QST amateur radio

April 1972
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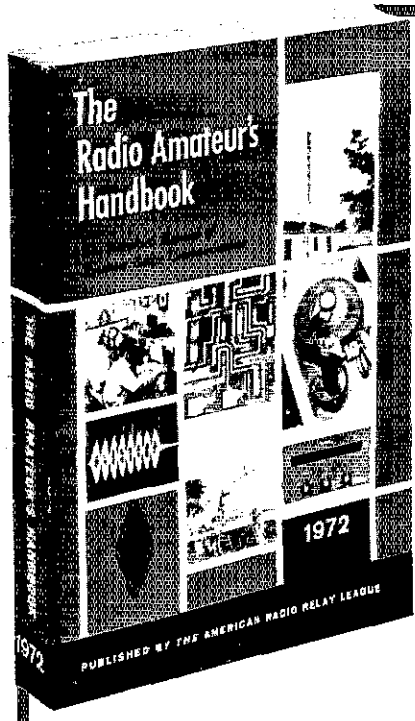

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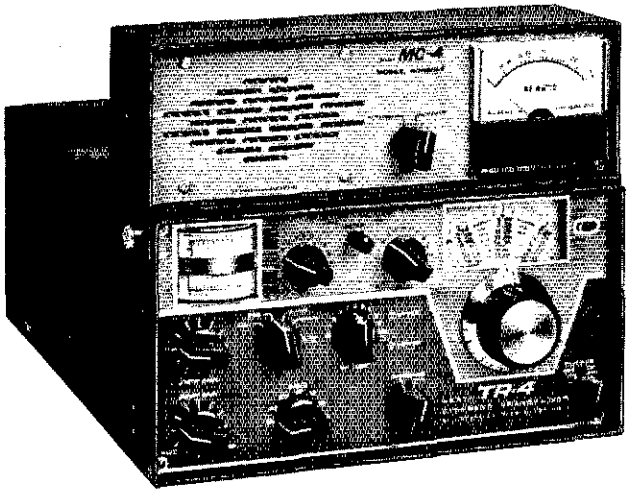

the optimum Sideband Transceiver

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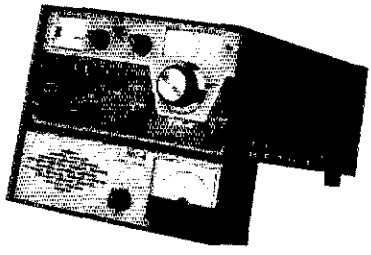

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APRIL 1972

VOLUME LVI NUMBER 4

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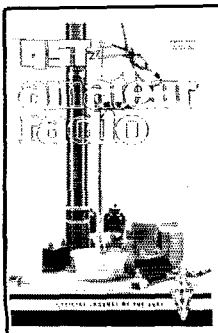

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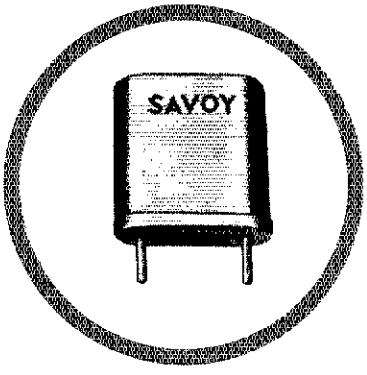

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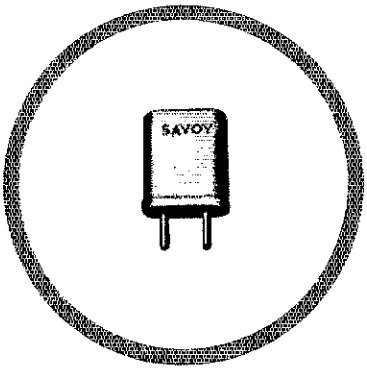

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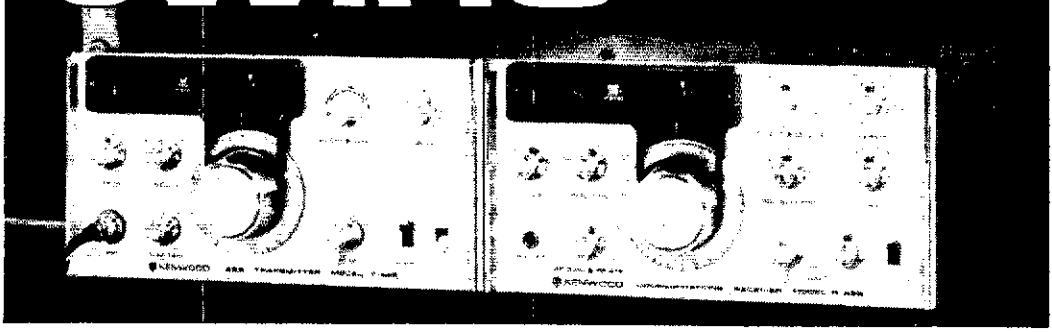

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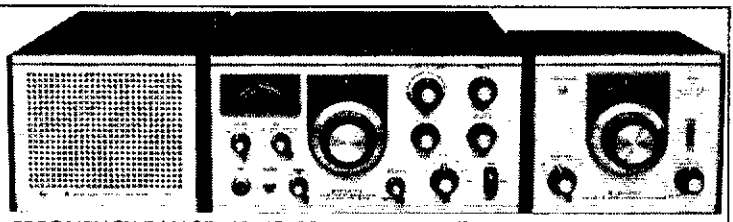

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Reports Invited. All amateurs, especially League members, are invited to report station activities on the first of each month (for preceding month) direct to the SCM, the administrative ARRL official elected by members in each Section. Radio club reports are also desired by SCMs for inclusion in *QST*. **ARRL Field Organization station appointments** are available in areas shown to qualified League members. General or Conditional Class licensees or higher may be appointed ORS, OVS, OPS, OO and OBS. Technicians may be appointed OVS, OBS or V.H.F. PAM. Novices may be appointed OVS. SCMs desire application for leadership posts of SEC, EC, RM and PAM where vacancies exist.

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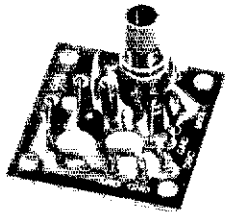

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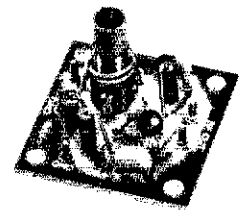

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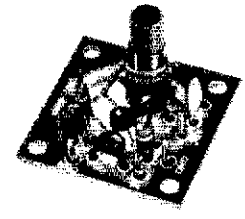

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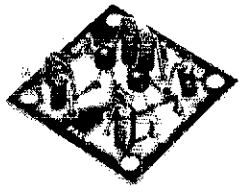

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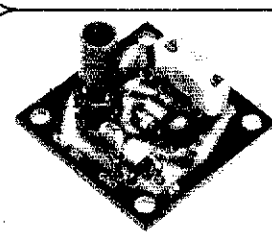

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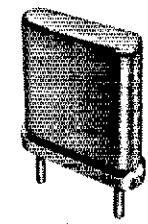

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It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors.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

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

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

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* Member Executive Committee

"It Seems to Us..."

QST *ON NEWSSTANDS – WHY NOT?*

FROM TIME TO TIME there arises the suggestion that our official journal ought to be put on the general newsstands, as it was many years ago. The argument – often from those who, like your editor, started in the 30s – goes something like this:

"As a teenager, I got my first interest in ham radio by picking up a copy of *QST* at the local drugstore, and I know lots of other fellows – good and capable amateurs today – who started the same way. In those days we were a young crowd, enthusiastic and growing. Today we don't offer others enough introduction to the game, since the mag is not available at the corner store. I think we're missing the boat – we aren't getting enough youngsters in ham radio today. They're attracted by other magazines and led to different interests. *QST* ought to be there to catch their fancy, and get them started in ham radio."

Well, that sounds pretty good, offhand. We do need new blood. Some of us did start that way, as youngsters. Maybe we are overlooking a good thing?

Yet the Board of Directors, at its annual meeting in January, after careful examination voted down a proposal to put the magazine on general newsstands. Why?

For one thing, it was found that we're already getting a rather substantial portion of youngsters joining amateur radio these days. In other words, the premise that it's becoming an old man's game because we aren't interesting youth is a false one. It has been parroted so often in recent years many of us have come to accept it as fact. Surveys show that nearly one-half of the 16,000 or 20,000 new licensees in the amateur ranks each year are teenagers (or younger!).

For another thing, the recollections many of us have of being first exposed to amateur radio via *QST* on the newsstands is much more pure nostalgia than it is a practical procedure today. There are now at least ten times as many magazines on stands as when we older goats started. They cover many more fields. A journal of a society is not going to get much prominence in the stand display, and thus not much attention from the customers. Out front are *Playboy*, the hot-rod magazines, those on photography, home-making, and such. Nearly all of them have splash headlines to entice the prospective buyer with "promises" of better health, saving money, and all that. Even staid old publications like the *Ladies Home Journal* spice up their covers with risque banners. It is all in the battle for newsstand circulation. Old Granny *QST* wouldn't do very well in such an atmosphere. (We assume there is no intention of altering our journal to compete with Playboy style.)

Perhaps the most telling point was that the printed word has never been much of an identifiable factor as the major means of interesting newcomers in amateur radio. We learn from surveys that today it is much less so than ever. All forms of printing – magazines (ham and non-ham), books, handout literature – in 1949, for example, got credit for the main spark of interest among one-fourth of the newcomers that year. Twenty years later, such "promotion" accounts for only 14%. And many of those instances appear to be the reading of a feature article in non-ham magazines received on a subscription basis, or in a doctor's reception room, not necessarily one obtained at a newsstand. (Even *CQ* magazine, the only one in the amateur field on the stands throughout the 20-year period cited, dropped 50% in mentions among newcomers surveyed.) Any way one looks at it, printed matter has lost considerable of its impact.

What, then, *is* the approach to promote more ham radio interest? These same surveys show that in 1949 one-half the newcomers – increasing in 1969 to three-fourths – indicated primary interest was sparked by personal attention – an amateur relative or friend, a radio club or school class. So keep in mind the continuing need for personal guidance, of invitations to visit home and club stations, to keep those code and theory classes going (or initiate them) and to follow through with personal assistance in selection of equipment, construction, and set-up for operation. The gratitude of the newcomers you help is only part of your reward; equally important is the satisfaction from breathing new life and continued growth into the greatest of all avocations. QST

League Lines . . .

Depriving amateurs of 2 MHz to allow more space for citizens expansion is not a proper answer to the CB dilemma, says ARRL in strongly opposing the bid of the Electronics Industries Association for 220-222 MHz -- it's just the easy way out! Rather, the League says, a study should be made to identify the real causes first, and then propose solutions. See the full text of our filing in "Haps" this month.

Detroit hams will likely be doing a better job of log-keeping in the future. Word has got around that FCC is calling in logs for spot checks. W8MPD, who tipped u off, says it does seem a low-cost way to keep us in line; but "too bad there isn't some way to do the same in the 27-MHz spectrum!"

We'll be reminding you regularly until July 1st that on that date League dues go up to $7.50 U.S., $8.50 Canada, $9 elsewhere. And that you can renew now -- no matter when your normal month of expiration -- for as long in advance as you wish at current rates. Or save a bigger bundle by joining 2,000 others in an ARRL Life Membership; eight quarterly payments at $16.25 each will do it -- if started prior to July 1, that is.

Even hams who are relatively inactive occasionally receive QSL cards through the ARRL Bureau system. Have you one or more self-addressed, stamped envelopes on file? If so, do they have the current postage rate -- 8¢, 16¢, or other multiple? See the QSL Bureau listings later in this issue, or write for a free reprint explainin how the system works.

On April 10th ARRL Treasurer David H. Houghton is marking 50 years of service wit the League. Now retired as QST Circulation Manager, Dave is probably the only individual who, on account of arriving early and staying late, will ever be able to say that he worked at the Hq. for half a century. Fit and able, he continues to serve!

Training new hams is the ambition of many Boys' Clubs around the country. A rece inquiry from BCA headquarters brought responses from over 50 Clubs wanting to get a program started. ARRL helps by providing literature and training aids. But, the greatest need is for local help from already-licensed hams for code and theory instruction. Why not give a Boys' Club near you a call to offer your assistance?

With announcement last month (pg.58) of another Oscar -- this one to provide som unusual DX as the sun-spots decline -- we are pleased to report that a July launch is likely. Amsat-Oscar C is planned to go into orbit piggyback with the Itos-D meteorological satellite. In a future issue we'll have some ideas for getting your station ready for this 2 to 10 meter repeater.

The week before an FCC engineer arrives to conduct exams, the Oklahoma University club runs an intensive review session to check the progress of prospective ap plicants. Great idea! Those who realize they are not fully prepared save $9, and the examiner's precious time, by not showing up for almost certain failure.

WA1DJC offers a Quote-of-the-Month from Popular Electronics: "Magazines devot ed to amateur radio and many groups with the same interests make valuable contributions; but when the chips are down, it's the ARRL that's snapping at the FCC's kneecaps for rules changes -- or defending some ham wrongly accused of TVI." (Come, now -- we don't snap!)

DXCCers -- watch QST next month for dope on a new lapel pin.

Amateur Radio on the Move

BY HARRY J. DANNALS, W2TUK

AS NEWLY ELECTED PRESIDENT of ARRL, it is a distinct pleasure to have the opportunity to greet you via the pages of our official journal, and to share with you some of my thoughts on how you and the League are so closely and essentially involved in the future of amateur radio.

We face challenging and exciting years ahead. They are *challenging* because amateur radio faces a real test, both nationally and internationally, of its position in the world of telecommunication – and of our continued use and retention of frequencies. They are *exciting* because the age of satellite electronic techniques is here, and we are laying plans for active participation by radio amateurs in the continuing growth of this fascinating form of space activity. Your League is involved with every facet of the rapidly changing world of communications . . . keeping amateur radio on the move.

There are those among us who disagree and say amateur radio is static – if not stagnant; that the League is a zealous guardian of the past, slow to respond to and accept new ideas; that today's amateur is a different breed with a new outlook on his role in today's world.

Are these opinions valid? If so, to what extent? Let's take a look at the facts and then let me, if I may, share some of my own views with you.

Fact number one: amateur radio is alive and well – very much alive and doing very well indeed. With a world-wide amateur population of nearly half a million, the percentage growth each year is not spectacular. But in the U.S. alone nearly 20,000 newly licensed amateurs join our ranks each year. And between a third and a half of these newcomers are teenagers or younger. On the technical and operating side, whole new vistas are opening up for us in vhf/uhf, in satellite communications, in slow-scan TV, and in many other ways.

Fact number two: today's amateur does have new, more diversified interests than in years gone by. But the evidence of FCC licensing figures, emergency communication activity, and the public service record generally, demonstrate pretty conclusively that he is as firmly committed as ever to the traditional principles on which amateur radio has been built.

Fact number three: most amateurs agree that without ARRL we just wouldn't have amateur radio as we know it today. In direct services to amateurs everywhere, in representation before our Government, and in its influence on global amateur radio through the International Amateur Radio Union, its performance is and has been indisputably distinguished. This superb record might have been somewhat less impressive had the League been impulsive and seized upon straws in the wind, and thus been less-acutely conscious of its stewardship on behalf of amateur radio in *all* its ramifications.

If all this sounds like a defense of the status quo – a plea for things-as-they-are – nothing could be further from my intent and my conviction.

We do have problems now and in the years ahead. We also have great opportunities and a great challenge. These do not concern just the League

headquarters and the League's officials, but *every* amateur — wherever he may be and whatever his particular interests or degree of dedication. We have a universal and equally shared stake in the future of amateur radio. It is to this stake that I would like to address my comments and set forth what I believe to be our common cause.

My call is for your assistance in strengthening the ARRL through drives for increased membership in an organization completely dedicated to amateur radio. An identical call is sent internationally so that societies of other nations will seek further strength and provide for the future of amateur radio within their own areas of influence. My call is for a sense of involvement and teamwork within the fraternity. It is not expected that each of us can — or must — share the load equally. It is obvious that some can contribute far more than others. It isn't necessary for us individually to become world-renowned leaders as long as the sum of all our individual efforts is worthy of the fine traditions of amateur radio and service to our fellow man.

As we seek to provide for the growth of membership within amateur radio societies, we must remember the need to communicate within our own ranks. Understanding of the other fellow's special interest, a willingness to assist the newcomer, participation in programs for growth and recognition of amateur radio within our communities — all are part of involvement and awareness. Your hand extended to the budding Novice, whether he be eight or eighty, is a hand extended on behalf of further attainment of our mutual goals. Recognition of the communicator, engineer, hobbyist, rag-chewer — each as an essential part of our overall character and each a contributor in some way to amateur radio is paramount.

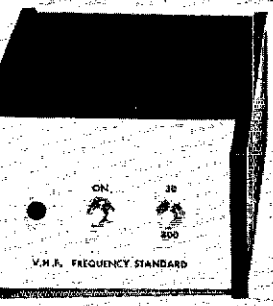
Finally, it is increasingly more important that we recognize the need to efficiently use our most important resource — the amateur frequencies. While it is fascinating to contemplate additional amateur band assignments in the years ahead . . . and I truly hope that we see them . . . it is far more practical to utilize efficiently what we presently have. Use of the proper band and power level for the communications desired will provide more room for all of us. Recognition of the communications capacity and capability of the world of vhf/uhf will greatly expand enjoyment of amateur radio for many. Let's not forget the vhf/uhf satellite communications developments around the corner. Many of us will see the day when a few milliwatts into a ground repeater will provide global communications via an amateur radio satellite.

During his term of office my predecessor, WØDX, devoted a very considerable portion of his time, his energies, and his talents to working with our sister societies around the world in strengthening the International Amateur Radio Union. He will continue to serve this vital function in his new role as ARRL vice president and principal liaison with IARU, a role for which he is uniquely qualified. Traditionally ARRL's president has also served as president of IARU. Splitting our domestic and international leadership functions is part of your Board's move toward a new concept of teamwork administration. We expect this to mean a deeper involvement on the part of each director in the League's continuing policy development as we meet changing needs. In another major step in the Board's continuing effort to identify and serve future as well as present circumstances, a special *ad hoc* committee is now in the process of developing a more tangible, long-range planning concept and procedure. This move holds great promise; it will give new direction to policy development, put us in a better position for anticipating change, and foster even greater responsiveness to membership requirements.

In all this your director is the key man. It is through him that you can exert your influence and take as active a role as you wish in the League's affairs. By the same token, he needs your opinions, your participation, your help to do his job effectively.

We are on the move and I pledge that you will continue to see more evidence of progress and vitality in the months ahead. But the League is *all* of us and it needs all of us. Most of all, it needs ***you***. QST

Double Standards



BY DOUGLAS A. BLAKESLEE, * W1KLK

A SECONDARY FREQUENCY standard is one of the most useful accessories that an amateur can build for his shack. The hf operator needs a standard to check the calibration of his receiver and VFO, to assure that he is operating within the amateur bands, and, perhaps, to try his hand in the ARRL Frequency Measuring Test.[1] Vhf fm users need a "channel spotter" to assist in setting crystal-controlled rigs on frequency and to provide channel markers for tunable fm gear.

Two frequency standards are described in this article; both make use of low-cost TTL integrated circuits. TTL logic devices are now selling for 7 to 10 cents per gate from surplus dealers, a bargin indeed for such complex devices. Both standards use four ICs: one as an oscillator/buffer, two as frequency dividers, and one in the power supply.

Circuit Details

The circuit of the 1-MHz standard is shown in Fig. 1A. Two NAND gates are connected to function as a crystal-controlled multivibrator. This simple oscillator circuit was originally described by Robbins.[2] Trimmer C1 is included to allow a slight variation of the crystal frequency to align the standard with a WWV or WWVH standard-frequency transmission. A NAND gate, U1C, is employed as a buffer between the oscillator and the following frequency-divider ICs.

The ultimate stability of the standard will depend on the quality of the crystal chosen for Y1. Low cost, rather than a high order of temperature stability, was the objective in the design of the standards shown in Figs. 1A and 2, so a general-purpose International type EX crystal was used. For high accuracy over a wide temperature range, a crystal with a known temperature characteristic which can be compensated with a negative-temperature-coefficient capacitor should be used (as has been described by Hoff).[3] Shunt capacitance in the oscillator circuit can upset the operation of the standard. Thus, a low-capacitance crystal holder should be used, or the crystal can be soldered directly into the pc board. Only crystals in low-capacitance cases such as the HC-6/U are suitable. FT-243 types may not oscillate.

The 1-MHz output from the oscillator is divided to 500 kHz, 100 kHz, and 10 kHz by two 7490 decade counters. If 25-kHz markers are desired to spot the Extra and Advanced Class subbands, the circuit of Fig. 1B may be added. Output from the decade counters is isolated by a NAND-gate buffer, U1D, which also provides some shaping of the output wave form.

The power supply uses a Motorola "Functional Circuit" IC regulator and a bipolar transistor as the pass element. Control R1 allows adjustment of the output voltage to 5. As can be seen from the inside photograph of the 1-MHz standard, the power supply requires most of the circuit-board space. Batteries can also be employed as a power source, if desired, to reduce cost and provide portability.

A Standard for FMers

The fm operator needs to spot vhf-band frequencies with accuracy. Most fm transceivers are crystal-controlled, although some tunable receivers and an occasional VFO-controlled transmitter are in use for fm on the 6- and 2-meter bands. The crystal-controlled standard shown in Fig. 2 is intended as an aid to setting vhf gear "on channel." The circuit is similar to that of Fig. 1A, except that a high-speed gate package is used as the oscillator

Need a secondary frequency standard for your hf or vhf station? Here are two designs using inexpensive TTL logic devices, one for hf operators and one for fm devotees.

* Assistant Technical Editor, *QST*

[1] ARRL Frequency Measuring Tests (FMTs) are held four times a year. See the Operating Events listing elsewhere in this issue for details.

[2] Robbins, "Transistors and ICs in a Phase-Locked Local Oscillator," *QST*, February, 1972.

[3] Hoff, "The Mainline FS-1 Secondard Frequency Standard," *QST*, November, 1968.

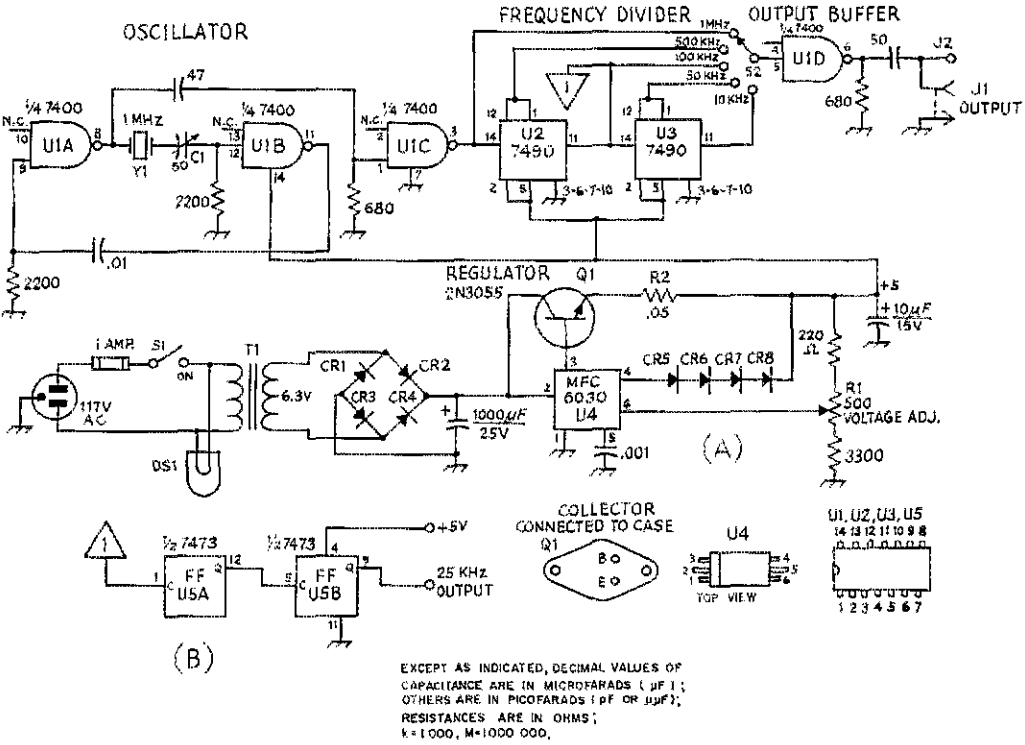


Fig. 1 — (A) Circuit diagram of the 1-MHz standard. Unless otherwise marked, resistors are 1/2-watt composition and capacitors are disk ceramic, except those with polarity marked, which are electrolytic. (B) Circuit to produce 25-kHz markers.

C1 — 8- to 50-pF ceramic trimmer (Centralab 822-AN or equiv.).
CR1-CR8, incl. — Silicon diode, 200 PRV or more, 500 mA or more (Motorola HEP156 or equiv.).
DS1 — Neon panel-mount indicator, 117 V (Allied/Radio Shack 272-1501 or Leecraft 36N2311).
J1 — Panel-mount jack, phono type (Switchcraft 3505F or 3501FR or equiv.).
J2 — 5-way binding post (E.F.Johnson 111-0102-001, H.H.Smith 920-0561 or equiv.).
Q1 — 80-watt silicon power transistor (Motorola 2N3055, HEP704, or equiv.).
R1 — Linear-taper composition pc-mount control, 1/2-watt (Centralab R501B, Mallory MTC52L1, or equiv.).
S1 — Single-pole, 5-position, single-wafer phenolic rotary (Allied/Radio Shack 275-326, Calectro E2-161, or Centralab PA-1001).
S2 — Spst subminiature toggle (Allied/Radio Shack 275-326 or Calectro E2-116).
T1 — Filament transformer, 6.3 V, 0.3 A or more, channel mount (Allied/Radio Shack 273-050, Stancor/Essex P-8385, or equiv.).
U1 — Quad TTL 2-input NAND gate (Signetics N7400A, Motorola HEPC3000P, or equiv.).
U2, U3 — TTL decade counter (Signetics N7490A, Motorola HEPC3800P, or equiv.).
U4 — Motorola MFC6030 voltage regulator.
U5 — TTL dual flip-flop (Signetics N7473A, Motorola HEPC3073P, or equiv.).
Y1 — International Crystal, type EX.

and an "on-card" regulator is employed in the power supply. The use of high-speed gates assures that oscillation at 3 MHz can be achieved and that fast rise-time pulses (rich in harmonics) are provided. A Schottky TTL IC (SN74S00) might be a better choice, especially if harmonics into the 220- and 420-MHz bands are desired.

Only two outputs, 300 kHz and 30 kHz, have been provided from the 3-MHz standard. The 300-kHz markers are useful as "sign posts" among the 30-kHz markers. For example, when the 300-kHz output is selected, markers will be heard at 147.00, 146.70, and 146.40 MHz. If reception of 146.94 is desired, once the 147.00-MHz marker signal has been located, the standard is switched for 30-kHz output. Then, the receiver should be tuned lower in frequency past the marker on 146.97 to the signal at 146.94 MHz. If 60-kHz markers are needed, an additional output signal can be obtained from point A (Fig. 2).

After the 1-MHz frequency standard was completed, it was easy to see that the power supply was the "tail that wagged the dog." To reduce the size of the unit, a smaller pc-mount transformer was purchased along with a three-terminal regulator.

National Semiconductor, followed by Fairchild, has recently introduced 5-V IC regulators in TO-3 or TO-22 housings. These devices have only three connection leads (input, output and ground) and

require a single external bypass capacitor to perform their function. Current output up to 1 A is available, if an appropriate heat sink is used. These ICs were originally designed so that a separate regulator could be included on each logic card in a computer to reduce noise and common-impedance problems engendered when a single high-current supply is used. Hence the name "on-card" regulator!

If battery operation is desired, 12 V dc may be applied to points B and C of Fig. 2. Mobile operators may wish to include a switch to allow a quick changeover from ac to battery power.

Parts Talk

The first task of any construction project is to collect the parts. Appendix A lists suppliers for the crystal, ICs, cabinet and pc board used in this project. Most of the components needed will be available at local dealers or by mail order from "catalog" houses. A check in the Hartford area showed that everything except the cabinet and the pc board could be purchased "over the counter." Kits were available for those who wanted to make their own circuit boards, also. One dealer indicated he could order the Ten-Tec case. Parts procurement shouldn't be much of a problem for this project.

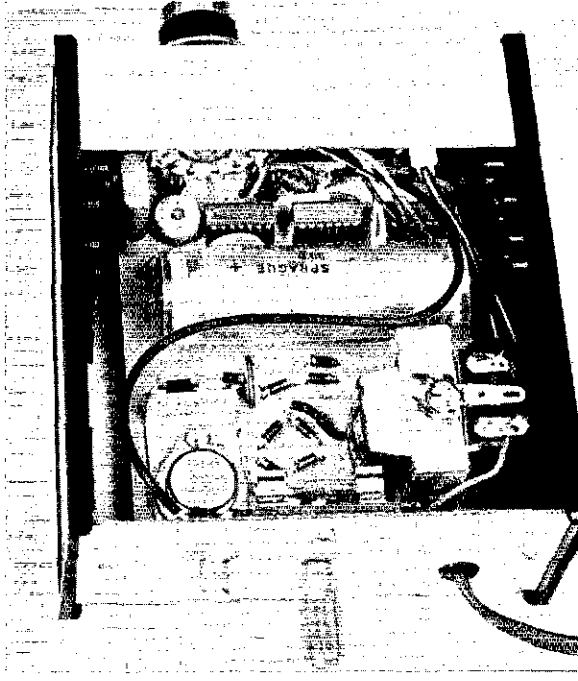
The circuit-board foil pattern and parts-layout diagram are shown in Fig. 3. Alternatively, a commercially made pc board may be purchased for the project (see Appendix A). The circuit board is a universal design that will be suitable for either the 1-MHz or 3-MHz standard. The foil pattern of the board is arranged to use the on-card regulator and the pc-mount power transformer.

