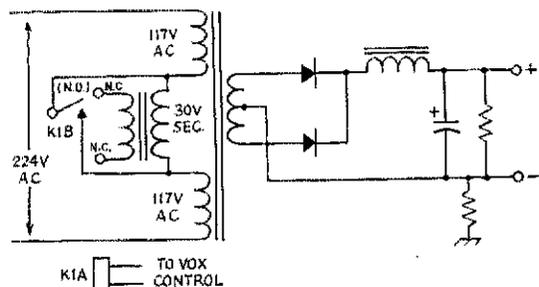
Since I use the transceiver both mobile and in the house, I found the best answer is to have a separate speaker at both locations, and to modify the power plug. The power plug has two unused pins on it. As shown in the drawing, connecting or disconnecting the power plug (and the antenna) is all that is required to shift the transceiver from car to house operation. - *Thomas W. Donohoe, W2NJS*

REDUCING POWER-SUPPLY IDLING CURRENT

My amplifier power supply was delivering 3900 V with 49 mA of bleeder current, or 195 watts of dissipation during standby periods. This did nothing for the equipment except to create heat. The answer to my problem was to drop the no-load voltage to about half, and at the same time reduce initial charging currents for the filter capacitors.

The primary side of my plate transformer has a dual 117-volt winding which was series connected for 220-volt operation. At the center tap of these windings I placed an inductance made from the secondary of a 30-volt 10-ampere transformer, and normally-open contacts of a relay in parallel as shown in the drawing. The added inductance now drops the no-load output voltage to slightly more than 2000 and the power dissipated by the bleeder resistor is about one quarter of the original power.

The exciter VOX relay actuates the transmit relay, K1, shorting out the added inductance during periods of transmission, returning the B+ to normal during this time - about 3000 volts.



The primary of the B+ transformer has had a 30-volt secondary added to reduce the primary voltage during idle periods. This inductance is shorted out by the normally-open contacts on K1B, returning the primary voltage to normal.

Not only has the heat been reduced, but the turn-on surge of current is reduced considerably. Before this modification the transformer had a "whomp-like" sound upon applying power, where now there does not appear to be any sign of strain.

All other parts of the power supply — relays, blowers and filament transformer — are supplied by 117 volts directly and do not use the modification. This change has been in effect now for three months. There have been no difficulties. *Wes Bolin, K4APL.*

A ZIP-CORD SPECIAL ANTENNA

Recently I found myself in need of an 80-meter antenna to help me keep in touch with some of my friends back home while operating portable in Arizona. The antenna and feed line were not readily available, but I remembered that one of my friends had recommended zip cord as a substitute feed line for a dipole, provided low power was used. Going one step further, I felt the entire antenna could be made of this low-priced material. I purchased 80 feet of zip cord at a local hardware store (at 4 cents a foot) and peeled it apart for 60 feet. This gave me the required 120 feet for a dipole, plus a 20-foot feed line which was taped to prevent further splitting. The feeder was fastened to a 2 x 4 which was used as a center support. The ends were extended as far as possible, then tied with heavy cord to a fence that was in the trailer park where I was staying. This made a slight inverted-V antenna.

To reach the desired frequency of 3935 kHz it was necessary to shorten the antenna somewhat. I did this by folding three feet on each end of the dipole back upon itself. This enabled me to keep skeds with many "7s" at home.

Having met with success on 80-meters I immediately began to eye the 40-meter band for possible use. I then measured out 32 feet from the center and cut the wire there, then tied a knot in the two pieces, leaving a couple of inches of bare wire dangling. Now for forty meters, I merely disconnect the wires and reconnect them for 80 meters.

As the *ARRL Antenna Book* states, a 40-meter dipole will often present a good match at 15-meters, and this one is no exception; I have worked many stations across the country on 15 meters with low power while using this simple antenna.

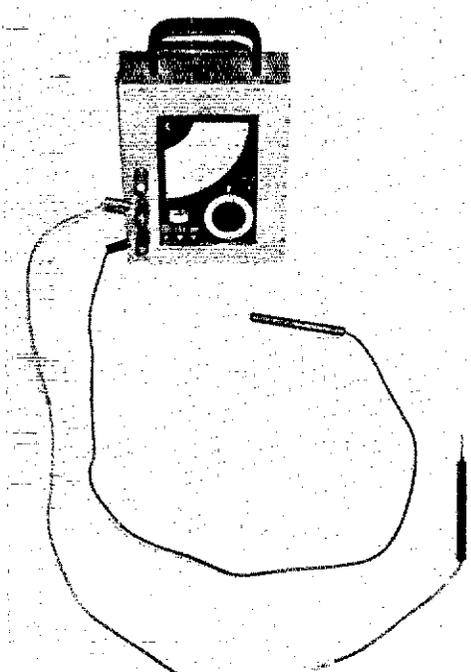
The *Handbook* or *Antenna Book* has not recommended this type of feed line in many years, though using a twisted pair at one time was usual practice in feeding a doublet. But, when the need is there for a quick and easy antenna, I don't think you can find an easier one as long as you remember to use low-power transmitters (100 watts or less) and trim the wire for a low value of SWR. — *Frank S. Wise, W7QYC.*

DRESS UP THAT INEXPENSIVE VOM

In most electronics stores inexpensive VOMs are available, and though adequate in their present form, their small size and lightness of weight makes them subject to breaking. At least that was true in my case.

My 3 x 5 x 3/4-inch imported meter has been mounted in a 5 x 7 x 2-inch chassis (Bud AC-402) which was cut to receive the VOM. Lead weight has been added inside the chassis. Sponge-rubber lining protects the meter and prevents it from moving about. A carrying handle and a larger binding post were added to the chassis for extra convenience. The large banana jacks, which have been connected to the correct post internally, in the meter, have been a great advantage. Now most any type meter lead is usable — even hookup wire if necessary. Rubber feet have been placed on the bottom of the chassis to prevent movement of the unit and scratching of furniture. — *Evan P. Rolek, K9SQG/9*

My small VOM has been given some weight and size with the mounting in a Bud AC-402 chassis. Banana jacks were added and will accept almost any lead.



Recent Equipment

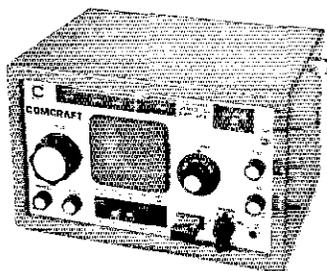
To acquaint you with the technical features of current amateur gear.

The Comcraft CTR-144 Two-Meter Transceiver

THE CURRENT BOOM in fm and repeaters started with crystal-controlled transmitters and receivers has led to the impression that the fixed-channel method is the only way to go with fm. Nobody denies the basic advantages of crystal control, particularly in work with repeaters, but why anyone should be stuck with it is beyond this writer's comprehension. The usual answer when this question is raised — that the stability requirements of fm are too critical for tunable gear — is little more than arrant nonsense. If ssb transceivers, many times more critical as to stability, can be mass-produced for mobile use, certainly tunable fm rigs can be.

The main advantage of crystal control lies in the ability to be *precisely* on whatever channels may be in use in a given locality. This was no problem when most activity was on the "34 - 94" combination, or, at the most, two other channels. But with the proliferation of input and output frequencies now in evidence almost everywhere, operation entirely with crystal control is both inconvenient and expensive.

The Comcraft CTR-144 Two-Meter Transceiver provides practical solutions to transmitter and receiver frequency-control problems, and it can be used with either a-m or fm, over the entire 2-meter band. The receiver is tunable, and well designed for either a-m or fm service. The transmitter can be either crystal or VFO controlled, choice being made with a 5-position switch on the front panel that also takes care of crystal selection. Three crystals plug into sockets inside the unit, and a fourth has a front-panel socket. Neither transmitter nor receiver exhibits any harmful degree of frequency instability, even under the rather severe conditions encountered in mobiling during a New England winter.



Functions and Features

The frequencies and stage functions detailed in Fig. 1 may be of interest to home-builders of vhf gear, as well as to prospective purchasers of the CTR-144. The diagram is a simplification of that given in the instruction manual, to clarify the stage functions and separate transmitting and receiving lineups.

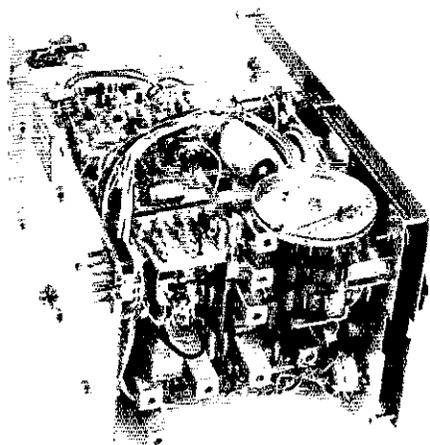
The transmitter oscillator for crystal control (1, upper left) uses 8-MHz crystals, and is followed by two conventional tripler stages. When the selector switch is in the VFO position (5), the top three stages are disabled and the second row takes over. Heterodyning replaces frequency multiplication, to get to 72 MHz. The final doubler and power amplifier, right, work with either exciter line.

Some rather interesting circuit tricks are involved here. Two stages in the exciter share a common collector circuit, as shown in Fig. 2. The 72-MHz output of the VFO-controlled system is low, so mixer 3 has a following amplifier, Q201, at the lower left of Fig. 2. The crystal-controlled stages multiply to 24 MHz, and drive the tripler to 72 MHz, Q202, upper left.

The tripler and amplifier stages are tapped down on their collector circuit, T201, to preserve the *Q* of that 72-MHz circuit. A bandpass response at 72 to 74 MHz is achieved by the coupling circuit consisting of T201, T202, and capacitors C204, 206 and 207.

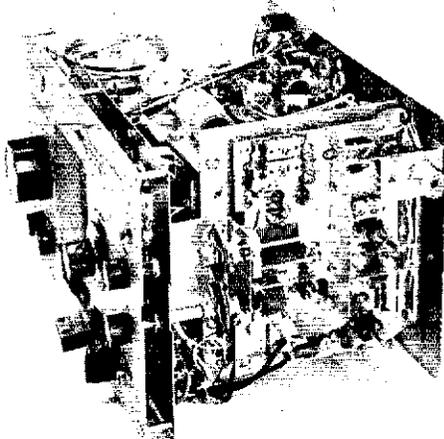
Also of interest, to users of amplitude modulation, at least, is the fact that full modulation is applied to the last two amplifier stages. The final doubler stage, not shown in Fig. 2, has modulation in the upward direction only.

At the left center, a 65-MHz crystal oscillator (2) serves both transmitter and receiver. Its output heats with the transmitter VFO (7 to 9 MHz) in



Looking into the left (receiver) side of the Comcraft Two-Meter Transceiver shows the receiver section, mounted on a vertical circuit board. Audio and power components are on the horizontal shelf at the top.

The right side of the CTR-144 Transceiver is mainly the transmitter. Like the receiver, it is on a vertical circuit board. Variable capacitors, center, for final tuning and loading, are the only transmitter controls brought out to the front panel, other than the vernier dial for the VFO.



mixer 3, to give output at 72 to 74 MHz. The following 72-MHz amplifier builds up the output to drive the doubler and amplifier. Transmitter power output runs 6 to 8 watts.

In receiving, the output of oscillator 2 is multiplied to 130 MHz and fed to mixer 1, where it beats with amplified incoming signals, to give a first intermediate frequency of 14 to 18 MHz. The first i-f amplifier is tunable over this range, tracking with the tunable receiver oscillator as the latter covers 12 to 16 MHz. The two combine in mixer 2, giving a fixed second i-f of 2 MHz. The limiter-discriminator and audio-agc system shown at the right complete the receiver lineup.

This simple combination of heterodyning and oscillator-multiplier techniques does several things very well. The 18-times frequency multiplication following the crystal oscillator makes possible good-sounding fm of adequate deviation, while retaining the obvious advantages of crystal control — with inexpensive and readily available 8-MHz crystals. Heterodyning the VFO output to the 72-MHz range preserves the hf stability of the VFO at the operating frequency. Getting adequate deviation at 7 MHz is, of course, no problem with a tunable oscillator. You can monitor it in your 7-MHz receiver, if you like, as a check. The final deviation will be only twice that at 7 MHz. The modulation methods involved are such that the deviation is essentially the same with either crystal or VFO control. Deviation is adjustable, up to a maximum of 10 kHz.

Inclusion of a-m operation, a real plus on its own, pays an incidental dividend in solving a frequency-spotting problem that hampers users of

fm-only receivers. It is in the nature of fm receivers to respond only to the strongest signal on a given frequency. With any appreciable difference in signal levels, the spotting signal merely blanks out the incoming signal, and zero-beating is impossible. Flipping the mode switch to the a-m position eliminates the inherent capture-effect of fm, and even a very weak incoming signal can be zeroed accurately. (Hint to fmers: it is easy to arrange for a-m detection in any fm receiver, and it's a great aid in getting on-frequency without expensive test gear.)

An even better solution to the spotting dilemma is offered by W1K1K in April *QST*.¹ His simple frequency standard provides for simulating almost any repeater input frequency accurately in your receiver, avoiding the chance that you may zero the wrong station, if you use incoming signals for spotting purposes. This way, you don't have to hear either the repeater or its input signals, to get things started. You do, of course, have to know its input frequency.

¹ Blakeslee, "Double Standards," *QST*, April, 1972.

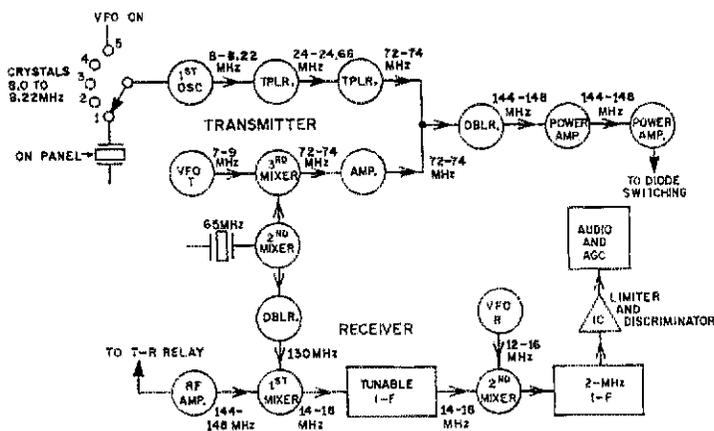


Fig. 1 — Simplified diagram of the stage functions and frequencies in the Comcraft transceiver. The 65-MHz crystal oscillator, center, serves both transmitter and receiver. Audio and power functions are omitted, in the interest of clarity.

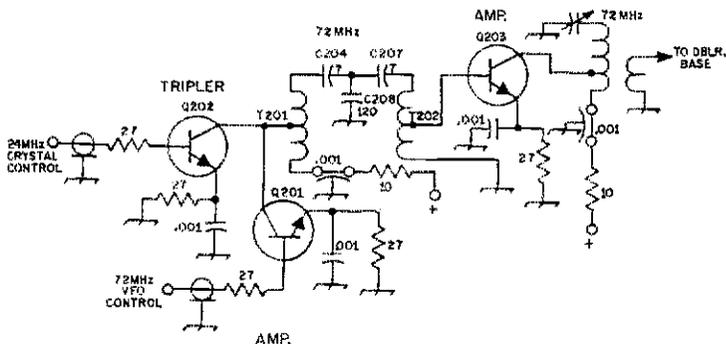


Fig. 2 - Partial schematic diagram of the exciter stages in the CTR-144 that are common to both the crystal- and VFO-controlled portions. The VFO amplifier and crystal-controlled tripler stages use a common collector circuit without switching.

Now just a word about a-m, for its own sake. Many fm-ers, in their rock-bound isolation on a few fixed channels between 146 and 147 MHz, may not realize it, but a-m still does fill important roles on the vhf scene, especially when combined with good variable-frequency control. After several years of frustration with look-alike work-alike imported crystal-controlled boxes that are usable only when you have the right crystals, being able to tune the whole band again and hear anyone within your receiving range brings back some of the old pleasures of having a 2-meter rig in the car when traveling. The modes have complementary advantages, and need not be competitive. The fm repeaters sound great, and they certainly do open up the reliable operating range of mobile stations, but a-m shows its worth, too, in direct comparisons. This is the nature of the two modes: fm is unbeatable within its service area, but a-m "hangs in there," at least marginally readable, with somewhat lower signal levels.

Construction and Packaging

The transceiver is built mainly on three circuit boards. Looking into the unit from the top front, the left side is the receiver and the right the transmitter. Audio and power components are on a horizontal shelf at the top. Miscellaneous others are on the rear wall, and on a plate set back from the panel. The general impression is one of open accessibility, not often seen in compact solid-state gear. One feels that he might have a fighting chance of servicing the CTR-144 successfully.

The dial, controls, and packaging are faintly reminiscent of early Gonsset Communicators, which is certainly no knock. Receiver tuning is smooth and the squelch and anl work nicely, the latter serving very well in a-m reception. The speaker grille near the center, apparently cemented in place, is not part of a baffle, the speaker and grille being separated by an inch or so of space. This doesn't help the audio quality, and this operator would use the built-in provision for a separate speaker, in a permanent installation.

The panel meter, upper right corner, indicates relative received-signal strength, relative power

output, and, with pressure on a small red button, battery voltage, if used. Transmitter tuning and loading controls, right side, require readjustment only with large excursions in frequency. The small VFO vernier drive, right center, tunes smoothly enough to permit accurate zeroing. It is not easily brushed off the intended frequency, but this conservative user would be inclined to add a dial lock on its rim.

Five black rocker-type switches in line below the speaker grille are, left to right, power on-off, dial illumination on-off, a-m-fm, spotting, and transmitter on-off. The transmitter is normally turned on with the PTT switch on the microphone, but a separate control is useful. Remote switching can also be handled through connections in the power fitting on the rear wall.

Separate cables for 117-volt ac and 13-volt dc attach to the 12-pin power fitting. Power drain (20 watts on transmitting, 100 mW receiving) is low enough to permit operation from a battery pack, and a matching pack, CBP-12, is available.

The front panel has a natural brushed finish, with all marking anodized. The case, rear wall, and speaker grille are rough-surfaced baked-epoxy finish, blue in color. The selded-seam one-piece case slips on from the front, and is held in place by five screws, one running into the antenna jack bracket and the others into the bottom plate. Heavy threaded inserts in the side walls provide for under-dash mounting, with the maker's CM-1 bracket. - *W1HDQ*

Comcraft CTR-144 Two-Meter Transceiver

Dimensions (HWD) and Weight:

6-1/4 x 10-1/4 x 7-1/2 inches, 13 pounds.

Power requirements: 117 volts ac or 13 volts dc, 20 watts transmitting, 100 mW receiving.

Price Class: \$460, including crystal for 146.94 MHz.

Manufacturer: Comcraft Company, P. O. Box 266, Goleta, CA 93017.

Bird Ham-Mate

Directional Wattmeter

BIRD ELECTRONIC CORP., with its new Ham-Mate line, has made it possible for the amateur to determine accurately the power being delivered to or reflected from his antenna. This is a more meaningful measurement than just an SWR reading. The power is being measured at a precision comparable to the expensive laboratory Bird Thru-line wattmeter, but at a fraction of the cost.

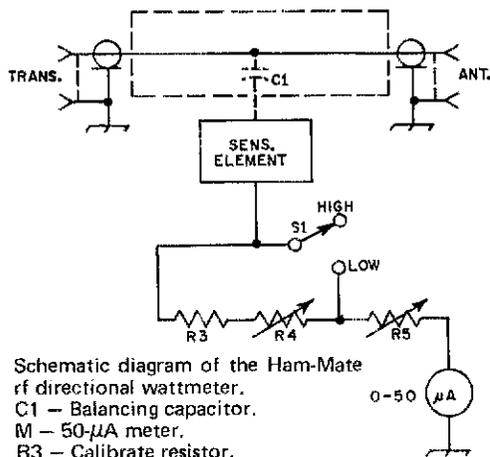
The Ham-Mate is available in three models. The 4350 and 4351 are intended for frequencies from 1.8 through 30 MHz and the 4352 is usable in the 50- to 150-MHz range. The 4352 and 4351 are the units described here. These models indicate average power up to 400 and 1000 watts respectively, while the 4350 is usable up to 2000 watts.

The Ham-Mates are housed in sloping, heavy-duty cast-aluminum cases. They are designed to be placed near the transmitter (or on a wall) for viewing. The meter cannot be separated from the rest of the unit. There are two controls on the wattmeter, a HIGH or LOW power selector and a RFL-FWD switch. If SWR readings are desired, the instruction booklet power-to-SWR nomographs may be referred.

The Ham-Mates were compared with a more expensive Thru-line wattmeter, and though only a ± 8 -percent accuracy is claimed there is no discernible difference between the two wattmeter readings. The owner is cautioned against meter damage when using any transmitter having a greater power



output than the Ham-Mate is designed to handle. When power is applied, it takes three seconds for the needle to come to rest, which is characteristic of well-damped meters. The wattmeters will indicate the average power output of most transmitters. This writer considers the Ham-Mate a great addition to any amateur installation. It should be pointed out that Ben Bryant, W8IGQ (seen in all the advertisements), does not accompany the wattmeter. — WINTH



Schematic diagram of the Ham-Mate of directional wattmeter.

- C1 — Balancing capacitor.
- M — 50- μ A meter.
- R3 — Calibrate resistor.
- R4 — High-range trimmer resistor.
- R5 — Low-range trimmer resistor.
- S1 — Range switch.

Rear view of the Ham-Mate shows the few adjustment points for calibration. R4 (high power) is the lower of the two variable resistors on the back of the meter and R5 (low power) is the upper variable resistor. The coupling capacitor is accessible through the hole in the center of the line section.

Bird Ham-Mate Directional Wattmeter
Dimensions (HWD) and Weight: 5-3/4 X 4 X 3-5/8 inches, 1-3/4 pounds
Impedance: 50 ohms, all models.
Price Class: \$80, all models
Manufacturer: Bird Electronic Corporation,
30303 Aurora Road, Cleveland OH
44139.



Technical Correspondence

A MORE-MODERN SOLID-STATE OSCILLATOR

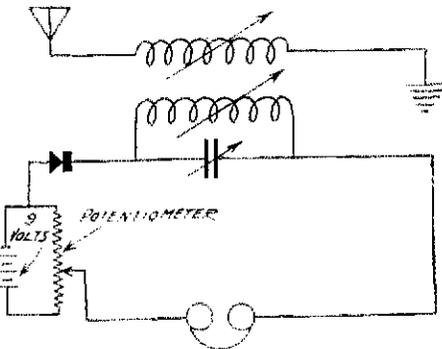
Technical Editor, *QST*:

I am writing with reference to the letter from W2GS in *QST* for September, 1971.¹ I would like to call your attention to a note under "Strays" on page 44 of *QST* for March, 1920. This note states that G. W. Picard of Wireless Specialty Apparatus Company has developed an oscillating crystal and gives a "hookup." The circuit given is very similar to that from *Radio News* of September 1924. The note in *QST* (1920) makes no mention as to whether the crystal is galena, silicon, carborundum, or what have you. However, since Dr. Picard is the inventor, I would assume that perhaps he used a good old Wireless Specialty "Perikon" detector which had two crystals, chalcopyrites and zincite.

I agree with W2GS in "What else is new?" but it would appear that Picard was at least four years ahead of Lossev in the development of a crystal oscillator. — William B. Gould, K2NP, 926 Woodgate Ave., Elberon, NJ 07740.

[EDITOR'S NOTE: The "Stray" which Gould references is reproduced here as it actually appeared in the March, 1920, issue of *QST*.] ▼

Did you ever hear of an oscillating crystal? Mr. G. W. Pickard, of the Wireless Specialty Apparatus Co., has done it, and here's the hookup. The secret is the



nine volts at the potentiometer. CW is received by heterodyne beats in the usual manner. The Editor would like to know what results are had with this hookup.

SUNRISE-SUNSET EFFECTS ON VLF SIGNALS

Technical Editor, *QST*:

In *QST* for February, 1972, W3QY discussed sunrise and sunset effects on 20-kHz signals from WWVL.² In 1940 when I was at the Navy Department we had an opportunity to make an

¹ Ehlinger, "The Modern Solid-State Oscillator," *Technical Correspondence, QST*, September, 1971.

² Pearson, "Sunrise-Sunset Effects on Signals from WWVL," *Technical Correspondence, QST*, February, 1972.

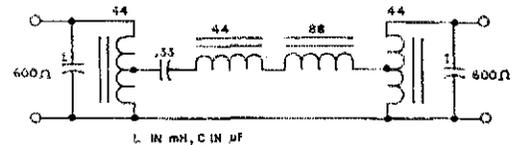
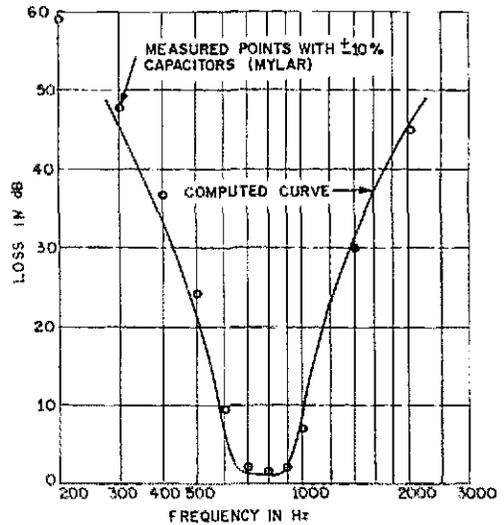


Fig. 1 — A 780-Hz filter. The computed loss curve assumes a coil Q of 40.

extensive study of this effect on 15- to 35-kHz signals, with transmitters and receivers located over a wide area of the world. Unfortunately, the study was classified for security reasons, and could not be published as we desired.

The appearance of a partial "double hump" caused us to reject the suggestions of smoothing out the little one, inasmuch as it suggested a cause. We then investigated this theory and found that we could predict on which paths the effect would occur. It was found that there was no consistent effect over all-water paths, but it was severe when the great-circle path came reasonably close to land that was subject to temperature inversions, such as the length of Cuba, and along the Mexican west coast. The effect was believed to be from a ground wave with partial or complete cancellation by a tropospheric wave.

I have a field-strength tape recording made in December, 1946, of an on-off keyed radioteleprinter transmission at vlf, using the "Quick Brown Fox" keyer with a transmitter output of 500 kW (yes, half a megawatt!). It shows the characteristic keying averages during one of these fades, each repetition of the printed line being at a slightly lower signal level. Although the transmitter also was capable of 10-Hz fsk, both had problems with the antenna Q being too sharp to handle the 60-speed keying. Once when told that vlf RTTY was a "physical impossibility," I suggested an approach and a laboratory test which, later, was successfully applied to a megawatt vlf transmitter using keying up to 500 words per minute. It isn't always safe to tell a ham that something is impossible — he may not know that!

The on-off keying tests at vlf, lf, and hf also indicated that there are simple means to use A1 cw keying for satisfactory radioteletype, in lieu of the F1 system. A1 radioteletype has been heard on commercial and amateur frequencies. This is something that hams should consider for more widespread use. — *Bill Conklin, K6KA, Box 1, La Canada, CA 91011.*

BAND-PASS CW FILTERS IN ABUNDANCE

Technical Editor, *QST*:

I would like to add something to the comments which appeared in the January 1972 issue of *QST*³ on my article, "Low-Loss Passive Bandpass CW Filters."⁴ First, if Mr. Wetherhold's suggested circuit change is carried one more step a simpler filter results. As shown in Fig. 1, if 1- and 0.33- μ F capacitors are used, a 780-Hz filter is obtained. A center frequency of about 800 Hz is more pleasing to many ears than, say, 1000 Hz. In addition, the filter now uses only three standard-value capacitors. No special capacitance values are needed.

Second, with regard to Mr. Gutowski's comments, the transfer function of the filter in question has six poles, three complex-conjugate pairs. The filter is often called a 3-pole filter, as Mr. Gutowski indicated. — *D. C. Rife, WA2PGA, 10 Broadmoor Dr., Lincroft, NJ 07738.*

Technical Editor, *QST*:

I enjoyed seeing the excellent application of modern network theory to cw filtering in February *QST*.⁵ The 600-Hz center frequency is a wise choice also!

I'd like to point out in this note that it is possible to obtain the same filter, but using fewer toroids. The series-resonant center-arm inductance can be made equal to the shunt-arm inductances by an ingenious ideal transformer trick described on pages 33 and 34 of Philip R. Geffe's little blue

³ Wetherhold and Gutowski, "Low-Loss Passive Bandpass CW Filters," Technical Correspondence, *QST*, January, 1972.

⁴ Rife, "Low-Loss Passive Bandpass CW Filters," *QST*, September, 1971.

⁵ Hall and Myers, "The CRUD-O-Ject," *QST*, February, 1972.

filter book, *Simplified Modern Filter Design*, John Rider, 1963. The "cost" of doing this is that two more capacitors are required in the circuit.

For example, for the *QST* article specifications of 600-Hz center frequency, 600-ohm equal terminations and 362-Hz 3-dB bandwidth, the circuit of Fig. 2A results. If, instead, it is desired to use unmodified 88-mH toroids, a little fiddling with the bandwidth gives a center frequency of 600 Hz, 600-ohm terminations, and a 3-dB bandwidth of 331 Hz. This circuit is shown in Fig. 2B.

These designs are based on a lossless prototype, as was the CRUD-O-Ject. Hence, with lossy toroids, they will also have loss and edge roll-off as per Fig. 2 of the February article. Also, it is possible to save one capacitor in these designs by transforming the delta of capacitors to a wye and by then combining a pair of series capacitors which result. The total net capacitance will be greater for the filter, however. — *Dave Hallock, KØAZJ, 605 Grand Ave., Marion, IA 52302.*

Technical Editor, *QST*:

The number of inductors required in the series-resonant arm of the CRUD-O-Ject⁶ can be substantially reduced from the present six 88-mH inductors to one 88-mH and one 44-mH inductor by connecting the series-resonant arm, after modification, between the center taps of inductors L2 and L3. The modified series-resonant circuit will consist of a 0.532- μ F capacitance (0.47 μ F + .068 μ F) and a 132-mH inductance (88 mH + 44 mH surplus inductors).

The inductors L2 and L3 mentioned in the article must have the required additional 40 turns equally distributed on the core to maintain a true center tap. Thus, twenty turns should be added to each of the two windings on each inductor, L2 and L3. This technique of reducing the size of the inductance required in the series-resonant arm of this particular filter configuration was briefly discussed in my letter⁷ recently published. The application of this technique appears to be particularly appropriate in the case of the CRUD-O-Ject circuit. — *Ed Wetherhold, W3NQN, 102 Archwood Ave., Annapolis, MD 21401.*

AVOIDING OVERLOADING AND CROSS MODULATION IN MODERN RECEIVERS

Technical Editor, *QST*:

Blakeslee's recent article⁸ describing a special receiver for 3.5-MHz DX work brings to mind a very simple system I use to overcome the propensity which modern commercial receivers have for overloading and cross modulation from strong signals in (and out of) the 3.5- and 7-MHz bands. I gain the needed isolation by using two fixed-tuned rf amplifier stages ahead of the antenna terminal on my 75A4. (I've also used this system on a 75S1 with equally good results.) The extra rf stages, operating at a controlled low gain, clean up the band beautifully, letting some of the weaker choice DX signals come through in readable shape, even in the midst of periods of high band occupancy such as DX contests and Sweepstakes.

The two fixed-tuned rf stages are obtained by setting up an old surplus BC-342 (or BC-312) receiver near the operating position, tuning it to

⁶ Ibid.

⁷ See footnote 3.

⁸ Blakeslee, "An Experimental Receiver for 75-Meter DX Work," *QST*, February, 1972.

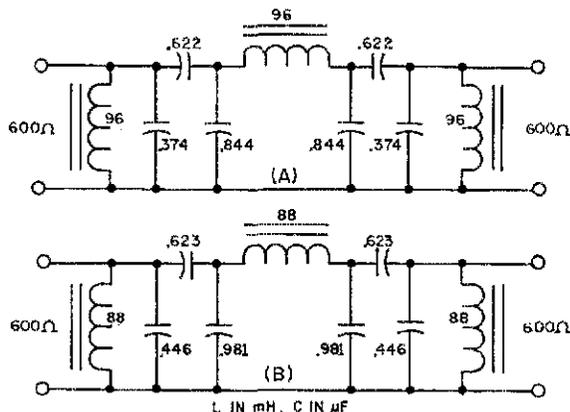


Fig. 2 — At A, the equivalent of the CRUD-O-Ject filter with fewer inductors. At B, a filter using standard-value surplus inductors with nearly the same response characteristics.

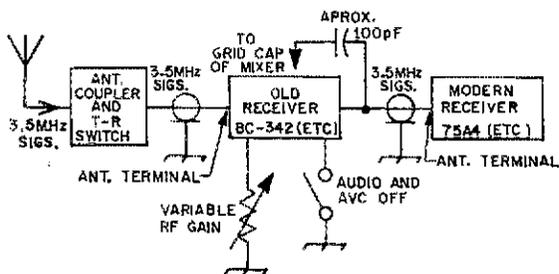


Fig. 3 — Block diagram of W1FTX's setup using an old receiver to avoid overloading and cross modulation.

the approximate operating frequency, and stealing a little signal from the grid cap of the converter (mixer) tube. This signal is then fed by a random length of small-diameter coaxial cable to the antenna input terminals of the main station receiver. The rf gain control on the BC-342 is used to set the level of signal desired at the input of the main station receiver, and the audio output of the BC-342 is turned off (by unplugging the speaker). The whole system is shown in block diagram form in Fig. 3. Once the BC-342 is set to the approximate operating frequency it is left alone, and all tuning is done with the main station receiver, as usual.

This has really opened up the 3.5- and 7-MHz bands for me, as it permits full use of the obviously superior i-f selectivity of the modern receiver, and overcomes its principal front-end shortcomings that Blakeslee described so well. I see no reason why other old-fashioned 2-stages-of-tuned-rf receivers cannot be used in a similar hookup. This puts the old "standby" receiver to good use, and takes a lot less time than building a whole new receiver. Also, it has the advantage of requiring absolutely no modification of the circuitry of the modern receiver, thus preserving its resale value. I thought this information might be of value to your readers. I have no instrumented data to evaluate the effectivity of the system — only the fact that it works for me. — Dick Smith, W1FTX, RFD 2, West Hill, Winsted, CT 06098.

LIGHTNING BOLTS

Technical Editor, *QST*:

Allow me to add a postscript to Graf and Clinch's article on spherics.⁹ A local bolt of lightning is heard anywhere on the radio spectrum up to and into the vhf region, and is heard at the same time anywhere in this band. This static is weaker the higher the frequency, but, except for this, one would expect that spherics are the same on all channels.

One day when the 75-meter band was nothing but spherics, I connected the i-f output of two BC-454 receivers to an oscilloscope, one to the X terminals and one to the Y terminals. When the two receivers were tuned to the same frequency the spherics were the same, and the scope showed a circle, an ellipse, or a diagonal line. The figures were imperfect but recognizable. When one of the receivers was detuned a few cycles per minute the scope showed these same three figures, but in a

⁹ Graf and Clinch, "High-Frequency Atmospheric Noise," Parts I and II, *QST* for October, 1971, and February, 1972.

succession that gave the appearance of rotation, as when two signals of slightly different frequency are presented to the X and Y axes of an oscilloscope. When the two receivers were tuned to well-separated frequencies there was no correlation apparent. The scope showed wavy lines going every which way across the face of the scope.

A bolt of lightning is a complex antenna, of many elements, and many wavelengths long. It must have an extremely complex radiation pattern with many sharp lobes and nulls, changing rapidly with frequency. The result is that, while lightning is heard clear across the band, it has an uneven distribution with frequency even within such a narrow range of frequency as the bandpass of a communication receiver. — Volney Wallace, W7SJZ, Box 534, Dugway, UT 84022

FLIP-FLOP OUTPUTS

Technical Editor, *QST*:

I wish to point out an error in Burnett's letter in the February 1972 issue of *QST*.¹⁰ He states that the Q and \bar{Q} outputs of a flip-flop would be alike only if the flip-flop were defective. In fact, both outputs of an R-S flip-flop will be high if both inputs are low (assuming positive NAND gates). — E. Douglas Jensen, WSOGJ/Q, Principal Research Engineer, Computer Technology Section, Honeywell, Inc., 2345 Walnut St., St. Paul, MN 55113.

¹⁰ Burnett, "More on Digital Logic ICs," Technical Correspondence, *QST*, February, 1972, pp. 53-54.

FEEDBACK

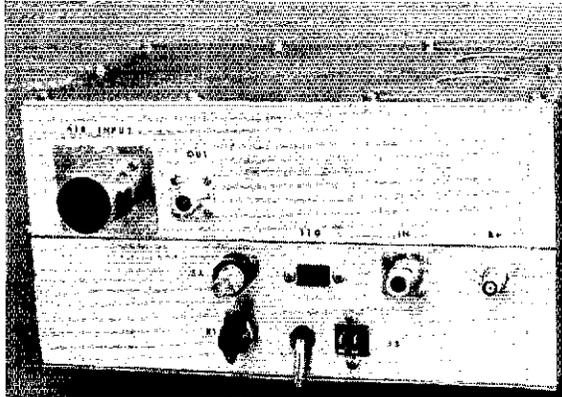
Coil L3 was not included in the parts list of Fig. 1 for "A High-Performance Tunable Fm Receiver," *QST* for April 1972, page 44. The coil is a slug-tuned type whose nominal inductance is 10 μ H. A Miller 4506 was used by the authors. Also, the photo captions on pages 46 and 47 are reversed.

Ready-made circuit boards are now available for "A Simple IC Keyer with Weight Control," *QST*, July 1971. These boards are of G-10 glass epoxy, drilled, and may be obtained for \$3.50 each from Spectrum Research Laboratory, Inc., P.O. Box 5824, Tucson, AZ 85703. Coauthor WB4YOJ, formerly WA1IRG, advises that the 22-ohm resistor connected between C11 and C12 in the power supply section of Fig. 5, implied as being 1/4 watt, should be of 1/2 watt or greater rating.



K7KHA reports that the National Bureau of Standards/WWV has informed him that the resumption of Morse transmissions will not be considered unless proposed again by a significant number of users. Heinz is urging listeners who share his feelings to write Mr. John Stanley, Engineer-in-Charge, National Bureau of Standards of WWV, requesting resumption of the Morse transmissions in the interest of convenience, readability, and overall usefulness.

Rear view of the 432-MHz amplifier. Note that, unlike most amplifiers requiring forced-air cooling, this one has the air input to the plate compartment.



A Strip-Line Kilowatt Amplifier for 432 MHz

Part II — Power Supplies, Performance, and Safety Measures

BY RICHARD T. KNADLE, JR.,* K2RIW

THE AMPLIFIER requires 2000 volts at 500 mA, 300 volts at 50 mA, and minus 90 volts with a 50-mA current-sinking capability. Fixed bias simplifies tuning adjustments, and negates the need for high-voltage switching relays, in that the amplifier will simply turn itself off when drive is removed.

The High-Voltage Supply

A reliable 2000-volt 500-mA supply requires considerable care in its design and construction. Handbooks extol the virtues of the choke-input supply (good regulation, smooth filtering, and no starting surge) but few of them give specific information on how to construct one. Choke input lowers the dissipation of the transformer and rectifiers considerably. I discovered this difference after burning up the secondary windings in two power transformers with a capacitor-input filter. A calculation disclosed that the transformer was dissipating over 300 watts, because of the high current peaks. The instantaneous dissipation equals I^2R , so the difference between the two kinds of supply can be 10:1. A good capacitor-input supply is possible, using a low-internal-resistance Hypersil transformer, a surge protector, a large capacitor bank, and high-peak-current diodes, but these components are not common on the surplus market and are quite expensive if bought new. Even this supply will not equal the regulation of a good choke-input supply.

Choke-input supplies with solid-state rectifiers have experienced diode failure. The usual cause is the inductive kickback of the power transformer due to stored magnetization energy, when the supply is turned off. A spike arrestor consisting of

CR10, CR11 and C9 handles this. Putting the choke and meter in the grounded leg increases reliability, since they need not stand the B+ potential. The bleeder resistor is wired so that the meter does not indicate bleeder current.

The high voltage is carried to the amplifier with RG-59/U coaxial cable and MHV connectors. These are similar to BNC, except for the extended center insulator. They are rated to 5000 volts, and they automatically create a ground through the coaxial shield. Many amateurs use the SO-239 and PL-259 in this application. Though they may arc over, they at least meet the safety requirement.

Screen Supply

Screen supply problems are common in amplifiers using the 4CX250-series tubes. In the supply of Fig. 3, R14 protects the supply and amplifier from high screen voltage, by draining off the negative screen current that can occur during conditions of excessive plate loading or low drive. R13 is very important because it prevents the screen dissipation from exceeding 12 watts, under all conditions. Without R13 the screens will fail in a few seconds, if drive power is applied without plate voltage, or if the loading is excessively light. Most tubes deliver maximum power in this amplifier with approximately 5 mA of positive screen current, so normally R13 is dropping only 10 volts of the 300-volt supply.

Bias Considerations

The control-grid bias supply need not furnish much current. In fact, it must act as a load for the 20 mA the tubes normally deliver when driven. This situation calls for a shunt regulator, which should be able to tolerate 100 mA without failure, in case drive is momentarily applied without high voltage.

* 316 Vanderbilt Pkwy, Dix Hills, NY 11746.

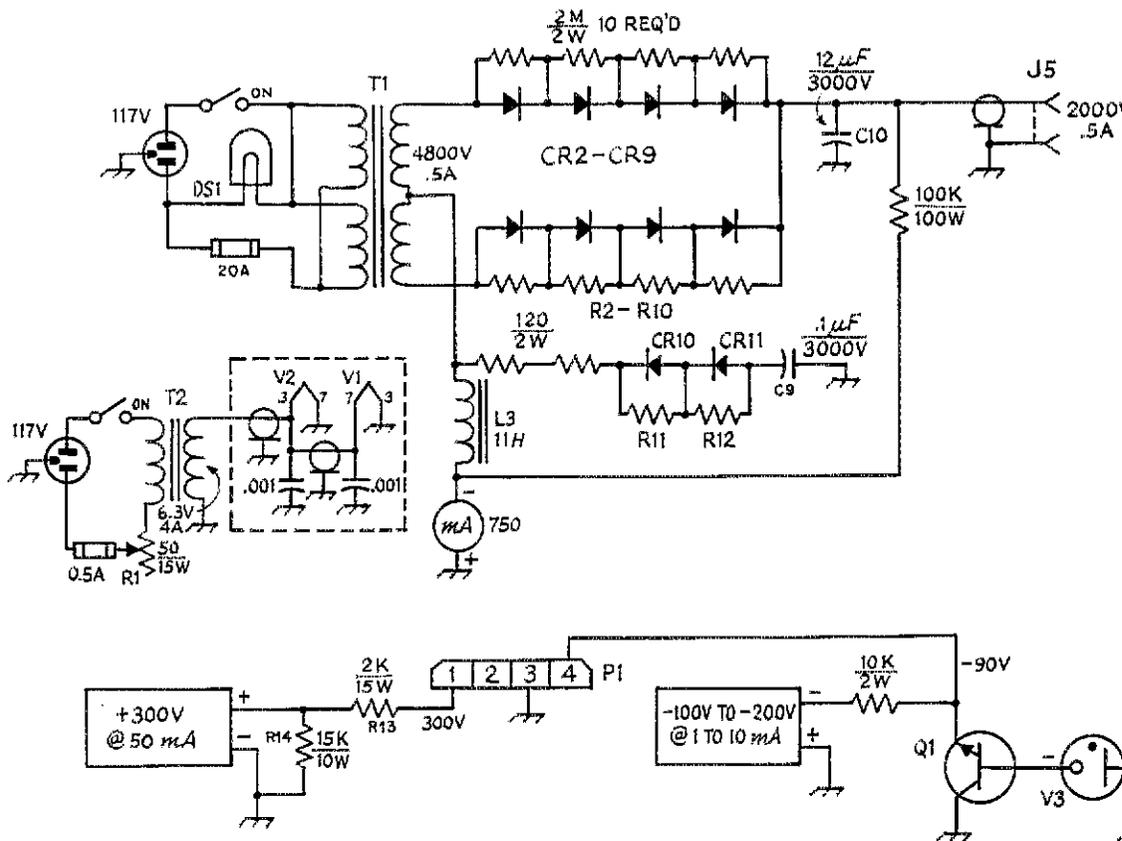


Fig. 7 - Schematic diagram and parts information for the power supplies needed for the 432-MHz amplifier. Heater transformer and circuitry are built into the amplifier. All other supplies are in a separate unit, not shown in the photographs.

- C9 - .1- μ F 3000-volt, oil-filled.
 C10 - 12- μ F 3000-volt (3 4- μ F, 3000-volt oil-filled in parallel).
 CR2-CR11, incl. - 3-kV 500-mA diode, 20-A surge rating (G.I. K6100F).
 I1 - 117-volt pilot lamp.
 J5 - MHV connector.

- L3 - 11-H 500-mA filter choke (UTC D3227, surplus).
 P1 - 4-pin female power connector.
 Q1 - Npn 10-watt 100- V_{CE} , beta at least 15 (Delco DTS-401).
 R1 - 50-ohm 15-watt control. Set for 5.5 V at sockets.
 R2-R12, incl. - 2-megohm 2-watt.
 T1 - 4800 V, ct, at 500 mA (UTC D3221, surplus). Lightweight type (new) available from Edco Electronics, 398 Bedford Ave., Brooklyn, NY 12111. Price \$90.
 T2 - 6.3-V 4-A filament transformer (UTC S-55).
 V3 - 5651, VR-90, or 90-volt 1-watt Zener diode.

Without a shunt-regulated bias supply, the bias increases when the driving power is applied. This can increase the drive requirement for full output and back-bombardment of the tube cathodes. As an experiment to determine whether significant back-bombardment was occurring, I ran the amplifier key-down for ten minutes at full power, with 5.5 volts on the heaters. When I turned the heater voltage off, the power output began dropping within five seconds. If much back-bombardment had been present, the excess heating would have kept the cathodes hot enough to continue emitting with no heater voltage applied.

Performance

I used my 20-watt 144-MHz exciter¹ to drive the amplifier-tripler,⁴ operating as a tripler to 432 MHz. I lowered the driving power and dropped the tripler screen voltage to 200, to lower the 432-MHz output to 22 watts, to be used to drive the parallel kilowatt amplifier.

As Fig. 4 shows, less than 22 watts will give acceptable results with cw or fm, though plate efficiency is slightly lower. A simple way of developing the 432-MHz drive is to use one of the

¹ References are grouped at the ends of Parts I and II.

uhf fm transmitters currently available on the surplus market. I understand that a Motorola TU-204 fm transmitter strip can be made to deliver as much as 35 watts, with increased plate voltage, a blower, and modification of the 2F26 grid circuit to link coupling.

The amplifier-tripler, when used to full power as a tripler to 432 MHz, puts out 28 milliwatts on 144 MHz. Almost any tripler will have a similar or greater output on the driving frequency. In a good vhf location, this 144-MHz signal can be heard by 2-meter operators over a considerable area. The 432-MHz parallel amplifier attenuates the 144-MHz signal by 50 dB, while delivering 700 watts output on 432 MHz. For this reason I recommend using the amplifier at all times, rather than operating with the driver stage when lower power is desired. Since I use narrow-band fm, and fixed bias on the final amplifier, I can lower the power output continuously, from 700 watts to less than 1 watt, merely by detuning the grid capacitor, C1.

When the amplifier is running as described, and delivering 700 watts on 432 MHz, the 144-MHz output is 71 dB down, the 288-MHz component is 69 dB down, the 864-MHz component 45 dB down, and the 1296-MHz component 50 dB down, after corrections for the directional coupler. A spectrum analyzer showed no other significant components, from 0 to 12.4 GHz. The levels given represent 56 microwatts on 144, 89 microwatts on 288, 22 milliwatts on 864 and 7 milliwatts on 1296 MHz.

A Bendix 1200-watt power meter was my first method of power-output measurement. As a second method, I used a Hewlett-Packard Calorimeter, and X-band directional couplers as power samplers, because 30-dB directional couplers were not available to me. A well-designed directional coupler can be used below its designed frequency.

This merely causes the attenuation on the directional port to increase. I calibrated the directional port at each of the frequencies of interest.

A third method of measuring the efficiency of the final stage was measurement of the temperature of the air which passes through the anodes, during 15 minutes operation at full power. The air temperature was found to be 217°F and 197°F at the two anodes. Then I removed the drive and adjusted the bias until the anode input was 300 watts, and ran this for 15 minutes. The anode air temperatures were then 217 and 202°F. This suggests that when 1 kW input is applied to the amplifier under rf conditions, the anodes are dissipating 296 watts, and the output should be 704 watts.

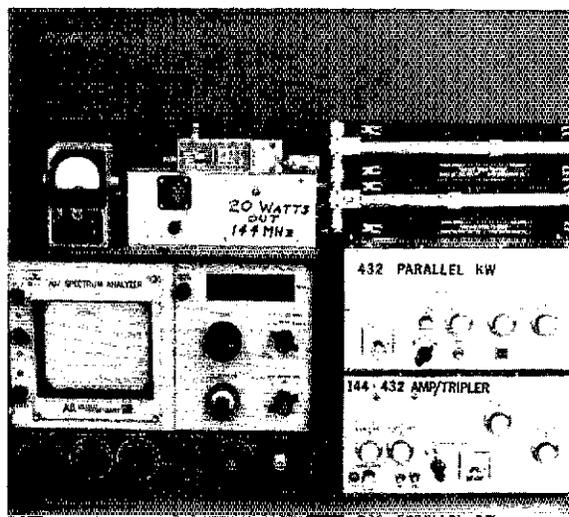
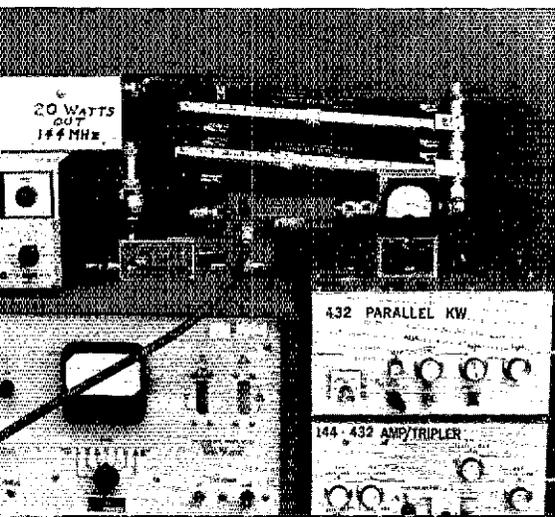
Safety

A uhf amplifier with 700 watts output, using a 2000-volt supply, represents several possible hazards, if some care is not exercised. In addition to the well-known safety precautions in working with dangerous voltages, it is good practice to avoid standing near to an antenna carrying more than 10 watts of rf power. The amplifier should never be operated with the plate compartment open, nor with the shield cover incompletely fastened down. An open compartment can radiate dangerous levels of uhf power at close range, and it is possible for a crack along one side to act as a slot radiator. Radiated uhf energy causes thermal heating of skin tissue. The U. S. Government has set a limit of 10 mW/cm², averaged over a six-minute period, as the maximum for human exposure. The heating effect is most dangerous to the eyes, as it can cause immediate injury and development of cataracts.

Along with thermal effects of rf radiation are some possible nonthermal dangers, such as disturbances to the nervous system, though these have

Two test setups used to document the performance of the K2RIW 432-MHz kilowatt amplifier. In both pictures are the 20-watt solid-state exciter for 2 meters,¹ upper left, strip-line amplifier or tripler,³ and the 432-MHz parallel kilowatt amplifier. The left photo shows setup for measuring input-output characteristics. The large instrument is a Hewlett-Packard 434A Calorimeter. The middle row contains an HP-431C Power Meter, Narda Coaxial Directional Coupler, and a Bendix SWR and Wattmeter. At the upper right is a double-stub tuner.

The right setup includes several of the above items, plus an AIL Spectrum Analyzer, covering 0 to 12.4 GHz.



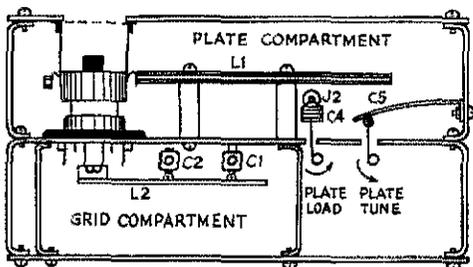


Fig. 8 - Cut-away view of the 432-MHz amplifier, showing all principal rf circuit components. C5 has a 1/2 by 3-inch stiffening plate bolted to its bent-over portion. C4 is soldered to the output fitting, J2. Both are 1/2-inch below L1 in their free positions.

not been confirmed in this country. The Soviet Union, Poland and Czechoslovakia have set standards of 2.5 microwatts/cm² to 1 mW/cm², because of these possible effects.⁵

Fred Telewski, WA2FSQ, found that radiation from 100 watts, into a 7-dB 432-MHz corner-reflector antenna, measured with a Narda Model B86B3 radiation monitor, was safely below the limit of 10 mW/cm² if you were more than 6 feet in front of the antenna.⁶ The back and sides of the antenna were considerably safer. Since rf energy falls off by the inverse square law, this says that, by U. S. standards, you are safe 16 feet in front of that same antenna, with 700 watts going into it. It is well to be conservative, and I would recommend treating uhf energy with healthy respect. I would not operate this kilowatt amplifier into an antenna less than 30 feet from me, nor would I climb the tower with the transmitter operating.

I did some probing with an rf detector, with the parallel amplifier running full power, and I found that nowhere around the Premier boxes, cover plates, meter, knobs or connectors could more than one milliwatt of rf energy be detected. This level was found only within 1/4 inch of the screened air exhaust holes in the top cover plate. It should be emphasized again that these safe conditions apply only with the amplifier properly enclosed.

Summary

The techniques used in this 432-MHz parallel kilowatt amplifier have other applications. With judicious measuring of intertube resonances, and mode-killing, I am sure that more than two tubes could be used to achieve 2 kW PEP at 432 MHz. I know that two or more 4CX250B tubes in parallel could be used to simplify and reduce the cost of kilowatt amplifiers for all vhf bands. I have good reason to believe that we will be seeing such articles in the near future. For those who wish to become more familiar with the versatile technique called strip-line, there is an excellent text covering this subject.⁷

We are entering an exciting era of 432-MHz communication. The recent availability of very low-noise uhf receiving transistors, combined with

advances in transmitter and antenna design, should soon contribute to the shattering of existing DX records.

A chart of overland tropospheric path loss observed on a 630-mile path, in winter, by Lincoln Laboratory,⁸ shows an attenuation of 255 dB. This implies that 600-mile 432-MHz communication is realizable on an every-day basis to well-equipped stations. It is 6 dB easier than moonbounce, which has been demonstrated to be within the capabilities of amateurs at 432 MHz. Even longer-range 432-MHz communication will take place with the launching of AmSAT-OSCAR-B sometime this year, or the SYNCART (Synchronous amateur radio transponder) satellite, scheduled for 1975.⁹ Moon-based amateur transponders may eventually offer even more intriguing possibilities.

These developments, and the rapid growth of amateur television and fm communications in recent years, make the 420-MHz band a very interesting frontier that any amateur with pioneering spirit should enjoy. Concerning 432 and higher frequencies, I believe it safe to say, in the modern vernacular, "This is where it's happening!"

I would like to thank the Microwave Instruments Division of ALL for providing the test equipment used during the evaluation of this amplifier. I would also like to thank Fred Telewski, WA2FSQ, for suggestions concerning the text and the air-cooling method, James Buscemi, K2QVS, for his comments concerning text, and Rusty Holshouser, K4QIF, for his suggestion of efficiency determination by air temperature measurement.

EDITOR'S NOTE: A condensation of this two-part article by K2RIW, with some different photographs and drawings, appears in *The Radio Amateur's VHF Manual*; Edition 3, 1972, Chapter 13.]

The following information, related to Part I of this article but received too late for inclusion with it, was supplied by the author:

If C7, a high-voltage feedthrough bypass capacitor, is not readily available, a good substitute can be made by hand. Mount two metal plates of four

(Continued on page 79)

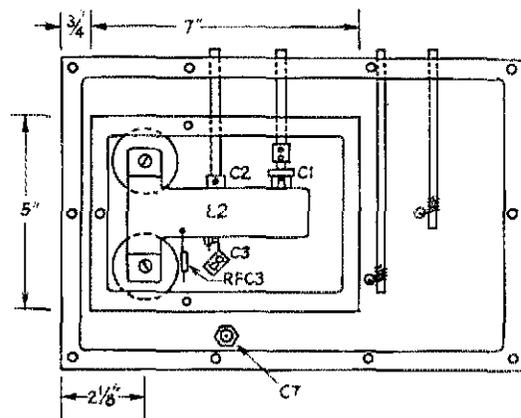


Fig. 9 - Bottom view of the amplifier, giving dimensions not available from Figs. 2 and 6.

Light of a Diode

(Continued from page 36)

state revolution continues to drive equipment power consumption and the cost of most devices down. Reliability and life expectancy are being improved. For those who like to experiment with new ideas, new devices and new techniques, it is indeed an exciting time.

Appendix A - References

- 1) Stern and Carroll, "The Vanguard of the Optoelectronics Revolution," *Motorola Monitor*, March, 1971.
- 2) Smith, "Applications of Opto Isolators - Appnote 2," Litronix, Inc., April, 1971.
- 3) Doyle, "The Right Numeric Readout, A Critical Choice for Designers," *Electronics*, May 24, 1971.
- 4) Wendland, "Solid-State Combo Senses Light Well Enough to Vie With Tubes," *Electronics*, May 24, 1971.

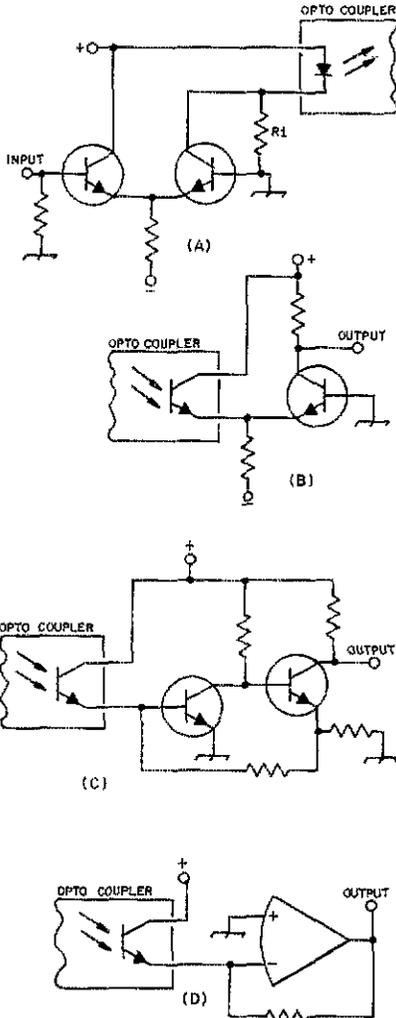


Fig. 13 - (A) Circuit to feed analog signals into an opto coupler. Output analog circuits using (B) a transistor, (C) a feedback amplifier, and (D) an op amp.

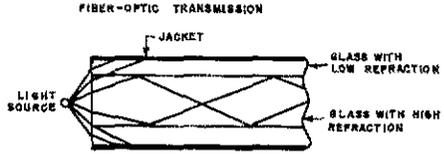


Fig. 14 - Some light entering a fiber-optic transmission line is lost, but most is carried by reflection down the line.

- 5) McDermott, "Solid-State Optoelectronic Components Put Imagination in Engineering," *Electronic Design*, May 27, 1971.
- 6) Hunt, "What You Should Know About LEDs," *Electro-Procurement*, July, 1971.
- 7) "Directory of GaAsLite Products," Monsanto Electronic Special Products, August, 1971.
- 8) Altman, "Optoelectronics Makes It At Last," *Electronics*, November 8, 1971.
- 9) Rostky, "Focus on Readouts," *Electronic Design*, November 25, 1971.
- 10) Li and Marcatilli, "Research on Optical-Fiber Transmission," *Bell Laboratories Record*, December, 1971.
- 11) Lancaster, "Liquid Crystal Displays," *Radio Electronics*, February, 1972.
- 12) Stepke, "Liquid Crystals: Perspectives, Prospects and Products," *Electro-Optical Systems Design*, February, 1972.
- 13) Bergh and Dean, "Light-Emitting Diodes," *Proc. of the IEEE*, February, 1972. (Note: this important 67-page paper covers all phases of the design and construction of LEDs, including 348 references.)

Appendix B - Manufacturers of Optoelectric Devices

- 1) Fairchild Microwave and Optoelectronics, 2557 Charleston Road, Mountain View, CA 94040.
- 2) General Electric, Nela Park, Cleveland, OH 44112.
- 3) Hewlett-Packard, Inquiries Manager, 1601 California Ave., Palo Alto, CA 94304.
- 4) Litronix, Inc., 19000 Homestead Road, Cupertino, CA 95014.
- 5) Hixco, 26101 Miles Road, Cleveland, OH 44128.
- 6) Master Specialties, 1640 Monrovia, Costa Mesa, CA 92627.
- 7) Monsanto Electronic Special Products, 10131 Bubb Road, Cupertino, CA 95014.
- 8) Motorola Semiconductor Products Division, 5005 East McDowell Road, Phoenix, AZ 85008.
- 9) Opcoa, Inc., 330 Talmadge Road, Edison, NJ 08817.
- 10) Texas Instruments, Box 5012, Dallas, TX 75222.

Note: A letter to the sales manager of any of the above firms will bring a list of their local sales representatives and parts distributors. LED lamps and LED readout devices are available surplus at attractive prices - see vendor's ads in *QST*. QST

Strays

Recent investigations have revealed some startling information about the identity of the first amateur radio operator in the U.S. It seems that our first president may also have been our first brass pounder. In fact, ham radio may have been the hobby of the entire first family. Regarding the cherry tree incident, researchers tell us that when Washington's father asked, "Who di dit?" George reportedly answered, "I di dit, da dah." - *Edward Blocker and WB2EIG*

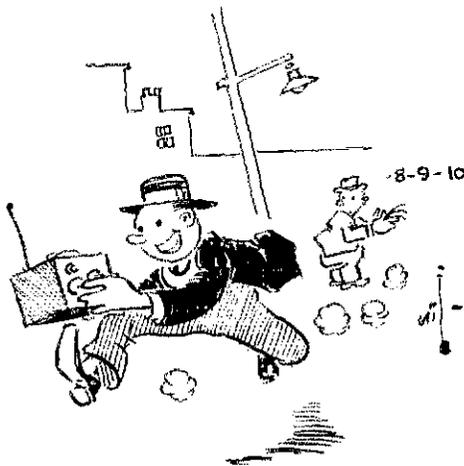
Towards a National Plan for 2-Meter Fm Channels

BY JOHN L. MASON,* W5NSQ

IN AN ERA of a radio when 2-meter fm repeaters are being installed as fast as the FCC can license them, it is important to establish a national plan for frequency usage and for the pairing of frequencies for repeater use. While many may argue that the habits of fm-ers are fixed in this regard and that standards based on common usage already exist, it is not true that the standards are applied to the degree that the subject requires. Nor is it yet true that the standards are universal or nationally accepted.

The current popularity of inexpensive domestic and imported fm transceivers, most of good quality and nearly all containing provisions for up to 12 crystal-controlled frequency pairs, immediately introduces an owner to the problem of crystal

* 7727 La Risa Drive, Dallas, TX 75240.



"Current popularity of 12-channel fm transceivers."

The ARRL Board of Directors has asked the Vhf Repeater Advisory Committee to study standards for repeater operation and methods of frequency coordination. The Texas plan described here has been widely adopted, in whole or in part, by repeater groups. Most fm-ers agree on the need for a single nationwide plan for the 2-meter band. Those with differing views or other plans are invited to submit their suggestions to any VRAC member or to ARRL Hq.

selection. The manufacturers and importers of these rigs have yet to standardize on the frequencies of crystals supplied with the result that, unless the new buyer lives in an area which supports several repeaters, he may be left with crystals that operate on frequency pairs that are useless to him. And, as the ham operating mobile travels from one part of the country to another, he'll find that repeaters are not all situated on frequency pairs he considered standard closer to home.

Added to this individual confusion is the much more serious problem faced by those amateurs in the areas that do not yet have repeaters but who are considering building (or are actually building) systems to serve their communities. These amateurs undoubtedly will follow the standards established in the nearest metropolitan community. As this trend continues, the circles of influence will gradually enlarge until zones of incompatibility are established wherever two or more such circles overlap. The predictable result is confusion and uncertainty for the out-of-town mobile operator, considerable unintentional interference, and increasing crystal purchases by those who travel regularly from one area to another.

Why Are There Different Standards?

When fm started to increase in popularity in the vhf bands, most operation was conducted on only two frequencies, 52.525 MHz and 146.94 MHz. For 6-meter operation, 52.525 MHz was selected because it was the lowest frequency on which wide-band fm operation could be conducted with an adequate guard band between that frequency and 52.5 MHz.¹ The two-meter frequency of 146.94 MHz was selected because it was the highest frequency derived from the commercial

¹ FCC amateur regulations (Part 97.61) limit the bandwidth of F3 (frequency or phase modulation) to that of an a-m transmission having the same audio characteristics below 29.0 MHz and in the 50.1- to 52.5-MHz frequency segment. Greater bandwidths are allowed from 29.0 to 29.7 MHz and above 52.5 MHz.

Fig. 1 -- 146 to 147 MHz standard direct and repeater frequencies. (A) 146.70 MHz is recognized nationally as an AFSK radioteletype calling and working frequency. This leads to the designation of 10/70 as a dedicated pair for radioteletype repeater use only. (B) 146.52 MHz is designated as the common direct and DX frequency. Repeaters and other automatic transmitting devices are never located on that frequency.

Standard Direct and Repeater Frequencies

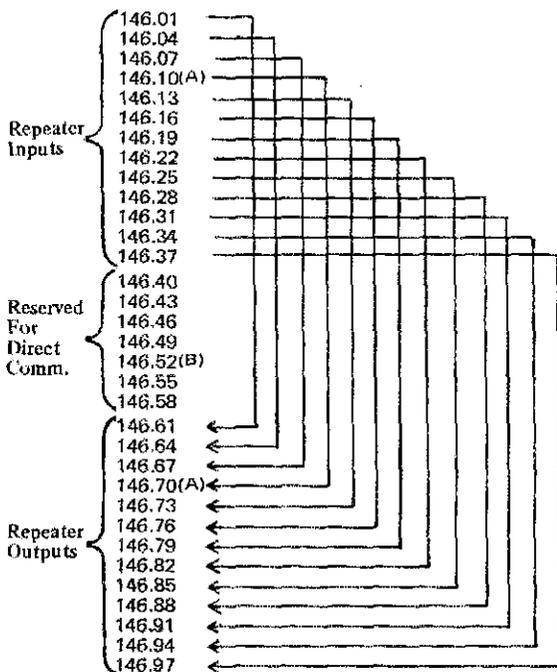
channel spacing² which could be used by Technician licensees. From this modest bit of practical reasoning, 146.94 MHz (or simply "94" as it is called) became the standard 2-meter fm calling frequency. Hardly anyone had capability for a second frequency and, because 94 was so sparsely populated, none was needed. Activity on 94 grew slowly and steadily. When the idea of amateur fm repeaters was first born, many puzzled about the "right" frequency for the input. Through experimentation, it was discovered that most General Electric and Motorola transmitters would operate over a maximum frequency excursion of approximately 600 kHz without retuning, and 146.34 MHz was born as the repeater input frequency, with 94 used as the output. There were many, however, who had invested considerable time, money, and talent in building effective stations with adequate power, receiver sensitivity, and antenna gain so they could work 94 "direct" (without the aid of a repeater). These amateurs vigorously fought the establishment of repeaters which transmitted on 94 because of the threat of depreciation of their individual efforts. Repeaters and serious direct operation on the repeater output frequency are an incompatible combination.

The result of the 94 pioneers' objections was that in some cities 34 was retained as the input frequency, but 146.76 MHz was designated as the output frequency.³ Thus the current incompatibility began with some of the earliest repeaters using the pair 34/76⁴ and others, where the 94 pioneers weren't very vocal, using 34/94.

² The highest frequency was chosen instead of the lowest because most of the equipment used was cast-off commercial equipment previously used in the land mobile services situated above, rather than below, the 2-meter band. Thus it was easier to convert to amateur frequencies, and many cases needed no conversion at all.

³ One of the earliest (c. 1960) formal repeater plans, devised by K4ZAD, W4DYE, W4GCE, K4STE and others, specified 420 kHz input-output spacing with 34/76 as the primary repeater pair. Their plan provided for five repeater pairs, a decision compatible with 420 kHz spacing and a maximum 600 kHz transmitter excursion. The 94 channel was to be preserved for direct, emergency, and out-of-town mobile visitor communication. The condition which stymied the wide acceptance of this plan was the almost immediate construction of "second pair" repeaters using the apparent 600 kHz standard spacing by amateurs who were unaware of anything except the existence of 34/94 repeaters.

⁴ Fm frequency designations are usually abbreviated so that 146.34 MHz becomes 34. Repeater pairs are always specified with the input frequency given first. Thus a repeater receiving on 146.34 MHz and retransmitting on 146.94 MHz is referred to as a 34/94 repeater.



There are those today who will still argue endlessly that 94 should never have been used for repeater output. Without attempting to judge the merits of their argument, it is current fact that the number of 34/94 repeaters now on the air is so large that that frequency pair is, unhappily or not, a national standard for repeaters. There are a number of extremely active 34/76 machines currently operating in areas where 94 is still regarded as the standard direct frequency. It is tempting to dismiss those who now support 34/76 operations as backward, old fashioned, and inflexible. But that is hard to do when such operations flourish in metropolitan areas like Chicago, Atlanta, Baltimore, Detroit, Cleveland, and Philadelphia.⁵ These cities, and others like them, fostered the early growth of fm as we now know it. Who can say they are wrong? They are just different, but it is safe to predict that the differences will be eliminated in the long term.

In Search Of "The Standard"

The ultimate standard for which we are all looking does not exist. It may not exist for some time. But, out of the mix of current operating systems, there stands a pattern so uniform and so workable that it is proposed here as a standard suitable for adoption by all repeater groups. The plan has been devised by committee workers of the

⁵ [EDITOR'S NOTE: At the January 8th meeting of the Northeast FM Repeater Association at West Chester, Pa., the Philadelphia repeater operators agreed to change frequencies to standard channels following the Texas plan.]



Each repeater should use a standard channel pair.

Texas VHF-FM Society,⁶ and has been formally adopted by that group. Such plans cannot be legislated by any amateur body; they have to be adopted voluntarily. However, if the plan cannot be criticized on technical grounds, and if its adoption poses no financial burden on those who do adopt it, there should be no reason why amateurs of good will cannot follow it. And, there is an urgent need to adopt and follow some reasonable plan quickly. The FCC has demonstrated, in docket 18803, their willingness to legislate subbands. Most amateurs will agree that the plan proposed here is more workable than any plan that could be devised within the limitations proposed by that docket. The plan should be especially welcomed by those undertaking their first repeater project — and there are still many cities and towns without such a facility.

Channel Spacing

Fm operation derives much of its usefulness from the fact that virtually all operation is on one or more of a set of well-defined channels, usually crystal controlled, and usually maintained to accuracies of a few hundred cycles. This practice is an extension of the land mobile services channel specifications in the range from 150.8 MHz to 162 MHz.⁷

Channels are spaced every 30 kHz from 146.01 MHz through 147.99 MHz. This covers the spectrum allowed to those holding Technician licenses, and the top megahertz open only to General,

⁶The Society (via the author) and the ARRL Vhf Repeater Advisory Committee are especially interested in hearing from all organizations choosing to adopt the Texas plan. They are equally interested in hearing from organizations objecting to the plan — where such objections are based on reasonable argument.

⁷Channels there are presently specified every 15 kHz but have, until recently, been assigned every 30 kHz for most systems.

Advanced, and Extra Class licensees. Most repeater operation is conducted in the range from 146.01 MHz through 146.97 MHz; a few operate between 147.00 MHz and 147.99 MHz. Table I lists the standard 2-meter channels.

Until recently, most amateur operation was conducted according to wide-band standards which permitted only half the number of channels, each spaced 60 kHz instead of 30 kHz. Actual peak deviation was plus and minus 15 kHz, and an unused 30-kHz-wide band was maintained between each channel. In amateur practice, this was found to be unnecessary. Even wide-band equipment with broad i-f filters can be used successfully if deviation is, by mutual agreement, reduced slightly. While some forward-thinking groups have established fully narrow-band systems using only plus or minus 5 kHz peak deviation, some amateur systems coexist nicely with a mix of wide- and narrow-band equipment if the repeater is set up for about plus or minus 7 to 10 kHz deviation. The penalty paid in lower signal-plus-noise-to-noise ratio when a wide-band receiver is used to receive narrow-band signals has been found, for amateur purposes, to be negligible. It is, then, fully practical to recommend the more modern 30-kHz channel spacing for all repeater operation with the single proviso that repeaters adjacent in frequency not be adjacent in physical location. For example, in Dallas, Texas, the 22/82 and 28/88 repeaters are located only about three miles apart and they coexist nicely.

Standard Direct and Repeater Frequencies

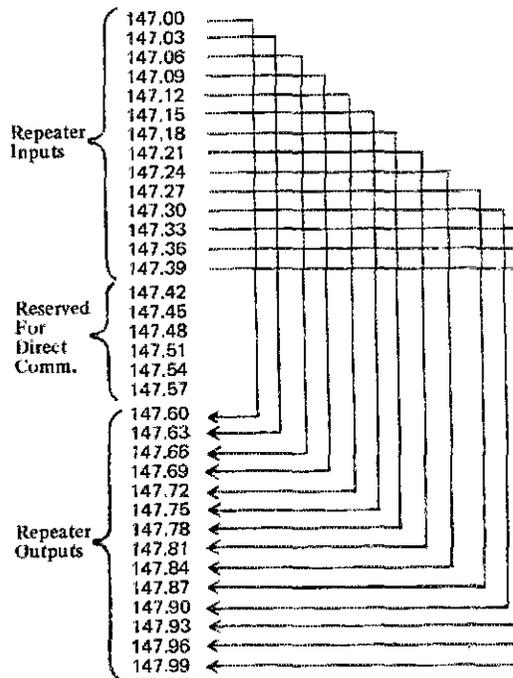


Fig. 2 — 147 to 148 MHz standard direct and repeater frequencies.

The 25/85 repeater, however, is some 20 miles away in another city, and functions without interference. Such geographical spacing, arranged by local agreement between repeater operators, or through a regional frequency coordinator, is highly recommended.

To be sure, some fm operation is conducted on frequencies other than those shown in Table I. For the most part, however, these are special-purpose systems established by small groups attempting to operate privately. As more and more of the standard channels come to be used in a community, those who have established off-channel operations inevitably will have to move to a standard channel and share its use with others or else endure the interference caused by split-channel operation. The situation, it seems, is self-resolving and the channels already established as standard will endure.

Where Are The Repeaters?

Given the 33 channels in a portion of the 2-meter band most used by fm-ers, where should repeaters be situated? Based on the contemporary practice of separating inputs and outputs 600 kHz with the output frequency the higher of the two, a very useful arrangement of channel pairs into repeater groups can be devised. Fig. 1 shows this contemporary practice applied to the subband from 146 MHz to 147 MHz. Thirteen repeater systems can be established using this scheme. Inputs occupy the channels from 01 through 37 while outputs occupy those channels from 61 through 97. The seven channels between 40 and 58 can't be used for repeaters if the plan is to be constrained to occupy no more than one megahertz. And, it is fortunate that they can't. Those channels are, according to the Texas plan, reserved for direct, nonrepeater, operation by those who favor long-haul, point-to-point, and DX activity. It is important that those aspects of 2-meter fm activity not be forced out of existence or even

146.01 MHz	147.00 MHz
146.04	147.03
146.07	147.06
146.10	147.09
146.13	147.12
146.16	147.15
146.19	147.18
146.22	147.21
146.25	147.24
146.28	147.27
146.31	147.30
146.34	147.33
146.37	147.36
146.40	147.39
146.43	147.42
146.46	147.45
146.49	147.48
146.52	147.51
146.55	147.54
146.58	147.57
146.61	147.60
146.64	147.63
146.67	147.66
146.70	147.69
146.73	147.72
146.76	147.75
146.79	147.78
146.82	147.81
146.85	147.84
146.88	147.87
146.91	147.90
146.94	147.93
146.97	147.96
	147.99

Table I - Standard frequencies, or channels, used for virtually all amateur fm operation in the 2-meter band.

forced out of the range between 146 and 147 MHz by the landswell of repeater growth.

The Texas plan accommodates the need for keeping some frequencies open for direct operation by specifying that, if more than thirteen repeaters are needed in a given area, another set be established between 147 MHz and 148 MHz. Fig. 2 shows such an arrangement. Incidentally, it is

A Nationwide Effort to Coordinate Repeater Channels

The Texas VHF-FM Society has been a leader in band planning and frequency coordination. Many other groups are also working to solve the interference and channel-loading problems where repeater operation has developed in a haphazard fashion. The efforts of the Northeast FM Repeater Association were reported in March *QST*. As a result of NFRA activity, over a dozen 2-meter repeaters in New England, the Middle Atlantic states and metropolitan New York have changed to standard frequency pairs, and other machines are now in the process of moving. A new frequency coordination group has just been formed in Chicago under cochairmen WA9EXP and W9HEP. WA8GVK is spearheading an effort to form a regional group, after attendees at the ARRL Great Lakes Division Convention repeater forum unanimously agreed that an organization was needed.

Further south, the Southeast Repeater Association has also adopted the standard 30-kHz channels and 600-kHz spacing. But in the Florida/

Georgia area 94 has been left as a simplex channel and 34 has been adopted as a universal secondary input channel for all Association repeaters. The 34 input to each repeater uses a different Touch-Tone code. Thus, a mobile operator does not need more than one transmit crystal when driving through the Association area - an excellent feature for emergencies, too. The North Carolina Repeater Association and similar groups in Ohio, Arkansas, and Indiana have been doing outstanding work to develop standards in their areas.

The California Amateur Relay Council and the Central States VHF-FM Society have been in business for some time now. The California group has appointed W6GDO, the chairman of their technical committee, as the frequency coordinator, while the CSVFS has selected WA5BPS. In West Virginia, K8SXO has been helping repeater operators choose frequencies. The nationwide effort to establish standards for fm operation demonstrates again how hams can get together to put their own house in order.

unwise to establish a repeater which receives in the Technician portion of the band and repeats into the General portion, at least so long as FCC takes the view that Technician transmissions repeated in the General portion is a rules violation. There are several such systems currently operating, but the invitation to violate the rules seems so great that they are not recommended — especially in a band occupied by many holding Technician-class licenses.

In some areas, Texas among them, some stations adopted 146.64 MHz as the primary DX frequency. That frequency was chosen long ago because it lies halfway between 34 and 94 (the original repeater pair). A mobile transmitter arranged to transmit on 34 for input to the repeater and 94 for direct operation out of range of a repeater will work well on 64. In fact, 146.64 MHz is an ideal frequency to use when tuning a transmitter intended principally for operation on 34 and 94. And, in the early days of fm, most equipment was cast-off commercial gear equipped for only one or, at the most, two frequencies. It was, therefore, reasonable to build one's entire operating pattern around the capability for operation on 94 or 34/94 with 64 used for direct DX work. That approach is not reasonable now that multichannel capability has become so commonplace. With the advent of the inexpensive 12-channel transceiver, the approach becomes even less reasonable. The pair 04/64 is just too attractive as a repeater pair to attempt to preserve 64 on a nationwide basis for very long.

The Texas plan designates a new spot frequency for direct or DX operation, 146.52 MHz. Admittedly, this is an arbitrary choice. However, once a few stations begin to use it (many already have), and if repeater operators across the country refrain

from establishing repeater outputs on 52 or any of the seven channels specified for direct operation, 52 and its adjacent direct frequencies should become active and interesting for all who enjoy DX operation.

How Do We Achieve The Standards?

A fair question at this point concerns those repeater users and operators who currently have systems operating on nonstandard frequency pairs. How are they to move to one of the standard pairs and preserve the usefulness of their investment in crystals? Sadly there is no easy answer. One encouraging observation is that nearly all large communities already support more than one repeater. As more and more repeaters are installed, amateurs slowly will achieve the capability to operate on more and more channels. The 12-channel transceiver surely will have an impact on the situation because of the invitation offered by numerous empty crystal sockets. Operators will not, for long, resist filling them all up. Also, the predictable realization of an inexpensive frequency synthesizer within the means of most amateurs will increase greatly the number of channels in general use within each coverage area. When the majority of users in an area do achieve multiple-channel capability, it will be largely immaterial (in terms of crystal expense) which pairs of the available channels are used for the local repeaters. Some day, then, it will be entirely reasonable for the few remaining nonstandard repeaters to move to standard frequency pairs. The practical achievement of a completely uniform nationwide frequency scheme will provide 2-meter fm operation with a potential for more public service and personal enjoyment. It is a goal worthy of our best efforts.

Power-Amplifier Circuits

(Continued from page 45)

member. The same design is also being duplicated by the Minuteman Repeater Association in a group effort headed by WIPRI.

Acknowledgement

The author wishes to acknowledge with thanks the contributions of Edward Loupe who constructed the amplifiers and provided many excellent suggestions about the circuit designs.

Appendix A

- 1) Amidon toroid cores are available from Amidon Associates, 12033 Otsego Street, No. Hollywood, CA 91607.
- 2) Ferroxcube components can be purchased from Elna Ferrite Laboratories, Inc., 9 Pine Grove Street, Woodstock, NY 12498.
- 3) J. W. Miller chokes are available from distributors, or directly from J. W. Miller, 19070 Reyes Ave., Compton, CA 90224.
- 4) Underwood mica capacitors must be ordered directly from the manufacturer, Underwood Electric and Manufacturing Company, Inc.,

P. O. Box 188, Maywood, IL 60153. Price for the J-101 units specified in this article is approximately \$1.20 each (specify the value — in pF — desired).

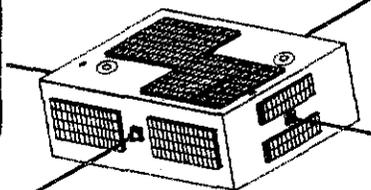
5) A circuit board for the 50-watt amplifier will be available from Spectrum Research Labs, P.O. Box 5824, Tucson, AZ 85703. 

Strays

I read about FCC's concern over Conditional Class licensees, and the possibility of calling them all in for re-examination. And I said to myself, "Dottie, they're talking about you!"

So out came the theory books again. The last time this renewed interest in study hit me it was because I wanted to go for my Advanced ticket, so I already had the Ameco guides for Advanced and Extra Class on hand. I know that I'll have to take the General exam first anyway, so I am working on both sets of questions — the General from ARRL Manual and the Advanced from Ameco. The latter actually makes the digging fun. At least it encourages ME to think that I'm understanding a lot more than I did before. Then when I get to the *Handbook* to try for further light on something that needs explaining, the *Handbook* seems easier to understand. . . . — *Dottie's Diary (W5EAO) in "Off Resonance" of the Texas Southmost A. R. Club.*

This summer is the target for the start of interesting DX via an amateur communications satellite. Are you ready? Here are some suggestions on equipment which can be used to take advantage of an intriguing new facet of amateur radio.



How to Get Ready for Oscar DX

BY WILLIAM I. DUNKERLEY, Jr.,* WA2INB

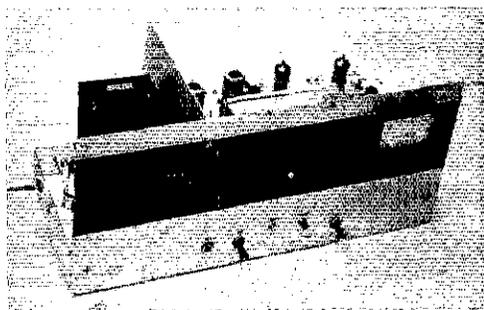
THE AMSAT-OSCAR C satellite, soon to be launched, promises some unusual DX opportunities (see March *QST*) in these days of decreasing sun-spot activity. You don't have to think for long about using it before you wonder if your station is suitably equipped. What kind of gear . . . which modes . . . what types of antenna will work best?

Your first hurdle is in getting a signal on 2 meters. The satellite receives signals between 145.9 and 146.0 MHz and retransmits them in the segment 29.45 to 29.55 MHz. Any mode appearing within the 2-meter input passband will be repeated, but cw and ssb offer the most efficient use of Oscar. You should aim for about 100 watts of effective radiated power (erp). This can be achieved with 10 watts into a 10-dB antenna, 100 watts into a nondirectional antenna, or some such combination.

Transmitting Converter

An expedient way of getting your signal on 2 meters is through use of a transmitting converter. One good example, shown in the photo, is described in detail in the 1972 *Handbook* (page 198). The rig includes a power supply and receiving converter for two meters. Of course, the receiving converter is not needed for AOC operation, but

* Assistant Secretary, ARRL.



should be included if you anticipate direct two-meter operation, also. The "transverter" can be used with any 14- or 28-MHz exciter; about 20 watts PEP of drive is needed. To minimize exciter interference in your own receiver with Oscar's 10-meter down-link signals, 14 MHz rather than 28 MHz is recommended as the transverter input band. Crystal frequency (Y1) should be 43.9335 MHz. This will provide for conversion of 14 MHz to 145.8 MHz. The satellite's input band would then be tuned on your exciter's VFO dial from 14.1 to 14.2 MHz.

The transverter uses a 6360 final amplifier tube which should produce an output of about 20 watts PEP. Thus, an antenna gain of 7 dB would give you the desired erp of 100 watts. If you estimate a transmission line loss of 3 dB, an antenna gain of 10 dB would be needed.

A transmitting converter designed for use with a 6-meter rig is described in the League's *Vhf Manual* (page 121 in editions 1 and 2; page 125 in the 3rd edition). It, too, uses a 6360 as a final amplifier, but with a rated output of about 12 watts PEP. Power can be increased by use of a linear amplifier; or, about 9 dB of antenna gain (excluding line loss) will bring the 12 watts up to par.

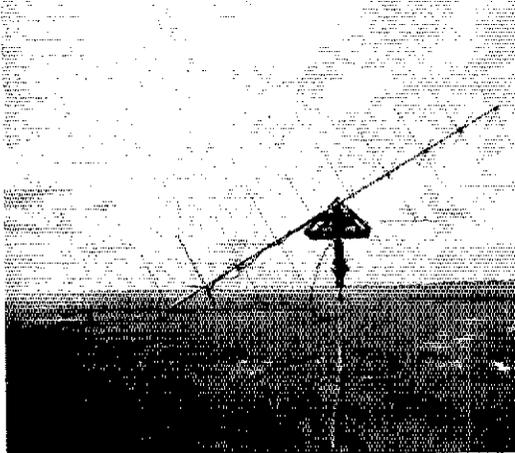
Cheap and Easy

As is true in other areas of amateur radio, cw can provide the simplest and most straightforward means of getting on the air. A cheap and easy way to put a signal into AOC is through use of a commercial surplus fm transmitter strip, modified to key the carrier. Most "high-band" rigs readily cover the 2-meter band. And, some of the older taxi cab and police gear is obtainable at low cost. Since fm won't offer the most efficient use of AOC,¹ such rigs are best modified for cw opera-

¹ Limited spacecraft output can more efficiently be shared by user stations with lower duty-cycle modes such as ssb or cw.

Fig. 1 -- This transmitting converter will heterodyne a 20-meter ssb signal up to Oscar's input passband at 2 meters.

Fig. 3 — An azimuth-elevation mount "steers" this crossed Yagi at WA1IOX. The elevation rotator is mounted on its side within a homebuilt tower section.



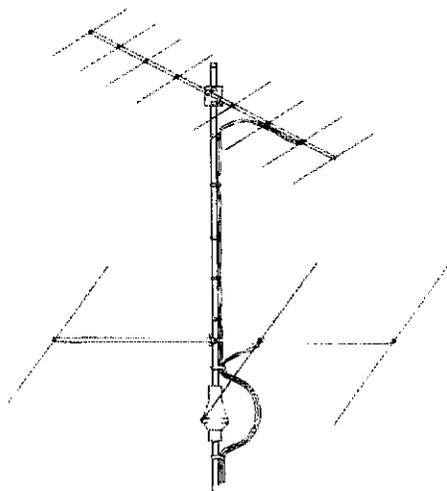
tion. In general, use of grid-block keying in two of the doubler stages will do the trick. If you should wish to key a transistor-type fm rig, keying could be applied to the emitters of the doublers. In order to use surplus fm gear — designed primarily for mobile operation — an ac power supply of conventional design will be needed.

Receiving

Almost any good amateur receiver of modern design, capable of tuning the 29.45 to 29.55 MHz range, will serve well for receiving signals from AOC. Because of the high level of man-made and galactic noise at 10 meters, an extremely good receiver front end is not required.² But, if your receiver sensitivity and performance at 10 meters are suspect, consideration should be given to the addition of a preselector.

Details on an 80- through 10-meter preselector appear in the 1972 *Handbook* beginning on page 255. The unit described is built on a 4 x 5-inch etched-circuit board and provides the necessary improvement to the receiver lacking in sensitivity. Some older or inexpensive receivers may also offer stability and calibration problems at 10 meters. In many cases, the solution lies in utilization of a converter, permitting the receiver to tune a lower frequency range, such as 80 meters. A down-converter of suitable design is described in the new *Handbook*, page 265. Output is from 3.5-4.0 MHz.

² Sensitivity of about one microvolt/meter will put the receiver noise sufficiently below the level of external noise sources.



To tune AOC's down-link, the frequency of Y1 should be 33.3 MHz.

Antennas

The antennas you use for AOC can contribute much to the effectiveness of your station. A particularly important item is the 10-meter receiving antenna. While simple antennas will work, superior performance can be achieved by employing a gain antenna. With a directive array, the strength of signals from AOC will be improved by the amount of antenna gain. Also, the directivity of the antenna will serve to provide immunity to noise sources not within the antenna's main lobe, thus further improving the signal-to-noise ratio.

A typical amateur installation with a 10-meter rotary beam or tribander at about 50 feet above ground should perform well for AOC work. An antenna mounted higher, thus having a lower angle of radiation, will be superior for maximum DX communication which occurs when the satellite is near your horizon. For passes closer to your station (at higher elevation angles), the lower antenna will pay off because of its higher take-off angle.

Signal levels of stations coming through Oscar will not all be the same.³ Thus, the stations with really effective receiving antennas will be the most successful in pulling out signals. However, if you don't have a beam, don't despair. Many AOC signals are expected to be strong enough for usable reception on a dipole. Even such a simple antenna should be rotated so that it can favor the heading of Oscar. A crossed dipole or turnstile antenna will produce a more omnidirectional pattern so that rotation becomes unnecessary.

While gain is of importance on 10 meters, your 2-meter transmitting antenna can be a simple

³ A detailed discussion by K2QBW on AOC propagation appears in the March, 1972, issue of the *Amsat Newsletter*. For a copy send an s.a.s.e. to Amsat, P.O. Box 27, Washington, DC 20044.

Fig. 2 — A practical antenna set-up for Oscar is a 10-meter beam (boom horizontal) plus a 2-meter Yagi mounted with an approximate elevation angle of 30 degrees.

dipole and still provide maximum (100 watts erp) performance. This is possible because you can use increased transmitter power to compensate for low gain. Indeed, 80-100 watts into a dipole will give you a "full power" signal at the satellite. Any signal stronger than this will either overload the repeater or cause age action to reduce Oscar's sensitivity. So, the 100 watt erp maximum should never be exceeded!⁴ If your rig's output is less than 100 watts, you can compensate by increasing antenna gain. For example, 50 watts to your antenna (after subtracting transmission line loss) is a ratio of 2:1 (100 watts erp required, to 50 watts output), and an antenna gain of 3 dB is needed for the desired erp. Gains for other ratios can be determined from Fig. 2-36 on page 40 of the *Handbook*.

If a gain antenna is used for transmitting, it becomes necessary to consider aiming it at the satellite. A moderate gain (less than 10 dB) two-meter antenna can be mounted at a fixed elevation angle of about 30 degrees (see Fig. 2). The take-off angle will then be high enough and beamwidth sufficiently broad to catch most AOC passes. For the greatest DX performance, however, the antenna should be mounted normally with the boom horizontal for the low-angle shots.

An azimuth-elevation mount can be used with the two-meter antenna for effective results. It will allow for pointing of the antenna directly at Oscar. One can be constructed using two conventional rotators mounted at right angles as shown in Figs. 3 and 4.

The polarization of the satellite's signals will be changing due to tumble and Faraday rotation. Thus, use of circular polarization on the ground will tend to minimize fading. Antennas such as a crossed Yagi or helix have been used with good results by many amateurs. You'll need an extra 3 dB of antenna gain, however, if you should use a circularly polarized antenna. Little difference will be experienced between use of conventional vertical or horizontal polarization, a distinction which loses meaning when the antenna is pointed skyward. But, aimed at the horizon, a vertical 10-meter beam will tend to receive a higher noise level than a horizontal antenna. Horizontal polarization thus has an advantage in this case.

Will you be ready?

The launch of Amsat-Oscar C is expected sometime this summer, leaving just enough time for you to get your station prepared. Approval has been granted by NASA for the "piggyback" ride into space with the Itos-D meteorological satellite. Upon launch, AOC will be redesignated Oscar 6. The necessary licensing waivers have been issued by FCC for Oscar's operation (see Happenings of the Month). In future issues we hope to have articles describing the design of AOC in greater detail, along with suggestions for operating techniques.

QST

⁴ Tricks for effectively reducing your erp, if it's already too high, will be discussed in a future article.

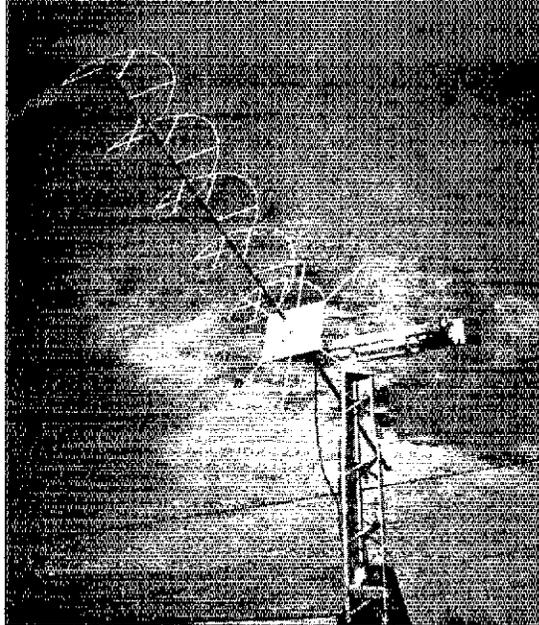


Fig. 4 - W9CJS built this az-el mounted helix. A relatively broad-banded antenna, the helix can be designed for Oscar use and still perform well near 130 MHz for weather satellites. (For helical antenna design info, see *Antennas* by John D. Kraus [W8JK], McGraw-Hill Book Co., Inc., 1950, New York.

Strays

The Foundation for Amateur Radio, Inc., a non-profit organization, with its headquarters in Washington, D.C., announces its intent to make the annual award of the John Gore Memorial Scholarship for either graduate or undergraduate study. The Scholarship pays \$500 for the academic year. Upon re-application, it is subject to being renewed for succeeding years.

Licensed radio amateurs who intend making a career in electronics or related sciences may now request the application for the academic year 1972-1973. Requests should be addressed to the Chairman, Scholarship Committee, 8101 Hampden Lane, Bethesda, MD 20014. Requests for applications must be postmarked prior to May 31, 1972.

To be eligible for the award, applicants must have completed at least one year in an accredited college or university and must be enrolled in a course of studies leading to a degree. They must be radio amateurs holding a valid FCC license of at least a General class level. All things being substantially equal, preference will be shown to applicants from the area served by the Foundation - the District of Columbia, Maryland, and Northern Virginia; however, applicants wherever resident are eligible.

The Foundation is devoted exclusively to promoting the interests of amateur radio and to those scientific, literary, and educational pursuits that serve to advance the purposes of amateur radio.

John W. Gore, in whose honor the Scholarship is named, was until his death in 1960, the President of the Foundation. A prominent radio amateur for many years, he was a Vice-President of the Bethlehem Shipbuilding Corporation in Baltimore, Maryland.

AMATEUR RADIO PUBLIC SERVICE

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In the Public Interest, Convenience, Necessity HRH

CONDUCTED BY GEORGE HART,* WINJIM

TIME TO REGROUP

IT IS A CHARACTERISTIC of most amateurs (perhaps most *people!*) that they feel that what they do is more important than what anybody else does. Moreover, within their own circle of advocates, they feel that the way they do it is superior to the way anybody else does it. This applies to DXing, working in contests, rag chewing, even to non-operating experimental and construction pursuits - and especially to the direct public service operating pursuits which all too many of us neglect.

But perhaps the characteristic is not really unfortunate. We all *should* feel that what we do is important; it inspires us to do it better, to strive for perfection, and this has a salutary effect on all of amateur radio. Where the unfortunate part comes in is that too often we tend to fight among ourselves over matters which are strictly internal to the amateur radio fraternity and which should be kept on a level-headed plane.

Well, we're supposed to be talking about public service in this column, so let's get down to it. Of all the groups within the amateur fraternity who fight among themselves to the point of complete separation, those trying to perform a public service are perhaps the worst. Yes, your conductor has been in the midst of such fights and is as bad as anybody else when it comes to having strong personal opinions. There have been fights about phone versus cw versus RTTY versus sideband/a-m/fm and hf/vhf, AREC/RACES/MARS, record traffic versus phone patching, NTS versus independent nets, and many others. Actually the word "fight" is strong and expressive but not strictly accurate, although the heat has been pretty high in some cases.

Too high, fellows and gals. The impression is being gained in many circles that we amateurs can

* Communications Manager, ARRL.

never render a decent or effective public service because we can't get along together, we can't agree even among ourselves on specifically what to do or how to do it, with the result that our public service efforts are divisive and duplicative, without unanimity or cohesiveness. Too many minority groups go their own way, refusing to become a part of any overall organization that doesn't function the way *they* want to function. This has opened the doors to various kinds of exploitation, dividing us still further.

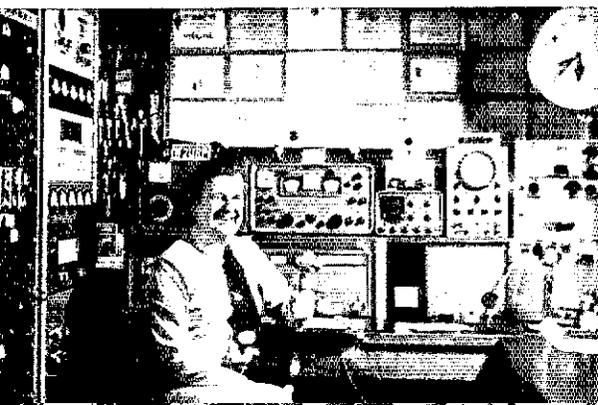
It's time to regroup, to close ranks and present a solid front to those who would be served by amateur radio for public benefit purposes. It's time to put things in their proper places, to define areas of controversy and analyze and resolve them without rancor, bitterness, invective or separatism. This means that compromises must be sought and accepted, for no single solution is going to be found that pleases anybody (not everybody, *anybody!*) one hundred percent.

A few examples of bitter controversies that have not been resolved are in order. We mention these in the order in which they occur, with no intention of order of importance.

The controversy raging right now, which brings the above subject to the fore for discussion, is the proposal for a daytime supplement to the ARRL-sponsored National Traffic System, with its corollary consideration of the status of the present system and ultimately the question of whether cw is an obsolete mode. The latter question was dragged in only because of allegations that NTS as it now exists is a "cw empire." It has brought some enraged comments from ardent NTSers as well as a few cw men, and some equally caustic comments from those engaged in independent phone net operation to the effect that the cw nets in particular and the League in general are floundering around in the horse-and-buggy age while closing their eyes to modern techniques. Compromise: NTS as it now exists has a good following, let it stand or fall on its own merits, with continued support from headquarters. If the current appointee poll is favorable, attempt to organize a daytime supplement for those operators who operate daytimes and wish to be part of the ARRL-sponsored system. Meanwhile, more en-

Pictured here is W2URP. Chuck has been active in many aspects of Public Service work and currently serves as SEC for Eastern N.Y.

QST for



This group of amateurs, which includes SCMs, SECs, ECs, OO's, and an Asst. SCM, gathered for a SET planning meeting in Riverside, Calif. in early Jan. Pictured seated, left to right, are: W6MNY, WB6CQR, WA6YWS, K6SJA. Standing: K6YCI, WB6FYM, K6GGS, W6PCB, W6SRS, W6NSN, K6QES, WA6TAG, WA6TVA, K6CID.



couragement to independent public service operations and interface between ARRL-sponsored and independent facilities.

The controversy between AREC and RACES has been in existence ever since RACES was established in 1951, and has never really been resolved. On the one side are those who contend that RACES is and was unnecessary, that with a little cooperation by the government agency responsible for civil defense the AREC could have been utilized as the amateur's civil defense arm, and that RACES is a grab for use of amateur frequencies by a government agency. On the other side are those who feel that it is necessary for the government to have complete control of any amateur operation in this sensitive area and that amateurs as such are not capable of administering a service which serves a government agency. The National Industry Advisory Committee's Amateur Radio Subcommittee was wrestling with this problem until FCC came out with Docket 19245, concerning the amateur's right to handle traffic for non-amateur organizations, but since the study involved many non-amateur organizations, no further progress was then possible until the Docket is settled. When this occurs, however, any subsequent proposal will have to be a compromise, because adamance seems to be prevalent on both sides.

Another controversial item: Is MARS amateur radio? One faction contends that the only thing amateur about MARS is that an amateur license is recognized as a symbol of eligibility, otherwise it is 100% military. The other side of this question is that all non-military MARS people are licensed amateurs engaged in a communications pursuit completely imbued with the spirit and flavor of amateur radio, and that military sponsorship is the only difference between it and any other kind of amateur radio. Compromise: Let's keep a place in our hearts for MARS, which has a long tradition of amateur cooperation behind it, and for the thousands of amateurs who take part in it, most of whom consider it a part of their amateur activities.

Other controversies exist, of course quite a few of them, but we hope we have made our point, which is that compromise is possible on nearly any kind of difference provided each side is willing to give a little. This is what we need to do in our public service aims: give a little. If we can do that we can successfully regroup and all push together in the same direction toward the ultimate goal of maximum public service, rather than against each other. - W1NJM.

Traffic Talk

Our topic for this month is the NJN (New Jersey Net) Bulletin for Sept. '71, in which we find three things *not* to do in a net, a product of the clear thinking of WA8FKQ who operated in NJN /2 for quite some time but who we understand has now left for other parts. Here's how Norm sees it:

1. Don't report into a new with a traffic list, then cancel it during the session. Either you have valid traffic or you haven't, and if you report it into the net, give the net a chance to handle it. Otherwise, you are wasting the NCS's and the net's time.

2. Don't ask to be excused from the net while you still have traffic, unless absolutely necessary. This is similar to the above (since your traffic list is automatically QTA when you QNO), but it is very discourteous. It just may be that NCS is holding stations on the net to handle your traffic as soon as opportunity permits.

3. After reporting in and listing your traffic, don't later remind the NCS you still have it. This is an insult to his ability as NCS and also wastes the net's time.

Being NCS is not an easy job. It requires a lot of mental agility, something we don't all have. When you have only *your* traffic to worry about, it's easy enough to be critical of an NCS when you don't think he's giving *you* enough attention. The experienced NCS operator is the one who suffers along with another NCS when he is having problems. Help your NCS along, don't throw obstacles in his path and heckle him.

National Traffic System. The "limited QNI" net is becoming more popular in NTS circles, and it helps speed things up considerably. In some of our snappier NTS nets at all levels, these days, the "receive only" stations don't report into the net at all; they merely handle traffic on a QNY frequency. Even on voice nets, which usually have to use the net frequency for handling traffic, the principle has application. Try it, you'll like it.

While the problems at the various NTS levels are not all the same, here, in general, is how it works. The NCS *knows in advance* that certain stations will be on deck to clear traffic for certain points. So the net starts with QNI only from those stations *with* traffic (which might include some of the above stations, of course). If side frequencies

(QNY) are available, as soon as traffic appears on the net for one of the unheard receive stations, the station holding it (A) is told to contact that receive station (B) on the side frequency and clear whatever traffic the latter is designated to take. After the traffic is cleared, Station A checks back into the net frequency, while Station B merely monitors the NCS for his next assignment.

Things happen, of course. For example, while Stations A and B are getting their traffic cleared, NCS decides to send Station C to the same side frequency to clear some traffic to Station A (QNO). In this case, then Station B reports in on the net frequency, to indicate to the NCS that the traffic from A to B has been cleared and that Station C has made contact with Station A on the side frequency. But if all Station B does is clear traffic, he may not report into the net at all, although he has certainly been a part of it.

An experienced NCS can do wonders in effecting prompt dispatch of traffic to experienced net stations, and this is especially applicable at the "higher" levels of NTS where the same NCS works with the same net stations on a particular night of the week. For example, on a Wednesday night on EAN, NCS K2KIR knows that K1SSH will be his CAN receive, W1NJM will be his PAN receive, and usually also knows who will be his receive stations from the various regions. Unless any of them has traffic, it is not necessary for them to report in at QNI time, and often they do not do so. If there is no traffic for the area or region represented, in some cases it might not even be necessary for the representative to transmit at all — except to get credit for receive representation in the net statistics. Similarly, knowing the other region people who will be present on Wednesday night, NCS can adopt all kinds of shortcuts to speed up the procedure, such as (1) using the first letter of the call suffix to indicate a return from QNY, (2) a single dit to acknowledge, (3) dispatching stations to a side frequency when he hasn't even heard one of them (but having full confidence that he is listening and QRV), and many other little quirks of NCSing when the NCS is familiar with his people and his people familiar with his methods. When an unfamiliar station appears, however, full procedure is used. No "snowing." It's the procedure that is snappy, not the codespeed. This is the main reason why EAN has had the highest "rate" of any NTS net consistently over the past many years. — W1NJM.

February reports: W3NEM reports his first perfect month since taking over the reins of 3RN. W9HRY expresses a belief that all Ky. traffic handlers went south for the winter. Bob issued annual certificates to WA9YSD and WB9ANT. An initial certificate went to WB9EAY. K7NHL reports the strange disappearance of all Wyoming stations from TWN but promises to organize a search party.

Net	Sessions	Traffic	Rate	Avg. Rep. (%)
EAN	29	2432	1.767	83.9 99.4
CAN	29	1714	1.439	59.1 100.0
PAN	29	1353	1.069	46.6 100.0
IRN	28	980	.555	16.9 95.4
2RN	58	766	.881	13.2 95.9
3RN	58	1210	.504	10.9 100.0
4RN	56	871	.478	18.5 95.5
RN5	56	1315	.612	23.5 96.0
RN6	58	828	.509	14.1 100.0
RN7	58	338	.376	5.8 61.0
8RN	58	726	.516	12.5 95.4
9RN	58	595	.513	10.2 91.4
TEN	58	870	.740	15.0 86.8
ECN	57	206	.232	3.6 89.0
TWN	52	282	.234	5.4 65.2
TCC Eastern	961	949		
TCC Central	871	787		
TCC Pacific	1161	1029		
Sections ²	2087	12393		
Summary	2803	29644	EAN	22.4
Record	3059	34238	1.494	24.3

Public Service Honor Roll February, 1972

This listing is available to amateurs whose public service performance during the month indicated qualifies for 30 or more total points in the nine categories below. A definition of the points awarded for each function is given in the category key at the end of the Honor Roll listing. Please note maximum points for each category. Those making fewer than 45 points are listed with point totals only.

Category	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Total
Max. Pts	10	10	12	12	20	5	5	5	5	
WA3JQZ	10	10	12	12	12	9	3		5	73
WA2EPI	10	10	12	12	12	10	3			69
WB8BMV	10	10	12	12	12				5	62
WB2AEH	10	10	12	12	12					61
WB4KDI	10	10	12	12	12					61
W0LRW	10	10	12	12	12					61
WB4SON	10	10	12	12	12		3			59
W7BO	10	8	12	12	12					59
WB6ZVC	10	10	12	12	9					58
K3ZNF	10	10	12	12	12	1				57
WA9VAS	10	10	12	12	12	20	3			57
WA2UO	10	10	12	12	12					56
WA3NAZ	10	10	12	12	12		1			56
WA3PIC	10	10	12	12	12					56
WB4SVH	10	10	12	12	12					56
K9BAD/4	10	10	12	9	12		3			56
V01CA	10	5	12	12	12					56
V01GQ	10	10	12	12	12					56
W3FCS	4	10	12	12	9	2				54
K7CTP	10	10	12	12	10					54
K4BR	10	10	12	12			3			52
WA7JQS	10		12	12	14					52
W7OCK	10	5	8	12	12					52
WA1NNL	10	5	12	12	12					51
WB5DEK	10	10	12	12	2					51
WB9ANT	10	10	12	12	2					51
WB4DAJ	10	10	12	12						49
WB4PNG	10	10	12	12						49
W8SBM	10	10	12	12						49
WA6TVA	10	10	12	12						49
K0MRI	10	10	12	12						49
VE3FRU	10	10	12	12						49
VE3GFN	10	10	12	12						49
WB2HFG/S	10	2	12	12						47
W4NOG	10		12	20						47
WA6DI-1	10	10	12	3	12					47
WB4PTH	10	10	12	12	2					46
W0YC	10	10	12	12	2					46
WA3ERV	10	10	12	12	1					45

W2RU	44	W1UBG	39	K4KNP	34
WA2ICU	44	W2FR	39	W6YHV	34
K3JG	44	W2RDE	39	W9HRY	34
WB4JMH	44	WA3PI	39	W9QLW	34
K5ROZ	44	W1JOS	39	VE5AWF	34
WB6XKM	44	W1NEM	39	VE3PWD	34
W7EM	44	WB4NCH/4	39	VE3HXI	34
K7OUF	44	W4ZJY	39	VE6KK	34
W7PI	44	WB8BYJ	39	W12PV/9	33
WA6JIC	44	W0HI	39	W6JTA	33
WA8SJC	44	VE3DPO	39	W6OAW	33
VE3DY	44	WB4THU	38	WB4FOS	32
VE4EA	44	W7LRK	38	WB4D1	32
VE6YI	44	W2MTA	37	W0HHY	32
WA4VW	43	K6IYK	37	VE3RPP	32
W1BVR	42	K2KTR	36	VE3GRR	32
WA2VLS	42	WA3SUF	36	VE3SB	32
WB4EKJ	42	WA2HO	35	W3YA	31
WB9AHJ	41	W4UO	35	W8IHK	31
WA6ZTW	41	W5RBB	35	WA2AL/4	30
WA6YTW	40	W1CE	34	WA2CCF	30
WA6VYB	40	WA2LLD	34	K3MVO	30
		W3GKH	34		

* Denotes multioperator station.
Category Key: (1) Checking into cw nets, 1 point each; (2) Checking into phone/RTTY nets, 1 point each; (3) NCS cw nets, 3 points each; (4) NCS phone/RTTY nets, 3 points each; (5) Performing assigned liaison, 3 points each; (6) Legal phone patches, 1 point each; (7) Making BP, 3 points regardless of traffic total; (8) Handling emergency traffic directly with a disaster area, 1 point each message; (9) Serving as net manager for entire month, 5 points.

¹TCC functions not counted as net sessions.

²Section nets reporting (65): AENB, AEND, AENM, AENT (Ala.); NCN, WARN, OrgCoARFC, OrgLO (Calif.); CHN (Colo.); CN, NVHFTN (Conn.); QFN, PMTN, VEN, WFPN (Fla.); GSN, GTN (Ga.); ILN (Ill.); QKS (Kan.); KTN (Ky.); LAN (La.); SGN, PTN (Me.); MDCTN (Md.); WMN (Mass.); MNN, QMN (Mich.); PAW, MSN, MJN, MSPN (Minn.); NHVTN (NH and Vt.); NJEPTN, PVTEN (N.J.); NYS, NLI (N.Y.); ONL (N.C. and S.C.); SSEN, OSSBN, APRMN, BNR (Ohio); EPA, WPA, GCRN, PTN (Pa.); RISPAN (R.I.); TEX, TEN (Tex.); BUN (Utah); VSBN (Va.); WSN, NSN, PSEN (Wash.); WVNN (W.Va.); WIN, SWERN, WSSN, BEN, BWN, WBSN (Wis.); APSN (Alta.); MTN (Mont.); GBN (Ont.); WQV/UHF (Queb.); SATN (Sask.).

Transcontinental Corps. W7DXZ reports everything running smoothly for TCC Pacific. John says that W6VNO is back in the saddle as Director after returning from an off season vacation. W3EML reports as follows: "Feb. was a pretty fair month with traffic holding up well and only two failures. The good month was in spite of the Director's problems in filling nine long haul function assignments permanently and coming up with a few substitutes." W0LCX also reports an excellent month for TCC Central with only two failures reported.

Area	Functions	% Successful	Out-of-Net	
			Traffic	Traffic
Eastern	96	98.0	2822	949
Central	87	97.7	1602	787
Pacific	116	97.4	2058	1029

The TCC roster: Eastern Area (W3EML, Dir.)— W1s BIG NJM QYY YNE, K1SSH, W2s FR GKZ, K2KTK, WA2s ICU UWA, W3EML, K3MVO, W4s SOQ UQ, K4s KNP VDL, W8s IBX PMJ RYP VDA/4, K8KMQ, WA8PIM. Central Area (W0LCX, Dir.)— WB2UFG/5, W4s OGG ZJY, WB4KPE, W5s MI QU SBM, W9s CXY DND YB, W0s HI INH LCX ZHN, WA0s IAW MLE, K0AEM. Pacific Area (W6VNO, Dir.)— W5RE, K5MAT, W6s BGF EOT IPW MLF MNY RSY VZT, WA6s DEI LFA, W7s BQ EM KZ PI DZX EKB GHT, W0LQ, K0JSP.

Independent Net Reports (Feb.)

Net	Sessions	Traffic	Check-ins
Intl. Mission Radio Assoc.	23	345	966
East Coast Teenage Traffic	29	94	260
Hit & Bounce Morning Watch	29	1250	356
75 Meter Inter-State SSB	29	266	1126
Northeast Traffic	29	659	425
7290 Traffic	42	330	1829
Eastern Area Slow	28	108	188
Forty Meter CW Traffic			
& Emergency	29	62	157
All Service Net	4	39	57
Clearing House Net	25	352	409
North American 20 Meter SSB	25	224	308
Interstate 20 Meter SSB	21	1851	416
Mike Farad Emergency & Traffic	25	246	314

Public Service Diary

A number of Alberta amateurs responded to a request by YV7KBY/YV1 for a rare drug. The drug was needed by doctors in Venezuela to save a patient's eye. VE6AQF was the first to hear the call and he immediately alerted VE6XJ. In the meantime, WB4UPD broke and offered to try to locate the drug through his facilities. VE6XJ finally located the manufacturer of the drug and arrangements were made to have it transported to Venezuela. Other amateurs participating in this event were VE6FK, VE6YL, VE6AA, and W5VIE. -- (VE6YL)

Lancaster Co., Pa. amateurs were kept busy providing a number of services during a heavy snow storm on Feb. 19 and 20. A number of health and welfare messages were originated on behalf of stranded motorists. These were handled first on 2

BRASS POUNDERS LEAGUE

Winners of BPL Certificates for Feb. Traffic

Call	Orig	Rced	Rel	Del.	Total
W3CU/4	260	1839	1784	31	3914
K0ONK	116	695	689	14	1434
WA5VJW	723	258	67	166	1224
K0ZSO	—	522	—	522	1044
W7BA	29	498	450	45	1022
W1QYY	31	484	474	11	1000
WA4JH	7	472	463	6	948
K3BHU	20	455	414	22	911
WA2EPI	97	323	236	87	743
W0LCX	16	394	316	11	737
W6RSY	29	371	292	19	711
WA0VAS	118	286	14	272	690
W3VR/4	167	270	211	14	662
W3EML	46	354	236	2	638
K3NSN	14	300	300	—	614
WB2WEI	21	296	214	76	607
W1PEX	30	294	272	5	601
W0ZWL	1	344	—	248	593
K0BAD	19	274	287	2	582
WA3QDZ	113	263	145	57	578
WA3GCM	69	272	227	9	577
W5QU	102	186	225	32	545
W1EFW	86	258	165	15	524
W4BFX	58	239	224	2	523
W0CKY	27	246	254	2	519
WB2JZ	33	255	173	55	516
K6UYK	117	206	165	25	516
K5TFY	12	301	299	—	502
W9CXY(Jan.)	25	254	250	2	531

More-Than-One Operator Station

W4DUG/4	2306	—	—	2306
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BPL for 100 or more originations-plus-deliveries

WB6VTK	287	WB4SON	132	W8JBC	107
K8ONA	186	WA3QU	126	K1BCS	102
W4OGG	172	W4QYV	121	WB8FNC	102
K3BR	154	W3TN	119	WA3SU/1	100
W4SMCR	144	K8NQW	118	WA3QU(Jan.)	149
K5TYP	137	W4YPA	110	WB4RNT(Jan.)	110
W2OE	133	WB4PSP	109	WB21YV(Jan.)	100
		WB4JJK	107		

More-Than-One Operator Station

VA2UN	124	WB4TON/4	114	WSAC	106
		VA2UN(Jan.)	100		

BPL Medallions (see July, 1968 QST, p.99) have been awarded to the following amateurs since last month's listings: WB4KSG.

The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SCM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL form.

meter fm and then relayed to a number of 75 meter phone nets.

During the storm, W3DNU mobile became stranded in the snow. A call on his two meter fm mobile transceiver resulted in assistance from a number of amateurs. With their help, W3DNU was on his way again within fifteen minutes. -- (K3VAX)

On blustery Feb. 22, WB0CAU mobile spotted a fire on the railroad right of way about ten miles east of Chadron, Neb. Contact was established with WA0JKN at Chadron who alerted the railroad company and the fire department. The fire was extinguished before it had spread outside the railroad right of way. If it had not been for the timely arrival of WB0CAU, the high wind blowing at the time could have easily spread the fire to adjoining timber. -- (K0ODE, SEC Neb.)

The Apricot Message Net of Ohio again swung into action handling health and welfare messages during the recent flood disaster in West Virginia. On the morning of Feb. 27, EC W8GRG listed all



A Certificate of Appreciation from the Kentucky Traffic Net was presented to WB4EOR (left) by net manager K4MAN at the Lexington, Ky. Hamfest held last Oct.

Florida Cerebral Palsy Telathon held in Orlando, Fla. on Feb. 13 and 14. A number of two meter fm base stations in surrounding cities and town updated pledge totals to the Telathon winners while others with hand carried portable units provided communications between officials within the auditorium. - (W4LSR)

affected towns where inquiries could be directed. Announcement of the net's action was made over a number of Ohio radio and television stations as well as in a number of newspapers. Before operations had secured, a number of days later, over fifteen local Ohio amateurs had taken part. - (KSONA)

On Feb. 19, a group of amateurs provided communications for a special "March of Dimes" on which young people marched twenty miles around Lake Hefner in Okla. for contributions to the March of Dimes. Various check points were manned using two meter fm walki-talkies and a few requests for first aid were handled as well as reporting on the progress of the march. - (WA5FSN, SEC Okla.)

On Feb. 28, W6AJZ of Santa Monica, Calif. responded to an emergency call from KC4USP at Palmer Station, Antarctica. KC4USP reported that two Navy aircraft returning to Christchurch, New Zealand were short of fuel and unlikely to make their destination. Due to abnormal radio conditions, Palmer Station had no contact with Christchurch. W6AJZ was requested to phone the Naval Station in Miami, Fla. and request them to notify Christchurch that both aircraft were attempting an alternate landing at Dunedin, New Zealand. It was urgently required that this airport implement emergency conditions including the turning on of all landing and field lights.

On Feb. 19 and 26 a group of Alberta amateurs provided communications for snowshoe races. A number of check points along the route reported the progress of the races to a centrally located base station. Over a dozen amateurs took part in this activity. - (VE6PM)

Informed of the situation, the Navy in Miami contacted Washington, D.C. For the next forty-five minutes all communications between Palmer Station, Washington and Christchurch were relayed by W6AJZ.

Thirty-three SEC reports were received for the month of February accounting for 10,491 AREC members. Sections reporting: Alta, Colo. Conn. EFla, ENY, Ind, Iowa, Kan, MDC, Mich, Minn, Mont, Neb, Nev, NNJ, NTex, Ohio, Okla, Ont, Org, Oreg, Sask, SV, SDgo, SD, SNJ, Tenn, Utah, Va, Wash, WFla, WMass, WPa.

Virginia was inadvertently omitted from the list of sections with 100 per cent SEC reporting for 1971 that appeared in last month's QST.

During this period KC4USP reported that radio contact had been lost with one of the aircraft. By authority of the Commanding Officer of Palmer Station, an emergency status was declared. Washington, D.C. then reported that all required emergency measures had been implemented at Dunedin airport and that air-sea rescue facilities on the southern island had been alerted. With all emergency preparations in New Zealand confirmed, radio contact with KC4USP was secured.

During the night and early morning hours of March 3, about a foot of snow fell on the small towns of Pottersville and Chestertown, N.Y. The snowfall was heavy enough to force the closing of local schools. In trying to reach a radio broadcast station some 90 miles away to inform them of the closing, school officials discovered that all long distance telephone lines were out of order. They then turned to WB2DUJ, an ex-school teacher in Pottersville, for assistance. WB2DUJ put out a call on the AREC six meter frequency and was answered by K2AYQ who made the call to the broadcast station who in turn notified the general public of the closing. During the remainder of the day K2AYQ and WB2DUJ monitored 51.0 MHz in the event that their services would be needed again. Late in the afternoon it was necessary to obtain information on a scheduled evening school function. WB2DUJ sent the request to K2AYQ who in turn relayed it to WA2AQD in Glens Falls. WA2AQD obtained the needed information and passed it back to K2AYQ. (K2AYQ, EC Glens Falls, N.Y.) QST

Later that day W6AJZ was advised that both aircraft had landed safely. - (W6AJZ)

Using a repeater, a total of thirty-two amateurs provided communications for the annual Central

WB5AXM, pictured here is only one of a number of amateurs who provided communications for the March of Dimes Walkathon held on Jan. 22 in Brazoria Co., Texas.



QST for

VHF QSO Party Announcement

Starting Time 1900 GMT, June 10
Ending Time 0600 GMT, June 12
 Operate any consecutive 28-hour period

IF YOU haven't already done so, it's time now to start planning for this year's June VHF QSO Party scheduled to take place June 10-12.

You may operate any consecutive 28-hour period, working the same station on different bands for additional QSO and section credit. All that is necessary is to exchange your sections. Your final score equals the total QSO points times the total number of band-sections worked.

Read the rules carefully, then send right away for your free contest logs, being sure to state the quantity desired (38 QSOs per log sheet). To aid us in getting these logs to you as fast as possible, please be sure to include with each request a self-addressed stamped legal-size envelope containing your full name, call and mailing address complete with Zip code. We can send 5 log sheets First-Class for 6 cents postage. Using this as a guideline, you can estimate the amount of postage to include.

Be sure your entry is postmarked no later than July 4th and don't forget to include comments and pictures with your log. — **W4IKQM**

Rules

1) The June 1972 VHF QSO Party begins at 1900 GMT, Saturday, June 10, and ends at 0600 GMT, Monday, June 12. Entrants may operate any continuous 28-hour period beginning no earlier than 1900 GMT Saturday (starting on the hour) and ending no later than 0600 Monday. All claimed contacts must be within the chosen 28-hour period and must be made on amateur frequencies above 50 MHz., using authorized modes of operation.

2) Name-of-section exchanges must be acknowledged by both operators before either may claim contact point (s). A one-way exchange, confirmed, does not count, there is no fractional breakdown of the 1-, 2-, or 3-point units.

3) Fixed-, portable- or mobile-station operation *under one call*, from one location only, is permitted. A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period (with the exception of family stations where more than one call is assigned to one location by FCC/DOC).

While no minimum distance is specified for contacts, equipment in use should be capable of real communications (i.e. able to communicate over at least a mile).

Contacts made by retransmitting either or both stations do not count for contest purposes.

4) Scoring: 1 point for completed two-way on 50 or 144 MHz., 2 points for such exchanges on 220 or 420 MHz., 3 points for such exchanges on the higher vhf bands. The sum of these points will be multiplied by the number of *different* ARRL sections worked per band; i.e., those with which at least one point has been earned. Reworking sections on additional bands for extra section credits is permitted. Crossband work does not count. Aircraft mobile stations cannot be counted for section multipliers.

5) Foreign entries: all contacts with foreign countries (such as Mexico and the Bahamas) count for score. All foreign countries are grouped together, and a multiplier of *no more than one* (per band) may be claimed for contacts with all foreign stations worked. Foreign stations may only work stations in ARRL sections for contest credit and will give their country name.

6) A contact *per band* may be counted for each station worked. Ex., W2EIF (S.N.J.) works K1YON (Conn.) on 50, 144 and 220 MHz. for complete exchanges. This gives W2EIF 4 points (1-1-2) and also 3 section-multiplier credits. (If W2EIF contacts other Conn. stations on these bands, they do not add to his section multiplier but they do pay off in additional contact points.)

7) Each section multiplier requires a complete exchange with *at least* one station. The same section provides another multiplier point only when contacted on a new vhf band.

NAME **K1ZNR** QTH **CT**

Call	Band	Mode	Points	Section	Score
44 1903	K1ZNR	CT	1		1
1918	K2FA	W1	2		2
50 1933	K1MUS	CT	1		1
1937	W1HNS	EFL	2		2
220 1958	K1YON	CT	1		1
420 2232	W1QW7	W1	2		2
425 2347	W110X	CT	1		1
706 13					
144 0031	W110X	CT	3		3
0042	K1NTV	CT	1		1
0217	W1RSH	W1	4		4

Single operator Multiple operators
 Total points: 14
 Total sections: 9
 Final score: 126
 Name: **K1ZNR**
 Address: **1440031 W110X, Middletown, CT 06457**

8) Awards: Entries must be postmarked no later than July 2, 1972. A certificate will be awarded to the high-scoring single-operator station in each ARRL section. In addition, the high-scoring multioperator station will receive a certificate in each section from which three or more valid multiple-operator entries are received. Certificates will also be given to the top Novice in sections of less than three entries, who in the opinion of the Awards Committee, displayed exceptional effort. Awards Committee decisions will be final.



Back Copies and Photographs

Back copies of *QST* referred to in *QST* issues are available when in print from our Circulation Department. Please send money order or check — 75c for each copy — with your order; we cannot bill small orders nor can we ship c.o.d.

Full size (8 by 10) glossy prints of equipment described in *QST* by staff members (*only*) can be furnished at \$2.00 each. Please indicate the *QST* issue, page number, and other necessary identification when ordering, and include full remittance with your order — we do not bill or ship c.o.d.

Sorry, but no reprints of individual *QST* articles are available, nor are templates available unless *specifically* mentioned in the article.

9. Miscellaneous Rules:

a. Operators participating in the FD may not, from any other station, contact for point credit the FD portable station of a group with which they participated. This is intended to outlaw any kind of manufactured contacts.

b. A station used to contact one or more FD stations may not subsequently be used under any other call during the FD period. This rule is intended to outlaw multiple contacts on the same band with the same station, using different calls. It is not, however, intended to prohibit the use of jointly-owned stations which are normally used under different calls by members of the same family.

c. Any Class A group whose entry classification is three or more transmitters may also use one novice operating position (to be set up and operated only by novice class licensees) without changing their basic entry classification. The novice position must use a novice call sign and must keep their own logs and check sheets. The novice position QSO total may be added to the group QSO total before multiplier.

10. Scoring: Scoring is based on the number of valid contacts times the multiplier corresponding to the highest power used at any time during the FD period, plus bonus points. Power Multipliers. If all contacts are made using a dc input power of 10 watts or less and if a power source other than commercial mains or motor-driven generator is used (e.g. batteries, solar cells, water-driven generators, etc.), multiply by 3. If any or all contacts are made using a dc input power of 200 watts or less, multiply by 2. Multiply by 1 if any or all contacts are made using a dc input power over 200 watts up to 1000 watts. Over 1000 watts, multiply by ZERO! Power on sb phone is considered to be half the peak envelope power. 1. Batteries may be charged while in use for Class C entries only. For other classes, batteries may be charged (during the FD period) from a power source independent of the commercial mains. Bonuses. The following bonus points may be added to the score (after the multiplier is applied) to determine the final score. Only Class A and B stations are eligible for bonuses.

1. 100 points for 100% emergency power, per transmitter classification. ALL equipment and facilities at the FD site must be operated from a source independent of the commercial mains.

2. 50 points for public relations. Publicity must be obtained or a bona fide attempt to obtain publicity must be made. Evidence must be submitted in the form of a clipping, a memo from a BC/TV station stating publicity was given or a copy of material sent to a news media for publicity purposes.

3. 50 points for message origination. A message must be originated by the club president or other FD leader, addressed to the SCM or SEC, stating the club name (or non-club group), number of operators, field location and number of AREC members participating. The message must be transmitted during the FD period and a fully serviced copy of it must be included with the Field Day report.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	10	
1																												
2																												

If the Op Aid 6 system is used (see sample above), enter the suffix of each station worked in the appropriate call area block under the first letter of the suffix. Just enter Ws; underline Ks; circle WAs; and double underline WBs. (For example, WA1NFS, would be listed by taking the letters FS, placing them under the N column and circling same since the prefix is WA.) Whatever dupe system you choose, be sure to submit a separate listing of stations worked *per hand* in numerical order (by call area) and alphabetical order (by suffix within each call area). Remember, each phone and each cw segment is considered as a separate band.

4. 5 points for each message received and relayed during the FD period, up to a maximum of 50 points. Copies of each message, properly serviced, must be included with the Field Day report. Club Aggregate Mobile Score. Entries under Class C may be combined to form an aggregate score for their club, having no connection with the club's portable entry, if any. Individual reports must include the club name. The club secretary or other designated club official must submit the club aggregate mobile score claim. Only bona fide members of a club operating in the club territory (175 mile radius from the club headquarters address) may contribute to this aggregate mobile score.

11. Reporting: Entries must be received by ARRL Headquarters by August 1. The proper summary sheet, plus a list of stations worked on each band and appropriate profit(s) for bonuses constitute an entry. A copy of your FD log is *not* required unless specifically later requested by ARRL. This does not, of course, relieve you of the responsibility of keeping an operating log as required by FCC/DOC. Send a stamped addressed envelope to ARRL Hq. for FD forms which include the rules, a summary sheet and a sample of a suggested check sheet.

QST

Strip-Line Amplifier

(Continued from page 62)

square inches area, any shape, on opposite sides of the chassis wall. Insulate these from the chassis with 10-mil mylar. Drill a half-inch clearance hole for the metal screw which is to act as the through connection.

The diode, CR1, can be a Schottky-barrier type, HP-2800, as well as the 2301 specified.

K2RIW added a suggestion that should be helpful in obtaining maximum efficiency with any uhf power amplifier. Even with this highly-effective design, there is some slight increase in tube capacitance as the anodes heat during a transmission period. If the plate circuit is detuned slightly on the low-capacitance side of resonance, after the amplifier has reached its stable output condition, the stage will drift into maximum output rather than drifting out of it.

References

5 Scott, "Is Today's Standard for Microwave Radiation Safe for Humans?" *Microwaves*, January, 1971, p.9.

6 Telewski, "432-MHz Corner-Reflector Antenna," *Ham Radio*, November, 1971, p. 27.

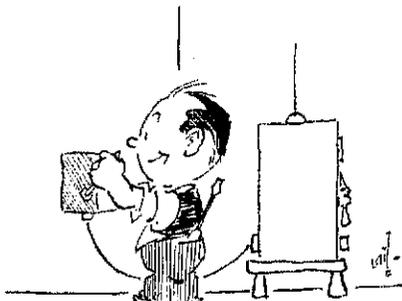
7 Wild, et al, "Handbook of Tri-Plate-Microwave Components," Sanders Associates, Inc., November, 1956. Document AD110157, from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22151.

8 Chisholm, et al, "Properties of 400-Mc. Long-Distance Tropospheric Circuits," *Proceedings of the IRE*, December, 1962, p. 2464.

9 Klein, "From the President's Desk," *Amsat Newsletter*, June, 1971.

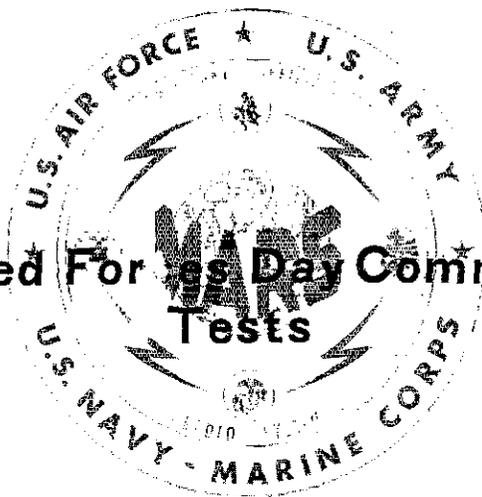
10 Moonray references: November, 1967, *QST*; March, 1969, *CQ*.

QST



DO YOU KILL ALL TRANSMITTER CIRCUITS COMPLETELY BEFORE TOUCHING ANYTHING BEHIND THE PANEL?

1972 Armed Forces Day Communication



THE RADIO AMATEUR operators' contributions to the field of communications, assistance in promoting international goodwill and military morale and providing emergency services, are recognized by every echelon of the military services. Each year, on the third Saturday in May, the Department of Defense sponsors the observance of Armed Forces Day. This year's observance, the twenty-third, will be held on Saturday, May 20, 1972. As in past years, as one of the many Armed Forces Day Programs, the Departments of the Army, Navy and Air Force will conduct radio communication tests. These tests are designed to be a tangible demonstration of the firm and long-standing Department of Defense policy to encourage and support amateur radio activity and the partnership and mutual respect enjoyed between the U.S. amateur and the U.S. military.

The communication tests will consist of military-to-amateur crossband operations, using continuous wave (cw), voice (ssb) and radioteletypewriter (RTTY) modes of operation and cw and RTTY receiving tests. Special QSL cards confirming crossband communications will be forwarded to those amateurs who establish two-way contact with participating military stations. Certificates will be awarded to those who aptly demonstrate *their operating ability and technical skill by receiving an acceptable copy of the Secretary of Defense originated cw and/or RTTY message(s) transmitted during the receiving portion of the communication tests.* Interception by shortwave listeners (SWL) will not qualify for a QSL card in confirmation of communications. However, anyone who has the equipment and the ability may copy the Secretary of Defense messages and receive a certificate.

Military-to-Amateur Crossband Test

The military-to-amateur crossband operations will be conducted from 20/1400 GMT to 21/0245 GMT. The military stations, WAR, NSS, NPG, and AIR will transmit on military frequencies and listen for amateur stations transmitting in the portions of the amateur bands indicated below. Additionally, consistent with operational and training commitments, a U.S. Navy aircraft using the call sign NSSAM will conduct crossband operations on frequencies listed below while flying at 21,000

feet over various cities at times indicated. Amateur operators should monitor the frequencies plus or minus one hour.

Station	Mil. Freq (kHz)	Emission	Ham Band (MHz)
WAR (Army Radio Washn. D.C.)	4001.5 4020 4030 6997.5 14,405 20,994	cw lsb RATT cw cw lsb	3.5-3.65 3.8-4.0 3.65-3.8 7.0-7.2 14.0-14.2 21.25-21.45
NSS (Naval Comm. Station, Washn. D.C.)	3385 4012.5 4040 6970 7301 7350 7380 13,827.5 14,385 14,400	cw RATT lsb lsb cw cw RATT RATT usb cw	3.5-3.65 3.65-3.8 3.8-4.0 7.2-7.3 7.1-7.15 7.15-7.2 7.1-7.2 14.1-14.2 14.2-14.35 14.0-14.1
NSSAM (Navy Aircraft)	Depart Washington, D.C. 20/1300 GMT; Providence, RI 20/1400 GMT; Buffalo, NY 20/1500 GMT; Indianapolis, IN 20/1630 GMT; Memphis, TN 20/1730 GMT; New Orleans, LA 20/1830 GMT; Tallahassee, FL 20/1930 GMT; Miami, FL 20/2030 GMT; Jacksonville, FL 20/2115 GMT; Spartanburg, SC 20/2215 GMT; Washington, D.C. 20/2300 GMT.		
	2790 49,692.1 143,820.1	usb a-m a-m	3.8-4.0 50.1-54.0 144.1-146.0
NPG (Naval Comm. Station, San Francisco, CA)	4001.5 4005 4010 6971.5 7301.5 7347.5 7365 13,922.5 14,356 14,375 14,389 49,992.1 143.71	lsb cw cw cw lsb RATT cw RATT usb cw usb a-m, usb, cw, fm a-m, usb, cw	3.8-4.0 3.5-3.8 3.7-3.75 7.0-7.1 7.2-7.3 7.1-7.2 7.1-7.2 14.1-14.2 14.2-14.275 14.0-14.1 14.275-14.35 50.0-54.0 144-148
	** 148.411 ** 148.951 * 222	a-m, afsk fm a-m	144.1-148 144.1-148 220-225
	* To be operated from Mt. Vaca ** To be operated from Mt. Diablo 1 MHz		

AIR	4025	lsb	3.8-4.0
(Air	7305	lsb	7.2-7.3
Force	7315	cw	7.0-7.2
Radio	13,997.5	cw	14.0-14.2
Washn.	14,397	usb	14.2-14.35
D.C.)			

Cw Receiving Test

A "cw" receiving test will be conducted for any person capable of copying International Morse Code at 25 words per minute. The cw broadcast will consist of a special Armed Forces Day message from the Secretary of Defense addressed to all radio amateurs and other participants. The schedule for this broadcast is as follows:

Time	Transmitting Station	Frequencies (kHz)
20 May 1972		
21/0300 GMT	WAR - Army	4030, 6997.5 14,405
20/2300 EDST	NSS - Navy	4012.5, 7350 14,385
20/2000 PDST	NPG - Navy	4005, 6971.5 14,375
	AIR - Air Force	7305, 13,997.5 Force

RTTY Receiving Test

A Radioteletypewriter RTTY receiving test will be conducted for any individual amateur or station possessing the required equipment. This is a test of the operator's technical skill in aligning and adjusting his equipment, and serves to demonstrate the growing number of amateurs becoming skilled in this method of rapid communications. The RTTY broadcast will consist of a special Armed Forces Day message from the Secretary of Defense to all radioteletypewriter enthusiasts. The message will be transmitted at 60 words per minute in accordance with the following schedule:

Time	Transmitting Station	Frequencies (kHz)
20 May 1972		
21/0335 GMT	WAR - Army	4030, 6997.5 14,405
20/2335 EDST	NSS - Navy	4012.5, 7350 14,385
20/2035 PDST	NPG - Navy	4010, 7347.5 13,922.5 148.41 MHz
	AIR - Air Force	7305, 13,997.5

Submission of Test Entries

Transcriptions should be submitted "as received." No attempt should be made to correct possible transmission errors.

Time, frequency, and call sign of the station copied as well as the name, call sign (if any) and address, including Zip code, of the individual submitting the entry must be indicated on the page containing the test. Each year a large number of acceptable copies are received with insufficient information, thereby precluding the issuance of a certificate.

Entries should be postmarked no later than 25 May 1972 and submitted to Armed Forces Day Tests, Chief, Navy-Marine Corps MARS, 4401 Massachusetts Avenue, N.W., Washington, D.C. 20390, Mail Stop 394.

Other Activities

As they did last year, several military groups are offering certificates to anyone contacting them.

The 128th Air Refueling Group (TAC), Wisconsin Air National Guard, WA912ZL, will be operating as follows:

14.295 MHz ± 5 kHz	1300 - 2100 GMT
7.280 MHz ± 5 kHz	1300 - 1730 GMT
21.360 MHz ± 5 kHz	1730 - 2100 GMT

Send your QSL to WA912ZL, 128th Air Refueling Group (TAC), General Mitchell ANG Base, Milwaukee, WI 53207.

The 143D Communications Flight, Rhode Island Air National Guard will be operating and will send a certificate to those contacting them. The operating schedule of their station, K1FCO, is as follows:

14.310 MHz ± 5 kHz	ssb	1300 - 1430 GMT
21.375 MHz ± 5 kHz	ssb	1430 - 1530 GMT
50.7 MHz	a-m	1300 - 1530 GMT
7.280 ± 5 kHz	ssb	1300 - 1530 GMT

Send your QSL with an s.a.s.e. to K1FCO, 143D Communications Flight, E. F. Green Airport, Warwick, RI 02886.

The U.S. Naval Academy's ARC will operate six stations during the 24-hour period on May 20. NØNNN will engage in military to amateur QSOs on 4008.5 kHz cw and 7385 kHz cw/lsb from 1400 GMT through 0245 GMT (May 20-21). WJ3SNA will handle the amateur QSOs from 0401 GMT to 0359 GMT (May 20-21). The schedule will be:

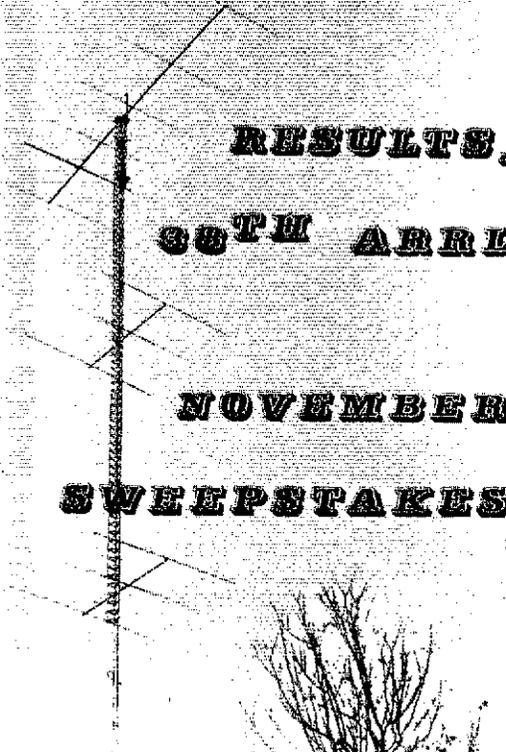
Cw	Ssb	Novice
3590	3930	3718
7060	7260	7175
14,060	14,280	21,125
21,060	21,385	
28,060	28,610	

Send QSLs to W3ADQ, U.S. Naval Academy ARC, Radio Rm 726, USNA, Annapolis, MD 21204. 

Strays



General John D. Ryan, Chief of Staff USAF, presents a plaque to Senator Barry Goldwater, commemorating the 100,000th phone patch through MARS Station AFATUGA. Looking on is the Hon. Robert C. Seamans, Jr., Secretary of the Air Force.



RESULTS,
38TH ARRL
NOVEMBER
SWEEPSTAKES

REPORTED BY AL NOONE, *WAIKQM

CURRENTLY the DX Test leads the pack as "most popular ARRL activity," but the November Sweepstakes continues to gain ground toward recapturing that title—1971 entries reached just below the 2400 mark. To be exact, there were 2386—about an 8% growth over the previous year.

Participation in the 38th event, November 13-15 and 20-22, 1971, was excellent. Many stations commented that this was the most activity they had ever heard in an SS. A breakdown of entries shows 668 cw participants chose high power, while 568 stuck with the "A" classification—150 watts or less. (Did I hear someone say QRP was dead?) On phone, 757 used more than 150 watts while only 393 stayed in the low-power class. Incidentally, a reversal of an ever-increasing trend has occurred: cw entries outnumbered phone, 1236 to 1150!

Without a doubt, the shortened exchange looms as the major factor for bringing so many stations out of the woodwork. There was hardly an entry that didn't comment on how great an improvement it made. I think it's safe to say it'll be around for awhile! Other comments which ran high were: bring back the low-power multiplier; raise the cut-off point from 150 to 180 or possibly 200 watts; and, have separate awards for both classes. You can be sure that both Hq. and the ARRL Contest Advisory Committee will carefully consider these and other comments prior to next year's event.

*Asst. Communications Mgr., ARRL.

The 21 MHz tower at W7RM sports 6 elements at 160 feet plus 3 stacked three-element beams at 120, 80 and 40 feet (bottom beam is not visible in the picture), all fixed on the East coast!

Remember how difficult it used to be to make a "Clean Sweep?" If so, you may find this year's fantastic totals of 29 cw, 125 phone, somewhat difficult to believe. There would have been more, too, except for the fact that a number of stations had multipliers chopped from their score. Better be sure of that KZ5, VE4, etc. before you put him in the log! Otherwise, you may be in for a surprise when you end up with only 74!

Special congratulations to W1FEG, K2AU, W3EZT, K4CG (WA4KJR, opr.), K4HPR, K4PJ, W4KFC, W7RM (K7VPF, opr.), W8SH (K7NHV, opr.), WB8EUN (WB4JEZ, opr.) and VE7BDJ who scored twice with a "Clean Sweep" both modes!

Each year we end up with about 30 clubs ineligible for the Club Aggregate listing because they're not affiliated with ARRL. If your club score doesn't appear in the listing, that's probably the reason. Why not do something about it? Drop a note to ARRL Hq. for the affiliation package and club kit. Club contest participation is a real side benefit of affiliation.

Certificate awards are scheduled for a May 15th mailing. Stand by! — WAIKQM.

TOP TEN

CW. Single Operator: W7RM (K7VPF, opr.) 164,775; W7NQ (W7CFJ, opr.) 164,550; W6MAR 156,140; KH6RS (K2SIL, opr.) 151,700; W6HX (WB6OLD, opr.) 150,072; K6EBB (W6NUT, opr.) 148,814; K1LPL/3 146,292; W1FBY 145,928; W9YT (K9KGA, opr.) 145,780; W8SH (K7NHV, opr.) 145,200. Multioperator: K4SXD 113,813; WA9LQG 111,328; W2SZ 108,558; W8UM 104,171; W9YB 100,788.

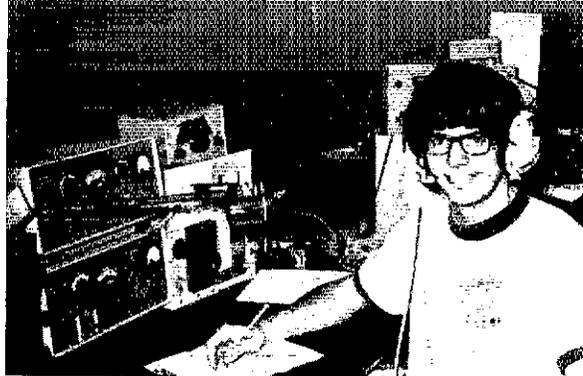
PHONE. Single Operator: W7RM (K7VPF, opr.) 249,600; W6HX (WB6OLD, opr.) 210,600; W9YT (K9LBQ, opr.) 197,400; WA5JMK 195,000; W3MVB (K3EST, opr.) 178,800; W3GRF (K1ANV, opr.) 178,575; KG4EQ (WA9SXQ, opr.) 176,550; K5RLW 175,972; W7IR 173,700; K1VTM 172,800. Multioperator: WA7ORM 195,525; K8RMK 182,325; W7SFA 181,875; W1FBY 164,700; WB6OOL 159,026.

CONTEST PERIODS

1972

Starts		Ends
Saturday, Nov. 11		Monday, Nov. 13
2100 GMT	PHONE	0300 GMT
Saturday, Nov. 18		Monday, Nov. 20
2100 GMT	CW	0300 GMT

Here's Chip, K7VPF at the controls of W7RM. To the right of the S-line is a box containing remote tuner and direction indicator for the 80-meter beam! (see antenna page) Partially hidden behind him are 40-meter beam rotator controls and various antenna switches. It's no wonder he had little difficulty taking top honors on both modes!



NOVICE CORNER

This years Top Ten novice entrants are as follows: WN5DLY 39,092; WN4PSP 29,370; WN9GIT 26,145; WN2PWS 25,200; WN0AMD 24,852; WN4RGO 23,313; WN6AIU 20,296; WN5BNG 17,484; WN4SON 15,847; WN9HZB 13,632.

Other certificate winners are: WN1s MMY PDM, WN2s AXV QDF OXA, WN3OJL, WN4UCC, WN5s CKR/5 DML, WH6HIQ, WN6s FNI HVW, WN7s QFI QIW QYI/7, WN8s JCG KYX, WN0 CFR CSG DLT.

SOAPBOX

CW

My first SS, had a lot of fun. (WB0DLE). . . Elimination of time and date a big improvement. (W5QJH). . . Working 40 stations in 40 minutes on 10 meters was quite a thrill. (K5MAT). . . Slogan for 1972 SS, "More punch on forty!" (KZSOD). . . Some kid said "Wow" when I gave my check as 32! (W4DXL). . . Why not have a different category for club stations? (KH6HKM). . . Based on comments received, I guess I was the only Nevada station to put in any appreciable effort on cw. For those who need Nevada cards, I suggest QSL via WA1HAA. (KIAGB/7). . . If any of the big contesters missed SV, it's their own fault since there was at least 11 SV stations active. (W6KYA). . . The new SS message much, much better. (W6BIP). . . As long as you have done away with the low-power multiplier, why not a section winner for both classes? (W6WLV). . . Suggest that repeat QSOs be permitted on each different band, 10 through 160 meters. (W6NUT). . . First time I've managed a clean sweep on both modes. (WA6DKF). . . Last year, after missing KL7EWA in the closing minutes, I ended up with 74 sections on cw. After sending logs in, I received a QSL from him for the QSO, he had copied my report but the QRM eliminated his reply and I didn't claim it! Did better this year, a clean sweep on both modes.

(WA4KJR, opr. K4CG). . . Super SS with great activity! (W4YZC). . . Conditions on 3.5 MHz were fantastically good from about 0500 to 0700 GMT on 11/21. (W4ZC). . . Not a big score, but an honest try and a very enjoyable 22 hours of cw. (WB4TBO). . . Had fun working Novices but 5 - 2X2 calls will do more good than 1 - 10X10! (WA0ZQB/KL7). . . All operation in 1971 SS was in Novice bands only, with 75 watts. (KL7EWA). . . Thought the XYL was going to shoot me after the phone SS. See you next year. . . if she doesn't! (W7CFL). . . The short message speeds things up considerably but its a little bit annoying to find some of the big guns shortening it still more by not sending their call in the message. (W7GEB). . . My first SS contest. Didn't do fantastic, but it was fun. (WN1OUM). . . There should be a multiplier for new and/or reactivated ulcers among the old goats! (W1FAF). . . Got every section except VE8 during the phone weekend. Guess what prefix was NR 1 on the cw weekend? (K1GAX). . . Biggest surprise was the 15-meter Novice who outdid my 45 wpm exchange with a 50 wpm exchange! (W1BPW). . . Where in the %%% was Nevada? (WA1MJE). . . The Novices I worked really appreciated the QSO. (WA0VJE). . . Next year I'll fill out the cross-check sheets as I go. It helps a lot! (WB0CXN). . . Toward the end of the SS our CQ machine started eating its tape and punching its own holes! (W2SZ). . . The ARRL SS and DX contests are the best. Rarely operate at other times due to heavy work schedule. (WA2HA1). . . The friendly ragchew is the staple diet of amateur radio, but contests provide an interesting and exciting change-of-pace. (WN2RDQ). . . Sure was good to work old friends again. (WB8FUO, ex. WA6WTD). . . After hearing what some stations do to their own call, I would only anticipate more difficulty should they send the call of the last station contacted in the SS. (WB8FDO). . . New format is a great improvement. We will have the best exchange when

KL7EGS, operated by Larry, WA8JWP and KG4EQ, operated by Mike, WA9SXQ provided two of the rarer sections for many of the SS gang.



AFFILIATED CLUB SCORES

<i>Club</i>	<i>Score</i>	<i>Entries</i>	<i>Phone Winner</i>	<i>CW Winner</i>
Mad River Radio Club (Ohio)	9,960,874 *	174	W8SH	W8SH
Potomac Valley Radio Club (Va.)	8,792,822	133	W3MVB	K1LPL/3
Murphy's Marauders (Conn.)	7,364,568	116	K1VTM	W1FBY
Minnesota Wireless Association	2,811,532	46	WA0VKP	K0JL
West Valley Amateur Radio Club (Calif.)	2,316,123	35	W6HX	W6MAR
Radio Club of Tacoma (Wash.)	1,461,060	47	W7RM	W7RM
Boeing Employees Amateur Radio Soc. (Wash.)	1,378,961	54	WA7JBM	W7VMF
Richardson Wireless Klub (Tex.)	914,616	14	WA5JMK	W5ONL
128 Contest Club (Mass.)	914,409	11	K1EUF	W1BPW
Northern California Contest Club	812,087	13	K6EBB	K6EBB
Frankford Radio Club (Pa.)	645,738	10	WA3OTV	K3DPQ
Northern California DX Club	592,873	7	WA6IVN	. . . . .
Rockford Amateur Radio Assoc. (Ill.)	571,093	9	K9WTS	W9LVT
South Jersey Radio Assoc.	523,579	22	WA2VYA	WA2VYA
Suburban Amateur Radio Club (Pa.)	433,434	9	K3MNJ	K3KPV
Texas DX Society	423,183	4	. . . . .	. . . . .
Arapahoe Radio Club (Colo.)	346,963	4	. . . . .	. . . . .
Albany Amateur Radio Assoc. (N.Y.)	342,687	19	WA2EAH	WA2EAH
IBM Owego Amateur Radio Assoc. (N.Y.)	341,548	8	WA2CPO	W2BHP
Wisconsin Valley Radio Assoc.	336,269	9	W9RQM	W9RQM
Douglas Co. Amateur Radio Club (Kan.)	332,163	11	WA0ZTW	WA2HSF
West Park Radiops (Ohio)	329,012	10	W8KZH	W8FNE
Hollywood Amateur Radio Club (Fla.)	321,014	11	W4OZF	W4OZF
W. Palm Beach Amateur Radio Club (Fla.)	312,650	14	WB4QFH	W4PZV
Wheaton Community Radio Amateurs (Ill.)	310,013	9	WB9FJX	WB9FJX
Johnson Co. Radio Amateur Club (Kan.)	285,594	9	WA0VJF	WA0VJF
Dallas Amateur Radio Club (Tex.)	283,478	7	WA5YAS	. . . . .
Suffolk Co. Radio Club (N.Y.)	271,050	3	. . . . .	. . . . .
Canton Amateur Radio Club (Ohio)	269,094	10	K8YQW	K8YQW
Delta Amateur Radio Club (Tenn.)	235,689	25	WA4FDR	WA4FDR
Overlook Mtn. Amateur Radio Club (N.Y.)	228,647	4	. . . . .	. . . . .
Connecticut Wireless Assoc.	226,552	9	W1BIH	W1ECH
Indian Hills Radio Club (Ohio)	224,698	6	. . . . .	W8AEB
N. Carolina DX Assoc.	195,700	4	. . . . .	. . . . .
ARINC Amateur Radio Club (Md.)	189,748	11	W3HH	WA3JYV
Evendale Amateur Radio Soc. (Ohio)	185,533	7	K8HBN	K8HBN
Massillon Amateur Radio Club (Ohio)	172,921	10	WA8VEV	W8VYU
Central Michigan Amateur Radio Club	162,672	7	WB8BPY	W8VPC
Ozaukee Radio Club (Wisc.)	150,186	8	WB9BGJ	W9NYJ
Massapequa Amateur Radio Club (N.Y.)	124,722	10	W21J/2	WA2CZ
Chicago Radio Traffic Assoc.	121,614	9	W9HOG	W9HPG
Ramona Radio Club (Calif.)	120,857	8	WA6GSV	WA6DQ
Fidelity Amateur Radio Club	120,163	4	. . . . .	. . . . .
Coastside Amateur Radio Club (Calif.)	119,878	4	. . . . .	. . . . .
East Meadow High School ARC (N.Y.)	100,794	5	. . . . .	WB2LY
Wayne Amateur Radio Club (N.J.)	99,656	3	. . . . .	WA2DF
Norwood Amateur Radio Club (Mass.)	91,955	4	WA1EOT	. . . . .
Scarboro Amateur Radio Club (Ont.)	84,944	4	. . . . .	. . . . .
Central Illinois ARC	80,890	10	WB9APC	W9QET
Kankakee Area Radio Society (Ill.)	78,192	7	. . . . .	WB4QV
S. E. Virginia Wireless Assoc.	77,027	4	. . . . .	WA2NP
Gloucester County ARC (N.J.)	75,955	4	. . . . .	K9DUA
L.E.R.A. Amateur Radio Club (Calif.)	74,525	5	. . . . .	WB6EX
Kentuckiana Radio Club	66,411	4	. . . . .	. . . . .
Nashville AR Explorer Post 15 (Tenn.)	65,462	5	. . . . .	. . . . .
Chicago Suburban Radio Assoc.	62,148	7	W9SW	W9KRR
Auburn University ARC (Ala.)	59,794	3	. . . . .	. . . . .
University of Delaware ARC	58,318	3	. . . . .	. . . . .
Key City Amateur Radio Club (Tex.)	52,193	. . . . .	. . . . .	WA500
Oak Park Amateur Radio Club (Mich.)	47,028	4	. . . . .	. . . . .
Larkfield Amateur Radio Club (N.Y.)	33,606	5	. . . . .	W2HAE
Lake Success Radio Club (N.Y.)	13,950	6	W2CZZ	W2CZZ
Monterey High ARC (Calif.)	8222	4	. . . . .	. . . . .

* At publication time the validity of the score of the Mad River Radio Club is under challenge concerning the eligibility of some of its members to participate in the club aggregate score. The matter is now being examined with final disposition to be determined at a later date.

Best SS ever for me! (VE6VV). . . Moving to VE6 in January 1972. (VE8BB).

QSO LEADERS

(Single Operator)

Cw		Phone	
W7RM	1100	W7RM	1664
W7NQ	1097	W6HX	1410
W6MAR	1062	W9YT	1316
KH6RS	1030	WA5JMK	1300
W6HX	1016	W3MVB	1194
K6EBB	1007	W3GRF	1192
K1LPL/3	1002	K5RLW	1192
W9YT	1000	KG4EQ	1185
W1FBY	986	W7IR	1166
W8SH	968	WA1JLD	1153

the check again is the RST. They won't all be 599s, honest! (W9VBV). . . Hope Santa brings me a bug or keyer for next SS! (WB9AYN). . . I think a low-power multiplier is needed, my Ranger doesn't stand much of a chance in pile-ups. (W9EI). . . I always get up tight when I read about the "anti-contest" movement. Competition is the primary factor that caused our country to grow and prosper as it has and competitive activities in amateur radio are what cause stations, knowledge and skills to grow. (W9HE). . . Seems to me that we should encourage low power! (K9LWV). . . A real fine introduction into the contest world for me, Wish I could have spent more time in the shack, but homework comes first, unfortunately! (WN0BQA). . . Best part about ARRL SS, I think, is contacting old and new friends. (W5KL, ex. W4 AGI, YE, K6CN). . . As always, my favorite contest and I have participated in them since the time when they ran through two weekends and the intervening week and the exchange was a five-letter message. (K4PJ). . . After 25 years of only sporadic operating, this was my first participation in organized CD activities since pre-WW2 participation as SCM (NM W5AH) and later ORS (W6BMC) back in the 30s. (W7BMC). . . Signals on 3.5 MHz were the best I've ever heard in any SS! (W6GEB). . . Heard KZ5 everywhere during the phone SS, not a peep out of one during cw. (K5RLW). . . Can you standardize your power classification to go up to 180 watts. This seems to be a common power rating on most ssb rigs today. (VO1CA). . . Equipment trouble start to finish but lots of fun. (VE2AH). . . Really enjoyed my first taste of SS, should be back next year. (VE5XC). . .

Phone

Would be nice if certificates were given for the low-power entries. (WA3OBY). . . First clean sweep thanks to WA6QWW's willingness to help with Sacramento Valley. (K3MNI). . . The LP antenna at 300 feet worked great for the DX sections, but not so well for stateside QSOs! (K3KMO, opr. W3USA). . . PVRcers are something else! (W3DBT, ex: XW8CS). . . Murphy struck here: Burned out the linear, stopped the alarm clock and scorched breakfast! (W2MU). . . My 10th consecutive Phone SS and I found operators to be extra courteous this year. (W7FCG/9). . . Having close competition with a friend sure helps! (WB9APC). . . It's been a long time since I've heard so many S9 signals on 10 meters! (K9KOR). . . Beautiful weather teamed up with my XYL to shorten what was otherwise to be a full-time effort. (W9ZBD). . . The new exchange is outstanding! (W0PAN). . . The recently approved 175 mile club radius is unreasonable, unnecessary and stupid. (K4FK). . . After calling for 30 minutes, gave up on KL7GIC/KL7 for a multiplier. Four minutes later caught KL7HAB! (WB8DCR). . . Wish W8SH would get a poor phone operator just one year! (WA8ZDF). . . Why does the lying about power still go on? Even without the additional multiplier guys are still running wide open and giving an "A" precedence. (WA8TGX, opr. W8UMD). . . Did we hear correctly? Standby BY3. QRZ SS! (WB8EAS). . . Who'd have ever thought I'd miss SV for a clean sweep. (WA2EAH). . . First time in the SS, enjoyed it more than our home

QRP CHAMPS

(150 Watts or Less at All Times)

CW		Phone	
WA3DSZ	107,152	K1EUF	152,144
K4VFY	103,806	WA1LXE	123,284
WB8DKZ	99,826	W7CFL	114,300
W0ISJ	96,360	W7GKF	110,250
W5RTX	95,192	WB4MRI	100,229
W5ONL	91,306	WA7MPS	99,680
WA0VJF	90,000	WA5WZA	92,667
WA8ZAV	87,000	WA7OBC	92,278
WA0WBG	84,135	W9ROM	90,375
WA5WZA	83,773	WA5YSC	85,320

DIVISION LEADERS

CW			Phone	
Single Op.	Multitp.		Single Op.	Multitp.
K1LPL/3	W2LY	Atlantic	W3MVB	WA3DEQ/2
W9YT	WA9LGQ	Central	W9YT	WA9UCE
K0JL	WN0CAI	Dakota	WA0VKP	K0VYV
W5WMU/5	K4SXD	Delta	K5AEU	K5TYP
W8SH	W8UM	Great Lakes	W8SH	K8RMK
W1BGD/2	W2SZ	Hudson	W1BGD/2	WB2OEU/2
WA2HSP/0	W0SOE	Midwest	K0LUZ	W0SOE
W1FBY	W1ARR/1	New England	K1VTM	W1FBY
W7RM	W7GLC	Northwestern	W7RM	WA7ORM
KH6RS	W6BIP	Pacific	K6EBB	WB6OOL
W4KFC	WB4PVQ	Roanoke	K4WCC	WB4OXD
W5QJH	WB5AXC	Rocky Mtn.	W7OAD	WB5AXC
K4BAI/4	WB4RSV	Southeastern	KG4EQ	WB4PKP
W7NQ	WN6HVH	Southwestern	W6HX	WB6NSI
K5RLW	W5FC/5	West Gulf	WA5JMK	W5M5A
VE7BDJ	VE3BUV	Canadian	VE5US	.....