Alignment

Once a standard has been constructed and all connections have been rechecked for errors, plug in the power cord and turn on the power switch. Use a voltmeter to check the output of the power-supply regulator, which should be 5 volts. Monitor 15 MHz on an hf receiver. A marker signal should be heard very close to 15.000 MHz. When band conditions are suitable, listen to WWV or WWVH on 15 MHz and adjust trimmer C1 (of Fig. 1A) or C2 (of Fig. 2) so that the output of the standard is zero beat with the NBS transmission.

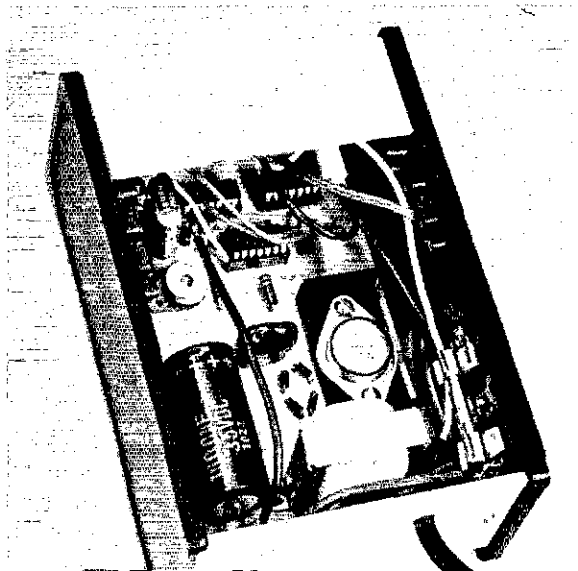
Correct alignment of the standard is vital if accurate markers are to be obtained. The receiver tuned to 15 MHz should have wide-band audio response so that low-frequency beat notes can be heard. As the oscillator trimmer is adjusted so that the output from the standard is close to zero beat, pulsations will be heard. The difference in frequency between WWV (or WWVH) and the standard will be the number of pulses per second. Thus, C1 (or C2) should be carefully set for the minimum number of pulsations per second.

Most crystals age slightly in the first few weeks of use. The standard should be rechecked for correct alignment once a week, or so, during the first month of use. However, a check against WWV is a good idea whenever the standard will be needed to make accurate measurements.



Inside view of the 1-MHz standard. The oscillator is located at the upper left; the power supply occupies the lower two thirds of the circuit board. The case is a Ten-Tec JW-5.

All components in the 3-MHz standard, except the switches and the fuse, are mounted on an etched circuit board. The trimmer capacitor is used to align the frequency of the crystal oscillator. A Ten-Tec JW-4 enclosure is used for this version. The IC regulator is mounted on a small aluminum heat sink which has been painted to improve its ability to radiate heat.



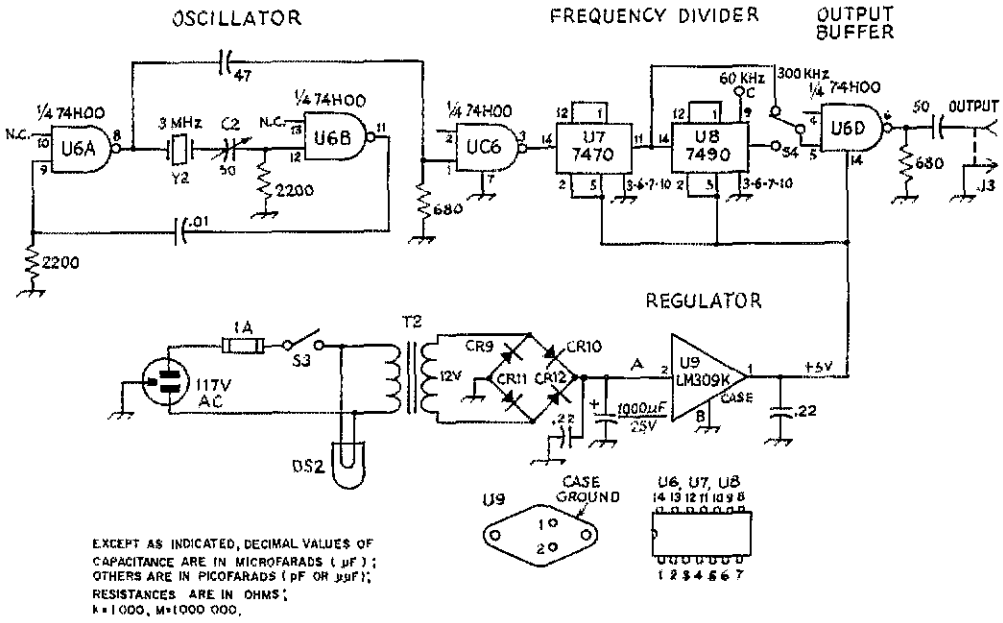


Fig. 2 Circuit of the 3-MHz standard. Unless otherwise marked, resistors are 1/2-watt composition and capacitors are disk ceramic, except those with polarity marked, which are electrolytic.

C2 — 8- to 50-pF ceramic trimmer (Centralab 822-AN or equiv.).
CR9-CR12 — Silicon diode, 200 PRV or more, 500 mA or more (Motorola HEP156 or equiv.).
DS2 — Neon panel-mount indicator, 117 V (Allied/Radio Shack 272-1501 or Leecraft 36N2311).
J3 — Panel-mount jack, phono type (Switchcraft 3505F or 3501FR, or equiv.).
S3 — Spst subminiature toggle (Allied/Radio Shack 275-325 or Calectro E2-116).
S4 — Dpdt subminiature toggle (Allied/Radio Shack 275-326 or Calectro E2-118).
T2 — Filament transformer, 12 V, 0.3 A, pc mount (Allied/Radio Shack 273-1385).
U6 — Quad high-speed TTL NAND gate (Signetics N74H00A, Fairchild SN74H00 or equiv.).
U7, U8 — TTL decade counter (Signetics N7490A, Motorola HEPC3800P, or equiv.).
U9 — On-card regulator, 5 V (National Semiconductor LM309K, Fairchild LM309 or UGH-7805393).
Y1 — International Crystal, type EX.

Using a Frequency Standard

Output from the standard can be coupled to a receiver via a short length of shielded cable. Or, a short whip antenna connected to the output jack of the standard may provide markers of sufficient strength. The edges of the hf amateur bands can be located with the 1-MHz standard set for 50 kHz output. To measure the frequency of an incoming signal, select 10 kHz output from the standard. (Note that no signal will be more than 5 kHz from a marker.) An audio oscillator and oscilloscope can then be used to determine the difference in frequency between the marker and the signal using Lissajous patterns, as described in *QST* for April 1964, pg. 44.

Use of the 3-MHz standard to find a channel on a 2-meter tunable receiver has been described above. The procedure for a crystal- or VFO-controlled transmitter is similar. Once the correct harmonic from the standard has been located on the receiver, the transmitter frequency is zero beat against the marker. For a crystal-controlled transmitter, the crystal trimmer provides the means of frequency adjustment.

If a crystal-controlled receiver is to be set "on channel," monitor the discriminator output voltage with a voltmeter or microammeter. Consult the manufacturer's instruction manual for the proper test point. Turn on the standard and adjust the crystal trimmer for a zero-voltage indication on the meter. Some receivers use an oscillator where the tuning of the tank circuit affects the crystal frequency. Thus, the tuned circuit should be set for maximum drive to the following multiplier stage before the crystal trimmer is adjusted.

The author acknowledges the assistance of A. M. Wilson, W1NPG, during the construction and testing of these frequency standards.

Appendix A

Listed below are sources for the major components needed to build the frequency standard. The list contains the sources actually used; many other vendors can supply suitable parts.

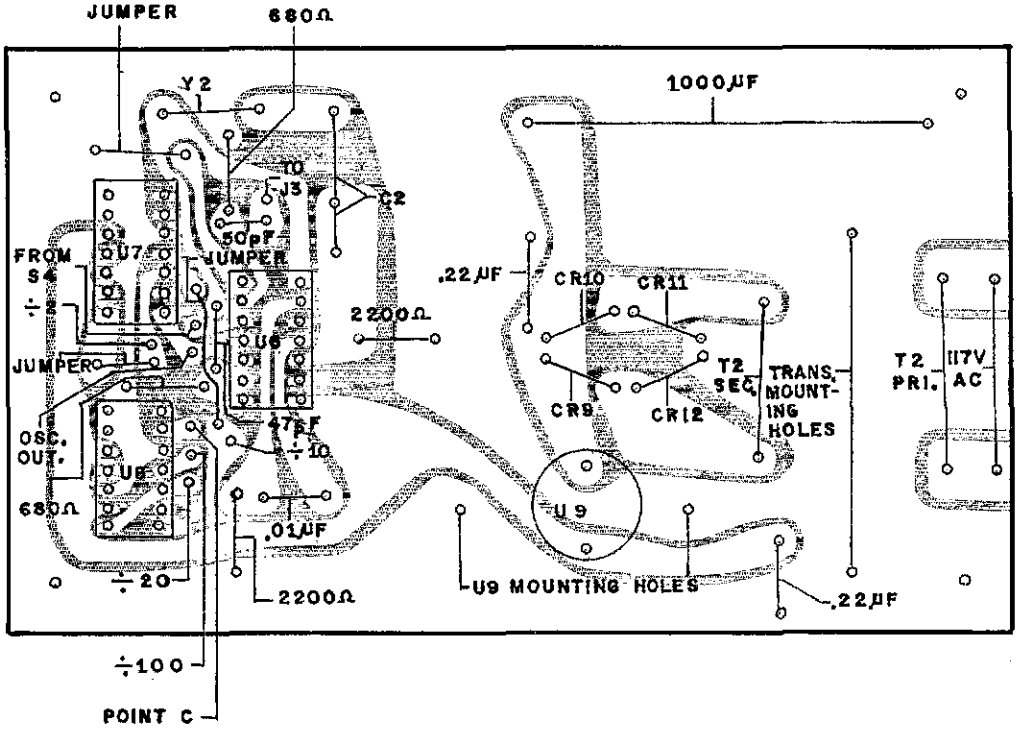


Fig. 3 — Full-size circuit-board pattern and parts-layout diagram.

Cabinet: From Ten-Tec dealers or direct from Ten-Tec, Inc., Highway 411 East, Sevierville, TN 37862.

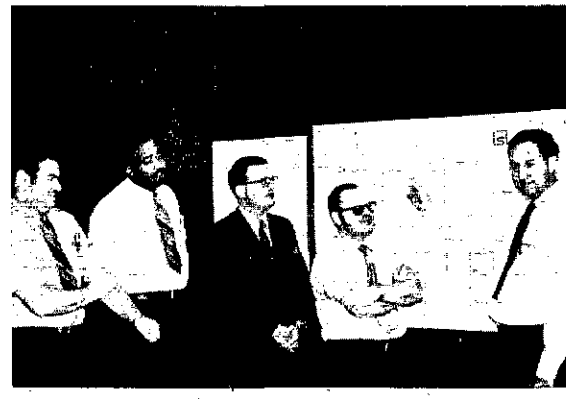
Circuit board: A pc board similar to that shown in Fig. 3 is available from Spectrum Research Laboratory, P. O. Box 5824, Tucson, AZ 85707. Price: $3.50.

Crystals: International Crystal Mfg. Co., 10 N. Lee, Oklahoma City, OK 73102. (Note: Other crystals are suitable if ground for a 32-pF load capacitance and mounted in an HC-6/U holder.)

Integrated circuits: Fairchild and Motorola components are available from Allied Electronics, 2400 W. Washington Blvd., Chicago, IL 60612 (free catalog available). Motorola HEP devices can be obtained by mail order from Lafayette Radio Electronics, 111 Jericho Turnpike, Syosset, NY 11791 (free catalog available). A list of local HEP dealers is available from Jack L. Jacques, Motorola Semiconductor Products, 8201 East McDowell Road., Scottsdale, AZ 85251. National Semiconductor components can be purchased from Cameradio, 2801 Liberty Ave., Pittsburgh, PA 15222, and Signetics components are available from Compar, 2531 Whitney Ave., Hamden, CT 06518. QST

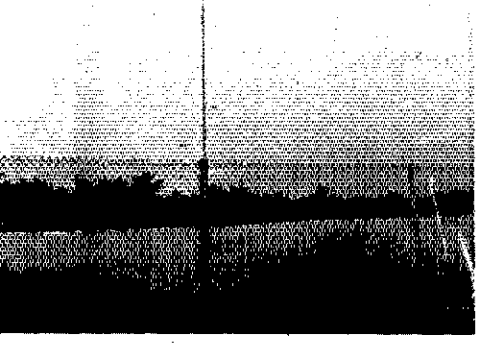
Strays

During a recent visit to the West Coast, *QST* Assistant Technical Editor, W1KLK, had the opportunity to visit Signetics Corporation, a major manufacturer of integrated circuits. An all-day review of new devices applicable to amateur equipment ensued. Shown here (l. to r.) Carl Weston, WB6LZQ, Linear Product Engineering; Jerry Lawson, WA2OFU/6, MOS Applications; W1KLK; John Curtis, WA6JNJ, MOS Product Marketing; and Art Fury, WA6JLJ, Manager of Linear Product Marketing.



Phased Verticals for 40

BY GARY D. ELLIOTT,* KH6HCM/W7UXP



THE IDEA of using a pair of phased verticals on 40 meters had occurred to me before, but the antenna never materialized since I seemed to get out fairly well with an inverted V up 50 feet. I normally do not work much on 40 meters except during contests, because of the high level of foreign broadcast QRM that is so bothersome on this band in Hawaii. A clear frequency is hard to find and one usually has to duck in between some 40-over-S9 Asian commercial stations.

During the first weekend of the 1971 ARRL DX contest, I used two antennas on 40, an inverted V and a hastily erected sloping dipole directed towards the U.S. Mainland. There was little difference between the antennas, which was disappointing, since the "Sloper" was erected with the hope that it would reduce some of the foreign-broadcast QRM from Asia. Upon conclusion of the first weekend of the contest with a mediocre performance on 40, it was evident that to do well on this band during the second half of the contest, I had to reduce the level of the troublesome QRM, and put a better signal into the East Coast. So I decided to try a pair of phased verticals and then run some comparison checks with the inverted V before round two of the contest commenced.

Theory

Two or more vertical antennas spaced a half wavelength apart can be operated as a single antenna system to obtain additional gain and a directional pattern. There are two practical ways that verticals for 40 meters can be combined, end fire and broadside. In the broadside configuration, the two verticals are fed in phase, producing a figure-eight pattern that is broadside to the plane of the verticals. In an end-fire arrangement, the two verticals are fed out of phase, and a figure-eight pattern is obtained that is in line with the two antennas, Fig. 1. However, an end-fire pair of verticals can be fed 90 degrees out of phase and spaced a quarter wavelength apart, and the resulting pattern will be unidirectional. The direction of maximum radiation is in line with the two verticals, and in the direction of the vertical receiving the lagging excitation; see Fig. 2. The end-fire arrangement fed 90 degrees out of phase was decided upon because it would, I hoped, accomplish my two goals: one, some rejection of foreign broadcast signals off the back of the antenna from Asia and two, increased gain over a dipole.

Construction

Physically, each vertical was constructed out of telescoping aluminum tubing that started off at 1-1/2-inch dia and tapered down to 1/4-inch dia at the top. The length of each vertical was 32 feet 6 inches (234/*f*). Each vertical is supported on two standoff insulators set on a 2 by 4, 6-feet long (as shown in Fig.3) and strapped to a fence. An alternative method of mounting would be a 2 by 4 about 8 feet long and set about 2 feet in the ground. After one vertical was mounted on the 2 X 4 it was raised into position and the resonant frequency was checked with an Omega-T antenna noise bridge. It was found that the vertical resonated too low in frequency, about 6.9 MHz. This was to be expected as the fundamental equation for the quarter-wave vertical is 234/*f*. However, this formula is only reasonably correct for very small dia. tubing or antenna wire. When larger dia.

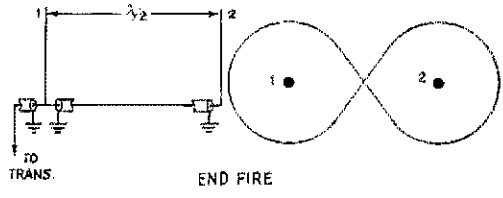


Fig. 1 — Pattern for two verticals spaced one-half wavelength apart fed 180 degrees out of phase.

* 5952 Gannet Ave., Ewa Beach, HI 96706

TABLE I

Total Observations	*Signal Difference* *Inverted "V"*	*Phased Vert's*	*Remarks*
2500 Miles (West Coast) 38	11	–	No difference in sig. strength
	–	14	Phased verticals less then 1 S unit better
		7	More than 1 S unit better
	–	6	More than 2 S units better
2500-3500 Miles (Mid West) 35	3	–	No difference in sig. strength
	–	6	Phased verticals less than 1 S unit better
	–	15	More than 1 S unit better
	–	11	More than 2 S units better
Over 3500 Miles (East Coast) 27	–		No difference*
	–	2	Phased verticals less than 1 S unit better
	–	15	More than 1 S unit better
	–	10	More than 2 S units better

*All stations past the Midwest reported that the phased verticals were always better than the inverted "V"

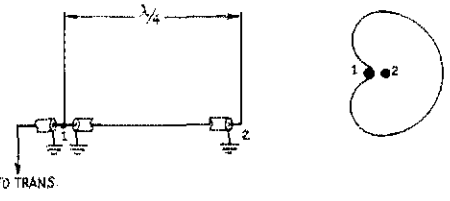


Fig. 2 — Pattern for two verticals spaced 1/4 wavelength apart and fed 90 degrees out of phase.

tubing (1-1/4 inch and larger) is used, the physical length will be shorter than the actual calculated length. Using the antenna noise bridge, an inch at a time was cut off the top until the resonant frequency was 7100 kHz. This resulted in 6 inches being cut off in my particular case, thus making the vertical exactly 32 feet long.

The ground system is very important in the operation of a vertical. The two usual methods of obtaining a ground system with verticals are shown in Fig. 4. In my particular case I used a ground rod at the base of each vertical and used two radials, each a quarter wavelength long at the lowest operating frequency desired. I am fortunate in that there is a salt-water lagoon at the rear of my property and the radials were run into the salt water and anchored. Since most hams will not have a salt-water lagoon in their back yard it is highly recommended that more radials be used.[1]

[1] [EDITOR'S NOTE: The importance of a good ground and numerous radials cannot be stressed too strongly. Use as many radials as possible on each vertical. See Sevick, "The Ground-Image Vertical Antenna," *QST*, July 1971.]

Feed System

In order to achieve the unidirectional pattern shown in Fig. 2, the two verticals must be separated by a quarter wavelength and one vertical must be fed 90 degrees behind the other. Two suggested feed methods are shown in Fig. 5. An electrical section of line cannot be used by itself to connect the two verticals together to achieve the 90 degree lag because of the velocity factor of RG8-U. The length of an electrical wavelength of transmission line is based on the calculation:

$$\frac{234 \times 0.66}{7\ \text{MHz}} = 22'6''$$

Obviously, 22 feet, 6 inches of coax cannot be used as the verticals are spaced 34 feet apart. This is overcome and a 90-degree lag is still obtained by using a 3/4-wavelength section of transmission line

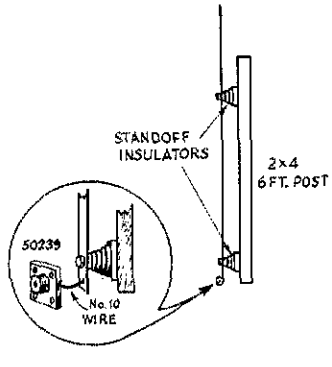


Fig. 3 — Method of mounting the vertical element on a 2 X 4.

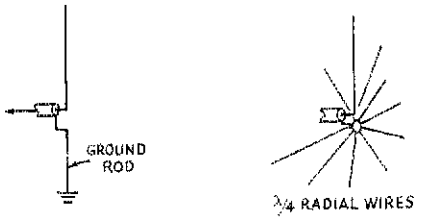


Fig. 4 — An eight- to ten-foot ground rod should be installed at the base of the antenna and as many radials as possible installed.

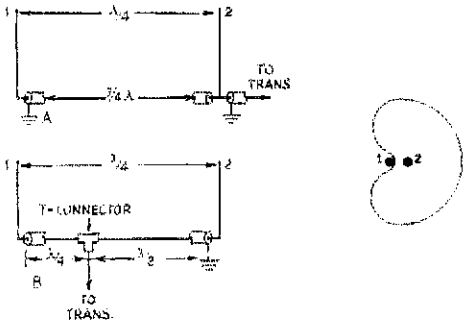


Fig. 5 — Two methods of feeding the phased verticals.

between the two verticals, Fig. 5A.[2] The SWR is less than 1.25 to 1 across the entire band, using 52-ohm coax and no matching network.

Evaluation and Performance

Lacking elaborate test equipment to evaluate the phased verticals, I had to be content with on-the-air comparisons between the verticals and my inverted V. A coaxial relay was utilized in order to have instantaneous antenna transfer and all tests were run with the same power level. A total of 100 different stations on the U.S. Mainland were contacted and participating stations were briefed that I was trying to compare two different antennas and that as accurate as possible comparison reports would be appreciated. Table I shows the results of the comparison. As can be seen, the results were very impressive. In addition there was a noticeable reduction of QRM interference from the Asian commercial stations while on the phased verticals.

The proof of the pudding however, is in the eating. The phased verticals were used extensively during the second weekend of the ARRL DX contest.[3] Band openings to the Mainland on 40 occurred more than 45 minutes earlier when compared to the inverted V. Many stations reported "Loudest KH6 on the band."

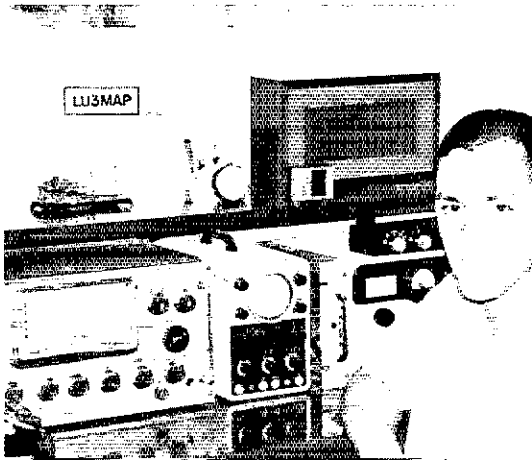
I would highly recommend to any ham really interested in putting out a good signal on 40 and who does not have the money to put up a beam, to try some form of phased verticals. An added bonus is that the verticals should load very well on 15 meters. However, since I have a beam for this band no tests were run. QST

[2] [EDITOR'S NOTE:] In calculating the phasing-line lengths keep in mind that the velocity factors for solid polyethylene and foamed material used as the insulator between the inner conductor and outer braid are different. Whichever cable you use for the phasing line, be sure to use the correct velocity factor.]

[3] None of these contacts was used in tabulating the results shown in Table I.

Strays

For the past few years K1MKV, Needham Heights, Massachusetts, and LU3MAP, Mendoza, Argentina, have maintained an important link in the continuing program of the Moonwatch Division of the Smithsonian Astrophysical Observatory. The Moonwatch Division coordinates a group of amateur astronomers around the world for the tracking of certain artificial satellites. K1MVK and LU3MAP provide communications between the group's tracking station in Argentina and Moonwatch Headquarters in Cambridge, Massachusetts.



The principle involved in making a directional coupler for monitoring rf power in a coaxial transmission line is not at all new. There have been several amateur and commercial examples of the circuit in the past. What makes the author's version so attractive is that it can be assembled from commonly available hardware items, and the only tools needed are those usually found in an average workshop. The end product is rugged, inexpensive, and can be as accurate as you want to make it. A visit to your local plumbing supply store will get you started, so think big and build one for each vhf band in which you operate.

The Line Sampler

An RF Power Monitor for VHF and UHF

BY THOMAS McMULLEN,* W1SL

A NEED FOR a power and SWR monitoring device at a remote repeater location led to the development of this sampling unit. It has filled the original requirement very well, but during the construction and testing it became obvious that it could be a device of many applications. Its features make it flexible enough to be useful in almost any vhf or uhf station. The accuracy of the end product is directly related to the precision of its construction and the patience of the builder. The line sampler is rugged enough to withstand considerable abuse from mishandling or exposure to the elements encountered at some repeater sites. Construction cost is low. The meter is likely to be the largest item, cost-wise.

Circuit Simplicity

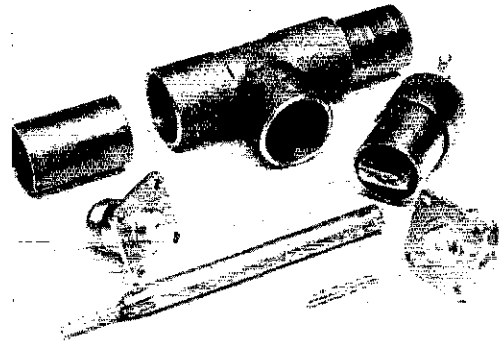
The basic line sampler circuit is quite simple, as shown in Fig. 1. It consists of a short section of transmission line, in this case 50-ohm, with a pickup loop or probe coupled to the rf field within the line. The pickup loop is terminated with a resistor at one end and connected to a rectifier diode at the other. The terminating resistor matches the impedance of the pickup loop (not the section of 50-ohm line). The diode rectifies the rf energy and the resultant dc is fed to a meter through a calibrating resistor. The probe is reversible, so the meter can be calibrated to measure forward and reflected power.

Construction

A brass plumbing T is used as the foundation for the unit, with short extensions of copper pipe to aid in constructing the 50-ohm section. A short piece of pipe with a cap provides a housing for the pickup and its associated circuitry. These fittings are of the solder type, commonly called "sweat" fittings in the plumbing trade. The choice of 3/4-inch pipe was made for ease in construction. Fortunately, a common size of copper tubing is available for the required center conductor. A 5/16-inch (outside-diameter) center conductor within the 3/4-inch pipe has an impedance that is very close to 50 ohms. Other transmission-line impedances can be matched by changing the size of the center conductor.

A hint to those who are not familiar with this type of plumbing: Tin the inside of the T and the outside of the pipe before assembly. When the pieces are heated and pushed together the pipe will slide smoothly into the ends of the T, forming a good mechanical and electrical seal. Most brass fittings have internal shoulders to aid in seating the pipe sections to their full depth. A torch can be used in soldering the assembly together, but should supply only enough heat to cause the solder to flow. An overheated and discolored fitting will not accept solder, and the connection will be noisy and can cause a high SWR. The units pictured here were assembled while using a 300-watt iron.

The inside of the 50-ohm section must be smooth and without gaps. Any burrs or solder drops that protrude into the line must be removed with a file or reamer. If a tubing cutter is used to



A collection of parts needed to assemble the line sampler. The center conductor is shown with one end completed. The other end has been slotted in preparation to accept the center pin from the coaxial connector. The brass pipe T and copper extensions serve as the body of the unit.

*Assistant Technical Editor, *QST*

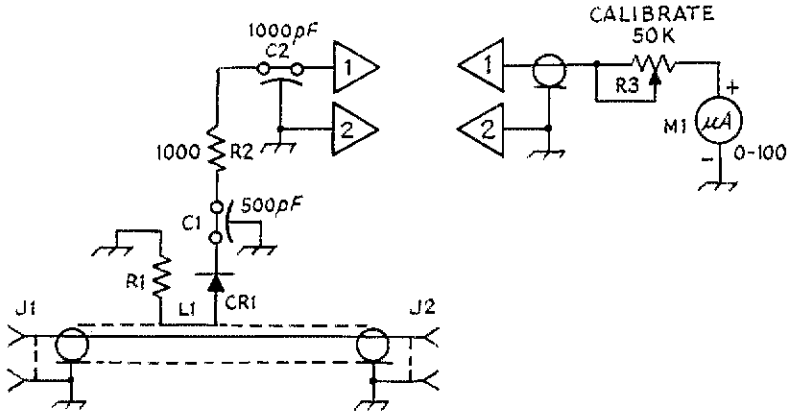


Fig. 1 — Circuit diagram for the line sampler.

C1 — 500-pF feedthrough capacitor, solder-in type.
C2 — 1000-pF feedthrough capacitor, threaded type.
CR1 — Germanium diode, small signal type, 1N34, 1N60, 1N270, 1N295 or similar.
J1, J2 — Coaxial connector, type N (UG-58 A/U).
L1 — Pickup loop, copper strap 1 inch long X 3/16 inch wide. Bend into "C" shape with flat portion 5/8 inch long.
M1 — Microammeter, 0-100μA, panel mount (Simpson 2121C-17816 or equiv.).
R1 — Composition resistor, 82 to 100 ohms. See text.
R3 — Linear-taper composition control, 50k-ohm.

cut the sections of pipe, it should be applied with care. A great amount of pressure on the cutting roller will cause large burrs that will be hard to remove.

Teflon-insulated coax connectors are used in the assembly. Insulation of Lucite or any similar plastic will melt from the heat needed for soldering. The center pins must be removed from the connectors, and this is done by opening the split-ring washer that secures the pins to the insulation. One of these split rings will be needed for each end of the center conductor upon reassembly. These rings are usually of a soft metal and can be opened with the point of a knife blade.

The center conductor should be prepared by making eight saw cuts, 1/2-inch long, in one end of the tubing. The fingers left between the cuts are bent in toward each other, forming a taper. A fine-toothed blade in a coping saw was used to make the cuts. The center pin from the coax fitting should fit snugly into the end of the tapered portion of the inner conductor. If it does not, a small shim of sheet copper can be wrapped around the pin to provide a closer fit. The pin can then be soldered into the end of the center conductor. Again, the tubing and pin should not be overheated.

In preparation for soldering the body of the coax fitting to the copper pipe, it will be helpful to make a holding fixture from an old coax fitting that matches the threads of the one being soldered. The fixture can be clamped in a vise with the T assembly resting on top, held in place by its own weight. Use the partially prepared center conductor to assure that the center of the coax connector is concentric to the outer conductor, and that the ends of the 3/4-inch pipe sections are not cut at an angle. Apply heat to the flange of the coax fitting, and use just enough to obtain a smooth fillet of solder where the flange and pipe meet.

Before completing the center-conductor assembly, it must be checked for proper length. It should clear the inner surface of the coax connector by the thickness of the split-ring on the center pin. After the tubing has been filed to the right length, it should be slotted. Then the center pin can be soldered in place. The coax fitting can now be soldered on to complete the assembly of the 50-ohm section.

Probe Assembly

A 1-1/2-inch length of copper pipe serves as the body for the probe, with a pipe cap on the top to provide a support for the feedthrough capacitor. A copper disk is cut to fit inside the pipe, with four small tabs around the edge of the disk to aid in soldering the assembly in place. Two Teflon standoff insulators are mounted on the disk, and the pickup loop is soldered to these for support. The diode is connected between one end of the loop and a 500-pF feedthrough capacitor that is soldered to the disk. The terminating resistor is connected between the other end of the loop and ground. Use the *shortest* leads possible. After this assembly has been made, it should be soldered in place in the probe body by heating the outside of the pipe and applying solder to the tabs around the disk. The exact position of the assembly within the pipe will be determined by the size of the Teflon standoffs used, and by the amount of protrusion necessary for the loop. For power levels up to 200 watts the loop should extend beyond the face of the pipe approximately 5/32 inch. For use at higher power the loop should protrude only 3/32 inch.

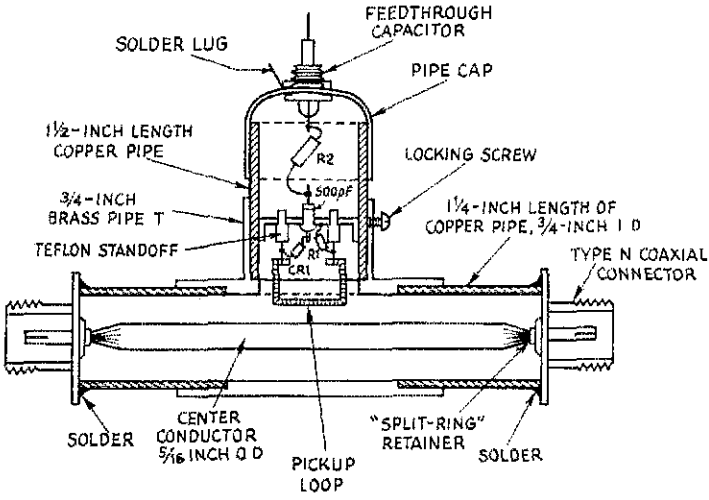


Fig. 2 — Cross-sectional view of the line sampler. The pickup loop is supported by two Teflon standoff insulators. The probe body is secured in place by means of one or more locking screws through threaded holes in the brass T.

A 1000-ohm decoupling resistor and the .001-μF feedthrough capacitor can be connected next and the pipe cap put in place. The threaded portion of the feedthrough capacitor must extend outward through the cap, and a solder lug should be put in place before tightening the nut on the capacitor. The cap is fastened with two small screws that go into threaded holes in the pipe.

Calibration

Three things are needed to calibrate the line sampler: a source of rf, a wattmeter of known accuracy, and a load that has a low SWR at the frequency in use. If the sampler is to be used for more than one band it should be calibrated on the highest frequency contemplated.. If an accurate wattmeter is not available the sampler can still be calibrated for relative output and SWR. A dummy load that is less than perfect (reactive) can be used if it is connected at the end of a length of high-loss coax. A 200-foot length of RG-58 cable would isolate such a load at 144 MHz. This coax would also dissipate considerable energy so that a low-wattage load could be used at higher power.

The first step in the calibration procedure is to obtain the lowest reading possible with the probe positioned to read reflected power. This can be done in either of two ways: The resistor can be selected or modified by filing it to match the loop impedance,[1] or the loop can be modified to match the value of the resistor. Since the loop is easier to get at, the latter method was used in calibrating this unit. Filing the loop to reduce its width will *increase* its impedance. Increasing the cross-section of the loop will *lower* the impedance, and this can be done by adding a coat of solder. When the reflected power reading has been reduced as far as possible, the probe can be reversed and calibrated for forward power by increasing the transmitter output in steps, then making a chart or graph to correspond to the meter scale. Calibration control R3 is used to set the maximum (full-scale) reading.

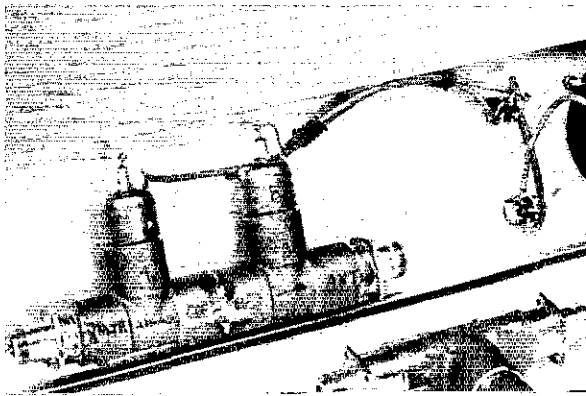
[1] The resistance will increase as the carbon is filed away.

Variations

It is not recommended that one line sampler be used for monitoring both forward and reflected power by repeatedly reversing the probe. The lack of a precision fit between the probe body and the brass T will eventually cause noise and erratic meter readings. It is quite easy to assemble two T fittings end-to-end fashion and make two probes, one for forward and one for reflected power. A single meter can be switched between the two units, or two separate meters can be used.

The line sampler described here was tested and calibrated at 146 MHz. However, this calibration will not hold true for other frequencies. At a higher frequency the reading will increase, and on a lower band it will decrease. This is because of the relationship between the length of the loop and the wavelength of the rf energy. Calibration for two or three bands could be accomplished by making the

(Continued on page 25)



A trio of line samplers. The single unit has its dc output through a miniature cable connector instead of a feedthrough capacitor as discussed in the text. Either method is acceptable. W1NTH assembled two samplers as one unit, shown mounted on a panel. A switch connects the meter to either the forward- or reflected-power probe. Another switch selects either a high- or a low-power calibration.

A 10-Element Yagi for 220 MHz

BY WALTER L. WOOTEN,* WINTH

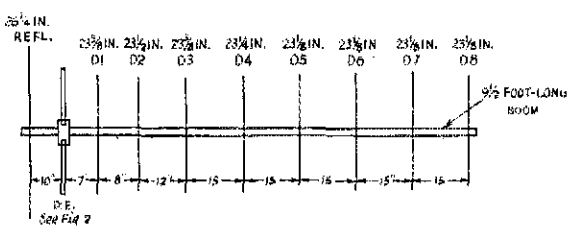
BECAUSE OF increased activity and the resulting squeeze that has come about from fm activity in the 2- and 3/4-meter bands, there is greater interest in venturing into the 220-MHz band. Until recently, 220 has not enjoyed the popularity of some of the other bands for various reasons, one of which is lack of commercially available equipment, but many ideas are beginning to surface on how to modify or build the necessary equipment for this part of the spectrum. And so, the interested vhf amateur begins a search for an antenna that will best suit his needs on this band. Described here is a 10-element Yagi that can be used as is, or stacked with a twin for an additional 3-dB gain.

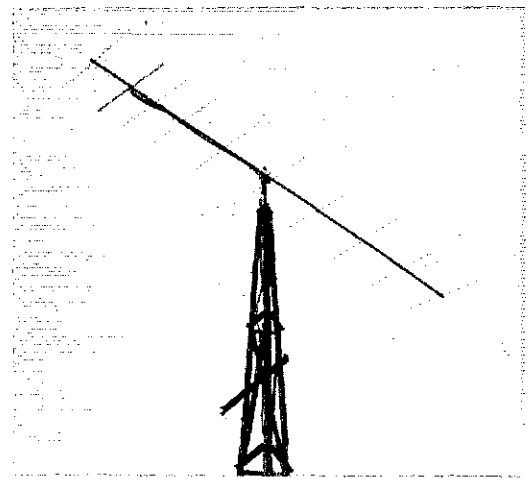
Construction

A 10-element optimum-spaced beam of this type has a theoretical gain of approximately 13 dB, and should be mounted on a boom 2.75-wavelengths long. The boom for this antenna is only 9-1/2 feet long, approximately 2 feet shorter than called for in the *ARRL Antenna Book*. Therefore, the gain will be something less than optimum. The boom is constructed of one 8-foot and one 18-inch length of Reynolds Do-It-Yourself aluminum tubing, 0.049-inch wall.

As can be seen from Fig. 1, directors 5 through 8 are the same length, and all directors forward of D3 are equally spaced, which tends to limit the bandwidth but will provide increased gain. All elements except the driven element are made from 1/8-inch aluminum wire. The driven element is 3/8-inch aluminum tubing, mounted on a Plexiglas block which serves as the insulator.

* Editorial Assistant





Phasing and Matching

A half-wave dipole in free space will exhibit approximately 70 ohms impedance at its center, but when placed in the proximity of parasitic elements the impedance will depart from this figure. This may cause a problem when using 50-ohm coaxial cable. Therefore, a method of presenting the antenna as a suitable load to the line is an area of concern.

A half-wave dipole is about 25-1/4-inches long at 220 MHz, but an inspection of Fig. 2 shows the driven element to be somewhat shorter. A 4:1 balun, when used with 50 ohms as the feed, requires an impedance of 200 ohms for a proper match. The hairpin is used to match the 200-ohm output of the feedline. Then it becomes necessary to shorten the driven element, thus giving a resonance effect at our 220-MHz frequency. The hairpin dimensions were found primarily by the cut-and-try method. It was later learned that time could have been saved by the use of a dip meter to indicate resonance during the pruning process. Near-optimum readings are found by checking the frequency at the loop with the driven element separated from the rest of the antenna, much like that described in April 1962 *QST*. Upon replacement, additional dips are found above and below the driven element's resonant frequency, indicating the presence of the reflector and directors.

Coax-Balun

The intent of raising the impedance to 200-ohms is to allow this antenna to be fed with 50-ohm coax via a 4-to-1 balun, and to help balance the beam pattern. A 4-to-1 balun was built from a half-wavelength section of coax line and connected to the driven element and hairpin. The first balun made consisted of 16-1/2 inches of RG-8/U Poly-Foam, while a second, made of polyethylene RG-8/U, was 14-1/2 inches long. This

Fig. 1 — The 10-element Yagi has been mounted on a 9-1/2-foot boom with element spacing and length as shown. The driven element is in greater detail in Fig. 2.

is as expected because of the difference in the velocity factors of the two types of coax. The type of feed line in use must be taken into account when duplicating this balun, or any other. If suitable measuring equipment is available, such as a dip-meter, further checks would assure accuracy in length. Fig. 3B shows how a half-wavelength of coax is found.

Hairpin-Loop Adjustments

The hairpin loop was made of 3-1/4 inches of No. 12 copper wire, spaced 1 inch at the terminating ends and formed as shown in the drawing of the driven element, Fig. 2. After the desired results were found, and as a check, further adjustments of the loop, in steps of 1/2 to 1/4 inch, altered the SWR from about 1.1:1 to 1.5:1 and higher. The size of the wire and width of the loop also affected

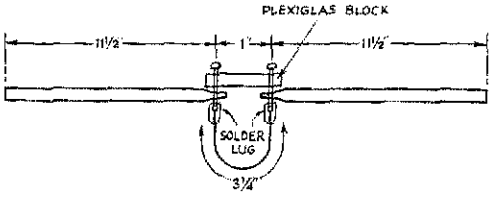


Fig. 2 — The driven element is made of two pieces of 11-1/2-inch, 3/8-inch diameter aluminum tubing which is mounted on a block of Plexiglas. The hairpin section is made of 3-1/4-inch No. 12 copper wire and shaped as shown with 1-inch spacing at the ends. Solder lugs have been installed at the driven-element bolts to attach the hairpin and balun.

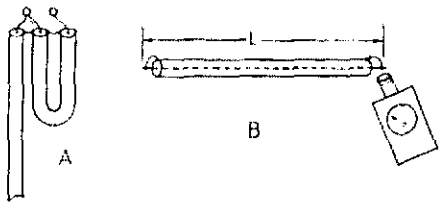


Fig. 3 — The 4:1 balun length is found with the use of a dip meter,and is 16-1/2—inches of RG-8/U Poly-Foam.

these readings, though not as much as did the total length.

Additional Gain

If more gain is desired (than that possible from a single antenna), a duplicate model can be built. The two antennas can be stacked for approximately 3-dB of additional gain. A change in the hairpin loops is then required for a proper match to the feed line. Each beam would require a feed point impedance of approximately 400 ohms. Lengthening the hairpin raises the impedance. Both antennas can be fed by approximately 1 wavelength of 450-ohm open-wire feed line. The 50-ohm coax and 4-to-1 balun are then connected at the midpoint between the two antennas. This point would appear near the desired 200-ohm value as did the single beam.

In each case, after assembly, best adjustment for minimum SWR should be made while observing a good quality vhf bridge or wattmeter. QST

The Line Sampler

(Continued from page 23)

probe depth adjustable, with stops or marks to aid in resetting it to a given position Since it would destroy the mechanical simplicity of the sampler, this method was avoided. A switch to select different calibrating resistors would accomplish the same thing.

Other sizes of pipe fittings can be used, of course, and the formula

$$Z_o = 138 \log \frac{b}{a}$$

can be used to find the inner and outer conductor dimension needed for the impedance desired. Dimension a is the *outside* diameter of the center conductor, and b is the *inside* diameter of the outer conductor. Both a and b should be the same units — inches or millimeters.

Type-N coax fittings were selected because they have excellent constant-impedance characteristics, and most of those on the market can be taken apart easily. A few were found that had a crimped-together method of assembly, as did all of the BNC connectors. If it is necessary to use a connector that cannot be disassembled, a small hole must be drilled in the outer conductor near one end. This hole should be just large enough to admit the tip of a soldering iron to heat the connection between the center conductor and the pin in the coax connector. A small hole, up to 3/8-inch diameter, should have very little effect on the unit.

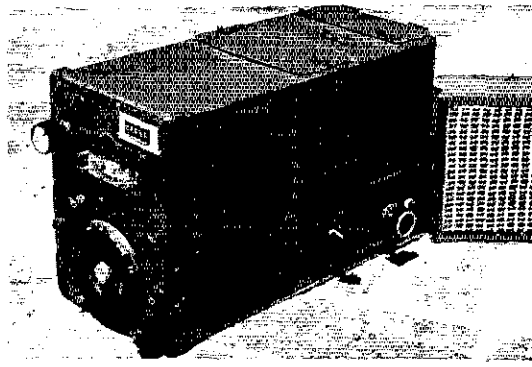
Telemetering could be done by replacing the meter with a resistor to complete the dc path from the diode. The voltage developed across this resistor can be applied to a voltage-controlled oscillator to produce a tone that changes with a variation in transmitter output power. This tone could be monitored remotely at a control point as an indication of how the transmitter is performing.

In Summary

Almost everyone who has seen the line sampler has thought of some modifications that would fit his own particular need or desire. The unit lends itself well to physical changes as long as the basic principle is observed, that is, the line section must match the transmission line in use and the pickup loop must be terminated properly. Indeed, the author has several ideas sketched in his notebook for future development, as time permits. QST

The Super-Simple 80-20 Receiver

BY THOMAS R. SOWDEN,* KØGKD



The band switch and antenna trimmer are mounted on the side, near the lower rear of the cabinet. The knob at the upper right on the front is for the gain control.

LIKE MANY HAMS, I find building your own gear for the shack can be a luxury not easily afforded, particularly when such projects take time from domestic duties and business obligations. The author is no exception, because of his XYL and two children and a very demanding job. However, availability of multifunction integrated circuits, coupled with the new copper tape available for making circuit boards "as you go," allow for quick assembly of a multitude of projects without burning the midnight oil. One can still maintain a relatively happy home life, and with bread on the table.

The introduction by National Semiconductor[1] of the multiple-mode i-f-strip IC, LM373, provided the backbone and initiative to piece together a single-conversion two-band receiver, borrowing some of the better ideas of recent vintage.[2,3,4] This device will surely qualify as one of the most complex communications microcircuits presently available, at a price hard to beat – around $5. Fig. 1 shows the several internal functions of LM373, in addition to the block layout of "S-S 80-20." In short, the IC provides four stages of gain, several impedance transformations, product detection, and agc detection and control. Connected with an external crystal filter, the unit becomes a complete i-f strip, lacking only front-end direction from a mixer and sufficient tail-end amplification for high-level audio.

In keeping with the simple approach, a used ARC-5 surplus transmitter was stripped down, leaving just the 150-pF variable capacitor which is solidly mounted in the unit. The stripped-down ARC-5 serves as the chassis for the receiver. This helped to reduce the mechanical construction work that one experiences when starting from scratch – something the author is most inept in doing. Persons talented in metal bending or chassis fabrication will likely want to compact their version of the receiver in a Minibox of some sort. The rest of us can take comfort in knowing it would be practically impossible to achieve the placement of the oscillator variable capacitor in the same solid manner as did the manufacturers of the ARC-5.

Circuit Description

The front end utilizes a dual-gate MOSFET in the mixer. The diode-protected gates should handle up to about 10 volts of transmitter rf before breakdown. This should certainly be adequate for protection from the mating transmitter, pro-

* Route 3, Arkansas City, Kansas 67005

[1] National Semiconductor Corp., 2900 Semiconductor Drive, Santa Clara, CA 95051.

[2] Gotwals, "Solid State Receiver for 160 Meters," *Ham Radio*, December 1969.

[3] Hayward, "A Second Generation MOSFET Receiver," *QST*, December 1970.

[4] Haivnak, "Integrated-Circuit Communications Receiver for 80 Meters," *Ham Radio*, July 1971.

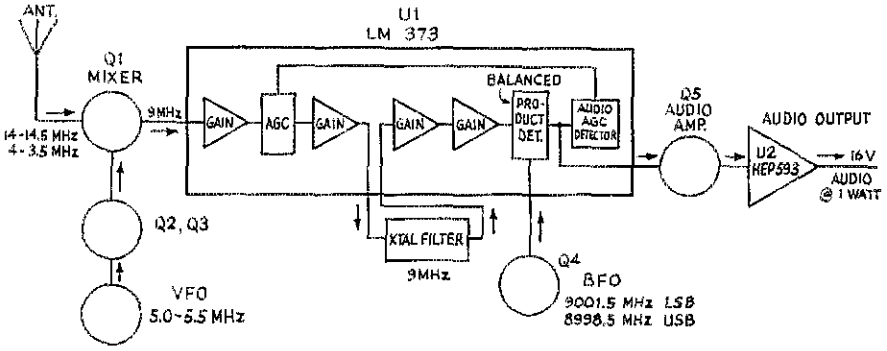


Fig. 1 – Block diagram of the receiver.

viding, of course, a good antenna relay is utilized. The incoming 80- and 20-meter signals are injected into gate 1, mixing with a 5- to 5.5-MHz oscillator output fed to gate 2 to provide a 9-MHz i-f.

For isolation and excellent Q, toroidal transformers are used in the mixer circuit. The good isolation between ports, and the maintenance of a low oscillator injection level at gate 2, minimize spurious response and cross modulation in the 40673. Though a higher oscillator injection would increase the gain of the stage, more than adequate amplification is available in the LM373.

A Colpitts VFO is used. It is very stable. Coupling capacitor C4 is selected for 100-200 mV injection into gate 2 of the mixer. For those wishing to cut a few corners, a MPF102 FET could be used at Q2 by replacing R1 with a 47,000-ohm resistor.

The LM373 can handle large signals without causing distortion. The first i-f stage is followed by an age control section which can provide a gain reduction exceeding 60 dB. The second i-f follows the age circuit with a built-in emitter follower for low-impedance matching to an external crystal filter. The third and fourth i-f stages, following the external bandpass network, are emitter-coupled amplifiers with an emitter follower between them to reduce third-stage loading. A balanced mixer follows which, during ssb reception, serves as a product detector. The last section is the peak detector or the age activator. The control voltage developed at the activator (pin 8) is smoothed by an external 25-μF capacitor, which is charged rapidly on peaks. It has a relatively slow discharge characteristic between peaks, thus providing fast-attack, slow-release age. Manual gain control is achieved by disconnecting this stage from pin 1 and providing a variable dc voltage source. Gain is maximum with 3.8 volts dc at pin 1, with full attenuation occurring at about 4.1 volts dc.

The recommended BFO injection level is 60 mV rms at pin 6. A switch is used for activating the usb or lsb crystal in the circuit of Q4. The BFO carrier generated is placed at the 6-dB point

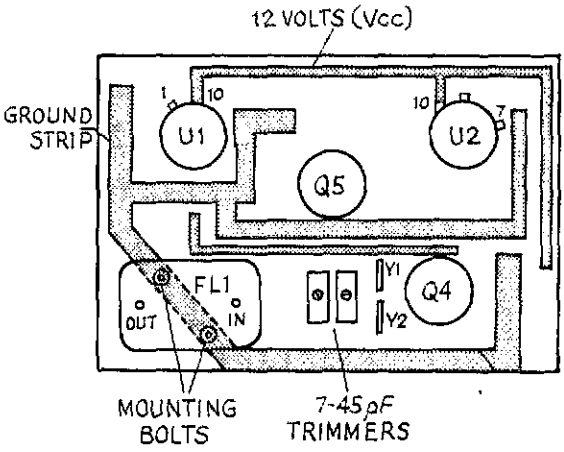


Fig. 2 — General layout of the perf board for the i-f/audio section.

on the passband curve of FL1 by adjusting the 7- to 45-pF trimmers. Care should be taken to limit the maximum level to 100 mV rms. Excess input might activate the age.

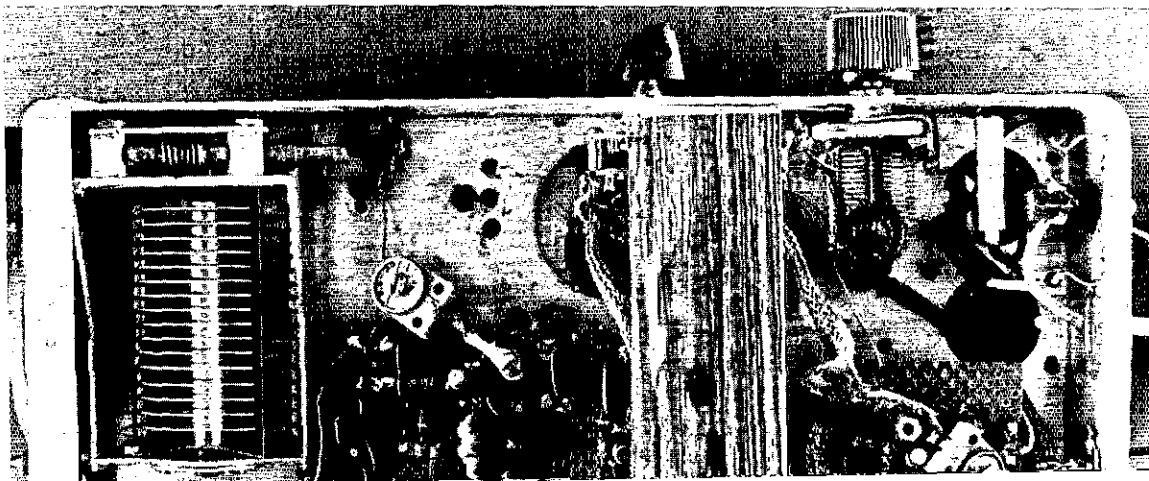
While the audio output of U1 is sufficient (at 50 mV BFO injection) to drive U2 to full output, the addition of Q5 provides the proper impedance match between the 10,000-ohm input of the audio IC, U2, and the 1000-ohm output of U1. The output of the "op amp" is more than adequate to provide comfortable listening in a small room with a one-ton air conditioner running at full speed. This circuit was previously described in detail.[5]

The power supply is conventional and provides excellent regulation with low-output ripple.[6] The HEP176, U3 of Fig. 4, is a complete silicon-rectifier bridge. The 40389, Q5, is mounted by the manufacturer on a heat sink, and is of sufficient wattage to handle the receiver load easily.

[5] "A 1-Watt Solid-State Audio Module," Gimmicks and Gadgets, *QST*, May 1970.

[6] Olson, "A Survey of Solid-State Power Supplies," *Ham Radio*, February 1970.

At the front is the vernier-driven ARC-5 capacitor. The oscillator board is just to the rear of the capacitor. Located near the rear of the chassis is the perf board that holds the mixer components.



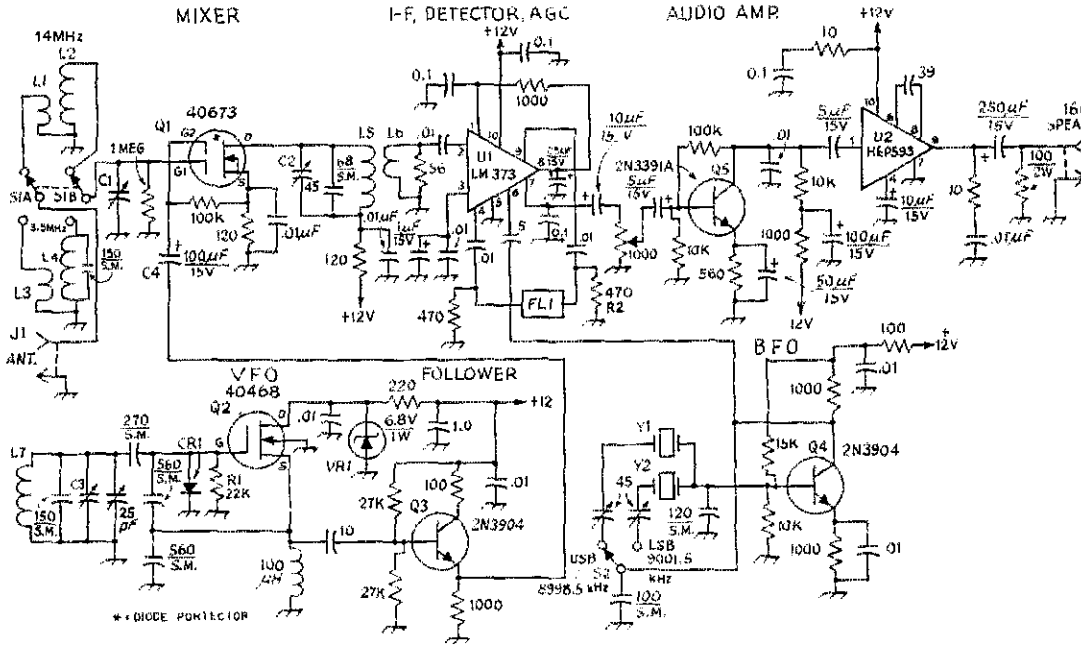


Fig. 3 — Circuit diagram of the Super-Simple 80-20 receiver. Resistors are 1/2-watt composition.

C1 — 100-pF variable.
C2 — 7- to 45-pF variable.
C3 — ARC-5 variable, 150 pF.
CR1 — 6.8-V, 1-watt Zener diode.
J1 — Phono jack.
L1 — 3 turns No. 24 enam. wound over L2.
L2 — 17 turns No. 24 enam. wound on Amidon T-68-2 toroid form.
L3 — 3 turns No. 24 enam. wound over L4.
L4 — 40 turns No. 24 enam. wound on Amidon T-68-2 toroid form.
L5 — 26 turns No. 24 enam. wound on Amidon T-50-2 toroid form.
L6 — 3 turns No. 24 enam. wound over L5.
L7 — 1.7-2.7 μH (Miller 4503).
R1, R2 — Value to match filter impedance.
Note: FL1 — The filter used is a Spectrum International KVG XF9A. A Wheatlands WF4 would be suitable with proper resistors for R1 and R2.

Construction

The receiver was put together on three separate "perf" boards, one each for the variable oscillator, the mixer and the i-f/audio segments. Fig. 2 shows the general layout of the i-f/audio module, which is mounted on the top side of the stripped ARC-5. The mixer and vfo are placed on the under side, shielded by a small partition. Shielded cable was used between the mixer and i-f/audio to reduce stray pickup. Numerous ground connections were soldered at regular intervals to avoid ground loops. Pressure-sensitive adhesive-backed copper tape was used throughout, along with precut mounting pads for transistor and IC socket soldering. As with any high-gain device, short leads and proper placement are mandatory to maintain stability. Care should be taken in placing the sideband crystal-selection switch as close as possible to the crystals.

Performance

Sophisticated instrumentation was not available for testing the SS 80-20. However, while switching the antenna from my TR-3 and the receiver, the comparison was very encouraging. Selectivity and sensitivity is very satisfactory. And, of course, the thrill of building your own gear is the greatest! Tuning the signals is done smoothly with the worm-gear drive on the ARC-5 variable capacitor, and age action appears to be excellent.

Remarks

It took the author one week (spending a little time each evening) to construct the receiver. Most of the parts were relatively easy to obtain. Much more will likely be heard about the LM373 because of its many functions. In addition to

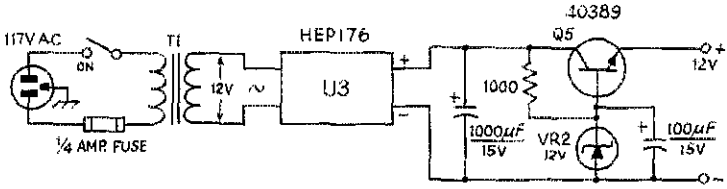
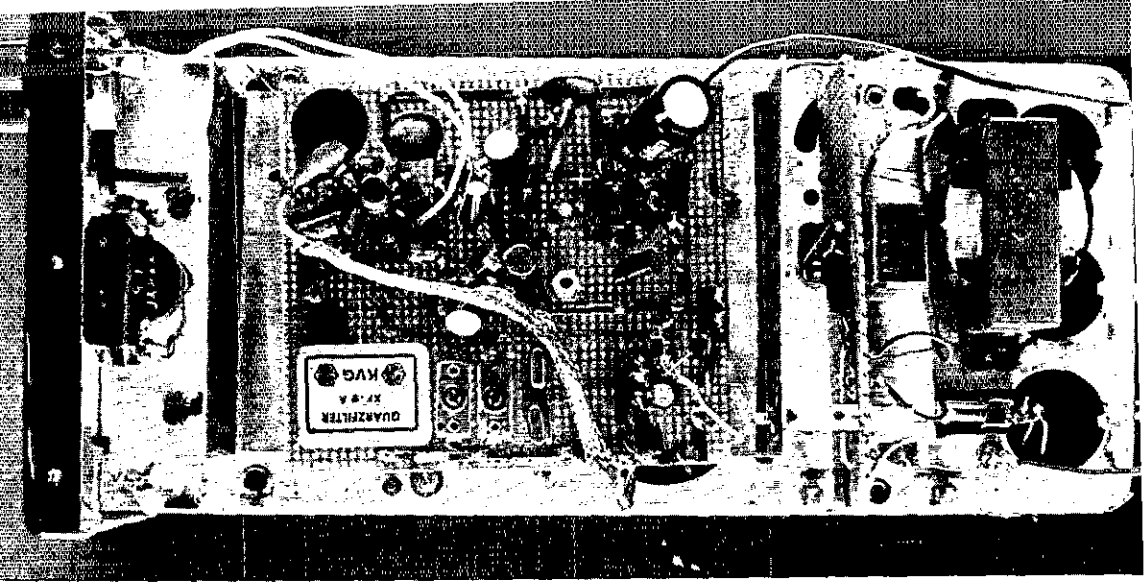


Fig. 4 — Circuit diagram of the power supply.
Q5 — 40389 heat sink is integral part of device.
T1 — 12-V, 1-A filament transformer.
U3 — Rectifier assembly.