CLEAN SWEEP CW

K1ZND	W3FZT	W5WMU/5	
W1BPW	K4HPR	WA0GVO/5	
W1DAL	K4PJ	WA6DKF	
W1FEG	K4PUZ	W8OK	
W1FLM	W4DM	WA8ZAV	
K2AU	W4DQS	K0DDA	
K3EST	W4KFC	VE7BDJ	
W3USA	K3KMO, opr.	W7RM	K7VPF, opr.
K4CG	WA4KJR, opr.	W8SH	K7NHV, opr.
W4PZV	WA4SVO, opr.	W8WPC	K8BPX, opr.
W7NQ	W7CFJ, opr.	WB8EUN	WB4JFZ, opr.

LED SECTIONS BOTH MODES

(Boldface = over 100K each mode)

K1CTQ*	W5WMU/5	W9YT**
K1GAX	WBSAXC	K0LUZ
K2AU	K6EBB**	W0NQ
W1BGD/2	W6HX	W0SOE*
K4BAI/4	WA6IVN	W0WLO
WB4VJK*	K1AGB/7	W0WSV*
WB4SZS/4*	W7RM	VA2UN
KG4EQ**	W7UQ*	VESUS
K5AEU	W8SH	VE7BDJ
K5RLW	K9CUIY	VE8BB

*Multioperator

**Different station call or operator each mode.

CLEAN SWEEP PHONE

K1JHX	K4BNC	K8RMK*
K1VTM	K4HPR	K8UNG
W1BIH	K4LDR	W8DQL
W1FBY*	K4PJ	W8EDU*
W1FEG	W4KFC	W8KIC
WA1JHQ	W4WSF	W8QXQ
WA1KZE	WA4FFW	WA8OSE
WA1PID/1	WA1IRG/4	WA8RWU
K2AU	WB4UYD	WA8TBO
K2BK	K5AEU	WA8TSP
W1BGD/2	K5TSR	WA8VBY
W2MB	K5TYP*	WA82DF
W2MU*	W5MYA+	WB8BMV
W2SZ*	W5WMU/5	WB8CCE
W2UC*	WA5JMK	K9CUIY
WA2CPO	WA5RTG	K9IU*
WA3DEQ/2*	WA5VWH	K9WTS
WA2DZU	K6BEP	W9LVT*
WA2NPO	K6SSN	W9RQM
WB2OEU/2*	WB6KBK	WA9AQZ
K3JYZ	WB6VZI	WA9LUD
K3MNI	K1AGB/7	WA9UCE*
K3MTK	K7LTV	WA9WUC
K3WUW	W7BUN	WB9BJR
W3AZD	W7CFL	WB9FIJ
W3CRE	W7GKV	K0LUZ
W3EZT	W7IR	K0MMS
W3IN	W7SFA*	K0VVY
W3MKV	WA7JBM	K0YVU
W37KH/3	WA7ORM*	W0INH
WA3ATX	WB4BES/7*	W0NQ
WA3GJU	K8CSG	WA0HVR
WA3JZR*	K8EHU	WA0VKP
WA3NKO	K8HBN	WA0VQX/0
WA3OTV	K8IDE	VE7BDJ
K4BAI/4		KZ5ZZ

WA1JUY	WA1JYY, opr.	W7RM	K7VPF, opr.
W3GRF	K1ANV, opr.	W8SH	K7NHV, opr.
W3GZ	WA3HTQ, opr.	W8UM	WA7EWC, opr.
W3MVB	K3ESI, opr.	WB8EUN	WB4JFZ, opr.
WA3FXJ	WA3IAQ, opr.	W9EUN	WA9UAG, opr.
K4CG	WA4KJR, opr.	W9YT	K9LBQ, opr.
K4WCC	K4PQL, opr.	W9ZRX	W9VNE, opr.
K6EBB	WA6DKF, opr.	VESUS	VESUF, opr.
W6HX	WB6OLD, opr.	KG4EQ	WA9SXQ, opr.

*Multioperator

competition. (F2YS/W2). . . The mean, old North wind got my Quad! (WA21YH). . . Out of 956 QSOs, 506 were on 40! (WA1IRG/4). . . Contest should begin earlier on Saturday and end earlier on Sunday. (WB4UYD). . . Knew I'd better start paying more attention to my check sheets when one of Murphy's Marauders said, "Nice work CG, got you on 20 and 40, see ya on 80!" (WA4KJR, opr. K4CG). . . Took time off to watch a football game on TV Sunday afternoon; best part of the game was at half-time, when I went back on the air and worked sections 74 and 75! (W4KFC). . . I've worked SS on cw for 24 years and I finally worked all sections for the first time on phone. Maybe there is a message there! (W0INH). . . Why can't the SS weekends be separated as the DX contest is? It is difficult for me to convince the XYI (and myself, too) that contests on successive weekends are justifiable. I suggest at least a weekend (and preferably two) between the two modes. (WA0LGS). . . How about a separate section for the Aleutian Islands? We are too far out to compete with the mainland. QTH is Shemya Island; 1500 miles from Anchorage, 240 miles from the USSR. (WA0ZQB/KL7). . . Hope to have a linear next year and make it easier to confirm Idaho. (W7CFL). . . I was born in West Virginia, so I think it is still there, but if it's in this contest, heck if I know where! (WB8AME/6). . . Hard to compete on 40 and 80 from here. (KZ5ZZ). . . Needed only KZ5 for a clean sweep. Called one CQ KZ5 and one came back on the first call! (W7IR). . . Finally heard a VES, he called me after the contest was over to run a phone-patch for him! (WB6HDG). . . Am awaiting contest results to see who won the "West Coast Derby" between W6HX and W7RM. What a horse race! (K6MP). . . Nice to hear the majority of the contestants using the frequencies listed as a guideline. For the record, Newfoundland (VO1) is part of the Maritime section and not Maritime Mobile! And Yes, we are part of Canada! (VO1CA)

THIRTY-EIGHTH SWEEPSTAKES CONTEST

Scores are grouped by Divisions and Sections. Within each section, scores are further broken down by power category. The total operating time to the nearest hour, when given for each station, is the last figure following the score. Example of listings: WA3DUM 4060-70-29-6 or final score of 4060, number of QSOs 70, number of sections 29, total operating time of 6 hours. An asterisk denotes a Hq. staff member, ineligible for an award. Multi-operator stations are grouped in order of score following single-operator station listings in each section tabulation.

CW SCORES

ATLANTIC DIVISION

Delaware

WA3DUM 406D 70-29-6
 150 Watts or Less
 WA3QVC 21.69D 341-45-20
 WA3QVF 306A 50-31-10

Eastern Pennsylvania

W3ABT (WASKLX, opr.)
 112.110 758-74-24
 W3YUW/3 110.303 758-73-24
 K3KPV (K3WR, opr.)
 93,002- 637-73-22
 K3DPO 69,012 487-71-24
 WA3NQX 59,362 443-67-19
 WA3JYB 54,528 384-71-21
 W3ARK 52,000 400-65-17
 W3KV 47,610 345-69-15
 WA3NNA 16,836 185-46-7
 W3HMC 9546 111-43-9
 WA3OGM 8352 116-36-5
 K3MNI 7200 60-60-0
 K3DVS 3270 55-30-5
 W3YR (WA2UR/WA31PM)
 12,384 129-48-6

150 Watts or Less

WA3DSZ 107.152 724-74-21
 W3QVW 67,000 500-67-21
 WN3OIL 14,200 132-50-9
 K3YFD (WA3NQY, opr.)
 12,300 150-41-10
 WN3QLG 2691 62-23-4
 W3MDO 2376 44-27-5
 WN3QWP 175 15-7-3
 K3CSG (WN3PXR/RGN RGO)
 15,322 163-47-23

Maryland-D.C.

K11PL/3 146,292-1002-73-24
 W3CFR 135,926 931-73-24
 W3HHTQ 130,536 882-74-24
 W3IN 124,538 853-73-24
 W3MVB (WA3IAQ, opr.)
 112,858 775-73-24
 W3AZD (WA3GHI, opr.)
 110,084 754-73-24
 W3E2T 108,300 722-75-22
 W3GN 102,784 704-73-20
 K3JNV 100,368 700-72-20
 K3JLVW 100,122 677-74-24
 K1TKS/3 97,980 690-71-24
 W3USA (K3KMO, opr.)
 96,150 641-75-24
 K3EST 90,900 611-75-16
 W3OAF/3 90,576 629-72-24
 K2QBW/3 87,330 615-71-22
 W3DRT 83,650 610-70-22
 W3GRF 81,145 603-69-18
 W3KWB (WA3LJO, opr.)
 72,360 540-67-24
 W3MFI 71,190 509-70-20
 K3JANA 70,656 512-69-19
 K3KCT 67,104 466-73-24
 W3GRM 65,700 450-73-20
 K3JYZ 62,780 430-73-20
 W3FA 57,013 402-71-6
 W2DW/3 54,873 410-67-14
 W3AXW 53,605 378-71-14
 WA3MJI/3 46,620 333-70-14
 W3AFM 42,420 303-70-17
 W3HYM 37,800 270-70-14
 W3JKE 29,016 279-52-11
 W3JGLM 25,680 214-60-8
 WA3HHW 25,380 235-54-8
 W3AWN 19,980 185-54-17
 WA3AIFQ 12,750 125-51-8
 WA3FEOQ 12,600 150-42-8
 W3L1W 8692 106-41-6
 K3RFB 8170 95-43-7
 WA3NAV 7872 96-41-4
 W3HII 5112 71-36-7
 WA3OGV 144 12-6-1
 W3RIL 2 1-1-1
 W3ZKH (+K3FST)
 44,064 306-72-2
 W3TOS (+WA3MLI)
 35,624 292-61-17
 K3IYO (4 opr.)
 30,480 254-60-23

150 Watts or Less

WA3JYV 47,520 330-72-18
 W3PPP 42,600 355-69-24
 W3ABC 39,040 305-64-19
 W3GVP 35,397 257-69-8
 W3L3C 21,216 208-51-15

W3ZV 16,468 179-46-10
 W3SP 15,008 112-67-11
 W3FN 14,637 144-51-12
 WA3PKY 13,338 171-49-18
 K3ORS (WA1JJK, opr.)
 4004 77-26-6
 WA3RBI 2928 61-24-4
 W3KK 576 24-12-2
 W4SON/3 12 3-2-3
 WN3QIA/3 (+WN3RME)
 780 27-15-6

Southern New Jersey

W2RUF 110,230 758-73-24
 WA3VYA 76,285 525-73-24
 K2JCC 53,392 378-71-18
 W2FSX 34,397 325-53-
 WA2NPD 25,311 215-59-12
 W1DRN/2 14,500 145-50-7
 W2SDR 8000 100-40-7
 W2VLVD 7178 97-37-13
 WA2YSW 8 2-2-2
 W2MBC (WA2OBC/W2OBS)
 5740 85-35-10

150 Watts or Less

W2LYL 54,672 408-67-23
 W2FYS 34,800 270-70-18
 W2FBF 5000 100-25-8
 W2FA 2700 50-27-5
 W2WRP 2448 51-24-10
 WN2OLS 1920 40-24-13
 WA2IAL 1280 32-30-6
 WN2IRK 546 27-13-8
 K2MZP 18 3-3-3
 W2LY (4 opr.)
 64,540 461-70-24

Western New York

W2FZK 138,972 939-74-24
 K2CC (WA2HDS, opr.)
 80,640 560-72-23
 W2DHO 55,677 417-67-22
 W2BSMD 37,800 300-63
 WA2BCK 34,840 268-65-17
 W2IWK 16,000 151-53-6
 W2HPNN/2 6634 107-31-10
 WA2MBI 3146 72-22-5
 W2IKI 2800 50-28-4
 W2IPO 1178 40-19-6
 K2DTQ 622 24-14-4
 WA2PKL 72 6-6-1
 W2CXM (4 opr.)
 48,490 373-65-23

150 Watts or Less

WA2CAL/2 61,479 446-69-19
 WA2LCC 61,124 520-59-23
 WA2DMM 53,724 411-66-21
 W2BHP 51,048 358-72-24
 WA2ICU 49,104 396-62-14
 W2BJN 31,248 248-63-15
 W2BQR 31,104 243-64-15
 K2FJ 29,016 234-62-21
 WA2LOG 20,790 165-63-10
 WA3MBM 20,604 292-51-14
 WA2CDV 15,500 155-50-
 W2BKJ 11,052 154-36-8
 WN2QXA 9030 105-43-17
 WA2ODC 6562 98-34-19
 WN2SIS 4089 73-29-15
 WN2SIV 4089 72-29-18
 WN2AOF 528 22-12-3
 WA2ZOG 288 16-9-3
 K3IAM/2 (+K3HUA)
 33,728 248-68-22
 WN2RPD (+WN2TWX)
 1836 51-18-12
 WN2AIK (+WN2QOP)
 1826 43-22-15

Western Pennsylvania

WA3NPK 81,550 586-70-22
 W3YA (WA3JH, opr.)
 68,206 509-67-18
 K3HZL 61,904 426-73-15
 WA3MDY 46,200 385-60-23
 WA3GTV 17,812 148-61-11
 WA3MWO 15,450 156-50-20
 WA3JU 12,669 156-41-3
 WA3HCG (WA3JRN, opr.)
 10,528 94-56-11
 W3SMY 1540 35-22-3
 WA3JXG 102 9-6-1

150 Watts or Less

WA3NKO 64,722 471-69-20
 K3XVY 60,192 418-72-21
 WA3KQA 56,100 425-66-22
 W3FPI/3 49,000 350-70-20

WA3KOS 30,240 280-54-10
 WA3POF 28,380 215-66-11
 WA3KYC 25,194 221-57-16
 W3GJY 21,120 165-64-11
 W3KK 16,995 155-56-13
 WA3PWY 10,537 129-41-14
 K3YVN 198 11-9-4
 WA3LSD (+WA3MPD)
 23,280 195-60-19

CENTRAL DIVISION

Illinois
 W89JX 129,056 872-74-23
 W89AWY 111,962 759-74-24
 W9LVY 106,416 744-73-18
 WA9LUD 94,464 656-72-23
 W91VH/9 87,696 609-72-17
 W9VBV 82,080 570-72-21
 K9DUA 66,690 513-65-25
 K9DVK 47,501 355-67-17
 K9QOV 44,195 343-65-17
 W9KDX 33,512 284-59-18
 W9KRR 31,122 249-63-20
 W9BFB 25,740 287-45-13
 W9WR 16,320 136-60-13
 W71CG/9 14,670 163-45-9
 W99KD 7178 100-37-13
 W9SW 3348 54-31-6
 W9AGM 3300 50-33-3
 W9QEL 3016 52-29-5
 W9B9VW 2898 63-23-9
 W9YNI 2784 58-24-12
 W9CCU/9 (W9JLO, opr.)
 1632 51-16-4
 K9HO 1564 34-23-4
 W9HOG 3120 40-14-3
 WA9AUM 546 21-13-1
 K9BGL (+K9VTA)
 90,170 635-71-24
 WA9FGX (4 opr.)
 33,396 254-66-20

150 Watts or Less

K9LUI 68,832 484-72-24
 K9KOR 61,908 467-67-22
 W9BCOY 56,404 478-59-24
 W9BFBK 51,200 400-64-20
 W9UDK 46,970 367-64-18
 W99AYN 38,482 271-71-1
 K9KHV/9 33,600 300-56-18
 W9HPC 32,232 237-64-20
 W9REK 27,200 200-68-18
 WN9GT 26,145 210-63-23
 W9DEE 20,060 170-59-17
 W91NQ 12,994 89-73-8
 W9B9DK 101,911 124-43-17
 W99GL 7363 100-37-3
 W99YLD 7200 100-36-5
 WN9HMY 5820 97-10-18
 WN9HKA 5214 80-33-18
 WN9GFC 3666 75-26-14
 WN9HAD 3360 57-30-9
 WN9EJ 3193 52-31-10
 WN9JZC 3180 59-10-19
 K9WTS 2373 57-21-3
 WN99NY 2300 44-25-12
 W99HI 2016 36-28-5
 W9ZLN 1872 52-18-4
 K9RVE 1632 48-17-7
 W9BFDL 520 20-13-2
 WN9IGD 328 21-8-7
 WN9GPZ 296 22-8-8
 W9ZPC 180 10-9-3
 K9ORP 140 10-7-2
 W99APC 8 2-2-1
 WN9FVD/9 (+WN95 GLZ ITH)
 448 17-14-5

Indiana

K9CUI 98,716 670-74-24
 W9SFR 70,128 487-72-20
 K9RDP 66,960 465-73-24
 W9ZTD 52,336 400-66-16
 W9HOO 50,184 169-68-18
 W9UL 39,000 300-65-17
 K9CLO 38,659 289-67-13
 WA9ZUC 37,290 301-63-13
 W99DGY 37,180 286-65-5
 WA9WU 23,364 301-59-16
 WA9WIP 18,792 162-58-17
 W99BP/9 15,300 150-51-10
 W99OTK 14,490 175-42-13
 W9EIO 10,700 107-50-8
 W99AU 6630 100-34-10
 WA95MH 3648 57-32-15
 WA9TGO (WA95AUM BWY)
 111,328 784-71-24
 W99Y (3 opr.)
 100,788 684-74-24

WB9AT (3 opr.)

41,724 347-61-18
 150 Watts or Less
 W9FI 28,820 262-55-22
 WB9ELE 15,759 156-51-13
 WN9HWY 4752 74-33-1
 WN9IHH 3510 65-27-1
 WB9IAZ 846 35-18-5
 WA9NPM 748 22-17-3
 WA9WUC (+WB9EMF)
 45,140 374-61-22

Wisconsin

W9YT (K9KGA, opr.)
 145,780 1000-74-24
 W9ROM 114,464 984-73-20
 WA9SUI 92,418 633-73-24
 W9NYJ 91,152 635-72-23
 K94SF 81,420 594-69-20
 W9IH 75,800 542-70-19
 W9PJT 52,260 402-65-18
 W9BRC 25,724 2108-59-11
 W9GKJ 16,940 154-55-16
 W9IR 16,100 164-50-11
 W9TFC 10,000 100-50-8
 WA9AWO 1776 37-24-7
 WB9DK 1216 32-19-1
 K9LAM (3 opr.)
 59,760 415-72-22
 WB9CI (+WB9FD)
 49,000 351-70-20
 WB9BPS (+WB9MHI)
 846 23-19-4

150 Watts or Less

K9LWV/9 72,720 505-75-24
 WB9RI 52,500 375-70-16
 W9BFLK 32,964 246-67-18
 W9IRW 25,376 208-61-15
 WN9HZB 13,632 142-48-14
 WN9FE 13,260 130-51-11
 K9KSA 11,778 151-39-12
 WA9RTE 11,136 116-48-5
 W9CJ 8056 106-48-12
 W9BDR 5120 81-32-7
 K9CDD/9 4526 73-31-3
 WB9HPW 96 8-6-3
 K9BID/9 (3 opr.)
 6138 96-33-23

DAKOTA DIVISION

Minnesota
 K0JLL 109,224 741-74-23
 WA9BWM/0 107,300 725-74-24
 W0YF 103,530 742-70-23
 W0YCR 101,033 712-71-24
 WA9EN 95,676 705-68-22
 W0HW 87,892 602-73-18
 WA9MHI 81,137 607-67-16
 W0AA (WB9F, opr.)
 76,032 528-72-19
 WA9WEZ 75,684 560-68-15
 K0CNC 63,648 468-68-9
 W0DDY 51,100 365-70-17
 K9GROU 42,642 309-69-17
 W0BRT 26,784 251-54-9
 WA9YLN 25,358 207-62-14
 W0VCS 17,238 169-51-10
 WA9RW 14,300 150-47-7
 W0BPKS 13,152 137-48-5
 W0BVKP 11,266 131-43-3
 W0BASX 8160 120-44-8

150 Watts or Less

W0BIS 96,360 662-73-24
 WA9BWB 84,135 593-71-24
 K0BZE 83,028 562-74-24
 W0BXL 74,368 581-64-18
 WA9VFN 70,380 510-69-19
 W0BADO 48,251 400-61-20
 W0AII 40,052 423-62-7
 W0BAJA 26,220 223-60-21
 WA9RKB 16,932 166-51-2
 W0BMBK 8172 104-39-4
 WA9WNV 7616 112-34-22
 W0BIRW 5184 74-36-3
 WN0CF 3120 61-26-8
 W0BDFX 3103 58-29-8
 WA9DKA/0 2346 51-23-
 W0BDSJ 1804 42-22-12
 W0BATT 1748 38-23-9
 W0BBOA 1020 30-17-5
 WN0CAL (+WN0AMR)
 25,194 223-57-22
 North Dakota
 WA9ELO 2116 46-23-5

<i>150 Watts or Less</i>			WVPC	57,720	390-74-14	WBHXL	8159	100-41-11	WBZXC	1680	40-71-2
WA0AAD	81,528	600-68-23	WRTZZ	48,180	371-66-24	WBOZA	6036	79-42-3	WAZPJL	1376	45-16-2
WNB0TIC	4968	68-36-2	KRIDI	32,264	218-74-4	WR0VZ	4788	61-38-5	WN2BH0	648	27-12-6
South Dakota			WBHPY	24,450	245-50-11	WBRDCYR			W01SL	560	20-14-3
W0WNV	15,036	459-71-20	WBRIYF	24,760	219-55-10		4320	75-40-13	WN2BLU	126	2-7-5
W0WYK	14,448	168-43-11	WBRJYX	32,176	198-56-16	WABZGP	4374	64-34-1	WN2CUH	30	7-3-8
<i>150 Watts or Less</i>			WAKUNU	11,632	208-52-6	WBSHGP	2000	50-22-5	WAZROA (+WA21-H)		
W0AZPT	15,822	149-54-22	WAS0BG	20,020	183-55-6	WAZTZY	1216	38-16-1		118K	33-18-4
1JGXVW	6068	8-47-8	WASVNZ	18,816	169-56-8	W8KZJH	1178	31-19-2	N.Y.C.-L.I.		
WNB0CVW	1496	34-22-9	W8K1U	12,464	148-59-8	W8CHT	708	25-14	K2AU	121,950	818-75-23
DELTA DIVISION			W8HISA	16,254	189-43-13	W8BRC	600	20-15-1	WR2MAN	68,228	462-74-21
Arkansas			W8RDC	15,200	152-50-6	W8WNIH	120	10-6-1	K2DW	44,100	316-70-17
W8K1	118,333	811-73-27	W8WMD	10,496	128-41-15	W8WKNR(+WABAZJ)	29,992	536-72-20	WAZTZG	35,750	275-65-7
W8TJ	6408	89-36-6	W8WVY	6936	94-37-2	W8ZPT (4 ops.)	55,314	440-63-20	W21FV	35,070	251-70-17
<i>150 Watts or Less</i>			W8WBIH	5,566	95-31-6	W8L14 (ops.)	43,152	372-58-9	WAZTHR (+WA2MDX, opr.)	30,186	351-43-18
W8SSK1	14,575	13-55-6	W8WBLX	3978	81-39-7	WRTO (3 ops.)	26,622	230-58-21	WAZ2HW	17,940	173-52-6
W8NSCKR/S			W8WMSR (+W9AOW, opr.)	3102	47-31-1	W8VHV (+W8BRC)	27,800	300-57-16	WAZ2URD	12,250	126-49-8
			W8WUJ	168	12-5-1	W8WWM/B (+WBZRM)	8080	101-40-6	W21AL	10,600	106-50-10
			W8WU3 (3 ops.)	104,171	718-73-77				W21WZ	10,584	126-42-4
Louisiana			<i>150 Watts or Less</i>						WAZ2MD	8694	106-42-13
W8WU1/S	139,574	935-75-24	W8BDKZ	99,826	704-71-24	W8WYQ	66,600	465-72-24	W21CQ	7138	83-41-6
W21LJ G/S			W8ZAV	87,000	580-75-24	W8WY1	56,880	395-72-19	K2CHN	4914	63-39-4
W8QB	16,104	122-66-8	W8TJQ	60,384	408-74-23	W8WZB/R	53,820	414-63-23	K2CRU	1016	38-26-2
<i>150 Watts or Less</i>			K8IKM	53,280	370-72-16	W8WZAR	50,844	398-64-20	W21J2 (WB21VK, opr.)	598	18-10-8
W8RTX	95,192	65-273-24	W8RDCR	48,706	345-71-16	W8RFR (-W8BRC, opr.)	48,106	360-67-18	W21YR	55,476	417-67-13
W8WZA	81,776	620-68-23	W8WDM	40,986	297-69-14	W8R1U	44,620	344-63-21	W8J0YV	30,912	243-64-16
W8W	30,008	243-68-23	W8PVI	21,692	187-58-12	W8R1U	38,400	300-64-19	W8WXR	26,474	217-61-17
W8SCM	3350	63-26-6	W8RUSI	16,744	161-52-10	K8ML0	31,808	285-56-14	W21G	26,455	242-53-16
W8S1AY	1879	41-24-10	W8R1AU	16,808	173-48-10	W8R1M	31,200	260-60-17	WAZLUM	25,400	247-54
Mississippi			W8TJG	11,700	130-45-7	W8R1M (WB3GVE, opr.)	28,500	282-57-17	W2114	21,114	207-51-13
K5ALU	14,986	847-74-22	W8TJG	11,396	130-44-11	W8WMO	27,508	211-64-12	WAZ2REW	13,630	147-47-12
W0GVO/S	45,600	306-75-13	W8TJG	11,396	130-44-11	W8WON	22,540	162-70-14	W21CZ	10,160	127-40-7
W8KUR	24,738	218-57-4	W8R1FZ	10,500	100-35-9	W8W0CY	20,020	182-55-12	W21DUS	8610	105-41-5
W8HJ75	19,981	190-53-14	W8R1CC	8040	101-40-24	K8IK0	17,175	154-54-12	W8WQDF	5600	82-35-11
Tennessee			W8R1DM	7760	97-40-11	W8W0F	15,351	180-43-22	W8W2PVH	2184	81-32-6
K4PUZ	179,060	931-75-24	W81AW	3520	94-40-2	W8W0P	11,026	149-37-9	W8W2P	4560	76-70-8
W4DMS	113,072	766-74-24	K8C0J	6400	80-40-3	W8W0YX	8707	124-41-24	W8W2UN	3344	80-22-4
K4DCD	89,096	602-74-24	W8C0P	6080	80-38-8	W8W0K	4788	133-33-3	W8W2U1K	3132	61-27-1
W45Q1	49,404	358-69-14	W9A0GWB	5472	72-38-3	W8W0L	7926	91-41-5	W8W2PVM	2772	54-28-6
W441DR	32,640	240-68-9	W8R0GL	4154	69-31-13	W8W0W	6866	81-43-5	W8W2R0D	2310	57-21-19
W44USG	11,480	140-41	W8ZTQ	2976	48-31-9	W8W0X	6572	101-34-19	W8W2V1	1494	43-18-13
W44LP1	1560	39-20-2	W81YJ	2964	57-26-4	W8W0Y	6745	95-35-10	W8W2CGZ	618	22-14-2
W44YNL	189	11-9-2	W8RGV/S	2780	56-25-7	W8W0Z	6496	112-39-14	W21NI	608	19-16-3
W44NMX	12	4-2-1	W8R1U	1050	66-15-10	W8W0K	8787	101-34-19	W8W2H0	598	23-13-4
W4G1E	8	2-2-1	W8VSK	988	26-19-1	W8W0L	6235	87-37-23	W21NI	432	18-12-2
K45XD (+W441E)			K9DVK/R	573	26-11-7	W8W0M	5064	115-24-23	WAZ1PKA	230	12-10-4
			W8WNB	286	12-12-3	W8W0XV	4379	80-29-19	W8W2NWX	198	11-9-3
			W8WCR (+WABZSP+W8R1U)	37,655	444-63-24	W8W0Z	3120	60-76-11	W8ZAPV	8	2-2-1
			K8JAC (3 ops.)	4587	70-33-10	W8W0K	2800	66-25-17	WAZ2GLP (5 ops.)	18,894	201-47-15
			Ohio			W8W0L	3556	51-28-5	WAZ2PNU (5 ops.)	260	13-10-3
			W8WPC (K8RPX, opr.)	138,600	924-75-24	W8W0R	2500	50-28-6	W8W2R2P (+W8W2BVS)	250	13-10-4
			W8QX0	136,752	924-74-24	W8W0R	2185	49-22-5			
			K8RMK	123,662	850-73-34	W8W0Y	1702	39-21-3	Northern New Jersey		
			W8K1C	119,209	817-73-21	W8W0Z	1615	48-17-13	WAZ1ARW2	121,399	833-73-24
			W81DU (+WAZ3BGE, opr.)	115,128	800-72-22	W8W0H	986	19-17-3	W2YT	105,790	745-71-24
			W8ZDE (+W8RWU, opr.)	107,675	741-73-24	W8W0I	756	27-14-4	W82RJ	93,010	655-71-24
			K81H0	106,288	728-73-24	W8W0J	589	20-14-2	WAZ2BAN	67,134	501-67-16
			W8RAK	97,820	670-73-24	K8BAX	189	11-9-7	WAZ2NYN	62,270	479-55-23
			W8K0C	91,650	611-75-19	W8W0K (+W8WPU)	69,030	532-65	WAZ2DFC	57,960	414-70-34
			W81TZ (W81-MC, opr.)	90,286	627-72-21	W8W0L	43,014	131-67-24	W2G0C	55,632	419-64-19
			W8VYU	85,540	611-70-24	W8W0M	3772	100-38-24	W2CJC	37,088	305-61-16
			W8R1NI	66,732	499-67-20	W8W0N			K2DNW	30,840	257-60-8
			K8HBN	58,460	396-74-16	W8W0O			WAZ2MPC	24,240	210-58-14
			W8AMCR	50,320	340-74-11	W8W0P			WAZ2APZ	21,420	212-51-12
			W8ARTY	48,552	357-68-13	W8W0Q			W8W2W	18,400	200-46-4
			W8ARTV	47,300	430-55-11	W8W0R			WAZ2NAM	10,856	118-46-13
			W8AMFM	46,992	356-66-19	W8W0S			W2NPT	2950	59-25
			W80PH	46,980	435-54-20	W8W0T			K2GQ2 (7 ops.)	27,000	280-54-24
			W81FNK	40,608	423-48-18	W8W0U			<i>150 Watts or Less</i>		
			W8DQ	39,798	397-57-10	W8W0V			W821AF	62,926	431-73-19
			W8VQJ	39,060	290-63-18	W8W0W			W821JH	57,680	412-70-15
			W8NH0	38,100	318-60-21	W8W0X			WAZ2ALB	39,664	206-67-24
			W8MB	37,820	305-62-22	W8W0Y			W821R	28,200	212-60-22
			W8PMJ	31,980	267-60-15	W8W0Z			W821W	26,000	200-60-17
			W8ALWH	29,880	249-60-11	W8W0A			WAZ21L	19,360	220-44-20
			W8AQJY	29,160	243-60-6	W8W0B			W821ZC	10,994	108-08-12
			W81H	28,014	203-69-14	W8W0C			W821W	7280	105-18-7
			W8RA1U	27,199	231-59-16	W8W0D			W821W	5033	51-24-3
			K81NG	26,076	250-53-13	W8W0E			WAZ2NL	2326	53-21-2
			K8MWB	25,680	216-60-19	W8W0F			W821P01	494	20-13-8
			W8G1H	25,482	206-67-10	W8W0G			W821P02 (+WAZ2BL1/W)	49,896	378-66-77
			W8ZCK	22,800	200-57-10	W8W0H					
			K81VO	21,728	194-56-12	W8W0I					
			W8RCWD	21,094	199-53-12	W8W0J					
			K8R1D	18,900	175-54-11	W8W0K					
			W81NG	15,600	150-52-6	W8W0L					
			W8R0EL	11,906	133-41-11	W8W0M					
			W8RAKU	9744	116-42-5	W8W0N					
			W8R1DO	9184	112-41-14	W8W0O					
			K8WUW	8960	128-35-2	W8W0P					

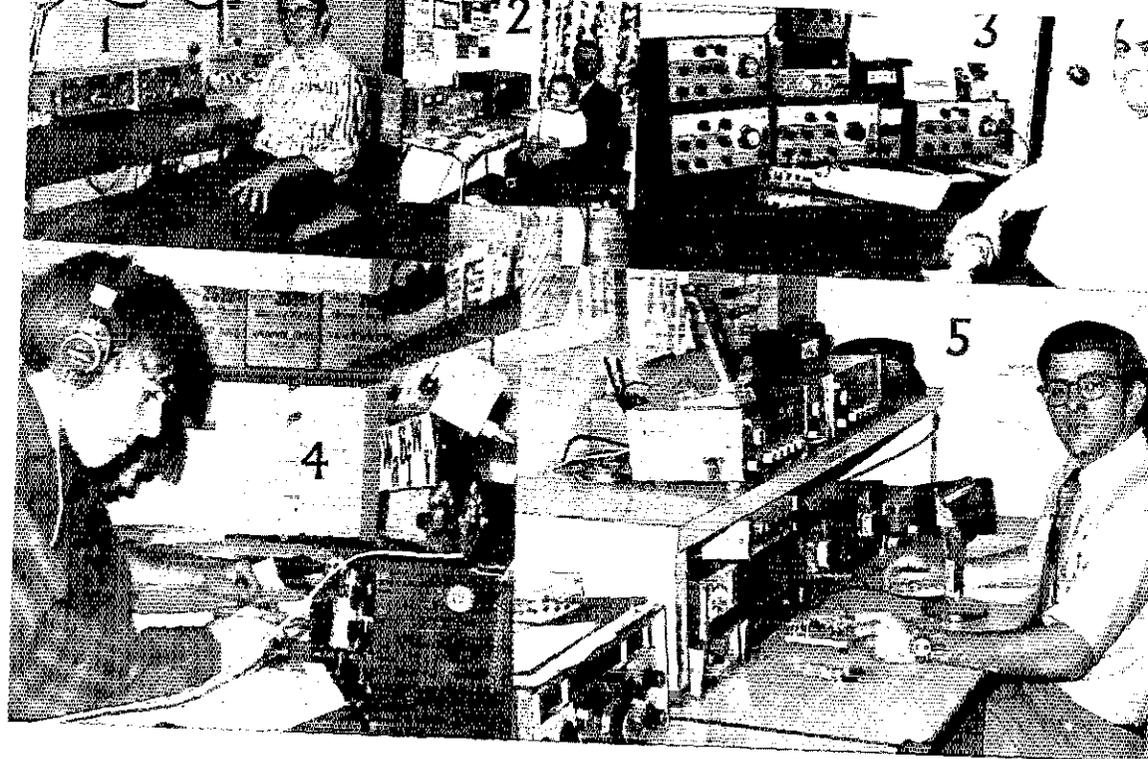
MIDWEST DIVISION

Iowa
 K0LUD 106,074- 747-71-22
 K0DDA 81,600- 545-75-18
 WA0VXD 73,590- 560-66-15
 WA0BOK 45,612- 362-63-19
 WA0A1Y 44,590- 343-65-20
 K0GXR 32,634- 259-63- 7
 K0CVI 30,564- 285-64-20
 K0YVU 10,965- 128-43- 6
 WA0JFN 7800- 99-40- 7
 W0TO (WA0KST, opr.)
 2508- 57-22- 3
150 Watts or Less
 W0M0Q 75,670- 543-70-17
 WA0YJW 50,190- 361-70-19
 WA0VBB 17,056- 165-52-15
 K0AZJ 12,432- 84-74-11
 W0NCSG 11,34- 28-21-13
 W0NFRM 1064- 31-19-12
 W0N0EI 504- 18-14- 3
 W0WSV (7 opr.)
 5181- 82-33-20
Kansas
 WA2HSP/0 108,040- 742-73-24
 W0INH 72,708- 498-73-12
 WA0YMK 62,492- 641-68-24
 W0BDOX/0 15,795- 187-45-16
 WA0ZTW 9880- 125-40-18
 K0CML 136- 9- 8- 1
 W0SOF (6 opr.)
 81,144- 588-69-30
150 Watts or Less
 WA0VIF 99,000- 630-72-21
 WA0TAS 79,165- 565-71-19
 K0JPC 57,723- 408-71-22
 W0DLP 56,800- 464-60-24
 W0BCW 33,972- 302-57-12
 W0BCRO 27,132- 239-57-22
 W0BAMD 24,852- 218-57-18
 W0J1 20,200- 202-50-16
 W0B0GV/0 11,778- 123-46-21
 W0ZJY 9912- 118-42- 8
 W0BBIY 180- 10- 9- 1
 K0BLI (2 opr.)
 4059- 62-33- 5
 W0B0BIC (+W0N0IS)
 658- 26-14-22
Missouri
 WA0NVZ 86,976- 610-72-21
 K0DLE 68,616- 477-72-20
 WA9BZY/0 62,634- 479-66-24
 W0BCFD 61,132- 451-68-16
 WA0JBX (WA0FBQ, opr.)
 55,131- 405-69-21
 W0QWS 47,124- 347-68-32
 W0KCG 43,014- 333-67-16
 WA0YEF 18,762- 177-53-11
 WA0CWJ 13,888- 124-55- 7
 WA0ZSU 13,694- 167-41-11
 W0B0CY/0 12,528- 131-48-19
 W0NUG 5069- 69-37- 8
150 Watts or Less
 W0B0CXN 24,206- 250-45-18
 WA0WZR 19,600- 202-49-24
 W0BVB 17,150- 172-50-10
 W0B0AFW 9512- 117-41-10
 W0N0DLT 8800- 100-44-12
 W0N0FJY 935- 33- 17- 1
 W0B0GAO/0 544- 17-16- 3
 W0B0CSF 462- 21-11- 1
Nebraska
 W0WLO 94,973- 654-73-23
 W0NGJ 86,940- 622-70-22
 W0G0MD/0 17,600- 200-44-10
NEW ENGLAND DIVISION
Connecticut
 W0FBY* 145,928- 986-74-74
 K1ZND 141,150- 942-74-24
 K1VTM 137,566- 930-74-24
 WA1JLD 125,414- 859-73-24
 W0ICP (WA1PID, opr.)
 120,132- 846-71-23
 W0FEG 117,000- 780-75-24
 W0FLM 114,075- 769-75-24
 K1JLX 108,186- 741-73-20

K1GUD 84,315- 579-73-20
 WA1JZC 83,912- 618-68-21
 K1ASJ 83,628- 611-69-20
 K1TZD (WA1JQI, opr.)
 80,869- 570-71-13
 76,580- 547-70-24
 W1WCG 76,560- 580-66-20
 W0DRE1/* 76,560- 580-66-20
 W1ECH 59,203- 406-73-19
 WA1KOC 53,361- 433-63-23
 W1RZG 34,776- 177-63-12
 G3XPM/W1 29,380- 226-65- 5
 WA1NNO 27,434- 246-58-21
 W1TS 20,016- 139-72-11
 W1RME 17,050- 156-55-18
 W1FTX 16,080- 130-67- 8
 W1QVB 12,220- 120-47-10
 WA1KOM* 11,600- 100-58- 6
 W1SL* 10,672- 116-46-13
 W1NJM* 7560- 90-42- 3
 W1EWF 5460- 78-35- 3
 WA1KMP 5168- 76-34-11
 K1DPB 4096- 64-32- 2
 K1THQ (+K1ZND)
 52,966- 373-71-12
 KINGL (+WA1G00)
 21,216- 204-52-18
150 Watts or Less
 W1DGL/1 67,603- 505-67-21
 W1ACR 66,625- 514-65-24
 K1ZJX 63,829- 453-71-19
 WA1MAO 56,140- 402-70-20
 WA1NFS 53,728- 368-73-27
 WA1NBS 34,100- 311-55-16
 WA1KKM 19,274- 210-46-17
 W1BID 12,960- 121-54- 7
 W1DMMY 12,512- 136-46-22
 W1NILD 11,720- 159-40-22
 WA1HYN 11,622- 149-39- 9
 W1EFR 11,176- 127-44- 9
 WA1NYU 4968- 92-27- 9
 WA7GWL/1* 4158- 63-33- 4
 W1EJF 2850- 58-25-10
 W1N0QM 240- 15- 8- 6
 W1RW* 216- 12- 9- 1
Eastern Massachusetts
 W1MX (WA8WNU, opr.)
 126,984- 858-74-24
 K1EUF 117,586- 795-74-24
 WA1JUY (WA1JYY, opr.)
 100,440- 699-72-23
 W1DAL 100,350- 669-75-24
 WA1LXK 98,039- 67-73-24
 WA1NRV 76,840- 265-68-24
 WA1LKU 72,136- 408-71-24
 K10MF 70,848- 595-72-18
 WA1LXE (WA1RIY, opr.)
 61,755- 448-69-16
 W1EJN 44,352- 308-72-10
 K1UCA 33,069- 229-73-22
 W1PI 25,792- 208-62- 8
 W1WMI 11,880- 110-54-10
 WA1KSF 11,460- 192-30- 9
 W1PLJ 9847- 115-43- 9
 WA1NLX 5400- 75-36- 9
 WA1EOT 795- 27-15- 1
 WA1LHQ (+WA1LXE)
 44,850- 345-65- 8
 W1AX (+W1E0B)
 33,840- 235-72-10
150 Watts or Less
 W1FNW 66,385- 468-71-24
 W1EFC 64,170- 485-69-24
 W1EMZ 60,582- 439-69-24
 K1CUD 40,296- 292-69-21
 WA1LAK 22,715- 207-53-13
 K0LLI/1 16,848- 158-54- 8
 WA1ROO 10,176- 106-48- 7
 WA1PCO 7776- 108-36- 5
 WA1MYK 5400- 100-27- 5
 W0N1PD 4560- 77-30-14
 WA1MSB 3750- 63-30-10
 WA11A 2960- 75-20-10
 W0N1RT 2652- 51-26-11
 W1EAF 2511- 48-27- 8
 WA1MNI 1302- 31-21- 2
 W0N1LY 363- 19-11- 5
 WA1CQW/1 2- 0- 1- 1
 WA1GFW/1 (+WA1HSF)
 13,112- 150-44-10
 W0N10E (+W0N10F)
 7252- 111-37-24

Maine
 K1GAX 56,800- 400-71-14
 K1TEV 32,686- 277-59-14
150 Watts or Less
 W1N0HJ 4521- 76-33-16
 WA1OIT 1846- 42-22- 4
 WA1KVV 1208- 34-18- 6
 WA1NZZ 162- 9- 9- 2
 K1SGU 154- 11- 7- 3
New Hampshire
 W1RPW 130,200- 868-75-24
 W7MTL/1 108,706- 736-74-24
 WA1JTM 396- 17-12- 1
 K1JYM (+WA1MZV)
 30,798- 267-58-19
150 Watts or Less
 W1DXB 77,461- 546-71-24
 K1CTQ (WB4MZD+D1JUS)
 69,930- 501-70-24
Rhode Island
 W1YNP 106,470- 766-70-17
 W1FLN 33,880- 243-70-13
 WA1AUL 16,588- 160-52-13
150 Watts or Less
 W1EIR 46,690- 334-70-24
 K1E0D 39,274- 269-73-16
 W1FQZ 29,106- 232-63-16
 W0N1MPU/1 1820- 37-26- 8
 W0N1000 319- 17-11- 2
Vermont
 WA2U0Q/1 90,984- 671-68-19
 W1EPE 16,986- 151-57-20
 W1ARR/1 (+W0Z2YEW)
 91,590- 646-71-23
 W1DC/1 (K1TWF+WA1EIH)
 44,744- 332-68-24
150 Watts or Less
 K1FYV 15,910- 185-43-13
 W0N1NW 4865- 72-35-23
Western Massachusetts
 W1E2D 64,192- 472-68-20
 K1SSH 62,440- 446-70-18
 WA1MJF 52,500- 375-70-17
150 Watts or Less
 W1DKU 59,697- 447-67-24
 W1WF 11,880- 136-44- 9
 WA1NHZ 9933- 116-43-12
 WA1LPT 7524- 100-38-11
 W0N1NW 1750- 35-25- 5
 W0N10A1 975- 34-15-13
NORTHWESTERN DIVISION
Alaska
 K17HCZ 36,036- 286-63- 9
 K17MF 21,200- 200-53- 6
 WA0ZQB/KL7 1343- 40-17- 9
 KL7EGS (WA8JWP, opr.)
 396- 19-11- 3
150 Watts or Less
 K17JDO 20,300- 203-50-10
 KL7ACV/KL7 4272- 90-24-11
 KL7EWA 1980- 47-22-10
Idaho
 W7GHT 59,498- 419-71-18
 W7IQ (5 opr.)
 22,444- 188-62-16
150 Watts or Less
 W7UTL 51,150- 413-62-22
 WA7OQL 20,565- 232-45-19
 W0N6HS/7 1449- 37-21-16
Montana
 W7GKE 110,704- 753-74-24
 W7YB (W71R, opr.)
 86,654- 614-74-21
 K7LTV/7 (+W7ISA)
 64,960- 510-64-23
150 Watts or Less
 K7CPC 77,380- 531-73-23
 W7TYN 19,266- 169-57- 9
 W7LLK 4818- 74-33- 4
Oregon
 W7GEB 75,260- 533-71-19
 WA7MOX 47,748- 346-69-22
 WA7KWS 38,640- 322-60-16

W7VSE 29,078- 217-67-17
 WA7QCF 34,416- 221-56-11
 K7WRW 19,431- 192-51- 8
150 Watts or Less
 WA7PKM 29,315- 273-55-21
 K7QOC 2187- 41-27-11
 W0N7ROP 2- 1- 1- 1
 W0N7SKY 2- 1- 1- 1
Washington
 W7RM (K7VFF, opr.)
 164,775-1100-75-24
 VE7ZZ/W7 112,274- 778-73-24
 W7VME 90,216- 627-72-24
 K7NWS (WA7MJK, opr.)
 77,210- 557-70-21
 WA7JCB 68,340- 514-67-23
 WA7ASM 63,549- 466-69-24
 WA7JBM 63,245- 494-65-18
 WA7KYZ 62,424- 462-68-17
 W0SQQ/7 60,316- 444-68-12
 W7GYP 59,898- 452-66-19
 W7UBA 44,950- 392-58-19
 K4ZDK/7 42,240- 320-66-15
 W7EA 40,068- 318-63-21
 K3RIW/7 32,192- 252-64-20
 K7MOK 31,171- 263-61-18
 W7YRX 20,388- 237-62-15
 K7HTZ 23,722- 205-58- 8
 W7UD 21,204- 186-57- 7
 WA7HKD 16,422- 162-51-13
 W7YTN 13,356- 126-53- 6
 K7RSB 10,368- 108-48-11
 WA7I0V/7 9632- 312-43- 6
 W7PK 8600- 100-43- 5
 K7GGD 8400- 100-42-10
 WA7NOQ 7980- 105-38- 7
 WA7FEG/7 4278- 69-31- 5
 WA7GYR 3604- 53-34- 4
 K7AWB 3000- 50-30- 6
 K7ZGO 936- 27-18- 6
 WA7PNY 900- 30-15- 6
 K7UWT 510- 17-15- 2
 W7OS 352- 16-11- 7
 W7OCY 90- 8- 6- 1
 W7GLC (+WA71DD)
 92,160- 646-72-20
150 Watts or Less
 W7WMY 65,100- 466-70-20
 W7WMO 48,180- 365-66-16
 K7BHN 45,110- 348-65-16
 WA7OBI 44,899- 383-59-20
 K7JRE 43,112- 317-68-20
 WA7LGI 39,820- 249-60-24
 WA7N0H 17,280- 180-48-11
 W7N7Y 15,548- 150-52-17
 W7B7SO 6802- 90-38- 8
 W0N7OY/7 6747- 88-39-23
 W0N70I 6510- 94-35- 7
 K7BEL 5644- 84-34- 7
 W0N7RWK 2236- 43-26-15
 W7ZTJ 1760- 44-20- 9
 K7EKC 800- 25-16- 7
 W7RJW 672- 21-16- 7
 W0N7QAT 630- 21-5- 9
 W0N7QAT 440- 23-10- 7
 W0N7SCN 252- 14- 9- 8
 W0N7QOC 40- 5- 4- 5
 WA7ACU 32- 4- 4- 4
 WA7IOF 2- 1- 1- 1
 W0N7RE 2- 1- 1- 1
PACIFIC DIVISION
East Bay
 W6RQZ 31,850- 245-65-16
 W6BKB (+W6BBD)
 63,360- 440-72-24
 W6DOD (+W6GK)
 60,760- 434-70-23
150 Watts or Less
 W6BBC/6 40,788- 309-66-22
 K6LRN 34,560-
 W6BNT 14,790- 145-51- 8
 W6AGN 8448- 96-44-22
 WA6LHD 6240- 80-39- 5
 K6AUD 2356- 38-31- 1
Hawaii
 K1H6RS (K2SLN, opr.)
 151,700-1030-74-23
 K1H6J 48,128- 376-64-11
 K1H6HAM 19,860- 167-60-13



Just a few of the SS participants. 1) George, W1DAL. 2) Zenon, VE3CSZ. 3) Bob, WB8DKZ. 4) WA8I WV multrop. 5) WA0JBX (WA0JBQ, opr.) 6) Don, WA0LGS. 7) Stan, WA5RTG. 8) Russ, WB6NSI. 9) Hugh, WA8VHV with Terry, WB8CKI assisting.



150 Watts or Less

KH6HKM 67,620-490-69-24
W6HHQ 10,575-125-45-18
W6HJL 3752-69-28-13
KIPKQ/KG6 70- 7- 5- 1

Nevada

KIAGB/7 83,352-604-69-19

150 Watts or Less

W7YKN 9061-114-41- 7

Sacramento Valley

WB6ABK/6 109,340-781-74-22

W6NKR 54,908-372-74-16

W6NVTY 48,484-357-68-18

K6KWV 12,864-137-48-17

W6KYA 9306-99-47- 5

150 Watts or Less

K6SG 41,124-299-69-18

W6EGX 29,376-217-68-12

W6NGCE 546-24-13-20

San Francisco

K6NCG (WA0VPK, opr.) 79,094-557-71-21

W6BIP (+K6QSO, WA6JL) 79,772-539-74-22

150 Watts or Less

WA6NLQ/6 77,965-495-69-24

W6WLX 32,340-231-70-18

WN6IRI 200-14-8-3

San Joaquin Valley

WA6IVN 125,060-859-74-24

WA6IWX (5 opr.) 47,464-349-68-21

150 Watts or Less

WA6JDB 14,768-142-52- 8

WN6DGT 2100-44-25-16

Santa Clara Valley

K6FRB (W6NUT, opr.) 148,814-1007-74-24

WA6DKF 134,400-898-75-24

WB6GFI (WA6DIL, opr.) 106,116-717-74-22

K6QZ 98,864-668-74-21

K6QEZ (WA6AMW, opr.) 77,532-550-71-23

W6GJV 22,360-503-72-23

W6OKK 50,439-368-69-17

WA6LFA 37,800-300-63-19

WA6QQI 37,062-261-71-19

WB6KSZ 35,145-249-71-21

W6GWO 22,204-182-61-12

W6IAQ 19,116-162-59- 8

W6CLM 18,408-156-59-14

WB6FXW 11,750-118-50-13

W6CTZ 10,368-108-48-10

K6CN 7290-81-45- 4

WA6OKU 4788-65-38- 5

W6CUF 3388-61-28- 1

WB6EWM 2790-48-30-11

WA6BTF 224-14-8-2

W6PIY (4 opr.) 39,780-306-65-20

K6LY (WB4LEK+WB8AA) 38,760-324-60-21

150 Watts or Less

WA6PYS 18,040-164-55-10

WA3GBU/6 16,500-150-55- 9

WN6HVV 12,466-136-46-23

W6IGU 6050-55-55- 9

W6MED 4736-64-37- 8

WN6LZA 2496-52-24-14

WN6NKM 1482-40-19- 2

W6IHP 972-27-18- 2

WA6HAD 234-13-9-9

WN6LQO 96-9-6-6

ROANOKE DIVISION

North Carolina

K4CAX 103,180-737-70-24

WA4FIV 96,460-689-70-22

WB4JYB 11,653-137-43-14

150 Watts or Less

K4FBG 451-21-11-3

South Carolina

WB4QNP 55,352-407-68-15

WA4JHU 28,728-259-56-23

WB4CGA 20,064-176-57- 9

150 Watts or Less

WB4RNN 7134-123-29- 9

K4QF 6318-81-39- 9

WN4VGG 950-28-19-20
WB4VJK (WA2FEV+WB4NXY) 3528-75-24- 7

Virginia

W4KFC 130,725-872-75-21

K4PQL 121,824-846-72-20

K4KCG (WA4KJR, opr.) 110,775-741-75-23

W4NOA/4 105,435-743-71-20

K4LDR 92,455-669-73-23

W4DM 90,675-605-75-22

K4CFB 88,948-601-74-21

K4DJZ 88,560-615-72-20

W4UO 87,984-611-72-18

W4KXV 78,402-538-73-19

K4ORQ 74,692-526-71-21

W4YZC 73,080-522-70-17

K4OD 69,083-487-71-22

W4NH 68,272-502-68-18

W4JK 66,304-448-74-23

W4EZ 65,700-452-73-12

W4WSF 57,240-398-72-16

WA3LST/4 54,960-458-60-12

W4VC 54,535-423-65-23

WB4QVG 49,786-402-62-21

W8VDA/4 46,846-397-59-13

K4ZA 44,112-286-72-14

W4BVV (K1ANV, opr.) 38,912-304-64- 7

W4ZM 31,000-250-62- 8

W4CF 30,752-250-62-11

W4ZC 27,404-221-62-15

W4DIW 20,760-173-60-14

W4HM 19,760-191-52- 5

W4WJC 18,900-189-50- 7

W4WBC 14,400-135-52- 5

WB4PYO 1540-36-22- 7

WB4PVQ (+WB4HR) 46,632-348-67-16

150 Watts or Less

W4BOP/4 57,800-425-68- 2

W4TKR 54,239-372-73-18

W4HIR 50,022-397-63-23

WB4MRI 43,310-355-61- 7

W7BHX/4 40,820-316-65-20

WB4RFK 40,572-414-49-21

K4KGD 39,808-311-64-15

WB4UYD 34,914-254-69-19

WB4RVD 30,000-250-60-19

K4DSZ 16,968-152-56-11

K4GEL 14,453-149-49-15

WB4SWE 12,691-174-37-16

K4EJF 11,832-116-51-18

K4FTO 9552-100-48-10

WA4HQW 6630-85-39- 7

W4JLS 5400-90-30-19

WB4MMV 3750-63-30-11

WN4QP 2484-59-23-13

WB4SIV 2016-48-20- 3

WB4OXD 1102-29-19- 3

WB4JTT 8- 2- 2-

WB4TBO (+WB4TEL) 26,962-237-61-23

West Virginia

W8HRQ 81,200-580-70-21

WA8POS 56,760-473-60-12

WB8BMV 48,552-357-68-15

W8HAX 12,792-125-52-12

150 Watts or Less

KTACD/8 38,935-300-65-17

WB8JW 26,718-221-61-20

W8JWX 14,194-151-47-10

WB8DFE 11,760-147-40-13

WN8LGF 3664-54-33-12

ROCKY MOUNTAIN DIVISION

Colorado

W8NQO 126,217-874-73-23

W8LO 63,426-482-66-22

WB8SD 15,792-141-86- 8

WA8YSK 11,546-124-46-23

WB8AWB 4080-68-30-10

150 Watts or Less

WB8DIF 68,474-511-67-22

W8MSV 714-21-17- 2

New Mexico

W8QJH 135,050-933-73-24

WB8HN 70,242-509-69-23

W8RE 20,298-199-51- 6

W8SCA 5808-89-33- 6

W8RSZ 510-17-15- 1

WB8AXC (6 opr.) 39,884-340-59-17

150 Watts or Less

K5MAT 48,168-335-72-11

W7CYH 119,280-840-71-24

W7OAD (W7MWR, opr.) 68,508-519-66-15

W7HVH/7 11,417-120-49- 7

W7TSM 65,688-484-68-15

W7HRM 12,348-126-49- 6

W7RMI 12,348-126-49- 6

WBSAZL 57,936-427-68-23
 WBSLIF 33,988-298-58-18
 WASZGC 13,019-139-47-11
 WSPC/5 (4 ops.) 77,792-572-68-74
 K5ICK (+K5BKO) 13,008-136-48-7

150 Watts or Less

WSONI 91,106-645-71-24
 WBSAOL 56,304-415-68-22
 W5OGC 53,084-396-67-11
 WBSAAR 40,820-337-60-14
 WASOOR 39,996-306-66-15
 WASZOO 35,952-321-56-14
 K5PXY 22,686-200-57-18
 WNSBNG 17,484-186-47-16
 WBSDRU 11,666-139-62-8
 WB4PLW 810-12-15
 WNSLPR 731-24-17-5

Oklahoma

K5OCX 114,975-791-73-22
 WASDIL 28,800-240-60-18

150 Watts or Less

WSDS 23,876-513-73-24
 WNSDML 11,760-124-48-15
 W5URJ 6552-84-39-9

Southern Texas

K5RIW 140,230-948-74-24
 K5TSL 128,160-890-72-23
 K5DPL 106,069-736-73-19
 W5LJT 40,052-323-62-11
 K3ZML/5 13,124-917-68-14
 WBSFIN 7622-103-37-10
 WASZWC 1020-30-17-1

150 Watts or Less

WASJDR 59,268-450-66-23
 WNSDLY 39,092-349-58-22
 W5RJP 38,936-320-62-21
 WNSDVS 4290-68-33-16
 WNSEYL 1273-35-19-6

CANADIAN DIVISION

Maritime

VF1ASJ 82,764-627-66-
 VO1CA 38,330-353-55-13
 W1ZJ/V1E1 11,700-150-39-14
 VE1HN 6786-87-39-7

Quebec

VA2HN (WA3HRV, opr.) 15,200-802-72-24
 VE1AH 38,610-297-65-22
 VE1AQQ 17,168-148-58-13

150 Watts or Less

VE2AQP 27,192-211-66-19

Ontario

VE1CSZ 36,996-282-64-15
 VE1SYL 3038-49-31-4
 VE1AOL 468-18-13-6
 VE3BOV (+VE2YU) 76,320-531-72-18

150 Watts or Less

VE1FLW 48,240-335-72-21
 VE1DHI 22,770-207-55-12
 VE1GGT 16,692-162-52-22
 VE1EHI 11,421-123-47-20

Manitoba

VE45C 4290-68-33-15

Saskatchewan

VE1SUS (VE1SUF, opr.) 121,804-824-74-20
 VE1SXC 23,142-203-58-21

150 Watts or Less

VE1STF 14,406-148-49-11

Alberta

VE16VV 54,648-414-66-17
 VE6AXH 33,062-273-61-19

150 Watts or Less

VE16MA 31,588-298-53-16

British Columbia

VE1TBJ 141,600-944-75-24

150 Watts or Less

VE17RH 12,015-136-45-15
 VE17BBL 10,580-118-46-16

Yukon-N.W.T.

VE18BB 38,502-312-62-15

PHONE SCORES

ATLANTIC DIVISION

Delaware

WA3OTV 115,500-770-75-22
 WA3DOM 5984-83-24-5
 WA3JOYA (+WA3PHG) 69,138-501-69-

150 Watts or Less

WA3OHY 50,274-402-63-18
 WA3OJU (+WA3OVY) 63,472-496-66-24

Eastern Pennsylvania

E3MNI 121,200-808-75-22
 WA3NNA 106,358-753-71-17
 WA31LK 69,420-534-65-23
 WA3ATX 61,956-413-25-19
 K3DPO 54,944-404-68-14
 WA3JYB 32,768-256-64-18
 WA3OWO 30,492-242-64-16
 WA3IKL 27,840-229-60-18
 WA3INQY 5400-75-36-4
 K3MTK (5 ops.) 110,250-738-75-23
 W3YR (4 ops.) 24,360-174-70-16

150 Watts or Less

K3DVS 76,396-539-71-22
 WA3NXC 61,008-497-62-21
 WA3LIC 20,292-178-57-13
 K3OBU 19,894-203-49-11
 WA3NAY 44,16-69-32-9
 WA3MHI 324-14-12-

Maryland-D.C.

W3MVB (K3SI, opr.) 178,800-1194-75-24
 W3GRF (K3AN, opr.) 178,575-1192-75-23
 W3CRL 172,200-1148-75-24
 K3LPL/3 162,790-1135-73-24
 W3AZD 157,950-1053-75-14
 W3ZKH/3 154,350-1029-75-22
 K3JWU 141,300-944-75-22
 WA3LXJ (+WA3JAQ, opr.) 140,100-936-75-24
 W3GZ (WA3HL, opr.) 135,000-900-75-24
 W3FZT 130,725-873-75-24
 W3JN 122,100-814-75-23
 W3KMW 120,150-804-75-23
 W3USA (K3KMO, opr.) 96,214-639-73-24
 W3DBT 82,448-607-68-20
 K3IYZ 87,050-547-75-21
 W3GN 80,290-543-74-20
 K3NPV 69,296-488-71-9
 W3JPT 56,994-413-69-22
 W3C3Z 48,642-363-67-12
 W3GRM 42,840-306-70-18
 K3ANA 39,690-315-63-15
 K3OAL/3 38,400-300-64-11
 W3HVM 38,190-285-67-13
 WA3NAV 37,855-283-67-8
 WA3GZT 27,134-262-71-22
 E3CJT 27,026-281-66-15
 W3KDP 22,000-250-64-11
 W3HH 25,074-199-63-15
 W3FA 23,780-205-68-11
 W3AWN 22,550-205-55-12
 WA3QGV 21,070-245-43-18
 WA3HWW 20,340-226-45-8
 WA3AFQ (12 ops.) 12,925-118-55-6
 K2QBW/3 9114-147-31-3
 W3F1Z 8918-91-49-6
 W3PWO 6586-89-37-6
 W3KE 4950-75-33-6
 W3GLM 2112-48-22-3
 W3BHC 1180-30-20-6
 W3RHL 2-1-1-
 WA3JZR (3 ops.) 97,500-650-75-16

150 Watts or Less

W3PQT (4 ops.) 85,968-597-72-24
 E3VJO (WA3VHM + WB6KGB) 45,024-336-67-15
 K3ORS (K1EJR + WA1JGK) 42,980-307-70-18
 W3AXW (+WA3LJF) 34,775-268-65-8
 W3ZH (4 ops.) 5254-71-37-8

150 Watts or Less

W3MFE 26,838-213-63-14
 WA3JYV 21,460-185-58-9
 W3NUH 16,390-150-55-8
 WA3ERL 13,356-126-53-7

WA3OHG 12,360-103-60-13
 WA3FOQ 5824-104-28-5
 W3LTW 3720-62-30-7
 WA3OFC (+WA3JOA) 11,176-129-44-10

Southern New Jersey

WA2VYA 75,384-534-72-21
 K2IQO 63,086-457-69-24
 W2PAU 52,469-371-21-16
 W2NTR 52,270-373-70-17
 WA2NPD 43,728-327-68-16
 W211G 13,780-133-52-10
 W2SDV 7400-100-37-6
 W2VLD 4200-84-25-12
 WA2BPL 2970-55-27-3
 K2MZP 1280-32-20-3
 W2VMX 792-22-18
 WA2YSW 2-1-1-
 W2LPA (+WA2JUF) 72,648-511-72-24
 W2XCP5 (+K2S DE1 YBN) 14,472-278-61-19
 W2ZJN (+W2Z BKK POG) 15,950-145-55-14

150 Watts or Less

W2VMD 32,520-271-60-16
 W21YS 24,420-185-66-15
 WA2EMB 13,000-125-52-7

Western New York

WA2CQP 155,600-910-75-24
 W2VDC 46,472-314-74-21
 WA2BPH 43,200-301-73-12
 W2PNN/2 30,976-242-64-15
 WA2PKE 17,730-398-30-7
 W2FKZ 17,204-187-46-4
 W2DKL 9408-168-28-
 W2BKDC/2 1020-34-15-1
 W2JNA 8-2-2-1
 WA2DEU/2 (+WA3COW) 128,925-865-75-24
 WA2NPO (WA2EAF + WB2AIO) 81,075-541-75-18
 K2CC (6 ops.) 77,112-567-68-18
 K2DTQ (+WB2JY, WN4OP) 61,620-517-60-23
 WA2RFR/2 (+WA2JHF) 43,520-341-64-14

150 Watts or Less

WB2EOP 52,224-384-68-24
 WB2ZOW/2 44,968-308-73-14
 WB2LOW 41,048-367-56-20
 W2BHP 35,280-260-70-24
 WA2ICU 28,152-306-46-13
 WA2DKV 34,108-246-49-22
 WA2LCC 23,250-333-50-10
 WA2IBE 21,000-210-50-14
 WA2MBM 19,008-198-48-13
 K2QLE 7260-110-35-6
 W2MU (6 ops.) 72,600-484-75-24
 WA2LDQ (4 ops.) 10,710-119-45-16
 WA2MBI (multop.) 9720-182-27-9

Western Pennsylvania

WA3GJU 110,850-739-75-19
 W3SMX 41,548-307-68-22
 WA3MWO 40,848-296-69-22
 K3OTY 27,140-230-59-11
 WA3MDY 21,420-255-42-7
 WA3KOS 13,248-138-48-4
 K3YVN 5285-76-35-3
 K3HZL (+WA3JLL) 112,275-753-75-21
 W3NKI (5 ops.) 18,432-192-48-12

150 Watts or Less

WA3NKO 78,150-521-75-20
 W3YA (WA3JH, opr.) 32,160-268-60-9
 K3LWM 23,760-216-55-18
 WA3JBO 11,450-115-50-11
 WA3PQI 2185-58-19-4
 K3VXY 1120-35-16-4
 WA3NCH (+WA3SJP, OTK) 34,046-396-69-22
 WA3QUO/3 (3 ops.) 38,918-322-61-23
 WA3MPD (+WA3LSD) 33,733-279-61-18
 WA3MHY (+WA3OKP) 17,490-159-55-14

CENTRAL DIVISION

Illinois

W9EUN (WA9UAG, opr.) 129,450-864-75-21
 WA9LUD 114,600-764-75-14
 WB9LFX 99,450-670-75-13
 G3PAC/W9 82,289-588-71-23
 WA9YLD 78,260-559-70-20
 K9BGL 76,822-541-71-18
 W7FCG/9 62,480-440-71-18
 W9QXO 59,892-434-69-24
 K9WTS 59,100-394-75-8
 W9ZMR 51,748-383-68-10
 WB9DED 41,072-302-68-10
 WA9AWY 34,742-300-58-7
 W9HOG 33,858-297-57-8
 K9BQL 26,880-224-60-13
 WA9DRE 26,460-210-63-12
 W9VBU 15,600-150-52-5
 W9SW 14,196-169-42-18
 W9YIT 11,374-121-47-10
 K9DWD/9 7954-97-41-5
 W9YQP 6674-71-47-13
 WA9BLP 5136-107-24-2
 W9RFP 5025-101-25-6
 WA9YDQ 2340-45-26-4
 W9BYDY 1380-46-15-5
 WB9CCO 1308-57-12-2
 W9QET 1020-34-15-12
 WB9FHI 812-39-14-3
 WA9UCE (+W9MKA) 134-625-902-75-24
 W9LVT (+K0GXR) 132,075-886-75-20
 WA9FGX (4 ops.) 49,038-373-66-14
 WB9FZNF/9 (W9GYN + WA9SIS) 44,064-325-68-23

150 Watts or Less

K9MFD 68,228-462-74-24
 WA9UMZ 50,820-383-66-24
 WA9SVY 50,008-324-71-20
 WB9APC 37,092-281-66-16
 K9ORP 25,440-265-48-15
 W9RDS 21,772-216-31-24
 WA9ZYG 21,318-190-57-16
 W9BFTL 16,800-150-56-11
 WA9OUE 14,200-150-47-8
 W9CRN 14,080-110-64-
 W9LNO 13,578-93-73-12
 W9KRR 8050-115-35-13
 K9OKR 5168-76-34-3
 K9IMX 3924-86-23-3
 W9BEDL 3096-56-27-4
 W9RKC 1484-46-27-7
 W9GFT 2400-34-25-3
 WA9WQC 216-12-9-1
 W9BHCZ 562-13-2-6
 W9DRS 2-1-1-1
 W9LW9 (+WN9HGN) 1056-33-16-2

Indiana

K9CUI 116,775-781-75-24
 W9ZRX (W9VNE, opr.) 108,300-722-75-18
 W9DXXW 103,879-714-73-22
 WA9AOZ 92,175-622-75-20
 W92TD 91,760-623-74-17
 K9HDP 87,552-608-72-24
 K9CLO 60,236-408-74-11
 W9KAS 57,960-414-70-11
 WA9UMD 47,784-362-66-11
 WA9UFO 46,383-327-71-19
 W9SFR 45,816-332-69-13
 WA9HWY 37,200-300-62-6
 WA9MJP 34,980-318-55-11

150 Watts or Less

WA9ZUC 27,216-717-63-12
 WB9SBR 20,328-154-66-9
 WB9CI 18,496-138-68-14
 K9DFU 11,421-122-47-8
 W9YF 11,200-100-56-8
 WA9VGY 9964-106-47-6
 WA9WP 9492-113-42-12
 W9CCL 3596-62-29-3
 K9CCS 336-21-8-2
 W9YB (3 ops.) 96,798-666-73-17
 WB9ATL (4 ops.) 52,536-398-66-23
 WB9DGY (+WB9AYN) 52,398-369-71-19
 WA9NPM (multop.) 47,982-364-66-23
 WB9FGO (+WB9FFK) 19,776-206-48-14

150 Watts or Less

WA9WUL 78,610- 525-75-24
K9GHL/9 6888- 84-41- 7
W9UEM 6272- 98-32- 6
K9IU (5 ops.)
104,475- 700-75-24
W9CUL (6 ops.)
20,450- 209-50-14
WA9ZLS (+WB9CFT)
12,350- 163-38-12
WB9FXL (+WN9CWS)
3192- 58-28-12

Wisconsin

W9YT (K9LBO, opr.)
197,400-1316-75-23
WB9ARG 83,877- 581-73-
K7RSQ/9 43,800- 300-73-23
W9GKJ 41,790- 299-70-16
K9DXO 38,080- 280-68-15
K9GSC 28,944- 268-54-14
W9ZBD 22,538- 191-59- 7
WB9DRK 16,352- 149-56-13
K9EYA 13,832- 137-52-14
WB9BGJ 13,664- 122-56-11
WB9CHP 8000- 100-40-11
WB9ACT 4810- 67-37- 5
W9CTI 1748- 38-23- 8
WB9FMU 1540- 39-20- 4
WA9AWO 630- 35- 9- 3
WB9CMD 2- 1- 1- 1
W9NYJ (+WN9KJK)
29,464- 254-58- 9
WB9ELH (+WA9PUN)
17,490- 166-53- 9
WB9DXX (+WB9CMD)
5577- 85-33- 5

150 Watts or Less

W9ROM 90,375- 603-75-18
WB9BJR 71,700- 478-75-16
W9ZHE 38,892- 286-6-13
WB9HLM 36,270- 282-65-24
WB9HNI/9 18,450- 185-50-16
K9VER 16,250- 163-50-10
K9JPS 7600- 100-38- 9
WA9RTU 4320- 80-27- 4
K9LWV/9 3813- 62-31- 8
WA9KBB 3696- 66-28- 3
WB9BPS 1558- 42-19- 4
WB9BWP 756- 21-18- 5
W9WYL 594- 27-11- 4
K9GDF/9 72- 6- 6- 1
WB9ELB (5 ops.)
55,074- 411-67-23
WB9BPN (+WB9BPO)
28,320- 240-59-17

DAKOTA DIVISION

Minnesota

WA0VKP 150,300-1003-75-24
W0PAN 122,988- 831-74-24
K0JLL 115,200- 805-72-22
WA0WEZ 107,019- 808-69-15
WA0MHJ 87,264- 607-72-11
WA0PRS 78,336- 545-72-20
WA0RBW 64,350- 495-65-18
W0IYP 63,273- 459-69-14
WA0HVR 60,000- 400-75-13
WA0ENP 49,126- 424-58-11
WB0ANT 48,650- 348-70-11
W0AA (W0BE, opr.)
43,470- 317-69-13
WB0DJY 39,438- 313-63-16
WA0IEF 37,210- 305-61- 7
K0CNC 21,000- 210-50- 4
W0AII 17,640- 180-49- 9
WA0YLN 9856- 112-44- 6
WA0VHO 7200- 91-40- 7
WB0BU 552- 23-12- 1
WB0A6X (+WV0AYE)
14,664- 188-39-23
WB0CQP (2 ops.)
2112- 48-22- 4

150 Watts or Less

W0ISJ 69,715- 482-73-22
K0ZKE 69,345- 403-69-21
WB0DSP 62,640- 456-72-23
W0AQY 57,190- 409-70-20
WB0CJV 56,440- 415-68-16
WA0BWM/0
22,116- 195-57- 8
WB0AJA 20,805- 185-57-10
WA0UPD 9200- 100-46- 6
WA0DKA/0
3422- 59-29- 6
WA0VOX/0 (+WA0s VEB WBC)
76,425- 512-75-52

WA0VPN (+WB0CLY)

64,184- 452-71-20
WA0WUD (+WA0BW)
20,634- 182-57-19
North Dakota
WA0LJM 23,903- 226-53-15
WA0ZZZ 17,920- 162-56-17

150 Watts or Less

K0RSA 14,504- 148-49- 8
South Dakota
WA0YAK 104,112- 726-72-20
K0VVY (4 ops.)
111,600- 748-75-24

150 Watts or Less

WA0SHA 26,350- 213-62-19
K4GXV/0 4320- 60-36- 6

DELTA DIVISION

Arkansas

WA5RTG 125,250- 835-75-21
W5EJH 3520- 55-32- 5
WASVWH (+WA5s SOG TAB)
134,550- 900-75-22
150 Watts or Less
WASZKE 53,265- 400-67-11

Louisiana

WSWMS/5 179,175-1200-75-24
W5HGT (WB2UFG, opr.)
34,176- 267-64-14
W5QPS 15,180- 165-16-11
150 Watts or Less
WASWZA 92,667- 673-69-21
K5LVZ 23,312- 188-62-17

Mississippi

K5AEU 161,775-1085-75-22
W5RUB 47,700- 400-60- 7
W5NCB 44,336- 326-68-13
K5TYP (7 ops.)
147,750- 985-75-24

Tennessee

WA4HR 76,220- 515-74-15
K4HHA 64,540- 462-70-21
WA4EPF 28,050- 275-51- 8
WB4RYL 23,498- 190-62-15
WA4IPZ 14,352- 138-52- 8
WB4IDY 8400- 100-42-10
W4GYV 4756- 61-39- 3
WB4FVZ 4484- 57-39- 4
WB4PNE 4080- 85-24- 4
WA4YNF 1892- 43-22- 3
WB4NMX 1088- 32-17- 5
W4SQE 120- 10- 6- 1
WA4TFI 48- 6- 4- 1

150 Watts or Less

WB4HSS 50,881- 350-73-22
K4PJ 40,650- 277-75-13
WB4COL 39,600- 300-66-15
WB4LHO 30,744- 257-61-24
W4OQG 21,560- 196-55-12
WB4RIJ 17,546- 143-62- 6
WB4RIJF 17,296- 184-47-14
WB4KZX 11,051- 129-43-17
WB4USG 8448- 129-33-18
W4MEA 3816- 53-36- 8
K4QZV 1600- 33-25- 4
W4QMI 748- 22-17- 1
W4WBK 644- 23-14- 1
WB4EAB 264- 12-11- 1
W4GEF 24- 4- 3- 1
K4HPP 8- 2- 2- 1
K4ZZO 2- 1- 1- 1
WB4TNY 2- 1- 1- 1
WB4OMK (+WN4UNK)
23,192- 223-52-22
WB4RAU/4 (6 ops.)
17,100- 171-50-22
WB4RKM (7 ops.)
15,504- 165-48-24
WB4IRQ/4 (7 ops.)
14,652- 169-44-24
WB4QDX/4 (7 ops.)
7626- 93-41-15

GREAT LAKES DIVISION

Kentucky

K4QW 71,978- 493-73-22
K4CSU 69,292- 510-68-12
K4FNN 61,344- 426-72- 6
WB4TPN 28,600- 220-65-13
K4FIK 28,500- 250-57- 7
WB4VEK 2100- 42-25- 5

150 Watts or Less

WB4NFQ 71,558- 486-74-24
K4FU 55,626- 382-73-17
WA4WSW 41,888- 308-68-13
WB4TTB 20,935- 201-53- 8
K4CSH (K4s B4M DMU YZU)
1207- 36-17- 3

Michigan

W8SH (K7NIV, opr.)
157,350-1049-75-24
WA8ZDT 157,242-1077-73-24
WA8VBY 138,750- 925-75-21
WA8TBO 111,075- 741-75-22
W8UM (WA7EWC, opr.)
105,975- 711-75-23
W8DOL 104,475- 698-75-19
W8OQH 101,454- 686-74-22
WB8EUN (WB4JEZ, opr.)
97,200- 648-75-24
WA8NTA 93,888- 653-72-24
K8IJE 84,975- 576-75-15
WB8JAB 66,924- 507-66-17
WA8OBG 61,798- 605-53-10
WB8CCE 55,350- 370-75-17
WA8JUN 52,114- 367-71- 9
WB8FUO 48,384- 337-72-17
WA8EDC 41,072- 302-68-13
WB8BPY 41,052- 311-66-21
WB8DZR 22,800- 190-60-19
WB8JYX 22,715- 194-59-22
WA8LTX 18,876- 143-66-13
WA8ZTQ 14,430- 111-65-14
WB8GDO 11,900- 120-50- 9
W8TWJ 10,320- 120-43- 9
W8VPC 4080- 85-24- 4
K8UDJ 3500- 50-35- 2
W8EGI 1978- 43-23- 3
WA8GUF (+K8HLR)
131,128- 889-74-24
W8MSR (WB8JH+W9AQW)
35,092- 283-62-15
WB8IH (+W9AQW)
24,416- 218-56- 7
WA8VNZ (+WB8JOS)
23,232- 242-48-12
WASVYR (+W8F AW)
3550- 72-25-

150 Watts or Less

WA8ZAV 47,952- 333-72-24
W8TJO 47,212- 319-74-16
W8TZZ 38,415- 298-65-23
WB8DBN 37,468- 278-68-15
K8HKM 26,800- 200-65- 7
K8MJZ 24,844- 208-59-12
WB8EJ 23,880- 199-60-12
G3ZCZ/W8
20,286- 162-63-22
K8GSR 18,480- 154-60-20
WB8BN 1968- 41-24- 4
W8OM 840- 28-15- 3
W8GLC 490- 25-10- 3
WB8DCR (6 ops.)
51,120- 361-71-22
W9AQW/8 (multiop.)
12,852- 126-51- 6
K8DAC (WB8s GC HYD)
4140- 60-36-12

Ohio

WA8ZDF 155,550-1045-75-24
WBKIF 153,000-1026-75-23
W8AUSP 144,900- 966-75-22
K8EHU 138,825- 926-75-24
W8OQX 135,675- 905-75-22
K8JNG 134,925- 907-75-24
W8FCM 132,460- 895-74-23
W8WPC 122,988- 831-74-21
WB8AKU 115,200- 804-72-24
W8ARWU 111,300- 742-75-17
K8WVU 108,843- 748-73-16
W8YWX 106,726- 731-73-23
W8BOSE 99,600- 664-75-21
W8AEB 90,374- 619-73-20
W8KZH 86,578- 594-73-24
WB8QIY 81,030- 555-73-11
W9GIV/8 76,442- 517-74-21
W8TMD (WA8TGX, opr.)
67,176- 468-72-17
W88BQ 61,612- 422-73-15
K8HBN 59,925- 400-75-14
W8MCR 56,140- 401-70-10
W8AJZY 54,993- 399-69-15
K8BPX 53,600- 400-67-15
W8KKI 49,436- 366-68-14
W8ATMK 45,500- 325-70-20
W8OK 43,776- 304-72-11
W8CFC 43,282- 323-67-12
W8MEM 37,830- 291-65-19

K8CSG 37,800- 252-75-21
W8HJ 37,080- 258-72-16
W8SPQ/R 35,441- 298-61-16
W8ZPF (WB8ML, opr.)
33,198- 252-66-10
WB8U 29,852- 220-68-13
W8ARV/V 28,880- 260-54-21
K8SWF 27,690- 213-65-14
W8VQI 25,200- 200-63-16
W8VYU 25,200- 210-60-10
W8NHO 24,808- 223-56-13
WB8ADI 24,120- 270-45-16
W8RFV 23,968- 214-56-10
WB8FNE 23,722- 205-58-11
20,064- 152-66- 8
WA8IYF 17,952- 176-51- 5
W8SDV 16,500- 150-55-18
W8VZF 15,453- 152-51- 9
W8BLV 11,200- 175-32- 5
WB8BHP 10,804- 146-37-11
W8EQG 10,272- 107-48-16
W8BQV 9360- 104-45- 11
W8KLC 8800- 100-44- 8
W8HSC 8448- 96-44- 3
W8ZCK 7310- 85-43-10
W8GKA 6816- 108-32- 5
W8FDN 4284- 102-21- 3
W8FMG/8 (WA8LUR, opr.)
4104- 76-27- 5
WB8AM 2976- 48-31- 6
W8BFC 2781- 52-27-10
W8RLWH 1530- 45-17- 3
K8RST 640- 20-16- 6
K8H8Q 576- 24-12- 3
K8RMM (+WA8BGE, WA8PZA)
182,325-1216-75-24
W8EDU (5 ops.)
127,725- 854-75-24
W8SVHV (+WB8CKI)
103,008- 696-74-23
W8TFZ (7 ops.)
81,252- 549-74-24
W8BKN/R (+WA8s AJZ YVM)
77,182- 522-74-20
W8BWM/R (+WB8ZREM)
66,640- 476-70-23
W8TO (WB8s CEE, DCX GBO)
59,853- 422-71-23
W8AZPP (+WB8s BF-P BXT FJII)
53,992- 397-68-16

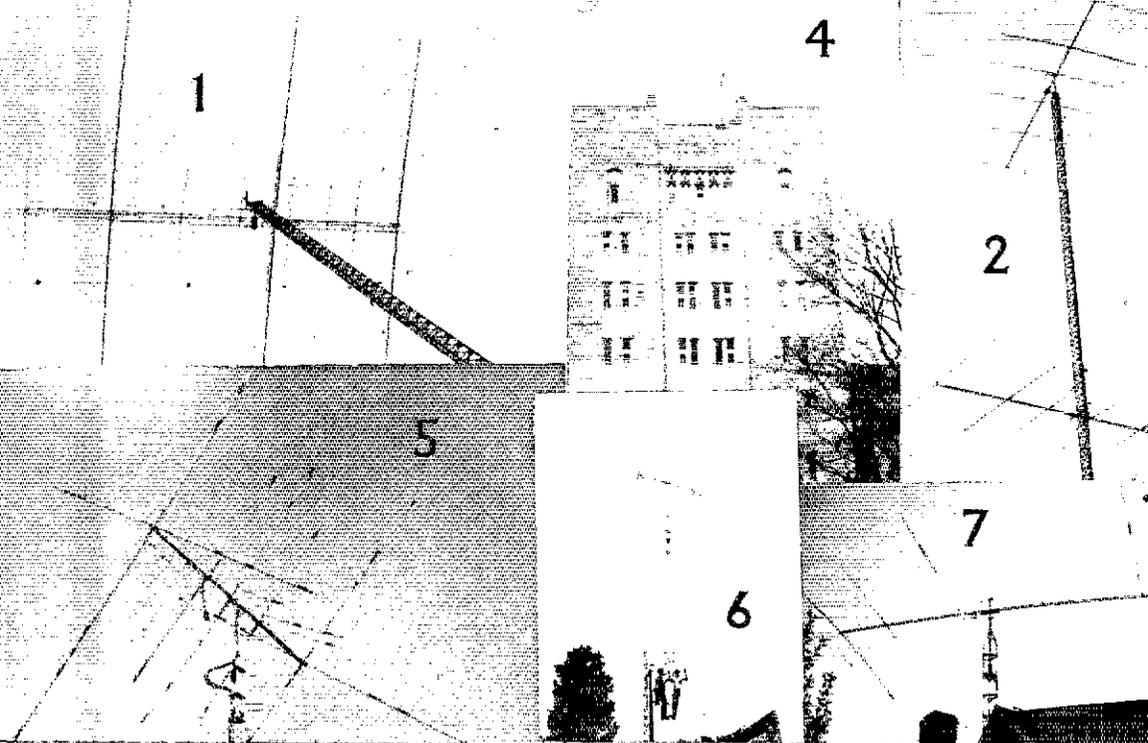
150 Watts or Less

K8YQW 49,104- 341-72-19
W8SWM/R 33,880- 308-55-20
WB8IAY 33,120- 230-72-18
K8MILO 31,616- 248-64-16
WB8IAUF 26,390- 203-65- 7
W8MXO 22,440- 165-68- 8
WB8ECL 16,378- 157-52-16
W8DTP 15,908- 194-41- 9
W8UD 10,246- 109-47- 5
W8A2TV 9010- 133-34- 6
W8IDM 8100- 100-44-10
W8GYR 7800- 100-39-13
WB8HHN 6992- 152-23- 8
W8RCWD 4800- 100-24- 8
W8RC5V 4480- 80-28- 6
WA8IXI (WA8YU, opr.)
2300- 50-23- 3
WB8BCU 1056- 33-16- 3
W8KCO 570- 19-15- 2
WB8IAS (7 ops.)
47,320- 340-70-24
WA2KAT/8 (+WB2OQL, WN8LE/K)
32,330- 305-53-19
WB8FHN (+WN8GSY)
16,468- 181-46-16

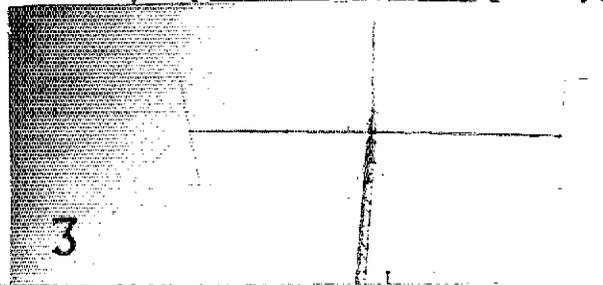
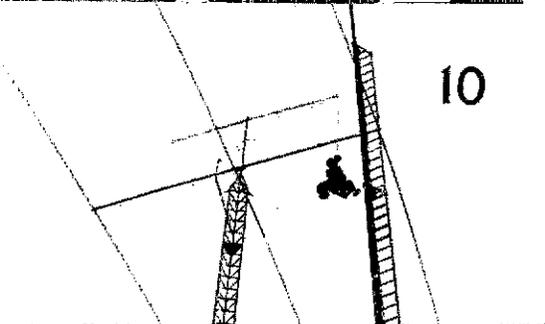
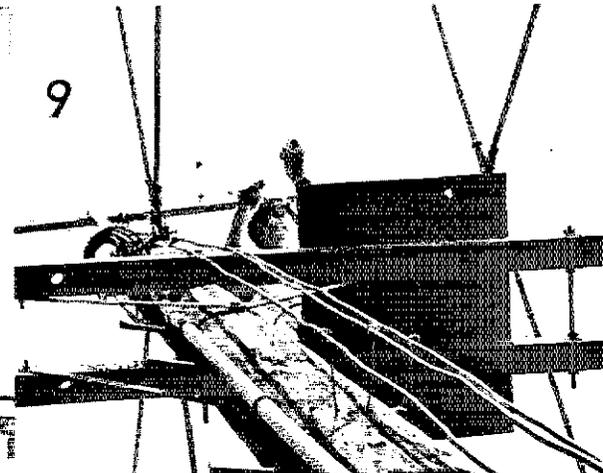
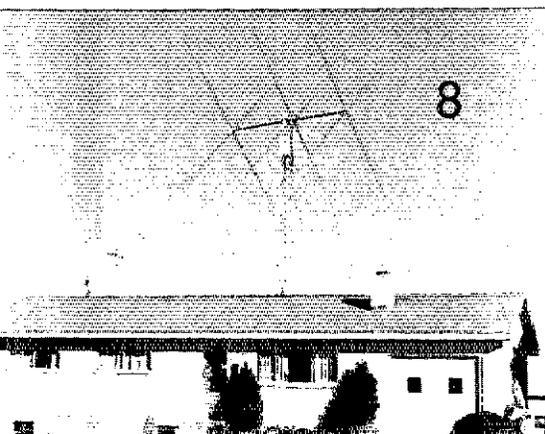
HUDSON DIVISION

Eastern New York

W1BCD/2 172,650-1151-75-24
WA2FAH 146,816- 995-74-24
WB2JAM 98,406- 754-66-34
F2YSW/2 67,206- 487-69-22
WA2RQ 24,540- 205-60-14
WB2VJB 14,896- 133-56- 8
W2KZN 14,357- 147-49- 9
W2OQJ 11,760- 140-42-18
K2BUF 9408- 98-48- 7
WA2DTE 7410- 95-39- 7
WA2EUX/2
2920- 73-20- 3
WA2KUL 1222- 47-13- 5
WB2OFU/2 (+WA2RAL)
153,750-1027-75-24
W2SZ (3 ops.)
129,000- 860-75-24
W2LUC (8 ops.)
85,800- 572-75-24



How often we hear that loud signal during the SS and wonder! Well, here's just a few for your inspection. 1) Three elements on 40, eight elements on 10 with a common 52-foot boom at W7RM. 2) Six over six on 20 meters, also W7RM. 3) A two element rotatable 80-meter yagi at 170 feet at W7RM. 4) Three elements at 165 feet, K9IU. 5) Quad at W7GEB. 6) WB4SZS/4 quad. 7) WA2LKH. 8) W7CFL. 9) Mike, WB6QND making last minute repairs. 10) WA8ZDFs XYL, Mary Ann, tuning the full sized 40-meter yagi!