This shows the top of the chassis. The power supply is mounted near the rear. Reference to Fig. 2 will help in locating the components on the filter board. The meter on the front panel is not used in the unit.

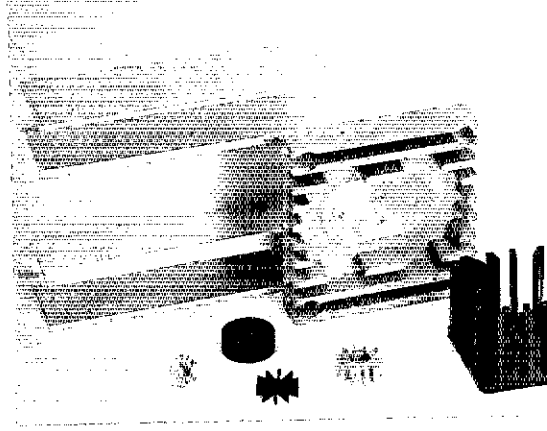
a-m, fm, and ssb, the IC can be used as an amplitude-modulated rf oscillator, a gated video amplifier with age, balanced modulator, suppressed-carrier signal generator, or a synchronous-demodulating i-f strip. I am working on an ssb transmitter with the IC in the suppressed carrier/signal generator mode. This should be a fun project!

The writer wishes to thank Bob Kuhlmeier, WAØUMZ, for his help in circuit evaluation, and for making constructive suggestions during the project. QST

Strays

The K4YLP Memorial Award, presented each year to a member of the Virginia Amateur Radio Association who most displays the qualities of the late Bert Simons, was awarded recently to Wilmer G. Rogers, WA4OPW (right), by Bert's widow, Terri. Looking on from left are S. E. Fellerman, K3FEC, and Robert R. Rodman, WB4JAW. The award, a certificate and a Savings Bond, was made possible by the Lox & Bagels Radio Club.

The Santa Clara County (California) Amateur Radio Association turned 50 last December. "Watching the birdie" during the celebration are: J. A. "Doc" Gmelin, W6ZRJ, Pacific Division Director; Charter Members Armand Humberg, W6BON, Frank Quement, W6NX, and Ray Thomas, W7III; and Sheffie Geyer, WB6VWQ, club president.



Typical heat sinks from the small clip-on type to large finned radiators.

Thermal Design of Transistor Circuits

BY JOHN WHITE*, VE7AAL

THE PROBLEM of what to do with a hot transistor has generally been solved by clamping or bolting the device to a large piece of metal in the hopes that the heat will go away. But, just as one designs a circuit to be electrically sound, one can also design for proper thermal operation. The design procedure involves determining the size of the heat sink that will be needed, and the maximum operating temperature for the transistor. The notes and tables in this article will enable one to choose a suitable convection-cooled heat sink that will assure a safe operating temperature for a power transistor.

Methods of Heat Transfer

There are three modes by which heat can be removed from a body: conduction, convection and radiation:

1) Conduction is the transfer of heat through the body. In order for heat to flow, there must *always* be a temperature difference. The amount of heat that can be transferred will depend upon the area through which the heat flows, the temperature differential, the distance over which the differential exists, and the thermal conductivity of the material. Thermal conductivity is a measure of the ease by which heat can travel through the body and will vary from material to material.

2) Convection results from the hot body causing local heating of the air. As the density of the heated air is lower than that of the surrounding cooler air, the hot air rises and cool air takes its place. This air is in turn heated and will also rise, setting up a steady flow of air past the hot body. Heat is continuously removed from the body and transferred to the air in this manner. The amount of heat that can be removed depends on the area of the body over which convection is taking place, the temperature difference between the air and the body, and the convective characteristics of the flowing air (laminar or turbulent flow). Natural convection is generally laminar flow while turbulent flow is associated with forced convection.

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3) The radiative means of heat transfer results in heat removal by direct transmission of energy from the surface of the body. It does not rely on the conductive or convective methods. The amount of heat which can be transferred is proportional to the temperature difference between the body and the surroundings, the area of the body exposed to radiation, and an emissivity factor. This emissivity factor relates the ability of the body to radiate energy as compared to an ideal radiator known as a black body. The emissivity factor can vary by as much as 30 times, depending on the surface finish of the body.

While all these terms of temperature differential – area, length, emissivity – appear formidable, they can be combined into a single useful term known as thermal resistance. This is exactly analogous to electrical resistance and can be considered as the opposition to heat flow. Just as an electrical resistor has a voltage drop, because of the current flowing through it, the thermal resistor has a temperature drop because of the heat flowing through it. There is a conductive thermal resistance, a convective thermal resistance and a radiative thermal resistance. The resistance is expressed in degrees/watt, where watt is used as the rate of heat flow. Fig. 1 shows a simple schematic diagram.

The Transistor

The reader should have a general idea of transistor construction in order to understand its thermal properties. Fig. 2 shows two common transistor cases in a simplified cross-sectional view. All transistors which have metal cases are constructed similarly, as are plastic transistors with metal heat-sink tabs.

The transistor is a very small germanium or silicon chip mounted on a rather spacious metallic header. In power transistors, the chip may be less

With the amateur's usual emphasis on electrical design and construction, thermal considerations are often not given sufficient attention in solid-state projects. This article describes in detail how to assure that a transistor operates within its heat-dissipation rating.

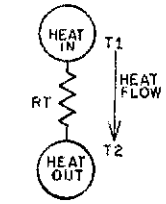


Fig. 1 — Diagram of heat flow.

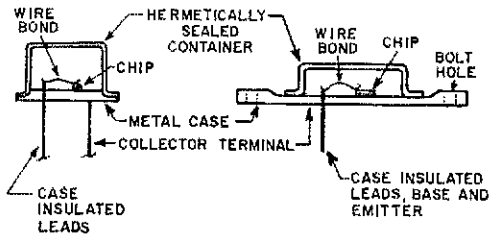


Fig. 2 — Internal mechanical construction of TO-3 and TO-5 transistors.

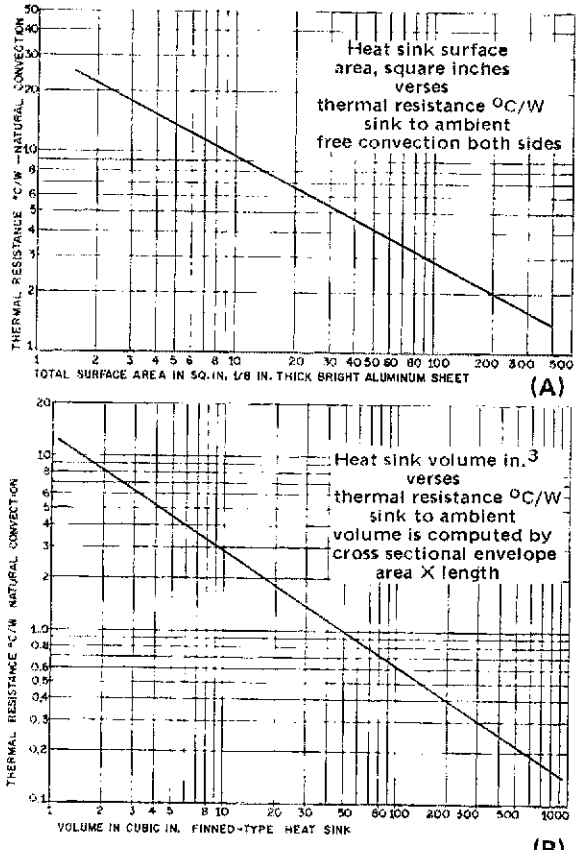
than 1/64 inch on each side for a 1-watt device and up to 1/4 inch on each side for a 200-watt device. The case size will be bigger for higher power devices, as well. The collector terminal is almost always on the bottom of the chip and is bonded directly to the case, while the base and emitter leads are taken off via wire bonds to separate insulated leads which come out through the case. The case often is connected to the collector and is electrically hot.

The heat to be dissipated is generated in the collector-emitter junction of the chip, which is a very small area and which will get very hot. The transistor manufacturer specifies the maximum temperature at which the junction is permitted to operate. This rating should not be exceeded. The junction temperature must be kept as low as possible to extend the life of the transistor. For germanium transistors, the maximum junction temperature (T_j) is usually not lower than 85 degrees Celsius (C) and not higher than 110 degrees C, and for silicon 135 degrees C to 200 degrees C, respectively. Obviously, silicon is desirable for power devices from a temperature standpoint. Also, leakage currents in germanium transistors can be very high at elevated temperature. The heat generated in the chip is passed directly to the case through the collector-case bond.

The Heat Sink

A heat sink is the device which will take the heat from the transistor and couple it into the surrounding air. Although other metals have higher thermal-conductivity ratings, aluminum is most often used when large heat sinks are required, which can range from simple plates to elaborately finned extrusions. The fin is used to increase the area exposed to the air, allowing more heat to be transferred. High-power transistors which can be bolted to the heat sink are used with the finned arrangements. For lower power transistors, small clip-on fins are available to remove the excess heat. The mechanical mating of the heat sink to the transistor is very important; a good tight fit with a maximum of common contact area is required for maximum heat transfer.

Heat sinks come in various finishes which determine emissivity. If a flat plate is used as a heat sink, its ability to dissipate heat by radiation is greatly increased if it is painted rather than left as bright aluminum. A white enamel paint is only about 5 percent lower in emissivity than a flat

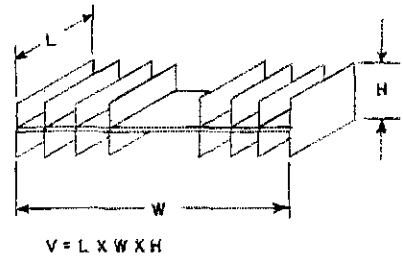


TO-5 type clip-on heat sinks	Number of fins or width	Thermal resistance
FINS	1 2 3 4	70° C/W 50° C/W 45° C/W 30° C/W
WIDTH	1/2 in. 3/4 in. 1-3/8 in.	70° C/W 50° C/W 30° C/W

(C)

Fig. 3 — Thermal resistance of (A) a flat plate, (B) a finned heat sink, and (C) a clip-on heat sink.

Fig. 4 — Volume determination of a finned heat sink.



black laquer, which means the sink can be painted any color without markedly effecting its radiative properties. Calculations have shown the radiative heat loss under painted conditions to be 20 to 40 percent of the total heat loss, the rest resulting from convection. A different set of circumstances exists with the finned heat sink. Radiation leaving one fin simply impinges on the fin beside it where it is reabsorbed. As most of the heat sink area is in the fins, no effective radiation takes place. As the fins are employed for maximum convective heat transfer, the radiative component is relatively small. Painting a finned heat sink may only lower its thermal resistance by 10 percent.

The convective and radiative properties of the heat sink are not usually split up but are combined to determine the overall ability of the sink to dissipate power. Thus, the thermal resistance of a heat sink is a combined property. The dissipative properties of the heat sink can be affected by its orientation in space. A flat plate will dissipate more power when mounted vertically than when mounted horizontally. A finned heat sink should be mounted with the fins vertically orientated so that the air has a free bottom-to-top passage.

The graphs of Fig. 3 give the thermal resistances of flat plates and finned heat sinks, respectively. Fig. 3A assumes a vertically mounted plate with air passing over both sides; the plate should be approximately square. If the plate is painted, the thermal resistance could be lowered by 25 percent. A horizontal plate may be utilized, such as a chassis, but convection is essentially restricted to the top side resulting in a thermal resistance about 40 percent higher. Fig. 3B holds approximately true regardless of the fin configuration. The volume is computed by taking the outside dimensions of the height, width and length. It is not the actual volume taken up by the metal. Fig. 4 shows the dimensions of interest.

Ambient Air

The heat sink will be placed in an air environment which is going to absorb the heat from the sink. If the amount of air is large, such as in a room, then the power from the heat sink has little effect on the overall air temperature. However, if the heat sink is inside a cabinet where the air flow is nonexistent, then the heat sink is going to raise the local air temperature by a substantial amount. This condition must be avoided.

In order to design a heat sink, the first parameter to be set is the maximum expected ambient air temperature in which the sink will operate. The exact figure will depend on the application, but the air temperature on a hot summer day could be 95 degrees F (35 degrees C). If the heat sink is inside a cabinet, the air temperature inside the cabinet because of all the other components dissipating power could easily be 120 degrees F (49 degrees C).

A Thermal Model

Fig. 5 shows the theoretical model of the transistor mounted on the heat sink. R_{jc} is the thermal resistance from the transistor junction to the transistor case. This is the conductive thermal resistance of the chip and the collector-case bond. The power dissipated in the chip is conducted from the chip to the case with a resulting temperature drop. This parameter is normally specified by the manufacturer on the transistor data sheet as θ_{jc}; the symbol θ is very commonly substituted for R. Because data sheets are not always available, Table 1 gives some values which may be used. R_{jc} varies considerably from transistor to transistor, because of different chip sizes, chip material, and bonding arrangements.

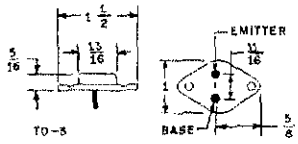
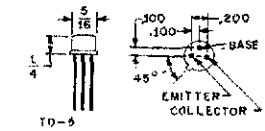
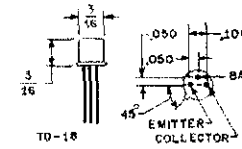
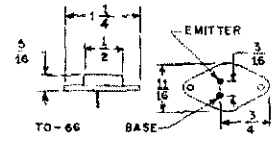
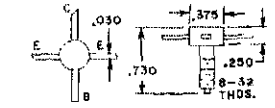
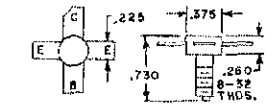
R_{cs} is the conductive thermal resistance which exists between the transistor case and the heat sink, because of the imperfect mating of the two surfaces which results in a decrease in contact area with air insulating the voids. Bolting the transistor to the sink in this manner results in a "dry" contact which is electrically conductive so that the heat sink is now part of the collector circuit. The thermal resistance can be cut in half or more by introducing a heat-conductive silicone grease which flows over all interface surfaces, driving out air voids and increasing contact area. Electrical conduction is still maintained through the mounting bolts. It may be required electrically to isolate the transistor from the heat sink, in which case a mica washer may be used to isolate the case and the sink. The mounting bolts must be isolated with Teflon or nylon shoulder washers. The mica washer will increase the thermal resistance. The washer should be coated with grease. Table 1 summarizes the typical thermal resistances using a .002-inch-thick mica washer.

Table 1

Thermal Resistance Case to Sink R_{cs}	Dry 0.25°C/W	Greased 0.1°C/W	Dry with Mica Washer 0.8°C/W	Greased with Mica Washer 0.40°C/W

Table 2

Thermal resistance, junction-to-case and case-to-ambient ratings of some transistor cases.

Case size and typical dimensions in inches	R_{jc}	R_{CA}	Typical maximum spec'd power dissipation
	0.5 to 3.0° C/W	35° C/W typical	up to 300 watts at T_{case} = 25° C
	25 to 250° C/W	150° C/W typical	up to 6 watts at T_C = 25°C
	90 to 150° C/W	320° C/W typical	up to 1 watt at T_C = 25° C
	3 to 8° C/W	55° C/W typical	up to 40 watts at T_C = 25° C
	12° C/W to 24° C/W	no info. available	up to 15 watts at T_C = 25° C
	2° C/W to 50° C/W	no info. available	up to 87 watts at T_C = 25° C

R_{sa} is the conductive thermal resistance through the sink and the convective and radiative thermal resistance to the ambient air. This parameter is defined by the heat-sink manufacturer. It may be given directly in degrees C/watt or more usually is given in a graph which relates the temperature rise of the sink above ambient versus the power being dissipated. Again, there may not be access to this information. Figs. 3A and 3B give the thermal resistances of plates and finned heat sinks, respectively.

R_{ca} is the thermal resistance from the case to the ambient surroundings. In some applications a large transistor can be used to dissipate a small amount of power without requiring a heat sink. The specifications for R_{ca} will be useful in determining if the sink can be omitted. Refer to Table 2.

A very simple and useful equation can be written from Fig. 5:

$$V_1 - V_2 = IR, \text{ electrically}$$
$$T_j - T_a = P(R_{jc} + R_{cs} + R_{sa}), \text{ thermally}$$
$$T_j - T_a = P(R_{ja})$$

Note (from Fig. 5) that the temperature of the sink and the case can be calculated and measured quite easily, if required.

An Example

Assume that we have designed a circuit in which a transistor in a TO-3 case is going to dissipate 10 watts. What size heat sink do we need to limit the maximum junction temperature in the worst case?

First, from the equation, calculate the total maximum allowed thermal resistance from junction to ambient knowing the maximum ambient air temperature, the power to be dissipated, and the maximum junction temperature of the transistor. (If the transistor junction temperature is not known use 135 degrees C for a silicon transistor and 85 degrees C for a germanium transistor.)

$$R_{ja} = \frac{T_j - T_a}{P} \qquad T_j = 135°C$$
$$R_{ja} = \frac{135°C - 35}{10} \qquad T_a = 35°C$$
$$P = 10 \text{ watts}$$
$$R_{ja} = 10°C/watt$$

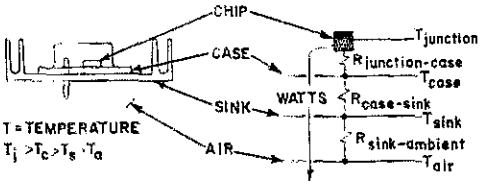


Fig. 5 — Heat flow through a transistor and heat sink.

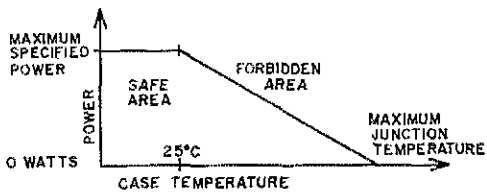


Fig. 6 — Typical power derating curve for a transistor.

Second, allow for the case-to-sink thermal resistance according to Table 1. Probably the builder will not use grease and will want to isolate the collector from the sink for dc.

$$R_{cs} = 0.8°C/W$$

Third, look up the junction-to-case thermal resistance on the transistor data sheet or use the examples given in Table 2.

$$R_{jc} = 3°C/W \text{ for a TO-3 transistor}$$

Now, since

$$R_{ja} = R_{jc} + R_{cs} + R_{sa}$$
$$R_{sa} = 10 - (3.0 + 0.8)$$
$$R_{sa} = 6.2°C/Watt$$

Therefore our heat sink must have a thermal resistance equal to or less than 6.2 degrees C/Watt. What will the transistor-case temperature and the heat-sink temperature be?

$$T_{sink} - T_{air} = PR_{sa}$$
$$T_{sink} = PR_{sa} + T_a$$
$$T_{sink} = (10)(6.2) + 35°$$
$$T_{sink} = 97°C\ (208°F)$$
$$T_{case} - T_{sink} = PR_{cs}$$
$$T_{case} = PR_{cs} + T_{sink}$$
$$T_{case} = (10)(0.8) + 97$$
$$T_{case} = 105°C\ (220°F)$$

The temperature differential between the case and the junction is:

$$T_j - T_c = 135° - 105° = 30°C$$

Note that one could burn his fingers on a 97 degrees C heat sink. It would be prudent to keep the sink temperature below 55 degrees C. Therefore, we should select another heat sink:

$$R_{sa} = \frac{T_{sink} - T_{ambient}}{P}$$

$$R_{sa} = \frac{55° - 35°}{10}$$

$$R_{sa} = 2°C/Watt$$

This results in $T_{sink} = 55°C\ (131°F)$
$T_{case} = 63°C\ (144°F)$
$T_{junction} = 93°C\ (198°F)$
for $T_{air} = 35°C\ (95°F)$

This represents a conservative design with the transistor junction operating below its maximum rated temperature. The heat sink could be anything from a vertical aluminum plate of approximately 10 × 10 inches to a 4-1/2 × 3-1/2 × 1-inch finned sink.

Transistor Data Sheets

Transistor data sheets will sometimes give a power derating curve with the temperature. As the case gets hotter because of increased ambient temperatures, the power being dissipated must be reduced to keep the junction temperature the same. An example is shown in Fig. 6.

Below a case temperature of 25 degrees C, the junction is operating at less than the specified maximum temperature, but the power is limited by the maximum current and voltage ratings of the transistor. Above 25 degrees C case temperature, the junction is operating at its maximum rating which is not, in the author's opinion, a reliable operating temperature for an extended period of time. Note that at 25 degrees C case temperature where the power dissipation is specified, it would be necessary to have the heat sink operating in a very cold environment.

In lieu of a curve, the maximum power dissipation may be specified at 25 degrees C. This power must be decreased linearly for increases in temperature and is usually specified in terms of milliwatts per degree Celsius. Again, this is assuming that the junction temperature is running at specified maximums.

One rule-of-thumb may be applied when testing a heat sink. If you cannot hold your finger on the transistor under normal (room temperature) conditions, a bigger heat sink is probably required.

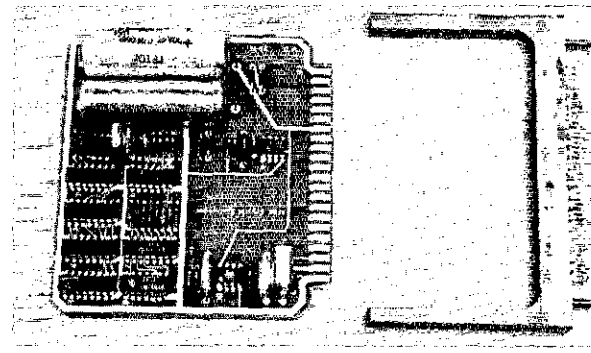
Acknowledgement

The author would like to acknowledge the fact that Lenkurt Electric Co. of Canada, Ltd., facilities were made available for the gathering of data for this article.

An Audio Synthesizer

A Device to Generate RTTY Tones with Crystal-Controlled Accuracy

BY HERBERT DRAKE, JR.,* WB6IMP



The completed afsk crystal synthesizer and mating connector. A ready-made circuit board is available; see footnote 3.

NOW THAT THE day of the inexpensive medium-scale integration (MSI) integrated circuit has arrived it is possible to consider some digital approaches to design that would have been rejected as hopelessly complex and expensive only a few years ago. This article presents a flexible audio frequency-shift keyer for RTTY that, with relatively few parts, provides many advantages over previous units that depended on variable *RC* timing circuits.

First, it is crystal controlled. This makes it unnecessary to have access to a frequency counter to adjust it periodically as, indeed, it has no adjustments. This also eliminates the problem of *RC* oscillator frequency and level stability with temperature changes. All output frequencies have the same percentage accuracy as that of the crystal, resulting in near-perfect on-the-air shifts as well as providing a useful shop tone standard that can assist in tuning up RTTY demodulator filters.

Second, it incorporates a 3-bit sinusoidal digital-to-analog converter to structure the sine-wave output. This technique minimizes the amount of low-pass filtering which is necessary to remove offensive harmonics and thus reduces the distortion and amplitude peaking that the filter can contribute because of its inevitably imperfect transient response.

Third, it incorporates a photon-coupled isolator to sense loop current in a manner that puts no constraints on the teleprinter loop circuit with respect to ground.

Uses of the AFSK Synthesizer

This afsk generator has a pure enough output so as not to limit its use to a-m or fm operation on vhf. With a good filter-type ssb transmitter and a carrier-generator crystal that is properly selected with respect to the ssb filter passband for using the standard afsk tones, it can operate well as an fsk keyer. This system has the advantages of easily selected, stable shift on all bands without adjustment and easy operation in transceive. Refer to Hoff[1] for a good discussion of this practice.

Circuit Description

Refer to Fig. 1. A crystal clock operating at 6.426 MHz serves as the only time base for the unit. The oscillator may be shut off with a control lead while receiving if desired.

The clock drives three synchronous counter chips (U3, U4, and U5) which have the very useful property that all output changes occur at once (within nanoseconds), that they can be preset into any state, that counting can be inhibited, and that all commands to the counters are ignored until clock time. Also, a carry output is available to extend the counter length, and, in this case, detect the last state without external gates.

* 16 Monte Cimas Ave., Mill Valley, CA 94941.

[1] Hoff, "A.F.S.K. for RTTY," *QST*, February, 1969, p. 11.

Deriving multiple audio tones simply from a crystal-controlled bf oscillator has long been a dream of amateurs desiring accurate and stable tone generators. The obvious advantage is that, with as much as several hundred hertz shift in the oscillator frequency, the output tones will shift only a fraction of a hertz. Here, using a mere handful of ultramodern integrated circuits and other components, the author describes a device which provides four different tones derived from a 6-MHz crystal oscillator. Although the device is designed to produce frequencies which are used for amateur RTTY operation, the technique may be applied in many other fields of amateur interest.

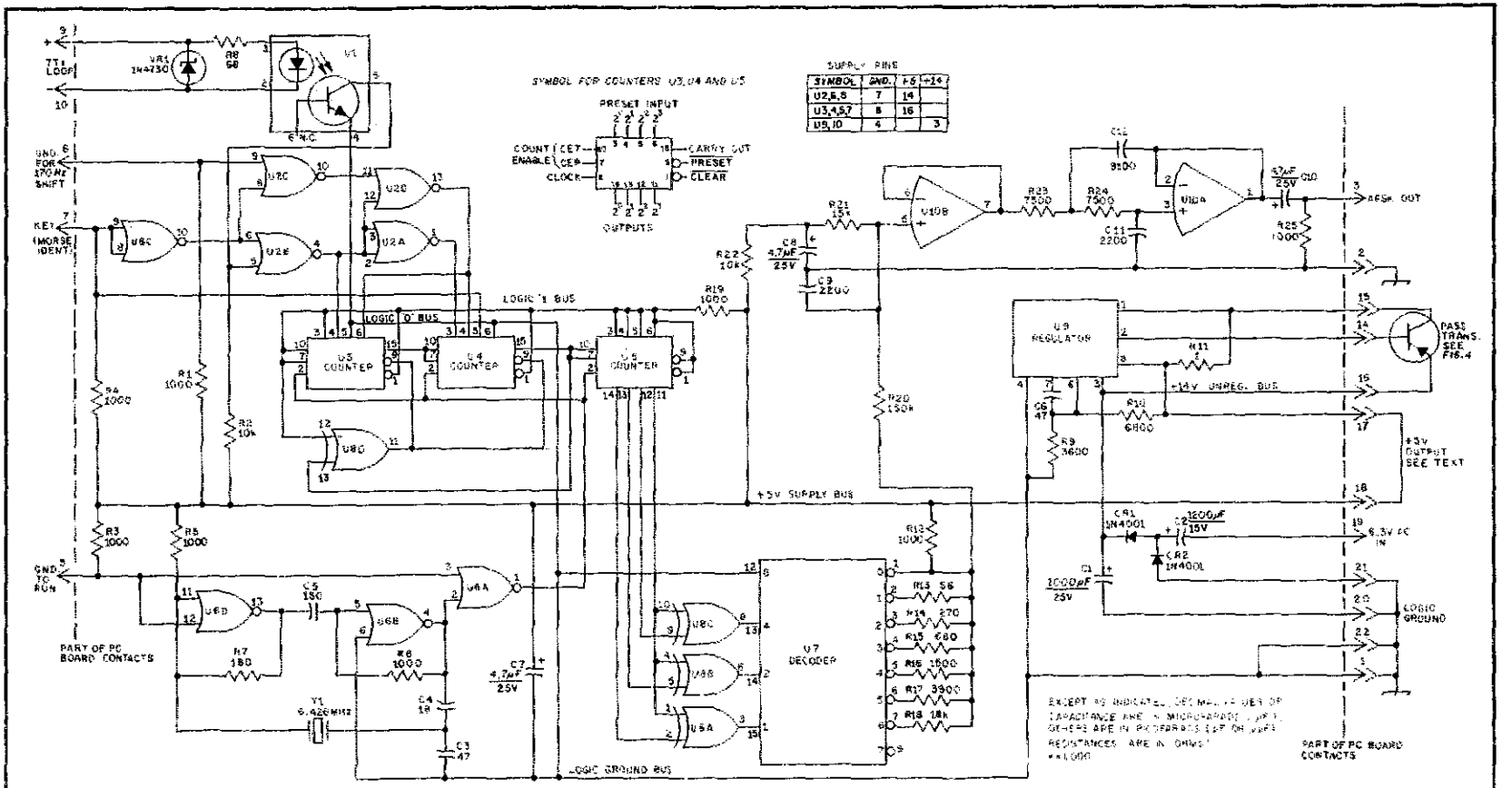


Fig. 1 — Schematic diagram of the afsk synthesizer. Unless specified below, resistors are 1/4 watt, ten-percent tolerance. Components not listed below are identified in the diagram for circuit-board location, Fig. 3. See Table 3 for integrated circuit types for U1-U10, inclusive.

C1, C2 — Electrolytic (Sprague type 39D or equiv.).

C3-C6, incl. — Disk ceramic, NP0, ten-percent

C7, C8, C10 — Tantalum (Kemet T331A475M025 or equiv.).

C9, C11 — 2200 pF, 5-percent tolerance, 160 V, polystyrene (Siemens type B31011 or equiv.).

C12 — 9100 pF, 5-percent tolerance, 160 V, polystyrene (Siemens type B31310 or equiv.).

R9, R10, R12-R18 incl., R21, R23, R24 — 1/4 watt, 5-percent tolerance.

R11 — 1 ohm, 1/2 watt, 10-percent tolerance.

U2, U6 — Quadruple 2-input positive NOR gate.

U3, U4, U5 — Synchronous 4-bit binary counter.

U7 — BCD-to-decimal decoder/driver.

U8 — Quad 2-input exclusive OR gate.

U9 — Voltage regulator.

U10 — Dual operational amplifier.

VR1 — Zener diode, 3.9 V, 1 W.

Y1 — 6.426 MHz, HC-18/U holder, series resonance preferred. (International Crystal type FM-1 general purpose suitable.)

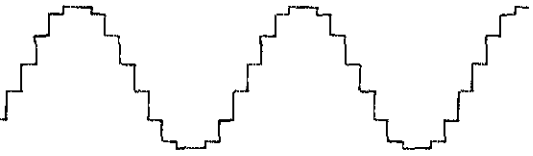


Fig. 2 — Output of digital-to-analog converter (U7, pin 11).

TABLE 1

Clock Frequency	*Counting Modulus*	*Output Frequency*
6.426000 MHz	199 X 16	2018.216 Hz
6.426000 MHz	189 X 16	2125.000 Hz
6.426000 MHz	175 X 16	2295.000 Hz
6.426000 MHz	135 X 16	2975.000 Hz

TABLE 2

Output pin of U5				*Output pin of U8*			*Grounded pin on U7, all others open*
11	*12*	*13*	*14*	*8*	*6*	*3*	
0	0	0	0	0	0	0	1
0	0	0	1	0	0	1	2
0	0	1	0	0	1	0	3
0	0	1	1	0	1	1	4
0	1	0	0	1	0	0	5
0	1	0	1	1	0	1	6
0	1	1	0	1	1	0	7
0	1	1	1	1	1	1	9
1	0	0	0	1	1	1	9
1	0	0	1	1	1	0	7
1	0	1	0	1	0	1	6
1	0	1	1	1	0	0	5
1	1	0	0	0	1	1	4
1	1	0	1	0	1	0	3
1	1	1	0	0	0	1	2
1	1	1	1	0	0	1	1

The first two counters (U3 and U4) serve in a variable modulus mode; that is, they divide by 199, 189, 175, or 135. This is accomplished by presetting these two counters with a binary number that is the twos' complement of the desired counting modulus each time the two counters have reached (and remained at for one clock time) their last state (all outputs high.) Note the inverter, U8D, that asserts the preset input to these two counters when they are in this state. A third counter simply provides an additional fixed divide-by-sixteen function. The resulting frequency plan is shown in Table 1.

U2 serves as control logic that places the divider chain in the 2125-Hz mode when the teleprinter is marking (loop current flowing and U1 pin 5 low). When the loop is switched to spacing, the counters change to either the 2295-Hz or 2975-Hz mode, depending on whether the shift-select lead is open (to select 850-Hz shift) or grounded (to select 170-Hz shift). When the KEY input is grounded, the counter shifts to the 2018-Hz frequency, providing 106.784-Hz shift, which is slightly in excess of the 100-Hz minimum.[2]

It is important to note that the counting modulus can change only at the completion of

[2] [EDITOR'S NOTE: There is no minimum amount of shift stipulated in the FCC regulations for the required Morse code identification when fsk is used. The FCC, however, in its 1964 Report and Order for Docket 15267 permitting Morse code identification by automatic means, set forth guidelines for such identification. This information was originally published in *QST* for September, 1964, on pages 81 and 82. ". . . the transmission of the amateur call sign automatically at more than twenty or twenty-five words per minute and/or with a frequency shift of less than about 100 cycles would make identification difficult, especially when monitoring from a mobile unit. Licensees are advised, therefore, that for telegraphic identification they will be expected to observe reasonable standards for code speed and keying methods. In the event that there are abuses in this area, the Commission will be obliged to set forth standards in the Rules. . . ."]

TABLE 3

Integrated-Circuit Supply Data

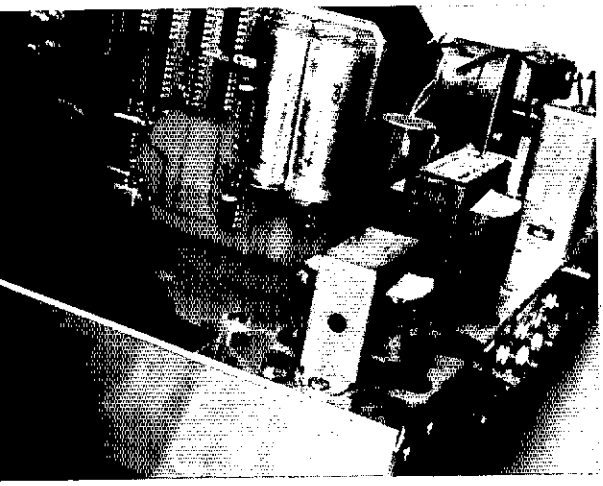
Symbol	*TI*	*National*	*Signetics*	*Motorola*	*Monsanto*	*Fairchild*	*Litronix*
U1	TIXL112	NA	NA	NA	MCT-2	FLA 810	ISO-LIT1
U2,6	SN7402N	DM7402N	N7402A	MC7402P	NA	U6A740259X	NA
U3,4,5	SN74161N or SN74163N	DM74161N* or DM74163N*	N74161B* or N74163B*	MC9316P	NA	U7B931659X	NA
U7	SN74145N	DM74145N*	N74145B	NA	NA	NA	NA
U8	SN7486N	DM7486N	N7486A	MC3021P	NA	U6A748659X	NA
U9	NA	LM376	NA	NA	NA	NA	NA
U10	SN72558P	LM1458N	N5558V	MC1458P	NA	NA	NA

*To be announced NA = Not available

Suppliers:

1) Kierulff, 3969 E. Bayshore Rd., Palo Alto, CA 94303.
2) Elmar Electronics, 2258 Charleston Rd., Mountain View, CA 94040.
3) Allied Electronics, 2400 W. Washington Blvd., Chicago, IL 60612.
4) Cramer Electronics, 85 Wells Ave., Newton, MA 02159.
5) Newark Electronics, 500 N. Pulaski Rd., Chicago, IL 60624.

TI can be obtained from 1,4, and 5.
National Semiconductor can be obtained from 2,4, and 5.
Motorola can be obtained from 1,2,4, and 5.
Monsanto can be obtained from 1 and 2.
Fairchild can be obtained from 2,3, and 4.
Litronix can be obtained from 3.



The complete afsk synthesizer including power supply (less transformer) is constructed on a circuit board measuring 4-1/2 X 4-1/4 inches. Here the board is shown in place in the author's station control panel.

each cycle of U3 and U4, thus assuring "constant-phase" fsk. This is true because the presetting inputs of these counters are sampled only during the time that their pin-9 input is low and during the rising clock edge. This sampling goes on no less frequently than once every 1/12125 X 16) second, resulting in the introduction of distortion no more than

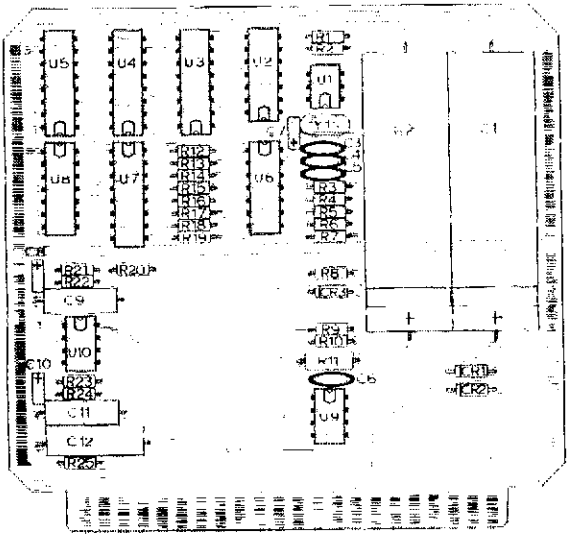
(.000029 second) X (45 baud) X 100 = 0.13 percent (at 60 wpm).

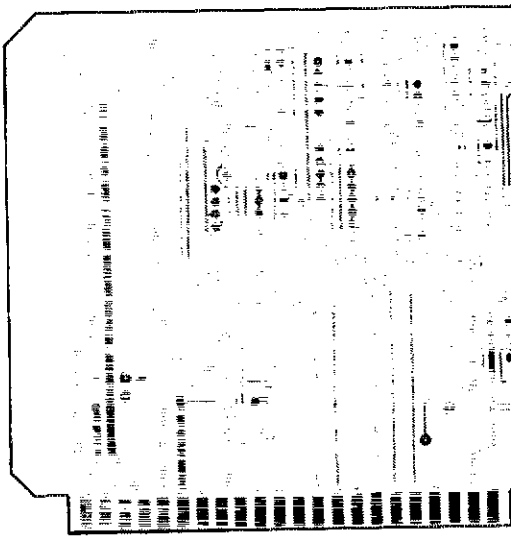
The TTY loop is sampled by passing a portion of its current through a light-emitting diode that is optically coupled to a photo transistor, both being part of U1. The Zener diode, VR1, serves to protect this device against reverse polarity and over currents. The isolator itself is not expensive and provides at the least 500-volt isolation, depending on the type purchased.

EXCLUSIVE-OR gates, U8A, B and C, serve to take the sixteen binary states of the third counter and convert them to eight states that move sequentially up and then sequentially back down, repeating the highest and lowest states once. (See the truth table, Table 2.) These eight states are then decoded by U7, consisting of eight individual open-collector output transistors that are saturated one at a time as the inputs of the decoder change. Resistors R13 through R18, plus open and short, are thus switched into the bottom leg of a voltage divider to provide eight voltage levels calculated to approximate a sine wave. See Figure 2.

A 3-pole active low-pass filter with a modified Butterworth response, U10 and associated components, follows the converter. Observation of the output of the filter on an oscilloscope shows a clean sine wave with no more than two percent amplitude peaking during keying events. A filter with 5 or more poles, which would have been necessary to clean up a square wave (available on pin 11 of U5), would have provided quite a bit more peaking.

A regulated power supply is used since all of the digital integrated circuits are designed for a 4.75- to 5.25-volt range. The regulator shown is inexpensive, accurate, and includes current limiting, thus making the 5-volt output short-circuit proof. The dual operational-amplifier chip will reject ripple on its positive supply sufficiently well as to require no decoupling except on the bias supply (C8), and thus the single 5-volt regulator





(A) (B)

Fig. 3 — At A, etching pattern and component layout for the afsk synthesizer, component side of board. At B, etching pattern for solder side of board. These patterns are two thirds actual size.

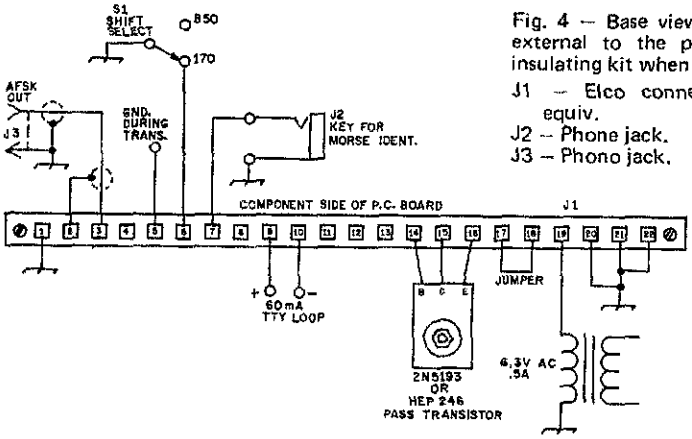


Fig. 4 — Base view of connector. All connections external to the pc board are shown. Use mica insulating kit when mounting the pass transistor.
J1 — Elco connector 00-6022-022-940-002 or equiv.
J2 — Phone jack.
J3 — Phono jack.

and a source of unregulated dc voltage is all that is required. A voltage doubler permits the entire unit to operate from a 6.3-volt heater bus, and requires about 0.5 ampere.

Note that the 5-volt regulated output passes through off-board jumper 17-18. This allows the testing of the regulator and measurement of load current without the danger of damaging the rest of the circuitry. The 5-volt load should be about 250 mA.

Construction Notes

All parts but the regulator pass transistor are installed on a 4-1/2 X 4-1/4-inch pc board, which is available at reasonable cost.[3] Since the board requires fine traces, close clearances, circuitry on both sides, plated-through holes, and should have gold-plated contact fingers, it is not recommended that home fabrication be attempted. See Fig. 3 for parts placement.

Some difficulty with parts procurement may be expected. All are readily obtained from various wholesale industrial suppliers as all are in common usage, but most retail dealers do not stock the integrated circuits. An effort has been made to select parts available from more than one source, but at the time of writing U9 can be obtained only from the one manufacturer. Table 3 gives various part numbers for several sources. I obtained all parts by mail order from industrial suppliers by paying cash in advance.

The circuit board should be located in a shielded enclosure if installed inside of the exciter to prevent the very fast rise-time pulses on the circuit board from causing spurious signals. If mounted inside the TU or in a separate box only normal bypassing precautions should prove necessary. An Elco 00-6022-022-940-002 connector with integral card guides, shown in one of the photographs, provides an easy means to mount the pc board. Fig. 4 summarizes all external connections.

The output level is just about right to drive the speech amplifiers of most exciters. Because of variations in speech amplifier roll-offs and ssb filter responses in different exciters some experimentation may be required to obtain the same rf output level for both mark and space tones. The output may be shunted by a capacitor or, if necessary, the value of C9 may be varied to compensate for these conditions. QST

[3] Boards can be obtained from Douglas Electronics, Inc., 718 Marina Blvd., San Leandro, CA 94557; price: $10.50.

Strays

Stolen Equipment

On February 3, a Yaesu Model FT-101 transceiver, SN 107036, equipped with cw filter, was stolen from the automobile of WA2YSW while it was parked in the driveway at his home. Please contact Frank W. Widmann, 328 Farwood Road, Haddonfield, NJ 08033 or Officer Latham, Police Headquarters, Borough of Haddonfield, 242 Kings Highway East, Haddonfield, NJ 08033, if you can provide information leading to the recovery of the equipment.

Stolen from WB2LRR in Elmira, New York, a Drake ML-2, SN20189. The transceiver was modified and had a 100-hertz PL reed. Contact Chemung County Sheriff, Elmira, N.Y.

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 — 75¢ 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.

NEW BOOKS

Vintage Radio, by Morgan E. McMahon. Published by Vintage Radio, Box 2045, Palos Verdes Peninsula, CA 90274, 5-1/4 × 8-1/4 inches, 240 pages, illustrated. Price: $3.95.

This *pictorial* history of wireless and radio covers the period from 1887 to 1928. After a brief introduction covering history, inventions, and technical progress during the period, mention is made of some of the personalities and companies around during those "good ole days." The book then goes into photographic coverage of transmitters, receivers (crystal, trf, regenerative, and superheterodyne), components (inductances, condensers, transmitting and receiving vacuum tubes, headsets, loudspeakers, batteries, and microphones to name a few!), and even a scanning-disc TV of the day. Also included are reproductions of old photographs and ads, an index of early manufacturers, and a patent-numbers guide to help the reader judge the date of manufacture of any gear he has in question.

If you have an old radio piece (of commercial or amateur service) or component around that you'd like to identify, you'll probably find it illustrated here. Some of the items shown even have their original selling price listed, as well as their date of manufacture.

This is a fascinating book for young squirt and old timer to thumb through for reference or an evening's entertainment. — *WICUT*

Batteries and Energy Systems, by Charles L. Mantel, published by McGraw-Hill Book Company, size 9-1/2 × 6-1/4 inches, 221 pages including index, cloth cover. Price: $14.00.

As soon as amateurs started using tubes, the use of battery power became an important consideration. But soon, the A, B, and C batteries were replaced by ac-operated power supplies. Until the advent of solid-state QRP transmitters and handheld fm transceivers, most battery-powered amateur equipment was designed only to operate from automotive electrical systems.

Today, a wide variety of battery systems are available. Author Mantel writes about the features and construction of each type, using a multitude of drawings, graphs, and charts. The characteristics of each battery are described in depth. Reference standards, silver batteries, water-activated systems, zinc-alkali-manganese batteries, lead secondary cells, Ni-Cads, mercury batteries, and fuel cells are covered in separate chapters. In addition, the theory and practice of recharging batteries are recounted.

The book is written as both a reference text and a handbook. The characteristics of a particular battery can quickly be found in a chart. Or, the reader can spend an evening digesting a complete explanation of the design and use of a particular type of battery. Anyone who has an interest in the design of portable or emergency equipment will find the book useful. In fact, the only fault of the book is that it may tell you more than you want to know, pointing up problems and limitations of battery-power systems that are often ignored by equipment designers. — *W1KLK*

ARRL Technical Information Service

Any member of the League is welcome to appropriate help from the Hq. technical staff in connection with equipment problems he may encounter. We ask that you observe the following guidelines so that we may provide the best possible service to the greatest number.

1. Before writing for technical assistance, search your files of *QST* and other ARRL publications. The answer you need is probably there. Consult the annual index of articles in each December issue.

2. All inquiries must relate to amateur radio. (We cannot respond to questions about CB, marine radio, hi-fi, etc., unless they concern TVI or RFI caused by amateur gear.) Please be reasonable in the number and kind of questions you ask. Limit the number of questions to three per letter.

3. Use a typewriter if possible; otherwise, write or print clearly, on one side of each sheet. Circuit diagrams should be on separate sheets. Put your name and address (including zip code) on each sheet, not just the call. Staple or clip the pages together. Include a self-addressed, stamped *business-size* envelope. (No stamp required for foreign inquiries.)

4. For practical reasons there are certain things we cannot do. Please do not ask for comparisons between commercial products, or ask for advice on repairing in-warranty commercial equipment (write the manufacturer for assistance). Do not ask for advice or information on articles published in other magazines; write to the magazine editor or author of that article. Do not request custom designs for amateur gear.

5. We may refer you to a back issue of *QST*. If so, and if that issue is still available, you may purchase it. If not, photocopies of a particular article are available at 25 cents per page. Include payment with your order.

6. Address all technical questions to: *Technical Information Service*, American Radio Relay League, 225 Main Street, Newington, CT 06111.

FEEDBACK

Builders of "A Relay Driver for Use with Solid-State Keyers" (*Gimmicks and Gadgets*, *QST* for October, 1971), will obtain improved operation if two bypass capacitors are added. Connect a .001-μF capacitor across the KEY LINE terminals, and connect a .01-μF capacitor from the + KEY LINE terminal to the chassis. In addition, a silicon diode, such as a 1N4001, should be added across the relay coil to protect the keying transistor from transients. The diode should be wired with its cathode at pin 8 of the relay. — *K1PLP*.

• *Beginner and Novice*

VFO / Xtal - Controlled Gate / Grid Dipper

BY WILLIE L. STEED,* K4PRL

GRID-DIP METERS are not known for their precise frequency calibration or frequency stability. Two dip meters emphasizing stability and calibration accuracy are described here. One is a vacuum tube version, the other is solid state. The grid-dip meter will be described first. It has all of the performance characteristics of a conventional grid-dip meter together with the capability for crystal control. The gate-dip meter has the same features as the vacuum-tube version except it is battery operated and thus is portable.

Circuit Description of the Grid-Dip Oscillator

The circuit shown in Fig. 1 consists of a tuned-plate grounded-grid amplifier driving a cathode follower. The output of the cathode follower is coupled through either C2 or a quartz crystal (operated in series-resonant mode) to the cathode of the grounded-grid amplifier. This completes the feedback loop and causes the circuit to oscillate, producing cathode-follower grid current. The resonant frequency of L1 and C1 determines the frequency of oscillation when the coupling capacitor (C2) is used. When a quartz crystal is installed in place of C2 and the tuned circuit L1C1 is tuned to the series-resonant frequency of the crystal (fundamental or overtone) the oscillator will be crystal controlled.

When an external tuned circuit is brought close to L1 and is tuned to the dipper frequency, some of the rf power of the dipper will be coupled to the external circuit, and the grid current will be reduced. This dip is indicated by the meter. The potentiometer is used to adjust the meter reading to occupy the upper half of the meter scale. Tuning capacitor C1 is a single-section, grounded-rotor unit. The circuit operates over the frequency range of 2.9 to 155 MHz using the coil set described in Table I.

TABLE I

Freq Range	*Turns on Blank FT-243 Crystal Holder*
2.9-5.9 MHz	65 turns of No. 30 enameled wire.
5.2-10.8 MHz	40 turns of No. 30 enameled wire.
8.1-17 MHz	20 turns of No. 22 enameled wire.
16.5-34 MHz	7 turns of No. 22 enameled wire.
33-71 MHz	3 turns of No. 22 enameled wire.
70-155 MHz	Hairpin loop inside crystal compartment.

* 6812 Lynbrook Drive, Springfield, VA 22150.

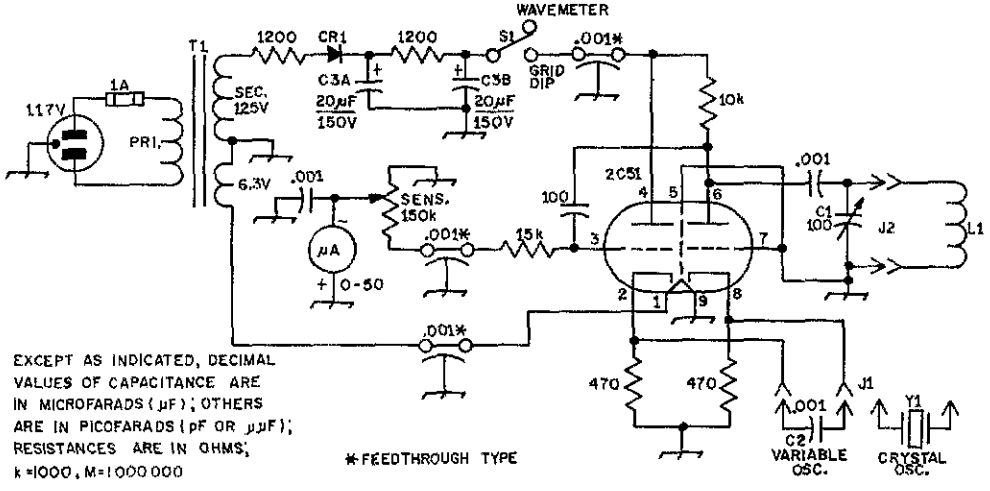


Fig. 1 — Circuit diagram of the grid-dip meter. J1 accepts C2 for variable-frequency operation, and Y1 for crystal-controlled oscillation. Component designations not listed below are for text reference.

C3 — Dual 20-μF, 150-V electrolytic.
CR1 — 400 PRV, 1 A.
S1 — Spst toggle.
T1 — 117-V primary; secondary 125 volts at 20 mA; 6.3 volts at 0.6 A.

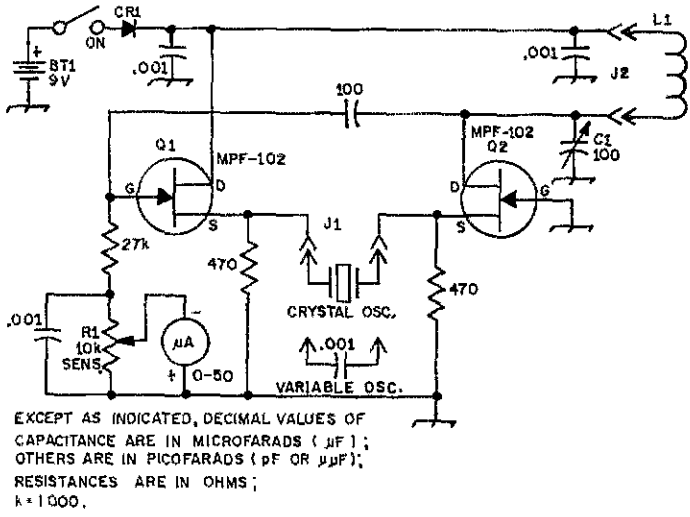


Fig. 2 — Circuit diagram for the crystal-controlled gate-dip meter. Component designations not listed below are for text reference.

CR1 — 50 PRV, 1 A.
Q1, Q2 — Field-effect transistor (Motorola MPF102).
S1 — Spst switch (mounted to the rear of R1).

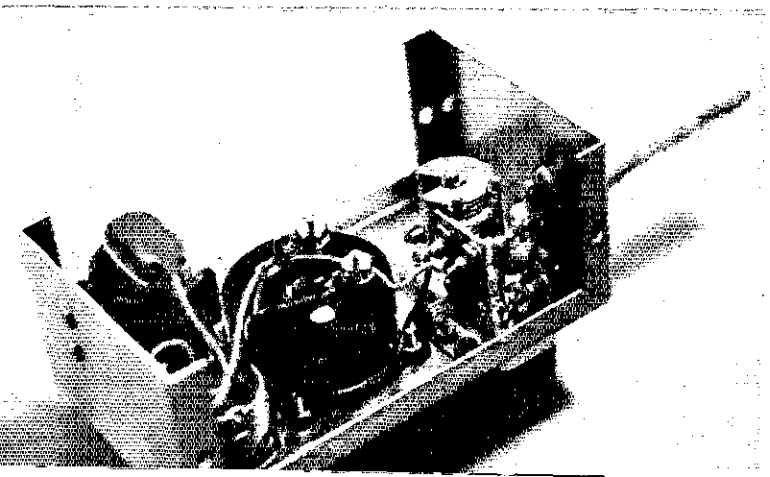
Construction

The dipper is constructed in two units, rf and power supply. The rf unit is contained in a 4 × 2-1/8 × 1-5/8-inch Minibox and the power supply uses a 5-1/4 × 3 × 2-1/8-inch Minibox. Layout of major components is shown in the photographs. The coils and crystals plug into sockets which can accommodate FT-243 crystal holders. A blank FT-243 crystal holder is used to contain C2 so that it may be conveniently exchanged for a crystal when variable-frequency operation is desired. Calibration of the dipper can be accomplished by using crystals at fundamental and overtone frequencies for reference points.

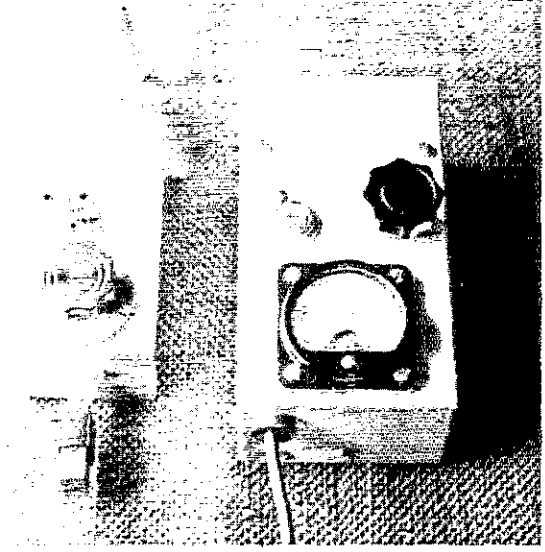
Operation

When the dipper is operated with C2 in place, the grid current changes very smoothly throughout the tuning range of each coil making a dip in grid current easy to discern. With C2 in place the dipper operates like a conventional grid-dip meter inasmuch as resonance of the external circuit is indicated by a dip in grid current. The dipper also may be used as an absorption wavemeter to indicate the frequency of rf power in an external circuit. S1 removes plate voltage when wavemeter operation is desired.

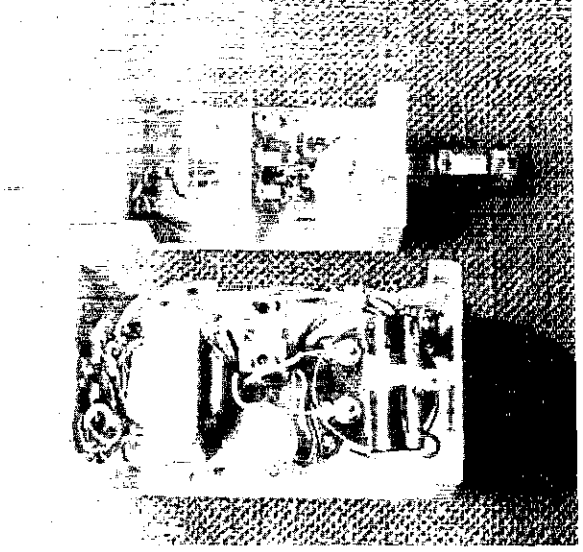
When crystal control of the oscillator frequency is desired, C2 is replaced by a quartz crystal and the appropriate coil is inserted at J3. C1 is tuned for maximum grid current. Oscillation will take place only when the crystal is operating in a series-resonant mode. Since most crystals are calibrated for parallel resonance, the frequency will be several kilohertz lower than marked on the holder. Coupling an external circuit to coil L1 that is resonant at the frequency of oscillation will cause a dip in grid current.



Inside view of the gate-dip meter. All of the components are contained within one Minibox making this unit ideal for portable use.



The power supply and meter for the grid-dip oscillator are mounted in a separate container. An interconnecting cable provides power to the tuning head.



Inside view of the grid-dip meter tuning unit and power supply.

The Gate-Dip Meter

A solid-state version of the dipper is shown in Fig. 2. The gate-dip meter is contained in a 5-1/4 × 3 × 2-1/8-inch Minibox. A saddle-mount, 6-pin transistor socket is used to accommodate the two transistors. The socket is mounted on an L bracket permitting short leads between various components. Both dippers use the same coil set. When the gate-dip meter is used as an absorption wavemeter, battery power must remain on. The solid-state circuit performs well as a gate-dip meter but is somewhat insensitive when operated as an oscillating absorption wavemeter. QST

NEW BOOKS

Designing with TTL Integrated Circuits, by the IC Applications Staff of Texas Instruments, published by McGraw-Hill Book Company, size 9-1/2 × 6-1/4 inches, hardbound, 318 pages plus index. Price: $18.50.

Transistor-transistor logic, known as TTL or T^2L, is by far the most widely used of the IC logic families. Every major IC manufacturer is turning out TTL – in fact, overproduction has led to drastic price reductions in recent months. Early amateur digital projects which used IC logic employed the resistor-transistor type (RTL) because it was the first low-cost family available. Today however, TTL costs less than RTL. Because many complex functions are available in TTL, and because of the immunity to rf interference that is a characteristic of the family, it seems safe to assume that the transistor-transistor logic family will be chosen for most amateur projects for the next year or two.