K2BK (+WB2BXL) 84,750-565-75-24
 WA2SVH (+WB2UV) 37,485-299-6-24

150 Watts or Less

WB2JLR 31,740-268-60-13
 WA2ROA 30,726-286-54-16
 WA2JXR 30,240-253-60-13
 WA2AZO 24,738-217-57-11
 WB2LXC 23,876-254-47-19
 WA2LXI 18,200-178-52-22
 WA2KHV 18,000-151-60-10
 WB2WSH/2 7072-104-34-2
 WB2OLQ 5328-74-36-6
 WA21BU/2 3800-76-25-4
 WB2KLY 2522-49-26-6
 WA2JLV/2 ?-1-1-

N.Y.C.-L.I.

K2AU 105,900-710-75-22
 W2DKM 96,441-664-73-24
 WB2JSJ 54,040-387-70-18
 WA2RAZ 52,904-390-68-18
 WB2MZU 46,220-372-63-18
 W2LEJ 45,080-327-70-21
 K2DW 40,625-314-65-19
 W2HAE 22,116-194-57-13
 W2MQB 16,758-171-49-12
 W2I1/2 (WA2RQ, opr.) 14,260-155-46-9
 WB2APV 13,800-150-46-14
 WA2LKH 10,305-115-45-6
 W2NZ 9936-108-46-6
 WA2SGK 7000-104-35-7
 WA2RRG 6408-89-36-6
 WB2IVK 3782-61-31-6
 W2NBI 192-12-8-1
 W2TUK 154-11-7-8
 WA2HTB (+WA31KG) 23,226-237-49-19
 WA2GLP (3 oprs.) 22,000-220-50-14
 WB2ENV/2 (+WA2s PRB PYG) 10,240-160-32-

150 Watts or Less

WB2AYP 83,232-478-72-24
 WA21YH 46,305-374-63-24
 WA2JWF 44,287-331-67-14
 WA2QEB 43,200-300-72-14
 WB2LYB 39,444-358-57-12
 WA2PWO 15,496-149-52-16
 WA2MZE 14,564-167-44-18
 WB2WXR 13,916-142-49-9
 WA2LOH 13,420-153-34-22
 WA2OQB 11,997-140-42-17
 WA2NWE 8888-101-44-9
 WB2ZIN 8442-101-43-10
 W2CZZ 2752-43-32-4
 WB2OYV 2701-40-17-5
 WA2PKA 2300-50-23-10

Northern New Jersey

WB2SQN 166,500-1125-74-23
 WA1ABW/2 145,562-1001-73-34
 W2MB 135,075-901-75-24
 WA2DZU 88,125-590-75-21
 WA2APG 72,420-535-68-23
 WA2DNY 37,570-288-65-16
 WB2WID 5000-100-25-1
 WA2BAN (+WA2s DMF DDO) 100,368-697-72-20

150 Watts or Less

WB2RJJ 75,040-536-70-24
 WA2RGM 15,345-145-55-16
 WA2KWB/2 9579-156-31-6
 WA2NLP 4160-80-26-4
 W2MQ/2 (WA2s BLU, F1W) 73,984-544-68-24
 WA2HID (+WA2AF1) 55,510-399-70-19
 K2BDX (3 oprs.) 19,942-171-59-12

MIDWEST DIVISION

Iowa

K0LUZ 125,100-834-75-24
 K0YVU 100,950-674-75-19
 WA0JCF 98,988-680-73-22
 K0MMS 90,000-600-75-22
 WA0ATY 44,850-325-66-17
 WA0ODK 42,510-328-65-23
 WA0VDX 23,691-225-53-8
 WB0AVV 22,656-193-59-17
 WB0DLC 17,800-178-50-13

WA0LFN 9594-117-41-7
 W0WVSV (13 oprs.) 57,984-456-64-22

150 Watts or Less

WA0YJW 30,814-252-62-10
 WB0CCQ 28,520-230-62-22
 WA0TACQ/0 24,544-208-59-21
 WB0BTP 10,140-130-39-10
 W0MOQ 6120-85-36-2

Kansas

WA0VJF 87,048-610-72-18
 WA0ZFW 52,866-410-66-20
 WB0DOX/0 32,304-347-48-17
 W0BNCW 30,300-206-75-9
 K0CML 18,928-172-56-8
 W0ICY 11,656-124-47-11
 WA0SVSO 2750-55-25-6
 WA0KVP 918-26-18-2
 W0SOE (8 oprs.) 100,465-709-71-23
 WA2HSP/0 (5 oprs.) 78,958-536-74-24

150 Watts or Less

K0PFV 31,310-254-62-14
 WB0CCW 31,248-252-62-15
 WB0BTV 26,598-216-62-14
 WB0ABL 24,278-200-61-16
 WA0DOZ 14,946-142-53-20
 WA0WRN 14,387-141-51-18
 WB0CFP 3782-61-31-9
 WA0SEV (5 oprs.) 36,736-288-64-24

Missouri

K0ZHD 61,488-428-73-22
 W0OWS 58,305-423-69-20
 WA0JBX (WA0H BQ, opr.) 54,579-398-69-17
 WB0AZK 42,174-321-66-21
 W0KCG 18,550-175-53-11
 K0DEO 14,700-150-49-8
 WA0CWH 722-19-19-2

150 Watts or Less

W0MYQ 26,550-226-59-19
 WB0ALW 23,885-203-57-17
 WB0CKC 12,780-142-43-13
 W0BVB 3944-68-29-7
 WA0ITU 3000-50-30-12
 WA0ZLI (+WA0FLM) 19,329-190-51-22

Nebraska

WB0WLO 74,460-511-73-18
 WA0LGS 62,720-448-70-13
 K0VVU 55,074-411-67-13
 WB0UMD/0 19,600-200-49-7
 W0BKK 4495-73-31-7

NEW ENGLAND DIVISION

Connecticut

K1V1M 172,800-1152-75-24
 WA1HD 170,644-1153-74-24
 W1FFG 151,050-1007-75-23
 WA1PDI/* 145,875-974-75-21
 K1ZND 134,612-923-73-24
 K1JHX 134,100-894-75-22
 WA1JZC 105,272-745-71-22
 K1TIQ 102,240-720-71-19
 K1GUD 93,906-638-74-20
 WA1DQI/1 73,960-529-72-12
 G3XPM/W1 73,730-505-73-19
 WA1KOC 70,924-526-68-24
 K1ASJ 70,716-499-71-23
 WA1EVX 59,856-526-58-24
 W1BIB 57,450-384-75-12
 W0DR/L1/* 45,480-379-60-15
 WA1L1J 44,289-352-63-17
 K1DPB 37,200-305-62-9
 WA1ISD 21,762-203-54-5
 WA1MNN 19,552-191-52-8
 W1FLM 19,396-188-52-8
 K1GFK 16,598-193-43-8
 W1DEP 15,080-145-52-13
 W1RML 15,080-145-52-19
 K1KTB 14,504-130-56-10
 W1RZC 12,054-148-41-11
 K1ONZ 8960-128-35-3
 W1QV 6980-76-40-4
 WA1NRG 1156-34-17-5
 WA1HUL 600-25-12-1
 K1QFN 156-13-6-1
 W1F1X 72-6-6-1

W1FBY (+W1ARR) 164,700-1098-75-24
 WA1GBA (+WA1DWE) 112,128-768-73-24
 WA7GWL/1 (+WA1KOM)* 73,584-309-73-21
 WA1GOO (+K1NGL) 39,000-300-65-21
 W1FRD (multiopt.) 24,510-215-57-17

150 Watts or Less

WA1MAO 54,600-390-70-18
 WA1MOW 39,366-367-54-15
 W1ECH 26,397-210-63-10
 WA1LWQ 14,070-201-35-15
 WA1NES 12,906-239-27-17
 WA1BSF 10,664-172-31-14
 W1WCG 7308-126-29-6
 K1PQA 2852-62-23-11
 WA1PHF (WB2CHO, opr.) 2544-53-24-5
 W1DGL 2520-45-28-2
 WA4WF/1* 2160-54-20-3
 WA1LWT 1840-40-23-3
 WA1MXP (+WA1NIO) 35,112-308-57-24

Eastern Massachusetts

WA1JHQ 168,000-1120-75-18
 K1OME 121,464-847-72-24
 WA1KZE 121,275-812-75-24
 WA1JUY (WA1JYS, opr.) 105,600-704-75-23
 W1MX (WA1KIM, opr.) 89,052-672-68-24
 W1EOT 89,329-604-74-24
 W1HWM 63,280-454-70-24
 K1MJE 55,220-298-60-10
 WA1LKU 34,036-258-67-16
 WA1NLX 29,760-240-62-20
 W1AX 23,800-175-68-8
 WA1NRV 18,312-202-40-5
 W1PLJ 9156-110-42-10
 W0JNQ/1 4758-92-26-7
 WA1FNM 2516-74-17-7
 WA1HAA 1840-40-23-1
 WA1LKK 1224-36-17-1
 WA8FMA/1 (+K0OPUR) 25,594-191-67-16
 K1IPB (+WA1KIS) 3620-91-20-7

150 Watts or Less

K1FUF 152,144-1028-74-24
 WA1LXE 123,284-852-74-18
 WA1KYJ 57,090-440-66-24
 WA1KBG 56,718-411-69-19
 WA1NII 51,532-359-72-14
 W1FCF 49,274-348-71-22
 WA1MCY 41,470-319-65-19
 WA1KBZ 28,890-231-63-20
 WA1NDM 28,050-281-50-19
 WA1NKW 27,830-256-55-16
 WA1ROQ 25,370-216-59-10
 WA1KFI/1 17,346-177-49-19
 WA1LBP 12,060-134-45-12
 W1GBO 8432-68-62-14
 WA1KSW 3640-65-28-6
 WA1LAI 1695-57-15-9
 WA1GFW/1 1408-44-16-2

KH6YI/W1 1026-29-19-10
 WA1LAK 1024-32-16-4
 WA1ITZ 742-27-14-6
 W1DC/1 (3 oprs.) 27,918-212-66-14
 WA1MYK (+W1NLR1) 12,342-184-34-22

Maine

K1GAX 80,142-542-74-18
 K1TFV 28,614-251-57-12
 W1DIS 20,792-226-46-5
 WA3GHC/1 13,892-151-46-20

150 Watts or Less

WA1NZZ 3720-60-31-7
 K1SGU 2900-50-29-6

New Hampshire

W1XLX 115,736-782-74-21
 K1ATL 113,068-721-54-12
 W1RPM 9900-110-45-4
 WA1JTM 45-8-3-1

150 Watts or Less

*W1DXB 40,950-294-70-15
 K1CTQ (WB4MZD/DJIIIS) 56,511-411-69-21

Rhode Island

W1VPY (WA2LBT, opr.) 100,240-716-70-24
 WA1MQO 92,796-631-74-23
 W1FLN 43,946-304-73-19
 WA1AUI 3996-74-27-15

150 Watts or Less

WA1NOE 25,228-241-53-17

Vermont

WB2YEW/1 64,064-573-56-22
 K2HVN/1 50,922-369-69-18
 WA1GXI 16,524-154-54-15
 WA1DWE/1 (+WA1HYN) 33,360-278-60-21

150 Watts or Less

WA1LVW/1 8350-119-38-12

Western Massachusetts

K1KNQ 37,820-309-62-8
 K1SSH 23,716-243-49-9
 W1EZO 22,260-210-53-8

150 Watts or Less

WA1NIC 26,082-284-46-22
 W1WE 12,546-123-51-7

NORTHWESTERN DIVISION

Alaska

KL7MF 25,010-205-61-4
 KL7EGS (WA8JW, opr.) 21,828-217-51-8
 WA0ZQB/KL7 374-17-11-6

Idaho

W7EYR 24,490-209-62-15
 W7CNI 21,677-205-53-4
 W7UD (5 oprs.) 58,344-449-66-24

150 Watts or Less

W7CFL 114,300-763-75-24
 WA7MPS 99,800-712-70-20

Montana

K7LTV 117,975-789-75-19
 WB4BPS/7 (+WA1GZV) 128,250-855-75-21

150 Watts or Less

W7GFK 110,250-791-70-22
 W7TYN 60,636-489-62-19
 WA7TZR 21,344-184-58-12
 W7ELK 3752-67-38-7
 W7FO/7 (14 oprs.) 55,120-424-65-24

Oregon

WA7OVU 44,968-311-73-24
 WA7OCC 39,424-309-64-24
 WA7OCY 37,560-261-53-18

150 Watts or Less

WA7JBE 65,700-454-73-24
 WA7KWS 27,360-228-60-11
 WB6KBI/7 2756-53-26-4
 WA7HNL 2050-41-25-4
 K7WWR 748-22-17-1

Washington

W7RM (K7VFP, opr.) 249,600-1664-75-24
 W7BUN 117,150-781-75-23
 WA7JBM 109,950-759-75-21
 W7NP 100,520-719-70-18
 W7UBA 90,000-633-72-18
 WA7NVX/7 85,698-621-69-19
 WA7JCB 72,781-502-73-21
 K4ZDK/7 40,480-420-72-16
 K7NWS (WA7BSO, opr.) 60,012-448-67-18
 WA7FBO 53,720-395-68-19
 W7GYP 53,056-415-64-19
 W7YTN 52,292-370-72-18
 WA7KYZ 50,085-400-63-17
 K7RSB 49,404-358-69-19
 K7MOK 43,095-335-65-17
 K3RIW/7 41,020-293-70-24
 WA7HKD 39,585-307-65-13
 W7FA 38,155-296-65-16
 W7VMF 34,869-296-59-14
 WA7BHH 31,903-263-61-15
 K7NZU 27,907-138-59-17
 K7GZO 24,244-211-58-16
 W7NG 23,313-206-57-10
 W7LOO 20,988-198-53-17
 WA7NLD 19,824-207-48-10

W5C-Q/7 19,380-191-51-4
 W7C JP 17,390-185-47-18
 WA7ACQ 17,376-182-48-10
 W7QCVC 13,728-156-44-10
 W7PK 12,300-150-41-8
 K7HTZ 99,200-124-40-
 W7IKG 8988-107-42-5
 W-JL 76,220-103-37-9
 W-TM 7600-100-38-1
 W7RGD 6,930-100-35-12
 K7UWT 6,708-86-39-4
 WA7JUB 5880-105-28-11
 WA7PYN 5610-85-33-12
 W7YBX 47,36-74-32-4
 W7OS 3886-67-29-6
 WA7L0M 3024-58-25-4
 W7GAX 2088-46-24-6
 WA2NPC/7 782-23-17-3
 WA7MLK 400-25-8-3
 WA7N00 142-19-4-1
 K7BBO 104-26-2-6
 WA7IPR 27-14-1-16
 WA7ORM (+771CA)
 1-3525-1813-75-24
 W7SFA (+VU7Z)
 181,875-121-35-24
 WA7JAY (+WA7S JAZ NK5)
 7486-100-38-8

150 Watts or Less

WA7ODC 92,278-628-74-24
 K7AWB 60,624-422-72-18
 W7WMY 40,200-335-69-16
 WA7OBI 29,848-270-56-13
 WA7IHG 29,610-235-63-17
 WA7LFG/7 19,894-203-49-11
 WA7MJX 14,560-140-52-8
 WA7NYI 13,959-150-47-13
 WA7JFM 13,776-165-42-21
 W7R1W 7800-100-39-12
 K7ANP 6902-119-29-14
 E7IND 2800-50-28-3
 W7ZPI 2070-45-23-8
 K7NKZ 500-25-10-2
 K7FKX 432-24-9-3
 WA7BSO 352-16-11-1
 WA7IBL 312-26-6-3
 WA7L0L 300-26-6-3
 K7NPG 182-13-7-2
 E7CYZ 44-22-1-6
 WA7GXF 3-4-1-1
 WA7NOH (+WA7NOG)
 5880-93-29-7

PACIFIC DIVISION

Fast Bay

K6AUD 102,711-70S-73-23
 W6ROZ 6,336-88-36-
 W6KG (+W6DOD)
 134,992-868-72-24
150 Watts or Less
 WA6CPY 57,084-403-71-18
 W6BWB 25,320-211-60-5
 WA6LHD 15,200-152-50-8
 W6BLRV/6 11,844-141-42-19
 W6NMT 7308-87-43-7
 W6BSWY 13,093-100-594-89-73-22
 W6B6C/6 (+W6G0XA)
 900-25-18-3

Hawaii

KH6J 88,128-612-72-13
 KJ6GMP 65,952-460-72-18
 KH6RS (K2SL+K1H6GXG)
 44,330-342-65-7
Nevada
 K1AGB/7 123,600-824-75-18
 WA7CWM 96,773-687-71-16
 W7YKN 52,290-415-63-13

150 Watts or Less

W6DPV/7 52,206-198-66-13

Sacramento Valley

W6KYA 22,528-176-64-8
150 Watts or Less
 WA6NYV 10,074-110-46-10
 K6SG 9061-112-41-12
 W6BABB/6 3260-48-35-

San Francisco

W6BIP 6,969-484-72-19
 W6NUI 16,368-186-44-6

150 Watts or Less

WA6NLO/6 55,948-198-71-24
 W6UDS/6 (+W6BAQV)
 16,848-163-52-16
San Joaquin Valley
 WA6IVN 167,018-1140-74-24
 W6BRKH 93,600-654-72-21
 W6MFB (9 ops.)
 26,962-221-61-18
150 Watts or Less
 WA6CP 10,334-119-43-6

Santa Clara Valley

n61 BB (WA6DKK), opr.1
 168,825-1128-75-24
 W6GKR 141,450-951-75-24
 K6VGW 78,455-554-71-20
 W6GPF 58,932-403-72-6
 WA6GTV (WB6JLX, opr.)
 51,724-411-63-20
 W6LY 48,620-361-68-12
 W6RAM/6 30,940-221-70-16
 W6QKK 16,588-161-52-10
 K6LY (WB4JLX, opr.)
 14,700-148-50-5
 W6CLM 11,815-118-49-10
 W6CTH 8260-118-15-2
 WA6HT 4158-63-13-9
 WA6AG 1470-35-71-8
 WA6BVY 1330-35-19-2
 W6G0L (+WB5LPK ZUC)
 159,026-1080-74-24
 W6PI (8 ops.)
 93,732-642-75-24
 W6B-NP (+WB6LH)
 3744-72-26-11

150 Watts or Less

W6RXXV/6 29,160-243-60-
 W6GIV 38,470-370-65-16
 WA6QKU 14,260-155-46-15
 W6IGU 5408-52-52-9

ROANOKE DIVISION

North Carolina

WA41EW 150,150-1006-75-23
 WA1IRG/4 142,800-956-75-24
 E5HWO/4 71,410-483-74-22
 W6PZ 61,612-422-73-21
 W64JY 40,796-329-62-14
 K4VNM/4 39,040-370-66-17
 K4CAC 17,600-200-44-10
 WB4OZQ/4 14,651-150-49-15

South Carolina

W64ONP 47,784-362-66-12
 WB4SJD 22,940-185-62-5
 WB4LRK 22,736-196-58-14
 W4YSJ 13,248-138-48-12
 WB4RNX/4 (+WB4NXY)
 23,868-222-54-16
150 Watts or Less
 WB4MY 67,409-445-71-15
 WB4GGA 28,116-213-66-8
 WB4TMM 2040-44-30-7
 WB4VJK (6 ops.)
 41,006-555-58-24

Virginia

E4WCC (K4POL, opr.)
 153,900-1045-75-20
 K4CG (WA4KJR, opr.)
 141,300-943-75-22
 W4KFC 121,050-807-75-14
 W4WSI 110,100-737-75-17
 K41DR 109,800-736-75-18
 W4DM 100,640-681-74-21
 W4UPI 89,034-628-71-22
 W4NOA/4 83,688-635-66-15
 K4PCL 70,484-526-62-19
 K4OD 69,430-455-73-23
 K4ORU 62,136-434-72-18
 W41Z 52,110-338-70-11
 WA4USB 52,164-379-69-17
 K4BO 45,472-406-56-9
 W4NH 38,808-308-63-10
 W4YZC/4 37,760-370-59-15
 K4ZA 35,668-241-74-13
 W4KXV 33,440-304-55-11
 W4ZM 28,230-215-61-9
 W6GPI/4 23,010-179-65-16
 WB4N1/4 14,946-159-47-7
 W4JVN 14,050-141-50-8

W4GF 12,838-131-49-5
 W4DIW 5200-65-40-6
 WB4BJ 5420-57-30-7
 WB4PYO 360-18-10-2
 WB4OXD (4 ops.)
 62,977-445-71-18
 W4JK (+WB4F11)
 53,712-373-72-23
 W4PAY (WB4S QUA SPZ IKA)
 20,552-185-86-13
 WB4SOK (+WB4OVG)
 1254-33-19-1

150 Watts or Less

WB4MRI 100,229-687-73-19
 WB4UIV 57,600-384-75-21
 WB4PAZ 54,240-452-60-18
 WB4RDV 37,940-271-20-24
 W4TRK 17,640-148-60-12
 W4HR 12,284-166-47-15
 K4GRD 7400-100-37-7
 WB4RFK 7002-107-13-12
 K41FO 4928-77-12-8
 W4VC 1518-51-15-4
 WB4SVE 871-34-14-4

West Virginia

WB8BMV 68,850-459-75-18
 WA8POS 9360-156-30-2

150 Watts or Less

WB4AX 22,680-199-57-14
 WB8BMV 6840-90-38-8
 K3ACD/R 588-21-14-2

ROCKY MOUNTAIN DIVISION

Colorado

W6NQQ 136,200-923-75-22
 W4UDNS/6 101,324-697-73-19
 W6LSK 93,024-646-72-21
 K01MM 50,540-361-70-20
 W6BWJ 39,312-273-72-18
 W6BWB 10,900-109-50-12
 W6BBI 8432-134-34-10

150 Watts or Less

WB6AMJ 55,943-415-67-14
 K6ZFL 28,908-219-66-13
 WA6YH 21,120-176-60-13
 WA6YSK 1738-42-22-12
 WA6OPY 78-7-6-24

New Mexico

W6RSZ 158,629-1098-73-24
 K51PO 97,310-660-74-21
 W55CA 53,312-395-68-10
 W5OZ 3024-54-28-5
 WB5AXC (8 ops.)
 65,408-518-64-17
150 Watts or Less
 W5QNO 15,631-161-49-7

Utah

W7OAD (W7MWR, opr.)
 164,280-1110-74-21
 W7GXC 82,740-604-70-20
150 Watts or Less
 K7AQB 59,072-416-71-23
 W7HVB/7 36,890-300-62-9

Wyoming

WA7OZJ 21,550-216-50-14
 W7RPV 2856-51-28-3
150 Watts or Less
 WA71WY 50,864-377-68-21
 K7VJ 198-11-9-3

SOUTHERN DIVISION

Alabama

K4UIP 51,300-342-75-11
 W4DS 16,236-123-60-13
 WB4SVX 15,276-147-54-9
150 Watts or Less
 WB4BUT 24,221-232-53-16
 WB4ADT 9800-100-49-4
 K4RY (4 ops.)
 3864-70-28-8

Canal Zone

KZ5Z7 157,590-1053-75-22

150 Watts or Less

KZ5OD 782-33-17-5
Eastern Florida
 WB4MK 100,688-727-72-20
 WA0ZI 87,423-638-69-15
 WB4OKI 73,769-520-71-19
 K4CI 71,070-515-49-14
 WB4OH 54,536-401-68-20

WA4TWO 31,770-260-61-16
 WB4COW 29,158-239-61-15
 K4BNC 26,100-174-75-
 W4BRB 21,438-199-84-7
 W4PZV 20,646-140-74-17
 WB4T1 17,808-168-53-14
 WB4LLD 13,965-145-49-10
 W41PO 12,508-118-51-13
 WB4RLU 10,272-107-48-14
 WB4VON 3536-64-28-8
 K4RU 2940-42-35-6
 WB4POR 540-18-15-3
 WB4PKP (+WB4S OPI OTH)
 115,804-783-74-24

150 Watts or Less

WB4TON/4 (WB4HSB, opr.)
 78,694-540-73-21
 WA4NLC 23,436-189-62-20
 WB4JCK 11,200-109-56-9
 WB4SVI 4836-78-31-4
 WB41ZO 1584-36-22-4
 WB4SZS/4 (+WB4RSV)
 55,772-385-73-21

Georgia

K4BAI/4 116,475-779-75-24
 K4GSI 95,016-648-74-23
 W4JM 40,698-323-63-8
 WB4RUA 35,242-265-67-11
 K4HZ 27,904-218-64-6
 WA4DWN 9280-116-40-
 K4AII 4247-69-31-10
 WA4OL (4 ops.)
 52,370-259-68-11

West Indies

KG4LQ (WA9NKK, opr.)
 176,550-1185-75-24
 K4GLX 14,617-158-47-10
 G44FN 4480-64-35-4
 KP4USN (3 ops.)
 82,500-625-60-16

150 Watts or Less

KP4DJ 53,330-303-55-14

Western Florida

W3ZBW/4 51,398-425-62-11
 WB4SBD 39,772-376-61-15
150 Watts or Less
 WB9AUI/4 7800-90-41-7

SOUTHWESTERN DIVISION

Arizona

W7IR 173,700-1166-75-24
 K7PXI 101,251-694-73-18
 W7GKV 67,520-415-75-22
 K7UWV 44,485-345-65-8
 W7WVZ 5412-82-33-9

150 Watts or Less

W37NAH 51,657-401-67-14
 W71CD 41,790-299-70-8
 WA7RWL 37,674-299-63-18
 W7ZMD 24,476-256-68-13

Los Angeles

W6HX (WB6OLD, opr.)
 210,650-1410-75-24
 W6WTT/6 160,016-1111-73-24
 K6BIP 138,150-923-75-24
 W6VZ1 118,350-790-75-21
 W6NOS 116,324-810-72-21
 W6BHDG 101,762-701-73-20
 W6NUJ 86,210-583-74-13
 W6AKKP 81,906-561-73-13
 K6SSN 58,575-391-75-19
 K6GPI 54,400-400-68-10
 W6BNSV 46,376-375-62-11
 W6GGO 44,940-321-70-18
 W6ADPO 38,760-285-68-10
 K6MP 35,945-277-65-8
 W6CI 25,896-249-52-8
 W6M3N 22,290-215-53-10
 W6DOX 19,716-186-53-3
 W6PFX 14,352-138-52-12
 W6IPI 11,224-122-46-3
 C6RU 9890-115-41-7
 W6ZK1 7155-61-45-16
 W6PXY 3068-59-26-3
 W6VPZ (15 ops.)
 71,781-506-71-24
 W6AMN (+WB6KJ)
 28,672-228-64-23
 W6LGH (+W6G0Z, WA6PO)
 7700-110-35-

ARRL QSL Bureau

The function of the ARRL QSL Bureau is to facilitate delivery to amateurs in the United States, its possessions and Canada, of those QSL cards which arrive from amateur stations in other parts of the world. All you have to do is send your QSL manager (see list below) a stamped, self-addressed envelope, about 4 1/4 by 9 1/2 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, WN1¹ - Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.

W2, K2, WA2, WB2, WN2 - North Jersey DX Assn. P.O. Box 505, Ridgewood, NJ 07451.

W3, K3, WA3, WN3 - Jesse Bieberman, W3KT, RD 1, Box 66, Valley Hill Rd., Malvern, PA 19355.

W4, K4 - North Alabama DX Club, P.O. Box 2035, Huntsville, AL 35804.

W4A, WB4, WN4¹ - J. R. Baker, W4LR, P.O. Box 1989, Melbourne, FL 32901.

W5, K5, WA5, WB5, WN5 - Kenneth F. Isbell, W5QMJ, 306 Kesterfield Blvd., Enid, OK 73701.

W6, K6, WA6, WB6, WN6¹ - No. California DX Club, Box 11, Los Altos, CA 94022.

W7, K7, WA7, WN7 - Willamette Valley DX Club, Inc., P.O. Box 555, Portland, OR 97207.

W8, K8, WA8, WB8, WN8¹ - Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, OH 43215.

W9, K9, WA9, WB9, WN9 - Northern Illinois DX Assn., Box 519, Elmhurst, IL 60126.

W0¹ Reggie Hoare, W0QYP, P.O. Box 115, Mitchellville, IA 50169.

WA0¹ - Lloyd Harvey, W0QGI, P.O. Box 7, Attica, IA 50024.
K0, WB0, WN0¹ - Dr. Phillip D. Rowley, K0ZFF, Route 1, Box 455, Alamosa, CO 81101.

KP4 - Alicia Rodriguez, KP4CL, P.O. Box 1061, San Juan, PR 00902.

KZ5 - Canal Zone Amateur Radio Association, Box 407, Balboa, C.Z.

KH6, W16 - John H. Oka, KH6IQ, P.O. Box 101, Alea, Oahu, HI 96701.

KL7, WL7 - Alaska QSL Bureau, Star Route Box 65, Wasilla, AK 99687.

VE1 - L. J. Fader, VE1FQ, P.O. Box 665, Halifax, NS.

VE2 - A. G. Daemen, VE2IJ, 2960 Douglas Avenue, Montreal 301, PQ.

VE3 - R. H. Buckley, VE3UW, 20 Almont Road, Downview, ON.

VE4 - D. E. McVittie, VE4OX, 647 Academy Road, Winnipeg R3N 0E8, MB.

VE5 - A. Lloyd Jones, VE5JJ, 2328 Grant Road, Regina, SK.

VE6 - D. C. Davidson, VE6TK, 1108 Trafford Dr. NW, Calgary 47, AB.

VE7 - H. R. Hough, VE7HR, 1291 McKendle Rd., Victoria, BC.

VE8 - Yellowknife Centennial Radio Club, P.O. Box 1944, Yellowknife, NWT, Canada.

VO1 - Ernest Ash, VO1AA, P.O. Box 6, St. John's, NF.

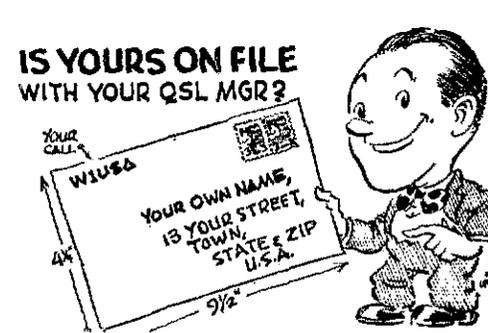
VO2 - Goose Bay Amateur Radio Club, P.O. Box 232, Goose Bay, LB.

SWL - Leroy Waite, 39 Hannum St., Ballston Spa, NY 12020.

¹These bureaus prefer 5 X 8 inch or No. 50 manila envelopes.

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

Note: First-Class mail in the U.S. and Canada is now 8¢ an ounce. QSL Bureau users should send their manager enough two-cent stamps to cover the envelopes on file.



150 Watts or Less
WB6ZVC 74,592- 504-74-16
WB6QND 74,102- 553-67-18
WB6PLH 48,762- 387-63-23
WB6UCJ (WB6DM, opr.)
40,572- 294-69-14
WA6PIM 51,104- 243-64-23
WA6LOW 15,648- 163-48- 8
WA6RJB 66,97- 91-47- 3
WB6ATV 11,59- 31-19- 3
WA6DHM (+WA6PZL)
54,320- 390-70-22

Orange
WB6YPK (WB6CIK, opr.)
122,901- 870-71-21
WB6NSJ (+WB6, LI, LI N)
108,989- 749-73-24

150 Watts or Less
WB6LAI 20,553- 203-51-10

San Diego
WB6VFJ6
133,152- 912-73-23
W5CWO/6 51,546- 366-71-13
WB6RMG 29,900- 231-65-13
W6MAR 41,76- 72-29- 1
WA6HLA (4 opr.)
80,869- 611-71-23

150 Watts or Less
W6JXA 13,600- 136-50-12

Santa Barbara
W6UA (W6HOH, opr.)
101,528- 686-74-16
W6RJ-U (WA6OUZ, opr.)
44,712- 325-69-19
W6GEB 21,318- 187-57- 6
W6MOF 40,92- 63-33- 3

150 Watts or Less
WA6LNF 52,360- 376-70-20

WEST GULF DIVISION

Northern Texas
WASJMK 195,000-1300-75-23
K5RIHZ 162,652-1099-74-23
WA6SLU/5
79,200- 603-66-16
WBSJHC 56,028- 409-69-22
WASVAB 41,674- 361-67-13
WASVDY 19,306- 197-49-13
W5LUD 10,720- 134-40- 3
WASZUC 12- 6- 1-
W5MYA (+K5HD)
151,200-1010-75-20
W5UCY5 (6 opr.)
92,690- 713-65-20
K5TCK (+K55 ALU BKO)
80,928- 563-72-23
WBSAZL (+WBSPIV)
48,192- 379-64-18

150 Watts or Less
K5YRK 63,196- 428-74-23
WASUC7 57,096- 397-72-11
WBSAOF 48,794- 395-62-21
WBSLLE 25,080- 224-57-13
WBSAAR 19,864- 191-52- 7
WBSCKH 16,430- 155-53-16
W5SQZ 15,048- 171-44- 6
W5ONI 12,152- 124-49- 6
WASVKG 2400- 50-24- 3
WASWZO 260- 13-10- 1

Oklahoma
WASDTL 33,960- 283-60-20

W5ZWO 6240- 80-39- 6
W5SDAM 3894- 54-33-10

150 Watts or Less
WBSJDX 45,201- 372-61-15
W5SDS 23,199- 208-57- 8
WASZWW/5 (+WBSAHT)
69,010- 518-67-22

Southern Texas
K5RLW 175,972-1192-74-24
K5TSR 152,250-1015-75-18
WBSRGV 21,120- 176-60-10
W5QAM 20,104- 180-56-11
W5CJG 5904- 85-36- 8
WBSBSB 5202- 77-34- 6
W5LJI 4165- 60-35- 2
WBSBQB 3968- 62-32- 9
K5PLL 912- 29-16- 1
W5YU (8 opr.)
108,928- 738-74-24
K5IEZ (W5RPY+W5QOD)
95,790- 776-62-20

W5PXZ (5 opr.)
55,314- 439-63-21
WASWJC/5 (+WBSAHX)
37,076- 300-62-21

150 Watts or Less
WASVQC 85,320- 594-72-23
WASWQF 82,512- 573-72-19
WASUGF 67,796- 502-68-22

CANADIAN DIVISION

Manitoba
VO1CA 75,628- 511-74-19
VE1IN 26,280- 219-60-14
VE1ASJ 19,968- 192-52-25

Quebec
VA2UN (WA3IRV, opr.)
148,296-1002-74-24
VE2AOQ 15,444- 143-54-12

Ontario
VE3BUV 103,748- 703-74-20
VE3ENM 41,406- 311-67-13
VE13SV 14,456- 139-82- 8
VE3JGA 9468- 132-36- 5

150 Watts or Less
VF3BNV 27,378- 255-54-18

Manitoba
VE4AK 1628- 37-22

150 Watts or Less
VF4FA 74,906- 559-67-16

Saskatchewan
VE5US (VF5UP, opr.)
168,900-1134-75-23
VF5TO 24,048- 167-72-17

150 Watts or Less
VE5IT 10,340- 112-47-12

Alberta
VF6HJ 24,274- 233-53-13
VE6LB 8118- 99-41- 7

150 Watts or Less
VF6MA 23,348- 225-52- 5
VF6AGV 19,224- 178-54-11

British Columbia
VF7BDJ 156,600-1046-75-22

Yukon-N.W.T.
VE8BB 51,220- 394-65- 9

Check Logs

CW, WN10NH, K2DT, WN4RVD, K5TYP, WA7HIA, WA9ZES, VE7AGN. Phone, WIBDX, K5DEC, WA7IIC, WB8JIR. And finally, the phone entry of W5WU/5 should read 160,875-1078-75-B-24. Sorry, Pat.

ARE YOU LICENSED?

• When joining the League or renewing your membership, it is important that you show whether you have an amateur operator license. Please state your call and/or the class of operator license held, that we may verify your classification.

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			

Alabama - The Annual Mobile ARC Hamfest is June 11 at the Knights of Columbus Hall. For further information write Bob Ryan, K4DBP, P. O. Box 7232, Mobile, AL 36607.

California - The Seventh Annual Burbank Hamfest is May 20 from 10 A.M. to 8 P.M., seven blocks east of the Hollywood-Burbank Airport. More information from Bill Welsh, W6DDB, 234 South Orchard Dr., Burbank, CA 91506.

California - The West Coast Uhf Convention is May 20 and 21 at Santa Clara. Write Joe Reiser, W6FZJ, 2614 Media Way, San Jose, CA 95125 for details.

Florida - The Orlando ARC Hamfest is May 20 and 21 at Howard Johnson Motor Lodge, I-4 and Lee Road in Orlando. Information from Elinor Roland, WA4ITP, Orlando ARC, 8024 Charltn Pkwy, Orlando, FL 32807.

Illinois - The Sixth Rock River Radio Club Hamfest is May 28 at the Lee County 4-H Center, Amboy. Free coffee and donuts from 9 A.M. to 10 A.M. Plenty of parking, camping area, enclosing building, and no charge for table. Talk-in on 3.950 and 146.94 MHz. Advance ticket \$1.50, \$2 at the door. Advance registration and information from Carl Karlson, P. O. Box 99, Nachusa, IL 61057.

Illinois - The Starved Rock Radio Club Hamfest is June 4 at the La Salle County 4-H Home and Picnic Area Southwest of Ottawa, just off Ill. Route 71. Meet your ARRL officials; free coffee and doughnuts at 10 A.M.; food available on the grounds and plenty of parking space. Follow yellow Hamfest signs from the south end of Illinois River Bridge at Ottawa. Advance registration until May 24 is \$1.50, at the gate \$2. Contact W9MKS, RFD 1, Box 171, Oglesby, IL 61348.

Indiana - The fourth annual Wabash Hamfest is May 21 at the Wabash 4-H Fairgrounds. Flea market, food available, technical sessions, bingo, camping and more. Call-in on 52.525, 146.940, and 146.34/76 MHz. Admission is \$1. More information from Bob Mitting, 633 N. Spring St., Wabash, IN 46992.

Kansas - The Central Kansas ARC will hold their Annual Hamfest Sunday June 4 at the 4-H Complex, Kenwood Park, Salina. For early arrivals there will be a dinner Saturday evening. Registration is Sunday morning at 9 A.M. with a program of interest to OM, YL, and harmonic. Covered-dish lunch with beverages supplied by the club. Talk-in on 146.34/94 MHz and 3920 kHz. For more information write WA0NXD, David Michael, 400 Woodlawn, Salina, KS 67401.

Kentucky - The Blue Grass ARC Hamfest is May 21 from 9 to 5 at the County Police Pistol Range back of the Blue Grass Field (local airport) on U.S. 60 west of Lexington. Follow the airport road past hangars and the main buildings. Free parking, free doughnuts in the A.M., sandwiches and soft drinks will be on sale. Information from Jim Odum, WA4GHQ, 401 Carlisle Ave., Lexington, KY 40502.

Maryland - The Maryland Mobileer ARC will have their Hamfest on Sunday, May 21 at Anne Arundel Community College at 10 A.M. The college is 6 miles north of Annapolis just east of Route 2. Talk-in on 7.255, 146.94 and 146.16/76 MHz, starting at 8 A.M. Plenty of parking, lots of goodies. For further information contact Donna Fournier, Rt. 1, Box 154, Dicus Mill Rd., Severn, MD 21144.

Massachusetts - The Sharon ARA will hold their auction on Saturday, May 20 at the home of WAILXE, starting at 1 P.M. Directions and information from Dave Fisner, WAILXE, 30 Ames Court, Sharon, MA 02067.

Missouri - The 16th Annual Hambutchers Net Picnic is June 18 at Rock Island Park, Eidon. Bring a covered dish, no fee. Talk-in on 7.280, 3.963, 146.34/94 and 146.28/88 MHz. Information from Hambutchers Net, 7280 kHz, 12:05 CST, Mon-Fri, or write WA0UPA.

Nebraska - The Pine Ridge ARC 18th Annual Hamfest/Picnic at Chadron State Park located 9 miles south of Chadron on Sunday, June 4. All amateurs and families are welcome; bring a covered dish and your own eating utensils. Soft drinks and coffee furnished. No fee. Write Pete Diehl, WA0BBS, Pine Ridge ARC, 511 North Morehead, Chadron, NE 69337.

New Jersey - The Bergenfield ARC Swap and Sellfest is May 21 at the Bergenfield Recreation Center, Legion Drive, Bergenfield at 1 P.M. Details from the club at 57 Clinton Park Drive, Bergenfield, NJ 07621.

New York - The 39th Annual West N.Y. Hamfest and Vhf Conference is May 13 at the Monroe County Fairgrounds, Route 15A, near Thruway exit 46. Activities start Friday night at the Rowtownner Motor Inn. Saturday will be a full day of programming with outstanding speakers, MARS, AREC, QCWA, general interest and vhf meetings, YL fashion show, and a huge flea market. Registration is \$3, with banquet in advance, \$7. Advance sale closes May 6. For tickets and information write WNY Hamfest, Box 1388, Rochester, NY 14603.

New York - The Rockaway ARC Spring Auction is April 28 at the Hall of Science at the World Fair grounds in Flushing Meadows. More information from The Rockaway ARC, P.O. Box 341, Lynbrook, NY 11563.

New York - The Rome RC 20th Ham Family Day is Sunday June 4 at Beck's Grove, 10 miles west of Rome. Technical talks and demonstrations, vhf roundtable, contests, ladies' and kids' programs. The Post Office Traffic Net will hold their annual meeting, as will MARS. The flea market is a growing favorite. Fee at the gate, 50 cents. Registration starts at 1100 with the famous (all you can eat) chicken and steak dinner served at 5 P.M. Advance adult reservations, \$5.50. Children under 12, \$2; under 6, free. Reservations to Rome RD, P. O. Box 721, Rome, NY 13440.

Ohio - The Goodyear ARC will hold its 5th Annual Hamfest Picnic on June 18 at Goodyear Windfoot Lake Park east of Akron, 1 mile west of Suffield on County Rd. 87 near Ohio Rte. 43. Join us for an enjoyable day of entertainment, swap and shop, and good fellowship. Refreshments, displays, huge flea market. Hours 10 A.M. to 6 P.M. Family \$2; \$2.50 at the gate. For details, tickets, and map write to Eugene Cooke, 3079 Rosebay Blvd., Norton, OH 44203.

Ontario - The fifth Annual Radio Society of Ontario Convention is November 3 and 4 at Kitchener. This is one of Canada's biggest. Excellent program for OMs and XYLs. For information write RSO Convention, Kitchener Waterloo ARC, Box 603, Kitchener, Ontario, Canada.

Pennsylvania - The 18th Annual Breeze Shooters Hamfest is Sunday May 21 at White Swan Park (Parkway West, 4 miles east of the Greater Pittsburgh Airport). No fees and parking is free. Tables and swap and shop are available. There is an amusement park close by for your family's enjoyment. Check-in on 29.0, 50.4 and 146.94 MHz. Information from Chuck Thomas, WA3MWM, 7022 Blackhawk St., Pittsburgh, PA 15218.

Pennsylvania - The Ninth Annual Penn-Central Hamfest will be held by the Milton and Williamsport clubs on Sunday, June 4 at the Union Township Volunteer Fire Grounds on Route 15 in Winfield starting at 12 noon. Bring your own lunch or use the snack bar. Indoor and outdoor facilities. Auction, contests, and swapping. Gate registration.

\$2.50, XYL and children free, free parking. Talk-in on 3.940, 50.4, 146.94 MHz. More information from Paul Mitch, W3LXN, RD 2, Milton, PA 17847. Telephone 717-742-8648.

Pennsylvania - The annual Presque Isle ARC Banquet is May 20 at the Concord Inn at North East, Penna. Social hour from 6:30 to 8 P.M. Dinner at 8 P.M. The price is \$5 per person. For more information write PARC, P. O. Box 1021, Erie, PA 16512 or call 814-866-0491.

South Carolina - The Blue Ridge Radio Society Annual Hamfest is Sunday, May 7, at Cleveland Park in Greenville. Additional details from Paul King, WA4SKT, Blue Ridge RS, 11 Jamison St., Greenville, SC 29611.

Tennessee - The Annual Humboldt ARC Hamfest is Sunday May 21 at the Shady Acres City Park, Trenton. Flea Market, ladies activities, and a playground for the children. For more information contact W4IGW, Edgar Holmes, 501 N. 18th Ave., Humboldt, TN 38343.

Wisconsin - The Yellow Thunder ARC Second Annual Yellow Thunder Hamfest is May 27 at the Dellview Hotel in Lake Delton. The program includes MAK5, vhf repeaters, ARPSO and others. There will be a banquet in the evening. Swap and shop outside the hotel. Registration begins at 12:30 and is \$5.25 or \$5.75 at the door. Registration and information from J. P. Anderson, WB9FWR, 624 14th St., Baraboo, Wisconsin 53913.

COMING ARRL CONVENTIONS

May 28 - Virginia State, Vinton, Virginia

June 10-11 - Georgia State, Atlanta

July 1-2 - West Virginia State, Jackson's Mill

August 5-6 - Michigan State, Sault Ste. Marie, Michigan

October 14-15 - Pacific Division, San Mateo, California

October 20-22 - Hudson Division, Tarrytown, New York

October 20-22 - Southwestern Division, Santa Maria, California

NOTE: Sponsors of large ham gatherings should check with League headquarters for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL Hq. for up to two years in advance.



May 1922

... QST says cw is coming into its own nationally. Traffic this month is the work of 192 cw stations and 331 spark stations. IARY-spark (U. of Vt.) was copied in France Feb. Sth. 6ZAC, Maui F. H., has made a first contact with 6ZQ and 6ZAF on the Coast. K. B. Warner now has the full report on the Governors-President Relay. Five didn't start but 40 out of the 48 states got their messages in. The texts are interesting.

... H. J. Goddard, 9XE/9FE, describes an "Efficient Tuner for Short Waves," a tickler-type set up with a single layer coil. S. Kruse and D. W. Richardson stress "The Importance of Higher Voltages for Amateur Spark." A sync gap and 24,000-volt transformer are indicated. Horace Beale's station, 3ZO, Parksburg, Pa., is featured. This is exceptional. . . . five operating rooms, ten receivers, twenty transmitters and 200-ft. masts. Fifty-one deForest units in one super-het!

... Amrad's new S tube is announced. It's for transmitting only: No filament, 50 mls, 300 to 750 volts, \$8. "Calls Heard" in March takes six pages. Popular among the reported, 1AW IARY 1XM 1QP 2BML 2OM 3BZ 3QV 4GL 4BY 5ZU 6EA 7ZU 8XE 9YB Can. 3BP and many more notables. 'Twas nice always to find one's own call listed. We looked better in last month's QST but do find our call here both under spark and cw.

... The Old Man is back with "Rotten Broadcasts." He could stand 8XK and then KDKA. He deplors the ruination of our 360 meters and the "yowling" of the new radophones. 'Tis good reading. In June we're to have a Police Chief's Relay.

May 1972



May 1947

... Here's a table-top kilowatt built for operating convenience as well as economy. This is what we've been looking for, 813s in push-pull with an 807-807 exciter. The description by George Grammer, W1DF, Don Mix, W1TS, and By Goodman, W1DX, breaks away from rack and panel design.

... This month has a report on the special ARRL Board meeting held in March. Secretary Warner outlined for the Board the amateur plans and strategy for the coming international conference at Atlantic City. The mystique of conferences was discussed by A. L. Budlong, W1BUD, last month. In this issue he explains how governments develop their frequency proposals, also how we amateurs make our case.

... Elimination of spurious sidebands and heterodynes in the low-frequency phone bands by proper technique and operating is treated at length by W1DF. Nat Bishop, W1EYM, compares narrow-band f.m. for voice with a.m.

... The "World Above 50 Mc." records a historic event - the first intercontinental vhf QSO by a U.S. amateur. W1UJ worked OA4AE on 50 Mc., March 23, thus winning the Milwaukee Radio Amateurs Club Gold Cup Award.

... "Operating News" announces a new BC1 circular available. There's to be a Vhf Relay and QSO Party May 17-18. The rules give a sliding scale of credit for the DX mileage. Let's take a quick look at advertising. There stands out among the many interesting displays National's Velvet Vernier (old), the NC-173 (new), Eimac's 4-125A and RME's VHF-152. The list of "Hams at Headquarters" is growing. There are now 24 names and calls. - W1BDI

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Correspondence From Members -

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

THE 1972 HANDBOOK

- The 1972 *Handbook* looks like a first-class job. I see you have switched to the IBM composer, or else I need bi-focals, but the print looks smaller — and at my age, I really notice such change! But the whole works looks great and I only hope I can hold up my head with pride when the 19th edition of our own *Radio Handbook* arrives, hopefully next fall or so. You have certainly set a high standard — *William I. Orr, W6SAI, San Carlos, CA*
- Doug Blakeslee, W1K1K, the *Handbook's* editor certainly made a hit with some of our membership whose attitude, prior to his Christmas visit, ranged all the way from apathetic to hostile towards the ARRL. On our "Tin Lizzy Club" 10-meter net, K8LIB suggested that we should place a club order for the 1972 ARRL *Handbook*. The enclosed check for 30 *Handbooks* is the result. — *Gene McAuliffe, WA3ZWX, Dearborn, MI*
- The best one you have published, plenty of good information on all phases of amateur radio. — *W9BUQ*. Excellent. More power and good health to the hard working staff at ARRL. — *VE3FQY*. I like the idea of dropping out the advertising section. Also those few extra chapters were greatly appreciated. — *WN2ABA*. Congratulations on the numerous innovations. The 49th edition is the finest *Handbook* ever produced by the League. — *W5EYB*. Please tell the entire Hq. crew that the *Handbook* is outstanding — one of the best works you have ever done. — *W6ZRI*. It's fantastic! please convey a "well done" to the gang. — *W0PAN*. Just received 1972 *Handbook*. Best yet and best book in my library so far. — *WA3NAZ*. I feel the most significant changes have occurred in RTTY, SSTV, digital and linear ICs, new solid-state devices, antenna and tuner design, vhf, fm and space communications. I see improvements, updates and revisions in every chapter. Thanks for a superb job! — *WA0WDX/WB0EWY*. I'm sure that the \$4.50 I spent will be repaid to me in the time and expense it would take to compile such an outstanding electronics reference library. — *WB6FDE/KP6AY*. Congrats on the best *Handbook* yet published by ARRL. Been licensed 42 years and have owned (or read) just about every issue to date — and can truthfully say the 49th Edition is tops. — *K6HV*.

QSO AUF DEUTSCH

- As one who speaks and writes fluent German, I found a slight mistake in W1YLV's article in March *QST* (The Growing Use of Foreign Languages by American Amateurs.) "73" is Dreiund-seibzig, not Siebenundseibzig (77). — *Michael Castellano, WA1CUN, New Haven, CT*
- I really enjoyed the article by C. J. Sletten, W1YLV, on W/Ks using foreign languages in their DX QSOs. I'm a German major in college and can make myself understood fairly well in a half-dozen other languages. Studying foreign languages was my first real hobby. That was to lead me to

become an SWL so that I could hear them spoken, and through SWLing I finally got interested in ham radio.

As an example of how much a few words in a foreign language can enhance a DX contact, take the following: There was the DK who went on ssb after I had given him a weather report and info on my QTH in German. We QSOed for about a half-hour *auf Deutsch* before he QRTed for work. One DL answered my QSL and short letter describing my set-up in German with a typewritten letter of his own in German giving me the complete rundown on his gear, job, frequency preferences, etc. and there was the XE, my first DX QSO, who thanked me for speaking Spanish to him, as his English was not too good.

Learning a foreign language just ain't that tough, guys, and a darn sight easier than that theory I'm struggling with now for my General. Come on gang, get with it and start to really enjoy your DX contacts. — *Joe Jensen, WN0ELM, Marshall, MN*

25 YEAR PIN

- It certainly was a splendid surprise to receive the ARRL 25 year pin. You are very thoughtful and kind on my behalf.
I first heard about ARRL in 1929. I sent a dollar bill and received a *Handbook* in the mail. I shall never forget that wonderful day long ago. I was the only amateur in Carroll County, Ohio. I used a one-tube Regen receiver and one-tube oscillator, but I had fun and a few contacts which "kept me going." Amateur radio forever! — *Lynn C. Wilson, K4DHB, Alexandria, VA*
- Received the most wonderful gift in my life. The ARRL 25-year pin. Thanks. I will talk about this over the air. — *Paul L. Stumpf, W3AQN, York, PA*

75-METER DX RX

- Hallelujah! My faith has been restored. A receiver based on tube designs ("An Experimental Receiver for 75-Meter DX Work," February *QST*) has surfaced in *QST* in spite of the policy that all receiver construction articles must be of solid-state design. Doug Blakeslee's article on the 75-meter receiver is a beauty and his remarks that tube designs out-perform transistors must sound like heresy to the solid-state group.
I say "right on" and lets have some more articles like it. Tubes, for receiving purposes, are not dead and won't be for a long time regardless of what the transistor cult would have us believe. — *Gordon R. Rugg, W3TXY, Allentown, PA*
- I appreciate the philosophy in the design and also the hours of work which obviously went into the final make-up. Indeed, it is also apparent in reading between the lines that you share the problems faced by those of us classed as "Homebrewers." — *Emory S. Begg, W7EN, Portland, OR*

MARCONI'S CHUCKLE

● Although Dr. de Forest enjoyed a snicker at Marconi's expense as reported in March "Correspondence," it seems probable that Marconi enjoyed a chuckle in point of time even before the snicker. For the Italian, Marconi, certainly knew that the word *amateur* derives from the Latin *amator* meaning *lover*. To be both the competent professional and the amateur at one and the same time indicates the highest dedication to the advancement of the science of communication. - *Stanford Solms, WA2MEL, Fair Lawn, NJ*

"WE GOT ACROSS . . ."

● Enjoyed "We Got Across . . ." (pages 54-57, December *QST*) very much since I was one of those involved.

The "Billboard" cover lists 2BML and 2EH. They were one and the same station. 2BML was Beverage's ham call; 2EH was my own. The other was Roland Bourne, W1ANA, until his death this year Curator of the ARRL Museum. We were all at RCA's Riverhead Transatlantic Receiving Station, at the time. 2BML was used for the code word *F5XVG* transmissions, and 2EH for the free-for-all transmissions.

Godley's "official report," the most complete story, as published in the 1950 Commemorative Issue of the *Proceedings of the Radio Club of America*, lists 2BML and 2EH many times.

Bourne and myself had the privilege of perhaps being the first in this country to know of the success of the tests. We were both on duty at Riverhead to take MUU's transmissions of Godley's daily results. At the time, it was quite a thrill. The antenna system at 1BCG as pictured on the cover of the *Proceedings* is identical with that used by 2BML/2EH. As a matter of fact, our antenna was up before 1BCG's. Robbie, W3RE, was also in the pack, from his New Jersey QTH, so you see, a few of us are still around. - *Mac Williams, K3AC, Germantown, MD*

● I remember well the Transatlantic Tests, having participated in them with my 1/2-kW rotary spark rig. My good friend Joe Dodge, 1UN, then located in Manchester, Massachusetts, brought his 1-kW spark rig over to our QTH in Hamilton, Massachusetts. We installed this and used it during the tests, alternating with my 1/2-kW rig. However, we apparently did not get across.

We missed 1ARY calling 1UN. Must have dozed off, hi! I had worked 1ARY at various times on spark. Sorry my logs of this time have been lost or disposed of. Was off the air from 1927 to 1967.

I wonder how many old timers are alive who were active in ham radio at this time? - *Carl G. Ricker, W1RV, South Hamilton, MA*

W8BU'S EDITORIAL

● Just had the chance to reread and review the "Guest Editorial" in November 1971 *QST* by W8BU, the Honorable James Russell. Having done so, I had to take a moment to thank you for allowing Judge Russell to get a few lines in to make such an excellent point. Having left his company (the Cleveland area) some time ago, it was like old times and the words ring true and solid as if Jim were at this time stating them aloud instead of being in writing.

This gentleman is not only a loyal ARRL man but knows the best approach to sell others on this wonderful group. From old timers to young sixteen Novices, he has the right words to convey

the message to all of the importance of ARRL. Many persons, young and old, have been brought into amateur activities by this man and probably 99 percent of them are now loyal ARRL members.

An exceptional type man, his article should not go unnoticed or unpraised. So many persons such as myself, owe so much to this man. - *R. H. Onines, K8MMH19, Buffalo Grove, IL*

GOLDWATER BILL

● My greatest joy is that the Goldwater Bill has now been proclaimed public law, so in the very immediate future I will get back on the air after an absence of two years.

Leaving Romania in order to come to the U.S., I have lost the right to a ham license and according to the Communications Act of 1934, I would have had to wait at least five years before I would have become a U.S. citizen and thus, eligible to apply for a license. Thanks and gratefulness to ARRL and all the others who contributed to the success. - *Serge Costin, YO3LM, Sunnyside, NY*

QUICK CODE

● The article about code practice in December's "Operating News" emphasized the important point that the code should be learned by the sound of the letters rather than by counting the dots and dashes. This article also brought to mind many discussions that I have had with other CW operators regarding the proper or "best" way to learn the code.

I learned the code some twenty years ago in what must be a unique way, since I have never met anyone who has used a similar method. After I learned the alphabet and numbers as corresponding dots and dashes, I listened to tape transmissions from stations like NSS and WSL. These stations often sent straight text and coded groups at about 20 wpm. After listening for a while, I began to recognize a letter or two. Gradually more and more letters were understood, and after several weeks of listening I finally could copy everything that was transmitted. In other words, my initial learning speed was 20 words per minute. I then bought a hand key and found that I could send at 20 wpm with no trouble at all.

Looking back on this method of learning the code, I feel that it has merit. An initial speed of 20 wpm bypasses all of the plateaus that seem to retard the Novice. This speed is comfortably above the 13 wpm used in the FCC test. Finally, I am convinced that the beginner should never do any sending before he can receive at this speed. If he learns by listening to tape, he will imitate the tape when he finally begins to use the key.

My problem is that I have never been able to convince a newcomer that he should try this technique. Most people start out at a very slow speed and gradually increase to a higher one, finally reaching 13 or 15 wpm. I think that it is more rewarding to begin at a much higher speed. - *Jim Roux, K4THA, Largo, FL*

ROTTEN QRM

● T.O.M. worried about Rotten QRM way back in 1917. I'll bet he would have had strong language indeed for some of our current operating practices. In fact words might not be enough; he probably would have grabbed the "Wouff Hong," rounded up that "worst plug ugly" he used to write about, and started a 1972 version of the ANTI-QRM Association. - *Ray McCormick, K8BYH, Dayton, OH*

Happenings of the Month

OSCAR GETS FCC OKAYS

Yes, even amateur satellites are required to have licenses and, if normal rules can't be followed, must get specific waivers. The Federal Communications Commission has just cleared the decks, as concerns regulations, for the expected operation of Oscar 6 this summer. Waivers have been granted of rules requiring an operator on watch, fixed station location, transmission of call sign (Oscar will sign his familiar HI instead) and logging.

Novice and Technician transmissions on 2 meters may be repeated by Oscar on 10 meters under another specific waiver of the rules. Any mode of emission legal to the user on 145.9 to 146 MHz may also be repeated by the satellite in the 10-meter band even though it might not normally be permitted there. Technical information on the Amsat Oscar C package appears in a separate article in this issue. The applicable portion of FCC's letter of authorization follows:

Due to the experimental nature of the spacecraft described in [Amsat's] letters of February 10, and March 2, 1972, and because of the provisions incorporated into the design, including reasonably well protected remote control command functions and very low transmitter power, the following sections of the rules are hereby waived for OSCAR 6 for a period not to exceed 180 days after achieving orbit, and under the authority of the WA3JNS license:

1. Section 97.43 with regard to fixed station location.
2. Section 97.61 with regard to authorized emission, to allow any mode of emission permitted on 145.9 to 146.0 MHz to be retransmitted by the spacecraft on 29.45 to 29.55 MHz.
3. Section 97.81 with regard to control of station.
4. Section 97.87 with regard to transmission of call sign. The letters "HI" are to be periodically transmitted by telegraphy using the International Morse Code on 29.45 MHz and, should the UHF beacon be utilized, on 4.35.10.
5. Section 97.103 with regard to logging station transmissions.

6. Sections 97.7 and 97.79 with regard to privileges of operator licensees, to the extent that communications originated by Novice and Technician Class operators may be retransmitted on 29.45 to 29.55 MHz. — JAMES F. BARR *Chief, Safety and Special Radio Services Bureau*

AMATEUR RADIO WEEKS

Rhode Island will celebrate amateur radio week May 29 through June 4 by proclamation of the Governor. There will also be a QSO Party June 3-4 to help celebrate the occasion; details in the "Operating Events" Calendar of this QST.

Next door, in Massachusetts, the Week is June 11-17 by proclamation of the Massachusetts Governor, and it, too, is being celebrated in part by a QSO party June 11 to 15, with details to appear in "Operating Events" next month.

The week of April 9 was declared by Governor John J. Gilligan as "Buckeye Belle Week" in Ohio, honoring the state's YL amateurs.

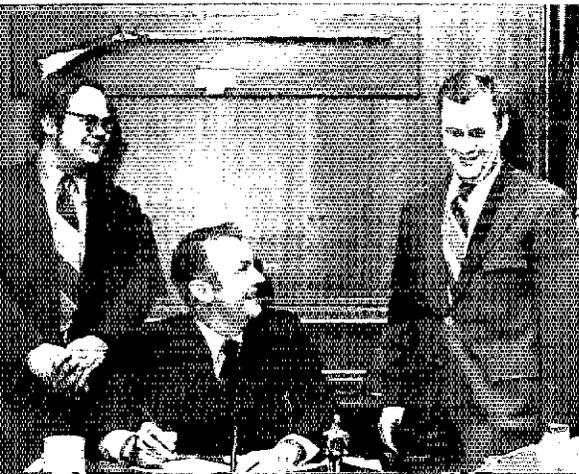
Other amateur radio weeks are reported in photo captions on the "Happenings" pages.

The "standard" amateur radio week for 1972, wherever there is no local reason for another date, is June 18-24. Next year the dates will be June 17-23.

SPECIAL CALLS ISSUED

The following special amateur call signs have recently been authorized by FCC for the events and periods noted. All amateurs and organizations are requested to apply at least 120 days prior to the desired date of authorization for such special calls as may be granted in accordance with Section 97.51(a)(4).

For short periods of time, a "Special Temporary Authorization" is used rather than a license. Thus, it is not necessary to use a formal application blank nor include a filing fee. On the other hand, only events of general public interest, preferably at the state level, are intended to be covered by this privilege; some purely local requests have been denied by FCC.



The 50th State! Not Hawaii, this time, but the 50th state to make call letter license plates available to its amateurs: Kentucky. After several tries in the past two decades, legislation has been approved providing for call letter plates in 1973. Governor Wendell H. Ford signs the bill while SCM Ted Huddle, W4CID (left) and ARRL Assistant Director George S. Wilson, III, W4OYI, register their hearty approval.

Special Calls Issued

<i>Call</i>	<i>Trustee</i>	<i>Event</i>	<i>License Period</i>
WM2GK	William Gould	75th Anniversary of British Channel Radio Test, Highland, N.J.	May 14-21, 1972
WS3VOA	Thomas Kelly	30th Anniversary of Voice of America Washington, D.C.	Feb. 25-Mar. 25, 1972
WJ4AFZ	Timothy Holick	NATO AZALEA Festival, Virginia Beach, Va.	April 25-30, 1972
KC4DX	Charles Cone, Jr.	Navassa Island DXpedition	April 1-May 31, 1972
WJ4ULY	Donald Price	1972 July 4 Celebration Independence, Ky.	July 4, 1972
KD6USA	Frederick Hagen	1972 ARMED FORCES DAY	May 19-21, 1972
W8WVA	Delf Norona	West Virginia STATE RADIO CONVENTION near Weston, W. Va.	June 28-July 3, 1972

MINUTES OF

EXECUTIVE COMMITTEE MEETING

No. 339

March 11, 1972

Pursuant to due notice, the Executive Committee of The American Radio Relay League, Inc., met at the Washingtonian Motor Hotel, Gaithersburg, Maryland, at 9:05 A.M., March 11, 1972. Present: President Harry J. Dannals, W2TUK, in the Chair; First Vice President Charles G. Compton, WØBUO; Directors Victor C. Clark, W4KFC, Noel B. Eaton, VE3CJ, John R. Griggs, W6KW, and Robert B. Thurston, W7PGY; and General Manager John Huntoon, W1RW. Also present were Atlantic Division Director Harry A. McConaghy, W3SW, Dakota Division Director Larry J. Shuma, WØPAN, New England Division Director Robert York Chapman, W1QV, Treasurer David H. Houghton, and Assistant General Manager Richard L. Baldwin, W1RU. The meeting was later joined by West Gulf Division Director Roy L. Albright, W5EYB, and General Counsel Robert M. Booth, Jr., W3PS.

On motion of Mr. Thurston, affiliation was unanimously GRANTED to the following societies:

Amherst College Amateur Radio Club, Amherst, Mass.; Caltech Amateur Radio Club, Pasadena, Calif.; Central Coast Amateur Relay Society, Atascadero, Calif.; Committee For Amateur Radio, Forest Park, Ohio; Dyer County Amateur Radio Club, Dyersburg, Tenn.; John Marshall High Amateur Radio Club, Cleveland, Ohio; Keystone Amateur Radio Club, Edina, Minn.; Lassen Amateur

Radio Club, Janesville, Calif.; Lincoln Land Community College Amateur Radio Club, Springfield, Ill.; Longfellow Jr. High School Amateur Radio Club, Watwatosa, Wis.; Nathan Weeks Jr. High School Amateur Radio Club, Des Moines, Iowa; Northstar Hibanders Amateur Radio Club, Inc., Minneapolis, Minn.; Spencer Amateur Radio Klub, Inc., Spencer, Iowa; University of South Carolina Amateur Radio Club, Columbia, S.C.; Wabasha Area Amateur Radio Club, Wabasha, Minn.; Wayne Amateur Radio Technical Society, Wooster, Ohio; Wehntuck Amateur Radio Club, Amentia, N.Y.; Westminster Amateur Radio Club, Dollard Des Ormeaux, Quebec, Canada; Wiregrass Amateur Radio Club, Dothan, Alabama.

On motion of Mr. Compton, unanimously VOTED to grant formal approval for the holding of a Virginia State Convention in Vinton on May 28, 1972, and a Michigan State Convention at Sault Ste. Marie on August 5-6, 1972.

On motion of Mr. Eaton, unanimously VOTED to cast the vote of the League in favor of IARU Proposal No. 133, to adopt the recommendation of the Hq. society that ARRL Vice President Robert W. Denniston, WØDX, serve as President of IARU.

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

A. Harvey Adams, K3BJ; John J. Adelsberger, WØNZG; James M. Alter, K3AU; Marvin H. Altman, WA5MNW/WA5OJD; M. Gerald Arthur, WØCHM; Joseph W. Babcock, WA3GPA; Toby E. Baker, WA6TUR; Bernard J. Bechard, W1DNM; Russell C. N. Beck, W4OR; Donald F. Beechey,

An ARRL Certificate of Merit was presented to the ARRL First Call Area QSL Bureau, sponsored by the Hampden County Radio Association earlier this year by ARRL Assistant Director Al Hall, W1IUB, (far right). In the photo from left are Paul Caputo, K1PKZ; Tom Barrett, W1KUE; Eunice Gordon, W1UKR; and Bob Gordon, W1KUL. Other Bureau workers not in the photo: Jean Peacor, ex-K1IJV; Mike Ludkiewicz, W1DGJ; Robert Little, W1WLE; Leo Brodeur, W1VNE; Mark Benedict, WA1LPJ; Walt Walczak, W1RDC; Robert Phoenix, WA1DNB; Mal Merchant, W1MQK; Eleanor Gray (XYL of WA1DVU); Osborne McKernaghan, W1HRV; Bill Jaciow, K1QMV; Bob Adolphson, W1NLE; and Oliver Quist, K1HYL.





The Society of Newfoundland Radio Amateurs presented an engraved silver tray to Ern Ash, VO1AA and his wife Mary as a token of thanks and appreciation for operating the VO1 QSL Bureau for 23 continuous years. John Tessier, VO1FX, president (center) "did the honors."

VE3DBT; Bradford S. Bennett, K4MR; Lee Bergren, W0AR/W0AIW; Darrell F. Best, WA0QYI; Carl W. Brown, W3LUL; Thomas W. Bruce, VE3-BFT; Frank M. Butler, Jr., W4RKH; John F. Carver, W4CNM; Robert M. Conner, WB2BCJ; Lloyd F. Cook, W2DG; Martin A. Cordes, KL7IR; Warren B. Croke, WA4DWR; Antonio R. M. Curci, I8KBT; James K. Curran, WB9EGX; Gerard de Buren, HB9AW/WA6QAU/3; Kenneth M. Decker, W6IZU; Phillip D. Deem, WB4EGA; Thomas C. Dorsey, K2LZL; Charles H. Emely, W3INW/WA1OQC; Rafael M. Estevez, WA4ZZG/KP4DNI; Fayette W. Estill, W5EJU; John E. Fairbank, K4GDB; H. L. Folkerts, K2EK; Alfred E. Friend, Jr., WA4BGW; Leo D. Fromm, Jr., W1SMO; Gabriel Fuentes, III, KP4BJD; Thomas E. Furrey, Jr., WA7HAG; William T. Gilliland, K5FNV; William N. Gilmore, Jr., WB8FPQ; William M. Glenn, Sr., WB4EOD; John A. Gloria, WA2CPW; Douglas M. Gray, VE4GD; Clarke Greene, WA1JLD; William R. Gregory, K2EKM; Charles E. Hansen, WA0NVZ; Allen B. Harbach, WA4DRU; John M. Heisey, K2FL/W3MDE; Raymond D. Hilborn, K0R XR; James L. Holmes, K7BPV; Stephen L. Hose, WA9AXE; James Howard, W0PAC; Keiichi Ishizuki, JA1GC; Ezell L. Jackson, WA3NAP; Craig L. Joly, WB9BXV; Marshall H. Jones, WA2MD; J. E. Judd, K6AR; Thomas G. Kelley, WA2KLZ; William N. Kendall, K0COU; Alfred B. King, W9LYT; David H. Knight, W4ZJY; Peter P. Kozlowski, K2RIP; Robert L. Kurth, W5IRP; Earl

Lagergren, K7OEP/WB6FSD; Thomas C. Lightfoot, W3KB; Michael A. Lintner, WA3HGV; John Lyon, W9LHG; Ivan H. Loucks, W3GD/K4GD; John H. Manning, WB4MAF; Robert D. Martin, K7NFZ; V. H. Meador, WB4ESX/KG4EC; David G. Meier, WB4EAB; J. William Miller, K4MM; John C. Montgomery, K9DQU/WB9AIE; Siedel E. Moravits, W5NXZ; Lee A. Musher, K9WRU; Earl Y. Nichols, WB4JTS; Tochy Nishiyama, JA1OBY; Archie B. Norris, W5FYD; Charles R. Panek, WN2NTT; Donald D. Peoples, K3NEL; Willie E. Petty, W5UR; Norman G. Preston, Jr., K4PRQ; Joseph E. Price, WA5UNK; D. M. Proudlock, VE6AD; Costantino Rallo, IIAOH; Arthur R. Rauch, W4CAZ; E. B. Redington, W4ZM; Marcel C. Reeds, W2LRW; Thomas Regan, K2JDH; Charles Renner, K3VYO; Marvin L. Richardson, WA0-AWH; Glenn H. Robinson, WB4TBG; George B. Sanner, WA3EQM; Victor Schorn, W4RAL; Hugh N. Siegel, K2CP; Leland W. Smith, Jr., W4YZC; James R. Snyder, K0ZUM; William R. Spears, WA4CQA; Harold F. Stevens, WN7RYJ/WN7SOI; Charles E. Stone, Jr., W4MPS; William P. Stott, Jr., K4CBE; Leonard E. Szymkowiak, WA9LXZ; John Tector, W8SSL; Henry Thel, VE7WJ; A. Scott Thorne, WA5VSL; Clarence L. Toiw, K6LZQ; Robert L. Treadwell, W2NYH; Michael F. Troy, WA2TYV; William T. Vance, W0PCY; A. Prose Walker, W4BW; Joseph F. Walsh, WB0GPC; Russell D. Ward, Jr., WA4ZZU; David Warner, WB8GBM; John R. Weiss, W4VEK; William E. Wentzel, W7BWA; David C. White, K9BZL; Earl M. Whitman, W9CK/WB8ETX; John K. Williams, K4GGY; Theodore J. Witliff, Jr., WA5MOD; John O. Wood, WA5IPQ; Samuel S. Yates, KA2AI/K4KAI; Christopher J. Yorio, W2KYI; Robert F. York, KB6CY; Thomas L. Yount, W0KC; Terry Zivney, WB9BXX; Richard V. Zwirko, K1HTV.

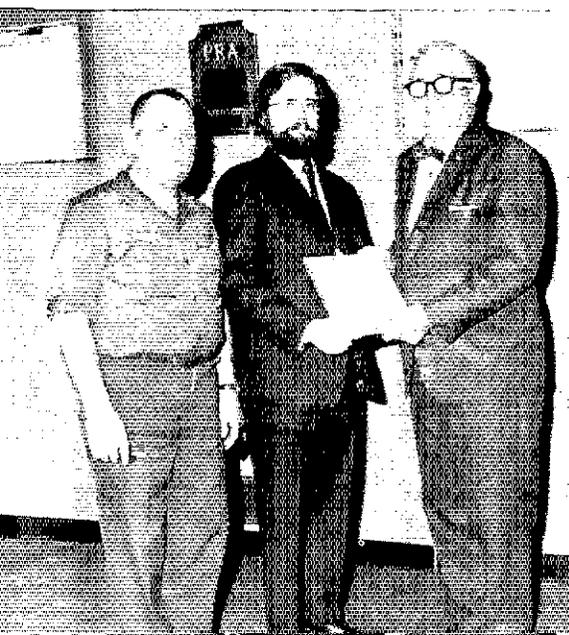
Mr. Thurston announced, with regret, that the Radio Club of Tacoma felt unable to sponsor the scheduled Northwestern Division Convention in August and so withdrew its application.

The Committee was in recess for luncheon from 12:15 P.M. to 1:15 P.M.

(During the course of its meeting the Committee discussed, without formal action, amateur satellite activity, World Telecommunications Day, a government contract for a study of RACES organization, club aggregates scores in ARRL contests, Liberty Lobby, postal delays in delivery of QST, and procedures for IARU travel schedules.)

There being no further business, the Committee adjourned, at 2:00 P.M.

Respectfully submitted,
JOHN HUNTOON, W1RW
Secretary



Fifty years is a long time — when the Providence Radio Association marked a half-century of affiliation with ARRL it called for a Certificate of Merit from New England Director Robert York Chapman, W1QV (right) to the association, represented by incoming president William Frankland, WA1LAD (left) and William Good, K1HZN. (Photo by Alec Tavares, K1UXS)

I.A.R.U. News

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

OKINAWA BECOMES JR6

With the reversion of the Okinawa (Ryukyu) Islands to Japan on May 15, new amateur licensing provisions will go into effect. Previously, licensing matters were under U.S. administration; KR8 call signs were issued to Japanese nationals, and KR6 to U.S. Forces personnel.

The Japanese Ministry of Posts and Telecommunications now announces the assignment of the new prefix, JR6, to the islands which have been under U.S. trusteeship since the end of World War II. Special provision has been made for operation by U.S. amateurs using the prefix KA6. Phone patches and other third-party traffic will no longer be permitted since operation is under the administration of the government of Japan which prohibits this type of amateur operation.

OZ REPEATER COORDINATION

Because of growth in vhf and uhf activity in Denmark, the *Experimenterende Danske Radio-amatorer*, the national amateur society, has sought to coordinate frequency use. The *EDR* VHF Committee reports that in Denmark channelized communication at 2 meters started in 1962 when amateurs began to use surplus taxi equipment which they modified to operate in the amateur band. Since then, the fm mode of operation has grown in popularity. It is estimated that there are now about 800 OZ amateurs participating.

In Denmark, as the rest of Region I (Europe and Africa), the amateur 2-meter assignment is 144-146 MHz. Simplex channels with 50-kHz spacing are in use from 145.55 to 145.95 MHz. Repeater systems utilize for down-links these same frequencies, except for the even-100-kHz channels (such as 145.60). Both standard 600 kHz and 1600 kHz spacing is used between input and output



Shown at the annual meeting of the China Radio Association at Taipei are from left, BV2A, K4GHN, TJ1AZ, and VS6AI.

frequencies. Many stations are using one- or two-tone selective calling techniques.

The VHF Committee of *EDR* offers to play an active role in the coordination of the geographical location and frequency selection of repeater stations. It is their hope that the efforts will alleviate possible interference problems and allow amateurs of other countries to readily make contact with OZ stations.

THIRD-PARTY AGREEMENT

The Canadian Ministry of Communications announces that an agreement permitting the exchange of third-party traffic between radio amateurs of Canada and Trinidad and Tobago became effective on March 12. Canadian amateurs may now exchange such traffic with amateurs in Bolivia, Chile, Costa Rica, Dominican Republic, El Salvador, Honduras, Israel, Mexico, Peru, Trinidad and Tobago, U.S., and Venezuela. A list of countries with which U.S. amateurs may handle third-party traffic appeared in last month's column.

Operating 8J1WJ from the World Scout Jamboree, Japan is W2GQN.





CONDUCTED BY ROD NEWKIRK,* W9BRD

W h e w !

DX Hoggery & Poetry Depreciation Society meetings sometimes start off tamely enough, and this year's affair was almost orderly at the outset. Chairman *pro tem* Hugh Z. Kiddin survived without serious injury right through his gavelled call for order at which time a razor-sharp Rettysnitch found its mark. This brought the mob to life in Long Hall with a DXHPDS cheer that rattled gallery seats and spilled our Old Haywire. Permanent (he hoped) chairman Ivan Itchyfist stepped over the remains and introduced our — yecchhh! — guest of honor.

The visitor, who could have passed for Igor, pal of Frankenstein, sneered grandly. He displayed dangerous dexterity by easily grabbing a red-hot Wouff Hong in midflight and hurling it back toward balcony hecklers. Itchyfist pointed out that our guest had a signal second to none, especially since converting his line service to 880 ac. At this point member Otto Frygood launched the program from the floor:

Flat-topping Crudboy MacGee
Replies to all gripers with glee:
"Paid 900 rocks
For this jazzy new box —
Complain to the factory, not me."

Our creature of honor now bragged how he pulls 14-inch sparks off his final tank with lead pencils — without lead.

"Understaffed old FCC
Won't bother with antics by me,"
figured General Clott
In the Extra Class slot.
Alas — Uncle silenced his key.

Mr. Loud continued his remarks unruffled, pointing out proudly that while other power-freaks dim or burn out the lights of neighbors, his rig melts 'em down — in "Tune."

Von Querk sits there screaming his call —
It's enough to make rugged men bawl.
When asked who he's after
He answers with laughter,
"Dunno, I'm just joining the brawl."

Two forklifts rumbled onstage to set down part of Sir Bigsig's DXHPDS award, some series-paralleled pole pigs with two-foot stand-offs. The slob next recommended AstroTurf as a cure for grass burned brown under antennas, and being careful not to go "Uhhh" or "Ahhh."

Sneakin' and cheatin' McKreep
Finds club buddies quite sound asleep.
Aye, there is the rub —
'Tis true that a club
Gets well known by the creeps it will keep.

A small derrick deposited the rest of eager Igor's well deserved trophy at stage center. The nut rubbed his hands fiendishly, recognizing components for what he considered might be a worthy buffer-driver. Our club tune-up committee appeared and quickly wired up the outfit with the aid of a pipe-cutter for the hook-up wire. Then out from stage right was wheeled the official DXHPDS dummy-load socket, a surplus electric chair converted for it. We all yelled as one great Niagara, "Plug in the dummy!"

Smooth-fisted ex-bug man Van Swing
Whose code had a glorious ring
Now wrecks your good ear
With every new keyer —
"Just getting the hang of this thing."

In a wink our honored kook found himself shaved and strapped into the dummy-load holder. "POWER ON — TUNE, TUNE!!" we shrieked. The lights blinked, there was an ominous *zunggg* and the whole lash-up blew apart. Ignor was saved by Auntie Murphy, long a foe of capital ham punishment, and he whizzed out the door with minor if burns. When next heard from he was nearing 5B-DXCC on two flashlight cells and that old QRP religion.

† † †

W h a t :

Better move some of the vox DX *populi* piling high on the "How's" desk before it topples over and spills more Old Haywire. Incidentally, you don't wipe that stuff up; you neutralize it. What's the DX man-on-the-band saying? We'll tune around via the mailbag, first on longer skip out

W O N D E R — Helvetia-22 DX Contest logs should be posted to me no later than the 15th of this month. (HB9AAA) . . . Still working an occasional Novice on 21 MHz. (11ER) . . . Returned to Fort Myers last month. (YG9NJ) . . . Our "DD39-Jura" certification is also available to SWLs. (F1A1H) . . . Surprising how few ham equipment manufacturers expressed interest in the planning of our Navassa DXpedition. (KC4DX-W4GKF) . . . The Munich Olympic Diploma is issued in three grades. (DJ8ZU) . . . One-sixty is usually crowded with interesting European prefixed here. (DL5BR) . . . As editor of Turkey Radio Amateur Club's publications I can state that no TRAC QSL Bureau was "closed by authorities." (DJ0UJ-TA2BK) . . . Our DX prefix is reserved for 2-meter frequencies and higher. (DL2QB) . . . International Reply Coupon prices have become exorbitant enough to make them unpopular here. (G3HB) . . . W9IDX has done much for Norway's handicapped hams. (LA6ZH) . . . XU1VS is the key man in keeping the Khmer Republic and XU1AA on the air. (9M2AA) . . . I've worked many TTRY countries since I first tried the printer last June. (9Q5BC) . . . We're mostly on 15 and 20 sideband from Johnston isle. (KJ6BZ-W9ONG) . . . The aim of Budapest Radio Amateur League contests is to enhance friendly relations between amateurs of the

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



HA2RB radiates from a rarish call area at Veszprem, Hungary is shown trying his vocal DX luck with a Hungarian-made transceiver. (Photo via WA2B4V)

world. (BRAL) . . . Have a heap of QSLs from the Frankford Radio Club gang. (G3JKY) . . . TR8CQ was my No. 100. (K4BZH/VP7) . . . Especially pleased with the DX performance of 40 meters. (KP4DJ) . . . Six years already since I was active at W4SQO. (HS4ACN) . . . I was surprised and quite delighted to receive ARRL's A-1 Operator award. (ON4QX) . . . Ten is the favorite here when skip permits. (DJ3YU) . . . QSOs qualifying for Grafton Radio Society's WALT (Worked All London Town) certification may date from January 1, 1958. (G3KEB) . . . QST is a very choice piece of mail in Antarctica. (KC4USI-WA7HOR) . . . Ninety percent of my 14-MHz cw contacts are with Russian stations. (ON8VH) . . . SP9s ADU AOX DH EVP and PT, assisted by DM2ATL, administered our 1971 SP DX Contest. (PZK) . . . Particularly interested in collecting USSR QSLs for our activity on Yap. (ex-KC6s WS YL) . . . Some Statesiders really think Monaco is in Africa. (DL4VA-3A0FN) . . . High power is not necessarily the key to consistent DX. (KA2A1) . . . ZL1AA at the Auckland Centennial performed with TR10, TS510, FT200, TA-33, and 18AVQ gear. (ZL1TB) . . . All continents and more than fifty countries participated in Scandinavian Amateur Radio Teleprinter Group's 1971 RTTY DX test. (SM4CMG) . . . Your monthly QSL info saves a lot of DXers a lot of trouble. (KX6IQ) . . . I'm most interested in managing QSLs for stations in the Pacific and Indian Ocean areas. (KP4DKY) . . . bad luck here with borrowed contest equipment. (VP2KF) . . . I'll gladly answer s.a.s.e. inquiries about Award Hunters'

Club International. (OH2YV) . . . Left an FTdx100 in the Caymans but you'll have to bring your own skywire. (ZF1JS-VE3AFY) . . . I'd like to provide QSOs from 601- and 701-land. (DJ9ZB) . . . Why should South Dakota be easier to work than North Dakota? (SV0WO) . . . Good radio location here on Tiksi bay, sea of Laptev. (UA0KQU) . . . Local taxi drivers zoom 50 mph through downtown Seoul. (K3ILC/HL9) . . . Thanks to Ws 2LFL 3KV and 8IZQ for DX assistance. (9J2FD) . . . QST improved greatly in 1971. (5WIAT-KR6CT) . . . Pirates occasionally adopt "QSL via RSGB" as some sort of respectability cloak. (G2MI) . . . With most Turkey stations off the air some W/Ks think I'm a hoax. (1A5ZH) . . . Great to hear the ham-band world pouring into Taegu. (HL9WI-WA9QVT) . . . My registered airmail with IRCs sometimes goes out three or four times to FK8, 9X5, etc., with no QSL results. (HP1AC) . . . Here's my fourth membership renewal. (K4DDQ) . . . Still checking for 160-meter authorization. (HL9VK) . . . Our JDXA anticipates further DXpeditions. (JA1KSO) . . . Fun working mobile-KM6 on 15 and 20 from my three-wheeled bicycle - or should that be tricycle? (KM6DX) . . . Gentlemen, this month's QST is late. (11CRW) . . . It's a shame to go home to WBSERN and leave all these beautiful rhombics behind. (KX61Y) . . . Seventy-three from Scotland's newest ham, and ARRL "lifer." (GMSAXO-WA4UAZ) . . . The island of Yeu, my recent portable QTH, is part of the French department of Vendee. (F5XA) . . . Help stamp out lids! (8P6DR) . . . Our third annual trans-equatorial 160-meter tests will be run daily next month. (PY1DVG) . . . I'll be looking for more "How's" items on ham radio's wonderful Elmers. (9G1WW) . . . Returned to the Marshalls in late March after a vacation at W3KVQ. (KX6EB) . . . I expect further action as VP2VAN and PJ8DX when time and funds permit. It should be noted that Sint Eustatius is not in the lower Antilles (Aruba, Bonaire and Curacao). (K2FJ) . . . Active in 160-meter contests here. (WA0ZQB/KL7) . . . IARL's ADXA diploma certifies confirmed contacts with thirty different countries in Asia. (JH1DNC) . . . The DX gang needs enlightenment on structure and function of the Army Post Office and Fleet Post Office systems. They waste a lot of IRCs when s.a.s.e. would suffice. (DA1SU-WA0TNW) . . . And now for some shorter skip from

HEREABOUTS - Who'll be the first 5B-DXCC winner using real QRP? (WA7QCNC) . . . The usual JOKERS crawled out of their holes on April 1st. (WB2JBJ) . . . The silence from the QSL manager of my only VQ9 is deafening. (K3RDT) . . . Still wondering about the 80-meter RG8 I worked last fall. (W1FLN) . . . Watched for you from VP2LA1 in the ARRL Test.

FO0GO (W6HJP) recently vacationed on Moorea island in French Polynesia, scoring some 400 QSOs with 46 countries on 7 through 28 MHz from this quaint QTH of the Month. For his radiator Greg needed only a stretch of chicken-wire draped over that inverted-V thatch roof.



... "Would appreciate a clear frequency for this phone patch" should be among famous last words. (W0MYK, T0DXA) ... Let's hope those big pile-ups don't lessen A51TY's DX enthusiasm at Thimpu. (K9KDI, N1DXA) ... My quad offers North Dakota. (W0G01) ... Interested in reading further discussions of the DX QSL problem. (W3LB) ... Navassa had a manned lighthouse till 1927 when automation took over. (K4CSY) ... Hungrily anticipate some long overdue DX QSLs. (WA3HEU) ... As an avid "How's" reader I guess it's about my turn to provide some input for the gang. (WA70UB) ... VA2UN commemorated the 100th anniversary of the founding of McGill U. (S. Dildine) ... Tell the mob to keep that DX data comin' in! (K4ELV) ... I suppose running lists of non-QSLers would take up too much space. (WA6CPP) ... Fuzzy ash relay contacts made me a cw man temporarily. (W8KZO) ... Hope we can persuade the local gang to keep that 1825-1830-kHz European DX window open on 160. (W6NUT) ... As WA4JSX we butted heads with Ws 2JSX and 8JSX in a recent DX test. (WA4ZZU) ... A fine Elmer can help a youngster appreciate his ham career and life in general (K6UGS) ... Too many of my s.a.s.e.s don't come back at all, empty even. (W9LEX) ... Mighty mean of those sunspots to pick on poor ten. (VE3CUI) ... Here's a 9Q5AF contest log better late than never. (WB5DOJ) ... School, work and hamming must run 1-2-3 here. (WA2MDX) ... Forty-four years a ham and I'm still after those DX QSLs. (W0EWF) ... Cards that cross in the mails are a problem: "Did he or didn't he receive my ... The appearance of this DX report is explained by late-burning midnight oil. (WB2AEH) ... After DXCC I'm out for those next stickers. (WB2YKA) ... Just how far do those guys go to get those QSLs? (W7HZL)

† † †

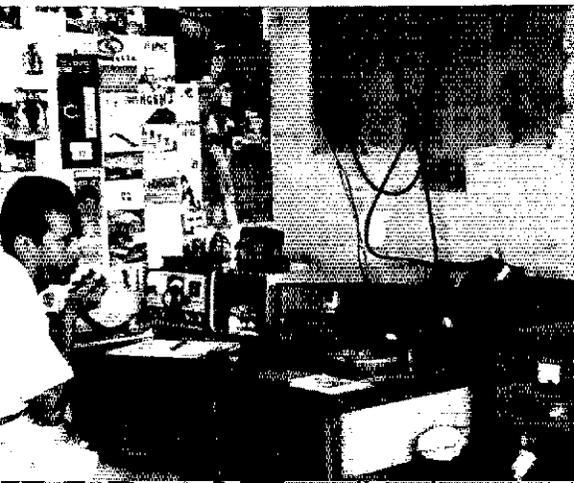
Where:

HEREABOUTS - Had such fantastic results after publication of the list of overdue QSLers I last sent "How's" that I'm back again. Pasteboards from DU9VVL, HA7KRP, HKs 3CNI, 6JH, KZ5AA, LU5MAO, OH6MK, OX3ND, PJ2CU, SP8EDQ, VK7MG, VP8LE, YO8MH, YV5DLH, and ZK1AA would help clinch my one-band less-than-100-watts DXCC. (K6UGS) ... More help needed: TR0US and TZAB by W2ICO; CE9AR, ET3JH, F07XL, H18XGM, VR1S by K2JLI; CR4AE, HC8FN, K66CY, OY7JD, UL7JA, VR2ET, ZD7BB, 3Cs 1EG and 0AN by K4RON; VPIs BA and LD by K6SE; KW6EJ '69, FI2AP '69, 6Y5ET '69 and YQ2BM '70 by WA2FIQ; CP6EL, 5T3TU and 5Z4MD by WA2NGB. Any 'alp? ... This month's "QSLers of the Month," nominated in "How's" correspondence from W6IQK, Ks 1NOK 2QJT 6SE 8PYD, WA3NMG, Wbs 4SXX 5HIU 6WHM, VE7s BAF BZY and E. Hammill for delightfully fast QSL comebacks, include CE6FZ, CR4BC, CT2BC, DJ9QY, EA8GK, EL2CB, FL8MM, HC1s KP RF, HP1RN,

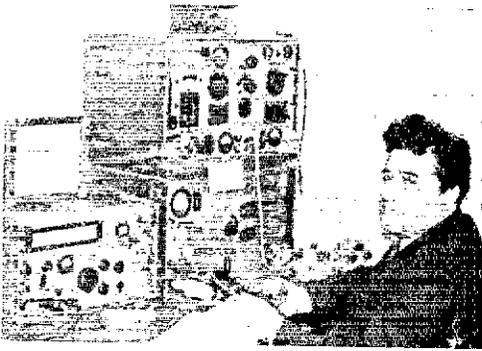
K4BZH/VP7, KA2A1, KG6BJJ, KJ6s B7 CF, Ks 4CJ 6DY, KV4AM, KZ5JF, OH0NI, PJ8AA, SK7AX, TG4SR, VPs 2GRN 2ML 7CQ 9GK, VQ9WF, WA2BVU/4X, XEs 1FFC 2MX, ZE1JU, ZP5TT, ZSs 3CCE 5DI 6KT, 4W1AF, 7P8AZ, 7Q7CY, 8R1G, 9G1WW and 9Q5DX, together with QSL tenders Ws 11IM 2GHK JHNK 4N1F 7VRO, Ks 3RLY 6GAK, WAs 3HUP 6AHF 8TDY, VEs 2JH 3GCO 4OX and DJ9ZB. Any quickies left out? ... We're available to serve as QSL aides to overseas DX ops in need. (WA2EPI, WB5FII) ... A recent ARRL QSL Bureau shipment to K6GAK contained cards from several W/K/VEs requesting EA8GK QSLs. It doesn't work that way, of course. Dick speedily delivers QSLs for Antonio on the customary s.a.s.e. (self-addressed stamped envelope) or s.a.e.-with-IRCs basis. Our QSL Bureau boys work hard enough to handle incoming non-W/K/VE mail. (WB6WHM) ... As an SWL my replies are much better from QSL managers in western Europe than from Stateside. We still have some mighty good ones, though. SA SU OD TF SV and FY seem toughest to confirm in that order. (E. Hammill) ... TG4SR says the chap bootlegging his call produces many unanswerable QSLs. (W1BBJ) ... VE3AAQ, as not unexpected, has no Revillagigodos QSL connections. (W2AXZ) ... I hold all logs for ZF1AA operation by the late K2FD dating from 1969. (K2MUB) ... K8REG's XPIAB QSL responsibility concerns only QSOs of February through December, 1967. (WCDXB) ... HR2WTA now offers to relay QSLs to any Honduras station. (NTDXA)

AFRICA - The Tanzania bureau is closing down. A 5H3 QSLs should be routed as indicated: JJ/5Z4JJ, JL/W9NNC, JR/W2SNM, KF/9J2CS, KJ/LA6GF, LV/VE3RIZ, LZ/G3LOP, MA/VE2DCY, MB/WA2UYX, ML/VE3ODX, MM/SM5ERI, MT/LA6PF and MV/VE7SE. Cards for 5H1LV go via VE3BLZ, and for 5H3KG via Italy's ARI bureau. (5H3LV, VERON) ... I've answered all QSLs received as of March 1, 1971, but if the next shipment from your local bureau does not include my awaited QSL you may reapply via W5EGH. Because of probable delays if other routes are used, I caution that QSLing be done *only* through W5EGH, W/Ks including self-addressed stamped envelopes, others supplying International Reply Coupons with s.a.e. By the way, I'm still appalled by the number of QSLs I receive bearing incorrect GMT and GMD. With ham-packed contest logs, checking such information becomes an awful chore. There not only are improper time and date conversions; even the wrong year shows up! My QSL policy is 100 percent but cards specifying QSOs not found in the log or carrying insufficient details are returned via bureaus. (9G1WW) ... Note that CR7GJ, EL2CB and ZS3CJ, all very active in recent contest sessions, should be QSL'd via my address. (W3HNK) ... I hold logs for VQ9WF, now back from the Chagos, and have replied to all mail that has come my way. I've also assumed QSL chores for ET3USA. (W4N1F) ... I'm no longer managing the QSLs of 9Q5s DG and PI. (W6KTE)

ASIA - JA0CUV/1, P. O. Box 22, Mitaka, Tokyo, Japan, is QSL manager for VQ9s SM TF, 3D6AF and 7X2SX. (NTDXA) ... I am no longer managing the QSLs of HL9KH, W6BCT/4X, XW8s AX and AZ. (W6KTE) ... The new HS1AA, an official of the Thai government who does not use cw, reports receiving QSLs for old HS1AA code contacts he cannot confirm. (WCDXB) ... 9V1QJ does not accept QSLs bearing commercial advertising. Other cards received are answered 100 percent. (L1DXA)



HC8GS is operated by Professor Lucio Saltos on Santa Cruz in the Galapagos, a rare entry in any log. QSLs are managed by W5GTW, donor of this photo.



YO2s KBH and KBO, representative Roumanian club stations at Oravita and Timisoara, are widely worked by the code crowd. YO2BV mans YO2KBH at left, while YO2API demonstrates YO2KBO's layout to a very interested local SWL who happens to be the father of YL WA2BAV and father-in-law of WB2AQC who contributes these pictures.

E UROPE — Those Russian "50" calls are commemorative specials. QSOs with fifteen such stations plus 35 regulars may qualify you for a multiQSL certification from Box 88. (K2QHT, DXNS) . . . W2GHK has JWIEE logs for QSOs through November 26, 1971. (NTDXA) . . . In addition to my direct address, DX contacts may QSL via RSGB. (GM5AXO-WA4UAZ) . . . I've QSLd all my 3A0GC contacts via bureaus but will respond to further inquiry. (F9OW) . . . QSLs received here via REF are answered 100 percent. (F5XA)

S OUTH AMERICA — Those still in need of deserved HC8AA confirmations should apply to HC1RF, P. O. Box 15, NASA, c/o U. S. Embassy, Quito, Ecuador. Regarding my own HC8GS QSL management, applicants should avoid using an obsolete QTH in old *Callbooks*. (W5GTW) . . . QSLs for 160-meter QSOs with PYs 1MGF INFC 2BJH and 2BKO can be obtained through me. (PY1DVG) . . . 5J4LR and 5K4LR are Colombian specials for April, details available from LCRA, Medellin Section, Apto. 51900, Medellin. (WCDXB)

O CEANIA — U.S. and Canadian contacts may QSL ZL4PM via my address on the usual s.a.s.e., or s.a.e.-plus-IRCs basis. (W8OZA) . . . Anyone with KG6 QSL problems be advised that KG6JBJ's card arrived at my QTH *one day* after February QSO. (W6IQK) . . . No longer QSL manager for 9M8KZ. (W6KTE) . . . YJ8BW still ignores my pleas for logs. (W4NJF) . . . Now on to specific postal suggestions found in the mailsack, but be mindful that each offering is necessarily neither "official," accurate, nor complete. Won't hurt much to try, though, so you're welcome to these:

- CP1EU, M. Long, USAID Bolivia, APO, New York, NY 09867
- CR3RY, SPM, Box 1778, Lisbon, Portugal
- DA1SU, R. Sullivan, Box 456, FPO, New York, NY 09514 (or to WA9TNW)
- DA2MP, Hq. Det., Sig. Bn. 68, APO, New York, NY 09061
- F0AEE/FC, BM/W4WFL, London, W.C.1, England
- FL8NB, Box 11, Djibouti, T.F.A.I.
- GM5AXO, S. Hawley (WA4UAZ), Box 265, USNavSecGruAct, FPO, New York, NY 09518
- HB9-ØXJA, BM/W4WFL, London, W.C.1, England
- HB9-ØXJG (to DL4VA via DARC or WA4WME)
- HC7NBA, Box 1007, Quito, Ecuador
- H18JAN, P. O. Box 138, Santo Domingo, D.R.

- HR1PJH, P. Holsen, Apto. Postal C-33, Tegucigalpa, Honduras
- HZ1SH, Box 2108, Jeddah, Saudi Arabia
- IBØCRW-IL7CRW-IMØCRW (via DK5JA)
- JT1s AM, MM, P. O. Box 639, Ulan Bator, M.P.R.
- JY6AS, P. O. Box 4353, Amman, Jordan
- JY6BM, Box 644, Amman, Jordan
- JY6MIH, P. O. Box 2353, Amman, Jordan
- KC6LG, P. O. Box 156, Yap, W. Carolines, 96943
- KX6CG, USCG Loran Stn., APO, San Francisco, CA 96333
- KX6EB, E. Blaszczyk (W3KVQ), P. O. Box 977, APO, San Francisco, CA 96555
- KX6s HY JI MH (via KX6BQ)
- PA9RA, BM/W4WFL, London, W.C.1, England
- PZ1DR, P. O. Box 369, Paramaribo, Surinam
- TJ1BB, P. O. Box 4, Yokadouma, Cameroon
- TY6ATE, B. P. 107, Natitingou, Dahomey (or via 5U7AL)
- VP2BVI, Box 440, Tortola, B.V.I.
- VP2GRN, R. Nellson, P. O. Box 628, Del Rey Beach, FL 33444
- VP5RF, R. Francis, Box 78, Grand Turk, W.I. (or to G3RWU via RSGB)
- VP8MM, P. O. Box 179, Port Stanley, Falklands
- WAØZQB/KL7 (to WAØZQB)
- WA6FSC/HC/HR/TI (via VE6AKV)
- XE1TM, P. O. Box 499, Aguas Calientes, Mexico
- KT2AF, N. Belanger, P. O. Box 127, Bobo Dioulasso, Voltaic Republic (or via VE2DLQ)
- YJ8BD, Box 26, Port Vila, New Hebrides (or via 111J)
- YK1OK, J. Bubenicek, P. O. Box 35, Damascus, Syria
- YN1AZ, P. O. Box 5013, Managua, Nicaragua
- YN1RSJ, Apto 2419, Managua, Nicaragua
- YN4SB, P. O. Box 8, Bluefield, Nicaragua
- YU2LW, A. Fabljani, 9 Siget, Zagreb, Yugoslavia
- YV5BIG/4, R. Eiris, Apto. 557, Valencia, Venezuela
- ZP5AQ, c/o U. S. Embassy, APO, New York, NY 09881
- 3AØFN (to DL4VA via DARC or WA4WME)
- 5H3KA, Box 939, Arusha, Tanzania
- 6Y5HR, 36 Roadway, Apt. 5, Kingston, Jamaica
- 7Q7AF (to DJ4IJ via DARC)
- 9K2CA, Box 69, Kuwait, Arabian Gulf
- 9Q5HE, Box 10, Bandundu, Zaire
- 9Q5ML, Box 8149, Kinshasa, Zaire
- 9Q5RA, R. Addison, EBZO, P. O. Box 4728, Kinshasa, Zaire

AS1FY (to ACSTY)
 BV2AA (via JH1HWN)
 C31DO (to ONSTO)
 CT2BJ (via REP)
 DU1GJM (to K8GJM)
 ET3FTU (via F8RU)
 ET3DUA (via W4NJE)
 FB8ZA (via F6BFA)
 EC0VQ (to D18HT)
 FK8CD (via VE6TP)
 ex-FL8MB (to F6BFA)
 FP8CW (via VE5NW)
 HB0AON (to DJ2YE)
 HC8AA (see text)
 HC8GS (via WSGTW)
 JD1ACF (to JA1OAF)
 JH3IU/mm (via JARL)
 JY8JK (via G3LOP)
 K3LGS/CT3 (to K2LGS)
 K3WEI/6Y (via W3HK)
 KC6RS (via W6MMG)
 KR8BY (via WASUHR)

ex-KX61Y (to WB5EEN)
 KZ5JF (via WA8TDY)
 LASYB/4W (via NRRL)
 OX3DX (to OZ3FD)
 OX4AG (to XP1AB)
 PJ8DX (to D2FI)
 SK1AQ (via SM1CNS)
 T19C/mm (via T12CAP)
 TY7ABM (to D1 7JK)
 VP2SAB (via WBBHZG)
 VP2VAN (to K2FJ)
 VR4BS (via ZL4NH)
 ZD9GB (via ZS2RM)
 ZF1AA (see text)
 ZF1SW (via W2GHK)
 ZL4PM (see text)
 3A0GC (to F9OW)
 3D2EM (via W2FXA)
 9J2LL (via WB2ZHM)
 9QSITU (via EP2WB)
 9Q5RN (via WA6CEB)
 9X5MK (to DL9PC)



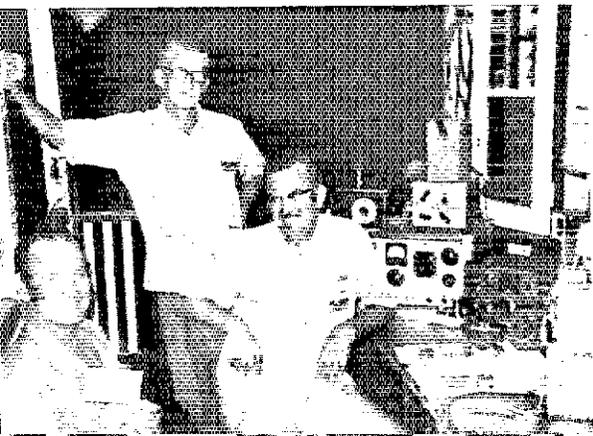
For the preceding rundown a bow to benefactors Ws 1CW 2HAE 2ICO 3FTG 5CNU 5GTW 6AM 6GSV 8K0I 9DY, Ks 1NOK 2QHT 4RON 4SD 5MAT 6SE 6VA 8PY, WA2s KWB NGB, WBs 4SXX 6WHM 9DRE, KX61Y, VE7s BAF BZY, N. Grasso, Columbus Amateur Radio Association *CARscope* (W8ZCO), *DX News-Sheet* (G. Watts, 62 Bellmore Rd., Norwich N.72T, England), Far East Auxiliary Radio League (M) *News KA2LL*, Florida DX Club *DX Report* (K4KO), International Short Wave League *Monitor* (E. Childers, 1 Grove Rd., Lydney, Glos., GL15 5JE, England), Japan DX Radio Club *Bulletin* (JA3UI), Long Island DX Association *DX Bulletin* (K2KGB), Newark News Radio Club *Bulletin* (J. Heien, 3822 Marshall Ct., Bellwood, Illinois, 60104), Nigeria Amateur Radio Society *News* (5N2ABG), North Texas DX Association *Bulletin* (W5S2), Northern California DX Club *DXer* (Box 608, Menlo Park, California, 94025), Southern California DX Club *Bulletin* (W6E11), OIRA's *On the Air* (ONS 44H 5VA), VERON's *DXpress* (PA0s FX INA LOU VDV WWP XPS) and West Coast *DX Bulletin* (WA6AU0), the latter recently radiating its 200th weekly issue. Let's keep that grapevine rollin'!

Wheree:

Sundry tidbits as remaining space allows . . . The lads commend 28 Mhz for another sensational spring DX performance. Don't scrap your tribander too soon! At the other end of our DX spectrum 160 is by no means asleep. W1BB says DL9KR knocked off every continent in a three-day February period with his new lop-loaded 30-foot vertical and plenty of radials. . . . On the DXpeditionary front KC4DX, an Atlanta combine with W4GKF trustee, intends Navassa fireworks commencing about May 12th. This energetic enterprise is

VO9N, convinced that he runs the lowest power among a dozen active Seychelles amateurs, works out fine on cw with his homespun midget 6AU6-6973 sender. Herman pumps through regularly near 14,010 or 14,050 kHz. "My vertical hits the U.S. on short or long paths but the all-ocean south polar route seems best." By vocation VO9N is a satellite-tracking specialist. You may have worked him previously as W6FHM/DU1.

planned to concentrate on (ssb) 3905, 7255, 14,280, 21,355, 28,605; (cw) 3530, 7030, 14,030, 21,030, and 28,505 kHz. One-sixty will be available, too. . . . SV0WXX & Co. may still be at it from Crete as you read this, likewise SV0s WII and WJ from Rhodes. . . . The same goes for WB2AQC and XYL WA2BAV who should be hopping around rarish African areas until late this month. "So far we have visas for Senegal, the Gambia, Liberia, Ivory Coast, Togo, Dahomey, Niger and Cameroon but we are not sure where we will be permitted to operate," writes George. . . . WA6FSC performed well from Central and South America on the first leg of a projected DX odyssey that could take her as far as the Himalayas. . . . H13ZU, HII and associates may renew Kamarin efforts this month or next. . . . VR3-Fanning flames are being fanned, according to the vine, results possible shortly. . . . VK3JW's Mellish Reef prospectus mentioned chances of May or June fruition. . . . The Zaïre Republic, already quite radio-active, could be an operating target of ZD8AY & Co. this month. . . . VE6NY, a DX-perienced rover, contemplates resumed Pacific propagation studies. . . . DXpeditionary rumors featuring the Spratlys, Minerva, Bouvet, Clipperton . . . you name it . . . are yours for the tuning right now. With long skip getting wobblier for actual DX things this looks like a lively season for local DX gossip! . . . We dedicate this month's DX pages to your contributing editor's mother so recently deceased. Mrs. Newark cheerfully assisted a teenager's frantic and clumsy beginnings in amateur radio, recognizing on first sight a worthy avocation for a worrisome son. And while we're at it we salute patient moms, dads and spouses of radio bugs world wide, indispensable auxiliary filers every one. [QST]



9Y4s LP MM and MH, left to right, hobnob happily in the front Porch hamshack of 9Y4MM at St. James, Trinidad. 9Y4MH also signs VE3MH back home. (Photo via VE3DPO)



CONDUCTED BY BILL SMITH,* KØCER

Practical 432-MHz EME

COMMUNICATION by reflection from the moon demands the best in every category of amateur station design. But "best" is not an absolute, and gradual improvement in transmitter efficiency, weak-signal detection, and high-gain antenna design have moved us ever closer to effective EME communication.

These advances have affected the choice of frequencies for EME. The first two-way communication via the moon, by W1BU and W6HB, on 1296 MHz, was fragmentary at best, and it was accomplished with equipment not widely available to amateurs. The big surge and widest range of EME success have been on 144 MHz, where the best combination of transmitter power and receiver sensitivity has been available. "Going for broke" in the antenna department has put ambitious 2-meter men all over the world into the EME business.

Recent uhf developments now open up similar prospects for 432 and 1296 MHz, especially 432. We can generate 600 watts or more of transmitter output at 432 MHz with relative ease. (See K2RIW's kilowatt amplifier in this and the previous issue.) Low-noise uhf transistors yield noise figures under 2 dB, practically eliminating the paramp, with all its technical problems, as a factor at this frequency.

This leaves the antenna problem as the prime area for productive 432-MHz EME work. For some years now it has been fairly clear that more-or-less conventional Yagi arrays have considerable EME potential, if mechanical and feed problems can be solved. The 32-bay 352-element phased-Yagi array built by WA6HXW and WB6MQG, pictured in this space last month, has a feed system that seems to handle this job. The EME success of WA6HXW, reported herewith, demonstrates that a homebuilt array having real EME potential can be assembled with materials and methods usable by almost anyone having the space and patience. Total cost of all parts, electrical and structural, was about \$55.

The basic 11-element wood-boom Yagis and four-bay configurations thereof are right out of *QST*¹ and *The Radio Amateur's Vhf Manual*,² including the open-wire phasing system. Similar phasing lines are used to join pairs of four-bay assemblies, as seen in Fig. 2.

A four-way power splitter and four 16-foot coaxial lines connect the main transmission line to the four 88-element sections. Each such bay is matched individually for 50-ohm feed with a balun and tuning stub, the latter adjusted for zero reflected power in its 50-ohm line. Details of the

* Send reports and correspondence to Bill Smith, KØCER, ARRL, 225 Main St., Newington, CT 06111.

¹ Tilton, "Yagi Arrays for 432 MHz," April, 1966

² 1968 and 1972 editions, Chapter 9.

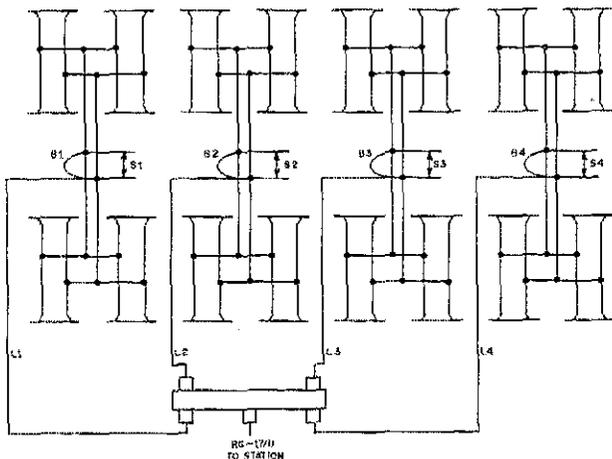


Fig. 1 — The WA6HXW-WB6MQG 352-element 432-MHz EME array is made up of 32 11-element W1HDQ-style Yagis, using the original information for eight sets of four bays each. Each 88-element set is fed through a 16-foot length of foam RG-8/U, L1-L4, a 10-1/4-inch balun of the same material, B1-B4, and a tuning stub, S1-S4. The stub is two 5-inch pieces of No. 10 wire, spaced 1/2 inch, with an adjustable short. These come out positioned about 3 inches from the feedpoints. The 4-way power splitter is shown in Fig. 2.

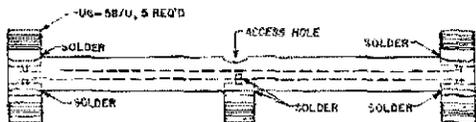


Fig. 2 - The 4-way power divider used in the feed system of the 432-MHz EME array at WA6HXW. The components of the 50-ohm line section are 15/32-inch ID (1/2-inch OD) and 7/32-inch OD brass tubes, 14-1/4 and 13-11/16 inches long, respectively, bought in a hobby shop. Five N-type (UG-58/U) coaxial fittings are used. These are shown without their flanges, to simplify the drawing.

power splitter are given in Fig. 3. It can be made from available components.

Results with this array at WA6HXW were immediate and very gratifying. With 625 watts output, 30 feet of RG-17/U, a receiver noise figure of 2.5 dB, and a receiver passband of 2400 Hz, echoes were received at 3 to 4 dB above the noise level, with little variation, for two hours at a time. The WA6HXW EME record since then demonstrates that this was no fluke, and that the 352-element array must be performing very close to its theoretical limit, 27.5 dB gain, exclusive of line loss.

220-MHz Yagis by WB6NMT

"Probably by no other effort can the average ham so improve his results, at so little cost, as by putting up a better antenna." This statement, in the opening paragraph of the antenna section of *The Radio Amateur's Vhf Manual* is assuming ever-greater importance in 220-MHz circles, as interest and activity grow on this band. The *Handbook* and *Vhf Manual* have good designs, for 7- and 11-element Yagis, but there is always need for more, as variations from published models may be necessary to take care of materials and hardware that may be available in some areas and not in others.

Louis Anciaux, WB6NMT, has spent considerable time on 220-MHz Yagis, with results on that band that speak for themselves. These include participation in the first EME work on 220, and considerable success in meteor and long-haul tropo communication. Louis has settled on two basic designs for 6- and 10-element Yagis that can be built easily at minimum cost.

Element lengths and spacings are conventional, but provision is made for use of various element diameters, boom materials, and mounting methods. Louis recommends increasing the element lengths given in Fig. 3 by two-thirds the boom diameter, when a metal boom is used with the elements running through it. For various conductor diameters, the lengths given should be modified by the following factors, which apply to all parasitic elements. The 3/8-inch copper tubing driven element used by WB6NMT is recommended as a standard; copper for easy soldering, 3/8-inch diameter for strength. 1/2 inch - 0.986, 3/8 inch - 0.995, 1/4 inch - 1, 3/16 inch - 1.011, 1/8 inch -

1.023. Lengths in Fig. 3 are for the low end. For 222 MHz, subtract 1 percent.

Booms used by WB6NMT are 1 x 2-inch redwood, though other materials may be suggested by your lumber dealer. Use nonmetallic paint, or plastic varnish. The elements run through the narrow dimension of the boom.

The delta dimensions shown at the right of Fig. 3 result in a 200-ohm balanced feedpoint, for direct feed of a single bay with a 50-ohm coaxial balun. Two-bay or 4-bay stacking involves similar deltas at each driven element, with phasing lines of open wire, preferably No. 14 or larger. Recommended stacking dimensions are: 6-element bays - 54 inches vertical, 67-1/2 inches horizontal; 10-element bays - 81 inches both ways. Phasing lines should be multiples of a wavelength (53-1/2 inches for open wire) and the feedpoint should be the center of the system. Use the arrangements for two-bay and four-bay systems shown in the *Vhf Manual* for 144 and 432 MHz. The 220-MHz stub length should be 30 inches at first. In practice the position of the sliding short works out to be about 26 inches from the phasing line, and the point of connection for a 4:1 balun is about 4 inches up from the short.

OVS and Operating News

50-MHz DXers were surprised in early March by F-layer DX to South America, the first from the United States in nearly two years. The March 5 solar event, which triggered the F2, TE, backscatter, and whatever, came within 24 hours of a similar event two years ago, as reported in the May, 1970, edition of this column. Don Hilliard, WØ-FYE, and the Space Environment Services Center at Boulder, Colorado, say the solar activity began in mid-February, as noted by the 2700-MHz flux index used to measure solar radio noise. The mean value is 120 to 130 flux units. There were numerous flares, but the largest Class X event, at 0810Z (GMT), March 5, produced a 2700-MHz flux index of 2200 units, the highest recorded in some two years. A second Class X event occurred at 1113Z, March 6, peaking 365 flux units at 2700 MHz. The March 5 flare was responsible for an aurora beginning around 2100Z March 6, and lasting until approximately 1200Z, March 7.

Mixed with the F-layer activity was unusual strong sporadic E, which confused observers as to exactly which propagation medium, or combination of mediums, was active at a given time. From the DX reports on hand, this is what appears to have happened.

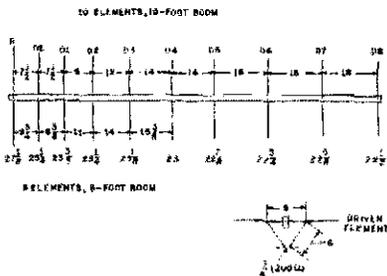
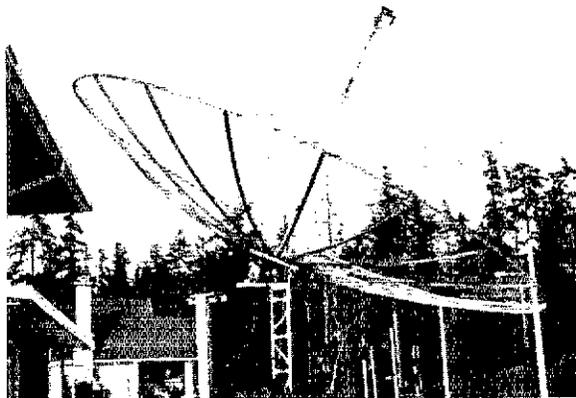


Fig. 3 - Principal dimensions, in inches, of the 220-MHz Yagis by WB6NMT. Details are given for 10-element and 6-element bays. Element spacing is slightly wider in the smaller array.

VE7BBG, Vancouver, British Columbia, used this 20-foot homemade dish for his 432-MHz moon-bounce contact with WA6HXW. A 1.5 dB receiving preamp is mounted at the feedpoint. The dish is made of laminated spruce struts and galvanized chickenwire.



By 1900Z, March 5, the *F*-layer muf at WA51YX/5, San Antonio, was 45 MHz and at 2042 Pat heard an unstable carrier on 50.1 soon identified as HK3OK, Bogota, Columbia. Some 30 minutes after WA51YX worked the Columbian, Pat heard Rusty, XE1PY, Mexico City, in contact with HK3OK. WA51YX is puzzled about the propagation mode — straight *F2* over a 2200-mile path or *E*, or a combination of *TE* and backscatter? Had Pat heard Argentina or Uruguay he would have been more assured the mode was *F2*. The signal strength and fading rate of the HK's signal was not indicative of either *F2* or *E*, having a slight suggestion of *F2* with very slow deep fades — but multihop *E* can do the same. At about the time, WA51YX was hearing 35 and 43-MHz *E* to the west, while channel 2 TV indicated *E* from Mexico. Pat heard no U.S. stations on *F*-layer backscatter.

At 0120 GMT, March 6, Pat noted *E* to Florida and later to 8s. WB4WXZ, Florida, told Pat he had worked KP4s and an Argentina station, as well as hearing Columbia and Ecuador stations the afternoon of March 5.

In Houston, WA5HMK reported hearing HK3OK at 2125Z, March 5 working a Mexican station. At 2202 Joe had a partial contact with XE1PY, apparently on backscatter from over the Caribbean. Joe heard WB4WXZ on backscatter, and then at 2222 briefly heard a weak LU (Argentina) station. Like Pat, WA5HMK reported strong *E* over distances under 500 miles the evening of March 5. Joe says XE1PY told him of working much *F*-layer to South America since mid-February, but hearing nothing from the Pacific. XE1PY also mentioned a few *TE* openings.

March 6 produced *E* at WA51YX/5 as high as channel 3 TV, from either Mexico or Guatemala in the early evening. Later that evening (0211 GMT, March 7), WA5HMK worked LU8AHW on *TE*, while earlier in the day he had worked LU8DIN at 2117Z and LU6ACH at 2325Z on *F2*. A number of 5s were heard on backscatter with strong signals. W5SSXD, Houston, worked LU8AHW at 0211Z, March 7.

The daylight hours of March 7 showed evidence of a variety of propagation modes at WA51YX/5. Backscatter began around 1500Z, the earliest Pat can recall having ever heard it. Mixed with the apparent *F*-layer backscatter was *E* to Florida and Mexico — “everything at once” Pat noted in his log at 1905Z. Sporadic *E* from Mexico at 98.5 MHz was heard in San Antonio as late as 0150, March 8. Pat noted *E* backscatter earlier in the evening. At Houston, east of San Antonio, WA5HMK was working Texas and Oklahoma stations on some form of backscatter, and LU8AHW apparently via *F2*. At 0123Z (7:30 P.M. local) Joe comments, “very late for *F2*.”

WA51YX has some interesting comments about the fm broadcast band *E* to Mexico. Pat notes the distance from San Antonio to Mexico City is under 700 miles. “If the Secant *E* theory is true, then the 1400-mile muf was 123 MHz.” Such intense *E* could account for the strange backscatter.

In the Los Angeles area, WA6JRA heard K7PXL, Phoenix, on backscatter at 0110Z, a WA3

calling CQ DX at 0120, and LU3EX on *TE* working a W5 at 0123. A CQ by WA6JRA at 0134 was answered by CP3IN, Bolivia! CP3IN also worked W5s and Arizona. This is the first report received on this station. WA6HXM heard WA7-FPO, Arizona, on backscatter, working LUs at 0025.

During the March 8 daylight hours there was scattered *E* over much of the eastern U.S. The *F2* muf toward South America peaked around 45 MHz at 2030Z, in San Antonio. In the evening, 0200Z March 9, WA5HMK and K5ZMS worked multihop *E* to W1 and 2, over a not-too-common path.

WA51YX says the *E* activity continued from March 9 to at least the 12th, but the *F*-layer muf peaked no higher than 44 MHz. Many thanks, Pat, for an excellent report.

At Muskogee, Oklahoma, W5WAX reported working WASUUD, La., and K5LZJ, Texas, on *F*-layer backscatter around 1800Z, March 7, and on March 8, Florida, Alabama, Louisiana, Arkansas, Texas, Arizona, and California, after 0045Z, apparently via the same mode, on a beam heading of 150 to 160 degrees.

At this point, your writer interjects a comment. What makes writing this column most interesting is the variety of propagation modes reported. The events of March 5-8 were the most confusing I've encountered in more than five years. I hope it was given due justice. More investigation is certainly needed before we can determine exactly what took place, if we ever do. One never knows what 50 MHz will produce!

Six meters pulled another trick March 19, a 2100Z *F*-layer opening to South America, when WA5HMK and W5SSXD, both Houston, worked LU3EX and LU8AHW, while hearing strong backscatter on stateside stations from Florida to Arizona. Column deadline prevented any further reports on this day, or what may have followed on later dates. Next month?

Several other *E* openings, unusual for March, were reported. WA51KU, Dallas, worked 8s on 52.525 fm the evening of the 3rd. WB6EVO worked many 5s on a 2-hour opening late March 11. W0EYV, Mo., caught his first large *E* opening on the 8th to 2s, 4s, and 8s. Mike worked 5s on the 3rd. W0MTK, Colorado, caught the March 8 *E*, working a log page of 8s, 9s, and 8s. And from Kansas, WA0VJF worked stations from Michigan to Florida during the 8th. A similar report was received from WA0NPT, Mo.

Mel Wilson, W2BOC, continues his *Es* studies. He needs Sporadic *E* data for July 11 and 27, 1970, as well as reports this summer. It will be

Repeater Update

Area	Call	In	Out	Access
Eastern NH	WA1KGO	146.19	146.79	COR
Southern ME	WA1KGP	146.13	146.73	COR
Cape Cod, MA	WA1KEQ	146.07	146.67	COR
Boston, MA	W1HWK	146.22	146.82	COR
Central CT	W1NHK	145.47	147.05	COR
Bergen Co., NJ	K2GCL	146.25	146.85	PL
Long Island, NY	WA2KEC	146.34	146.94	COR
		146.04	146.94	COR
Northern NJ	K2ODP	146.22	146.82	PL
		447.40	146.82	COR
Long Island, NY	K2QGT/2	440.20	449.30	PL
New York, NY	WA2YYQ	146.25	146.88	COR
		444.25	449.25	COR
Harrisburg, PA	WA3GRH	446.00	440.00	COR
Eastern PA	K3GUW	146.13	146.73	COR
		52.895	52.385	PL
Philadelphia, PA	WA3IGS	448.9	443.9	PL
Delmar, DE	WA3KWE	146.22	146.82	COR
Philadelphia, PA	WA3KWL	449.0	446.0	COR
Philadelphia, PA	W3MFY	146.19	146.79	PL
Maryland	WA3PPN	146.25	146.85	COR
		449.1	146.85	COR
Mt. Pisgah, NC	WA4BVW	146.16	146.76	COR
N. Wilkesboro, NC	W4DCD	52.780	52.525	COR
		146.420	52.525	COR
		52.525	146.050	COR
Raleigh, NC	WA4EHL	52.780	52.525	COR
		146.420	52.525	COR
		52.525	146.050	COR
Salisbury, NC	W4EXU	146.28	146.88	COR
Raleigh, NC	K4ITL	146.28	146.88	COR
Boca Raton, FL	WB4KVV	146.22	146.82	COR
Asheville, NC	WA4NUO	146.34	146.94	COR
Shelby, NC	W4NYR	146.28	146.88	COR
Greensboro, NC	WB4OFF	146.16	146.76	COR
Lexington, NC	W4PAR	146.31	146.91	COR
Roaring Gap, NC	WB4PPS	146.22	146.94	COR
		146.94	145.50	COR
Danville, NC	WB4QEP	146.28	146.88	COR
Chapel Hill, NC	K4RSH	146.16	146.76	COR
Durham, NC	K4RUQ	146.34	146.94	1682 Hz
Beulaville, NC	WA4UMH	146.34	146.94	COR

interesting to see what Mel has to say about March, 1972.

In other six-meter news, W4GDS has obtained a license to operate as VP5RS from Caicos Island in the Caribbean, located off the extreme eastern tip of Cuba. Bob says WB4BND and W1EXC have indicated interest in making the trip around June contest time. W4GDS, who operated during the June contests of 1970 and 71 as ZF1RS on Cayman, will use a 5-element Yagi and TR-6. A 50-MHz beacon will be operated, most likely around 50.11. He will also have a TR-4 for low-band liaison. Bob says QSLs will be handled only on a stamped, self-addressed envelop basis. At this time I know of no other planned DXpeditions this summer.

W6DOR is still in need of 35-mm color slides showing antennas, stations, and operators to add to his collection. Ev uses the slides for presentations at vhf gatherings.

WA6JA reports JA1MRS, Japan, now active with 800 watts and JA1UDG with 50 watts on 50.1. Both heard ZK1AA and an Australian February 17.

WB8JJS is planning a 50-MHz moonbounce effort as a senior electrical engineering project at the Case Institute of Technology in Cleveland. The antenna will likely be a rhombic. WB6NMT has his

6-meter rhombic completed. Gain is estimated at 27 dB and Louis is open for FME schedules. K8UNV, Ohio, is still looking for Delaware after 10 years. Schedules anyone?

Wireless World reports 6-meter beacons operating at Johannesburg, ZS6VHF on 50.1 weekends, and on Cyprus, ZC4VHF on 50.5 MHz.

And finally, British amateurs may be issued vhf phone-only licenses. Some 3000 such licenses out of 17,000 in the United Kingdom are held. In Japan there are over 256,000 issued licenses, but only 54 percent have calls and stations. Phone-only licenses, which comprise 86 percent of these, allow the holder a 10-watt limit, and hf and vht operation, other than 14 MHz.

Good news for 50-MHz DXers: FP0CA (K2-0JD) will be on ssb and cw, near 50.1 MHz, for two weeks beginning May 29. Rich will take his 2-meter gear along, too, though this latest of many such expeditions is planned mainly for sporadic-E and scatter work on 6. Another trip will be made in the fall, with the objective of providing FP0CA contacts through Oscar 6.

144-MHz news is highlighted this month with word from VE7BQH that both he and K6MYC worked German station DK1KO in February via moonbounce. The contacts were made on the 28th and 19th respectively. Lionel, VE7BQH, says the German operator runs one kilowatt input and an array of four 11-element Yagis, fixed on the horizon to take advantage of ground gain. VE7-BQH also completed another series of FME contacts with SM7BAE. KH6EEM is reportedly approaching moonbounce capability, as is W0LER, Minneapolis.

The solar event of early March 5 was responsible for a widely worked March 6 aurora. This began late in the afternoon, peaked in the early evening hours, faded, and then returned several hours later for a short period. In the early evening, W0RLI, Minneapolis, worked W2ROA, N.Y., over a 1000-mile path, and heard W3GF, Pa., and WA1JXN, Vermont; some excellent auroral DX. W0RRI also worked numerous 8s, 9s, and 0s. W0MJS, Minneapolis, got in on the session too late for the long-haul, but did work 8s, 9s, and 0s also. W0LER was pleased to note many new calls during the aurora, indicating to John that much new blood is being drawn onto 2 meters. W9YYF, Ill., worked K2OVF and W2ROA, N.Y., W2AZL and K2HLA, N.J., and heard WA1JXW.

Elsewhere, W8ST is now active with a kilowatt, in rare Arkansas. K7ICW, Las Vegas, reports periods of fairly good tropo in February. Al worked several San Diego and Arizona stations above 145 MHz. He has regular 1730 GMT Sunday schedules on 145.005, to Southern California, and invites others.

According to K7PFR there is much facsimile activity in Washington. John sent a list of 35 stations having fax on 145.8. W7QCV, at Bellevue, broadcasts ARRL bulletins via A4.

K8NGF, Okemos, Michigan, says there is a small but active group in the Lansing area nightly above 145 MHz. Denny runs 100 watts to a J-beam 45-foot high. He says WB8JXF has 150 watts and stacked 11-element Yagis, WB8E1Y runs an SB-500 to 8 elements at 56 feet, and K8NNZ has about 100 watts to 11 elements at 50 feet. K8HWW, Michigan, is a new entry in the states-worked box with 23.

VE3FKX enters the box with 16 states worked, all on tropo, but would like to become active on

meteor scatter. Rolf runs 400 watts on 2 and 225 watts on 432.

We regret to report that W5ML, active for many years from Louisiana, became a Silent Key in February.

220-MHz states-worked totals are climbing. Entries this month include W4UCH, Va., who takes over 4th call area honors with 9 worked. WB6NMT reached an impressive 8 worked from the West Coast, and K7HSJ, Oregon, enters with 3. WB6NMT and K7HSJ increased scores by their contact February 18, over a 400-mile path, after weeks of schedules. K7HSJ runs 35 watts and an 11-element Yagi. Don is finishing an amplifier to increase transmitting power. On February 19 he had a 250-mile contact with K7BBO, Tacoma. WB6NMT says his work with K7HSJ is apparently the first between Oregon and California on 220. K7BBO hopes to be ready for EME tests in early summer, with a 160-element collinear and kilowatt. WB6NMT has sent VK3ATN a converter for one-way EME tests.

K8HWW, Sterling Heights, Michigan, says there are a number of 220 stations in the Detroit area. Clem lists himself, W8UCI, WA8UVG, WA8KUI, and WA8WMQ as either active or nearly ready. Cold weather was holding up several antenna projects.

From WB8IDD's newsletter we learn W9JMF, Illinois, is rebuilding, after being disappointed in 1960 with the lack of activity. Also in Illinois, WA9HBN, K9LVC, W9CYT, K9TXH, and W9JMF are attempting to stir activity. Near St. Louis, K0ABK likewise is searching for those interested in 220. At Des Moines, WB0DIB and K0HTF will likely become Iowa's first 220 representatives, this summer. W9DJ, Wisc., has a new 5894 rig working and a 250-watt amplifier on hand, to feed a 15-element Yagi. K4GI, tells WB8IDD he will soon move to near Chicago, promising 220 activity with an 800-watt amplifier. K4IXC says that he, WA4GKH, and K4NTD are Florida's only 220 stations. W8WHJ is new on 220, joining the growing number of Ohio stations on 1-1/4 meters. Jesse runs 10 watts to a 10-element Yagi and W8RQV is active with a similar transmitter and stacked 5-element Yagis.

WA9UQO, Ill., says he will soon have a 32-element collinear and kilowatt ready for schedules. K0CER, S.D., has 500 watts and stacked 10-element Yagis ready for summer meteor and tropo schedules.

432-MHz moonbounce interest got a boost February 26 when WA6HXW, near Los Angeles, worked VE7BBG, Vancouver, B.C. WA6HXW was using the 352-element array of Tilton Yagis pictured in last month's column and a homebrew dish. WA6HXW's signals received at Vancouver, over a terrestrial distance of 1125 miles, peaked 12 dB above the noise, while Cor was 6 dB out of the noise at WA6HXW. The operators had partial contacts on two previous days, but were not satisfied with the signal report exchange. The contact is the first between California and British Columbia (or Canada) on 432.

A number of other EME schedules have been arranged by WA6HXW, including W6FZJ, W6DQJ, W9WCD, W0WYZ, and VE7BBG. Harley was surprised February 22, when he received a telephone call from W9WCD that George was hearing WA6HXW testing for echoes. George likewise was running echo tests, but neither knew the other was on the air!

2-METER STANDING

K1ABR	35	8	1478	K5WXZ	38	10	1450
K1HTV	35	8	1310	W5HFV	38	10	1285
W1AZK	34	8	1412	W5WAX	37	10	1310
K1WHT	31	8	1300	W5AJG	33	9	1360
K1UGQ	30	8	1370	W5UKQ	33	9	1290
K1WHS	29	8	1300	K5PTK	29	9	1330
W1VTU	29	8	1296	W5LO	29	7	1325
K1BKK	28	7	1275	K5BXG	25	8	1317
K1PXE	26	7	1140	W6GDO	18	5	1326
W1JSM	25	7	1100	W6WSQ	16	4	1390
W1HDQ	24	7	1040	K6HAA	13	4	1380
K1RJH	22	7	1450	K6JYO	13	4	1240
WA1FFO	21	8	1325	K6HMS	11	4	1258
W1FZA	21	7	960	W7JRG	27	6	1320
K1MTJ	20	7	1225	K7NII	25	5	1290
WA1MUG	19	5	-	K7ICW	18	4	1278
W1MX	18	6	850	K7VTM	10	6	950
K1JIX	18	6	800	W8KPY	41	9	1310
W2NLY	37	8	1300	K8AXU	38	8	1275
W2CXY	37	8	1360	W8IDU	36	8	1150
W2ORI	37	8	1320	W8YIO	36	8	1100
W2AZL	36	8	1380	W8IDT	36	8	1150
W2BLV	36	8	1150	K8DEO	35	8	1200
K2RTH	34	8	1215	W8NOH	31	8	1165
WA2EGK	33	8	1340	W8TIU	24	8	1000
W2CUX	33	8	1334	K8HWW	23	8	1125
WB2WIK	32	8	1080	K8ZES	22	8	675
WA2CJJK	31	8	1160	K9SGD	42	9	1300
W2CRS	30	8	1270	WA9DOT	41	9	1303
K2CEH	27	8	1200	W9AAG	41	9	1200
W2CNS	27	8	1150	K9AAJ	41	9	1200
K2DNR	25	7	1200	K9UIF	41	9	1150
WB2SIH	25	6	1000	W9YYF	40	9	1050
WA2EMB	23	8	1335	W9BRN	36	9	1260
K2BWR	23	7	1350	W9PBP	34	8	820
W2DWJ	23	6	860	W0MQS	45	10	1605
WA2UDT	22	7	1020	W0FBF	45	10	1380
WA2PMW	22	6	1000	W0NXF	45	10	1369
WB2YQU	22	6	850	W0LER	44	9	1440
WB2FXB	21	6	915	W0DOY	41	9	1300
K2YCO	21	7	750	W0LFE	40	9	1100
W3RUE	36	8	1250	WA0CHK	38	9	1120
K3CFY	35	8	1200	W0EYE	35	9	1380
W3BHG	33	8	1260	W0ENC	35	9	1360
W3GKP	32	8	1108	W0EMS	34	10	1320
W3BDP	29	8	1225	K0CER	33	9	1276
W3LNA	26	8	-	W0LCN	33	9	1100
K3CFA	25	8	1200	W0RLI	31	9	1115
W3HB	23	8	1310	W0DRL	27	9	1295
W3TFA	21	8	1342	K3OBU	21	7	930
K3OBU	21	7	930	VE1AUC	7	2	500
WA3GPL	21	7	925	VE2DFO	33	8	1385
W3ZD	20	7	850	VE2BZD	23	7	1309
W3TMZ	19	7	975	VE2HW	15	6	800
K4GL	39	9	1270	VE3ASO	37	8	1290
W4HJQ	39	9	1150	VE3BQN	37	8	1250
W4WNH	38	9	1350	VE3EZC	33	8	1283
W4HHK	38	9	1280	VE3AIB	29	8	1340
K4EJQ	37	8	1125	VE3DSS	27	8	1200
K4IXC	36	8	1403	VE3CWT	27	7	1072
W4VHH	36	8	1100	VE3E VV	25	8	1100
W4CKB	35	8	1440	VE3EMS	24	8	1100
K4QIF	35	8	1225	VE3DSO	23	8	-
W4FJ	34	8	1150	VE3FKX	16	6	-
W4AWS	29	8	1350	VE7BQH	11	3	7920
W5UGO	43	10	1398	SM7BAE	1	11	1055
W5ORH	42	10	1507	VK3ATN	3	31	0417
W5RCI	42	9	1289	ZL1AZR	2	21	1055

The figures after each call refer to states, call areas, and mileage of best DX. Revised May, 1972.

220- and 420-MHz STANDING

220 MHz

WA1MUG	15	5	450	K2YCO	14	6	675
W1HDQ	13	5	450	W2CNS	14	6	525
K1JIX	12	4	600	K2OVS	14	5	600
W1AZK	10	3	375	K3IUU	18	5	720
K1BFA	10	3	225	W3RUE	17	7	850
K2CBA	19	7	2650	W3UJG	9	4	400
W2DWJ	15	5	740	K4QIF	21	7	1065
W2CRS	14	5	600	W4FJ	21	7	995
K2RTH	13	5	960	K4EJQ	19	7	800
K2DNR	13	5	600	W4HJZ	15	5	560
W2SEU	13	5	325	K4SUM	15	5	462
W3UJG	14	5	460	W4VHH	15	4	750
W3RUE	11	6	480	K4GL	11	3	720
K3IUU	11	4	340	K4NTD	9	2	835
W4UCH	9	5	543	K4IXC	4	2	800
K4IXC	5	3	1115	W5RCI	19	6	880
K4GL	4	2	485	W5ORH	13	4	700
W5RCI	10	5	910	W5AJG	7	3	1010
W5AJG	3	2	1050	W5UKQ	6	2	590
W5LO	2	2	660	W5SXD	5	2	850
WB6NMT	8	4	2650	W5GVE	3	1	365
W6WSQ	6	4	1142	W6DQJ	4	2	360
W7CNK	6	3	923	WA6HXW	2	2	1125
W7JRG	5	3	959	W6FZJ	2	2	310
K7ICW	4	2	250	K7ICW	4	2	225
K7HSJ	3	2	400	W7JRG	2	2	420
W8PT	11	6	660	K8DEO	23	7	675
K9HMB	12	8	1070	W8YIO	22	7	650
W0EYE	11	5	950	K8REG	21	7	700
WA0QLP	4	2	923	W8HVX	16	8	660
VE2HW	5	2	225	W8CVQ	13	7	625
VE3AIB	7	4	450	W8MNT	13	7	600
				K8UQA	10	6	800
				W8RQI	10	6	425
				W8VHG	8	6	625

420 MHz

K1PXE	18	7	1210	K8BBN	7	6	425
K1HTV	17	5	610	W8FWF	7	4	450
W1AJR	16	5	680	W9WCD	21	8	840
WA1MUG	15	5	740	WA9HUV	17	7	780
K3EAV/1	14	6	700	W9JYJ	15	6	550
K1BFA	13	5	710	W9AAG	15	5	800
K1JIX	12	5	620	W9ANKT	13	6	850
W1SL	11	5	400	K9AAJ	12	5	425
WA1JTK	11	4	715	K9CEN	12	5	
W1HDQ	11	4	380	W0DRL	23	8	1210
K2ACQ	24	8	925	W0LCN	13	4	700
K2CBA	20	8	2670	W0LER	12	4	709
K2UYH	20	6	840	K0TLM	10	5	700
W2CLL	20	6	790	W0YZS	8	4	650
K2VDK	18	6	750	W0EYE	7	2	702
WA2EMB	18	6	720	VE2HW	6	3	750
K2RIW	17	6	812	VE3DKW	12	7	940
WA2FGK	17	6	745	VE3AIB	9	5	600
K2ARO	17	6	740	VE3EZC	7	5	510
W2BLV	17	6	732	VE4MA	2	1	420
W2DWJ	16	4	570	VE7BBG	1	1	1125
K2CEH	14	7					

The figures after each call refer to states, call areas, and mileage of best DX. Revised May, 1972.

W4FJ, Richmond, has sixteen 11-element Tilton Yagis assembled and is at work completing the 176-element array with moonbounce in mind. Ted says he may expand the array to 352 elements if initial tests with the smaller system are not satisfactory.

The Oscar 6 package scheduled now for a summer launch will contain a 400-milliwatt beacon on 435.1 plus or minus 3 kHz, built by W3DTN. The signal will be keyed and will also carry telemetry information. The satellite is expected to have a one-year life and also contains a 144- to 28-MHz repeater.

Most of the California 432 group switched to horizontal polarization in early March. WA6EXV continues his tropo schedules with W6FZJ, WA6HXW, and W6DQJ having good success. Chuck recently completed a kilowatt final and a receiver integrator system capable of detecting signals 4 dB below the noise.

During the March 6 aurora, W0LER, Minneapolis, heard radar signals to 60 dB over the noise. John says this is the first auroral radar he has heard on 432. VE4MA, Winnipeg, heard radar aurora from North Dakota during a February 27 magnetic storm. VE4MA reports also that VE4JX has some 80 watts output and on February 19 worked his first 432 DX, W0PHD at Warren, Minnesota. VE4MA maintains schedules with W0PHD and the two have noticed at times that beam headings must be altered several degrees from true headings for maximum signals.

K7ICW had contacts in February with several Los Angeles area stations over a 250-mile mountain-obstructed path. WB2JNA says he, WB2PSA, and WB2HDK have converted BC-645s to 420 and are interested in seeing more activity in the Rochester area.

WA5STI, Richardson, reports a large group of ATV stations in north Texas including himself, WA5TKU, K5SXX, WA5PCF, WA5HSL, W5UZ, W5WO, and WA5RWO. Transmitters are mostly converted Motorola strips, using a solid-state video modulator developed by WA5PCF. The North Texas ATV Club welcomes correspondence, which should be directed to WASTKU.

1296-MHz news this month is entirely moonbounce. Dick Turrin, W2IMU, says the W2NFA group is again active with 500 watts output and a 44-dB gain antenna system. Schedules are being run with G3LTF and W9WCD but Dick says other schedules are welcomed. The address for W2NFA is Box 45, RR 2, Colts Neck, NJ 07722.

W9WCD says EME signals from W2FNA are fantastic - solid copy peaking to 25 dB over the noise! George believes anyone with 7- to 10-foot dish, 200 watts, and a good receiving front end should work W2NFA. George reports G3LTF has moved his dish from his rooftop to ground level.

OZ1UF writes that the Electronics group of the H. C. Orsted Institute of Copenhagen University, wants EME tests on 432 and 1296 MHz. They are interested in April and May work, though their letter came too late to do very much about April, other than to inform WA6HXW (432) and W2NFA (1296) which we have done.

Calvin F. Hadlock, W1CTW

Vhf experimentation lost an outstanding advocate, and QST perhaps its most prolific nonstaff technical contributor, when a heart attack took the life of Cal Hadlock, W1CTW, March 17, 1972. A ham for more than 40 years, Cal was in QST as early as 1933. His two contributions that year set a pattern that would become familiar: probably the first 5-meter receiver ever to have an rf amplifier stage, and a compact one-package 5-meter transceiver, in a time when most 5-meter stations were haywire conglomerations, ill-adapted to portable work.

Before long he would be describing crystal-controlled vhf rigs, when almost everyone was satisfied with simple modulated-oscillator transmitters; modern converters, when the superregen was the rage; practical devices for fm, when a-m was king. His last article, "Wide-Band Fm with Crystal control," in the "ready file" when the sad news came, will be seen in *QST* soon.

Cal's skill as an innovator and adapter influenced the course of amateur radio through commercial channels, as well. In a long career with the National Company, he had a major part in the design that company's products, amateur and commercial, from the earliest days of that familiar name. For about ten years, through the summer of 1970, he filled a similar role with Sanders Associates, Nashua, NH, with results less obvious to amateur radio, only because his last employer does not serve our field.

Cal was an early holder of the Extra Class license. His manner of preparing for the Extra exam was typical: he got on cw on the hf bands and worked people. In this period, W1CTW and W1IQD, the latter used at his summer home in rural Lempster, NH, were likely to be heard in the cw portions of all bands from 10 to 160, though his real love remained the vhf bands. The "summer home" was also typical. Cal and his wife, Eleanor, spent years restoring an old farmhouse, turning it into a comfortable home for retirement, which came two years ago.

The W1CTW byline appeared on some 20 *QST* articles, but his influence extended beyond these. His urging of associates to get their efforts into print was a major factor in the appearance of other outstanding technical articles, over the same period. Widely known for his dry humor and down-to-earth practicality, he was a popular figure at ARRL Conventions, hamfests, and radio club meetings. His appearance on the program of the ARRL National Convention in Boston, September, 1970, provided an opportunity to recognize Cal's almost lifelong contribution to amateur radio. This was done with presentation by the undersigned of an embossed scroll, on behalf of the countless amateurs whose lives and works were influenced, perhaps more than they knew, or will ever know, by this quiet, practical, and ingenious New Englander. — *W1HDQ*

Strays

If you hear the call, WT3REE, sometime between May 17 and May 22, it will be the special call of the Indiana County ARC of Indiana, Pennsylvania. Indiana County is known for its trees raised commercially for the Christmas market. The tourist bureau and the Christmas Tree Growers Assoc. conduct a Candlestick Festival each spring to celebrate the new growth resembling candles on the evergreen trees. The ham group has exhibits at the local fairgrounds during the festival.

From a recent "50 Years Ago" column in the Bartlesville (OKla.) *Examiner-Enterprise* . . . "Last night was a good amateur radio night here. Fred and J. R. McKelvey, who have an apparatus, were in connection with Detroit from 5:30 to 6:30 and with Pittsburg, Pa., and Kansas City later."

Silent Keys

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

W1AUB, Arlington-AL-Bell, Clinton, ME
 W1CTW, Calvin F. Hadlock, Goshen, NH
 W1ERR, Donald P. Wise, Lunenburg, MA
 W1AIUT, Anne M. Stetson, Stoneham, MA
 K1PYX, Lyle V. Lathrop, Lanesboro, MA
 W1QX, Milton Robinson, Westford, MA
 W1RR, Wayne Mason, Piermont, NH
 W1TF, Elmer A. Turner, Meredith, NH
 W2AFB, Francis Keefe, Waverly, NY
 W2APB, Charles H. Thomas, Jr., Woodbury, NJ
 W2BKA, George Britting, Middletown, NY
 K2BWT, John J. Magin, Lynbrook, NY
 W2DBX, Stanley D. Conklin, Cobleskill, NY
 W2HWX, Chester E. Sharp, Oceanport, NJ
 Ex-K21XP, Irvin L. House, South Amboy, NJ
 W2LW, William Belfor, Bronx, NY
 K2OPC, Chester T. Owlett, Webster, NY
 W2SI, Howard G. McEntee, Ridgewood, NJ
 W2SRV, Frank P. Hotoph, Uniondale, NY
 K2ZNV, Carlye Brasser, Mountainside, NJ
 W3MBQ/Ex-W7DHW, Walter F. Weedman, Temple Hills, MD
 W4BYN, John E. Copeland, Durwoody, GA
 W4CQ, Earle J. Gluck, Charlotte, NC
 W4DFR, Dr. Roy R. Campbell, Lenoir City, TN
 W4EMZ, William L. Slusher, Fredericksburg, VA
 K4ERN, John T. Murphy, Ft. Lauderdale, FL
 W4GRC, Horace Phebus, Ridgely, TN
 W4HTS, Oden Smith, Chattanooga, TN
 K4KUU, George D. Washburn, Shelby, NC
 W4PAS, Don H. Reed, Tampa, FL
 W4QEM, Warren W. Sloss, St. Petersburg, FL
 W4SLC, Robert L. Westerman, Memphis, TN
 K5AD, Lamar J. Landers, San Antonio, TX
 Ex-W5ADW, Amos S. Rogers, Muldrow, OK
 W5AGV, Robert H. Collom, Sr., Enid, OK
 W5CQD, Mark Connally, Sulphur Springs, TX
 W5KYJ, William F. Casey, San Antonio, TX
 W5LVO, Gene O. Dyer, Oklahoma City, OK
 K5RJS, Lora Faye Wilson, Ft. Worth, TX
 W6AGO, Dr. James H. Dooley, Paso Robles, CA
 W6AKB, S. B. McClara, Alameda, CA
 W6CAA, William B. Krause, Saratoga, CA
 K6IBA, Roger S. Strout, Kentfield, CA
 W6JD, Curtis W. Mason, San Marino, CA
 K7DMV, William M. Hariu, Wise River, MT
 W7HCJ, Ralph J. Farano, Spokane, WA
 W7SZX, Robert G. Lingow, Dayton, WA
 K7YRS, William R. Hull, Spokane, WA
 W8HAB, Stanley R. Galloway, Durand, MI
 W8IMU, Wesley C. Keplinger, Middlebury Heights, OH
 W8MLX, John D. Newton, South Charleston, WV
 W8UDS, Jack S. Modica, South Euclid, OH
 W9BO, Paul R. Mangus, South Bend, IN
 W9END, Joseph H. Millus, Collinsville, IL
 W9GAD, Hobart L. Polk, Lynnville, IN
 WA9HSM, Edward L. Shekell, Daleville, IN
 W9OFW, Kenneth E. Weimer, Muncie, IN
 W9QID, Lester R. Shadley, Petersburg, IN
 W9SQW, Hiram R. Hartgrove, Newcastle, IN
 W9VWJ, Richard T. Pattie, Hillsboro, IL
 W0BKJ, Howard F. Greenwalt, Shenandoah, IA
 W0BO, Carol C. Parks, Hutchinson, KS
 WA0DLN, Edward L. Hobson, King City, MO
 W0LTU, Robert E. Miller, Brighton, CO
 W0OPK, Donald W. McKinley, Panora, IA
 W0QEM, Eugene M. Weber, Minneapolis, MN
 WA0RSR, Stanton C. Roberts, Bismarck, ND
 KL7HFJ, Sanford Peterson, St. Michael, AK
 VE2IL, J. Gerald McMullen, Valleyfield, PQ
 VE3AE, Edward Hnatuk, Gibsonia, PA U.S.A.
 VE3FW, Patrick J. O'Shea, Dundas, ON
 CNSAC, Antoine Jordan, Rabat, Morocco, Africa
 ZL2UW, Noel Souper, Otaki, New Zealand



YL news and views

CONDUCTED BY LOUISE RAMSEY MOREAU,* WB6BBO

The YL Story - Africa

AFRICA CONNOTES all sorts of pictures: Animals we never see outside of the circus or a zoo; romantic fiction and exciting movies of the Sahara; the mysterious Pyramids and the Nile, with a mental picture of Cleopatra a la Shaw, or Shakespeare, depending on our preference. It's desert and green jungle and modern cities, and it is many new countries that have added to our DXCC search.

Ever since the call ZS2AA was granted to Iris Hayes in 1937, the requirements for WAC-YL were complete, for then all continents had the feminine touch. Iris remained Africa's only YL for only three months. In November of that year she was joined by ZS2BR, Vi Cruickshank, and in 1938, ZS5DF, Meg Compling, became the third YL on the continent. At present there are 205 YLs in the Republic of South Africa, with the largest group holding a ZS6 prefix, followed in numbers by ZS5, then ZS1, and ZS2. South West Africa has just one YL, ZS3PP, listed in the Callbook magazine.

To add Africa for the WAC-YL certificate is as easy as working one of the gals in South Africa, or as difficult as trying to contact women in one of the many other countries, for there are about 226 YLs with amateur radio licenses in that continent. By using the Callbook magazine as the authority for this study, and with excuses for possible oversight due to language limitations (for not all of us are as "proficient in every civilized language" as Sax Rohmer's Dr. Fu Manchu), we are grateful for the listings preceded by Mrs. or Miss to assist in the search.

*YL Editor, QST. Please send all news notes to WB6BBO's home address: 1036 East Boston St., Altadena, CA 91001.

The countries that have just two women representing what has been called "the distaff side of amateur radio" include: A2CAN, A2CAN in Botswana; CN8CT, CN8EL, Morocco; CR4BF, CR4BH, in the Cape Verde Islands. The Canary Islands have EA8DL, EA8GZ; Libya, 5A2TL, 5A2TV; Senegal, 6W8BS, 6W8YL; 9G1FA, 9G1GV in Ghana; and Rowanda has 9X5CJ and 9X5MK.

Angola is represented by CR6GX, CR6YA, CR6YB, CR6YD, CR6YS, CR6YY. Mozambique adds CR7CC, CR7HK, CR7JN, CR7LU, and CR7RI to the picture, while EL2AD, FI2AQ, EL2I, and FL2NH, are the ladies in Liberia. There are three YLs listed for the Ivory Coast; TU2CB, TU2CO and TU2CR; only one in the Cameroons, 1J1AH. The four YLs in Rhodesia are ZE1AQ, ZE1JE, ZE1IK, ZE1JK. There are an even dozen in the Republic of Congo: 9Q5AL, 9Q5CM, 9Q5EL, 9Q5JN, 9Q5LD, 9Q5NI, 9Q5NQ, 9Q5QN, 9Q5RJ, 9Q5SM, 9Q5VR and 9Q5YL.