Texas Instruments has produced another book in their series on solid-state design, this one for TTL designers. This book has the same advantages and disadvantages of its predecessors. Some topics are covered in depth using an easy-to-read manner that most technicians can understand. Other sections are presented in a form that will only be understood by engineers working in the logic field. The descriptions of the TTL family groups, and the basic operation of each, are first rate. However, the complex ICs and their applications are described in such a way that one must fully understand the circuit before anything can be gleaned from the information given.

The book is divided into three sections. After the introductory chapters covering basics, a short section is devoted to extended-range operation of TTL, noise considerations, and combinational logic design. The largest portion of the book is devoted to circuit applications, including flip-flops, decoders, arithmetic elements, counters, and shift registers. Despite some shortcomings, the TI book is probably the best reference text now available on the subject, and, thus, it should be on the book shelf of anyone seriously interested in logic design. – *WIKLK*

Fifty Years of ARRL

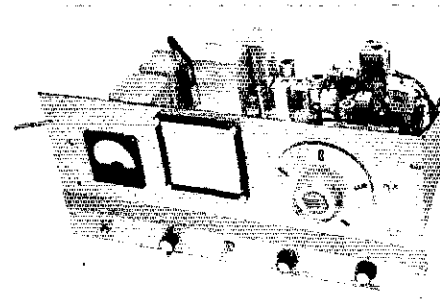
A bound 152-page reprint of the gold-edged historical articles which appeared in the 1964 issues of *QST* is available from the ARRL for two dollars postpaid. Titled *Fifty Years of ARRL*, the book covers the highlights of ARRL and amateur radio history during the fifty years from 1914 to 1964, and will make a companion piece to the classic *200 Meters and Down*, a reprint of which is also available from the ARRL for two dollars.

A High-Performance Tunable FM Receiver

Beating the High Cost of Crystals

BY DOUG DeMAW,* W1CER, AND

GUS WILSON,** W1NPG



This tunable 2-meter fm receiver is assembled rack-and-panel style using both surplus and homemade sections. Kurz-Kasch knobs and an old HRO receiver dial dress up the front panel.

THERE ARE MANY advantages in having a tunable fm receiver for fixed-station use. Perhaps the greatest benefit is the flexibility of operation afforded by not being restricted to a group of crystal-controlled channels. A secondary reward is that of not having to spend considerable money for commercial-standard crystals.

A tunable receiver enables the operator to listen to input frequencies of repeaters, and to scan the band when searching for spurious signals and interference of various types. Most operators, however, will find such a receiver of greatest value for monitoring the output frequencies of area repeaters, and for use during simplex operation.

Some Features

The project treated here is simplified through the use of a surplus receiver strip. In this instance a G.E. Progress Line high-band deck (2 meters) is used. The tuning range is continuous from 146 to 148 MHz through employment of a VFO which operates in the 11-MHz region. Output from the VFO is fed into the crystal socket of one channel, and the cathode of the oscillator in that channel is grounded so that the tube will conduct. Output from the VFO is taken across a 150-ohm resistor so that the grid of the receiver oscillator is swamped to prevent self-oscillation. The circuit of Fig. 1 provides an output of 3 volts (rms) across the 150-ohm resistor.

It was suggested by W1SL that an afc circuit be added for ease of tuning and improved stability. The afc section used in this example was borrowed in part from an fm-tuner circuit shown in RCA's tube manual. Modifications to that circuit were made and performance is excellent.

The receiver strip has a sensitivity of 0.4 μV for 20 dB of quieting over a range of approximately 500 kHz. Performance deteriorated rapidly when tuning beyond either end of that 500-kHz segment. A 40673 preamplifier was added, and by stagger tuning the overall front-end section of the composite package – preamplifier, rf, mixer, and oscillator chain circuits – good sensitivity was obtained from 146 to 148 MHz (0.3 μV for 20 dB of quieting).

An old HRO receiver dial with gear train was available for use as a tuning dial and drive. It proved to be superb for the application because of its resettability to a desired VFO frequency, and because it is free of backlash. Other dial mechanisms would be satisfactory provided they tuned smoothly, were free of backlash, and offered at least a 5:1 tuning ratio. A good substitute would be one of the vernier units from a war surplus TU-6 tuning unit (part of the BC-191 or BC-375 transmitters).[1] Another choice might be the J. W. Miller MD-4 or MD-5 type dials.[2] The chart frame used for containing the calibration scale of this receiver was burgled from the front panel of a TU-6 tuning unit.

A homemade power supply is built on the same chassis that contains the receiver and VFO. Any supply capable of providing 200 to 225 volts dc at 70 mA or greater, and 6.3 volts at 4 A will suffice. Operating voltage for the 40673 preamplifier is borrowed from the cathode of the 6AQ5 af output tube in the receiver strip. Approximately 11 volts were available in this model, developed across the cathode resistor.

A zero-center 25-μA meter is used to monitor the discriminator, thus allowing the operator to tune the signals for a zero reading. The same meter is switched to permit monitoring of the first-limiter current. The latter is useful in observing the relative strength of an incoming signal.

The VFO Circuit

Someone is certain to raise an eyebrow over the use of a tube-type VFO in this day of solid-state circuitry. The choice was made strictly to provide

* Technical Editor, *QST*.
** Lab Technician, ARRL.

[1] Available from Fair Radio Sales, 1016 East Eureka St., Lima, OH 45802 (Catalog No. 968). Also, check surplus ads in the various amateur publications.

[2] J. W. Miller Company, 19070 Reyes Ave., Compton, CA 90224 (Catalog No. 72).

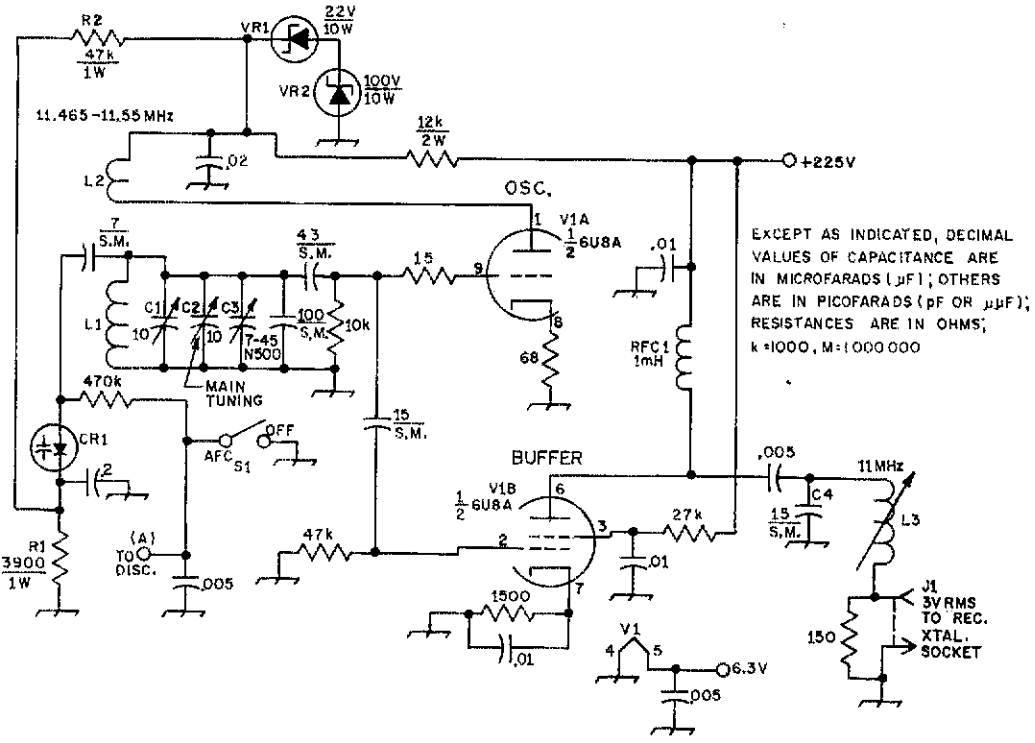


Fig. 1 — Schematic diagram of the VFO section of the tunable fm receiver. Capacitors are disk ceramic unless otherwise noted. SM = silver mica. Resistors are 1/2-watt composition unless otherwise indicated.

C1 — 10-pF miniature air variable.
C2 — 10-pF air variable, main tuning (James Millen Co. 19025 with one rotor and one stator plate removed).
C3 — 7- to 45-pF ceramic trimmer, type N500.
C4 — For text discussion purposes.
CR1 — Varactor diode, 33-pF (Motorola HEP R2503 or equiv.).
J1 — Phono jack, single-hole mount.
L1 — Inductor, 0.94 μH. 10 turns No. 18 enam. wire, close-wound on 1/2-inch diameter low-loss form. Alternatively, 12 turns No. 18 enam. wire, close-wound on 3/8-inch diameter low-loss form. (J. W. Miller 43A000CBI ceramic form, with slug removed, used in this model.)
L2 — Tickler winding. 4 turns No. 22 enam. wire close-wound over high-Z end of L1. Reverse leads of L2 if oscillation does not occur.
R1, R2 — Labeled for text discussion.
RFC1 — 10-mH rf choke.
S1 — Spst toggle.
VR1 — 22-volt, 10-watt Zener diode.
VR2 — 100-volt, 10-watt Zener diode.

compatibility with the power supply. A solid-state circuit would have required that an additional supply be built, thus increasing the cost of the project. However, those wishing to construct a transistorized VFO should be able to use the circuit described by Zilliox (*QST*, Dec., 1970, page 46). The tuning range would have to be changed to cover 11 MHz, or one could excite the receiver oscillator at half that frequency and use that stage as a doubler to 11 MHz.

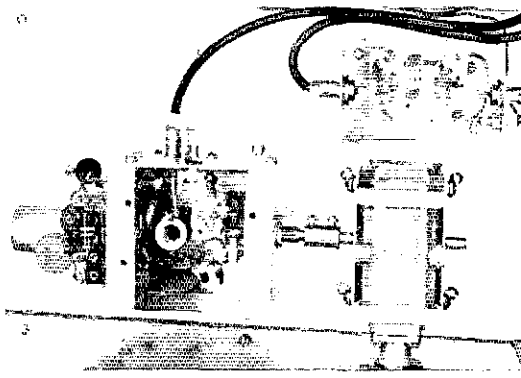
The triode section of a 6U8A serves as a tickler-coil oscillator. The Colpitts variety of oscillator was not used because of the hum modulation common to that circuit when operated in the upper part of the hf spectrum. Supply voltage to the VFO plate is regulated at 122 volts by means of two Zener diodes, VR1 and VR2 (Fig. 1). Those wishing to do so can substitute a VR-150 tube for the diodes.

A varactor diode, CR1, is used to provide the automatic frequency control (afc) mentioned earlier. CR1 is connected to the high-impedance end of L1 through a 7-pF capacitor. Reverse bias is applied to CR1 and is taken from resistance divider R1-R2. When the afc is operative S1 is in the open position, thus allowing voltage from the discriminator of the G.E. receiver strip to be routed to CR1. As the discriminator voltage changes from zero value (plus or minus), the discriminator-derived bias on CR1 changes and shifts the capacitance of the varactor diode to a value greater or less than the nominal value which exists at zero discriminator voltage. The change in diode capacitance raises or lowers the VFO frequency to keep the received signal in the i-f passband of the receiver. When S1 is closed the discriminator-derived bias is shorted to ground, thus disabling the afc function.[3]

The pentode half of the 6U8A serves as a buffer amplifier to increase the 11-MHz signal in level, and to offer some isolation between the VFO and

[3] If the afc circuit drives the VFO off frequency rather than pulling it on frequency, reverse the secondary leads of the discriminator transformer (T308 of Fig. 2).

View of the under side of the chassis. The filament transformer seen at the right center of this view is not shown in Fig. 3 (see text).



the receiver. Output from the VFO is taken across a 150-ohm resistor. If greater output voltage is needed (depending upon the brand and circuit of the fm receiver strip used) the resistor value can be increased. However, it should not be greater than 2200 ohms (approximately) when feeding a triode stage which operates on the same frequency as the VFO. Otherwise, instability is certain to result. If the receiver uses a pentode oscillator, the resistor can be deleted from the circuit.

Inductor L3, in combination with C4 and the capacitance of the coaxial cable feeding the VFO energy to the oscillator stage of the receiver, forms a pi-network plate tank for V1B. A relatively low value of Q is used to provide sufficient bandwidth across the range covered by the VFO.

The Preamplifier

The homemade preamplifier was described in an earlier issue of *QST*.[4] There is no reason why a commercially built preamp cannot be used. Furthermore, *if one wishes to tune but 500 kHz of the* band, the preamplifier can be eliminated. This part of the circuit, and the manner in which it is treated, should be a matter determined by the builder, and in accordance with his particular needs.

Receiver Strip

The choice of receiver strips is a matter of individual preference and availability versus cost. The G.E. "Prog-Line" (No. 4ER25B1,11) assembly shown here was obtained in a swap deal. However, some of the surplus fm dealers[5] sell the strips *(when available) for as little as $30 each.* Pre-Progress Line receiver strips are sometimes available for as little as $10. Similarly, Motorola

[4] Blakeslee, "Converting the GE MTS Progress-Line Transceiver for Amateur Service," *QST*, June, 1971, p. 23.

[5] Gregory Electronics Corp., 249 Route 46, Saddle Brook, NJ 07662. Also, Spectronics, Inc., 1009 Garfield St., Oak Park, IL 60304.

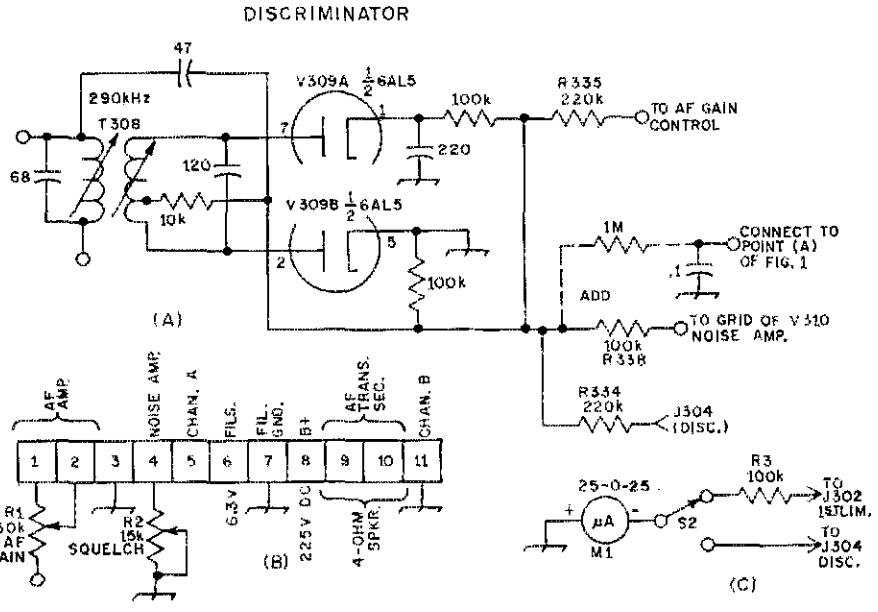
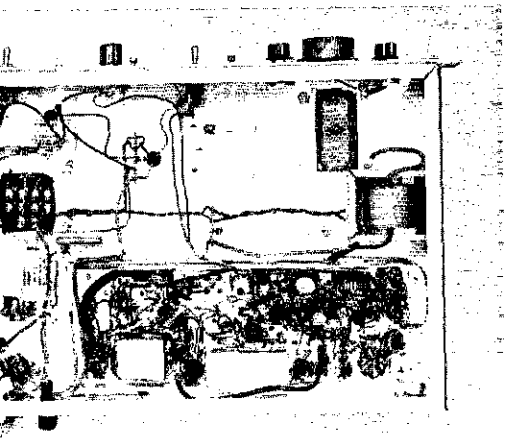


Fig. 2 — Diagram of the discriminator portion of the G.E. receiver (A). Dashed lines indicate circuit addition. Original G.E. part numbers are used in this drawing. At B, connections which must be made to the G.E. receiver 11-pin chassis plug. Illustration at C shows how to connect the metering circuit.



Close-up view of the VFO and preamplifier boxes with their covers removed. The VFO (lower left) is driven by a National Radio HRO gear box. The 6U8A tube projects out from the left side of the homemade VFO box. A 40673 dual-gate MOSFET is used in the preamplifier (upper right of the photo). Part of the G.E. receiver strip is visible at the top of the photo.

Sensicon strips can be purchased at low cost, and they are capable of doing a good job in this application. The main requirement is that the VFO be tailored to the oscillator frequency of the receiver used. Some receivers require a fairly high crystal frequency in the first oscillator, e.g., 28 MHz. In such an instance it would be wise to operate the VFO at 1/3 or 1/4 the oscillator frequency, then triple or quadruple in the oscillator stage of the receiver. This would enhance the stability of the system by having the VFO operate at a lower frequency.

Fig. 2 shows the details for connecting the receiver to the afc circuit. G.E. part numbers are used to help the reader follow the Prog-Line schematic, if one is available.[6] Information is given in Fig. 2B concerning connection of voltages, external controls, and the speaker. Fig. 2C illustrates the meter connections for monitoring first-limiter current and discriminator voltage. Those wishing to save the cost of a meter can ignore that part of the modification. Alternatively, one of the low-cost zero-center tuning meters sold by Lafayette Radio can be substituted for M1. A surplus 25-0-25 μA meter is used in the modification shown here. A less sensitive meter can be used. If so, the ohmic value of R3 should be reduced experimentally to obtain the amount of meter deflection desired.

Construction and Power Supply

The VFO is built in a homemade aluminum box which measures 2-1/4 X 3-1/2 X 3 inches. An aluminum thickness of 1/16 inch was selected to assure good rigidity of the box, thereby minimizing mechanical instability. A 4-inch-square plate of 1/8-inch aluminum stock is mounted below the

[6]Service manuals can be purchased from General Electric Co., Marketing Communications Production, Box 4197, Lynchburg, VA 24502.

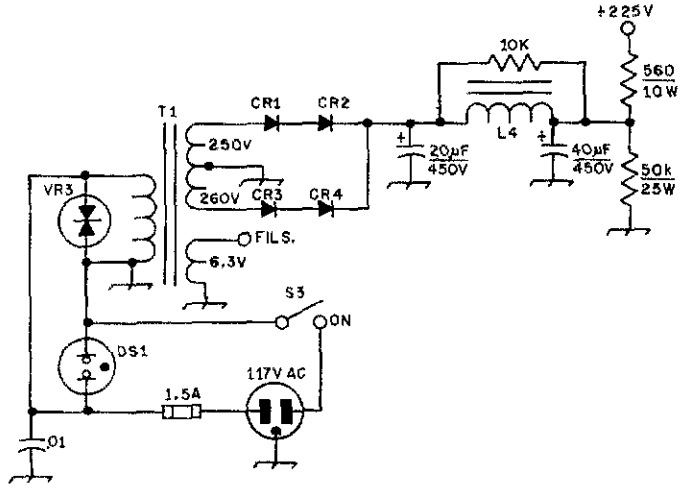


Fig. 3 — Diagram of a recommended power supply for the tunable receiver. Polarized capacitors are electrolytic.

CR1-CR4, incl. — 100-PRV, 1-A silicon rectifier.
DS1 — 117-V ac neon panel-lamp assembly.
L4 — 8-H 100-mA filter choke.
S3 — Spst toggle.
T1 — Power transformer. Secondary, 520 volts ct at 90 mA. Fil. winding, 6.3 V at 4 A. (Allied Radio 6K55VG suitable.)
VR3 — G. E. Thyrector No. GE6RS205P4B-4. Not required in installations where normal line voltage and minimum transients exist.

VFO box (under the chassis) to stiffen that section of the chassis. The 6U8A is mounted on one of the VFO enclosures to keep heat outside the assembly.

The complete receiver is assembled on a 12 X 17 X 3-inch aluminum chassis. An 8-3/4-inch rack panel is secured to the chassis by means of the controls and switches, and by attachment of a set of panel brackets. The trim strip on the front of the panel is a length of red Mystic Tape on which white press-on decals have been added to identify the controls.

The preamplifier is built on a pc board, and is housed in a 2-1/4 X 3-1/4 X 1-1/2-inch Minibox. Coaxial cable is used to supply input to the preamp, and to feed its output to the phono jack at the receiver input.

A schematic diagram of the power supply used by the authors is shown in Fig. 3. However, the particular transformer scrounged from our junk box did not have ample current available in the 6.3-volt winding. This caused the transformer to run hot. For this reason a separate 4-ampere filament transformer is used to feed the receiver strip, while the 6.3-volt winding of T1 is used only for the VFO filaments. The additional filament transformer is not shown in Fig. 3. The transformer specified in the parts list will be adequate for powering the entire package.

Some Closing Comments

The writers fully expect to receive some "mash letters" for having used a vacuum-tube receiver in this project. Solid-state enthusiasts may be tempted to point a finger of condemnation, but before doing so should consider the matters of cost and availability. Ideally, the entire package should be homemade and should employ solid-state devices throughout. The equipment shown here cost the writers approximately $50. Starting from scratch, designing an original circuit, and using only transistors and ICs would have cost *at least* $150, to say nothing of the time involved in troubleshooting and perfecting such a circuit.

No longer can the home-construction buff find the necessary components to build a complicated piece of amateur equipment – at least not in a reasonable period of time. With more and more parts houses dropping their services to small buyers, and because outrageous minimum-order fees are becoming commonplace, we must in some instances adopt procedures we might otherwise reject as being out of date. Whatever the case may be, the receiver described here performs nicely, did not take long to assemble, and did not require depletion of the well-known pin-money fund. As they say on TV, "Try it . . . you'll like it!" QST

April 1922

. . . The outcome of Mr. Hoover's Washington Radio Conference is the most important news of the day for amateurs and all radio users. The Editor details all the proposals; we find that amateur radio has been recognized and honored. Our President H. P. Maxim was put on the committee of experts with such men as E. H. Armstrong, Prof. C. M. Jansky, Jr., and Prof. Hazeltine. ARRL presented a most forceful case for us amateurs. Our spokesmen were Paul Godley, Secretary K. B. Warner and V. P. Chas. H. Stewart. We number 15,000 stations. Favorable Commission recommendations, we expect, will move Congress to adopt a new Radio Law to mean for us (1) an established amateur status, and (2) stating our amateur bands, with allocation for 150 to 275 meters for our amateur use.

. . . Larry Dunnam, 3ZY, describes his loop receiver. "Improving Antenna Efficiency" is the title of a thought-provoking technical paper by M. B. West, 9DEA, famous for such articles. This issue has the story of the big conventions of the day. Dep't of Commerce Chief Radio Inspector W. D. Terrell gave the keynote talk for the Third-Fourth District meetings at Hotel Raleigh, Washington. Paul Godley, J. O. Smith, David Sarnoff, Dr. A. N. Goldsmith and Chief Inspector Batcheller attended the Second District affair at Hotel Pennsylvania, NYC.

. . . Of top interest in this *QST* are 6XAD's work and items on cages *vs.* flat-tops, self-policing, and More on the Transatlantics. "Who's Who" gives us 4GL, "Chain Lightning" Hill; Amateur Stations 7ZU, Can. 9BD and 1BLE.

April 1947

. . . Our cover shows off the Micromatch. A "little black box" to read SWR and power is here. Mack Jones, W1PNX, and Carl Sontheimer explain its workings in our lead article. From now on, well-engineered ham stations will use one.

. . . K. B. Warner comments about the world telecommunications conference to open at Atlantic City May 15. He disavows rumors and says satisfactory U.S. proposals are in at the Berne Bureau. Elsewhere in this issue A. L. Budlong, W1BUD, presents Part I, "Atlantic City '47." Reviewing Washington '27, Madrid '32, and Cairo '38, he tells how we got our present bands.

. . . A good article is presented on "Gain vs. Element Spacing" by R. G. Rowe, W2FMF. Information is set down by N. A. Atwood, W3KTR, which makes it easier to use CRPL charts to predict amateur band conditions. Wm. L. North, W7BHE, has practical dope on Modernizing the Old Receiver. Ed. Tilton, W1HDQ, gives us "A Low Cost 2-Meter Transmitter." War surplus can be used but the use of crystal control instead of Hi-C will be progress.

. . . "Operating News" has a picture of W1AW's current operating position and operators. The proper ways to use ending signals are stressed. *KN* for "go ahead specific stations, others keep out" is new . . . will come into use. The 5th ARRL Member Party was a success. Here are scores. Lots of advance interest is expressed in the contest for April 4. This will be the first VE/W Contest since 1939! – *W1BDI*

A Strip-Line Kilowatt Amplifier for 432 MHz

Part I – Design Features and Construction

Hf Efficiency at Uhf, with 4CX250-Series Tubes in Parallel

BY RICHARD T. KNADLE, JR.,* K2RIW

HERE IS an amplifier that will run one kilowatt input conservatively at 432 MHz, with little evidence of the many problems that have plagued users of high power in this frequency range previously. Readily available 4CX250-series tubes are used in parallel in a unique strip-line arrangement which requires no neutralization or balancing. The amplifier is completely stable and remarkably free of spurious outputs, and it delivers more watts per dollar of construction cost than push-pull amplifiers previously described. Its performance has been verified with laboratory test equipment, and its reliability proven in extensive on-the-air use on 432 MHz.

The strip-line resonators, flashing copper in the grid circuit and copper-clad circuit board in the plate circuit, are contained in ordinary aluminum chassis. They are designed for unusually high Q, and are completely shielded, but they can be made with ordinary hand tools. Input and output coupling is capacitive, with loading controls conveniently located on the front panel. These controls have broad range and are a significant improvement over hard-to-optimize inductive coupling methods previously used at this frequency.

The parallel cooling arrangement differs from previous practice, decreasing the blower back-pressure requirement, and keeping the resonant components at room temperature. There seems little doubt that heat-cycling of tuned circuits has been responsible for at least part of the tuning drift so often reported in uhf amplifiers, both commercial and homebuilt.

The amplifier can be serviced quite readily. Both tubes can be changed and the amplifier put back on the air in about two minutes. This provides an excellent way of testing the uhf characteristics of used tubes of the external-anode family. A built-in relative-power indicator makes adjustment for optimum performance a simple matter.

Several features of the amplifier are usable on other frequencies, so some theory is included in the discussion, for readers who will wish to understand the basic principles and make logical variations using the versatile strip-line technique.

* 316 Vanderbilt Pkwy, Dix Hills, NY 11746.

Why Parallel?

A solid-state exciter capable of 20 watts output at 144 MHz is part of the driver chain for the amplifier.[1] The output stage of the exciter uses a 2N5016 transistor, an overlay device having the equivalent of 408 small transistors in parallel within its package. Engineers working in the semiconductor field some years ago discovered that paralleling small devices yielded high power gain and efficiency in the uhf range, and this led me to wonder if amateur uhf tube users could not learn from the semiconductor experts. This amplifier is the result.

The parallel arrangement requires about half the number of resonant-circuit components needed for a push-pull stage, and it does away with the need for balancing. In this amplifier, 15 unmatched 4CX250B tubes have been tried. A 4CX250B was combined with a 4CX250R, which has higher capacitance. The amplifier has even been operated with one tube cold. After adjustment of the tuning and loading controls, all combinations achieved nearly 70 percent efficiency.

Consideration of all available types of tubes led me to believe that 4CX250Bs offer the best

[1] The writer will gladly provide a schematic diagram of the 20-watt solid-state 2-meter exciter, on receipt of a stamped self-addressed envelope.

We have tended to rule out parallel operation of transmitting tubes as impractical above about 100 MHz or so, but K2RIW shows here that going higher is mainly a matter of virtual elimination of lead inductance. Using strip-line tank circuits of elementary simplicity, he has produced what is probably the first high-efficiency 432-MHz kilowatt amplifier that is within the capabilities of the average amateur uhf enthusiast. Even if you never intend to work on uhf, don't pass up this exceptional article. It is loaded with interesting ideas that are applicable wherever external-anode tubes are used.

combination of gain, efficiency, and watts-per-dollar. Various types in this tube family can be used without circuit changes, and some of these can be obtained at moderate prices on the surplus market. They seem preferable to other tubes usable at this frequency, including any larger single type, in both overall cost and maximum output with 1 Kw input.

Most designers of transmitters for the higher frequencies have felt that pushpull was necessary, in order to minimize the effects of tube and circuit capacitance. Except where a true resonant cavity or properly designed strip-lines are used, this is still true. In conventional coil-and-capacitor circuits especially, push-pull has marked advantages over parallel on frequencies near the maximum at which these techniques can be used.[2] But with the strip-line the inductance can be made as low as desired, simply by making the line wider. Any number of tubes can be put in parallel, and resonated, so long as the intertube resonances (push-pull modes) are controlled. With methods described in the next section, almost all configurations are controllable.

In this amplifier the parallel grid and plate networks force the rf voltages on the two tubes to be identical. If one tube has higher emission than the other, it may draw slightly higher current, but this is of little consequence because it happens to be the condition under which the amplifier will produce the greatest output with this pair of tubes.

Controlling Extraneous Resonances

Instability and low efficiency in some vhf and uhf amplifiers using tubes in parallel are believed to have been due largely to lack of control of push-pull resonances. A sad fact of tube design is that there is a certain electrical length within the tube, and this becomes an appreciable portion of the resonant circuit at frequencies above 100 MHz or so. Therefore, in a parallel amplifier there is always a push-pull-mode resonance between the tubes, regardless of how closely they are mounted. In the same vein, uhf push-pull amplifiers always have parallel resonances, which can be quite troublesome.[3]

The parallel amplifier described was checked carefully for stray resonances, in both plate and grid circuits. Both tune intentionally to 432, of course, in the parallel mode. The plate circuit has a push-pull resonance at 640 MHz, and the grid circuit one at 260 MHz. Such parasitic resonances exist in all amplifiers, but they are seldom recognized, and almost never actually measured. If extraneous resonances in the grid and plate circuits are close together in frequency there is the possibility of self-oscillation that cannot be neutralized out by conventional methods that would be effective at the intended operating frequency. In this amplifier the extraneous resonances are unrelated harmonically and unrelated to 432 MHz.