The Cameroons and South West Africa are only two of a number of countries where the YL story is told by a single call: 3B8DC in Mauritius; 5T5YL in Mauritania; 7U7YL in Niger; Lesotho, 7P8YL; Sambia, 9J2HC; and 9M8SPD in Sarawak.

It is not yet possible to plan for a Worked All African countries with YL contacts, for none are listed under some 34 countries. If there are, the names are hidden by an initial, or have been overlooked through inability to identify it as YL or OM. And all those countries whose amateur calls are not listed in the Callbook, as Sudan, Rodriguez, Equatorial Guinea, Liberia, and the Republic of Guinea, may have a YL in the picture somewhere, but if so, as with the OMs, she is unknown.



YLRC/LA officers who will be the hostesses of the 6th International YLRL Convention are I-r Evie Brightman, K6ZYT, Recording Secretary; Nell Davitt, WB6ERF, Corresponding Secy.; Roberta Baldwin, WA6DFN, President; Ester Gardner, WA6UBU, Vice-president; and Mary Savage, W6VDP, Treasurer. (W6CEE photo)

QST for

WB2YBA, Chris Haycock, who, along with her other duties as a doctor, colonel, and professor of medicine, will exhibit her ability as a photographer at the YLRL Convention Luncheon. W2PDG, left, discussing her slide production. (K2SKV photo)



The 1972 YL story in Africa is one of a beginning, almost an introduction, of a group of active amateur radio operators who are growing and expanding in numbers, many through the assistance of the ARRL people-to-people program providing aid in books and technical material. Through the YLRL Adoptee program some 15 ladies in Africa are members of YLRL.

The story can never be complete for it enlarges with every license issued. "YL News and Views," in the interests of accuracy, will welcome any and all corrections or omissions that have been made.

1971 Trillium Weekend Results

The following are the results of the Trillium Weekend held November 4-5, 1971. Most contacts - Gerry Robertson, VE3GNI, first place; Roy Tuttle, VE3BNV, second; Sid Wheat, VE3CQY, third. "Lucky Draw" winners W3JJR, K2DNN, VE3BBO. Ontario Trillium with most contacts - VE3IV, Ivy Smythe.

Contest coordinator, VE3BEI, reports that participation was the largest of any year in this newest of annual YL-sponsored events. Next one will be in November 1972.

Last Call - YLRL Convention

It isn't too late to register for the 6th International YLRL Convention, May 26, 27, 28, 1972, at the Edgewater Hyatt House Hotel, Long Beach, California. Darleen Souigny, WA6FSC, will be the main attraction at the Luau Banquet. All women amateur radio operators are welcome. It is not necessary to be a YLRL member to attend. See QST, April 1972, "YL News and Views" for details and registration information and join the YL crew to celebrate the 33rd anniversary of YLRL. See you there.

Ontario Trillium Activity

The Ontario Trilliums, who have done so much in helping and encouraging sightless persons become amateur radio operators, have added a new facet to their program of assistance to others with classes for veterans in the Sunnybrook Hospital.

Angie Kramer, WB4JJH, is the wife of the newly elected E. Fla. SCM, W4ILE. Angie is kept busy with 3 children, and publishes a statewide cw Traffic QFN Bulletin. She also works into Florida's Gator Net when time permits. (Florida Skip Photo.)

Sparked by Doree Butler, VE3EUV, a member of the hospital staff, instruction in code and theory began in July 1971, with TOT members augmented by OMs from the Metro Club as instructors. Louise Konyar, VE3AUZ, and Jean Evans, VE3DGG, started the instruction in cw. Tapes and code practice material were left with the class for study between instruction sessions. Books were donated for the use of the seven members who began the classes. As the work progressed, the DCC was requested to reserve the call, VE3SBH, for the group.

In February of this year four of the seven passed the examination. Classes are continuing with individual help for the other three who needed additional proficiency in the code.

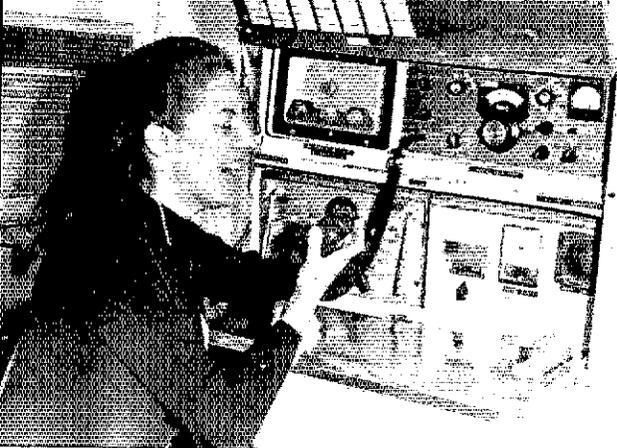
The work of the TOTs and the Metro Club in assisting those less fortunate in physical ability to participate in amateur radio activity is to be commended.

KP4CL First YL 5BDXCC

Alicia Rodriguez, KP4CL, has two very proud "firsts" on her record. The "First Lady" of amateur radio in Puerto Rico with the call K4EZR in 1939, she is now the first YL to earn the 5BDXCC Award.

Alicia, who is a member of QCWA, YLISSB, CHC, and YLRL, is well known to most DXers.





There is no "communications gap" in her family with OM, Felix, KP4CK, and their son, KP4AMG.

"33"

The emphasis on the YLRL anniversary this year has brought a number of inquiries about the source of the 33 we YLs use as a signature.

The numeral 33, adopted by YLRL began long before the club was organized just thirty-three years ago. It was originated by Clara Reger, W2RUF, then W8KYR, and the reason is best told by Clara.

"Long before YLRL started, when YLs were few and far between, warm friendships also started because we were working the same gals constantly. I thought we should have something other than 73; 88 was a bit too mushy, so I started using 33. It caught on as a signature between YLs. Frequently this friendship calls for something a little warmer than a mere 73, so when YLRL adopted it in 1939, the meaning was defined as 'Love sealed with friendship between one YL and another.'"

That is the answer. 33 is not limited to YLRL alone. It is that touch of the YL in any QSO between two women operators.

5T5YL, Mauritania's Only YL

Looking for a rare one for DX-YL? Try 5T5YL, Josette Duffau, in Mauritania. Josette passed her cw exam in Senegal, but did not get a call there because she left 6W8-land in 1960 and went to Mauritania where she became that

Josette Duffau, 5T5YL.

country's only YL amateur with the call 5T5YL in 1961. Two years later she received F8YL in France for operation when she is in her native country.

The activity at the station in Mauritania is often a team work affair with 5T5AD beginning a contact but leaving for work, and Josette finishing it. It is their dream to install slow-scan TV and be the first in Africa to operate DX with this mode.

Josette's hobbies include a large correspondence, stamps, and lectures. They have two daughters and a son who are, at present, in school in France.

5T5YL is active on 20, 15 and 10 meters. She writes that the language problem limits the length of QSOs unless the contact is proficient in French. If you want a contact with just the touch of a challenge of working the first and only YL in her country, 5T5YL will be glad to put Mauritania on your list of rare ones.

Clara Reger, W2RUF

The YL signature "33" is only a small part of Clara's contributions to amateur radio.

In October 1933, Clara became the only YL operator in Buffalo, New York, with the call W8KYR. Two years later she not only received her Advanced license, but was teaching classes in cw, her favorite form of emission. When amateur radio privileges were restored after World War 2, Clara received her present call of W2RUF.

Her activity has been mainly in the public service branch of radio for which she has received many awards. In 1936 she and her brother worked almost continuously for three days calling for doctors and medicines, and food for victims of the spring floods that affected several states. When her brother lost his voice on fone, Clara kept right on going covering his skeds on cw.

Other recognition of her efforts were for operating in the Ohio-Mississippi Flood Disaster of 1937, the New England Hurricane in 1938, Perth Amboy explosion in 1950, Niagara Falls Railroad Explosion in 1958. The 1964 earthquake in Alaska occurred as Clara was keeping a sked with her brother, WA6IVM, in San Francisco, and the family chat changed into a steady operation of emergency assistance in that disaster.

She has received the "Tell Your Neighbor" Award for handling messages for overseas servicemen, "Outstanding Amateur of the State of New York" in 1961, and a plaque for "30 years of Service to Amateurs" in 1963.

Clara's most cherished award is the Edison Award in 1957 for her help in teaching a 14 year old boy who had had both arms amputated following a railroad accident, to send code with his feet and to read it in words. With her help he had his Novice and Technician Licenses before he left the hospital.

Clara is busy with both news and training nets. We gals owe her a special "thank you" for originating the 33 we use when working each other.





Clara Reger, W2RUF, the gal behind that "33."

QST for

Operating Events

.....de W1YL

MAY

4 **W6OWP Qualifying Run** (W6ZLJ, alternate) 10-35 wpm, at 0400 GMT on 3590/7129 kHz, 10-35 wpm. This is 2100 PDST the night of May 3. Underline correct minute of highest speed copied, certify copy made without aid and send to ARRL for grading.

6 **World Telecommunications Day Contest cw**, p. 105 April.

6-7 **Bermuda Contest cw**, p. 110 March. **OZ-CCA cw** (at press time indications were that the contest would be held the first weekend of May), from 1200Z May 6 to 2400Z May 7, 30 hours only permitted for single ops (the rest period cannot be divided into more than 2 periods). There is also a multiop/club station category. Work stations on all continents 80-10 meters, exchange RST plus QSO no., starting with 001. QSOs with the same continent count 2 points, other continents 3 points. QSOs with OX/OY/OZ count double, each DXCC country worked counts as a multiplier. The following districts will count as separate countries for this contest: W/K 1-8, VE/VO 1-8, PY 1-8, LU 1-9, V/K 1-4 ZL 1-5, JA 1-9, OZ 1-9, GY 1-9, OK 3. Final score equals total QSO points times total multipliers all bands. Call CQ AW (CQ All World). Logs with the usual statement must be postmarked no later than June 15 and sent to the IPR Contest Committee, Box 355, 9100 Aalborg, Denmark.

10 **WIAW Qualifying Run** 10-35 wpm at 0130 GMT on 1.805 3.580 7.080 14.080 21.080 28.080 50.080 and 145.588 MHz. This is 2130 EDT the night of May 9. Underline one minute of top speed copied, state no aids used (typewriters OK), sign and mail to ARRL with your full name, call (if any) and complete mailing address.

12-21 **Dundalk Maytime Festival** special operation by the Dundalk AR Soc. of Ireland, signing E10DDM. The station will operate 80-10 cw and ssb, QSL via EI21.

13 **Frequency Measuring Test and World Telecommunications Day Contest phone**, p. 105 April.

13-14 **Russian Contest**, cw only starts 2100 GMT May 13 and ends 2100 GMT May 14, 80-10 meters. Contest call CQM (CO-Peace). Contacts with stations in the same country are not permitted. USSR stations will send RST plus their oblast (region) no. Others send RST plus no. of QSO. Multipliers are the countries/territories on the R-450-S list (similar to the ARRL Countries List). The same country is counted only once during the contest. Contacts between stations on the same continent are worth 1 point, between stations on different continents 3 points. SWLs may score 1 point for hearing one end of a CQM QSO, 2 points for hearing both ends of the contact. Total QSO points all bands, multiplied by the total different countries equals final score. Types of competition: single operator all band, single operator single band, multioperator single transmitter, and SWL. To be eligible for awards (certificates and badges), the country winner must show a minimum of 6 hours of operation and the continent winner a minimum of 12 hours of operation. Mailing deadline July 1. Logs go to the Central Radio Club, Box 88, Moscow, USSR.

13-15 **Connecticut, Georgia, and Montana QSO Parties**, p. 105/108 April.

13-21 **75th Anniversary of the Marconi-Kemp Bristol Channel Tests** with special operation by the OOTC and the Garden State AR Assn. using WM2GK. WM2GK will be located at Twin Lights, Highlands, N.J., site of Marconi's first radio experiments in the U.S. in 1899. Approximate freqs.: 1803 3530 3806 3930 7030 7228 14030 14285 21030 21250 28030 28550. Awards list available from K2NP.

20 **Armed Forces Day**, this issue.

20-21 **Michigan QSO Party**, p. 158 April.

JUNE

3-4 **Rhode Island QSO Party**, sponsored by the R.I. Radio Amateur Week Committee, open to all. Stations may be worked once on phone and once on cw per band. Mobiles may be worked twice if they change counties. No time segments within the operating period (starts/ends 2300 GMT) and no power restrictions. Use of FM simplex, such as 94-direct is encouraged. Suggested freqs.: cw, 1812 3550 7050 14050 21050 28050; phone, 3990 7290 14290 21390 28590; vhf, 50.3 145.2 146.94 (FM-direct). RI stations send report and county, others send report and ARRL section or country. Contacts on 160 and 2 meters (and above) count 2 points, 80-6 meters 1 point. R.I. stations multiply points times no. of sections and DX countries. Non-R.I. stations use the no. of R.I. counties for mult. (total of 5, Providence Washington Bristol

Newport Kent). Each complete 2-way exchange constitutes a QSO. Appropriate awards and special certificates for 160 and VHF plus a Genrad Award to the station with the highest no. of QSOs. Send a summary sheet with score computations plus a checklist of stations worked (do NOT send logs) to: R.I. QSO Party, c/o W1QFD, 31 March St., Cranston, R.I. 02910. Reports must be postmarked before June 15, 1972. For results, enclose an s.a.s.e. **CQ-VE VHF Contest**, limited to Bell System employees, from 1800 GMT to 2300 GMT each day. For rules, logs, etc., contact your local coordinator.

4 **Minnesota QSO Party**, sponsored by the Viking Amateur Radio Society, no time or mode restrictions, Minn. stations may work each other. All bands may be used and a station may be worked one on each band and each mode. Only one transmitter may be used at any one time; no crossband permitted. The following times/freqs. are encouraged to concentrate Minn. stations: phone, 0300-0400, 0400-0800, 1600-2000; cw, 0400-0800, 1200-1600, 2000-2400. Suggested freqs. are a 10 kHz range centered on 3585 7085 14085 21085 35985 7285 14290 21385. On all bands, please listen carefully to avoid nets, etc. Stations working more than 50 QSOs must include a check sheet for each band worked. Logs must contain all the contact exchange info, plus date/time/band/mode and score computations. Indicate your call/section/county or country on the log itself. Logs must be postmarked no later than June 25 and an s.a.s.e. must be included. You will be sent the results of the party plus a check sheet indicating how your log was scored. Appropriate awards. Minn. stations send QSO no., RST and county; figure score by multiplying total QSOs times multiplier (sections worked on cw plus sections worked on phone). Minn. contacts are counted as a section. A low power multiplier of 1.25 may be used if power during entire contest is 250 watts or less. A bonus of 25 points per mode is given if all sections in one call area are worked (to be added after the multiplier). Non-Minn. stations send QSO no., RST and section or country figuring score by multiplying total Minn. QSOs times multiplier (Minn. counties worked on cw plus those worked on phone). Same low power multiplier as above. A bonus of 25 points per mode (after multiplier) for every 5 counties worked. Logs go pronto to Viking AR Society, Box 5, Waseca, Minn. 56093.

6-8 **KANAA AHCEA Operation** (Armed Forces Communications and Electronics Assn.) during their annual convention. The station will operate from 0900-2200 EDT with 2 available positions for both cw and ssb 80-10. A special QSL signed by Chief of Naval Operations Admiral E. R. Zumwalt will acknowledge QSOs.

7 **W6OWP Qualifying Run**.

10-11 **VHF QSO Party**, rules this issue.

15 **WIAW Qualifying Run**.

24-25 **World Day**, rules this issue.

28 **WIAW Morning Qualifying Run**.

JULY

6 **W6OWP Qualifying Run**.

14 **WIAW Qualifying Run**.

15-16 **"Open" CD Party, cw, Space Net VHF Contest**.

22-23 **"Open" CD Party, phone**.

29-30 **CW County Hunters Contest**.

September 9-10: VHF QSO Party.

November 11-12, 18-19: Sweepstakes.

December 9-10: 160-Meter Contest.

QST

DXCC Honor Roll Pin Now Available

To apply for the pin, furnish references to the page, issue and year of the most recent Honor Roll you appeared in, your call, totals shown, complete mailing address and the unit cost of \$1.00 (U.S.).



Operating News

GEORGE HART, WINJM
Communications Manager
ELLEN WHITE, WIYL
Deputy Communications Mgr.
ROBERT L. WHITE, W1CW; DXCC
GERALD PINARD, *Training Aids*
ALBERT M. NOONE, W1KQM; *Contests*

Repeaters. Our folder of ideas for this column's lead contains three items on repeaters. The first is a little reminder memo for some discussion on "public" repeaters and the need to support them. A repeater may be old hat and very commonplace to telephone companies and microwave relayers in other industrial and government pursuits, but to many amateurs it is still something new and wonderful and becoming very widespread and popular, too. Someone, or some group, has gone to a lot of trouble and expense to set up a repeater for everybody to enjoy—that is, every amateur. True, a few try to restrict operation to a select circle, but by and large most repeaters are open to everybody who wants to use them—for free. All you have to do is muster enough signal to trigger the gadget on its input frequency and back comes your signal, loud and clear, on the output frequency.

There Is Always Time For Courtesy

(This is the second of two columns submitted by K3FDL on operating ethics. Any further material for this column must come from the field. At the present time, this exhausts our supply.)

That extra bit of thoughtfulness makes ham radio a more enjoyable hobby for all of us. For example, you're in the midst of an interesting QSO when your contact advises you there is a "breaker" on the frequency. He asks the breaker to identify himself and then proceeds to carry on a long-winded QSO with the breaker while you sit twiddling your thumbs, because you can't even hear the breaker. The courteous thing to do when something like this happens is to acknowledge the breaker and after making sure it is not an emergency, ask him to stand by until the current QSO is completed.

Then there are phone patches and nets, both of which should be respected enough to stay off their frequencies while their business is being conducted. The rare DX station should be allowed to complete his QSO before anyone starts calling him. When the DX station specifies a definite call area, give the operators in that area a chance to work him. Your time will come later.

You say you learned this stuff when you were in grade school? So did I, and I also learned to respect my parents and love the American way of life. All are still sound fundamentals in my book and should be practiced daily. —K3FDL.

Use it, enjoy it, but don't forget that it cost someone something; money and effort to build or buy, chasing down a suitable site, perhaps paying rent for it, installing it, getting it operating and maintaining it. If you use the repeater, support it. Most "machines" these days are run by club groups, so a user can become a member of the sponsoring organization. If you're short on funds there are other ways, too. Offer to assist with construction, maintenance, promotion. Hardly anybody who has occasion to use a repeater is incapable of doing anything to support it. Do your part. Don't be a parasite.

Then there is the matter of operating procedure, which we have already touched on in this column (Feb. issue). The depraved amateurs who sit on WIAW during code practice are probably also capable of disrupting repeaters, but this will be (we hope) exceptional. Thoughtlessness is something else, and can tie up repeater operation endlessly. Many repeaters, for that reason, have an automatic time limit on their transmissions, to prevent the longwinded from monopolizing them. If you operate through one of these, you ought to take the hint when your transmission is consistently cut off. In any case, make your transmissions short, to the point, snappy.

Now for a couple of field contributions on the subject. From WB4DRB in the *Virginia Ham* (combined Virginia Net bulletin, WB4FDT editor) we get the following tips for fm mobilers:

1. Arm yourself with an ARRL Repeater Directory.
2. Take along a wavemeter, SWR bridge and tool kit, especially on longer trips.
3. While mobiling in an unfamiliar area, give the time in 24-hour local time. Then give your call and your input/output frequencies. This makes it possible for someone to contact you if you are getting into a repeater you aren't aware of.
4. In areas with several repeaters using tone access, avoid breaking them by using sweeping audio tones. This defeats the purpose of a tone access device and may key several repeaters at once.
5. In reporting accidents or other emergencies, give (a) your call and location, (b) the nature of the emergency and (c) what kind of assistance required. If you don't get a reply at first, keep trying; some amateurs operate "scanner receivers" and will hear you if you try often enough.
6. Give your rig and antenna a thorough check before you start. Fixing things on the road can be difficult or impossible.

And finally (but not leastly), W2KQP in the *LIMARC Log* (Long Island Mobile Amateur Radio Club) looks ahead to the time (already here in some areas) when just casting your voice through a repeater is no longer a big thrill. What do we do with our sophisticated repeaters then? "In the early days of television broadcasting," sez Ed, "the primary emphasis was on getting good pictures and improving the technical standards. However, a

WIAW SPRING-SUMMER SCHEDULE

(April 30-October 29)

(The specific frequencies shown below are approximate and indicate general operating periods)

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. The station will be closed May 24, July 4, and September 4.

Times/Days GMT	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
0000							
0020-0100 ⁴			3.7 Nov. ⁵	14.080	14.080	7.15 Nov. ⁵	14.080
0100							
0105-0130 ⁴			3.990	50.190	145.588	1.820	21.390
0130							
0230-0300 ⁴			3.580		1.805		3.580
0300							
0310-0330 ⁴			3.625	14.095	7.095	14.095	3.625
0330							
0335-0400 ⁴			7.290	3.990	7.290	3.990	7.290
0400							
0420-0500 ⁴			3.7 Nov. ⁵	7.080	3.990	7.15 Nov. ⁵	3.580
1300							
1700-1800							
1800-1900			21/28 ⁵	21/28 ⁵	21/28 ⁵	21/28 ⁵	21/28 ⁵
1900-2000			14.290	14.080	14.290	14.080	14.290
2000-2030			7.080	7.290	14.095	7.290	7.080
2030			21/28 ⁵	21/28 ⁵	21/28 ⁵	21/28 ⁵	21/28 ⁵
2100-2130							
2130			7.15 Nov. ⁵	21.1 Nov. ⁵	7.15 Nov. ⁵	21.1 Nov. ⁵	7.15 Nov. ⁵
2200							
2300			CPN ⁶	7.095 ⁴	8.825	14.095 ⁴	CPN ⁶
2330				8N ⁶	RTTY BULL. ³	CN ⁶	

¹ CW Bulletins (18 wpm) and code practice on 1.805, 3.580, 7.080, 14.080, 21.080, 28.080, 50.080 and 145.588 MHz.
² Phone Bulletins on 1.820, 3.990, 7.290, 14.290, 21.390, 28.590, 50.190 and 145.588 MHz.
³ RTTY Bulletins sent at 850 Hz shift, repeated with 170 Hz shift, on 3.625, 7.095, 14.095, 21.095, and 28.095 MHz.
⁴ Starting time approximate, following conclusion of bulletin or code practice.
⁵ WIAW will tune the indicated bands for Novice calls, returning the call on the frequency on which called.
⁶ Participation in section traffic nets.
⁷ Operation will be on one of the following frequencies: 21.02, 21.08, 28.02, 28.08 MHz.
⁸ Operation will be on one of the following frequencies: 21.270, 21.300, 28.590 MHz.
 Maintenance Staff: W1s, Q18, WPT, YNC.

WIAW CODE PRACTICE

WIAW transmits code practice according to the following schedule. Approximate frequencies are 1.805 3.58 7.08 14.08 21.08 28.08 50.08 and 145.588 MHz. For practice purposes the order of words in each line may be reversed during the 5-13 wpm transmissions. Each tape carries checking references.

Speeds	Local Times/Days	GMT
10-13-15	7:30 PM EDST dy	2330 dy
	4:30 PM PDST	
5-7½-10-	9:30 EDST Sa TThS	0130 MWFSn
13-20-25	6:30 PM PDST	
5-7½-10-	9:00 AM EDST MWF	1300 MW+
13-20-25	6:00 AM PDST	
35-30-25-	9:30 PM EDST MWF	0130 TThS
20-15	6:30 PM PDST	
35-30-25-	9:00 AM EDST FTh	1300 TTh
20-15	6:00 AM PDST	

The 0130 GMT practice is omitted four times a year on designated nights when Frequency Measuring Tests are sent in this period. To improve your fist by sending in step with WIAW (but not over the air!), and to allow checking the accuracy of your copy on certain tapes, note the GMT dates and QST practice text (from the issue 2 months previous) to be sent in the 0130 GMT practice on the following dates.

May 12:	It Seems to Us
May 16:	Correspondence
May 19:	League Lines
May 25:	ARPS

The subject of practice text for the following sessions is *Understanding Amateur Radio, First Edition*.

June 2:	The Band Checker, p. 267
June 5:	How to Use WWV, p. 271

good transmission became taken for granted, the emphasis shifted to improving the program content in order to maintain interest in using the medium. In repeater operation, we are faced with a similar problem."

Ed then expands on this theme by pointing out that a good repeater net gives us all the elements of a lecture hall, for one thing. We can even add visual communication by using slow-scan TV and electronic blackboard techniques. We don't even have to stick to radio-technical subjects; various pillars of the community can give talks on any number of subjects, the whole idea being to uplift the intelligence level of our communications.

Yes, repeater operating is the "in" thing. Not the only thing, although those "hipped" on it may try to lead you to think so. But it's no longer experimental or simply technical. The object is no longer to get it to work. It does work. The idea now is to do something with it - something useful and progressive.

Service Charges Go Up. You members of the League won't have to worry about this, because for you it's free, but non-members in the U.S. and Canada, starting July 1, will have to pay higher fees for WAS and DXCC awards than previously. It will be \$3.00 for WAS, \$5.00 for DXCC and \$2.00 for DXCC endorsement. - WINJM.

DXCC Notes

Announcement is hereby made of the deletion from the ARRL Countries List of the Ryukyu Islands (KR6,8). This deletion is made in view of the retrocession of the Ryukyu Islands to Japan. DXCC credits for contacts made prior to May 15, 1972, may be claimed for the Ryukyu Islands

listing. Contacts made May 15, 1972, and later, will be creditable as Japan. JARL advises that stations located in the Okinawa Islands will be issued the prefix JR6. Calls issued to U.S. Military attached personnel in the Ryukyu Islands will use the KAO prefix.

DX CENTURY CLUB AWARDS

Radiotelephone listings follow the general-type "New Member" and "Endorsement" listings.

February 1-29, 1972

New Members

K2BT	268	VE3FRR	121	DM9ADL	107	HAKFZ	105	K6QGV	102	LZ1KBG	100
EP2TW	255	SM6DKU	118	UB5MV	107	OE3AX	105	WA7GYR	102	UA2EC	100
W6CN	252	SV0WEE	118	DM2BYE	106	DM2ADR	104	WA8YNU	102	VU2BEZ	100
JA2AH	232	CT2BC	111	DM3LDA	106	DM3UE	104	DL6NP	101	W1FLN	100
UW0FP	151	DJ6EU	110	DM3XI	106	UW3XX	104	DM4ZXH	101	WB2HJV	100
W4KVC	144	G3HB	110	KP4DEY	106	WA2ZRD/3	104	G3SKJ	101	WA3LJP	100
JAIWSA	139	JA1KA	110	W2CU	106	WB4UYD	104	K05GJ	101	W5ONO	100
W9RXJ	132	UV9OC	110	W2DPL	106	W6LNN	104	SP6DMJ	101	WA5OKC	100
JHIAGU	127	DM2CZM	109	WA4KLH	106	WA6HMT	104	UA2DP	101	WB6YPX	100
OH3AG	126	JA3KWJ	109	WA5ZWC	106	WB9CUB	104	UB5VK	101	W8RBC	100
9Y4KK	123	DK3OV	108	W6LNH	106	UA1BQ	103	EA1KC	100	WA8WTK	100
UV3TC	122	DM2DDN	108	WA2DYK	105	UO5SA	103	EA2IK	100	WB8BOI	100
VO2AF	122	IS1AOV	108	WA2NGG	105	UW3IO	103	F6KCO	100	WA9YZD	100
OH8SR	121	K1UKT	108	WA3BCG	105	K2DT	102	K1LWJ	100		

ON5MG	278	WA9QAM	206	WB2DZZ	122	DJ3FC	110	OZ3CE	107	DL3VV	102
W6AXH	243	K6HTM	186	F6AZM	118	WB4PNG	110	DL4VA	106	WA4KHL	102
JA2AH	230	LA4CM	182	OZ4TA	116	JA1KA	109	G3WEV	105	WB9DVV	101
W6CN	224	TIJR	166	ØMOM	112	WB4ISZ	108	W8FXJ	105	G3XPM/W1	100
WA7FSZ	212	5WIAR	141	AP2KS	111	IP1MTK	107	K3KHL	104	Z51KZ	100
W8COG	212			KG4EW	111			CT1PN	102		

Endorsements

In the endorsement listings shown, totals from 120 through the 249 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.

W9JUV	340	W5LJT	280	WA4YVQ	240	WA6TAX	200	W6RXW	180	WA2MDR	140
W9ZTD	320	WA3GTX	270	K4CG	220	WB6ZUC	200	W7EOI	180	WB2DZZ	140
K1YZW	315	WA3KSQ	270	SM7BWZ	220	W8FXP	200	W7SFF	180	W0KH	140
W4DRK	315	WA5VDH	270	SP6BZ	220	WA8TDY	200	W8KZO	180	ZL1AMN	140
G3JFC	310	WB6PNB	270	VF3OI	220	W0NAR	200	W9HDR	180	JA2AILR	120
JA1ZZ	305	W7DQM	270	W3BRB	220	W0TRF	200	WA7QJW/HRI	160	JA8AUS	120
K6GLC	305	K4CYU	260	W4VIH	220	D13LR	180	K4KA	160	JA8BK1	120
W6GB	305	DJ5JH	250	W4WHK	220	K4NE	180	K8NOP	160	K3OVT	120
JA8ZO	300	DL3AR	250	WB9FJX	220	K4RDE	180	UA4LM	160	K4FJC	120
K2LGJ	300	F2NB	250	W0Y7B	220	OZ1AJ	180	UA4QM	160	K6ICG	120
K8UDJ	300	G3AWP	250	K6HTM	200	OZ8BZ	180	WA2YVK	160	K6ZMB	120
OE1HGW	300	SM4CMG	250	K8RCT	200	W1DAL	180	WB2NLM	160	WA1HLX	120
W2YUF	300	W2MB	250	KP4DJE	200	W2AAU	180	W4IN	160	W4RNL	120
ZL1HW	300	WA9VOL	250	PY5QE	200	W3SDV	180	WA5UBV	160	W4ZVX	120
DK3PO	290	K2AA	240	VE4ST	200	W3YHR	180	WA5QWF	160	W6FVU	120
OE7UD	290	SMSBFJ	240	W2DKM	200	W3YT	180	W5UNF/6	160	WB9DZI	120
YU1AG	290	W4PGW	240	W5NBI	200	W4AX	180	YU1NIG	160	W0JIG	120
KH6GLU	280			W5RUB	200			W2RFK	140		

YV5AXO	320	W6CCB	300	WA4YVQ	240	WA6TAX	200	LA4DM	160	WB2MQI	140
K2IRK	315	W9ZTD	300	ZL1AAS	240	W9MKA	200	UY5XS	160	W5LJT	140
WA2EOQ	315	I4ZSQ	290	DL3OM	220	EA3SA	180	WA2MBF	160	W5MIG	140
W5AG	315	DK3PO	280	EP2DX	220	K4CG	180	W4IN	160	W7FSE	140
G3JEC	310	OE7UD	280	W5QBM	220	OZ1AJ	180	WA4YJY	160	W0KH	140
HA4	310	FA4LH	270	F2VX	200	WA4FZA	180	WA5WQF	160	DK4YA	120
JA3UI	310	W7DQM	270	KH6GLU	200	W7EOI	180	W5QHF	160	K2AAC	120
K4YYL	310	KP4CQB	260	K6SVL	200	WBDX	180	CT1ZW	140	K4PEK	120
W3ALV	310	CT1UA	250	KP4DJE	200	WB9FJX	180	K4BNC	140	K0ZFL	120
PY3AHJ	305	K2KGB	250	WA3GTX	200	CP1FW	160	K7GEX	140	W2MPK	120
W4DRK	305	HBGJ	240	W4PGW	200	DJ4ZD	160	WA7QJW/HRI	140	VE7XY/W6	120
OA4OS	300					HA4KI	160	WA2YVK	140		

All operating amateurs are invited to report to the SCM on the first of each month, covering station activities for the preceding month. Radio Club news is also desired by SCMs for inclusion in these columns. The addresses of all SCMs will be found on page 6.

ATLANTIC DIVISION

DELAWARE — SCM, Roger E. Cole, W3DKX SEC: WA3DUM. PAM: WA3GSM. RM: W3EEB, WA3HWC joined Silent Keys in Feb. Bill was one of the first group to organize a Delaware Hamfest and was known throughout the East for his vhf activity. He was NCS of the Del. 2-Meter Net for years and shared his skills unselfishly to help vhf beginners get on the air. Bill personified the idea that "An Amateur is a Gentleman." Note new appointment of WA3DUM as SEC. WA3QIU continues high level of activity making 3rd consecutive BPL and taking over as Net Manager of the DEPON. WN3SL and WN3RYH are new licensees in the Wilmington area. U. of Del. security recently spotted a fluorescent tube near the WA3GAY antennas as a UFO. Traffic: (Feb.) WA3QJU 259, W3EEB 86, K3IVV 38, WA3GSM 31, W3DKX 30, WA3FRV 23, WA3GAY 22, WA3DUM 15, K3NEZ 9. (Jan.) WA3QJU 464, WA3DUM 18, WA3GAY 18.

EASTERN PENNSYLVANIA — SCM, George S. Van Dyke, Jr., W3HK — SEC: W3FBF. Rms: W3EML, K3BR, K3MVO. WA3AFJ, K3PIE, W3CDB. PAMS: K3BHU, WA3PLP. OBS reports were received from WA3KFT, WA3AFJ, W3CBH, WA3QOZ, W3ED, WA3JKO. OVS reports from WA3MCK, WA3KFT, W3CL, K3VAX. OO reports from W3NNC, W3BFF, K3RDT, W3KEK. PSHR: K3BR, WA3QOZ, K3OIO, K3MVO. BPLs: WA3OGM, W3EML, K3NSN, WA3QOZ, K3MVO, K3BHU.

Net	kHs	Operates	QNI	QTC	RM/PAM
EPA	3610	6:45 P Dv	447	519	K3BR
PFN	3660	5:30 P M-F	827	557	K3BHU
PLTN	3610	6:00 P Dy	117	79	WA3AFJ
EASN	3726	6:30 P Dv	188	108	WA3OGM
					WA3JSU/1
EPAP&TN	3917	6:00 P Dy	451	237	WA3PLP

Delaware Co. EC is WA3QFN, please note! WA3ATQ moving to Pocono area this spring. New officers — Milton ARC, W3LXN, pres.; WA3BZO, vice-pres.; K3RCM, sec.; K3VDT, treas.; WA3QXJ, act. mgr. RF Hill ARC, WA3BHQ, pres.; K3AWZ, vice-pres.; WA3NOX, sec.; WA3NIE, treas. W3BUR will be MM2 for few months in VP7-VP9-HP4 and K24-Land; look for him on 7050, 7250, 14050, 14320. W3EML reports 98% of TCC skeds met, that's some kind of record. W3MPX now is K3BR! K3PIE made a nice analysis of EPA functioning, thanks. Penn ARC is preparing for the big FD. WA3QOZ reports the ERFN is going great 11152 week days. K3VAX reports their 2-meter emergency net did real Public Service during recent snow storm. W3EU says he is good for another 5 years. W3GMK got too much RF in his scope, R1TY down until repaired. WA3JKO reports he made top spot in Lia. QSO Party. The PFN operated around the clock on week end of Feb. 19, 20 snow alert. WA3EEC has 2-meter fm activity going in Scranton area, also stirring 6-meter boys too. Traffic: (Feb.) K3BHU 911, W3EML 638, K3NSN 614, WA3QOZ 578, WA3OGM 577, K3BR 439, K3OIO 208, K3MVO 159, WA3MQP 158, K3PIE 139, WA3KWU 108, WA3QVZ 105, WA3QFN 91, WA3PBM 78, WA3ATQ 49, WA3AFJ 48, W3VAP 45, WA3LWR 38, W3ADE 37, WA3PQA 35, W3OY 32, W3HK 27, W3YR 26, WA3LVC 18, K3KNL 17, W3A1Z 14, W3BNN 12, W3BUR 12, WN3QLC 12, K3KTH 7, W3VA 3, WA3BJQ 2, W3ID 2, K3VAX 2, WA3EJR 1, W3EU 1, W3GMK 1, WA3JKO 1, W3KEK 1, WA3OZB 1, W3YPF 1. (Jan.) W3YR 25, WA3OZB 2, WA3BSV 1.

MARYLAND-DISTRICT OF COLUMBIA — SCM, Karl R. Medrow, W3FA — SEC: K3KMO. PAM: W3FCS. RM: W3ET. WA3IIV renews OPS. K3TNN welcome as new OPS. WA3CUC is the new EC of Washington Co. W3TN renews his ORS along with WA3MSW. WA3PIG is new ORS/OPS. K3LFD looks toward a winter vacation. WA3EOP says his XYL is a certificated SWL.

W3FCS keeps getting edged over by XYL WN3PLN. Both W3EJZ and K3IYZ have 40-meter beams. K3IYZ has his at 95-ft. to keep from mowing down the apple trees. WA3LQV keeps increasing his traffic count each month. W3FZV passed out a few numbers to the Novices in the round up. K3ORW keeps the phone schedules despite piling up the overtime at work. WA3GXN has that gleam in his eye for retirement. W3RFX says no little flu bug is going to stop him. K3BA added a ten-meter antenna to his already overloaded ballun. WA3IYS is busy selecting the school of his choice. WA3PIG is putting out the mileage in MDD and MDCTN while waiting for warm WX to fix the Quad and then to DX. W3ABC has a short trip to S. America coming up. W3JZY snowed in for 5 days, monitored the emergency nets in case he got the call. W3OKN reports a busy month passing traffic; pleasantly surprised to receive ECN and GBN net certificates plus the GBN 100 award. W3TN says his rig and his end fed antennas are not getting along too well together. W3EOV got down to one transceiver before he could get repairs started. W3ZSR says the DX test is hard work but fun. W3CDO ran off to the Mardi Gras without the rig. W3QU now represents 3RN on EAN Mon. W3ZNV is a regular on MDD from rare Calvert County. W3LDD sends in a nice report on the goings on in Aberdeen. K3UAV and K3SMQ have new commercial tickets. W3JDG, W3LEY, W3NFS and W3LDD check the W. VA. net in the recent disaster. Everybody seems to be a county hunter in this area. New AREC men are WA3GYF and WA3RNG. The MDCTN met 17 times, handled 46 messages with an average attendance of 16.2. Traffic: (Feb.) W3TN 226, W3QU 198, WA3PIG 137, K3BA 105, WA3LQV 103, W3FCS 64, W3FA 53, K3LFD 46, W3FZV 42, K3TMM 28, WA3EKK 27, W3ABC 17, W3HFX 16, WA3GXN 15, K3ORW 10, W3ZNV 3. (Jan.) WA3IYS 41.

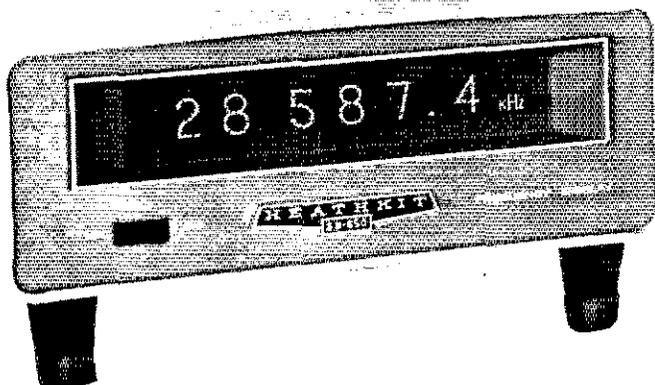
SOUTHERN NEW JERSEY — SCM, Charles F. Travers, W2YPZ — SEC: W2LVW. PAMS: W2FJE, W2YPC, W2HMU. RM: W2JI.

Net	Freq.	Time/Days	Sess.	QNI	Tfc.	Mgr.
NYPON	3925	6 Su	4	28	25	WB2FJE
ECTTN	7290	5 M-F	29	260	94	WB2HMU
MCVHFEPN	145.9	8 F	4	21	1	W2YPC

Violent winds the past few weeks played havoc with antenna systems in the area. No doubt greater efforts will be put forth in the installation of new antenna arrays. WA2FGS reports CD activities in Salem County are really booming and the conversion of Bell equipment to 2-meter fm is almost complete. K2ARY reports transmitting four bulletins during the month. OO W2ORS reports only one infraction of regulations during the month. W2ZI reports W3DH recently was inducted into the Society of Wireless Pioneers (SOWP) as its 1000th member. This society meets each Thurs. at 11:00 A.M. on 14125 kHz. WA2NZJ has joined Army MARS. Traffic: WB2VEJ 406, WA2NZJ 121, WB2HMU 50, WB2UVB 45, WA2FGS 34, W2ZQ 32, WB2FJE 31, W2YPC 16, WB2SFX 14, WA2KWB 13, W2ORS 11, W2ZI 2.

WESTERN NEW YORK — SCM, Richard M. Pitzeruse, K2KTK — Asst. SCM: Rudy M. Ehrhardt, W2PVI. SEC: W2CFP. Section net listing appears in Apr. Station Activities. WA2BCK is a new Extra Class licensee. A new club is the Buffalo Area DX Club, WB2YQH has details. W2GBX recently operated as PH3B from Malta. WB2NYI and WA2GCO have installed an antenna that has GOT to work — installed in 5 degree weather. W2ECM ventured from homebrew to a TR-4. K2ZEV has a new Tempo-1. The RAWNY meeting of May 9 will be held at the East Aurora High School. W2SET should be receiving his W4 call soon. WA2KAT reports a vhf gang forming in Lockport. Congratulations to K2UIR, new net mgr. of ESS. The Clarkson Amateur Radio Club elected WA2MOS, pres.; WB2SMD, veep; WA2IEQ, secy.; WA1UQA, treas. Also appointed was WA2MOR as traffic mgr. and WB2HUA as K2CC trustee. W2CFP is working hard at his new SEC job and is eager to get ECs in areas presently without one. Any AREC activity in your area? If not, contact W2CFP. W2RQF has the mobile going again. New ARRL prexy W2TUK will be at the RARA Hamfest on May 13. As you may know, there is talk of the possible transfer of Western New York to the Hudson Division. Like the idea? Let met know — and let W2TUK know at Rochester. Sorry to report the passing of W2ZGM, well known Auburn ham. K2DN is operating an RFTY net, NYR on 3613 kHz nightly. NYS handled 443 messages with 785 check-ins in Feb. Rome Family Day is at Becks Grove as usual, on June 4. There will be a meeting of the NYPON at that shindig.

New digital readout



Provides precise readout of frequencies on all Heathkit receivers & transceivers

New Heathkit SB-650 Digital Frequency Display... another "first" from the hams at Heath.

179⁹⁵*

- Resolution to within 100 Hz ± 1 count
- Compatible with all Heathkit SB Receivers and SB and HW Multiband SSB Transceivers
- Six bright readout tubes display MHz, kHz and hundreds of Hz
- Full 80 through 10 meter coverage

You asked for it and Heath produced it. An exciting piece of ham gear to bright-light frequencies... readable from up to 30 ft. away The new SB-650 digital frequency display reads the three frequencies of a heterodyne circuit; then computes and displays the actual signal received or transmitted. All within a tight 100 Hz accuracy. Six bright digital readout tubes show you exactly where you are as you tune across the 80 through 10 meter bands, from 3 to 40 MHz. The SB-650 lets you read kHz to five places... plus tenths of a kHz.

And talk about compatibility. The SB-650 is designed to team up with all Heathkit SB-Series Receivers and Heathkit SB- or HW-Series Multiband Transceivers. When it's in combo with a transceiver, the "650" calculates and displays both transmitted and received frequencies. To make installation easier, the SB-650 manual fully describes and illustrates all inter-connections necessary for the specific Heath gear you own.

The addition of a Digital Frequency Display will in no way degrade your station's performance — and when teamed with budget equipment, such as the Heath-

kit HW-101, the SB-650 can give you pinpoint tuning accuracy to rival transceivers costing hundreds of dollars more!

The all solid-state circuitry uses 35 ICs and six transistors. An IC voltage regulator protects the devices from failure due to overvoltage, a common problem with discrete regulators. A built-in memory assures non-blinking operation, and there's a special circuit to minimize last-digit jitter.

Your SB-650 assembles in just four to five hours... because IC's and display tubes plug into sockets on the double-sided glass epoxy board. And because there are no tuned circuits, only four easy internal adjustments are needed to get your "650" peaked up and ready to go.

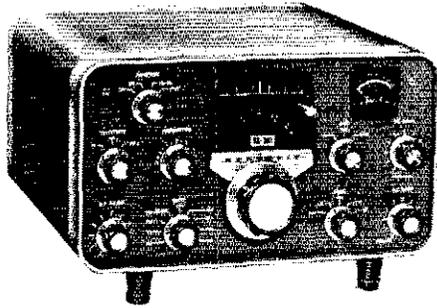
The SB-650 Digital Frequency Display. It's got to be one of the most "up-and-coming" pieces of ham gear ever offered. It's another trend-setting "first" you can count on... from the hams at Heath.

Kit SB-650, 9 lbs., mailable \$179.95*

SB-650 SPECIFICATIONS — Frequency Range: 3-40 MHz (80 10 meters). Frequency Display: 6 display tubes (kHz to 4 places, plus tenths of kHz.) Maximum Viewing Distance: 30 ft. Maximum Input Signal: 5v rms. Accuracy: 100 Hz ± 1 count. Compute Time: 160 msec. Sensitivity: Adjustable. Input Impedance: 2000 ohms. Internally Generated Spurious Frequencies: Approx. 0.25 μ V equivalent signal level. Crystal (clock Frequency): 1 MHz. Crystal Aging Rate: Approx. 10 ppm/yr. Ambient Crystal Stability: Approx. 10 ppm from +10° to +65° C. Ambient Operating Temperature: 0° - +40° C. Ambient Storage Temperature: -55° to +80° C. Power Source: 120/240 VAC, 50/60 Hz, 10 W. Dimensions: 3 $\frac{1}{2}$ " H x 10" W x 10" D.

...to team up with the

hottest combo in ham radio!



Heathkit SB-303 Receiver **319.95***

- Receives USB, LSB, AM, CW & RTTY, 80-10 meters
- 15 MHz WWV reception
- Compatible with the new SB-650 Digital Frequency Display

The Heathkit SB-303 — heart of the renowned SB-series separates — with the signal seeking capability the general and advanced ham wants. Its standard, trend-setting features provide the full-blown versatility you want... without the expense of those "add-on-dollars" options. And its compatibility with the new Heathkit SB-650 Digital Frequency Display offers you even greater operating convenience.

The SB-303 sports full transceiver capability with the Heathkit "400" or "401", three-position AGC, 25 kHz calibration, antenna and power connection for two VHF converters, 15 MHz WWV reception. All this with 2.1 kHz selectivity, less than 0.25 uV sensitivity and 60 dB image rejection.

The exclusive Heath factory assembled and aligned LMO, with 1 kHz dial readout, assures you of peak performance and incredibly smooth linear tuning. And a new RF attenuator lets you adjust sensitivity for optimum signal handling. The SB-303 solid-state design utilizes 27 silicon transistors and one IC for instant warmup, plus 100 Hz stability in 10 minutes. A dual-gate MOSFET front end provides outstanding dynamic range and large signal handling capacity with low distortion.

Wiring harnesses, nine plug-in circuit boards and an extender board make assembly, alignment and maintenance easy. As always, the famous Heathkit assembly manual guides you a simple step at a time.

- Kit SB-303, 21 lbs. **319.95***
- SBA-301-1, optional 3.75 kHz AM crystal filter, 1 lb. **21.95***
- SBA-301-2, optional 400 Hz CW crystal filter, 1 lb. **22.95***

229.95*

Heathkit SB-401 Transmitter

- Transmits USB, LSB & CW with 100W PEP
- Built-in power supply

Here's the high-performance transmitter that teams up with the "303" to deliver full transceive capabilities on a budget. The SB-401 covers 80-10 meters; transmits USB, LSB & CW with 100 W PEP. A single front panel switch selects transceive or independent operation of "401" and 300-series receiver. The optional SBA-401-1 crystal pack makes the SB-401 compatible with any receiver. There's also a built-in 120/240 VAC power supply. And a modular sub-pack packaging and assembly procedure add to the ease of building the SB-401. A hot competitor in any ham shack — order yours, today.

- Kit SB-401, 36 lbs. **299.95***
- SBA-401-1 crystal pack, 1 lb. . . . **29.95***

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Traffic this month is down a bit from last year. Check the expiration date of your appointment, and be sure you keep it properly endorsed. We could use active OOs and OBSs. If interested, drop me a line. BPL went to W2OE. Traffic with the *indicating PSHR: (Feb.) WA2ICU* 428, WA2ELL* 293, W2FR* 289, W2OE 204, W2FZK 193, W2RI16* 173, W3MTA* 115, K2KTK* 95, K2JBX 75, W2RQF 69, W2BU* 65, K2UIR 63, WB2LOP 51, K2CC 48, W2DBU 47, WA2SIR 46, W2MSM 31, WN2AOG 30, K2DNN 27, WB2HLV 26, K2OPV 25, W2LAF 21, WA2MPC 19, W2HYM 18, K2QW 18, W2PNW 16, WA2TLB 14, WB2YEM 14, WA2LUF 13, K2SPO 12, WA2ICB 11, WB2QAP 7, K2BWK 6, K2IMI 5, W2PVI 4, WB2FPG 3, WA2NPO 3, WA2OMN 3, W2CFP 2, WA2GLA 2. (Jan.) WB2YFM 11, WA2KAT 10, WB2FPG 7

WESTERN PENNSYLVANIA - SCM, Robert E. Gawryla, W3NEM - SFC; W3KPI. PAM: K3ZNP, RM: W3LOS, W3KUN, WA3IPU. WPA CW Net meets daily on 3585 kHz at 7:00 P.M. KSSN meets Mon. through Fri. at 6:30 P.M. on 3585 kHz. All times local. It is with the deepest regret we record the Silent Keys of W3OC and WA3MOX. There were a number of upgradings this past month with WA3MWO to Extra Class; WA3s POF, PKA and QAY to Advanced Class; WN3s OTO, PUX and PMT to General Class. WN3RDO and WN3ROX are new Novices. The Nittany ARC has nine new Novices as a result of their code and theory classes - WN3s SLY, SLZ, SMA, SMB, SMC, SMD, SML, SMP and SMG. The Radio Association of Erie honored W3YX as Ham of The Month. The RAE is completely rebuilding their repeater station and installing the equipment in new installations. They hope to have a KW on shortly. K3JAZ conducted an on-the-air election for the Metropolitan VHF net with W3YWL elected as the new net chmn. and WA3MAU as secy.-treas. WA3NAZ, IC for Green County, had the local net activated for possible help during the W. Va. flood. The Nittany ARC installed new officers at their annual Inauguration Banquet - K3RBI, pres.; W2KA173, vice-pres.; WA3JFC, secy.; W3SAY, treas.; W3NEM, trustee. WPA CW Net had 29 sessions in Feb. with 378 stations QNI and 271 messages handled. Public Service Honor Roll for Feb.: K3ZNP 57, WA3NAZ 56, W3LOS 39, W3NEM 39, WA3PIU 39, W3YA 31. Traffic: WA3PU 200, WA3NAZ 199, W3NEM 184, W3KUN 181, W3LOS 144, K3ZNP 123, W3YA 97, W3ATQ 85, K3RBT 66, W3MJ 56, K3ASI 42, K3SMB 20, K3VQV 20, K3SJM 19, WA3HSR 13, WA3PXA 12, WA3YA 8, W3IDU 2.

CENTRAL DIVISION

ILLINOIS - SCM, Edmond A. Metzger, W9PRN - SFC; W9RYU, PAM: WA9CCP and WA9PD (vbt). RM: WA9ZUL. Cook County EC: W9HPC.

Net	Freq.	TimeZ/Days	Tje.
EBN	3940	1400 Su	4
ILN	3690	2300/0300 Dy	196
NCPN	3915	1300/1800 M-S	141
III PON	3915	1430/2245 M-F	740
III PON	145.5	0200 MWF	7
III PON	50.28	0200 M	4

WINIM of ARRL Hq. will be the guest of the Starved Rock Radio Club's Hamfest to be held Sun. June 4 at the 4H club grounds at Ottawa. W9FLF passed his Advanced Class exam. All instructors are urged to register in the ARRL Instruction lists as mentioned in Jan. QST, p. 104. Our deepest sympathy to the families and friends of WA9ENM and W9ZDQ who recently passed away. It was nice meeting the gang at the Wheaton Hamfest. A great crowd was present and many an eyeball OSO was held with this being the first Hamfest of the year in this section. WB9AUR suffered wind damage to his Quad. K9DTR is manager of Land of Electronics in Lombard, Ill., which sponsors code & theory classes every Wed. nite at 8 PM) just west of Chicago with a very fine amateur supply. New officers of the McHenry County Radio Club are W9KDX, WB9CPT and WB9HPX. W9CWI is on the air with a new Allied sbwkw transceiver. W9HRY, 9RN net mgr. reports that the net handled 794 traffic of traffic during the month. This column's sympathy to W9BRD (DX Ft. of ONI) whose mother passed away on Feb. 24. WA9FGP, K9DQU/WB9AJI, K9AOL and W9YMF were elected as the 1972 officers of the Chicago Area Radio Club Council. WB9HPJ is a new General Class licensee. WN9EYD and WN9EYC have passed their General exams. WN9INX recently received his call. The new officers of the Dupage Amateur Radio Club are WA9LFL, WB9FXI, WA9LYB, K9ESW and WB9EJF; their code and theory classes graduated WN9GSS, WN9GSI, WB9EXI, WB9GTO and WN9HEG. W9LDU reports that his Lee County RACLs Net meets daily on 146.9 Mhz at 000Z. W4FVY is now W9MLF in Olympia Fields (previously K9MHW in Joliet). W91NO says more check-ins are needed for the III PON from Chicago, frequency 3915 at 2345Z. The Tri-Town Radio Amateur Club headed by its pres. K9ZZH, presented to the Homewood Public Library the publication, "From

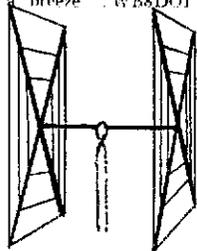
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made ordinary, everyday, run-of-the-mill antennas. No, no, no. We make winners through superior materials and design. WA1JFG won the New England Round-Up championship with our 3-element 15-meter beam by a margin of 5,982 points! In QST since '53.

QUADS

Totally satisfied with quad. Worked DK4VJ, SM7DLH, XE1AB, DM4SEE, FL8SR, F6AUM, HK7YR 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 fool-proof 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!



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 fool-proof 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' x 1 1/4" 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' x 1" OD aluminum 'hi-strength' alloy tubing, with telescoping 7/8" 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)

How to order: Send money order only (bank, store, or United States) in full. We ship immediately by REA Express, charges collect. **DEALERS WRITE!**

GOTHAM, 1805 Purdy Ave, Miami Beach, Fla. 33139

BEAMS

"Just a note to let you know that as a Novice, your 3-E1. 15 Beam got me RI 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; 7/8" 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 E1 20.	\$21	4 E1 10.	\$20
3 E1 20.	27*	7 E1 10.	34*
4 E1 20.	34*	4 E1 6.	20
2 E1 15.	17	8 E1 6.	30*
3 E1 15.	21	12 E1 2.	27*
4 E1 15.	27*		*20-ft. boom
5 E1 15.	30*		

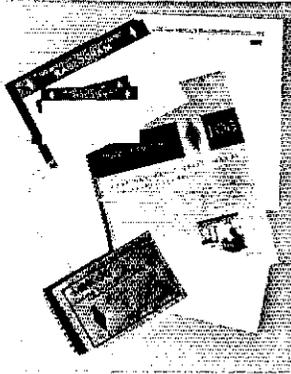
ALL-BAND VERTICALS

"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, T12FGS, W5KYJ, W1WOZ, W2ODH, WA3DJT, WB2FCB, W2YHH, VE3FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YSI-MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWI, VE3KT. Moral: It's the antenna that counts!

FLASH! Switched to 15 c.w. and worked KZ5IKN, KZ5OWN, HC1-LC, PY5ASN, FG7XT, XE2I, KP4-AQL, SM5BCK, G2AQB, 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

OPERATING



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70 blanks per pad.

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NEWINGTON, CONN. 06111

Semaphore to Satellite." WB9BXC, WB9EBD, WB9HXR, K9CVL and WB9EBD were elected as officers of the Southeastern Ill. Ham Society. WN9JCD is a new Novice in the Decatur area. WN9IXW and WN9JAB are new licensees in the Chicago Amateur Radio Club. The Six Meter Club of Chicago will hold their Annual Hamfest, Sun. Aug. 6 at Picnic Grove, on route 45 in Frankfort, Ill. The following members of the Shawnee Amateur Radio Assn. (SARA) handled a large amount of traffic for the Cerebral Palsy Drive: W9JL, WA9ZXT, K9WEN, WN9FZU, WA9GUU, WA9ZRS, K9LXZ, WN9IPA, K9IZE, W9OXQ and W9ERL. Traffic: (Feb.) W9NXG 321, WA9ZUF 314, K9AVQ 226, K9VFA 186, WA9OBR 117, W9FLF 85, W9IXV 81, WA9LDC 71, W9LNQ 49, W9HOT 43, W9MLF 41, WA9RTB 38, WB9AWY 24, WB9FHI 21, WN9FVG 18, WA9ELT 14, WA9LHU 7. (Jan.) W9FLF 65.

INDIANA - SCM, William C. Johnson, W9BUO - SEC: W9FC. RMs: WB9ANT, W9FC, W9HRY, WA9ZKC. PAMs: K9CRS, WA9OHX, (vhf) W9HWR, W9PMT.

Net	Freq.	Time(Z)/Days	Tfc.	Mgr.
IffCN	3910	1330 Dy 2130 M-S 2300 Dy	448	WA9OHX
QIN	3656	0000 Dy	148	WB9ANT
IPON	3910	0400 Dy 1245 Su 1840 S-S	25	WA9UMH
IPONVHF	50.7 50.2	0200 F-T 0000/0200/	10	K9ADH
IPONCW	3740	0000 Dy		WA9UMH
Hoosier VHF			26	W9PMT

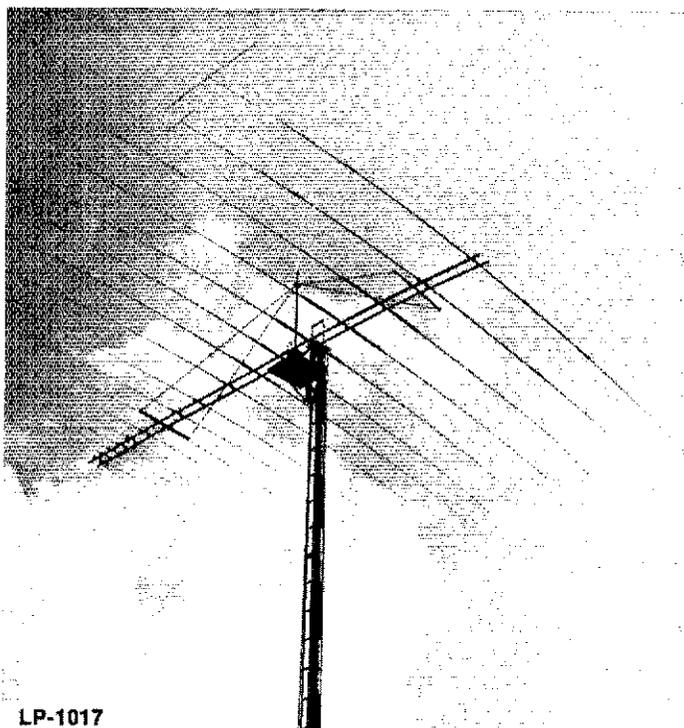
With deep regret I report W9HJJ and WA9QWK as Silent Keys. Clark County ARC new officers are WA9YXA, pres.: WA9BLP, vice-pres.: WA9FCM, treas.: W9HRY, secy. WA9OKK reports the Central Ind. AREC Net on 50.4 is closed, no activity. W9BF is the call for the club station of Tri State ARC at Angola. WN9ITB passed his General in Feb. GIBARC AREC Net is on 50.58 MHz at 0200Z first Wed. of the month. W9KZN and K9SUH were the first 2-meter fm to operate in Gibson County. The Indiana Repeater Council had their first meeting Jan. 23, 1972. Officers are K9LSB, chmn.: W9DUU, vice-chmn.; K9UBF, secy-treas. Members of the Council are fm repeater stations W9INX, WA9EAU, K9SII, W9EJV, K9JST, W9CSF, WA9WVC, K9LPW, W9APP, WA9GOP and K9FGV associate member. W4AZY, ex-W9DFW was reported as a Silent Key. The Lake County 19th Banquet was as big as ever. Speakers were W9HPG, Central Division Dir. and your SCM W9BUO, W9PRN, Vice-Dir. was also there with his family. WA9LQG has a broken feed line to the Tribander. WN9ERV editor of Dot "N" Dashes published by the Central Ind. Radio Assn. is doing a fine job. QIN Honor Roll: W9EI 65, K9OPL 57, W9QLW 51. Amateur radio exists because of service rendered. Traffic: (Feb.) WA9WJA 355, W9QLW 172, WB9ANT 140, K9OPL 123, W9BUQ 84, WB9EAY 81, WA9OEX 74, W9FWH 66, WA9TJS 46, WA9CHY 40, W9PMT 40, W9HRY 35, K9IQY 34, K9YBM 30, K9CBB 29, K9RPZ 29, WA9YXA 26, W9LZ 23, W9DZC 17, K9ILK 17, K9DII 16, W9ULH 16, WA9AXF 15, W9HWR 14, W9KWB 14, WA9OAD 10, W9RDP 9, WA9BEE 9, K9EFY 9, WB9FBP 8, WA9WME 8, W9NOA 6, W9UOZ 5, WA9BVL 2. (Jan.) WA9YXA 3.

WISCONSIN - SCM, Joseph A. Taylor, W9OMT - SEC: W9NGT. PAMs: K9FHI, WA9OAY, WA9QKP, WA9PKM. RMs: W9KQB, K9KSA, WB9DXK.

Net	Freq.	Time(Z)/Days	QNI	QTC	Mgr.
WSBN	3985	2300 Dy	1247	130	K9FHI
WIN	3662	0115 Dy	228	127	WB9DXK
BEN	3985	1800 Dy	682	82	WA9QKP
BWN	3985	1245 M-S	489	347	WA9OAY
WSSN	3662	0200 TTS	53	4	K9KSA
SWZRN	145.35	0230 Dy	140	5	WA9PKM
WI-PON	3925	1801 M-F	508	105	W9EMC

The Wisc. QSO Party held this month drew many happy QSOs along with 24 messages sent to your SCM. Don't forget the Yellow Thunder Hamfest May 20 at Lake Delton and WNA Picnic July 9 at Green Bay. K9FHI enjoying mobile on .94, WA9MCC and WA9SWX also enjoying fm with HR2A, porta packs and a couple of Honda Wet cells. W9TWR is building a new solid-state ssb exciter to go with his homebrew receiver. Marnette Club, M&M ARC, holds ev practice every Thurs. Your SCM would like to hear from any club holding regular classes, drop me a line. Also encourage all instructors and tutors to register with ARRL instructor corps. See Jan. QST p. 104. Congrats to K9PPI for QNI in the WI-PON for over three years without a miss, also to W9CXY for Jan. and Feb. BPL. WB9EQU/XE2 says it feels good to be on the receiving end of a pile-up when he operates XE2/TM. K9KSA has been reelected pres. of WNA. If you would like to get involved with WNA drop K9KSA

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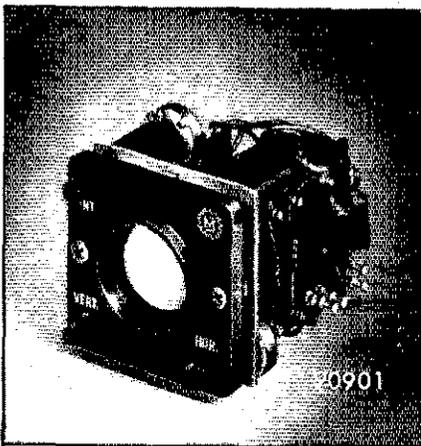
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Application



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Miniaturized, packaged panel mounting cathode ray oscilloscope designed for use in instrumentation in place of the conventional "pointer type" moving coil meters uses the 1" 1CP1 tube. Panel bezel matches in size and type the standard 2" square meters. Magnitude, phase displacement, wave shape, etc. are constantly visible on scope screen.

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a card. Traffic: (Feb.) W9CXY 519, W9DND 440, K9CPM 381, W9CIL 273, K9FHI 101, W9UCR 83, W9ESJ 68, WB9ABF 42, K9IPS 38, W9RKO 36, W9BCH 35, WB9DXK 34, W9IHW 30, WA9ZAZ 30, K9KSA 29, WA9OAY 28, W9ACW 26, WA9BZW 25, W9DXV 16, WA9PKM 14, W9ZBD 12, W9JR 10, WB9CMD 8, K9LGU 7, W9RTP 7, K9UQO 6, WA9MCC 4. (Jan.) W9CXY 531.

DAKOTA DIVISION

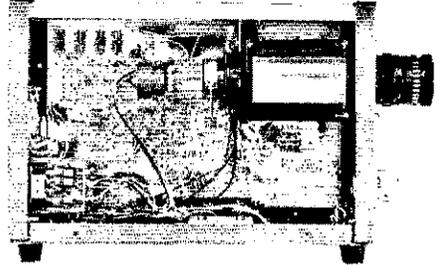
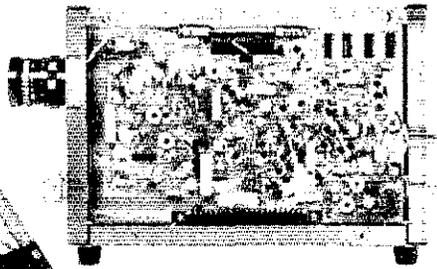
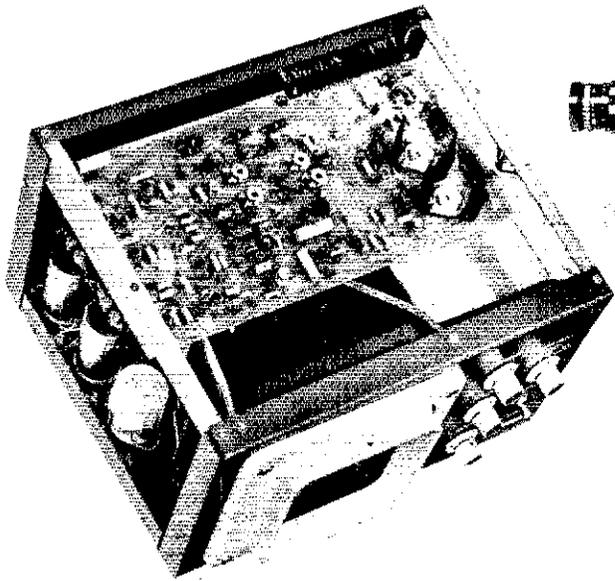
MINNESOTA - SCM, John H. Halstead, K0MVF - SEC: K0LAV. RMs: W0ZHN, WA0YAH. PAMs: K0FLT, WA0HRM. W0KUL, K0SGK and W0SYG are Silent Keys. WB0BYV urges all instructors and tutors to register with ARRL Instructors Corp. See Jan. 1972 QST. WA0VTZ, in Rochester, Minn. had a patient in the Methodist Hospital on her phone patch hooked up on 75 meters to WA0VAS in Minneapolis, who, in turn, patched to WA0VIK in St. Louis Park, Minn. WA0VIK was in contact with WA2RKU in Sanborn, N.Y. on 20 meters. The net result being the Rochester patient through three phone patches talked to WA2RKU and vice-versa. WN0GKH reporting traffic handled on MIN. Mitch also checks into the Handi-ham System via WA0RRA. Traffic: (Feb.) WA0VAS 690, W0ZHN 311, WA0YVT 246, WA0GRX 203, WA0IAW 132, K0ZRD 130, WB0CNM 120, WA0EPX 117, WB0DZA 112, WA0TFC 76, K0MVF 63, W0WFA 60, WA0YAH 56, WB0DYZ 54, WA0SGJ 48, K0PIZ 34, W0ATO 32, K0ZBI 29, WA0YWA 26, K0FLT 25, WA0HRM 25, WB0DSI 20, WA0VUP 19, W0BUC 18, WA0LWT 15, WB0DHQ 13, WA0VYB 13, WA0JPR 11, WA0URW 11, K0ZXE 11, WA0YGE 10, W0BUO 9, W0OBB 8, W0KNR 7, WB0BRG 6, WN0CWC 6, WA0DCQ 6, WN0CFMR 6, WA0MMV 5, WB0DDH 3, WN0GBX 3, WN0GKH 3, WB0ATE 2, K0ICG 2. (Jan.) WA0URW 16, WA0VHX 11. (Dec.) WA0URW 10.

NORTH DAKOTA - SCM, Harold L. Sheets, W0DM - SEC: WA0AYL. OBS: WB0ATB. QO: W0BF. WA0AYL and W0DM among others were relieved of some severe noise problems from power lines. WA0AAD/0 back in the woods has worked 90 countries on 15 meters with a 15-ft. dipole while at the same time swelling his DXCC count. WA0ELO is trying it the hard way by working DX on 40-80 meters with some success. WB0CMT was in the hospital. K0PZW, the Valley Jr. High School Radio Club of Grand Forks recently lost their mast and antenna. WB0FDT a new Conditional in Grand Forks is on with an NCX 3 and doing OK. WA0MLE has just moved to the Minot AFB from Ill. He has been very active in the NTS nets and is the asst. mgr. for the Central Area Net. WA0ELO has been working with WA0SUF on his Advanced Class license and reports the code test has been passed. You remember K0PZK from western NDAK - he turned up as W7HFI on the YL WX Net and renewed acquaintances with a number of his old friends. WA0SJB took a trip up in VE-5 and VE6-Land. He reminds us that the International Peace Garden Hamfest will be on the Canadian side in the Centennial Pavilion July 8, 9. Contact Dept. Communications, 600-266 Graham Ave., Winnipeg, R3C0K7 for application blanks for permit to operate mobile in Canada. He early fellows before the rush is on. WB0GBW, ex-WB9HYC and W0IKK are new calls in Grand Forks. WB0DTJ/0 is leaving the USAF and will be in Pueblo, Colo.

Net	KHz	CST/Days	Sess.	QNT	QTC	Mgr.
Goose River	1990	0900 Su	4	62	2	W0CDO
YL WX	3994	0730 M-F	21	380	367	WA0GRX WA0MND
PON	3996.5	0900 Su	12	311	15	WA0SJB
NDRACES	3996.5	1730 M-F	42	694	81	WB0ATI
ND CW	3640	1830 M-F				

Traffic: WA0AAD/0 171, W0MLE 137, WA0ELO 120, WA0SUF 72, W0DM 30, W0WWL 30, W0EJF 26, WA0REW 25, W0CDO 24, W0BHT 23, WA0JZF 20, WA0JPT 18, WB0BUF 15, WA0SJB 13, WB0CCA 11, W0MXF 10.

SOUTH DAKOTA - SCM, Ed Gray, WA0CPX - A repeater meeting was held at Brookings in regards to state-wide repeater planning with Civil Defense personnel present at the meeting. W0KXZ and W0SIR made presentations. Plans are in the works for two and possibly more repeaters in the state. Dick Neish 904-S Marday, Sioux Falls, S.D. 57103 will serve as coordinator and if you are planning a repeater please inform him so frequencies can be coordinated. Net reports: Morning WX Net - average 24 QNT; NJQ - 544 QNT and 9 QTC; Early Evening - 803 QNT and 50 QTC; Late Evening - 1401 QNT and 51 QTC; SDN CW - 709 QNT and 45 QTC. Traffic: W0ZWL 593, W0MZI 349, W0HOJ 125, WA0UEN 60, WA0FUZ 52, WA0TNN 50, K0AIE 25, WA0BZD 22, W0EOP 3.



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DELTA DIVISION

ARKANSAS - SCM, Jimmie N. Lowrey, WASVWH - SEC: WSRXU. RM: WAS7LS. PAM: WASOMQ. We were all sorry to hear of the passing of a great man, amateur, and friend to many. WASEFL. WB5CEL now has a TR-4 for mobile operations. WBSBRD is on the air with a new Conditional Class license and a Tempo 1. With the help of a non-ham secy. in preparing announcements for a new Novice class, WASAWA is going to be teaching the hopeful new Novices something called "Morris Code." WASWMD has a new TR-22 which he hopes to use marine mobile this summer. WBSBID now has a Swan-250 on 6 meters.

Net	(GMT/Day	Freq.	Mgr.
Razorback	0030 Dy	3995	WASOMQ
DX Info	0045 T	3995	W50YH
OZK	0100 Dy	3790	WAS7LS
Ark Phone	1200 M-S	3937	W4VFW
Ark Teenage	2100 SSu	3975	WASZKE
Ark P.O.	2130 M-F	3925	W5OEO
Ozark	2330 Dy	3995	WASZKE
CAREN	0200 F	146.34/94	W5RXU

Repeaters: WASSNO Fayetteville, \$2.550/\$3.020; WB5PKF Forrest City, 146.16/76; W45YUT Fort Smith, 146.34/94; W5DI Little Rock, 146.34/94; W5RHL Jonesboro, 146.34/94. Traffic: W5NND 202, W4SEVW 51, WASZKE 25, W4SHNN 7.

LOUISIANA - SCM, J. Allen Swanson, Jr., W5PM - SEC: W5OB. RM: WASQVE. PAM: W4SNYY. VHF PAM: WASDXA. Do not forget the Baton Rouge Hamfest May 6 and 7. Incidentally, I sincerely appreciate the many get well cards and feel confident that within a few months will be back to normal. The Delta DX Assn. and other GNOAR area clubs recently entertained Max Arnold at dinner. Although not attending personally we understand the Lafayette Dinner was a fine affair with a very good turnout. W45JVL is putting up a tribander. W5SPL has earned his LAN Net certificate. The new Ruston Area Amateur Radio Club has elected K5LXZ, pres.; W45QAL, vice-pres.; W45YRM, secy.-treas. W5EA reports activities on the increase. The GNOARC participated in the Mardi Gras parades and proved their value to the NOPD. W5AEH has been elected vice-pres. of the GNOARC replacing W5HUT who resigned. We hear via the grapevine the GNOARC helped the NO Golf Tournament on the Westbank. LARC has elected K5DPG, pres.; W5EXI, vice-pres.; W45QB, treas.; K5ARH, secy. K5UNZ has fully recovered from recent surgery. W5MPX is building an sb for 160. Again do not forget to vote your choice for SCM. Traffic: W52UPG/5 252, W45VQE 232, W45WBZ 38, W5EA 14, W45QEK 1.

MISSISSIPPI - SCM, Walker J. Coffey, W5NCB - SEC: W45JWD. RMs: W45YZW, W55DEK. PAMs: W5JHS, W45KEY, K5MDX. Our Novices need your continued interest and help.

Net	Freq.	Time(2)/Days	QNT	QTC	Net Mgr.
MTN	3665	0045 Dy	198	191	W45YZW
MNN	3733	2400 MWF	62	27	W55DEK
GCSBN	3925	2330 Dy	-	-	W5JHS
CGCHN	3935	0100 Dy	1678	98	W45LZB
MSBN	3987.5	0015 Dy	885	124	W45TMI

Traffic continues at a high level with more than 1300 messages handled this month. MNN certificates to W55DCY and K5TYP. W55BRM received his OPS appointment. K5VVM and W45VOR were endorsed as OPSs. W45YNZ does a fine job as NCS of the SWIN. W5AO is active on all bands through 2 in his 42nd year of ham radio. W55BM and W55DEK again made PSHR and W52KZM/5 made RPL this month. W5AO, W55CAV, W5PDG, W5TAD and W455UF are participating in FMT runs with good job. Now is the time to get set for that biggest ever Field Day. Traffic: W55BM 389, W45YZW 282, K5TYP 208, W5WZ 123, W5NCB 74, W5EDT 65, W55DEK 64, K5YTA 32, K8YUW/5 30, W45KEY 19, W5AMZ 18, W55EIN 15, W55BUE 10, W55W 9.

TENNESSEE - SCM, O.D. Keaton, W44GLS - SEC: W44ANX. PAMs: W44PP, K4MQI, W44EWW. RM: W44DAJ.

Net	Freq.	Time(2)/Days	Secs.	QNT	QTC	Mgr.
TFN	3980	1245 M-F	29	1748	101	W44PP
		1400 S-Su				
ETPN	3980	1140 M-F	21	520	26	W44EWW
TCN	3980	0200 Th	3	40	0	W44MPJ
	3635	0100 Dy	29	307	194	W44ZY
KVHFN	50.7	0200 T	5	27	0	W44MPI
MTTMM	28.8	0200 T&F	8	119	0	W44PSN
FTTMM	28.7	0200 W&F				W44QXC
IHARCN	7268	0130 W&F	9	88	4	W44QNK
EVHFN	50.4	0100 TTh&S	11	87	0	W44IOB
ELVHFN	145.2	0100 W&F	9	35	0	W44IOB
TSSBN	3980	0030 M-S	25	1472	156	K4MQI
TFN	3720	0000 Dy	27	109	22	W44USG
TFON	3980	0030 M	4	149	9	W44BHZ

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- 8 Building Receivers
- 9 Accessories for Your Receiver
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1000		.24	.48	.75

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The Novice Net has a new mgr., so please support him, operations are gaining. Logs from the Penn. QSO Party still are coming in; appears to have been a great success. Please get your station activities reports to me early. Your support of net activities is greatly appreciated. Be sure to attend the Humboldt Hamfest to be held at Trenton May 21, hope to see you there. Traffic: W4OGG 256, K4CNY 248, WB4DAJ 238, W4ZJY 168, WB4NIR 142, WB4ANX 70, WB4NEG 57, W4RUW 54, WB4ISG 39, WB4MYZ 36, W4PFP 35, K4AMC 33, W4WBK 33, WA4TWL 28, W4CYL 23, W4YAC 22, WA4GLS 21, WB4BZC 18, WA4YFG 18, WB4DYJ 14, WB4KZX 13, K4UMW 11, K4MOA 10, WB4MPJ 10, WA4ZXZ 9, K4SJV 6, WB4TPS 6, WB4YCV 4, WA4CGK 2, K4MLC 2.

GREAT LAKES DIVISION

KENTUCKY — SCM, Ted H. Huddle. W4CID — SEC: K4YZU. Endorsements: K4UNW and WA4DYL as ORSs; K4MAN as OPS; WA4GHQ as PAM (whf). Appointments: WB4AUN as PAM-MKPN. BPL: WB4PSP.

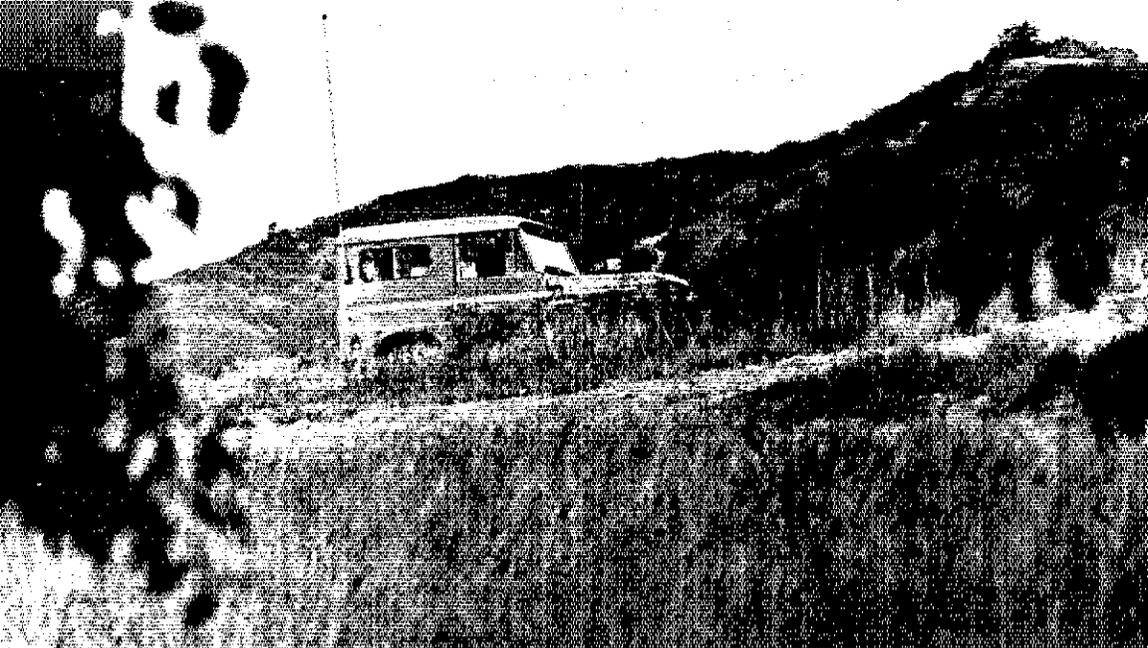
Net	QNI	QTC	Net	QNI	QTC
KRN	367	32	KTN	14.36	253
MKPN	551	73	KNTN	279	80
KYN	283	266	KPON	93	21
QVFN	195	104			

W4AZY and W4TLU are now Silent Keys. Bluegrass ARC held their annual auction in Lexington during Feb. and had a good turn out. Your SCM attended the annual dinner meeting of the Kentuckiana RC in Louisville and renewed old acquaintances. A new club is operating in Southeast Ky. The Mountain Area RC (MARC) has been meeting in Pineville and looking for new members. WA4UAZ is now GM5AKO while he is stationed in Scotland. K4TRT retires this month as mgr. of MKPN. WA4AUN is assuming duties as the new mgr. Many thanks to RB for a job well done and good luck to Glen. Traffic: WB4PSP 169, WB4JUG 142, WA4VZZ 136, K4PW 131, W4BAZ 98, W4OYI 98, W4QXM 88, WB4KPE 73, K4MAN 72, WB4PSJ 67, W4W4CM 59, K4TRT 59, W4CID 54, WA4ENH 52, K4TXJ 51, K4AVX 37, WB4EOR 37, WB4TFP 33, WB4AUN 28, WA4GHQ 28, K4YZU 23, WB4LF 21, K4HOE 20, K4LOL 15, K4VAI 15, WA4ACH 14, W4BTA 14, WA4AVV 12, W4CDA 11, WA4FAF 11, WA4MXD 11, W4IQZ 8, K4FPW 4, WB4GCV 2.

MICHIGAN — SCM, Ivory J. Olinghouse, W8ZBT — Asst. SCM: B. Peter Troml. W8KBZ. SEC: W8MPD. RMs: WB7YA, W8WVL, W8RTN, K8KMO, W8ADUL. PAMs: W8ABTN, K8MJK, K8PVC. VHF PAMs: K8AEM, W8WVY.

Net	Freq.	Time/Days	QNI	QTC	Secs.	Mgr.
QMN	3663	2300 Dy	1152	528	87	WB7YA
WSSB	3935	0000 Dy	733	99	29	K8PVC
BR/MEN	3930	2230 S-F	768	58	25	W8ABTN
UPEN	3920	2230 Dy	496	61	29	K8MJK
GLETN	3932	0230 Dy	602	52	27	W9KHK
PON	3955	1600 Dy	1024	342	39	E81NE
PON/CW	3645	2400 M-S	181	30	25	VE3DPD
Mi.6M	50.7	0000 M-S	230	16	22	W8ALRC
Mi.Nov.	3720	2100 Dy	107	40	19	W8RJAD

The Oakland Co. ARC Net held 4 drills with QNI 58 and QTC 6. S.W. Mich. 2- and 6-meter nets report 12 sessions, QNI 158 and QTC 3. Silent Keys: W8DXM, K8VEB, W8PXT and W8NZ. SRARS elected officers for 1972: W8UJZ, pres.; KRHSN, vice-pres.; W8EEXY, secy.; W8SSV, treas. Red Bud ARC elected W8JCU, pres.; W8DXP, vice-pres.; W8NLO, secy.; W8LKC, treas.; W8PDC, act. mgr. for 1972. The Mich. Novice Net has resumed operation with W8NJAD as Net Mgr. W8NFXE worked KJ6BZ on the Novice roundup. W8NJCJ made WAS after seven months of hard hunting. Fifty-one members of OMN traffic net made the Honor Roll for 1971. The BARA gang (W8MAJ/8) scored 12,570 points in the '72 160 meter contest. 15 mobiles helped make the Mothers March for MD a success in Lansing. SEMARA Old Timers night was a big success with almost a hundred attending. K8DX tired up his spark rig to bring back old memories. W8JYV and W8BGE are now General Class licensees. W8EIV has a complete new station. W8LN is new State Director for MARS. The Cadillac swap and shop will be May 13 at the National Guard Armory. They always have a good turnout. See you there? The Mich. Po Net Amateur of the Month is W8BDKQ with the special award to W8BYB. W8ULG is on 220 with 151 watts but no contacts as yet. W8MCD and W8ULG are both working 1296. Traffic: (reb.) W8WZF 479, K8KMO 368, W8JBY 353, W8SPIM 248, K8ZJU 193, W8SSQ 141, W8JYA 113, W8LKY 100, W8GLC 91, W8BPP 82, W8BYB 81, K8DYT 71, W8ZBT 70, W8NOH 57, K8PVC 56, W8ZAV 56, W8RMT 48, W8WVL 48, W8NJAD 45, W8BFG 44, W8TZZ 40, K8LNE 39, W8BDTJ 37, W8RTN 37, W8BONZ 34, K8MJK 31, W8LUC 28, W8LNU 27, W8RTP 27, W8BJJ 26, W8DT 26, K8JLD 26, W8ANR 25, W8KHB 24, W8WVY 23, K8HGA 22, W8ISC 21, W8MO 21, W8BICU 20, W8BDKQ 18, W8ACU 18, K8WRJ 18.



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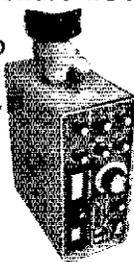
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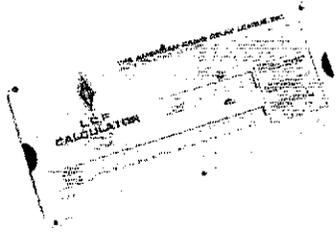
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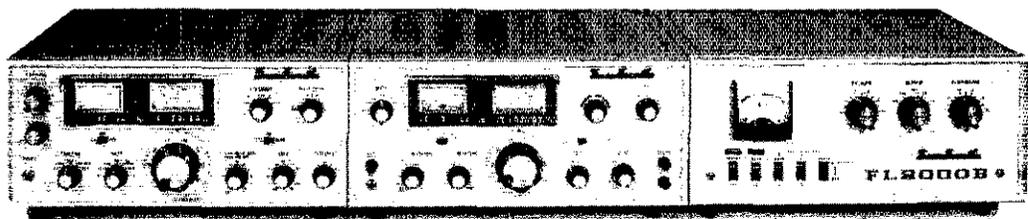
OHIO - SCM, Richard A. Egbert, W8ETU - Asst. SCM and RM; William Clausen, W8IML. SEC: W8OUU. PAM: K8UBK. VHF PAM: W8ADU.

Net	QNT	QFC	Sex.	Freq.	Time(Z)	Mgr.
OSSBN	3104	1004	79	3972.5	1530/2345	K8UBK
BN	690	527	58	3577	0000/0300	W8WAK
G6MtrN	532	61	58	50.61	0000	W8ADU
					50.16	0100
BN RTTY	351	151	29	3605	2300	W8ZYU
OSN	245	77	29	3577	2325	W8WAK

W8WAK assumes the Net Mgr. post of BN. Note the change in BN and OSN frequency. BPLs were earned by W8FTX, K8ONA, K8NQW, W8MCR and W8FNC. Welcome to new appointees: W9LEX/8 and W8CJT as OPSs; W8ZCQ and K1DJK/8 as OOs; W8IBU as ORS and W8WVX as EC of Jackson, Gallia and Meigs Co. OBS WRAN has been transmitting bulletins for 28 years. Trafficler K8RHH writes he is with the U.S. Army in Germany signing DL4PK and active in MARS. K8CMO reports that Millard HS has formed a club with W88PH as pres. with W88MAG as club call. OVS K8TUT tells about 6-meter openings to Okla., Tex. and La. Warren ARAs Q-Match reports W88EM now is CT2BG in the Azores. We regret to report the passing of W8BAH. Harry was founder of Amateur Radio Editors Assn., and writer of a newspaper column "Ham Antenna." Canton ARC's Feeldine says the Stark Co. Historical Society is starting a ham radio display and will use the spark rig that was owned by the late former SCM W8AL. Ham Shack Gossip reports W8GD is the 1972 Toledo Ham of the Year. Interested in playing chess over the air? Call "CQ chess game" on 21,370 kHz Tue. at 8:00 P.M. EST. The Apricot Net elected W8QFK, pres.; K8ONA, NCS, traffic mgr. and pub. tel.; W8ZUK, secy.; W8UDG, treas. The Massillon ARC reluctantly passed the Sweepstakes trophy to arch rival Canton ARC for the first time in their five years of competition. Watch for ARRL's FM and Repeater Handbook. Intercity RC's Bulletin reports 153 attended their auction. Westpark Radtop has "Experiments in Electronic Telepathy" by W8AEU for its Feb. program. Warren ARAs 1972 officers are W8GFG, pres.; W8KAK, vice-pres.; W8BZL, secy.; W8MKE, treas. Scioto Valley elected W8PZJ, pres.; K8SUB, vice-pres.; W8ZYU, secy.-treas. Dayton ARAs RF Carrier announces the formation of a Novice net on 21,116 kHz. Details from W8ILW. This is my forty-eighth and final column. I'm sure that you will give Bill Clausen the same fine cooperation and support I've enjoyed during my term of office. I look forward, now, to serving as your vice-director. Traffic: W8ETX 523, W8PMJ 465, K8ONA 329, K8NQW 321, W8MCR 316, W8MOK 250, W8UPI 235, W8JEL 220, W88GFD 218, W8BALU 216, W8RYP 216, W8WAK 201, W8QCU 197, W8IMI 195, W8JMD 187, W8ETW 179, W8GVI 154, W8CUT 153, W88CWD 152, W8HGH 148, W8UDG 130, W8FQC 128, W8LIC 126, W8QFK 124, K8BPX 112, W8DQU 107, W8FNC 105, W8AZSM 102, W8GVX 100, W88ED 100, K8UBK 93, W8FAF/8 82, W88BLH 79, W88LUP 79, W8SZU 78, K8MLO 77, W8WPO 76, W8CJT 72, W8LT 70, W8JD 68, W8OUU 64, W8FCT 59, K8MZY 53, W8AJZ 52, W8QZK 52, W8OE 51, K8ZYX 50, K8QYR 49, W8PBS 48, W8ETU 47, K8LGA 47, K8DHD 42, W8UPD 41, W8ZUK 37, W8ADU 36, W8YXB 35, W88FXD 34, W8VWH 34, W8DWL 32, W8EOJ 31, W8GOE 31, K8BYR 30, W8YIB 30, W8BHL 28, W8COA 27, W8GNL 26, K8DHJ 25, W8MMH 24, K8BNL 23, K8CMO 22, K8RXD 21, W88CQ 20, W8ROF 20, W8VXF 20, W8KPN 19, W8NAL 19, W88SI 17, W8ARW 15, W8GRG 15, W88KJ 14, K8MPR 14, W88CX 13, W8BAZN 12, W8GRT 11, K8VPM 11, W8BAJC 10, W88DNZ 10, W8VND 10, W8MCC 6, W8LZE 4, W88ULF 3, W8LAM 3, W88AYC 2, K8CKY 2, W8WEG 20.

HUDSON DIVISION

EASTERN NEW YORK - SCM, Graham G. Berry, K2STN - Asst. SCM: Kenneth M. Kroth, WB2VJB. SEC: W2URP. RM: W2VYS. PAM: WB2VJB. VHF PAM: WB2YQU. Nets: ESS 2300Z daily at 3,590 and 10 wpm (maybe change with W1AW moving); NYS 0001Z and 0300Z daily on 3.675. NYSPT&EN daily 2300Z on 3.925. FCs meet Sun. 1800Z on 3.950 with SEC present. On the club circuit; Hudson Council (HARC) well along in plans for permanent Hq. in New York City providing - if details pan out - a meeting place for visiting amateurs, permanent station, etc. Over 200 students enrolled in first Council classes for newcomers. Clubs



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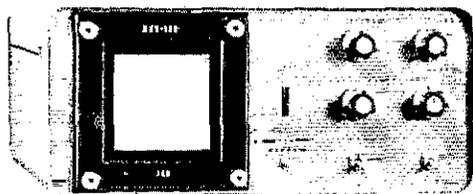
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in area with classes or plans include Harmonic Hills ARC, Communications Club of New Rochelle; others notify SCM, please! HARC officers/directors include K2SJO, secy.; W2FGI, dir. for 3-year term. Note HARC Biennial Convention Oct. 21, 22 at Hilton Inn in Tarrytown, plan now to be there. Hudson Division to sponsor National Convention on its 50th Anniversary in '74. Albany ARA heard Allan Dorwin from the FAA on airline safety, navigation, communications, etc., at Feb. meeting. Harmonic Hills ARA held session on ATV - slow scan and broadband at Feb. meeting. Classes now in progress under WB2UYD, with WB2ISL, W2VH, WA1OI-P, W2KGV, WA2KJF, WB2KDE all sharing teaching assignments. At RPI, new club elections: WB2UIS, pres.; WA2EUX, vice-pres.; WA2RAL, secy.; WA2FBI, treas.; WA8USA/2, equip. super. W2SZ having antenna problems - lost their 20-meter and part of the 15-meter beam. Snow storm cost Communications Club of New Rochelle a speaker in Feb., so W2JIO due for next meeting. Individual activities: W2URP fighting power line noise. K2UIR taking over from WA2VYS as Net Mgr. for ESS. Congrats to Ruth on her 8-year service! W2ITX now has K2FW as call. Welcome to WA2UDW as Advanced Class. Long-time ORS station K9DKU now /2 in Scotia; welcome aboard. New Director K2SJO out in the Division and section for club visits. All stations note: column due in mail 7th of each month, get your activities reports, traffic counts, club bulletins, etc. into mail accordingly. Many arriving too late for inclusion in column. Thanks. Traffic: (Feb.) WA2VYT 111, WA2VLS 100, K2FW 78, WA2ZHO 59, WB2LXC 42, WB2VJB 30, W2URP 28, K2UYK 17, K2SJM 16, WA2VXG 14, WA2FBI 12, WB2IXW 12, W2SZ 6, WB2AEQ 4, WB2AJD 3, WA2UDW 3. (Jan.) WA2VYT 103.

NEW YORK CITY AND LONG ISLAND - SCM, Fred J. Brunjes, K2DGI - SEC; K2HTX, RM: WA2UWA. HF PAM: WA2UWA. VHF PAM: WB2RQF. The following are major AREC Nets, join one!

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Richmond			146.88 fm
New York	29.50 MHz	50.48 MHz	
Queens	29.50 MHz	50.20 MHz	145.62 MHz
Nassau	28.77 MHz		145.10 MHz
Suffolk	28.73 MHz	53.51 MHz	146.82 fm

Note: Nets usually open 2000 local. Mon. Congratulations to the Staten Island ARA for 50 years ARRL affiliation (1922-1972). Springfield Gardens HS RC new officers are WA2AJI, pres.; WA2AOI, vice-pres. The newly-formed Radio Society of Greater Brooklyn is rounding up new members in the Brooklyn-Queens (or whatever) area. Contact WA2IYH, 2539 West St., Brooklyn, N.Y. for further information. Some new goody type gear at the Great Neck HS RC appears to be giving the Novice members the incentive to get their General Class ticket, bravo! WB2WFJ and WB2LZN have been awarded BPLs for their Feb. traffic, congratulations! A big 10-4 (ugh) to WB2EKK for making General Class. He was WN2ADH. Glad to see our fm Repeater groups have gotten around to frequency standards and coordination at a recent meeting. Latest changes affecting this area are: WA2YYQ 146.28 to 146.88; WA2SUR 146.13 to 146.73; K2LTC 146.04 to 146.64; HARC (WA2KEC/2) 146.40 to 147.00; WA2UWR 146.19 to 146.79; WA2PDF (LIMARC) 146.25 to 146.85. This change will standardize the entire East Coast from Maine to Fla. and west to Ohio. For all you RTTY enthusiasts, WA2PMW reports the Tu-Boro RC RTTY Net has an open keyboard for all comers nightly on 145.62 MHz so "mark" your activities calendar. WA2CXT takes over as Net Mgr. of NLS - Slow Speed Net meeting Mon.-Fri. 1845 EST on 3730 kHz. Here's a real opportunity for those interested in traffic, but were snowed under with the high speed nets. The NLS is for beginners to give you the opportunity to see what traffic handling is all about, so why not ONI some evening you just might like the change! Correction to Mar. column: SCRC secy. is WB2JYP not W2MGV as indicated, my apologies! WA2PII reports upgrading to General Class and now active with a 14AVQ and the Kenwood Pair. Glad to see the word coming in from the troops! Keep 'em coming the news of your activities sure beats my editorials 'nes par! The Hudson Amateur Radio Council has announced the 1974 ARRL National Convention will be held in the Waldorf Astoria Hotel in New York City. This decision came after many months of investigation in the Hudson Division area. Also the Division Convention sponsored by HARC will be held again this year at the Hilton Inn, Tarrytown, N.Y. Oct. 21 and 22. I would like to receive up to date information from all of our section clubs. I receive many requests from amateurs looking to join a radio club in their area. Here's an opportunity for those clubs looking for members to help themselves and others at the same time. Traffic: (Feb.) WB2WFI 607, WB2LZN 516, W2EC 465, WB2UFG 252, WB2OYV 124, WB2CHY 52, WA2CXY 52, K2JFE 22, WA2LJS 18, W2PF 11, WB2RZF 11, WA2PLI 8,



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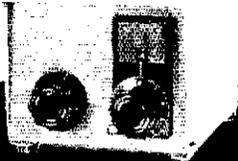


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W2D80 4, WA2JZX 4, WB2CUN 2, WA2GTK 2. (Jan.) WB2OYY 212.

NORTHERN NEW JERSEY — **SCM**, Louis J. Amoroso, W2ZZ — **SEC**: K2KDO. **RMs**: K2RXQ and WA2BAN. **PAMs**: K2KDO and WA2TAF.

Net	MHz/Time(PM)	Days	Sess.	QNI	QTC	Mgr.
NIN	3695	7:00 Dy	29	397	520	K2RXQ
NIN	3695	10:00 Dy	29	147	248	K2RXQ
NISN	3740	8:00 Su				WA2FVH
NIEPTN	3950	6:00 Dy	29	531	303	WA2IAE
PVTN	145710	7:30 Dy	29	112	62	WA2JNO
FOTN	145800	8:30 Dy	27	108	34	WB2LTV

Endorsements: K2RXQ, W2ZEP and WB2RKK as ORSs. W2FJK and W2TPI as OOs. The new club officers for the Wayne Amateur RC are: W2NHV, pres.; W2LVT, vice-pres.-treas.; WA2NAM, secy. WA2MAP is acting RACES officer for Union Co. WB2KNS still is looking for his first KL7 QSO to complete his WAS. WB2KLD has a new HW-100 and 99er. WA2UDT is QRL with college. WB2LTV is still waiting for someone to ask him to try out his new phone patch. WN2CPM joined ARCC. W2FJK has his new Class-33 and 55-ft tower project completed. I received a report that the 1m repeater groups in the section are all shifting their frequency in order to have a uniform 600 kHz spread. I suggest that the various groups notify ARRL Hq. of the new frequencies. K2IEF has a new keyer. The DX contest was a big success in our section with a good turnout from NJ. Be sure to keep SASE or credits current at the QST Bureau. The ORM has been cleared up at the salt mine and we are back at a normal speed. I expect to hear from more of you now. Please check you appointments and send them in if they are due for endorsement. Its great to be back and see you in the UD party. Traffic: WA2EPI 743, WB2DDQ 371, WA2EUO 349, WB2BS 101, WB2RKK 188, W2CU 139, WB2AEH 138, WA2UOO 104, WB2LTV 99, WA2NPP 85, W2ZEP 81, WA2CCF 66, WA2JNO 59, WA2CAK 57, WA2FVH 35, WA2OWT 35, WB2KNS 27, WA2NLP 25, WA2BAN 16, W2CVW 13, W2WQI 12, K2EOP 9, W2ZZ 7, W2JIC 6, WB2WNZ 6, K2ZFI 4, W2FJK 2.

MIDWEST DIVISION

IOWA — **SCM**, Al Culbert, KØYVU — **SEC**: KØLVB. Mark your calendars now for Sun. Aug. 20 which is the date of the Iowa 75 Meter Net Picnic at Marshalltown, more details in a later issue. The Cedar Rapids repeater white now operating .34 - .76 with 2000 Hz access will soon be on .16 - .76. The Waterloo repeater is now 1100 Hz access on .34 - .7694. WØKUS, WAØPTX and KØYVU at Charles City are now on 2 fm (yep, I finally made it up there). Sorry to note that WØKD has left the gray-box factory in Cedar Rapids for employment with that black-box factory in Ohio. Your SEC spoke to the Northeast Iowa ARC in Waterloo on Feb. 12 on emergency preparedness, an area in which this group has demonstrated it's ability several times. WØPHD is a new ham on the air from Westfield. WØBW recently spent a week in FAS-Land. KØGXR holds classes for General Class hopefuls in Clinton. KØLKH has a new GT-550A. KØOOD is sporting a new R-4B/T-4XB combo on the bands lately, and says that kw type pair of shoes is next if the KYL doesn't catch him. Beware the time changes coming up.

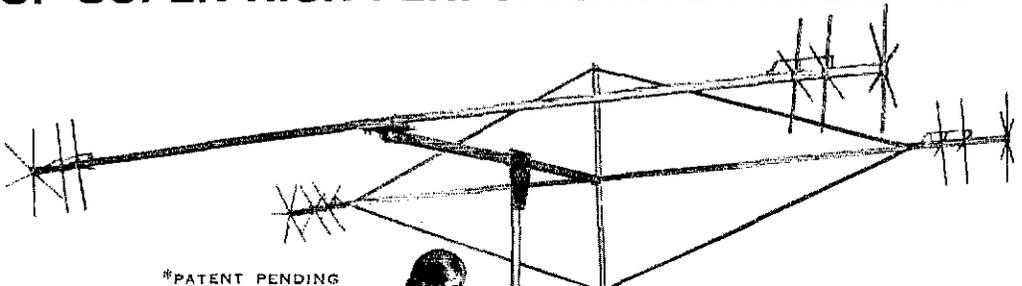
Net	Freq.	Time (A)	Days	QNI	QTC
Ia 75 meter	3.970	0000 M-S		1383	49
11CN (cw)	3.560	0030 Dy		154	154
Ia 75 meter	3.970	1830 M-S		1409	98

Traffic: WØLCX 737, KØDDA 238, KØAZJ 178, WAØAUX 123, KØODQ 111, WØMOQ 100, WAØYTW 46, KØYVU 20, KØMST 18, WØAVW 12, WØIO 9, KØJGI 8, WØBW 7, KØQKD 5, KØCNM 4, KØLKH 4.

KANSAS — **SCM**, Robert M. Summers, KØBXF — **SEC**: KØLPL. **RM**: KØMRI. **PAM**: KØJMI. **VHF PAM**: WAØTRO. The ham fraternity will miss WØMAL who joined the list of Silent Keys. From the KVRC Monitor we find the new club officers for 1972: WAØFZY, pres.; WAØPN, vice-pres.; WØNSW, secy.; WAØTW, WAØSQN, WØBXJ, WAØKBW, WØWTZ and KØBAU, dir. Be prepared for tornado alerts. Contact your EC and be ready to join the local ARCC group in any effort they might enter into. ARCC Zones 1, 2, 3, 4, 5, 7, 10, 12, 14 and 15A all reporting to NRC KØLPL this month with activity. ARCC membership stands at 585. The Kans. Weather Man of the Month is KØMRI. WAØTRO reports more 2-meter activity in the state. WØGPN has retired and working a lot of 20 meters. Mid-States Mobile Monitor Service reports 1603 QNI including 54 mobiles that were aided in some way, 47 patches or phone calls, 57 QIU in 87 hours of operation. KIC Net QNI 24, QTC 1 in 2 sessions: KWN QNI 583, QTC 86 in 29 sessions; OJS QNI 529, QTC 201 in 58 sessions with 100% participation in ITN. HBN QNI 566 in 21 sessions with 45 QTC. KSBN QNI 1221, QTC

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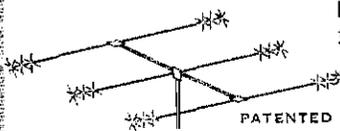
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115 in 26 sessions and KPN QNI 244 in 16 sessions with 14 QTC.
 Traffic: K0MRI 308, W0INH 279, W0IH 243, K0JMF 74, K0BXF 62, WA0JFC 61, K0PSD 47, WA0LLC 45, W0CHI 44, W0BGX 41, WA0TAS 30, K0ZHO 27, WA0LBB 23, W0BCZR 21, W0GCI 19, W0PB 17, K0FPC 14, W0FDJ 13, W0MCH 12, W0BBIY 10, K0GH 10, WA0SRQ 10, WA0SEV 8, WA0OWE 3, WA0OZP 3, WA0TRO 1.

MISSOURI - SCM, Robert J. Peavler, W0BV - SEC: W0ENW.
 New appointments: W0CBI as RM; K0LYM as Class IV OO.

Net	Freq	Time(Days)	Sex	QNI	QTC	Mgr.
MON	3585	0000 Dy	29	158	83	W0FH
MON 2	3585	0345 Dy	39	128	59	W0HH
MoC/D/CW	3531.5	1400 Su	4	14	3	K0RPH
MSN	3703	2100 MTh	8	34	31	K0BIX
MOFON	3963	3200 M-S	25	679	48	WA0TAA
MOEN	3963	2230 MWF	12	307	11	K0KUD
MOSSB	3963	2300 M-S	25	1070	45	K0RPH
WEN	3980	0130 M	4	11	4	K0BIX
PHD	50.45	0130 T	4	108	9	WA0KUH

WN0GDY announces the formation of the Central Missouri Novice Net, which meets 0130Z Sat. on 3740 kHz. I am glad to report WN0ERH is out of the hospital after surgery. W0B0TT passed First Phone exam. WA0JOG reports the formation of the first ham club in the Tri-Lakes area, which meets the first Mon. of each month at the Peoples Bank in Branson and on 28.7 MHz at 7:30 P.M. on other Mon.; officers are K0HQW, pres.; WA0SFS, vice-pres.; WA0TIV, secy-treas.; K0LXB, NCS. W00GLD and W00GLC, father and son, respectively, are new amateurs in Joplin. Congratulations to: W00ABR, who passed General; W00CKC, who passed Advanced; W00GNI, who passed both General and Advanced; WN0GVV/C03BY, who won the CQ DX contest from Bolivia; WA0SHC, who graduated from the University of Missouri at Columbia in Dec., and new Novices W00GOC and WN0GVE. W0GUZ, formerly of St. Charles, now is W7DXC in Ariz. Traffic: (Feb.) K0ONK 1534, K0YBD 259, K0ALM 205, W0BV 90, W0QUD 60, K0BIX 64, K0RPH 52, WA0TAA 33, WA0WOL 20, WA0KUH 16, K0SGJ 12, WN0ERY 8, W00CXN 4. (Jan.) K0AEM 249.

NEBRASKA - SCM, V.A. Cashon, K00AL - Asst. SCM: Velma Sayer, WA0GHZ, SEC: K0UDF. Renewed appointments: K0BRS as CK; WA0OQX, WA0IBL and WA0SOP as OPSs.

Net	Freq	GMT/Days	QNI	QTC	Mgr.
NSN I	3982	0030 Dy	1372	14	WA0LOY
NSN II	3982	0130 Dy	1047	21	WA0LOY
Neb. 160	1995	0130 Dy	849	389	WA0CJ
NEB	3590	0300 Dy	118	42	W0TOD
NMN	3982	1330 Dy	1251	24	WA0JUF
WNN	3950	1400 M-S	616	16	W0NIK
AREC	3982	1430 Su	204	4	W0IRZ
CHN	3980	1830 Dy	1160	41	WA0GHZ
DEN	3980	2100 M-F	429	2	WA0AUX

I have been asked to list the times and meeting places of Nebr. clubs. Forward a postcard with this information and I will be happy to fill this request. Our sincere sympathy to W0VYX on the loss of a loved one. A speedy recovery to W0VYV. New officers of the Central Nebraska ARC are WA0ZQC, pres.; WA0YFZ, vice-pres.; WA0LWK, secy. treas. WN0GUS is a new Novice in Chadron on the air with an HW-16. Box Butte Co. AREC 2-meter net reported QNI 17, QTC 1. Traffic: W0LOD 119, K0KJP 90, WA0SCP 89, W0FV 60, WA0CJ 57, W0TOD 40, W0HOP 38, W0BCAU 32, W0VEA 31, WA0YFZ 30, W0FVS 28, W0IAY 27, W0LWS 24, W0SGA 21, K0JFN 20, WA0WF 20, W0CW 19, W0NIK 15, WA0YGI 15, W0FOR 14, W0EWF 13, K0DCW 12, WA0JK 12, W0DMY 9, W0DFE 9, WA0BK 8, WA0JUF 8, W0GEO 6, WA0GHZ 6, K00AL 6, WA0PCC 6, WA0PF 6, W0IXB 5, K0MUF 5, WA0JH 4, WA0LRQ 4, WA0QLE 4, W0BCWD 3, WA0FJ 3, WA0GAT 3, W0VYX 3, W0ACK 2, W00GAK 2, WA0HAK 2, WA0HO 2, W0IRZ 2, W0JCP 2, WA0DTH 1, WA0LOY 1, W0MW 1, WA0RF 1, W0YFR 1.

NEW ENGLAND DIVISION

CONNECTICUT - SCM, John J. McNassar, W1GVT - SEC: W1HHR. RM: K1FIR. PAM: K1YGS. VIB PAM: K1XKF.

Net	Freq	Time/Days	Sex	QNI	QTC
CN	3640	1900 Dy	58	550	490
		2200			
CPN	3965	1800 M-S	29	489	224
		1000 Su			
VHF 2	145.98	2200 M-S	21	119	54
VHF 6	50.6	2100 M-S	21	81	8

High QNI: CN - W1KV, WA3JSU/1, W1KUO and W1CTI. CPN - W1GVT, K1XKF and K1YGS. We extend our most sincere sympathy to W1HHR during his time of sorrow - the death of his

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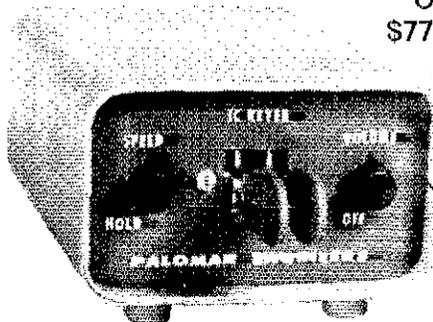
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XYL. Also with deep regret we add WIGVJ to the list of Silent Keys. Dir. WIOV would appreciate meeting you at the Tri-City Hamfest in New London, Apr. 29 - hope you can make it. CN Bulletin de K1EIR notes 72 SET very successful and thanks to WIAW and ARRL staff who helped with Hq. SET traffic. Amateurs are willing to help in an emergency - SET participation with organized Traffic Nets can provide the ability to be successful. WA3JSU/1, Net Mgr. EASN, invites joiners at 7:30 P.M. on 3726 kHz. OVS operators, check vhf letter from W1EJM - much food for thought, your action can make you a leader and a winner! Please talk it up on vhf. ARRL Instructors Corp details Jan. QST p 104 - please register. Congratulations to: WIDQJ for Extra Class; WN1PPV and WN1PSD new Novices, and WIFFW for Extra. BPL the long way again! Danbury CARA will again sponsor the Conn. QSO Party May 13, 14, - see QST for details, your active support will be appreciated. Traffic: W1FFW 524, WA3JSU/1 190, W1AINTR 177, K1SXZ 149, WA1GHH 128, W1CTI 113, WA1GGN 113, W1LXV 100, W1AW 85, WA1HEW 71, W1GVT 69, W1AKVI 60, W1JOPG 50, K1YGS 44, WA1PHF 42, W1DGL/1 39, W1AINYU 39, W1KV 24, W1QV 20, W1AOPB 14, W1RML 14, W1BBD 13, W1CUH 9, W1WEE 8, W1YBH 4, W1JGA 3.

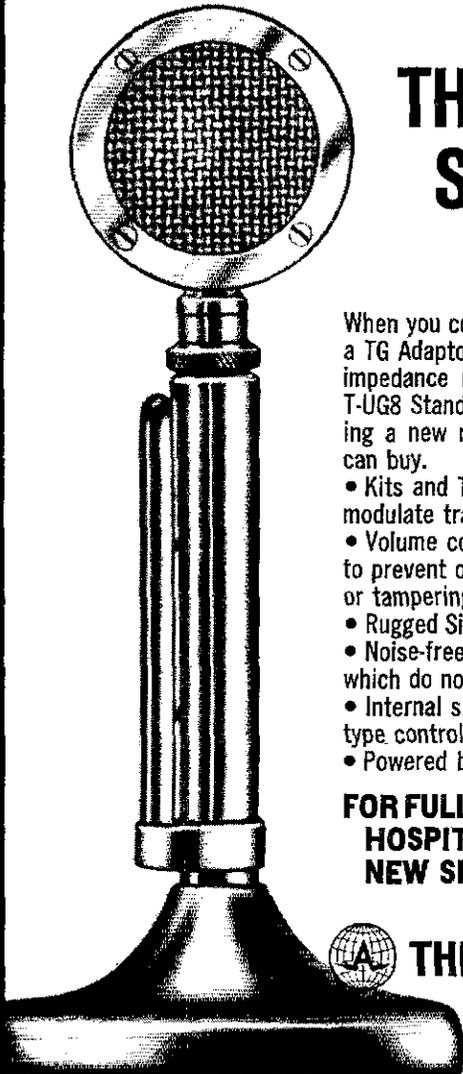
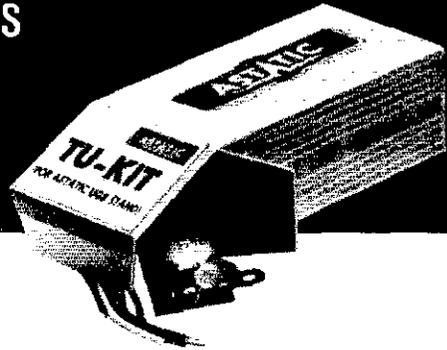
EASTERN MASSACHUSETTS - SCM, Frank L. Baker, W1ALP

Net	Freq.	Time/Days	QNT	QTC Mgr.
EMN	3660	1900 Dy	447	510 W1QVY
		2200 Dy		
EM2MN	148.8	2000 M-F	158	147 W1UWQ
6MCBN	50.85	1930 M-F	51	K1OKE
MPON	50.63	2000 Dy		K1JAT
NENB	3720	1830 MWF	18	7 K1PNB
NFFPN	3945	0830 Su	94	9 K1EPL

The following are Asst. Dir. to WIOV: W1s ALP, LJO, BCN, AOG, VRK, RGH, VN, J.E. WA1HPS. W1AUG enjoying Fla. W1GM was married in Fla. W1EZY on 2. W1PTC, Wentworth Inst. RC heard on 75. K1SAY has call WA1PTG to be used at N.U. W1NF been a ham 70 years. WA1PTD is a YL, also WN1PUV. W1s MPT, SA1 showed a film "A Dynamic Environment Simulator" at the South Shore ARC. W1ATI, K1YMW on 2-meter repeaters. W1AFC has a Kenwood 500, held an auction and lost dish for moon bounce. T-9 Club met at W1TYP's. W1AUQ doing OO work. W4YAC back in Tenn. K1SYF moving to Denver, Colo. W1QFN received a commendation from the Commissioner of Veterans Affairs of Mass. for his phone patch work to the South Pole. WA1MPP working DX. WA1NSF is asst. EC for No. Bellingham. WA1KJ/I working DX. W1BGW in FMT. W1AINRV DXing, Mass. Amateur Radio Week is June 11, 17 including City & Town Contest, send SASE to WA1DFL for details. W1MWN has an eleven-element beam for 2 and six-element 40-ft. boom for 6. W1s QVY, PEX trade BPL. Officers of the Swampscott HS ARC, K1BCL - WA1NPV, pres.; WN1PWP, vice-pres.; WN1PSE, secy.; WN1PSF, treas. Endorsements: K1DJG as OPS, OO; W1QFN, EC for Fall River; WA1EYV as OPS; W1ATX, WA1EYV as ORS; W1AX as OPS, ORS; W1DOM as OBS. Early 80 Free Net Mgr. is WA3QOZ, on 3733 at 1115Z. 1215Z week ends. W1BB sent out his 160-Meter DX bulletin. New officers of Norwood ARC: WA1JHQ, pres.; WA1LCD, vice-pres.; WN1OCX, secy.; WA1EOT, treas. Whitman ARC held their annual banquet at The Alamo. K1IBD busy in Army MARS. W1ALP maintains the "Raytheon" list of hams, and also a list of former members of the South Shore ARC. W1IIM and W1SCS on vacation as VP2ML and VP2MS. K1s BTF. A1U talked on repeaters at the Framingham RC. Capeway RC met at WA1NLK's. K1BGT has a skee with W4SFD. K1IPB has his YAESU back and DXing. W1EYP gave a talk on Maritime Mobile Operations at the Quannapowitt RC. W1BJO is on 75 in NH. WA1MXV, WA1MYK have an HW-10T. W1CE made PSHR. W1DBY endorsed as EC for Chelmsford. WA1KHB is the call of the Weston repeater. Traffic: (Feb.) W1QVY 1000, W1WEX 601, W1QTM 415, WA1EYV 343, WA1MSK 244, W1EY 222, W1EMG 138, W1QWQ 119, W1DOM 105, WA1MWN 99, WA1MYK 66, WA1MSB 59, W1ABC 54, WA1HF 51, WA1OM 43, W1ATX 29, W1AFU 26, WA1MEG 12, K1EPL 12, W1MKN 9, WA1FNM 8, W1DKD 6, K1LCO 4, W1LE 2. (Jan.) W1ABC 105, WA1MSB 40, WA1MXV 10, K1OKE 2. (Dec.) WA1KJ/I 7.

MAINE SCM, Peter E. Sterling, K1TEV - SEC- K1CLE. PAM: WA1FCM. RM: W1BJG. K1RXI is building a new linear as is WA1EN, WB4OUD/1 has been promoted to Warrant Officer. The North East Area Barnyard Net reports Feb. 664 check-ins, 1 traffic, 25 sessions. WA1PEN broke his leg skiing. Sea Gull net certificates were issued to WA1AJU, WA1PEN. We want also to welcome WA1PEN as new NCS on the SGN. The Sea Gull Net operates Mon. through Sat. on 3940 kHz at 1700. The Pine Tree Net meets daily on 3596 kHz at 1900. W1LLE acts as a monitor on the Barnyard Net and is of great help to the net control stations. New hams in Maine are WN1PSZ, WA1PSJ, WA1PTP, WA1PTT. Congrats.

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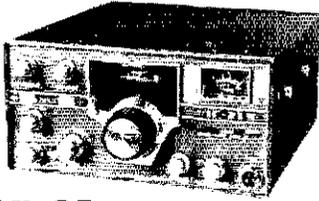
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Traffic: (Feb.) WA1FCM 415, K4BSS/1 188, WIBJG 175, K1TEV 15, WA1JCN/1 5. (Jan.) WB40UD/1 21, W1OTQ 13.

NEW HAMPSHIRE — SCM, Robert C. Mitchell, W1SWX—SEC; K1RSC. RM: W1UBG. Endorsements: W1BYS as OPS and W1SWX as OG. Welcome to WN1PSW, WN1PSR, WA1PST, WA1PUG, WN1PTU, WN1PTV, WN1PTW and WN1PUC. K1OXD and WA2COO/1 from Vt. are doing a fine job as NCSs and liaison on the NHVT Net. WA1JSD says that WA1CFT is a confirmed phone man. W1UBG's extensive NNVN Net report shows 99% of NH traffic handled on cw. Bob reports 193 check-ins and 230 traffic. W1DVC keeps schedules with OH gang in Finnish. K1VXX is pres. of the newly-formed Kearsarge Amateur Radio Club. News items are short this month. Traffic: (Feb.) W1UBG 186, DJ1US/W1 158, K1BCS 150, WA1MXT 127, WA1GCE 15, K1ACL 12, W1SWX 9, W1BYS 2. (Jan.) WA1GCE 39, K1YSD 4. (Dec.) K1YSD 11.

RHODE ISLAND — SCM, John E. Johnson, K1AAV — SEC; W1YNE. RM: W1YKQ. PAM: W1TXL. VHF PAM: K1TPK. R1SPN reports 29 sessions, 502 QNT, 57 traffic. The W1AQ Club has started preparations for Field Day and equipment is being checked over at the club on meeting nights. It is hoped that with more activity this year the club score will be larger. K1THE formerly of the club has been in the hospital and will return to his former activities soon. W1WAC hopes to have his 6-meter station on the air for FD. W1EI has been working mobile to England on 10 meters. K1LI has started to move his station to his new home and hopes to erect his vertical tower when the weather permits. K1PEL is working for his General license and hopes to move up from 6 meters. There has been some interest in forming a cw net. If you want to participate contact the RM or SCM. Traffic: W1YNE 210, K1QFD 28, W1TXL 20, K1VYC 6.

VERMONT — SCM, James H. Viele, W1BRG —

Net	Freq.	Time(Z)/Days	QNT	QTC	Mgr.
Vt. PO	3909	2200 Su	63	15	W1BQB
Carrier	3945	1400 M-S	487	24	WA1FAN
VTSB	3909	2300 M-S	386	85	K1YGI
		1330 Su			
NHVT	3688	2400 Dy	193	230	W1UBG.

The NHVT net needs more check-ins and support from VT stations. Congrats to new amateurs WA1PCX, WN1PDN, WN1PEC, WN1PFY, WA1PGL, WN1PHN, WN1PJ, WA1PME, WA1PNS, WN1POG, WN1PQU, WN1PRF, WN1PRM, WN1PSU and WA1PSK. Welcome to Middlebury College ARC now affiliated with ARRL. New England Emergency Phone Net needs a VT rep. Check in on 3945 at 1330Z. VT Green-Up day becomes VT Green-Up week this year. Check nets for details. Save Aug. 13 for Annual International Field Day. Complete information will follow in later issues. Traffic: K1BQB 181.

WESTERN MASSACHUSETTS — SCM, Percy C. Noble, W1BVR — SEC; WA1DNB. CW RM: W1DVG. PAM: WA1MFB. VHF & UHF PAM: W1KZS. The SEC reports the Sun. morning section AREC net held 4 sessions with a QNT of 40. Berkshire County Sun. 2-meter net is going well (2:00 P.M. via repeater K1FFK). WMN had QNT of 155 with total of 171 messages handled. Top five in attendance were: W1BVR, W1TM, WA1LNF, WA1OSK and WA1LPJ. WA1FBE and W1CSF getting repeater WA1KHC in operation for AREC use. K1VFN busy constructing 6-meter gear. Congrats to W1CSF for fine bulletin. Our West. Mass. SEC is CD Dir. for Belchertown. Navy Marine Corps MARS is looking for new members. Drop a line to Donald Leinhauser K1ZKH/NØGAX at 46 Doyle Ave., Springfield 01104. CMARA reports K1HIS, pres. WA1KRG, vice-pres.; W1OAS, secy.; K1RNG, treas. W2NSD/1 was their Feb. speaker. The 2-meter repeater receives in N. Grafton at WA1KRJ on 146.37 and transmits in Worcester at W1SPG or 146.97 (linked on 445.1). The repeater also operates on 32.522 monitored by W1HL, WA1KRJ, W1SPG, WA1FH and WA1FNN. HCRA reports the club celebrates its 25th anniversary with a banquet. The month's speaker was Mr. Emery from the Yankee Atomic Electric Co. MARC reports WA1LZJ and WA1MWT luckily escaped injury when the tilt-over arrangement on the 50-ft. tower they were working on suddenly let go. VARC reports with regret the passing of K1PRX, Bro. Bernard (former member of the club took a bad fall while installing new tower at his new QTH in Providence, R.I. Mt. Tom Repeater Assn. elected WA1JNV, pres. W1RYL, vice-pres.; WA1FKF, secy.; W1PHU, treas.; K1KBO, act mgr. Repeater WA1KGR is giving excellent coverage from southern Conn. to well up into VT. The Fourth Annual Mass. Amateur Radu Week is June 12, to 17. Details have been sent to all West. Mass clubs. Traffic: K1SSH 287, WA1LPJ 174, W1BVR 162, WA1LN 104, W1TM 93, W1STR 37, WA1NIC 34, WA1FBE 17, WA1ME 6, K1VFN 4, W1KZS 3.

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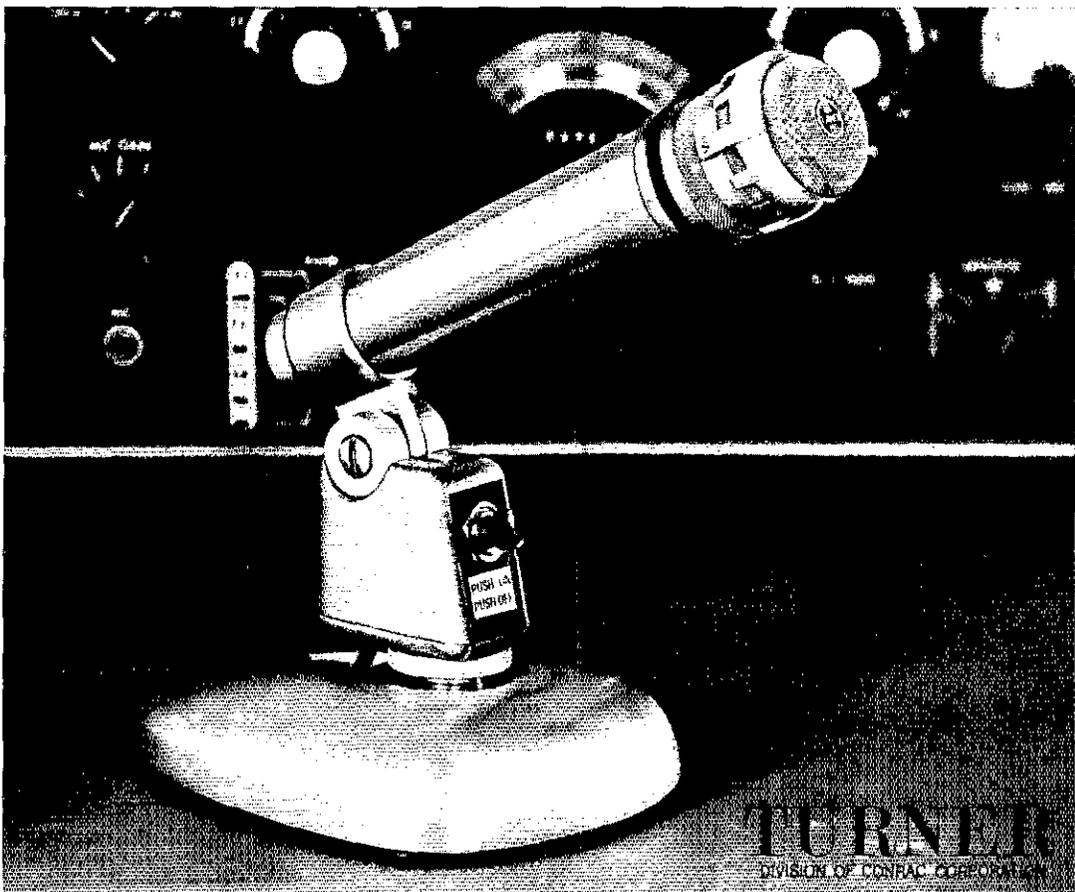
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NORTHWESTERN DIVISION

ALASKA - SCM, Kenneth R. Klopf, K17EVO - High winds damaged the GNC repeater in Fairbanks temporarily and KL7BIL stepped in with a standby repeater immediately. The GNC repeater is again in operation. Some of the Fairbanks hams are converting communicators and tweeters to work on 1m by removing the modulating power from the final and applying the audio from the modulator to the screen grid of the crystal oscillator stage through an rf decoupling filter (ie or rc). In the tweeter a 500K pot is added between the first and second audio stages to serve as a deviation control. The receivers are left as is using slope detection for the fm. Both conversions can be switched in and out so the rigs can be used on 1m or am. KL7AG has purchased an accessory which plugs into the communicator crystal socket to generate 1m. It rubbers the crystal at an audio rate by means of an audio amplifier and varicap. KL7GNP in Anchorage is interested in a possible 2-meter circuit to Fairbanks. KL7AG, VE6ADP/KL7 and WL7HII have the Fairbanks Alpine Club interested in ham radio. They'll use it on their climbing expeditions and trips. 80-meter QRP has proven reliable for a few hundred mile range in the Interior. KL7HGP reports usage of the code practice sessions on 3735 kHz 0600Z 4ThS in the St. Marys region.

IDAHO - SCM, Donald A. Crisp, W7ZNN - SEC: WA7EWW. The 1-ARM Net meets each day at 0200 GMT on 39.35 kHz. The Idaho RACES Net meets week days at 1515 GMT on 3990.5 kHz. The Idaho P.O. Net meets at 0130 GMT on 39.80 kHz on Tue., Thur. and Sat. (GMT). WA7OOL lost his 60-ft. tower in a wind storm. WA7ROI recently graduated from the Novice ranks. WA7BRB is recovering from an operation. WA7SJM and XYL WB0FRL are new hams in the Mountain Home area. FARL Net reports 31 sessions, 982 check-ins, 89 traffic handled. Idaho P.O. Net 13 sessions, 133 check-ins, 22 traffic handled. Traffic: W7GHT 94, WA7BDD 73, W7IY 27, W7ZNN 14.

MONTANA - SCM, Harry A. Roylance, W7RZY - Asst. SCM: Bertha A. Roylance, K7CHA. SEC: W7LYN. PAM: WA7IZR. WA7PZO was appointed as EC for Butte and WA7OBH endorsed as OPS. Have been asked by WA0UTT to have clubs notify Hq. if they are holding classes for new amateurs. See page 104 Jan. OST. Helena has their repeater license, call WA7KZZ and will be operating on 16-76. Be sure to attend the Glacier-Waterton hamfest at Badley Landing near Somers. EMC Sparkgap Society has their beams up 160-ft. The gang in the Bozeman area furnished communications for the Snowmobile race. Sorry to report the passing of K7QCO, W7EGN and W7NDS. Traffic: WA7JQS 215, WA7OBH 20, WA7IZR 11, W7L6K 9.

OREGON - SCM, Dale T. Justice, K7WWR - SEC: W7HUF. RM: K7GGG. PAM: K7RQZ. WA7GTX reports for the ARFC Net - (Feb.) sessions 28, check-ins 365, traffic 8, contacts 30, maximum no. of counties 12. WA7KIU reports for GSN, sessions 29, check-ins 147, traffic 106. Oregon State (tw) net now is meeting daily. EARS practice net awarded 20 wpm certification to WN7OVE, 13 wpm to WN7ORC and WN7OVD. EARS meets 1st and 3rd Wed. in Springfield. K7OIF now runs a FR-4 and RV-4 with a pair of 4-400s standing by. WA7FTN handled 211 patches to S.E. Asia. Director Thurston attended a meeting of the Portland ARC, with a board meeting discussion, slide and tape show of headquarters, and LM plaque for your SCM. Traffic: K7OIG 240, K7NTS 146, K7OIF 88, WA7BYP 26, K7WWR 22, WA7MOK 16, WA7KRH 14, WA7NWV 13, W7LT 10.

WASHINGTON - SCM, Arthur Henning, W7PI - SEC: W7UWT. RM: W7GYF. PAMS: W7GVC, W7MCW. VHF PAMS: K7BBO, K7LRD. EC K4ZDK77 is coordinating ARFC activities with CD and US Dept. Agriculture, WA7OBC in Canada at school.

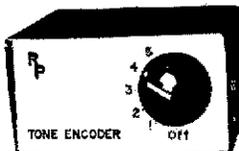
Net	Freq.	Time/21	QNT	QTC	Res.	Mgr
WSN	3590	0245	262	124	29	W7GYF
NSN	3700	0300	273	74	29	WA7OIV
NIN	3970	1930	1279	133	29	K7VAS
NWSSB	3945	0230	964	52	29	K7KFC

Don't forget Yakima Hamfest, Sun. May 21. W7LEC conducting code practice on 3728 kHz Mon. through Fri., save correct starting time is 9:30 A.M. K7GIG in Novice Roundup made 200 contacts RM W7GYF and WSN Mgr. wants more cw ops to check in on WSN on 3590 kHz at 6:45 P.M. More outlets needed to deliver traffic NSN members are especially invited to work WSN and please remember WSN accommodates code speed to suit you. The life blood of any net, tone or cw and also for BPL operators is traffic. Let's originate more written traffic - all of us. HAMS Club provides communications for Boy Scout Camporee. Western Washington DX Club, new AKRU affiliate, has 130 members and growing fast. The new club call is W7FR and you can expect to hear it prominently



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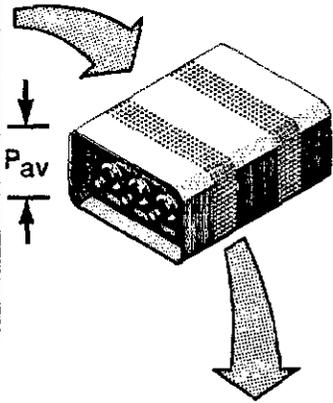
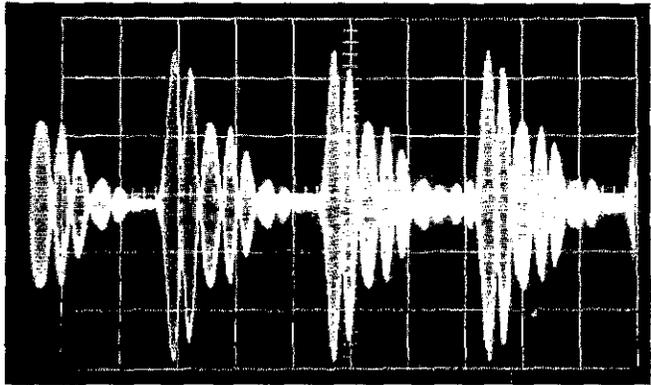
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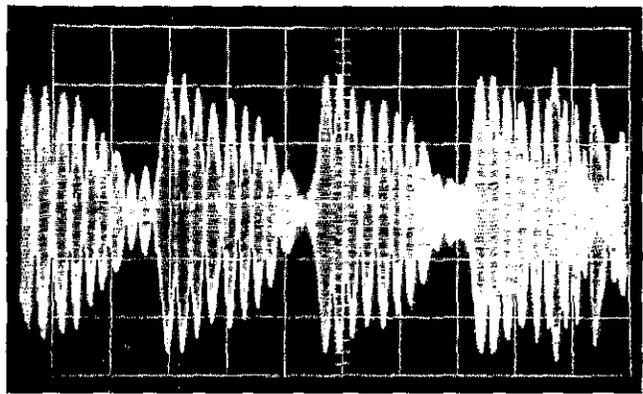
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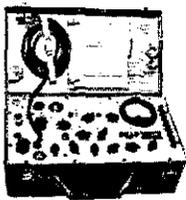
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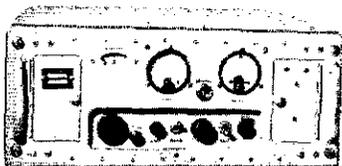


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upcoming FD in June. W7OCV passed Advanced the hard way — Conditional to Advanced in one jump — meaning all test elements. HI! AREC Net during SEV exercise averaged one message every three minutes during directed session with three NCS, eight NTS relay stations, 30 participating stations, 221 messages handled. W7BQ passed the 50-year mark as amateur. Traffic: W7RA 1022, W7PI 322, W7DZX 276, WA7DZL 154, W1BO 151, W7JEL 136, K7CTP 95, W7GYF 95, K7OZA 77, K7VAS 76, W7APS 61, W7MCW 61, K7PFR 59, W7AXT 52, W7FOE 50, WA7OCV 49, K7OXI 48, WA7KNW 34, W7BUN 29, WA7OET 28, W7AIB 22, W7OCV 20, W84YSU/7 (S, WA7HCL 11, W7JHZ 10, W7UE 9, W7FIM 7, WA7GVB 7, K7OKC 5, K4ZDK/7 3, W7VU/7 3, WA7OXU 3, W7UD 3, K7BBO 2, WA7AVI 1, K7JRE 1.

PACIFIC DIVISION

EAST BAY — SCM, Paul J. Packer, WB6DEH — RMs: W6LPW, WA6DIL. All those who hold appointments are urged to mail Form 1 cards in or lose their appointment. W6TTS built an fm receiver for 2 meters only to find that the repeater he wanted was off the air for 2 months. W6LPW reports UCI as active as ever. Traffic: W6LPW 414, WB6VEW 35, WA6LYB 14.

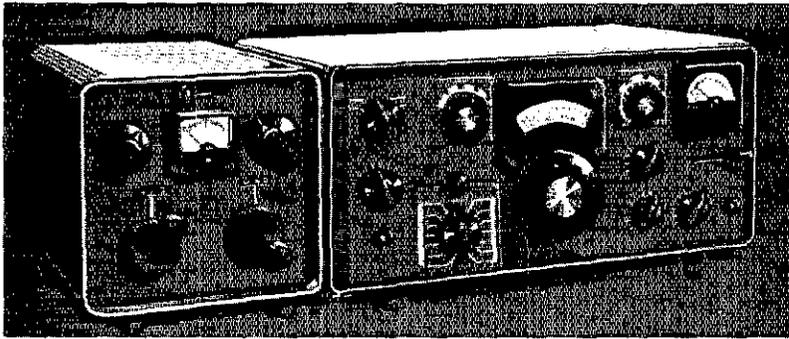
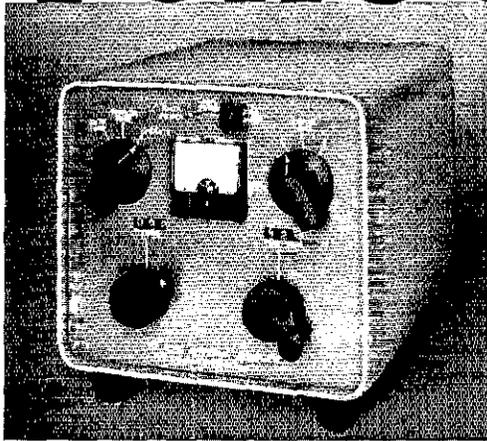
NEVADA — SCM, L.M. Norman, W7PHV — SEC: L.L. Mike Blain, WA7BEU, 560 Cherry St., Boulder City, NV 89005. Mark your calendar now for Sierra Hamfest on Aug. 5. Additional details from K7ZAU. W7LX is PON manager for Nev. K7ZOK helped host the REA National Convention in Las Vegas. WA7BEU has a new vacation trailer, his XYL says "watch those underpasses." The K7UGT gang has started planning for Field Day and the snow hasn't started to melt in the Reno area yet. K7ICW has completed an HB-432 MHz linear. WINJM vacationed over night in Las Vegas enroute to K16-Land for an extended vacation. W7PRM has retired as of Apr. 15 after many years with the U.S. Bureau of Mines Boulder City test and research facility as a metallurgist engineer. WA2MEO/7 completing his hitch in the Air Force has returned home to start working with New Jersey highway patrol. Mobiling in the West try WCARS-7255 daylight hours and WPS8-3952 night time. K7LGE in Boulder City and K7ZMA in Kingman, these fm repeaters afford good coverage in Southern Nev., Ariz., Calif. and Utah; K7UGT fm repeater provides coverage in Reno are all on 34.94. Traffic: W7LX 36.

SACRAMENTO VALLEY — SCM, John F. Minke, III, W6KYA SEC: W6SMU. Our section has acquired a new EC, WA6PCT of Crescent City. Those interested in participating in emergency communications and live in that area, contact him. WA6BJ received his General Class ticket and has been appointed as an OPS. K6KWN has increased his traffic participation by joining PCN (Pacific Coast Net) which meets at 2000Z on 7120 daily. K6GG missed his first FMT in many a year because of the flu! The GFARS in Chico moved their meeting place just across the creek at the state college in the new Industry and Technology Building. They now sport 53 members. Say, would you like to get more out of your amateur radio hobby? How about visiting one or more of the clubs near you (see SV news for Mar. for a club listing). You may enjoy the people. Field Day isn't far away. Start preparing now for that big June event. Think FD! Traffic: (Feb.) K6YZU 59, WA6IGU 47, K6KWN 30. (Jan.) WB6QZZ 21, K7AFL/6 2.

SAN JOAQUIN VALLEY — SCM, Ralph Saroyan, W6JPU — K6PKO is active on 2.0 MHz and also is playing with KITY. K6RPH was active in the DX contest, as well as WB6LRL and WA6WXP. K6OPE acted as Net Control for JD1ACH. WA6LXV is maintaining tropo speeds with W6EJZ and WA6HXW on 432 MHz. WA6EXV has a kw on 432 MHz using a pair of 4CX-250B tubes. W6ZNX has a 39U receiver. W6PQC is on 75 sb. W6UBK has a Swar 500C on sb. WA6JDB is building a new QTH with ham shack WN6BPH is now an Advanced Class licensee. W6BZH is active of the Confusion Net. WA6CPP is building a new QTH in Calaveras County. W6WSI moved to Sacramento. The Delta Amateur Radio Club meets on the 3rd Thur. of each month, at 8 P.M. at the Danie Webster Jr. High School. WA6SZS is conducting 2 meter hunts. W6HYZ has a new Collins 5 line. WA6EZV has an R-599 and a T-599. WB6LAY has an R-599 receiver. Reservations are being accepted for FM West to be held June 2, 3, 1972 at Tropicana Lodge, 4061 N. Blackstone Ave. Send reservations to WB6OSH. Traffic: WA6JDB 37, WA6CPP 8.

SANTA CLARA VALLEY — SCM, James A. Hauser, WA6LFJ — SEC: WA6KXB. RM: W6RVB. W6LZR is working on moonbounce station, expects his antenna to be up soon. WN6OQ is new Novice in Sunnyvale. K6C8S just completed vacation in SC from Truc. WA6NHID looking for DX. W6AUC is active on phor nets. W6IQU is active on NUN2. W6RFF is on NUN. W6LJ is also SBWAS, just needs 3 QSLs. K4BVD/6 is now W6OAT. Heard

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comment the other night at a local club meeting that SCV SCMs are partial to cw operators and include little phone information in column. This is not completely true however; I only include what is sent in to me. Send it in it will be included. Traffic: W6RSY 711, W6YBV 224, W6BVB 187, W6NW 140, WA6LFA 131, W6DLF 82, W6VZF 63, WA6AU 45, W6IQD 28, W6RFF 12, W6EJ 9, W6ZRI 5, W6OAT 7.

ROANOKE DIVISION

NORTH CAROLINA - SCM, Charles H. Brydges, W4WXZ - SFC - W4EYN. PAM: WB4JMG. RM: WB4PNY. The Buncombe County ARC "Smoke Test" relates club history to 1937; might be a good project for your club. EC WB4NXS reports WB4OBU is bicycle mobile on 2 with twelve other AREC members backing him up. WB4BGL is getting the antenna back up. The Eden ARC call is now W4JE. It is my sad duty to report Silent Keys W4CQ and W4VSI, K4MC and W4IRE gave programs on NIS to the Raleigh and Winston-Salem clubs. WB4PMI is Advanced Class as is WN4PZW. Raleigh ARS membership now totals 86. ON8UL turns out to be W4EJP from Lenoir. XYI is W4FIQ, W4ATC, State College, operator WB4IOJ in UK and France for Noel and had Christmas dinner with G3UML and family. WB4SXX reports his first QSO with China. The Mecklenburg ARS meets in the Charlotte Red Cross Bldg. last Tue. of month. W4IRE Fosyth CD RO reports completion of antenna installations and circuit descriptions. WB4MFI, is Commo Chief in Nam and we all send 73 and RR (return rapidly). K4THL has an eleven-element 2-meter beam at 100 ft. Cape Fear ARS had 31 activists in SET. 15 mobiles and 2 stations on generator, and congrats to EC WB4MTG on fine showing. The annual Ham-In planned by W4DCQ and K4VLR took place in Raleigh on Mar. 4. About 105 attended the banquet. Kudos to WB4MXX for another great show. As of this writing the annual LO meeting is scheduled for Greensboro, N.C. on May 13. Traffic: Feb 1 WB4PNY 319, W4EYN 244, WB4WZB 170, W4WXZ 54, WB4NRZ 11, W4ACY 10, WB4TNC 8, K4LZH 8, K4TIN 7, W4ELL 4, WA4WZO 4, K4MC 3, WA4KWC 1. (Jan.) WB4OZL/4 84, W4RWL 69, WB4TNC 13, WB4SPU/4 12.

SOUTH CAROLINA - SCM, Mrs. Elizabeth Y. Miller, WA4EFP - SEC: WA4FCJ. ASST. SEC: W4WOM. PAM: W4MTK. RM: K4LND. WN4YTM is a new Novice in Spartanburg. Welcome aboard. WB4OHz will soon be on the air from Meekin Abbey near Moncks Corner. Activity reports are almost non-existent this month. Please give your SCM support by sending in news items and traffic reports. The section nets go on Daylight Saving Time, please note the changes. SC S5BN 2300Z 17 P.M. EDT 3915 kHz, mgr. is W4MTK. SCPN 1600Z 112 noon EDT Mon. through Sat. 1230Z and 1930Z (8:30 A.M. and 3:30 P.M. EDT) 3930 kHz, CN (early) 2300Z daily (7 P.M. EDT) 3573 kHz, mgr. is K4LND, CN (late) 0200Z daily (10 P.M. EDT) 3573 kHz, mgr. is WB4TFE. S5BN 140. Traffic: W4NTO 92, K4QMK 4.

VIRGINIA - SCM, Robert J. Sagle, K4GR - Asst. SCM: A.L. Martin, Jr., W4THV. SEC: WA4PBG. Asst. SECs: WA4JUF, WB4CVY. RMs: WA4EUL, WB4NNO, K0PIV/4, W4SHJ, PAMs: WA4FCG, WA4YXK. Kudos go to West Va. this month for the marvelous way they handled the chain disaster. Also kudos to W4AKN and WB4EDT who led the successful fight on getting the increased fees for ham license plates killed in the legislature. WB4FJK splitting time between Winchester and Blacksburg W4UQ threatens sailboat interest. WB4RNT trying to get a Novice Net going. The Virginia Radioteletype Net (VRN) started this month under guidance of new RM, K0PIV/4. W8VDA/4 is now a member of TCC Eastern. W4YZC made 280 QSOs in Novice Roundup. WB4RDV reports DX contest much fun. WB4SKT has vfo troubles. Director, W4KFC lost his power the week end of our blizzard and had to move to a motel for the night (of the cw DX Contest!). K4JM reports nothing new. WN4WLK had his first DX contact. Business interfered with W4THV's hamming. OO IW K2HBA reported 7 intruders this month; OO W4HU still reporting out of band second harmonics. W4KX limited to VN only. Regret to note the passing of XYI of W4MK. W4JUJ has 2519 counties confirmed. W4KAO hopes to recover from work soon. W4DM cw and phone DX contested. Eastern Shore ARC, WB4MTN, pres. is really active

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BPLs: WB4EJK (Feb.) WB4RNT (Jan.) Traffic: (Feb.) WB4EJK 479 K4KNP 471, W4DQ 313, WB4RNT 257, K0PIV/4 208, WB4KSI 197, WB4SJK 168, WB4KIT 160, K4KA 120, W4TFE 111 W8VDA/4 102, K4FSS 83, K4GR 67, WA4FCG 66, WA4PBG 52

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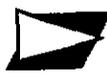
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WB4EAE 51, WB9BXX/4 35, WB4KBJ 33, W4YZC 32, W4HIR 30, WB4RDV 29, W4KFC 25, WB4SKT 25, K3VIV/4 24, WB4PCK 23, W4LOQ 12, WA2BEX/4 11, K4JFM 10, K4JYM 8, K4MLC 8, K4LMB 5, WN4WLK 5, W4THV 3, K2HBA/4 2, W4KX 1. (Jan.) WB4RNT 218, K4JYM 14.

WEST VIRGINIA - SCM. Donald B. Morris, W8JM - SFC: WA8NDY. RM: W8RBBG. PAMs: W81YD, W8DUW, K8CHW. Phone Net Mgr.: WA8POS. CW Net Mgr.: W8ACYE. CW Net on 3570 daily at 0001Z and new frequency for phone net, 3989 kHz at 2300Z daily. I regret to report the passing of W8MLX and W8GK/W8DJP. State amateurs were active in the Logan County flood emergency with WA8EKC first on the air. WN8IFU has new 21 MHz beam. Phone Net with 325 stations handled 86 messages and the cw net with 123 check-ins passed 51 messages. WA8EC lost all antennas during wind storm. W8BFVL has new T4-XB and 6-meter transmitter and receiver. Fairmont area amateurs installing 2-meter fm repeater, with K8OFQ, K8HIV, W8HAX, K8MYU, WA8MRK, W8JM, W8RBMW, W8BBMV, W8TGL, WA8NWN and WA8NPA. W8BBMV made PSHR, Roanoke Division LU meeting, Greensboro, N.C. on May 13, 14. West Va. State ARRL Convention at Jackson's Mill on July 1 and 2. WN8IH had 514 contacts and 72 sections in Novice Roundup. Traffic: W88CYB 171, W8BBMV 106, WA8POS 89, WA8NDY 65, WA8DXF 63, W8HZA 59, WA8LFW 58, W8JM 29, K8OEW 25, W8DUV 19, WA8KCI 18, WA8DXS 13, WN8IFU 13, WA8OKG 13, WA8EC 12, WA8WCK 12, W8SAKQ 5, WN8LGF 4, W8RDX 3, WA8UN 3, W8SAKR 2, W88EMG 2, W88GAA 2, WN8IH 2, W8IMY/8 2, W8ETP 1, W8FZP 1, WA8LZ 1, WA8THX 1, K8ZDY 1.

ROCKY MOUNTAIN DIVISION

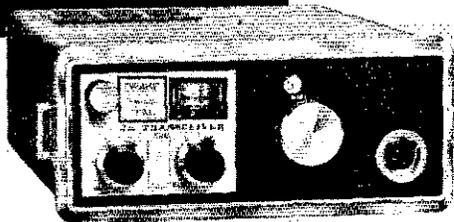
COLORADO - SCM. Clyde Penney, WA0HLQ - SEC: WA0QOY. RM: W0LRN. PAMs: W0AWG, W0CXW, W0LRW, WA0WYP. Newly-elected officers for the Pueblo Ham Club are W0MQH, pres.; K0PHF, vice-pres.; Betty McCrary, secy.; W0RSA, treas. and editor of the club paper "Grid Leak." Newly-elected officers for the Longmont Amateur Radio Club are WA0QOR, pres.; W0DZU, vice-pres.; WA0SLX, secy.-treas. It is with deep regret that we add W0JFD to the list of Silent Keys. He will be sorely missed by his fellow amateurs throughout the region. Columbine Net celebrated its tenth anniversary on Feb. 26 with a QSO party which was well attended by members and guests throughout the Rocky Mountain region. WA0WYP is the new Net Mgr. for Hi-Noon Net. He replaces K0IGA who resigned. Net traffic, Feb.: Hi-Noon QNI 1068, QTC 52, informals 70, phone-patches 56, phone calls 10, time of 918 minutes for 27 sessions. CTN QNI 258, QTC 28, informals 43, time of 586 minutes. Columbine QNI 894, QTC 93, informals 170, time of 1186 minutes for 26 sessions. Columbine (Jan.) QNI 997, QTC 105, informals 101, time of 1389 minutes for 27 sessions. CCN (Jan.) QNI 260, QTC 116, 31 sessions. Traffic: (Feb.) K0ZSQ 1044, W0WYX 280, W0LQ 155, W0LLA 134, W0LRN 94, WA0SIG 71, W2TPV/0 71, W0LRW 65, W0SIN 63, W0CCB 58, W0NZL 49, W0TW 44, W0DLE 37, WA0TMA 29, W0YCD 28, K0IGA 24, WA0YGO 22, WA0TRB 16, WA0HLQ 1. (Jan.) K0CNV 141, K0JSP 49.

NEW MEXICO - SCM. James R. Prine, WSNUI - The section cw net NMN 3750 is doing very well with regional coverage. Additional check-ins are always welcome at 0130Z. Plans have been completed for the awarding of certificates to stations outside the state for working 15 New Mexico stations. The 15 confirming QSL cards should be sent to New Mexico Ham P.O. Box 14381, Albuquerque, NM 87111. W5AXC participated in the UNM open house Feb. 25 and also demonstrated their first RTTY contact. The 2-meter fm activity is expanding with an additional repeater in Albuquerque. A novel club announcement ID tape has been developed by W5JDZ. K5MWN has a thunderbird beam with improved signal on the higher frequency. W5UH is anticipating parts delivery to restore phone section to transmitter. A lost dual cord on the 160-meter switch precipitated a major overhaul of K5MAT's Viking 1. K5IOV is now active from Santa Fe on 75 phone. Traffic: K5DAB 223, K5MAT 129, W5AXC 97, W5RE 59, W5UH 38, W5MYM 21, W5PDY 20, W5DAD 18, W5DMG 12, WA5MIY 6, K5ISJ 3.

UTAH - SCM. Carroll F. Soper, K7SOT - SFC: W7WKF. RM: W7OCX. K7CLO worked all states on 80 meters in 15 hours 45 minutes. W7HKC attempting to organize a club in the Brigham City area. W7IQU and K7PFB have started a traffic net on 145.5 MHz at 1200 and 1800 daily, "Busy Bee Traffic Net." The Ogden Amateur Radio Club reports their repeater on 146.22 input, 146.82 MHz output, should be in operation in approximately 60 days. It will be located on Francis Peak at an elevation of approximately 9500 ft. The Bee Hive Utah Net operates daily on 7272 kHz at 1230 MST.

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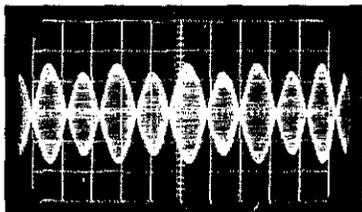
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reporting Feb. QNI 977, QTC 31, average time 13.97 minutes. Traffic: W7EM 302, K7HLR 94, WA7HCQ 35, W7OCX 34, W71QU 19, K7CJD 14, K7SOT 10, W7HKC 6, WA7MBL 1.

WYOMING - SCM, Wayne M. Moore, W7CQL - SEC: K7NOX. RM: W7GMT. PAMS: W7TZK, K7YUG. OBSs: K7NOX, W7SDA, WA7FHA. Nets: Pony Express, Sun. at 0800 on 3920; YO daily at 1830 on 3608. Jackalope Mon. through Sat. at 1215 on 7260 (alt. 3.920). Wx Net Mon. through Sat. at 0730 on 3920. PO Net 1900 Mon. through Fri. on 3950. WA7NHP lost his quad antenna during the wind storms in Feb. W7HEB and K7WRS went to Mo. the first part of Mar. HEB lost his father at that time. K7TAQ vacationed in Ore. during the first part of Mar. The hamfest planning is going well; it will be in Thermopolis at the Holiday Inn July 15, 16. There will be no Division Convention this year but it is assured for the next two years. Traffic: K7NOX 480, W7SDA 67, W7TZK 55, W7GSQ 44, WA7NHP 26, W7HNI 25, W7YWW 21, W7BHH 20, K7WRS 8, WA7OEC 7, K7BTE 4, W7BKJ 2, K7TWK 2.

SOUTHEASTERN DIVISION

ALABAMA - SCM, James A. Brashear, Jr., WB4EKJ - SEC: W4DGH. RM: W4HFU. The Birminghamfest will be held at the Ala. State Fairgrounds Exhibition Bldg., Sun., May 7. Inquiries to W4FKG. Another 2-meter repeater (.28/.88) is on the air in the Birmingham area. The K4TOR/K4HAL repeater is changing frequency to 146.10/146.70. Good to hear W9MLF (ex-W4FVY) on AENB. The Mobile ARC recently combined a fish fry with a monthly club meeting. Hope all clubs and groups are completing their plans for Field Day. Don't forget the publicity angle to let the public know what you are doing and why. A special invitation to your Mayor, Police Chief, CD Dir. and Red Cross officials to visit your FD site should help cement relations between them and the participating hams. The Huntsville ARC provided communications for a 15-mile march by Huntsville area high school students for the March of Dimes. WA4WRU was HARC Project Chmn. WB4SVH is starting a new AERC net for Novices which meets on 3.725 Sun. at 2100Z. WN4YQX is a new member of AEND. Congratulations to WA4YNG on getting the Extra Class license. He built a couple of hv power supplies and now is building a 350 watt amplifier to go with them. WN4TJX moved to Germany. Welcome to WB4YSH, WN4YSL, WN4YSS, WN4YTA, WN4YUD, WB4YUR and WB4YUT. Appointed WB4LNM as EC. Endorsed WA4AZC as OBS: W4DGH as OPS; K4PNK as EC. Traffic: (Feb.) WB4SON 284, WB4SVH 239, W4HFU 194, WB4ERJ 95, WB4KDI 85, W4YNG 78, WB4JMH 74, WB4SVX 55, WA4VEK 40, K4AOZ 38, WB4THU 37, WN4WBJ 18, WB4VKW 12, K4HJM 8, WB4KSL 5. (Jan.) WB4NLK 93.

EASTERN FLORIDA - SCM, Regis K. Kramer, W4LE - SEC: W41YT. Asst. SEC: W4SMK. RM: WB4OMG. PAMS: W4OGX 75, W4SDR 40. Fla. Amateur Sideband Traffic Net (FAST) certificates were recently issued to WB2NGI/4, K4FSZ and W4NKO. BPLers for Feb. were: WA4LH, W4YPA, W4DUG/4 (Tampa ARC), WB4TON (Hollywood ARC) and of course the Burkes W3CUI/4 and W3VR/4. The PSHR "cats" included WB4VOS, WB4PNG, WA2AF/4, WB4NCH/4 and WB4PTH. Nice going gang! WB4NXX, the West Palm PR gal, reports WN4TDZ has 49 states confirmed and working on Hawaii. K4TFQ is a Silent Key and W4BRB is looking for a New World! WB4PTH is a new traffic enthusiast in South Miami area. WB4AID enjoying traffic net activities plus some DXing now that he is retired! W41YT and Florida Skip worked with WB4GTY to get the Governor's signature on the proclamation declaring June 18, 24, 1972 as Fla. Amateur Radio Week. W4DUG/4 and company originated 2306 QTC from the Fla. State Fair at Tampa. W4YPX works at WFGA-TV CH-12 IAX when not on Gator Net. W4ZHG is ex-GN member back in Ohio and publishes the Ham Shack Gossip in Toledo area. Known participants in OCWA QSO Party included: W4YPA, W4HLY, W4ZF, W4NGR, W4YK, K4HS, W41YT, W4JO, W4HHQ/4, W4QBR, K4GJ, K1AG/4, W4FYE, G3GKS/W4, W4CNY, W4TZ, W4FYF and W4GJ. New appointments: WB4VOS, W4NTE, W4FPC, WB4NCH and W4YPX as ORSs; WB4AID, WB4PTH, W4LSR, WB4RLU and WB4NCH, OPSs; W4BWS Brevard, WA4BGW Citrus, LCs. Renewals: W4LK, K4FAC, WB4MIQ, WB4OMG, W4GDK, WN4RGQ, K4SC and K4AVH. K4C5C revives his cw interests and is welcomed back to QFN. Knights of Kiloycles and their ladies still going strong each Sun. morning at 7:30 on 3910. W4YSO is present master Oscillator. WN4RGQ is now WAS and hauling in DXCC. W4DJ is off to VO9 for 3 months. WB4TON/4 was QTC 114 with W4OZF and WB4HML doing the chores, at the Campers Fair in Hialeah. W4ATA reports K4BSS will be retiring in Fla. come June or July. W4LDM 100% QNI QFN/GN/HBN for Feb. Wow! W4YVP is on 1296 MHz with surplus APX-6. W4VIH watches closely for DX openings on 2. Prepare now for Field Day and Hurricane Season! Traffic: (Feb.)

W3CUL/4 3914, W4DUG/4 2306, WA4LH 948, W3VR/4 662, W4LDM 422, WB4OMG 395, WB4NCH/4 372, WB4JSK 335, WA4NBT 294, WA4SCK 278, W4FFP 251, W4YPA 214, WB4HJW 209, W4FPC 204, WA2AEL/4 175, WB4AIW 168, W4LE 153, W4SDR 144, W4DOS 118, WB4TON/4 114, W4KRC 110, W4DVO 107, WB4PTH 104, WB4VOS 89, K4SCL 88, WB4PNG 83, WB4SMA 83, W4BM 73, WB8ZY/4 68, K4JWM 54, W4JA 50, W41YT 49, WA4HDH 47, WB4AID 46, W4NGR 46, WA9JNK/4 43, W4LSR 40, W44BGW 33, K4BLE 32, K4FAC 30, W4OGX 28, W9UEM/4 27, W4VME 26, W4NTE 22, K4EYN 21, K4LEC 21, W4TJM 20, W44CIQ 18, K4LEX 18, WA4RUE 16, W4YPX 16, W4GUJ 15, WB4UOC 15, W4GDK 14, W4SMK 14, WB4MIQ 13, W41AD 12, WB2NGI/4 10, WB4ICD 10, K4DVV 7, K4EJW 7, K4EZE 7, WB4HML 7, WB4SKJ 7, W4BCZ 6, K4LBE 6, W4EH 6, K4LPS 6, W4OQH 6, W44YRU 6, WB4FLW 5, K4OFR 5, W4SCY 5, W44WBM 5, W4RKC 4, W4DFP 4, WB4FSF 2, W2J1/4 2, W4KGJ 2, W4MML 2, WB4OAA 2, W4DDW 1, K4OCC/4 1. (Jan.) W3FBN/4 139, WB4JPZ 18, W4YPA 10, K4GFW 3.

GEORGIA - SCM, A.J. Garrison, WA4WQU - Asst. SCM: John T. Laney, III, K4BAI. SEC: WA4VWV. RMs: K4BAI, WB4SPB.