A special versatility of strip-line construction lies in the fact that a push-pull resonance can be shifted in frequency without affecting the parallel-mode operation. A slot could be cut along the centerline of the plate inductor, L1, shifting the push-pull resonance lower in frequency. Strip-line advocates call this "mode killing." Unless the builder is prepared to do this kind of work, adherence to the dimensions given for the inductors and their shielding compartments is recommended.

Tuning and Loading Methods

To those conditioned to the conventional 432-MHz coaxial tank circuit, the strip-line plate circuit and tuning method may seem strange. The coaxial plate circuit commonly used with single-ended 432-MHz amplifiers works well for up to 500 watts input, but it is rather difficult to make, and it is not adaptable to use of more than one tube. It cannot be over-emphasized that there is nothing sacred about its classical round shape, even though the tube anode itself is round. In fact, there is a considerable advantage in a wide, flat shape, which has very low current density, and hence low losses. Mounting the tubes vertical and the resonator horizontal is also of no consequence. The anode is an equipotential surface; all of it works equally.

(Photograph I)

The K2RIW 432-MHz kilowatt amplifier is built in two standard chassis, making a package only 6 X 8 X 12 inches overall.

(2)

Strip-line resonator, with tubes and Mylar chimneys in place. Flapper-type tuning and loading capacitors, C5, right, and C4, above use the strip-line as their fixed plate. Chimneys fit into 3/8-inch brass collars attached to the underside of the cover plate.

(3)

Here the plate line, L1, is removed, to show the tuning and output-coupling capacitors. Both are controlled by fishlines, running through the chassis to Bakelite shafts in the lower compartment.

(4)

The half-wave grid line, L2, upper right, is made of flashing copper. The grid compartment, upper left, is a modified aluminum chassis. The plate line, L1, lower right, is two-sided circuit board. The 4CX250B tubes and their sheet Mylar chimneys are at the left.

(5)

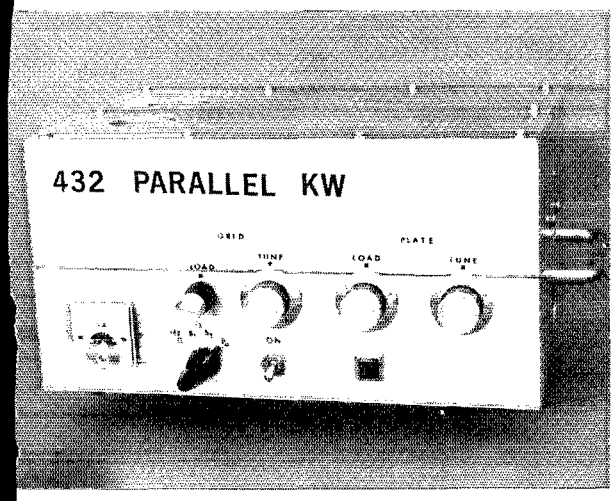
Bottom of the amplifier, with the grid compartment and resonator, L2, in place. The two dark shafts at the right control the plate tuning (far right) and loading (longest shaft).

(6)

Grid compartment and resonator removed, to show input-loading capacitors, C3 (at 45-degree angle) and C2. Capacitor on short shaft is C1. All three have rotors ungrounded. Note slight intentional misalignment of the mounting plates for shaft bushings, to put some tension on the shafts that control C4 and C5, right.

[2] *Radio Amateur's VHF Manual*, "Power Amplifiers — Single-Ended, Parallel or Pushpull?" All Editions, Chapter 5.

[3] Tilton, "Some Hints on Pushpull 432-MHz Power Amplifiers," *QST*, February, 1970, p. 44.



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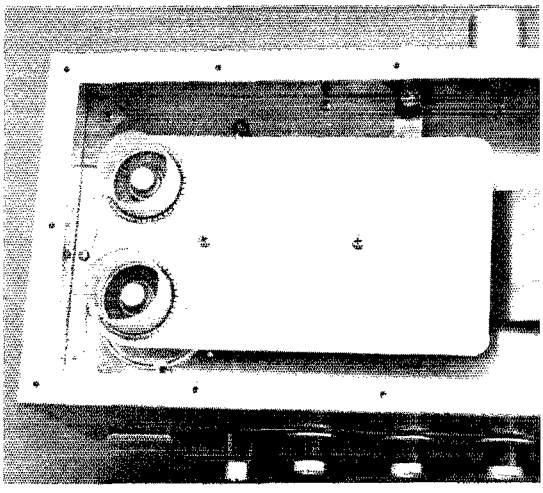

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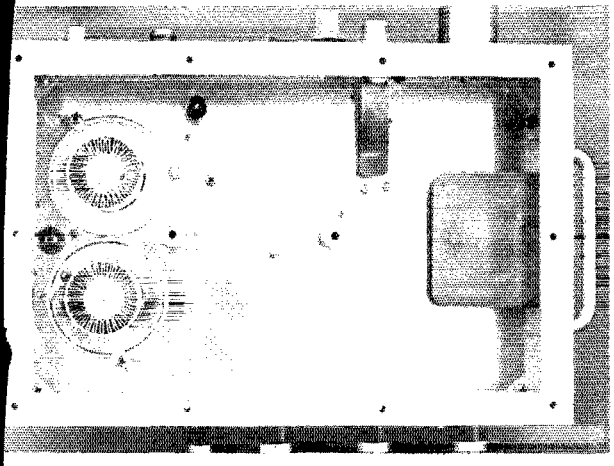

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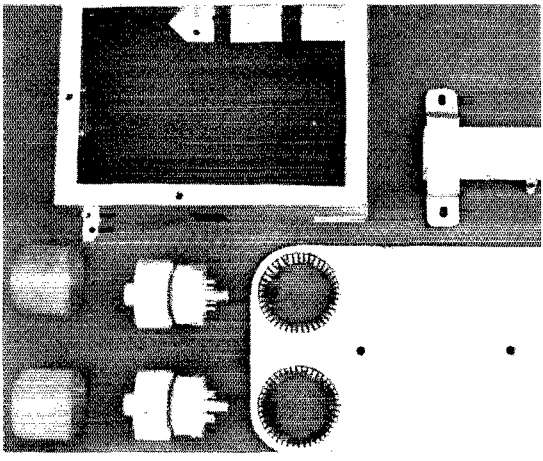

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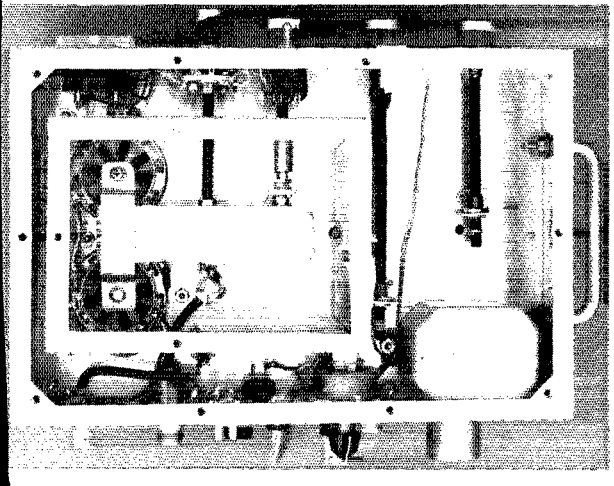

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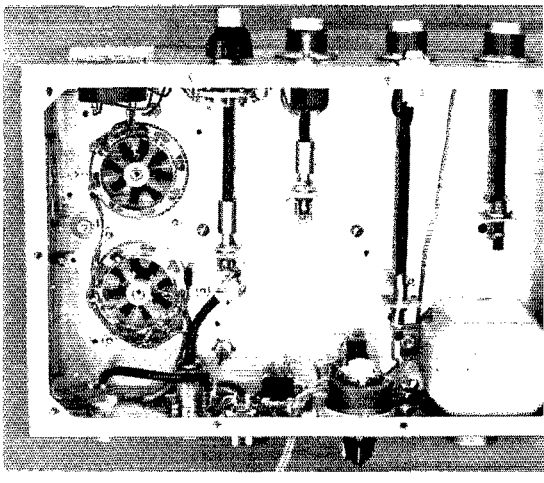

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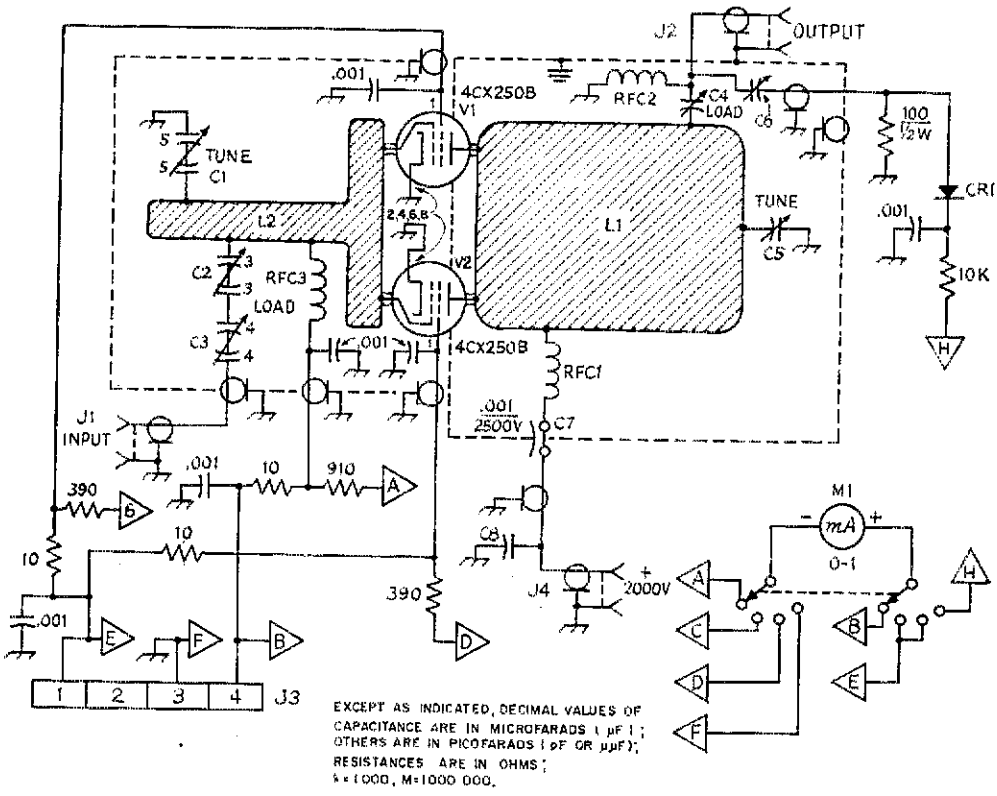


Fig. 1 — Schematic diagram and parts information for the 432-MHz kilowatt amplifier. In the interest of conveying mechanical information, some parts are not shown in conventional schematic form.

C1 — 5-pF per section butterfly (Johnson 160-205).
C2 — 3-pF per section butterfly (Johnson 160-203).
C3 — 4.5-pF per section printed-circuit butterfly (Johnson 189-251-5).
C4 — String-driven loading capacitor. See text and Fig. 2.
C5 — String-driven tuning capacitor. See text and Fig. 2.
C6 — Copper disk, 1/4-inch dia, 3/16 inch below J2 center conductor.
C7 — .001-μF 2500-volt feedthrough (Erie CSK-711).
C8 — .001-μF 3000-volt disk ceramic.
CR1 — Hewlett-Packard HP-2301 diode.
J1, J2 — N-type coaxial fitting.
J3 — 4-pin male power connector.
J4 — High-voltage connector (MHV type).
L1 — 5 X 9-inch double-sided glass-epoxy circuit board. Round corners 5/16-inch radius. (Half-wave strip-line.)
L2 — Half-wave grid circuit, flashing copper. See Fig. 6.
RFC1 — 5 turns No. 18, 1/4-inch dia, 1 inch long, axis vertical.
RFC2 — Like RFC1, but 1/2 inch long.
RFC3 — 0.2-μH rf choke (Ohmite Z-460).
Meter functions: Position A-B — grid current, 100 mA; C-E — screen current, V1, 50 mA; D-E — screen current, V2; F-H — relative power output.

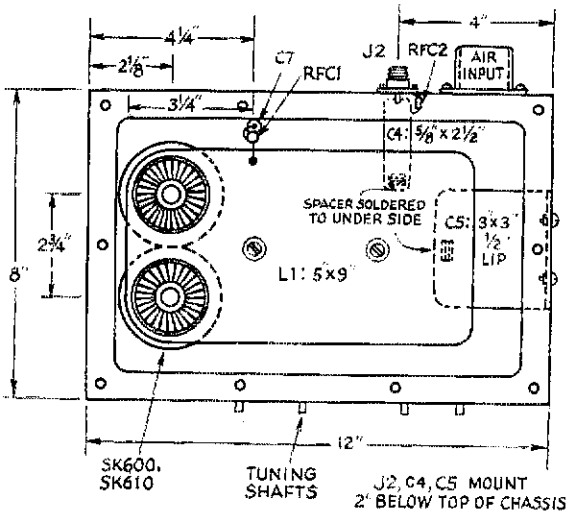
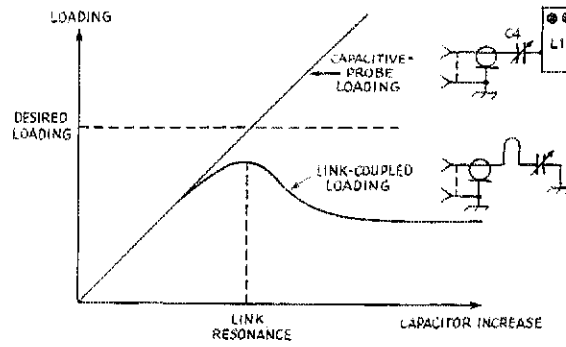


Fig. 2 — Details of the plate compartment, showing placement and dimensions of all major components.

Fig. 3 — Comparison of capacitive-probe and link-coupled loading methods. The latter may give a false indication of maximum output, at lower levels than might be obtainable with the capacitive method.



The plate circuit is tuned by C5, one plate of which is the strip-line itself. See Figs. 1 and 2, and photos 2 and 3. The movable element is a springy beryllium-copper flapper, whose position with respect to L1 is controlled by means of fishing string wrapped around a Bakelite rod which extends out to the front panel. This tuning method achieves very low loss, and eliminates problems resulting from the moving-contact surfaces and multiple ground paths inherent in most capacitors with rotating plates.

The output coupling capacitor, C4, is also a spring-type copper tab, controlled from the front panel in a similar manner. Major advantages of the capacitive-probe coupling are loading linearity and elimination of moving-contact surfaces. A possible pitfall with inductive coupling is illustrated in Fig. 3. A peak may occur in the middle of the tuning range of the link series capacitor, and the position of the link with respect to the plate inductor may appear to be set for optimum output, in that output decreases when it is moved closer. This can easily fool the operator into thinking that the maximum possible output has been obtained, especially at frequencies where accurate measurement of power levels is not possible with equipment available to the average amateur.

By contrast, with the capacitive-probe method the loading always increases as the capacitance between the probe and the line is increased. The range of loading is quite large, permitting matching to loads of from 20 to 200 ohms. Advocates of link coupling claim that it has the advantage of harmonic rejection, but typical link-coupling networks operate with a loaded Q close to unity, so there cannot be much difference.

There is a unique optimum plate loading for each drive level, if output efficiency is to be maximized. Loading must be readjusted carefully for any operating-condition change (plate voltage, screen voltage, bias) as well as drive level. Some amplifiers have inaccessible loading controls, making it hard to maintain maximum efficiency. The front-panel control for C4 is very helpful in this. Maximum efficiency occurs at the same settings as maximum output, if bias and plate voltage are held constant. The built-in relative-power metering makes the maximizing the output quite convenient.

When using the plate loading control it will be seen that there is some interaction with the plate tuning. This is a normal condition that exists to a degree with link coupling, as well. It may not be noticed in some link-coupled systems that are not working as well as they might, especially since link-coupled networks have a much smaller loading range.

The parallel amplifier, like all other 432-MHz amplifiers observed, does display a slight drift in plate-circuit resonance during long transmissions. After extensive testing I am convinced that the plate capacitance of the tubes increases slightly as the anode heats up. The effect decreases if the air flow is increased, or if the plate dissipation is decreased. Examination of circuit components as quickly as possible after a 15-minute key-down period shows perceptible temperature increase only in the tube anodes themselves, so it is apparent that circuit component heating is not responsible for any drift observed.*

Some builders of this amplifier have been mystified by the plate current rising more rapidly as C5 is moved in the high-capacitance direction than in the low. This is normal; as C5 moves closer to L1 the capacitance increases more rapidly than it decreases with similar movement in the

* [EDITOR'S NOTE: Severe detuning in some amplifiers, to the extent of a 50-percent change in output during each transmission, demonstrates that component cooling *is* important. It may well be that the unique cooling-air flow illustrated in Fig. 5 could be used to advantage in other amplifiers using external-anode tubes.

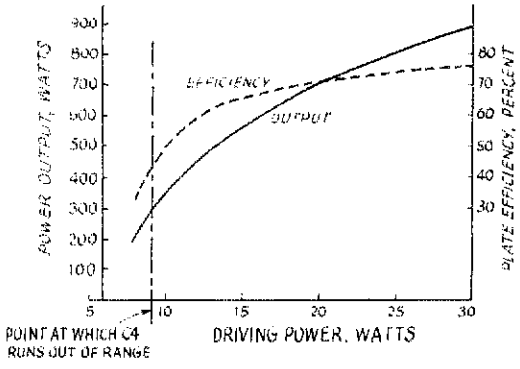


Fig. 4 — Output and plate efficiency of the 432-MHz amplifier when operated Class C, with bias, screen voltage, and plate voltage fixed at −90, +300, and +2000 volts, respectively, varying the drive level from 8 to 30 watts. Input drops with decreasing drive, so operation is always at safe levels of plate dissipation.

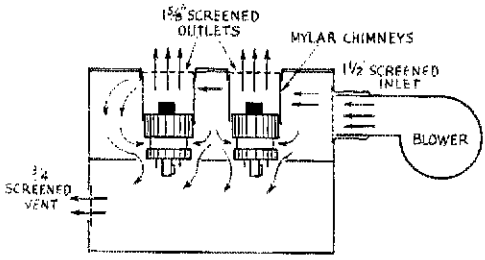


Fig. 5 — Cut-away end view of the amplifier, showing the air-flow division.

opposite direction. Detuning slightly on the low-capacitance side of resonance is recommended. The slight increase in tube capacitance with heating will then bring the circuit into resonance, reducing the effective change in operating conditions with repeated warming and cooling.

Construction

The amplifier was built in two Premier 8 X 12 X 3-inch chassis, screwed together top to bottom, as seen in Photo 1. The top surface of the upper chassis was cut away, leaving a 3/4-inch mounting surface around the edges for the cover plate. I made the cover of .091-inch aluminum, to insure mechanical stability in the plate circuit, but .061-inch would probably have been more than sufficient. The two 1-5/8-inch air exhaust holes placed directly above the tube anodes have copper screening soldered across them, on the inside, for rf shielding.

The screening was soldered by first tinning the inside of the box around the holes with Kester aluminum solder, using a soldering iron tip on a butane torch. The screening was then tacked in place. Collars made of 3/8-inch lengths of 1-5/8-inch ID brass tubing were then soldered to the screening, aligned with the exhaust holes. The collars hold the Mylar chimneys in place and create reasonably air-tight fit. The four butt-joint corners of the upper chassis were spot-soldered in the centers of the cracks on the inside, to insure good rf shielding.

I recommend using Pem-nuts, Rivnuts, or some other brand of blind fasteners for the cover plates. You will be removing the covers often, if for no other reason than to show the innards to fellow amateurs, and holes for sheet-metal screws will not survive this kind of use without stripping.

Placement of the tube sockets on the chassis and the holes in L1 should be done carefully. Misalignment will cause the tubes to skew in their sockets, which could result in poor contact to some of the screen-bypass fingers and also make proper tube insertion difficult.

The plate resonator is a 5 X 9-inch piece of 1/16-inch double-sided fiber glass circuit board. The conductor thickness is more than adequate, since the rf current skin depth in copper is 0.125 mil at 432 MHz. Almost any good conductor that is rigid and more than 1 mil thick will work well.

The finger stock around the anode holes is soldered to both sides of the copper-clad board. The intrinsic capacitance between the board sides eliminates the need for other connections. I like the soft folded-over silver-plated finger stock, for ease of tube removal, but stiffer brass or other materials should also do. Some builders of the amplifier have made anode connections with flashing copper and hose clamps, eliminating the finger stock, but this hampers tube replacement.

Two single-sided boards could be used if they are held together back-to-back with screws, or soldered together around the perimeter with copper or brass shim material. Some variation in board thickness makes little difference. Solid materials could be used, but cutting and soldering will be more difficult. The strip-line is supported above the ground plane on two 1-1/2-inch porcelain insulators. The rf choke is connected to the upper side only, for convenience.

Cooling air, brought into the upper chassis through a 1-1/2-inch screened hole, divides into two paths, as seen in Fig. 5. Three-fourths of the air goes through the tube anodes, the 1-5/8-inch Mylar chimneys, and out through the cover plate. The other fourth goes down through the tube sockets and out through the 3/4-inch screened hole in the side of the lower chassis. The cool air first runs past the plate circuit components, and the full air pressure is available at the tube anodes. The air back pressure is quartered, because normally the tube sockets create greater back pressure than the anodes, which need the most cooling.

The 6-inch diameter squirrel-cage blower is sound-proofed by mounting in a cardboard box, the air inlet side of the box being covered by a household air filter. The 2-inch car heater hose which is used as an air outlet is terminated in a tubular "Y." From there, two 1-1/2-inch hoses run to the kilowatt amplifier and the amplifier-tripler.[4]

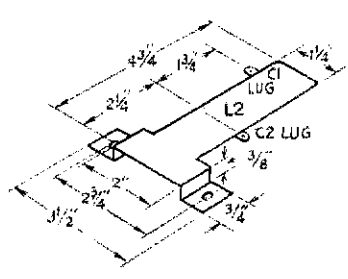


Fig. 6 — Details of the half-wave grid line, L2. Material is flashing copper or sheet brass. The principal surface is 7/8 inch above the chassis.

[4] Knadle, "Dual Band Stripline Amplifier/Tripler for 144 and 432 MHz, *Ham Radio*, February, 1970, p. 6.

The 10-mil Mylar chimneys are shaped by using the two 4CX250B tubes as a form. A 1-5/16-inch Mylar strip is overlapped a quarter turn, glued with silicone rubber adhesive, and held until dry with rubber bands. The finished chimneys are seen in Photos 2 and 4. Be sure that they are not so long as to separate the finger stock from the tube anodes when the cover is tightened down. Sheets of 10-mil Mylar are often used by draftsmen, which should make it easy to obtain. If the air flow is insufficient, melting of the Mylar could be experienced. In this case a larger blower, or chimneys made of Teflon, should be used.

The tuning and loading flapper capacitors, C5 and C4 respectively, are made from .008-inch beryllium copper, but other springy conductive materials are usable, since the current density through these components is not extremely high.

Fishing string is fastened to the free end of each flapper, using a small wire loop, metal spacer, or short piece of 1/8-inch tubing soldered to the underside. The strings go through chassis holes and wrap around Bakelite rods in the lower chassis. The rods extend out through the front panel. Drill each rod and tie the string through it, to avoid slippage. Slight misalignment of the mounting brackets for the shaft bushings can be made to cause friction enough so that the capacitors will hold their settings.

The natural rest position of the flappers is slightly below L1, so that they do not make contact with it, regardless of knob settings. Originally a piece of Mylar was cemented to each plate, for short-circuit protection, but dielectric heating in this area caused some loss in efficiency. The choke, RFC2, is a protective measure, in case C4 should accidentally contact L1.

The power-sampling capacitor plate, C6, is suspended 3/16 inch below the center conductor of J2. It is soldered to the inner conductor of 1/8-inch semirigid coax, which carries the sampled power to the lower chassis, where it is rectified by CR1, to give a reading on the meter. The semirigid coax is placed as near the rear wall of the chassis as possible, and its outer conductor is soldered to the chassis at the point where it passes through. The chassis was first tinned with aluminum solder. The end of the outer conductor is also soldered to a ground lug, under one of the mounting screws for the UG-58/U connector, J2. The position or size of C6 should be adjusted to give approximately 3/4-scale deflection on the meter, when full power output is being developed. Suitable coax can be made by running insulated wire inside small copper tubing, if semirigid coax is not available. RG-58/U coax is also usable, if it is grounded to the chassis thoroughly.

The grid circuit (Fig. 6 and Photos 4 and 5) is tuned and loaded by C1 and C2. These are butterfly capacitors with ungrounded rotors, so no rf current must flow through a sliding contact. One stator of C1 is soldered to a ground lug on the chassis floor, and the other is soldered to a lug on the lower side of L2. One stator of C2 is soldered to a lug on the lower side of L2. The other stator of C2 and one stator of C3 are soldered to a lug bolted to the top of a 3/8-inch threaded porcelain insulator, fastened to the chassis. The shield of the RG-58/U input cable is soldered to a ground lug under the insulator. C1 and C2 are tuned with Bakelite rods extending out through the front panel. Their proper adjustment will make the amplifier look like a 50-ohm load, over all reasonable drive levels. C3 is used to set the range of C2.

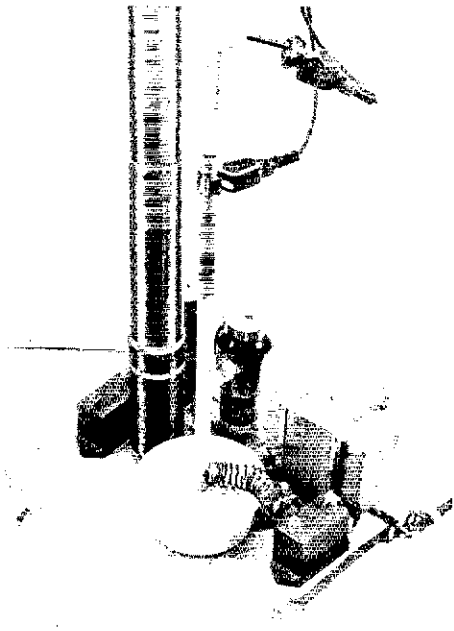
Very careful shielding and bypassing of all leads entering the grid compartment is required, if the drive requirement is to be kept low. There is a strong rf field in the vicinity of the grid connections, and it can couple some of the valuable driving power into the circuit wiring very readily. Note that no wiring is run close to the grid line at any point, as seen in Photo 6.

The grid shield is a modified standard 5 X 7 X 3-inch aluminum box, held in place with sheet-metal screws. The top of the box is cut away, leaving a 1/2-inch mounting flange. Slots are cut in the side of the box in the area of the shafts for C1 and C2, and around the input rf cable, for ease of box removal. Five 1/2-inch holes are drilled in the end closest to C1, for easy air flow.

Part II, detailing power supplies, performance, and important uhf safety measures, will appear in an early issue. QST

From the Museum of Amateur Radio

This single slide tuner, built by Hunt and McCree, was the very first piece of wireless gear used by Hiram Percy Maxim and his son Hamilton. The latter, during a recent visit to the Museum, spotted this tuner and told us a little about it. The coil has been rewound at some time due to shrinkage of the cardboard tube. We believe it was in use as early as 1910. – *WIANA*



Synthetic ruby-growing apparatus built by the author. The retractor has been removed in order to show internal detail (see footnote 2 for additional information).

One of the newest communications techniques makes use of the principles embodied by the RASER (Radio Amplification by Stimulated Emission of Radiation). This device exhibits characteristics similar to that of a LASER, but the energy radiated lies within the vhf spectrum rather than the light spectrum. Amateur radio can both benefit from and advance the technology associated with the Raser. This article is intended to acquaint the reader with the physical principles, and present a method of Raser construction with the results of a test.

Fundamental Raser Principles

An Introduction to Laser Technology as Applied to Amateur Antennas

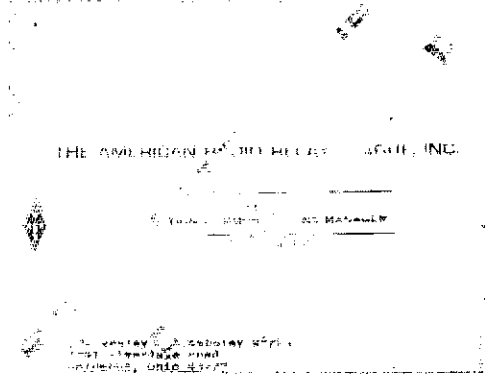
BY W. R. LAMBOLEY, W8FMG

THE RASER is a means by which rf energy is radiated; its physical makeup in this case includes a Yagi antenna. The Raser constructed by the author used standard Yagi dimensions at 432 MHz. Two modifications were made to the basic Yagi: a synthetic ruby rod of proper length (0.47λ) was "grown" and fitted inside the driven element, and a 750-ohm balanced feed was used instead of the usual 50-ohm gamma match.

How It Works

A signal is applied to the driven element through the 750-ohm balanced feed system. Approximately 20 percent of the signal is radiated normally; the remaining 80 percent is absorbed by the ruby rod. The signal absorbed by the rod is bounced from end to end until the hyper-excited atomic structure of the ruby can absorb no more power. At this time the ruby rod, functioning something like the laser, radiates all its stored energy in one coherent burst (see October 1971 *Journal of Transcendental Physics* for a more rigorous treatment of the principle). The peak power radiated during the "burst" is about 28 times that of the average power input to the driven element. The number 28 is called the "Time-

* 1841 Riverdale Road, Columbus, OH 43227.



Two rods grown by the author. The rod on the left is ruby (TCN=28); the rod on the right is silicon (TCN=12).

Details of the driven element. The ruby rod has been extended from one end to show detail. The aluminum tubing is a low-vibration type from Canada.