Net	Freq.	Time(Z)/Days	QNI	QTC	Mgr.
GSN	3595	0000/0300 Dy	810	241	K4BAI
GTN	3718	2300 Dy	-	-	WB4SPB
Ga. SSB	3975	0100 Dy	789	76	WB4DMO
Ga. Cracker	3995	1300 Su	-	-	WA4IQU

W4RSQ assisted by WB4RUA has a ham radio class going at Dalton Jr. College, Dalton, Ga. They have about 15 prospective future hams enrolled. W4JM reports he has 48 states confirmed toward his two letter WAS. He still needs Alaska and N. Dakota. W4REI, EC for the greater Atlanta area is planning an AREC drill in the near future. The Atlanta Radio Club plans to host the Georgia State ARRL Convention again this year in connection with their annual hamfest to be held in June. We should have a firm date by next month. Traffic: W4EEP 145, WB4KVE 126, W4RNL 123, WA4RAV 113, WB4RUA 104, K4BAI 86, W4AMB 63, WA4WQU 56, W4CZN 54, W4PIM 23, K4NM 20, W4REI 10, W4JM 9, W4FDN 3, WB4VF 3.

WESTERN FLORIDA - SCM, Frank M. Butler, Jr., W4RKH - SEC: W4IKE. RM: K4LAN. RITY: W4WEB. PAM: W4NOG.

Net	Freq.	Time(Z)/Days	Sess.	QNI	QTC
WFBN	3987	2330 Dy	29	817	56
QFN	3681	0000/0300 Dy	58	-	-

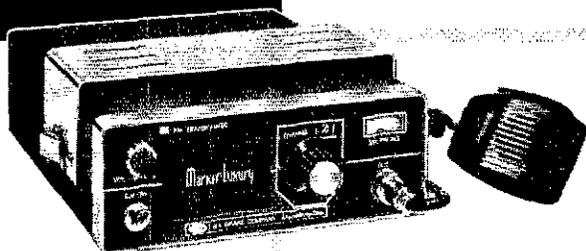
Pensacola: New officers of FFARA are: K0BAD/4, pres.; plus WA3ODA/4, WB4JHQ and K4FKV. W4COE is again active on QFN. The 6-meter VHF Net held a 24-hour QSO to stimulate interest in vhf. WB4PKW and KP4DFZ were the organizers. WB4KGW and others hope to set up a moonbounce station. The fm repeater is operating with a new receiver site closer to town. Milton: Nearly a dozen hams met to form a radio club and KACES group. WB4JRP arranged for medicine to be shipped to Colombia, S.A., when informed there was none available locally for an emergency case. WB4FND is a Catholic priest. Ft. Walton: WB4IPR was awarded QFTN Net certificate. The WB4KLT repeater has the first touch-tone operated autopatch in N.W. Fla., thanks to the skill of W4SMS. Also included is a 16-number auto-dialer. Bonifay: WB4PTJ has his Tech. ticket and is active on 2-meter fm. WA4GTA has added 100 wpm RITY capability. Panama City: WB4LEL is a new ORS. W4GGU and K4KHV are active on 29.60 fm. Tallahassee: WA4DCN built and demonstrated a cw audio filter for the club. WB4RCI edits the club Newsletter. Madison: W4RCO has a new HW-101 and W4PBO a new Swan 300-CS. W4WMA and K4WOI also are active. Traffic: (Feb.) K0BAD/4 582, K4CLM 110, W4NOG 24, WB91UJ/4 15, WA4IZM 9, K4DOT 4. (Jan.) WB4NHH 7.

SOUTHWESTERN DIVISION

ARIZONA - SCM, Gary M. Hamman, W7CAI - SEC: K7GPZ. RM: K7NHL. PAM: W7UXZ. The Highway Dept. reports that only about 30% of those eligible for call letter license plates are buying them and that if more plates are not bought, the rate for the plates will have to be increased (doubled) to keep from losing money. If you are eligible for these plates, send to your SCM or the MVD for an application form. Field Day is coming June 24, 25, start making your plans and getting equipment ready to go. The Ft. Ytuhil Hamfest at Plagstaff is scheduled for July 29, 30. The Amateur Radio Council of Arizona (ARCA) is considering publishing a monthly sheet of state-wide news. If your club is not a member of ARCA but would like to receive this sheet, send a card to ARCA chmn. K7JWB, 122 F. Pierce, Tempe 85281. K7WUG/mobile reported a bad accident on I-10 through the Phoenix 146.34/.94 repeater. Explorer Post 710, sponsored by the Ariz. ARC, is planning to operate from Camp Geronimo this summer and will need schedules with Phoenix area stations for phone patches. WA7NWL should be contacted for details. Section net certificates

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QS-5-72

were earned by K7EMM, WA7HIT, WA7JCK, WA7KQE, K7MTZ, WA7NWL, W7OUE, WA7QVN, K7RLT and K7UOK. Traffic: K7NHI 184, K7MTZ 111, WA7MAD 82, K7EMM 72, W7DOS 33, K7RLT 28, WB2HLI 21, K7RDH 20, W7PG 19, W7CAF 18, WA7NWL 13, WA7QVN 8, WA7KQE 7, K7UOK 6, K7GLA 3, W7LLO 3, W7OUE 3.

LOS ANGELES - SCM, Eugene H. Violino, W6INH - SEC: WA6QZY. RMs: W6L YY, WB6ZVC. It was brought to my attention that the Slow-Scan TV bunch may show up on any frequency. It was suggested they find a spot such as the RTTY boys have. The Santa Clarita club paper has a new look. New officers of the Pasadena Radio Club are WA6KZI, pres.; WB6ZGL, vice-pres.; WA6OKP, secy.-treas. The SOCON would like to have a liaison with NTS for traffic, please contact K6ASK. Palisades Club had about 150 members at their Feb. meeting, one of the guest speakers was W6KW. The Society of Wireless Pioneers now have over a thousand members. They meet on 3550 kHz Thur. at 7 P.M. local time. How about you instructors registering with the ARRL instructor corps? Twenty members plus their XYs attended a traffic (SCN) meeting to hash over net problems at the summer home of K6UYK, in Newport Beach. Crescenta Valley Radio elected WA6SNK, pres.; WA6CTJ, vice-pres. W6BHQ is in the Naval Hospital. WA6MEM keeping skeeds with WA6LUF and WB6PSE on 1245 MHz. W6MZW finding lots of citations on 160 meters. W6USY suggests that we have more practice for emergencies. WA6ZKI says that K6CBK wants magazines. WA6DHM is now building a new electronic keyer. Received my first copy of TRW radio club "Cross Talk" and a very fine bulletin it is. The TRW Club is very active. Its pres. is K6PSK. W6IPN giving talks on radio interference. Those interested in winning the "Jackalope" award should work five stations in the Antelope Valley, any band any mode. New officers of Telco Club are W6LYC, pres.; W6TZD, vice-pres.; W6PAZ, secy. WB6BBO has new vertical antenna. K6OPH participated in both phone and cw DX contests. W6RCV improved his Triband antenna. How many OOs would like to get together for a lunch and gab fest? Might be able to iron out some of the questions with the help of K6KA. W6IVC well after long bout with flu. K6ASK active as NCS on SOCON. W6LPI now is Asst. Dir. and also Chmn. of the Council of Radio Clubs. If you have any questions re antenna regulations advise the Council. The new officers of Western Public Service are doing a great job. If you see a hat with a beam on it its W6MDQ, attending the events. Traffic: K6UYK 516, W6INH 339, W6USY 148, WB6ZVC 86, W6OEO 79, WB6BBO 77, W6QAE 56, WB6KKG 33, K6EA 16, WA6DHM 11, W6IHJ 9, WB6YIZ 9, W6DGH 6, W6LYY 6, K6ASK 5, W6BHG 4, WA6MEM 4.

ORANGE - SCM, Jerry I. VerDuft, W6MNY - Asst. SCM: Richard W. Hirbeck, K6CID. SEC: WB6CQR. RMs: WB6AKR, WB6NX. WB6JOT is a new OBS for Riverside County. WB6VTK again made BPL. Appointment renewals: W6BUK as OPS, W6BNX as RM, ORS, OPS WB6NRK won a Signal One at the Fresno DX Convention and his OM, WB6UDC, is the new pres. of So. Cal. DX Club. W6MNY and asst. SCMs K6CID, W6CPB were guest speakers at the Univ. of Riverside ARC. K5BWZ/6 has put up a 2- and 6-meter beam in preparation for summer DX. WA6NDA has been working lots of DX with his new SB-303-401. W6BUK celebrates his 50th year as a licensed amateur. His first call was 3AKR in 1922. W6BAM now transmits Official ARRL Bulletins Mon., Wed., Fri. on 3580 kHz at 1930 and 7080 kHz at 2030 local time. Copying Shelly is a good way to get the ARRL info first hand the copies 'em direct from W1AW and improve your cw copy ability 'cause he has an excellent fist. New input of the San Bernardino 2-meter ARC repeater is 146.25 MHz with output still on 146.85. 1800 cycle tone access. The Desert RATs have a new meeting place the 1st and 3rd Wed. (8:00 P.M.) at the Santa Fe Fed. Savings Bldg., 300 So. Palm Canyon, Palm Springs. The following participated on 2 meters during SFT: W6GPR, WA6VKL, W6DRM, WB6VJO, K6QGV, K6JBG, WB6GEN, W6TAS, W6NZD, WB6VJY, WB6BYJ, WA6LJZ, WA6HKW, WA6QHH, WB6KQO, WB6CGG, WA6OAD, WB6WOO (EC), WB6FIE, WA6QIS, WB6YOS, WB6KAK, WA6TVA(EC). Many of these are members of the Anaheim ARA who helped boost 2-meter fm activity for public service. WB6ASR reports the So Cal VIII Club provided communications for the City of Carson Parade with eleven mobiles on 6 meters. PSHR: WA6TVA 49, W6MNY 43, WB6AKR 26. Traffic: (Feb.) W6ISL 307, WB6VTK 302, W6MNY 105, W6BNX 45, WB6AKR 34, WA6TVA 34, W6QBD 28, W6WRI 13, K6GGS 12, K5BWZ/6 6, W6BUK 2, WA6NDA 2. (Jan.) K5BWZ/6 47.

SAN DIEGO - SCM, Paul C. Thompson, W6SRS - Asst. SCM: Art Smith, W6INI. SEC: W6TAL. It is that time of the year. Getting all in readiness for the annual Field Day get together. This provides us with a fine opportunity to practice some of our emergency procedures as well as have a lot of fun. Break out the old generators,

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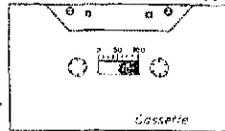


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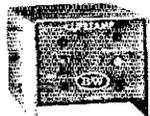
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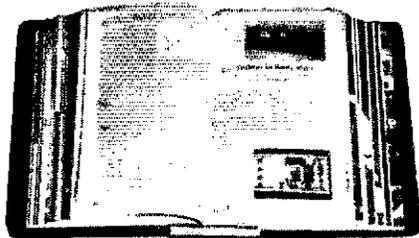
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portable antennas, etc., and head for the field. Most of the clubs here are participating this year. This is the real test against Murphy who always is lurking to upset the events. Clubs: North Shores held their annual auction with a number of goodies up on the block (VARA had a large crowd on hand for the equipment display. El Cajon had as their guest the 11th Naval District MARS coordinator, WA6IKY/NØVWV. SOBARS is chairing the Spring Homeshow for the San Diego Council. San Diego and Orange County DX clubs held their annual get together in Oceanside. The Palomar Club has their new repeater in operation and it is providing many fine OSOs throughout the section. San Diego fm is conducting transmitter hunts on a regular basis. Station activities: W6DEY has a new frequency counter. W6TAI a new shack for the gear. W6LRU is wrapping up another year of upgrading clubs. K6BTO is testing 450 equipment. K6EC awarded SDDX Club Plaque. K6PM has joined some new nets and is reading bulletins. PSHR: W6LRU 49. Traffic: W6LRU 109, W6JOU 65, W6DEY 29, W6SRS 5, K6PM 2, W6TAI 1.

SANTA BARBARA — SCM, D. Paul Gagnon, WA6DEI — K6TS spoke on shipboard antenna design at the Canejo Valley RC meeting in Mar. K6YHK and the HAMCON committees are working hard on the Southwestern Division Convention to be held in Santa Maria Oct. 21 and 22. Get your early bird tickets from W6PA. The HAMCON board of dir. include K6YHK, WB6ECM, WA6GOR, W6KW, W6DKQ and WB6JXL. The MAKRAC traveled to Morro Bay in Mar. to hold a joint meeting with the Estero Club. The Paso Robles and Satellite RCs also were represented. Speakers included SCM WA6DEI, SEC W6JTA and HAMCON chmn. K6YHK. The Ventura County Club held its annual auction in Mar. The Paso Robles RC is again active. Contact W6MSW for information. They are planning a joint FD with the Estero Club. WB6WKC advises they are planning a RACES repeater in Santa Barbara. WA6PFF has RTTY receive and will be transmit soon. W6JTA and WA6DEI attended the SCN picnic in Newport Beach. W6MUL is now on 2-meter fm mobile. WB6ELI passed his Advanced Class exam. WA6KRA is the new EC for Lompoc. WB6BWZ is an active OO, especially trying to help Novices. W6IDU has recovered from SFT and has his generator and 2-meter fm rig back on. WA6FUA completed an IC keyer to use on the traffic nets. The Ventura County Club had a good turnout to view Ham's Wide World at the Feb. meeting. W6ZYE is again active. K6VRK has a new Swan 2-meter rig. K6CFJ completed repairs on a Heath Maurader. AREC Net on 3935 at 8 P.M. Wed. PSHR: WA6DEI, WB6MXM, W6JTA. Traffic: (+eb.) W6JTA 227, WA6DEI 153, WB6MXM 60, WA6PFF 4, WA6JUX 1, WB6WKC 1. (Jan.) W6LUC 17, WA6FUA 5.

WEST GULF DIVISION

NORTHERN TEXAS — SCM, L.E. Gene Harrison, W5LR — Asst. SCM: Frank A. Sewell, W5IZU. SEC: WA5VJW. RM: W5OGZ. PAM: W5BOO. Following endorsements for ORS include W5PBN, W5QLA and W5QU, also W5PBN as OO. W5NFO SCMs WestTex organizer working on future trips to WestTex clubs for W5LR. Arlington ARC now holding code classes at NoWest Library Branch,

918 Cooper St. WA5VJB needs endorsement for OVS. Zone 5 MARS reports W5OUU moving to Lake Whitney. EC: WA5UOC for 4 counties turned in FB job in SET. Upcoming events: Lake Murval Hamfest, (Stovalls Landing) May 19, 20, 21; STEN Convention Victoria June 10; QXWA Tyler July 1, 2. W5IZU rebuilding antenna. W5HT new trailer. W5PBN RACES liaison, WA5PFF had serious accident Dec. 26 installing 4-400s contacted 3.5 kv at 2.5 amps causing 3rd-degree burns on right hand. Temple ARC meeting Feb. 12, attendance 12 and tower leaning. W5BQT, ex-Ft. Worth ham now PHD East Texas State on all bands. SCM attended state CD conference Feb. 14, 15. W5EBC on SET for 16 hours. Plainview TX bulletin known as "Farmers Wife" WA5MER, pres. W5QPX continues FB OO work. WB2ZFU/5 interested in AREC; is pres. Caprock ARC. What do you guys and gals think of daytime nets as per WINJM? SCM newsletter now in preparation. Comments appreciated. Richardson ARC new officers W5PAQ, pres.; W5LUI, WA5JMK, W5QWF, vice-pres. Club frequency 146.490 serves as excellent spot for locating the "rare ones" in DX chasing. May I suggest that we all support our local radio club. W5ATS worked many stations in SET and W5QU made BPL for first time. WA5VJW now BPL 2nd time. RM W5OGZ reports TFX cw needs support. WA5YKO new ORS, K5VOU RTTY very active, K5VRY on 2 meters. W5NFKK, age 12, new licensee. W5WLA has short in coax. W5OGZ RM and ORS endorsed. Traffic: WA5VJW 1224, W5QU 545, W5TI 154, W5IZU 135, W5DWV 43, W5EBC 36, W5PBN 24, W5LR 21, K5QKM 10, W5DFX 8, W5OGZ 2.

OKLAHOMA — SCM, Cecil C. Cash, W5PML — Asst. SCM: Joe M. Schlosser, W5IMO. SEC: W5FSN. RM: W5RB. PAMs:

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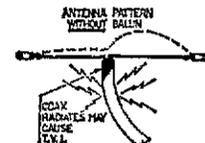
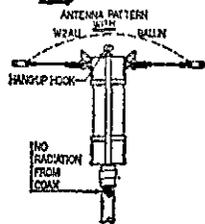
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T-94	.70	.75	.75	.95			.942	.560	.312
T-80	.55	.60	.60	.80	.90		.795	.495	.250
T-68	.45	.50	.50	.65	.75		.690	.370	.190
T-50	.40	.45	.45	.50	.60	.65	.500	.303	.190
T-37	.30	.40	.40	.45	.45	.55	.370	.205	.128
T-25	.25	.30	.30	.35	.40	.45	.255	.120	.096
T-12	.25	.25	.25	.25	.25	.35	.125	.062	.050

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WSMF-X, WASWHV, K45DLE and WASZRU. WSSUG is building a 2-meter rig. We have a new OBS in Ardmore WBSUCW who transmits ARRL Bulletins on both hf and vhf. Congrats to new EC of Wayne County WSQIV who also holds the call W5ZTN. The Tulsa group recently held a combined meeting of three clubs to prepare for the upcoming storm season and to update their emergency plan. Muskogee also reports their emergency gear ready to go. W5JJ has a new granddaughter. Congrats to new Advanced WA5LBI and General WBSOXS. K5OXC is a regular on OLZ and pleading for more QNT and QTC on the net. RM W5RB says he can use some more NCS and ANCS. The Okla. City VHF Club furnished communications from 0800 to 1500 Sat. Feb. 19 for a march of about 20 miles around Lake Heffner in support of the March of Dimes. Check points were set up along the route using 146.94 MHz fm manned by WASTRS, K5HQP, K5VRL, WASKFT, W5HXL, WBSCEJ, WASZRU, SEC W5AFSN and I were honored to be the guests and featured speakers at the Mar. 3 meeting of the Aeronautical Center ARC. Most nets are picking up very well, especially OLZ (the cw net). Traffic: K5TEY 602, W5RB 98, W5DIXP 56, W5FKL 39, WAS200 30, K5WPP 24, WSMFX 23, W5PML 19, K5ZDB 15, W5ASN 14, WASIMO 12, WBSUCW 11, WASNZM 11, W5SAZS 10, K5OXC 10, WASOUV 9, W5ADC 6, WASQOP 6, W5AWRC 4, WSSUG 3, W5JJ 2.

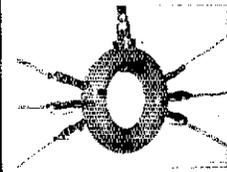
SOUTHERN TEXAS - SCM, E. Lee Ulrey, K5HZR - SEC: K5HXR. PAMS: W5FHA, W5KLV. RM: W5SSE. Renewed appointments: WASABA, W5FBI, W5ICI and W5TMM as ECs; K5SBR as OO: W5BHO as OPS. Visited amateur radio campers at Spring Creek. OBS K5JKV should be back on air soon from Gopher Hill. EC WSKR reports first mobile to mobile vhf fm contact in Brownsville with K5MSQ. ORS W5BWW and Tex. Southmost ARC pres. W5KFI and vice-pres. W5YXS report about 12 students of their radio class ready for exam. K5DIT won annual El Paso ARC WAE contest with 5192 points. Rumor has it that El Paso may have a new Repeater organization with repeater soon. OO K5HHA back after being hospitalized for a week. Enjoyed visit with OOs K5SBR, K5TSR and ORS W5ZHEY75. Congratulations to the boys at W5AC on RPL and vhf activity. OBS W5AIR advises Christmas present (new rig) doing fine. OBS/ORS W5ABO says STEN cw section will move to 3760 kHz soon. OO W5AMIN now on the air from Freeport. EC W5TFW reports W5DDW upgraded to General and Jefferson Co ARC had successful auction. Regrettably we report the passing of STEN member W5AQN. Received OO reports from K5HHA, W5NGW, W5RBB, W5RIF, K5SBR, K5TSR and W5VW. W5RRB and K5ROZ are again on PSKR.

Net	MHz	Seas.	QNT	QTC
1EX*	1770	58	444	525
TTN*	3961	29	1575	141
7290 Tfc	7290	43	1829	630

*NTS. Traffic: W5SSF 375, W5BHV 312, W5AC 111, W7WAH/5 96, W5RBB 93, K5ROZ 80, W5ABQ 74, K5EJL 69, K5HZR 66, W5YXS 65, W5AIR 58, W5VW 52, WBSCUR 51, W5OO 49, W5AFN 44, W5ZHEY75 43, W5STJ 35, W5KLV 34, W5LNV 31, W5BGE 29, K5LWL 27, W5NO 24, K5RVF 24, W5TFW 23, W5HWY 19, W5IUKN 17, K5HVI 12, W5JFZ 12, W5MUM 10, W5BHO 8, K5TSR 8, W5SSN 7, K5HUA 6, W5ACB 4, W5ZJY 4, K5SBR 1.

CANADIAN DIVISION

ALBERTA - SCM, Don Sutherland, VE6FK - Asst. SCM: Mrs. Dorez Booth, VE6YL, SEC: VE6XC. Reminder - Waterton-Glacier Hamfest, July 22, 23 at Somers, Mont. about 7 miles of Kalispell. Pre-register by July 12 - \$4.50 each or \$8.50 per couple to 531 Solberg Dr., Kalispell, Mont. VE6PM reports activity by 23 members NARC VHFers in recent snow shoe races. Congrats to VE6TK, now Alberta QSL Mgr. EA VE6AUZ is back on the air. Asst. EC VE6AVV carried on the net and his line relay work for APSN while VE6AG was hospitalized. Speaking of relaying; the principal of net operation is the relay system. Much more efficient than blind calling. I've been very pleased with the recent improve-



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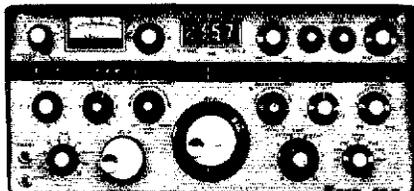
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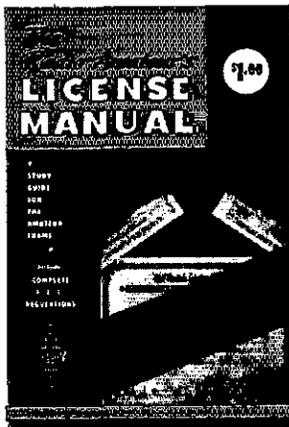
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ments on APSN in this matter. Many more stations are now willing to take traffic to another net. This helps liaison stations limited in time by other net assignments. Traffic: VE6YL 119, VE6FK 76, VE6ALQ 26, VE6AVV 25, VE6AFO 23, VE6XC 21, VE6ASL 17, VE6SS 9, VE6YW 7, VE6KS 4, VE6BL 3, VE6CO 3, VE6AGU 2, VE6AXH 2, VE6FS 2, VE6FV 2, VE6HF 2.

BRITISH COLUMBIA — SCM, H.E. Savage, VE7FB — Two new ECs are VE7AXI for Victoria and VE7BXN, who had been an asst. EC for some months. Old timers back are VE7CX with an HW-101 and the famous DXer VE7EF, both absent for all of ten years. VE7ALU derailed his Bud Car, all is OK. VE7SR is active on 2 and 20. VE7BVU recovered from heart attack and is back on 2 meters and 20. Vancouver Island's high winds totaled many sky wires. VE7US and VE7UR committee for Motor Vehicle license plates for 1973. The 1971 Centennial Committee award is closed and reports great success. Vancouver Island Picnic, Nanaimo Sun. June 4 and OCWA annual meeting in Victoria June 10 and 11. VE7NP holds down the Western end of Trans-Canada Net, time 1800Z, 14140 kHz. VE7BPK is RITTY. RM reports SET brought out many old timers on cw. Traffic: VE7BLO 120, VE7LL 72, VE7QQ 34, VE7TT 24.

MANITOBA — SCM, Steven Funk, VE4FQ — ORSs: VE4NE, VE4DL, VE4EA, VE4RE. OUs: VE4EW, VE4SW. OVS: VE4MA. OBS: VE4KE. Several VE4s were heard in the DX Test. WARC/AREC provided communications for snowshoe races at St. John's Boys School and Festival du Voyageur. VE4MA still keeps skeds with WØPHD on 432 and plans some solid state gear to improve FAX stability on that band. VE4EA reports some FB DX on 15 meters with an indoor wire, and VE4CR ran Man. Union for an Edmonton snowshoe race Feb. 19. MTN: 26 sessions, 95 QNI, 115 QTC. MEPN: 29 sessions, 1129 QNI, 38 QTC. Field Day is next month; prepare now for your outing. Traffic: VE4RO 193, VE4FA 113, VE4KE 35, VE4CR 20, VE4EF 14, VE4JA 12, VE4NE 10, VE4YC 8, VE4LN 6, VE4QJ 5, VE4EJ 4, VE4HA 4, VE4OP 4, VE4XN 4, VE4FO 3, VE4YQ 3, VE4FU 2, VE4JF 2, VE4RRC 2, VE4TE 2, VE4YP 2, VE4BC 1, VE4HR 1, VE4HS 1, VE4OM 1, VE4PA 1.

MARITIME — SCM, W.D. Jones, VE1AMR — PAMs: VO1FX, VE1YO. RMs: VE1RO, VO1CA. It is with deep regret I report VE1ADM, VE1OW and VE1VX as Silent Keys. VE1APE and VE1AIC helped to set up The Radio Mt. Allison Campus Radio station in Sackville, N.B. Three stations were operated by White Caners in conjunction with White Cane Week. In St. John, N.B. VE1ZW/1 operated on Feb. 11, assisted by VE1s TS, AVA and JE. In Moncton, N.B. VE1AAB/1 and VE1ACC/1 operated on Feb. 12 assisted by VE1s WV, AMF, CX, EL and AMB. In Halifax, N.S. VE1RO/1 operated on Feb. 12 assisted by VE1s AOZ, AGU, OM, GC, AIH, ASN, TG, LU and FQ. All operations were successful. The Society of Newfoundland Radio Amateurs "SONRA" is now acting as a Provincial Society. VO1BH, active since the early 30s is presently racking his memory of the early days of amateur radio Newfoundland and putting the story down on tape. s QNI 42, QTC 44 in 27 sessions. APN reports QNI 131, QTC 128 in 29 sessions. Traffic: VO1CA 164, VE1ARB 156, VE1RO 96, VO1GQ 69, VE1AMR 68.

ONTARIO — SCM, Holland H. Shepherd, VE3DV — Anyone wanting to pick up QSL for the Scarborough ARC25 Award is urged to check in to the VE3WE/3 net at 1030 Sun. on 28.4 MHz and 1145 on 3760 MHz. Congratulations to VE3FJM on receiving his Advanced Class license. Feb. had it's usual package of snow and wind. Many twisted beams and folded towers have been reported. ONTARS is fast becoming the most important thing to happen on the Ont. scene in many a year. It is most unfortunate that its coverage is restricted by the use of 75 meters. All clubs are urged to plan for their participation in the ARRL sponsored Field Day which falls on the week end of June 24. VE3CJ, Canadian Division Dir. spoke to the Hamilton ARC in Feb. The HARC may host the 1974 RSO Convention. All Ont. ECs are requested to establish liaison with your local FMO communications officer if you have not already done so. Ontario's only Region level NTS net moved to 3653 kHz (alternate 7040 kHz) Mar. 1. VE3GFN has taken over as mgr. of OQN which meets at 0001Z on 3535 kHz daily. VE3GOG is new mgr. for NWON 3750 kHz at 0015Z daily. Traffic handlers are urged to obtain telephone numbers when possible, it makes delivery so much easier. Congratulations to new ORS appointees VE3EHF and VE3SB. Traffic: (Feb.) VE3DV 184, VE3DPO 140, VE3ERO 133, VE3GFN 118, VE3SB 84, VE3FXI 74, VE3AWE 73, VE3EWD 73, VE3GBR 57, VE3ATR 53, VE3HQZ 44, VE3GJG 34, VE3GT 30, VE3BPC 28, VE3FGV 23, VE3EHF 21, VE3ASZ 20, VE3DU 20, VE3FRG 14, VE3GNW 5, VE3DVB 3, VE3DH 1. (Jan.) VE3CRW 9.

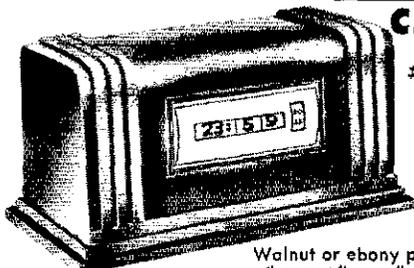
QUEBEC - SCM. Joe Unsworth, VE2ALE - The RAOI 1972 convention to be held on June 30 and July 1, 2. 1972 at Cite des Jeunes at Vaudreuil Quebec please participate. MARC dir. for 1972 are VE2s PQ, ZH, NB, HI, BQK, SH, AD, II, BYS, BF-W and DE-E. Change of calls are VE2AII to VE2ZX and VE2XE to VE3UH. Sorry to hear that the XYL of VE2MF passed away. VE2XW est certainement une des repetitives les plus occupees au Quebec aussi leur reseau d'information le dimanche soirs, aussi questions de leurs directeurs d'RAOI. Et en plus le mercredi soirs le reseau des poces de VE2DIH. Encore cette annee VE2CRS a organise de tres interessantes activites a l'occasion du carnaval souveiner de Chicoutimi. VE2APF en sait quelque chose! VE2SO opere maintenant de Chicoutimi-Nord. VE2WM reports a great amount of activity on the VE2AQC net for the Jan. '72 SET and also reports a new net - Quebec, Labrador Emergency Net on 3.765 MHz at 0830 local or Tu. 0130 GMT. VE2EC reports things are routine in his area. VE2WM also mentions that very small participation in the cw portion of VE2 contest week end Feb. 27. The VE2RM repeater now has an automatic frequency checker (Road-Runner) thanks to VE2BHH and company. PSHR. VE2APT 24. Traffic: (Feb.) VA2UN 171, VE2DR 134, VE2BP 58, VE2FC 29, VE2ALE 27, VE2WM 18, VE2AJD 11, VE2DLG 11, VE2OJ 10, VE2APT 5. (Jan.) VA2UN 110, VE2BP 52, VE2OJ 30, VE2DLG 2.

SASKATCHEWAN - SCM. Barry Ogden, VE5BO - A series of tests was carried out for three weeks on 7175 at 1900Z. Results should be in soon and could be very encouraging toward establishing an alternate ARRL Net frequency should 3780 prove unusable. Slow-Scan TV is one of VE5GF's endeavors these days from Saskatoon. For clubs that might be interested; there are a great many informative films available from ARRL Hq. which cover both the technical side of things as well as information on ARRL organizations and duties thereof. Again we would like to request that you send me any information that might be of interest to VE5Land. Remember the Hamfest in Moose Jaw this summer! Traffic: VE5LG 258, VE5GL 164, VE5SC 108, VE5CU 26, VE5RO 15, VE5DN 9, VE5KZ 7, VE5QO 3, VE5YR 3, VE5EF 2, VE5SM 2, VE5KF 2, VE5XJ 2, VE5JH 1, VE5LN 1.

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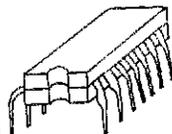
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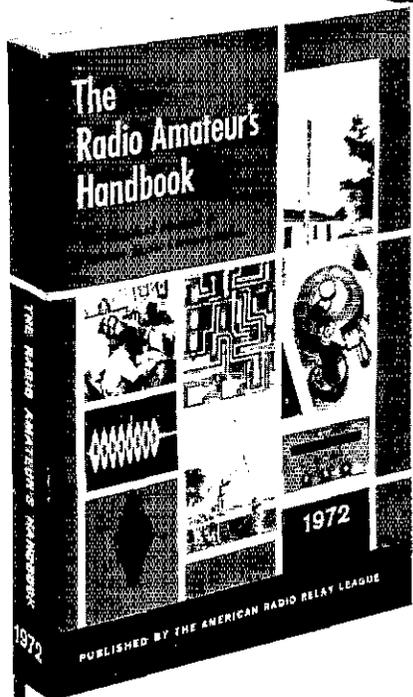


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QSLs??? Samples 25c. With DeLuxe 50c. Religious 25c. Sakkers, W8DFD, Box 218, Holland, MI 49423

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QSLs 300 for \$4.65, samples dime, W9SKR, Ingleside, IL 60041

RUBBER stamps \$1.50 includes tax and postage. Clint's Radio, W2UD0, 32 Cumberland Ave., Verona, NJ 07044.

QSLs "Brownie" W3CJL, 3111 Lehigh, Allentown PA 18103. Samples 10c. Catalog 25c.

DELUXE QSLs, Petty, W2HAZ, PO Box 5237, Trenton NJ 08638. Samples 10c.

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COMPLETE QSL catalog! 300 cuts, 10 report forms, ink and stock samples, plus ten sample QSLs, 25c. Cornelison's Quality QSLs, 321 Warren St., N. Babylon, NY 11704

DON'T buy QSL cards until you see my free samples. Fast service, economical prices. Bolles, Little Print Shop, Box 9848, Austin TX 78757.

QSL, SWL, WPE cards. Samples 25c. Log books, file cards, decals. Malgo Press, Box 375 Toledo OH 43601.

QSLs, SWLs, WPE samples 15c. Nicholas & Son Printery, PO Box 11184, Phoenix AZ 85017

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Excellent QSLs, reasonable. Samples 25c. W9CL Press, R.R. 1 Box 811, Carmel, IN 46032

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ONCE again available: Beautiful, exciting QSL, SWL cards from plates of late Warren Roger KA0GB. Samples 25c. Jim Patterson, 3013 North Victoria, St. Paul, MN 55113

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WANTED: All types of tubes. Top prices paid for Varian and Elmec, P.O. Box 414, Orlando, FL 32802. Jaro Electronics Corp.

WE buy tubes. Mantine International, 834 Hemlock St., Franklin Square, NY 11010

CASH paid for your unused tubes and good ham and commercial equipment. Send list to Barry, W2LNI, Barry Electronics, 512 Broadway, NY 10012.

WIRELESS sets, parts, catalogs, bought, traded. Laverty, 118 N. Wyeombe, Lansdowne PA 19050.

WANTED: An opportunity to quote your ham needs. 33 years a ham gear dealer. Collins, Drake, Galaxy, Tempo, Kenwood, Ten-Tec, Hy-Gain, and all others. Also \$25,000 inventory used gear. Request list. Chuck, W8UCG, Electronic Distributors, Inc. 1960 Peck St. Muskegon MI 49441. Tel: 616-726-3198

HAM ticket - Amateur radio license course for Novice, General, Advanced, Extra Class. Write for information. Clayton Radio Co. 220 Mira Mar Av. Long Beach CA 90803.

SPIDERS for boomless quads. Helicar welded aluminum. Al's Antennas, 1339 So. Washington St., Kennewick, WSN 98336

WE buy electron tubes, diodes, transistors, integrated circuits, semiconductors and resistors. Astral Electronics, 150 Miller St., Elizabeth NJ 07207. Tel. 201-354-2420

WANTED: Teletype machines, parts Models No. 28, 32, 33, 35, 37. Cash or trade for Drake equipment. Allronics-Howard Co., Box 19, Boston MA 02101. (Tel: day or night 617-42-0448)

VERY in-ter-est-ing! Next 6 big issues \$1. "The Ham Trader," Sycamore, IL 60178

QCWA Quarter Century Wireless Association is an international non-profit organization founded 1947. Any Amateur Radio Operator licensed 25 or more years is eligible for membership. Members receive a membership call book and quarterly news. Write for information. Q.C.W.A. Inc., Box 394, Mamaroneck, NY 10543.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't, police, etc. invited to join Society of Wireless Pioneers - W7GAQ/6 Box 530, Santa Rosa CA 95402.

AN INVITATION NYC area hams and SWLs are invited to attend NY Radio Club meetings 2nd Monday of every month, Williams Club, 24 E 39th St near Madison Ave. at 8 PM - interesting programs.

HAMFEST - Wabash County ARC fourth annual hamfest, Sunday May 21, rain or shine. Admission is still only \$1. Flea market, food, tech talks and much more. For information write Bob Mitling, 663 Spring, Wabash IN 46992.

A.W.A. National Historical Radio Conference, Smithsonian Institution, Washington, D.C., Sept. 23. Further details in August QST.

EDITING a club paper? Need public relations help? You should belong to Amateur Radio News Service. For information contact Rose Ellen Bills, WA2FGS, Secretary, 17 Craig Pl., Pennsville, NJ 08070

FREE sample copy Long Island DX Assn. bulletin. Latest DX news, business, s.a.s.e. to K2APV, Box 532, West Hempstead, NY 11552.

WARREN ARA's famous hamfest, now family style, Aug. 20, Yankee Lake, Ohio. Gigantic flea market, swimming, picnicking, playground, all free. Camping available. Details: QSL W8VTD.

SBRC Hamfest: June 4 - same site as last year. Near Ottawa, Illinois. Registration - advance, \$1.50, \$2.00 at the gate. For details write: G. E. Keith, W9QLZ, RFD No. 1, Box 171, Olesby, IL 61348

BE PATIENT! Only 170 days left before the gala opening of the Hudson Division Convention! Exhibits, lectures, 2-meter fun, RTTY, contests, gabfests, New York sightseeing, fun. Free gift for each early registrant. Oct. 21-22, Hilton Motor Inn, Tarrytown, NY. Info from Dave Popkin, WA2CCF, 303 Tenafly Rd., Englewood, NJ 07631. Worth waiting for!

ROCHESTER, N.Y. is again Headquarters on Saturday, May 14th for one of the largest Hamfests in the East. Full day of programming covering all phases of amateur radio, plus huge surplus equipment sale. See Hamfest Calendar for more information.

TRANSFORMERS rewound, Jess Price, W4CLJ, 507 Raehn, Orlando, FL 32806

WANT wireless (ready) magazines and equipment for W4AA historical library. Wayne Nelson, Concord, NC 28025

CAPACITORS - Brand new aluminum electrolytics, 275ufd at 500vDC. Top for \$19.50. K4THP, 6835 Sunnysbrook Ln., NE, Atlanta 30328

TV camera kits, plans, parts. Go ham TV the easy, economical way. Catalog 25c. ATV Research, Box 453-Q, Dakota City, NE 68731

CASH or trade for pre-1925 radios for personal collection. Carl Osborn, W6RXP, 13816 Calvert St., Van Nuys, CA 91401

NOVICE Crystals. Free flyer. Nat. Synthetic Electronics, Umatilla, FL 32784

TYPETRONICS needs your unused Teletype parts, M.14 up, for cash or trade. Typetronics, Box 8873, Ft. Lauderdale, FL 33310. W4NYF

NOVICES: Need help for General ticket? Complete recorded audio-visual theory instruction. Easy, no electronic background necessary. Write for free information. Amateur License, PO Box 6015, Norfolk VA 23508.

RECEIVING & Industrial tubes, transistors, all brands - biggest discounts. Technicians, hobbyists, experimenters - request free giant catalog and save! Zalytron, 469 Jencho Turnpike, Mineola, NY 11501

WANTED: tubes, transistors, equipment, what have you? Bernard Goldstein, W2MNP, Box 257, Canal Street, New York, NY 10013

TOWER climbing safety belt/lantern \$21.50. Prop pitch rotor \$65. P/S 175 frequency meters \$45. 2M handtalk \$50, coax rf switches multiposition \$16-\$48. Free list. Link, 1000 Monroe Tpk., Monroe, CT 06468

WANTED: BC-348, BC-375. State conditions, best prices. Lee, P.O. Box 440, New York 10013

SELL: KW-1 \$600, 32V2 \$100, HRO-50T1 \$90, HO-13 \$50, TR-108 with V-107 \$75. Local pickup. J. B. Catlin, W9WZY, 100 Grant, Neeriah, WI 54956. Phone: 414-725-9330

SSTV Robot camera No. 25123. Robot monitor No. 29138. 25mm f/2.8 25mm f/4 Macro lens complete \$850. SB-620 Hanscan \$100. W3AVJ, 717-286-1151.

SELL: SB-303, cw filter, SB-600, exceeds factory specs. \$320. W64VQZ, John Williams, Apt. B102, 1300 Warren Hites Dr., Augusta, GA 10901. Tel: 404-722-5003

INTERESTED finding French teachers, students, or French-speaking hams willing to speak French on ham bands with high school students. K7SPH, Box 4099, Tucson, AZ 85717

WANTED: Hallicrafters SR-2000, must be mint. Cash. W6EAO, Box 203, Manson, IA 50563

HAMMARLUND all band transmitter HX-50A, \$325; HX-1 linear amplifier, \$250; HQ-180AC with blander, \$350; S-200 speaker, \$18; Clegg 22'er MK II, \$225; HQ-215 all band solid state receiver, \$250. All mint condition. Swan vertical, \$35; Hy-Gain 2 meter "A" pole, \$35, like new. Hy-Gain THDXX, good \$85. Request list of Heath test equipment. W2ERV, 14 Bernice, Freehold, NJ 07728

SWAN 500-C w/ac, just factory overhauled \$90.-, Swan MK I linear 2000 W w/2 new finals \$85.-, Hammarlund HQ-170 a/hf factory overhauled \$20.-, Mosley 10-15-20 cub. quad never used \$75. Heath HM-10V watt meter 25.-. Converting to Collins gear. W1UQA, 802-985-2843, Shelburne, VT

HAMMARLUND HX-50 ssb, a-m, exc. w/citer. \$1150 or best offer. Jim Wilson, 202 Fowler, West Lafayette, IN 47906

FOR SALE: Hallicrafters SX-101A receiver, superb condition, w/speaker, \$180. Hammarlund Super-Pro WWII receiver w/pwrpk, excellent, \$98; Searer, 2403 Macloya Ln., Santa Fe, NM 87501

WANTED: late Collins S-line and accessories. Drake C-4 console. Allan, WA2NDU (201) 871-4644

MUST sell: immaculate mint Hallicrafters SX115 receiver outperforms most receivers today \$290; matching transmitter HT32 \$195; and matching linear HT33B which floats along at full kW \$290. Prices firm. org. boxes & manuals. One owner gear. Also have Novice gear: HT40 \$40; Globe Scout-680A \$35; CE20A \$70; receivers Heath \$3300 \$180; S-108 \$95; CMJ \$70; verified check, money order. WA4LXX, F. E. Coble, 251 Collier Ave., Nashville, TN 37211

1000 PIV @ 1 amp, diodes, new, epoxy, includes disc bypass and bridging resistors. 10 for \$2.50. 7/8 x 1/4 ceramic slug tuned coil forms, 5 for \$1. Ferrite and powdered iron cores, slugs, rods, etc., sample package 1/2 lb. \$1. Prepaid U.S.A., East Coast Electronics, 123 St. Boniface Rd., Cheektowaga, NY 14225

SALE: Model 19 teletype \$140 firm. No shipping. W1SUQ, 203-933-0594

WANTED: SB303, SB401, SB220, HM102, SB610, Hy-Gain TH6DX, W2UGM, #6 Columbus Ave., Closter, NJ 07624. 201-768-1884.

HAMMARLUND HX50 A transmitter 10-80 meters. Write WA3GPA, 295 W. Prospect Ave., Pittsburgh, PA 15205

SELL: 30S1 \$800, NC200 with pwr sup \$250, Hy-Gain 2 ele quad \$60, W2UJG, 2285 Holly Ct., Northbrook, IL 60062. Phone: 312-272-2443

SELLING my entire station, plus test equipment and many components. Send s.a.s.e. for list and prices. K5KDL, 2212 NW 40th, Lawton, OK 73501

WANT to buy: a Central Electronics 600L amplifier using an 813 in Class AB2. Sure it's outdated by newer linears like the SB-200, but is needed for experiment. State condition and price. Will need instruction book. W2ZC, Harold Churchill, 282 Snowden Ln., Princeton, NJ 08540

CHICAGOLAND hams! We have your needs. KM Electronics, 7622 Belmont, Chicago, IL

NOVICES: Drake 2-NT transmitter \$100. Hallicrafters SX-101 Mark II receiver w/extra filters, 160-10+WWV coverage, \$120. 350+ Texas crystals 1T-243 unused, perfect \$40! Call 6:00. Felix Triestman, WA2IPG, 150 Overbrook Ave., Great Neck, NY 11021

WANTED: Collins mechanical filter F 455 J-21. Frank McJannet, 11657 Evanston N. Seattle, WA 98133

MINT condition guaranteed: TR-3 \$345; AC-3 \$50; NCX-500 and AC-500, \$295; SR-150 \$285; AC \$58; DC \$50; MB-150 \$15; 32V3 \$175. Prices firm. Elvin Miller, Box 869, Marion, IN 46952

SELL: Heath SB401 \$250, SB301 \$250, SB600 spk. \$10. Millen transmatch 1T, 320 K602 bread in cw \$50. All postage paid. Paul Kubik, 402 Fourth St., Rochester, MI 48063

SUMMER DX special: Vacation in New York near Adirondacks, Herkshires, and Saratoga on highest hill in Schenectady County overlooking beautiful lake. Cottage with all conveniences available for two-week periods July and August. Antennas and sails 150 meters to 439 mt. included. Best view and D location in East. Write for complete information. Allens, W2CRS, Manville, NY 12053

LEARN Morse Code the fast, easy way with "Codette." One hour of convenient, easy to use practice material on cassette tape. Instructions included. \$2.50 postpaid. "Codette," Route 3, Box 278, Arkadelphia, AR 71923

COLLINS: Instruction manuals for all current models. \$5 each plus 75c. Inc. Class or \$1 Airmail. Ham Radio Center, 8342 Olive Bl., St. Louis, MO 63132

WANTED: Collins 136A-1 noise blander. Excellent condition with manual. Joe Patterson, W7MG, 8011 North Washburne Ave., Portland, OR 97217. Telephone: (503)285-3477

TEKTRONIX 545-CA-2 trace & oscilloscope \$1200, teletype 23ASH \$400, Mite \$250, H-P test equipment, counters, DVM, 2CA computer at junk prices. Free list. Perera, 410 Riverside Dr., NYC 10025

SELL: Eico 753 transmitter, with homebrew power supply \$90. W5DSD, Apt. 27, 200 Rebecca, Bryan, TX 77801

WANTED: schematic and/or manual for World Radio Laboratories Globe Chief model 90 center. Ed WabyXK, 231 Woodland Trail, Warner Robins, GA 31093

TEN-TEC RX10 receiver, never used, with guarantee card, \$50 delivered \$48 states. Fred Firestone, WN9IEE, 806 North School St., Normal, IL 61761

SELL: National NCL-2000 linear amplifier with extra set tubes and parts. C.O. Lindemann, W1MLM, Zacheus Mead Lane, Greenwich, CT. Tel: 203 661 6054

KWM-2, perfect condition, with ac power supply, \$575. Heath HB 101 frequency counter, new, \$175; 6214 1957 to date, \$3 per year if picked up. Arch Doty, W6CFU, 313-437-1938

CONTACT us for new or reconditioned Collins, Kenwood, Tempo-One, Drake, Galaxy, Hy-Gain, Mosley, Henry linear, towers, antennas, rotators, other equipment. We try to meet any need and to give you the best service, best price, best terms, top leadership. Write for price lists. Try us. Henry Radio, Butler, MO 64730

VAESU FT 101, serial 116289, purchased December 71 from Pyrotechnics full price - great rig - no time to operate - used 3 hours - never mobile - complete as advertised including new mobile mount, \$500 firm - 4 day shipping. References available. Write business address. Harold Weinberger, WA1KG 350 Mirabelle Mile, Coral Gables, FL 33134 or call days: 305-448-9863, nites 305-534-4450

SBE-34 and SBL-2-A combo \$300, Transcom-3 \$225, Hallicrafters \$36 \$50, Industrial 5144 with 3 filters plus an Eldico Sidebox. Generator-a superb combination \$850. A Marconi a-m-tri modulation Test Meter beautiful \$800. (Write) 75A4 with noise blander high serial like new \$450. S.a.s.e. for complete list. Trades considered. Reveal, Lawrence Rd., Dover, NJ 07801

GLEGG Interceptor B & 2 meter receiver and Chimaster Zen 6 w/ac 2 meter transmitter. Best offer over \$600. K3JDU, R.D. No. 1, Box 133CC, Derry, PA 16227, 412-537-6068

FOR SALE: Swan 850; P.S. 117XC; #10 VFO; Turner #2 mic manual. All in mint condition - \$350. W3KNU, 16100 Pot Meadow Lane, Bowie, MD 20715

SELL NCX-3 ac supply \$160; SBE-34 plus accessories \$270 Bruce Tis, K1WVY, 97 St. Stephen St., Boston, MA 02115 617-261-3251

SELL: Valant/1-A; CE-20A with CE458 \$120, 2-C with Ameer PCI, Nuistor preamp pickup only \$135. W2DF, evening (616)MY-4-0253

BC-221-J (Zenith) ac; original cal. Book. Clean; excellent cond \$50. Heath, Gnd-dip (tunnel-diode), brand new; \$21. Miller R-9er. RF preamp. \$16. Dineen, 9 Winter Terrace, Westwood MA 02090

HW-101, cw filter, HP-23, SB-600. Absolute mint cond \$366 HT-41 linear (572-B conversion) exc. cond. New tubes \$121 Pickup only. George Flanagan, W2KRM, 16 Hughes Ln., North Babylon, NY 11703

WANTED: Drake T-4XB and AC-4. Bob Manfredi, 14 Cayu Ln., Rolling Hills, CA 90274

DX-60 B, HR-10 B, VFO, antenna, tuner, cables, and station switchbox. Setup got me WAS in four months as a Novice. Perfect. First \$150 takes it. You ship. WA6JXE, Jeff Theede, 235 Canon Dr., Santa Barbara, CA 93106. (805) 587-7023

MAGAZINES: QST Jan. 1951-March 1970 complete (1951-1959 in binders); CQ 1947-1969 missing 6 issues. Also ARRL Handbooks 1947-1959. Make offer. M. P. Southworth, RFD 3, W. Redding, CT 06896

YAESU FTdx 560 with speaker and cw filter \$400; Electrovoice 619 microphone \$20; Heathkit SB-610 monitor scope \$45; Heathkit HD-10 keyer \$30; Hustler 4BTV vertical \$25; all perfect. Doug Henry, WA0HD/6, 292 N. Main St., Orange, CA 92668

SALE: Motorola 2MFM repeater/base station FSTRVRWZ-250BRE amplifier-power supply, ac 30D, fm station monitor model F4MU24BB1B, two mobile dc 30D; Collins 75A1 with speaker 800 cycle filter \$125, 32V-1 \$80, ART-3 w/ps \$40, Hammarlund Super Pro w/ps \$40, Pyrex 67017 xmitting insulators \$1.50. Harlow Blain, 274 Hermosa Dr., Bakersfield, CA 93308.

NEED NCX5, assortment of Toroidal coils, cores, transistors. Sell NCX3, mint condition, \$150. R. Jones, 111 Hillside Rd., Farmingdale, NY 11735

SB102, HP23A, HD10 keyer. Tri-band quad all \$375. Pair 572B 2 amp. \$50. KiliGO, Clinton, CT 203-689-2458

BC610-E, BC614-E speech amp. ESPEY R366/TRR-5. Johnson Matchbox 250-23. Spare power tube, many extras. Best offer. 218-2838947. R. Mohelski, Rogers Route, Inlet Falls, MN 56649

TRADE. NYC area only. HT-40K xmt. Knight VFO, and R-100A revr. for Lionel Electric trains or \$100 cash; Emmett Ward, WB2LJY, 645 East 14th St., New York, NY 10009

HAMMARLUND HQ 110-AVHF, 2 through 160 meters, \$140; Elmac AF-37, \$35. Home brew 2 and 6 meter converters, best offer. WA8BCJ, Robert Bohland, 6470 Strausser, North Canton, OH 44720. 216-499-3105

FOR SALE: DX-60B \$65; HG 10 B VFO, \$35. Randy Connett, WA6PNE, 2471 Lunada, Walnut Creek, CA 94595

FOR SALE: SR2000, power supply \$850; SB610 monitor \$40; Collins 310B \$50; Collins 1.5 kHz mechanical filter (75A4) \$40; Collins 4, 8, 16 kHz mechanical filter \$20; HP623B signal generator \$150. Brucella, 60 Willow, Shrewsbury, NJ 07701

SB-303, excellent working condition, 4 months old, \$295. Joe S. Belmont, 24 Brookfield Ln., Centereach, NY 11720. 516-732-1846

SELL: Heathkit DX-60 and HG-10 \$50 good condx; HR-10B \$50 very good cond. Jim, WB8FEZ, 4306 Farmercrest, Flint, MI 48056. (313)743-6390

WANTED: National VFO VX501, new or used in good condition. VE5LL, Ervin Lobb, Box 566, Melfort, SK, Canada. Zip - S0E 1A0

SELL: HW-16 and HG-10B, \$100 plus shipping. Hammarlund HX-50 and HQ-110A, \$400 plus shipping. Both excellent condition. Wanted: Free standing tower to hold 8 sq. ft. beam. Write Gordy, WA2RUP, 183, Cornelia St., Plattsburgh, NY 12901

FOR SALE: Save \$200, buy my Kenwood pair, R599 and T599. Used only two months, will state reason for selling upon request. Price \$544, prepaid. Jack Yeaman, W8VHY, R No. 4, Washington Court House, OH 43169

ANYONE have Command Sets in the SCR-274-A, -B, GT/RBD, Type K, Type A, or RAV series? Wanted for historical purposes, including data, development information, photos. G. White, Box 3227, Alexandria, VA 22302

HALLICRAFTERS SX-110, \$120; Heathkit HX-10 Marauder, \$140. Both in exlcat cond. WA1FFH, Bob Weaver, 26 Alma Rock Rd., Stamford, CT 06903

FOR SALE: Heathkit HW100 sbt trans. factory call! - HP-23A power supply - SB600 speaker HBP-21A desk mic - Cantenna dummy load - HD-16 code oscillator - Vibroxip auto key - HW11 SWR meter. Complete station - \$360. James Kunkle, W1DBG, 29 Hall Pl., Exeter, NH 03833

"Don and Bob" guaranteed buys. Motorola HEP170 epoxy diode 2.5A/1000PIV 39c; Cap; Sangamo DCM600MFD/460V 425 computer grade 10000MFD/15V 1.9c; 6.2V/600MA transformers 1.9c; Ham-M 99.00; TR44 59.95; AR22H 31.95; CDE rotor parts stock; Mosley CT-35 114.00; CL36 134.00; Hy-Gain TH6DX 139.00; 400 rotor 148.00; Hyvac 99.00; Gladding 25, ac 255.00; SBE144 2MFM 199.95; Triax MW60 229.00; Icore 2408T coil 5.00; Ray 61Q6 3.50; Collins 75A4 (clean) 395.00; SX116 250.00; Tempo Kenwood dealer. Prices correct. Write quote note, Warranty guaranteed. Madison Electronics 1508 McKinney, Houston, TX 77002. (713) 224-2668

DELCO CVT-1, 30 watts. Has 34/94, 76/76, 4 channel capability. \$150. W. R. Klum, WA7000, Broadus Stage, Miles City, MT 59301

SR-150 xcvr exc. cond. with Hallic. dc supply plus homebrew ac supply. \$295. W. A. Nelson, Rt. 5, Box 310, Lockport, IL 60441

DRAKE 2C, 2CQ, NB, XTL, cal., perfect \$200. Eico 720 Novice xmt. \$45. Instructor graph with code tapes \$25. WN4SYM, 1504 Elmhurst Dr., El Paso, TX 79925

HALLICRAFTERS SR160, dc supplies, Hustler ant. with resonators, Mounting bkts. Manual, etc. \$195. Pick up only. WA2NDO, 210 Appian Way, Middlesex, NJ 08846. 201-469-3594

TECH manuals - \$6.50 each: R-388/URR, R-389/URR, R-390/URR, R-390A/URR, R-220/URR. Hundreds more. S. Consalvo, W3JHD, 4905 Roanoke Dr., Washington, DC 20001

AMECO PT preamp, used 5 hours. \$50 Heath HO-10 monitor scope, excellent condx, \$45, oldstyle Hy-Gain 400 rotor \$45, 3 element Hy-Gain tri-band beam \$25, Transmatch with antenna switch \$35. Bob Ensminger, 11388 Campus, Loma Linda, CA 92354

SWAP - Will swap a 28 ASR, just overhauled, for a Collins 51J (R388/URR) receiver. Will ship. Contact Dick Volk, WA2BUC, 538 Morris St., Albany, NY 12208

HEATH - sell SB301/401 w/cw filter, Turner 454C mic, 4BTV vertical, excel. condx. \$525 or best, WB9BXV, 5116S. Carpenter, Chicago, 60609

GALAXY GT-550 like new, just factory modified and aligned, still in sealed factory carton. With ac supply \$325, G-1000 dc supply \$65. Want Swan Cygnat 270-B, W7LEB, 1911 Southmoor Dr., Salt Lake City, UT 84117. Phone: 801-277-1066

WANT: Collins 312B-4, sell HW32 \$65, K4GAX, Frank Wakefield, Franklin, KY 41344

WANTED: QST magazines, 1929 or older. Give price and condition. W5TCH, 3634 Ainsworth Dr., Dallas, TX 75229

CQ magazines, Nov. 46 to Oct. '63, inc., good condition, no shipping, make offer. W9DP, P.O. Box 66, Salem, WI 53168

SELL: Swan FM-2X, AC-PS, 7 channels, mint condition \$209. Hustler BBL-144 antenna, new \$19. W2ZKD, 3511 Barnes Ave., Bronx, NY 10467

HW-16 Heathkit Novice transceiver, excellent condition, \$75. Johnson 275W Matchbox, \$25. Heathkit reflecting power meter, \$15. S. Becker, WN2OSS, Apt. 15B, 320 South St., Morristown, NJ 07960. Tel: 201-287-0635

FIELD Day masts: aluminum alloy, 9-1/2 x 3" OD, 20 lbs. each. Unused. Extremely strong. \$7-15 each. Kleinschmidt teletypewriter w/aut. LP CLR, \$75. Aircraft emergency horn, 28V/5.5A, \$35. K3MNIJ, 8361 Langdon St., Phila, PA 19152

SELL: KWM-2, Q-mut., PM-2, 75S-3C, 500 Hz; 32S-3, 51F-2; DX engineering processor; Ham-M; Eico 717 keyer; HP-23A; Ameco P-1; Kat. F1V TM (203-224-4581)

WANTED: 75A4 500 cps mechanical filter. Yaesu FT-101, John Kelsey, 2 Montcastle, Chelmsford, MA 01R24

FOR SALE: New 4-d-82 tubes, \$8 postpaid, W2RXW, 405 Saytes St., Oneida, NY 13421

HEATH DX-60B excellent condition with new final \$60. You ship. Glenn Birkel, 24 Crown St. Hicksville, NY 11801. 516-938-0348

GONSET II - 2 meter transceiver - 6 or 12 volt - \$50; Gonset III - \$70; Clegg 25er - \$125; Poly Comm IV \$125. WB2GKF, Stan Nazimek, Jr., 506 Mount Prospect Ave., Clifton, NJ 07012

TRI-XE 51-foot self-supporting crank-up tower, Swan 4-element wide-spaced tri-band beam, TR-44 rotor, all cables and connectors, system slightly over one year old; excellent condition. \$375 or best offer. WA6JXJ, 3308 West Commonwealth Ave., Fullerton, CA 92633

SWAN 500 CX complete station with 117V and 14V supplies, microphone, cable, key and cable, manual, all brand new unused purchased from factory for expected ocean voyage of small motor sailor which was cancelled due to emergency. Equipment is in original cartons, not removed for any purpose, all just as received from Swan Electronics eastern offices. Will ship in original cartons. \$375 plus shipping. Inquire if interested in small boat antennas and related items. Dr. Davis, Room 1021, 40 Broad St., Boston, MA 02109

HOOSIER Electronics Your ham headquarters in the heart of the Midwest where only the finest amateur equipment is sold. Authorized dealers for Drake, Regency, Hy-Gain, Ten-Tec, Galaxy, Rohm-Spaulding, Electro-Voice, and Shure. All equipment new and fully guaranteed. Write today for our low quote and try our personal, friendly Hoosier service. Hoosier Electronics, Dept. C., R.R. 25, Box 403, Terre Haute, IN 47802

SELL: Hallcrafters SX-122 general coverage receiver. Asking \$150. Anthony Parise, WA3HR, 204 West Douglas St., Reading, PA 19601

HAMMARLUND HQ140XA covers a-m through 10 meter bands. AVC, BFO, 5 meter, bundspred, x-tal phasing, and x-tal selectivity. Mint condition. Best offer under \$90. Clarence White, 150 Boulevard Rd., Keokuk, IA 52632

TO SETTLE estate of W6NIT: SB110A with HP23A \$250; HQ170C \$120; HO10 monitor scope \$40; s.a.s.s. for various other equip. & instruments. Contact A. A. Trumble, 1311 So. Glendale Ave., Glendale, CA 91205. 213-242-0718

TV projector Norelco model PA-2A, produces 9' x 4' B&W picture on screen, \$218. No shipping. W9QDG, Grouit, 610 Canton, Wheaton, IL 60187

HEATH SB100 with HP23, cables, mic, manuals \$250; Heath HT-1, HP20, Johnson Viking II. Best offer. C. H. Willard, 110 Winchester Dr., New Hartford, NY 13418

CX7: Signal/One - must sacrifice due to illness. Absolutely perfect condition, plus Drake L4B, Heathkit SB-610, and HM-15 with all connecting cables etc. Call W2EXS, 212-242-6712

HAM radio counselor, male, for co-ed camp in the Berkshires, Massachusetts. Able to instruct campers in fundamentals of ham radio. Fully equipped ham radio station. Write to Robert Kinoy, Camp Taconic, 451 West End Ave., New York, NY 10024

VHF transceivers, amplifiers, spares, test and bench equipment, complete schematic files from marine and mobile shop. List from Box 429, Cape May, NJ 08204

KWM2, 516 F2, speaker, Turner microphone, Collins fone patch and Collins directional wattmeter, like new \$700. Al Sudley, Box 93, Bayport, NY 11705. 516-472-0366

COLLINS 312B-4, \$125; and 755-1 with 2.1 kHz and .8 kHz filters and Collins noise blanker, \$250. Both mint, never mobile. FOB WA5TNW, 73036

FINE stainless brass, other, threaded, washer, hardware fasteners! Guyton, accessories! Thumbclerk! Cable clamps! Thumbless! Insulators, Lists 20c! Walt Strasser, WBRLR, 29716 Bnabank, Southfield, Mich. 48076.

FIRST \$250 takes Swan 350 and ac power supply. Works perfect - xtal. cal. - new tubes - spare filters - manual. Davey 313-664-6956; evenings 313-664-8293. Edward Oyster, WBNCJ

HW-101 transceiver kit wired to alignment, \$225; college professor too busy to finish. HP-13 dc mobile power supply, \$60. Knight R100 amateur receiver, \$90. 20-15-10 Hy-Gain antenna and balun, \$90. Shipping costs extra. W9LHQ, 1836 24th Ave. Place, Greeley, CO 80631.

MARINE electronic equipment - Make money in your spare time. Sell vhf, radar, and all types of marine gear. Send for details. RAD-COM, Inc., Mamaroneck, NY 10543

WANTED: Heavy duty 70 foot crank-up self-supporting tower. K4BYM.

DRAKE 1-A revr \$75. Eico 723 xmtr with SWR meter \$25. I will pay shipping insured/parcel-post. R. O. Crosmer, 2131 W. Palmyra, Apt. B, Orange, CA 92668

ALL excellent. Drake MN-4 \$80; new 2-NT \$120; Eico 720 \$30; 730 \$15; 722 VFO \$15; Heath SB-610 \$70; HW-12 w/mic \$90; HP-13 w/cables \$40; Husler mobile 80M whip w/fold over stand \$20; Rohm roof tower w/rotor plate \$20; new 2M 8/8 beam \$20. Will ship first checks take. Chris Daly, WA2BAN, 2 Timberhill, Livingston, NJ 07039. (201)992-5648

HW32, HP20 ac supply, HS24 speaker HB preamp, like new, \$95. K5QNY 214-424-3984, 2400 17th, Plano, TX 75074

NAVY receiver for sale. 80-560 kHz, 1.9-24 MHz, cw - a-m; loud speaker; instruction manual; best offer. Arthur Lukach, 295 Fifth Ave., New York City 10015

WANTED: CGSI conduction cooled tetrode equivalent to 4CX250B, state price. Jesse Newton, 1071 Prosser Ave., Prosser, WA 99350

WANTED: Heath HR-10 receiver, WB8KJA, 1628 Mallard Dr., Mayfield Hts., OH 44124 (216)442-2764

QST, 73, R9, Radio - back to 1930s. S.a.s.e. for list. Karl Townsend, W2FIV, 102 Cobblestone Dr., Moorestown, NJ 08037

FOR SALE: TR44 rotor control box control cable also 15 meter mono band beam (160A) including BN86 balun \$125. Ben W1RX, NY area only, G89-4604

FOR SALE: Many copies of QST magazines, some years complete, some single copies as old as 1922. S.a.s.e. for list and prices. Mr. Ted Winstead, P.O. Box 365, Elm City, NC 27822

SELL: Drake MN-2000 Transmatch, \$145 firm. Danny B. Conna, WA2NJR, 314 Kitchell Rd., Mamaroneck, NY 10543. (914)834-6464

WANTED: Swan 117KC supply. WA7AZQ, 1607 6 St., Coeur d'Alene, ID 83814

SCOPE RCA W91C \$145. Field strength meter Sencore FS 134 \$70. 4-400A slightly used \$12. E. Becker, 1021 Chestnut, Waukegan, IL 60085

HEATH SB-100 ac supply, excellent mint condx \$275; TR-1000A tri band antenna \$25. (213)342-5854. W6UCJ, 17622 Willard St., Northridge, CA 91324

SELL or trade: Dumont 343 17" oscillograph (CRT) and 2622 cathode-follower adaptor in good condition \$60. Pick up a must. Frank Fallon, WA2YVK, 118-43 228th St., Cambria Heights, NY 11411 (212)525-4433

FOR SALE: Collins 75A4; U.S. 3.1, 6.0 filters, vernier knob, manual, serial No. 4402, mint, \$495. M. M. Kovar, 3 Puddingstone Ct., Morristown, NJ 07960. (201)267-2921

SELL: National R.D.F.-66 never used, in original carton \$25. Used electronic instruments, now collectors items over 70 years old. Other old surplus radio parts. Send stamped envelope for list and prices. W3KB, 1061 Beverly Rd., Jenkintown, PA 19046

HAMMARLUND HQ-180-AX receiver, excellent, a-m/ssb/cw, .54 to 30 MHz and ham bandspread, selectivity 500 to 6000 Hz, two noise silencers, calibrator, crystal controlled frequency selection, \$249 or trade for good ham band transceiver. W7DL, 8633 E. Palo Verde Ln., Scottsdale, AZ 85253

SELL: Swan 250C with 117AX power supply \$300. Also Gonset GSB-288B 2 mtr with both 110AC and 12VDC factory supplies \$260. Both good and working. No trades or counter offers. Will deliver up to 400 miles or ship at your cost. Robert Monroe, WB9EIP, 177 Spttler Dr., Decatur, IL 62521. Ph: 1-217-422-2756

FOR SALE: Johnson Thunderbolt linear, 10W in/2kW PEP out. Continuous 3.5-30 MHz. Pr 4-400As. Excellent condition. \$350 or best offer. 75A4 Ser 1762 w 2.1 kHz filter. Good condition. \$350 or best offer. KW3-1 ser 282. Looks good, may need some work. Covers 60, 80, 40, 20, 15, 11, & 10 M. All with manuals. J. Stanis, P.O. Box 284, Sierra Vista, AZ 85635

DRAKE TR3; DC-3; AC-3; and MS-3. Mint condition \$425. Tennialah 10 M beam 3 element, gamma match, plytubular const. w/east alt. fittings. \$85. John W. Karr, W9FYU, 1119 Greenleaf Ave., Waukegan, IL 60091. Phone: (312)261-7342

SELL: Collins 3253 serial 11366 and 516F2 serial 16356. Brand new never used. \$695. Ivan Fry, 202 W. High St., Minerva, OH 44657

WANTED: Swan or Drake transceiver. All band. WINGI.

SWAP Industrial directories, Thomas, etc. Polaroid Print Copier. Need preamp, converter for Hammarlund HQ110A. Kennedy, 791 Greenwich St., NYC 10014

APACHE TX-1, excellent condition \$85. Jim, WA6ONK, 218-793-9011

DRAKE 2B, 2BQ, 2AC \$190. Heath DX60B \$60, accessories. MacPadyen, 300 Mill Creek, Fremont, CA 94538

WANTED: Approx. 250 watt cw transmitter, local deal. John Herbst, 85 Keeley Ave., New Britain, PA 18901

MILLEN Monitorscope 90932, mint \$70; Heath keyer, mint \$25; Instructograph, 10 tapes \$16. E. Martin, 202 Kenny, Fayetteville, NY 13066

JOHNSON kilowatt Matchbox with bridge, manual, Heat offer over \$100. R1JYV, Dave Hachodnan, 10 Orville Dr. Middletown, RI 02840

DRAKE R4A receiver, \$300; Yaesu FDX-400 transceiver, \$350. Both excellent condition. Jim Schroeder, 4311-E, 1st St., Long Beach, CA 90805. 213-434-0339

NOVICES - Drake 2C and 2NT with 2CQ plus 2NB noise blanker. Perfect condition after one year. Two extra crystals for 2C. \$310 takes all. WB9GKV, 1422 Audubon Dr., Columbus, IN 47201

SB-100 ac supply matching speaker and mobile mic... only slightly used, and recently checked, tuned, etc. by Heath. Inactive ham in college asks \$300 complete. Tom, 2440 E. 5th St., No. 5, Tulsa, OK 74104

GARAGE sale: 2 hams cleaning out sheds, complete junk boxes to be cleared out. Small parts and large equipment, including TTY gear, tvs, kmtrs, etc. All will be sold at whatever price we can get. Sat. and Sun., May 20 and 21, 9 A.M. to 5 P.M. Send for list and directions. K2DAC, Larry Finch, 16 Linden Blvd., Great Neck, L.I., NY 11021

SELL new British KW 2000 B. This is a real nice transceiver, looks and operates like a Collins KWM-2. Sell for \$375. Real sharp Mosley CM-1 receiver \$100. Will compete with the Drake 2B. Have an almost new Swan FM-2K, 2 meter transceiver complete \$250. Also have a new Regency HR-2A in unopened carton, \$220. Will trade on 2-meter gear. Richard Scharck, 417 North Ferry, Ottumwa, IA 52501. Phone: 515-682-5741

CRYSTALS unsorted: Novice crystals - active - accurate FT-243, 10M - 15M - \$1.50, 80M - \$1.75, airmail 15c/crystal. 1st-cf. 40c. General purpose: FT-243 .01% 3500-8600 kilocycles \$1.90 (Nve - \$1.75 each), (nets, ten same \$1.45). 1700 - 3499 \$2.95. .005% ad 50c/crystal. Free info-order sheet. "Crystals Since 1933." Bob Woods, W9LPS, C-W Crystals, Marshfield, MD 65706

KWM-1 mobile mount for sale, W9MTU, Box 2248, Anderson, IN 46011

WANTED: National general coverage receiver. John Guthrie, W3SLJ, Virginia Rd., St. Marys, PA 15857

COLLINS 516E-1 12V dc supply for KWM-2. \$65. W7LJZ, Box 323, Lyle, WA 98635

GALAXY V MK2 - ac, dc supplies, speaker console, calibrator. Excellent \$375. W6WRW, 12080 Country Sq. Ln., Saratoga, CA 95070

WANTED: Electro-Voice noise cancelling mic. Sell: Tiny-Tiger 400 watt portable generator. K. Agrelus, 411 Mission Dr., Camarillo, CA 93010

FOR SALE: Viking II transmitter; giant pwr amplifier, 833s push-pull Class C 1000 watts input. Write for details. James Emerich (WA3JYO), 308 East Derry Rd., Hershey, PA 17033

FOR SALE: Galaxy five Mark II with external VFO, calib., cw filter, ac supply & speaker, and accessories. \$310 or best offer. Lance Jay Serner, WA6LTM, 2315 S. Corning St., L.A., CA 90034

HALLICRAFTERS HT-37 \$140; Drake 2-B & 2BQ \$160. Homebrew 4-411 linear \$40; Mosley TA-36-40 antenna & Ham-M rotor \$160. WA7JEZ, 1106 W. Holly No. 1, Bellingham, WA 98225. Phone: (206)733-8735

SELL: Collins 32S-1 with mic serial 10546 \$300, 755-1 serial 296 with Waters notch filter and telex phones \$225, 516F-2 serial 15349 power supply with speaker \$75; Ameco TX 68 with 4 crystals and coax relay \$75; Ameco VFO 621 \$25; Parig 2 meter Navigator converter \$40; CDE Autorotor AR33 \$35. T-meter 24 hour clock \$10; Vibroplex bug serial 171810 \$25 all excellent cond. Loc. #1084. 750 North Warner Rd., Mahtomedi, MN 56115. Tel: (612)426-3175

WANTED: Collins 65G-1 preselector for 51S-1, Campbell, 3206 Tom Green, Austin, TX 78705

WANTED: Hallcrafters HA-5 VFO. State condition and price John Foley, 261 El Conero, Los Alamos, NM 87544

(SALE) Hammarlund HQ-129X, speaker and manual \$75. E.N. Wood, W4JFL, 3800 Whitaker Ln., Lidia Springs, GA 30057

WANTED: Schematic diagram and/or operator's manual for National 2A-40D. Robert Patton, Route No. 4, Box 95 Hillsboro, OH 45133

NEED help with code and theory for General license. Equipment no problem. Joseph Deslites, 238 Emery Ave., Lowell, MA 01864

HOME brewers: meters, transformers, capacitors, filters, tubes insulators, and other parts available. List for stamp. Etter, Bo. T17, Riverhead, NY 11901

HW-12A 75M transceiver, HP-13 12 V dc power supply including cables, instruction books, \$125. Walter Marshall W1RMR, 52 Alison, Wallingford, CT 06492

TB-1000-4 4el beam (Swan TB-4H) never used. \$70. Prefer pickup, Terra Haute, Indiana. Write Alan Biddle, WA48CA, Box 54, Moody AFB, GA 31601

COLLINS 75A3 \$220, Hallicrafters HT-37 \$170, both mint. Want junk SX-73 for parts only. WSSET, 2001 Parkwood Rd., Charleston, WV 25314

SELL: Swan 500C, 117-XC pwr sply - good condition, tri-band beam, rotator, and 10 ft tower. \$375. Contact Steve, WB2DKT, 55 Wellsboro Rd., Valley Stream, NY 11580. Tel: 516-R25-2402

COMPLETE station, like new DX-60B - HR-10B - RQ-JOBFO SWR Monitor-keyer-speaker microphone. \$200. A. Wilson, Box 392, East Brewster, MA 02640

"HOSS Trader Ed Moory" says he will not be undersold on Cash deals! Shop around for your best price and then call or write the "HOSS" before you buy. New Regency HR-2A two meter fm transceiver, immediate shipment, amateur net, \$229.00; Gonset GSB 201 MKIV 2W linear, reg. \$525.00, cash \$389.00; New "store display" National NCX-1000 w/CXO-100 calibrator, reg. \$934.00, cash \$745.00; New Rohm 50 ft foldover tower, prepaid, \$239.00; New Mosley Classic 33 and demo Ham-M rotor, \$209; used equipment: Swan Mark I linear, \$385.00; trans, \$35.00; T-3, \$369.00; T-4-35, \$359.00. Moory Electronics Co., P.O. Box 506, DeWitt, AR 72042. Tel: 501-946-2820

WANTED: Heath HW-16, WN2PID, S. Meadow, Box 248, Catskill, NY 12414

NATIONAL HRO-60T, coils A through J, no "I." \$150. You pay shipping. W0KSK, 2300 South 4th Ave., Sioux Falls, SD 57105

PEARCE Simpson - Gladding 25s -2M fm - 25 watts Hi Skan - 8 channel scanners - Bull's Radio, RR1 Box 41C, Wading River, NY 11792. 516-928-6118

HT-32 \$170. Blizard, W8UMH, Rt. No. 1, Mt. Vernon, OH 43060

GALAXY V MKIII, ac supply, vox, cal, spkr console \$350. WA9TYU, 1414 28th Ave., Greeley, CO 80631

SB-401 with crystal pack \$240. SB-301 with cv. a-m filters and SB-600 speaker \$240. Excellent condition. WA2DYK, Jeff Evans (516)269-4840

HEATHKITS: SB-300, SB-600, DX-60, Mosley TA-33 jr beam, RC airplane equipment. Excellent. Offers? Doug Murdock, 477 Mercer Hall, UW, Seattle, WA 98195

SELL: mint SB-301 \$200; xfms 3600-0-3600 at 1 amp \$25, 1.7 amp \$40, 120/240 prl. All fob. W0AIH, Paul Bittner, 814 4th St., Virginia, MN

FOR SALE: HW-17A 2 meter transceiver with relay switching, inboard pre-amp, fm adapter, mobile power supply, mobile mount. \$125. Don Fox, RL, No. 2, Holland Patent, NY 13354

FOR SALE: Swan model 14A converter \$25. Hustler RM 75 \$9. RM40 \$7. RM20 \$5. M02 bumper mast \$7. RSS2 spring \$2. BMT bumper mount \$4. WB4ERS, Max O'Neal, Pine Mountain, GA 31822

COMPACT car owners! SBE-34 transistorized ssb transceiver - comes complete with mobile mount, calibrator, extra final tubes, and built-in 110VAC/12VDC power supplies. Works very well. \$195. Gary Johnson, K9KLR, 2121 Hoeler Ave., Rapid City, SD 57701

SWL receiver - Hallicrafters SX-62A \$100; HRO-60 with ABCDE coils \$150; Valiant transmitter \$80; SB-10 adapter \$80; Knight T-50 Novice cw transmitter \$40; Gonset super 12 converter \$25. Don Barnett, 2320 South 4th, Sioux Falls, SD 57105. Phone: 605-332-4778

SELL: (Tri-Ex) crank up tower, 54 ft, \$125. C.D.R. (Ham-M) rotator \$70. Thunderbird (Hy-Gain) (Tri B) beam, \$70. Dr. Patrick, Box 100, Caldwell, ID 83606

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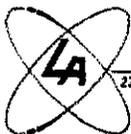
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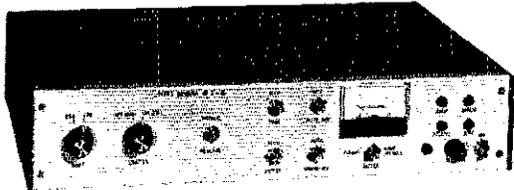


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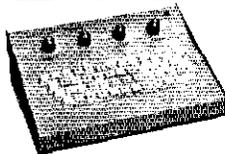
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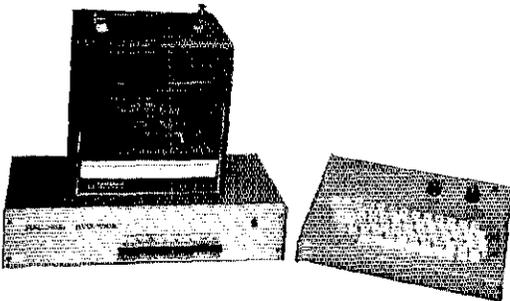
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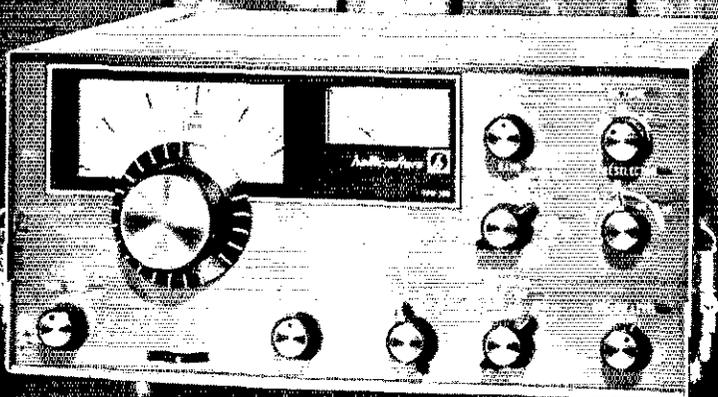
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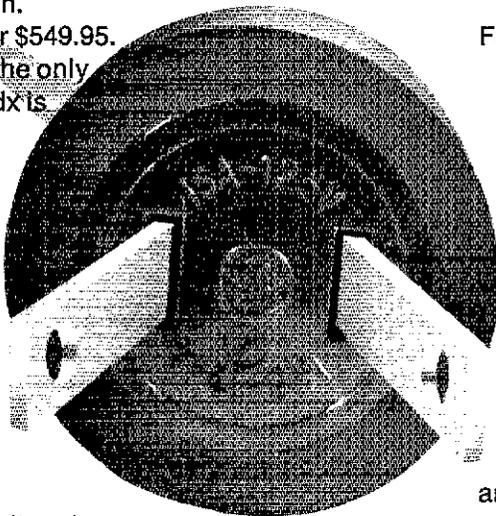
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