Continuum Number" (TCN) for ruby. Other materials exhibiting behavior similar to ruby and TCNs have been observed from 12 for silicon to over 100 for gallium arsenide.[1]

Before going further it must be stressed that the Raser does not give you something for nothing. In fact, its total efficiency is about 13 percent lower than that of a regular Yagi. What the Raser will do is redistribute the power fed to it with respect to time. The resulting power radiated from the Raser is similar to a pulse radar system in which average power may be of the order of 50 watts and peak power of the order of 50 kilowatts. However, there are marked differences between the Raser and a pulsed radar system. They are (1) energy radiated from the Raser is coherent and requires no more band width than the ordinary signal, while pulsed radars are extremely broadband; and (2) the Raser will accept regular ham transmitter outputs, while a pulsed radar requires very high voltage and current (25,000 volts at 2 amps.) during the pulsing interval.

Why Ruby?

Synthetic ruby was selected as the material used in this Raser due to its relative ease of growth. Growth of synthetic ruby has become a common high school science project in recent years.[2,3] The source books quoted are both geared toward using the ruby rods in laser application. However, since the wave lengths we use are much longer, silvering of the rod ends is not as critical and simply painting the ends of the rod with silver paint has proven adequate. In addition, the ruby need not be grown in a vacuum, as much higher impurity levels can be tolerated.

Theoretically, the effective power gain achievable using a ruby Raser is approximately 13 dB. However, higher gains have appeared in practice. A series of tests were conducted and a disinterested third party was asked to evaluate the increase in power. Results showed a gain of nominally 17 dB. No explanation has yet been offered which accounts for the additional 4 dB.

It is expected that the Raser art will advance rapidly in the next few years. Practical problems involved with long rod growth and maintaining a vibration-free environment inside the driven element are expected to be overcome. The theoretical lower limit of Rasing is about 10 MHz and the author predicts the hf bands will see some Raser activity within the next few years. It is expected that hams, in the best tradition of their service, will be in the forefront in pushing the Raser art ahead.

[1] Reinhart, Allen, "RASERS," *Journal of Transcendental Physics*, October, 1971.

[2] Rapp, Larsen E., *Ill-Advised Science Projects For the Layman*, Double-Cross, 1971.

[3] Ten, Wun Tu, *Build Your Own Laser for Fun and Profit*, Peking Publishing, 1971.

Strays

If you think this Stray is here because this is the April issue, you're right! We couldn't resist showing a new product press release that was received here recently. The device is called "The Mind Machine" and it consists of a vertical pointed axis mounted in a block of hard wood and three colorful spinners. The object is to balance a spinner on the point of the axis in a draft-free area, then through sheer mental power make the spinner rotate in first one direction, then the other . . . or stop it at will. Well now, this gadget has several ham applications: wireless antenna rotator, automatic receiver tuner, etc. If you really want one, write Early Mail Order Sales, 224 Lee St., Blakely, GA 31723 for information.

Hints and Kinks For the Experimenter

REDUCING OSCILLATOR DRIFT IN A 432-MHz TRANSMITTER

I was having drift problems with my 432-MHz transmitter as a result of the crystal oscillator being mounted on the transmitter main chassis. The drift would amount to 200 Hz or more during a half-hour schedule. I decided to rebuild and thermally isolate the crystal oscillator and first multiplier.

The circuit as shown in Fig. 1 consists of a JFET crystal oscillator and a bipolar transistor doubler. In order to adjust the crystal oscillator to the desired frequency and eliminate a capacitor shaft from coming out of the oscillator compartment, which would upset the thermal isolation, a varactor tuning diode was installed. A voltage divider using a fixed resistor, R1, and a ten-turn pot, R2, from a 9-volt regulated supply, was used to back-bias the varactor diode, CR1, and tune the crystal frequency.

With the values shown in Fig. 1, I was able to get about 40-kHz change in frequency at 432 MHz. If fm or frequency-shift keying is desired, the addition of an audio transformer, a three position switch, a pot and a key jack would be necessary.

To tune the oscillator initially, place the three-position switch, S1, in the cw position, the frequency control, R2, so that the arm is at ground, and the variable capacitor, C1, at mid-range. Connect the oscillator output to the transmitter, apply power and adjust L1 for maximum output power while observing the drive to some succeeding stage in the transmitter. Monitor the final transmitter frequency with a frequency meter or a calibrated receiver and adjust C1 for the desired frequency. This frequency will depend upon the values of C1 and CR1 and the characteristics of the particular crystal. Now set the frequency control, R2, to the opposite end of its travel (maximum voltage); the output frequency will now have increased. The value of R1 may be changed to obtain the desired upper frequency limit.

A 9-volt regulated power supply was used to operate this oscillator/multiplier and the output power was measured at 100 mW across a 50-ohm load. This was ample power for my transmitter.

A graph of bias voltage vs. frequency (F_o = 432 MHz) is shown in Fig. 2. The slope of the graph varies from approximately .08 volt/kHz at the lower end to 0.19 volt/kHz at the upper end of the curve. When using this circuitry for fm, the deviation will vary when changing the center frequency. There are various ways to circumvent this problem. However, I operate primarily on one frequency and therefore did not add the extra circuitry. If wide-band fm is used there will be some distortion because of the changing slope.

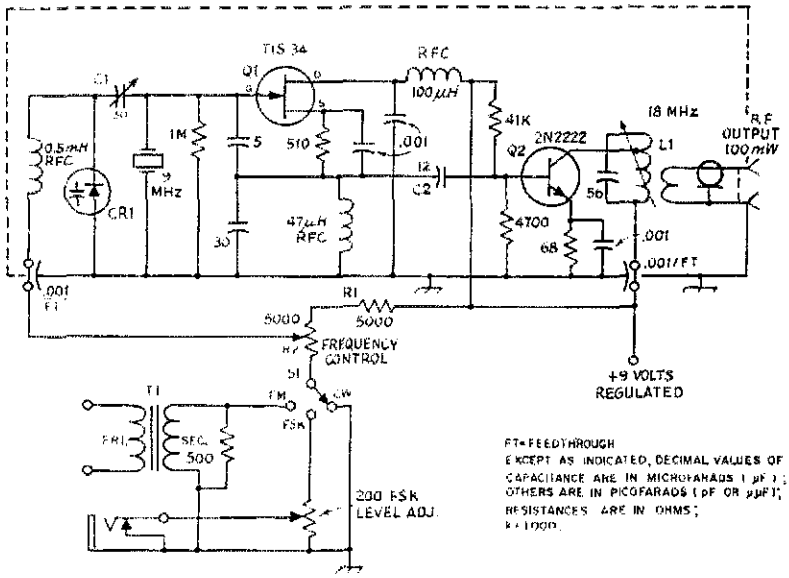
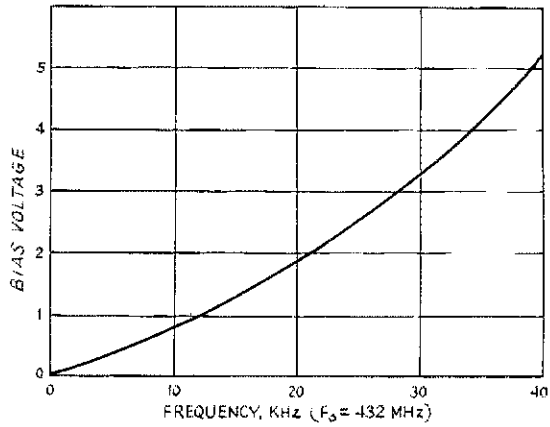


Fig. 1 — The schematic of the Varicap-controlled crystal oscillator used in a 432-MHz transmitter. C2 is selected to produce 20- to 25-mA collector current through Q2. CR1 is a 33-pF varactor diode (1N5146 or equiv.). L1 primary is wound with 20 turns of No. 27 enameled wire tapped at 9 turns from cold end on a 5/16-inch-diameter ceramic form. Secondary is 3 turns of No. 24 insulated wire placed over the cold end of L1. T1 is a line-to-line transformer.

Fig. 2 — A graph of the bias voltage vs. frequency for the oscillator in the 432-MHz transmitter. C1 has been adjusted for about midrange of the tuning limits.



The slope changes less toward the low end, so it would be best to set up the oscillator so that the desired frequency falls near the lower end. If the deviation is 10 kHz the frequency distortion will be near zero at the low end, increasing to 4 percent at the high end.

When using fm the peak af voltage should never be high enough to cause the varactor diode to conduct. When this happens severe distortion results. The varactor diode conducts when the peak af voltage plus the bias voltage equals -0.7 volt. To be safe, never let the peak af voltage exceed the bias voltage.

In the fsk mode I was able to obtain up to 4-kHz shift at the low end of the curve and 800-Hz shift near the upper end of the curve.

The circuit was built on a piece of single-sided copper-clad epoxy board and mounted in a 2 × 3 × 1/2-inch box. A second box with dimensions one inch larger than the oscillator/multiplier box was used as a thermal insulation holder. A block of expanded polystyrene was cut to fit inside of this box. The polystyrene block was cut in half and formed to fit around the oscillator/multiplier box. With the oscillator/multiplier box fitted in the polystyrene and clearance holes cut for the wires, the two polystyrene sections were glued together and placed in the larger box. Next, they were mounted on a rack panel along with the control pots, mode switch, af transformer and key jack. The completed unit was placed in a section of the rack where a minimum of heat and air movement existed.

This modification has greatly reduced the drift problem of my transmitter, and has made it much easier to get on frequency and stay there. – *C. E. Swedblom, WA6EXV.*

SIAMESE-TWIN POWER SUPPLY

A power supply for a high-power linear amplifier can contain a lot of metal and grow into a heavy, unwieldly monster. This became evident after a study of "Use Surplus and Save," October 1967 *QST*, in which W1ICP described a supply using two power transformers to obtain the desired voltages and current. A string of six high-capacitance electrolytic capacitors and associated items add to this bulk and weight.

An answer to problems of this nature is to build the equipment on two chassis, either of which is easier to move around. The transformers, switching system, and protective devices would go on one chassis; the rectifiers and filters on another. Interconnections should be made with high-voltage cabling and barrier strips. Quick-disconnect plugs might not be safe to use at these points. For flexibility, both chassis should be the same size, and if vertical stacking is more practical, heavy aluminum angle stock could be used on the corners. – *Julian N. Jablin, W9IWI.*

POOR SHIELDING IN AUDIO CABLE

I found that the wrap-around type of shield used on audio cable, though easy to work with, is a poor choice if used in the presence of rf fields, such as exist in an amateur station. I encountered the problem of rf feedback in my shack while using this cable and no amount of filtering of the transmitter would cure it. When the microphone cable was replaced with the standard woven-type of shielded cable the problem disappeared. This suggests that this wrap-around type audio cable would be no good for carrying rf. – *John Bipes, KØYQX.*

CALL-SIGN TIE CLIP

A few weeks ago I was searching for a tie clip as I dressed to attend an amateur radio meeting, and discovered that I had many tie clips with the stones or emblems missing. I cut a small rectangle of white paper to fit the area vacated by one of the emblems and lettered in, in distinctive fashion, my call sign. At the amateur meeting that evening I received a number of compliments on my ham tie clip. Some of the small dry transfers used for panel labeling will work just as well if they fit your format. – *Michael P. O'Grady, K9YVA.*

ENGRAVER'S PUTTY SUBSTITUTE FOR PANELS

I have heard the suggestion that a like-new appearance can be restored to worn panels by the use of engraver's putty, a white substance that can be pressed in the depressions left by the engraving. After many attempts were made to obtain such material (without success) a number of more common materials were tried. The most useful was ordinary white thread-seal compound sold in hardware stores primarily for use with plastic pipe. It is used in the way previously suggested for the engraver's putty, forcing a small amount into the grooves with the finger tips. Clean-up can be done with rubbing alcohol. For mail order purposes, Sears and Roebuck 422284 is suitable. – *Cliff Buttschardt, W6HDO.*

[EDITOR'S NOTE: White grease pencil works nicely for filling engraved labels, too. After application, simply rub the excess material away with a cloth or paper towel.]

Recent Equipment

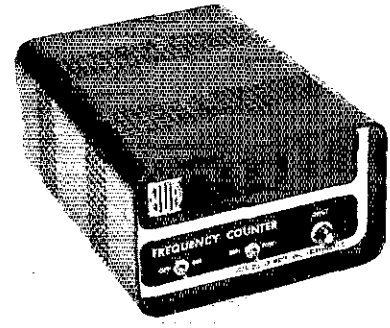
To acquaint you with the technical features of current amateur gear.

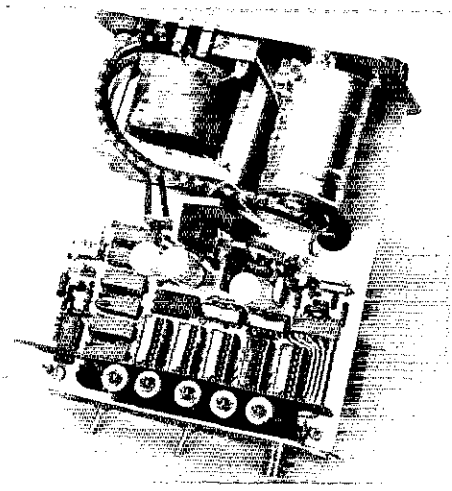
HUA Electronics Frequency Counter Model 1BC-1a

THE HUA 1BC-1a frequency counter, using the very latest in integrated circuit devices, packs about as much counter as is possible into a 3 X 5-1/2 X 7-inch space. And this counter, in addition to its small, handy size, offers many other features which will appeal to the radio amateur.

Eighteen integrated circuits and four transistors, plus a few resistors, capacitors, and diodes, provide frequency-counting capability from 20 Hz to 30 MHz. The display section utilizes five RCA DR2110 Numitron readout tubes. These are miniature indicator devices which stand only 1-1/2 inches high overall, containing seven-segment filaments that operate from low voltage. Numeral height is 1/2 inch. A two-position switch at the front panel selects the counting interval for displaying either kilohertz or megahertz. In the MHz position for the switch, frequency is indicated to the nearest kilohertz, and in the KHz position frequency may be read to the nearest hertz. The time-base section of the counter uses a 10-MHz crystal-controlled oscillator for its frequency reference.

As may be seen from the photograph showing the inside of the counter, approximately half of the space is taken up by the husky power transformer and the filter capacitor. A type 1723 IC voltage regulator and an MJE3055 pass transistor provide the regulated 5 volts to power the circuits. Use of this regulating setup over discrete components provides a large saving in space, but *real* economizing in circuit-board area is obtained through the use of Motorola type MC4050P integrated circuits in the counting and display section. This one type of IC performs functions which, until quite recently, would have required three or four separate ICs – a decade counter, a latch gate to store the counted information for display while the counter recycles through another count interval, a decoder to convert binary count information into 7-segment logic, and a driver for illuminating the readout indication. With these ICs in use, the complete circuit board, including the area for the socket-mounted readout tubes, is scarcely larger than a 3 X 5-inch filing card.





Internal view of the HUA 1BC-1a frequency counter. The power transformer and filter capacitor occupy the rear half of the chassis. The circuit board contains all other components except the front-panel switches and input jack. The time-base oscillator and dividers are visible on the left quarter of the circuit board, and the counter/latch/driver ICs just behind the five display tubes. The board-mounted regulator pass transistor of the power supply is fitted with a heat sink made from angle aluminum.

Uses in the Ham Shack

The preceding paragraphs give a brief summary of the physical appearances and the specifications of the 1BC-1a counter. There are several "neat" features in this little counter, however, which do not become evident in a casual reading of the specifications.

With the combination of the KHz-MHz switch and the five display indicators, frequencies throughout the spectrum of counter coverage may be read to the nearest hertz. Assume, for example, that one wants to measure his transmitter frequency, which we'll say is 14,267.153 kHz. First, the selector switch is placed in the MHz position, and the indicated frequency will be 14.267 MHz, the frequency being shown to the nearest kilohertz. Then the operator places the selector switch in the KHz position, and the indication will change to 67.153 kHz. The first three digits of the complete 8-digit number, 142, are still being counted; they simply do not register on the display. From the two readings, the exact frequency of 14,267.153

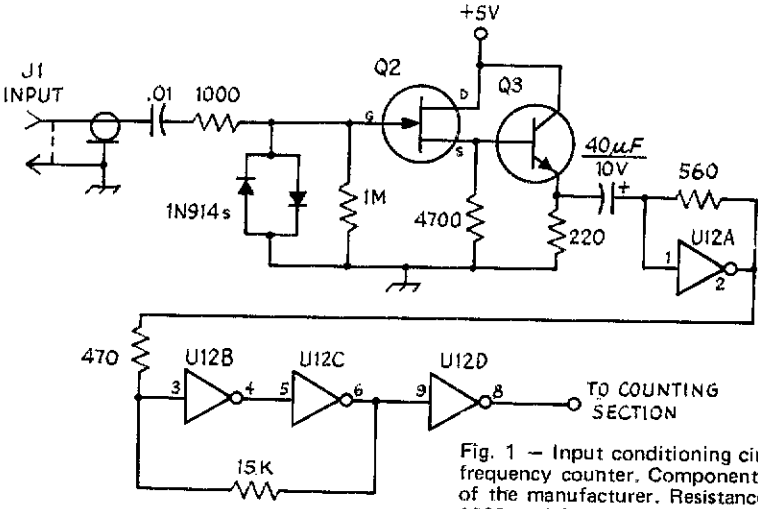


Fig. 1 — Input conditioning circuit of the 1BC-1a frequency counter. Component numbers are those of the manufacturer. Resistances are in ohms; k = 1000 and M = 1,000,000. Capacitances are in μF.
J1 — BNC connector.
Q2 — MPF102.
Q3 — MPS3563.
U12 — TTL hex inverter, SN7404N.

kHz is known. The counter displays a fixed-position decimal point, located between the second and third digits counting from the left. This decimal-point illuminator also functions as the pilot light. As is inherent in any counter of this type, the indicated accuracy is ± 1 count ± the time-base accuracy. In the MHz position of the selector switch the counting time is 1 millisecond, with the display updated every 1.2 ms, and in the KHz position the counting time is 1 second with the display updated every 1.2 s.

Another feature which was especially appealing to this writer is the inclusion of leading-zero blanking. In most counters having five display indicators, the indication would be 00.937 kHz if a 937-Hz note were being counted, and 00.000 kHz if no input signal was being provided. With leading-zero blanking, however, zeros to the left of the first significant digit are not illuminated, so the reading is merely ".937" for the audio note. With no input at all, *there is no significant digit*, and the result is that none of the indicators is illuminated — the lonely decimal point is displayed against a black background. Thus, the illumination of the display can be used as an indication of whether or not sufficient signal is being fed to the counter for proper counting operation.

This feature of leading-zero suppression is a boon to the cw operator who wants a direct digital-frequency readout of his transmitted frequency. Whereas the display of a counter without leading-zero blanking would alternate between 14.129 and 00.000 MHz at 35 wpm, for example (almost impossible to read), this little counter flashes the indication of 14.129 on and off at 35 wpm. The human eye and brain integrate these flashes to the extent that they are totally as usable as if the digits were illuminated continuously. Of course the counter may also be used for measuring the carrier frequency of other modulation types, too.

Another feature that could prove to be very handy at times is the capability for operating the counter from a battery. A 9- to 15-V source at 2 amperes, nominal, may be connected to a pair of terminals at the back of the counter. The filtering and regulating sections of the counter power supply act on this voltage to derive the 5-volt supply voltage. The obvious time to use this feature is for quick checks and adjustments of mobile equipment, with the counter being operated from the automobile storage battery. And if a "portable" frequency counter was ever needed on Field Day, this one, along with a battery pack, would certainly fill the bill.

Some Circuit Features

All of the ICs used in the 1BC-1a counter are of the TTL family. This group provides better noise immunity and higher operating frequencies than the RTL family, the type most often used in economical counters in the past. The frequency-range specification for this counter, with a 50-mV input signal, is from 20 Hz to 30 MHz. In the counter checked in the ARRL laboratory we found this specification to be rather conservative. Reliable counting information was obtained from 5 Hz (the lowest our audio generator would go) to 38 MHz with a 50-mV input. Sensitivity increases at the lower frequencies. We found the counter to be usable up to approximately 43 MHz, although the input signal amplitude gets somewhat "touchy" at these high frequencies for reliable count information. Best operation in this frequency range was obtained with a few hundred millivolts applied at the input. The maximum input voltage rating for the counter is 10 volts.

The input sensitivity, 50 mV, and the input impedance, 1 megohm shunted by approximately 50 pF, imply that very little signal energy is required to operate the counter. This is certainly

true. In the ARRL laboratory, situated at the center of the rhombic antenna used for W1AW 20-meter bulletin and code-practice transmissions, the transmitted frequency could be read directly merely by connecting a long unshielded test lead to the counter input. In aligning oscillator frequencies, we found it necessary only to place the input probe near the circuit under test or to clip the probe over the *insulation* on a conductor. It wasn't necessary to make a direct metallic connection. Such sensitivity is made possible by the input conditioning circuit shown in Fig. 1. Q2 and Q3 operate as unity-gain amplifiers, providing a match from the high input impedance to the relatively low impedance of the remaining counter circuits. U12A, one section of a TTL hex inverter, operates as an amplifier and feeds a Schmitt trigger circuit, U12B and U12C. U12D operates as an inverter and serves to buffer the output of the Schmitt trigger. The four cascaded inverter sections of U12 form a very effective trigger circuit. In the lab a variable dc test voltage was applied at pin 1 of U12A and metered with a digital voltmeter. The output, pin 8, was metered with a VTVM. With voltages up to +1.35 at the input, the output remained low; switching occurred at +1.35 volts so that anything above this value yielded a high at the output. The switching range was just a few millivolts, and the threshold was not affected by value changes of resistors shown with U12 in the circuit. Unlike most other counter input circuits having good sensitivity over a wide frequency range, this one does not require dual-polarity power supplies.

HUA Electronics 1BC-1a Frequency Counter

Dimensions (HWD) and Weight:
3-5/16 X 5-1/2 X 7-3/8 inches overall, 3-1/2 pounds.
Power Requirements: 115 V ac, 60 Hz, 20 W, or 9 to 15 V dc at 2A.
Price Class: $275.
Manufacturer: HUA Electronics, Inc., Route 2, Box 13A, Leesville, SC 29070.

HUA's 2BC-1 Counter

Vhf enthusiasts will be interested to know that HUA also manufactures a model 2BC-1 counter which may be used at frequencies up to 250 MHz. The basic counter is identical to the model 1BC-1a and may be used for frequencies below 30 MHz. For vhf work a frequency scaler is switched into operation. This scaler uses the same technique employed in the Dycom VHF Scaler[1] to divide the input frequency by a factor of 10. Thus, a 250-MHz input signal, when divided by 10, emerges as 25 MHz, and this frequency is then counted in the usual fashion of the 1BC-1a. Appropriate decimal-point switching is performed in the 2BC-1 counter when the scaler is put to use. The price class of the vhf model is $350. – *K1PLP*

[1]See "Dycom PSU-13 VHF Scaler," in Recent Equipment, *QST*, January, 1972, p. 58.

NEW BOOKS

Radio Transmitters, by V. O. Stokes, published by Van Nostrand Reinhold Company, size 9-1/4 × 6-1/4 inches, 190 pages including index, cloth cover. Price: $17.50.

The title of this book is rather misleading; its subtitle, RF Power Amplification, is far more descriptive of the contents, as the generation of rf power for hf ssb transmitters and mf and vlf broadcasting is the primary subject. It is a book about amplifiers using tubes, even though a short section on solid-state circuits is included.

The author describes the design considerations, component selection, and cooling systems for rf amplifiers. Each chapter is written from a practical viewpoint, using a minimum of mathematics. Thus, the information presented can be readily understood by a person of moderate technical skill. The designs described in detail are those developed by the Marconi Company of England. No attempt has been made to cover the entire field of transmitters; rather, specific examples of the circuits used to meet a given set of specifications are explained in detail.

Several sections will especially appeal to hams. The chapter on amateur transmitters describes all of the design and construction considerations for a 200-watt ssb amplifier. The chapter which describes a broadband 1-kW amplifier and the section on Class D high-efficiency amplifiers provide some interesting ideas. It is an idea book, one which will give plenty of food for thought for those who like to build QRO transmitters. – *W1KLK*

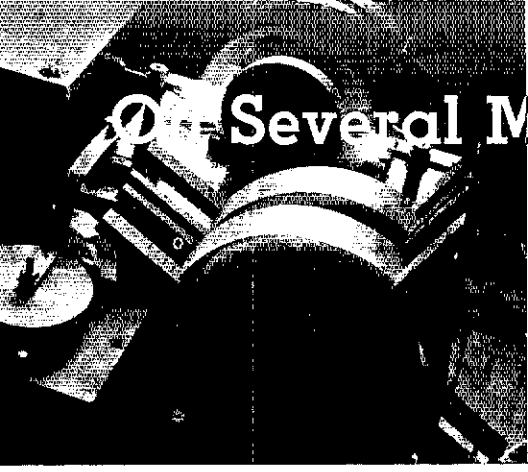
All About Cubical Quad Antennas 2nd Edition, by William S. Orr, W6SAI, published by Radio Publications, Inc., Box 149, Wilton, CT 06897. Paperback, 8 1/4 × 5 3/8 inches, 112 pages, price $3.95.

This is the second edition of Bill Orr's popular book about quad antennas. In comparing the previous edition to the current one it is quickly apparent that a considerable amount of work has been done to update the book.

Several new sections on quad antenna configurations have been added, these include the Swiss Quad, the Delta Loop, and the Birdcage Quad plus other arrays that are not so well known to the amateur fraternity.

Complete construction details are given for single or triband quads, including details for a tri-gamma matching method. Also, details for constructing multielement quads, including a "Monster" quad are given.

In this reviewer's opinion, any ham interested in being "savvy" about antennas should add this book to his reading material on the subject. – *W1ICP*.



Several Modern Advances in Amateur Radio

or "Nice Wx Hr Om . . . (Click!)

BY MIKE WHITE,* K3UFJ

IT WAS DURING one of my recent (frequent) "look-don't-buy" trips to the local magazine stand that I got the idea that's going to revolutionize modern amateur radio.

I was almost flat broke, having just bought the latest model super-sensitive, ultra-high gain, ultimate-resolution Panadapter with indirect dial lighting, digital read-out, automatic drift compensation, and built-in coffee maker. So, I was obliged to thumb quickly through the various periodicals before the proprietor ran me out. While so inspecting one of the more widely read electronics magazines, I happened to run across an article describing an automatic keying device that would allow an operator to pre-record a message, a CQ perhaps, and then simply turn on his tape player whenever he wished to make a call. This control unit then took over, keyed the transmitter and then, when the call was finished, switched the station back into the receive mode. Thus, the enterprising ham could tape a CQ, a cheerful greeting, a description of his rig, and a hearty 73 and simply let this robot control device do all the work. It seemed conceivable that an entire QSO could be carried out without the operator's ever touching the controls. Now here, I said to myself, is a man who knows where it's at. The guy who designed this little marvel is a man who is really in touch with what is happening. Why, any lid with half a watt could see the advantages of this approach. And if there were any doubts, ten minutes spent trying to find a hole in the QRM on 20-meter ssb would convince even the most skeptical DX man that automation was the only answer.

Needless to say, I bought the magazine (neatly blowing that week's date money; oh well, she probably didn't want to go to the Roller Derby again, anyway) and ran home to build the device. As soon as the solder was cool, I closed up the ole' junk box (from whence cometh all parts) and fired up the new gadget. I made the necessary connections and started the tape spinning. Fortune smiled on me and my 200 watts (PEP) and I got an answer right away. I listened to what the other guy had to say, then hit the tape player again and sat back to let the robot do the work. It was a great QSO. My tape did the talking and all I had to do was to start the sequence at the end of the other station's transmission.

Automatic Switching

After this went on for a while, I started wondering why I couldn't eliminate the manual switching step. So, a few hours of solder and junk box later, I had a sort of "reverse VOX" that switched the transmitter on when the other station stopped talking. Well then I had it: the first completely automatic QSO. From CQ to 73 I never touched the rig. The reverse VOX switched on the transmitter and the robot control switched it off again at the end of the transmission. Now all I had to do was sit back and fill out the log and enjoy the signal reports. Then when the QSO was over, I just moved to another spot and started over.

From there it was just a short step to tying in the Panadapter and putting an electric drive on the tuning knob to make the finding of a clear spot automatic. I just turned on the rig and filled out the log. Only that too soon went cybernetic. A circuit in an article entitled "Hyper Analogue Voice Recognition and Third Order Poly-Syllabic Demodulation Filters Using Two Soup Spoons and a Can Opener" found in a back issue of *Boys' Life* provided the answer. This wonderful circuit was inserted between the seventh and eighth i-f stages of my Mortgagetron receiver and coupled to a Teletype printer. The third-order filters extracted the call of the station, the date, time, frequency, and duration of the QSO and printed the information on the printer; hence, instant log!

Squeezed Out

Unfortunately, the equipment now filled up most of the shack, and I'm not exactly small myself. So rather than battle a 2000-volt power supply for space, I just moved out of the shack.

Now, the printer, located outside the shack, gives me a brief summary of the day's activity each evening at exactly 2100, at which time it knocks off for the night. So far I've got my WAS, DXCC, and am at present working on my WACS (Worked All Cybernetic Stations). Of course, when I say "I," I mean the machine. I really don't have too much to say about what the machine does; it's locked me out of the shack. So, I just kind of wander down to the printer every now and then to see what I've got. Oh sure, I sort of miss operating – you know, the fun of working DX and the smooth swing of a solid key – but then I guess that is just the price you have to pay for progress. At first I was worried by the fact that the QSOs from my machine always sounded the same, coming from the same tape and all. My machine never had anything to say that was new. But thinking back, QSOs have always sounded like that, so I guess that nobody will really mind.

(Continued on page 69)

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Oh, Math, Where is thy Sting?

BY C. F. ROCKEY*, W9SCH

WE ADDRESS these suggestions to the newer amateur in deference to the dignity of years. But, again, we know some amateurs with several license renewals behind them who live in fear lest their ineptitude with Ohm's Law be exposed. There is scant excuse for this. Next to the code, "that awful math" in the theory questions probably terminates more amateur careers at the Novice level than anything else. Such is the terror of root and decimal.

Yet such fears are groundless. While mathematical aptitude is probably a gift of the gods, one does not have to approach the skill and dedication of the mathematician to do a great deal of "radio figgerin'." Anyone can do it.

Entirely aside from that upcoming FCC exam that haunts you so, there is a new sense of pride left in using *your own* brains. No need to search the service manual for the value of that burned-out bias resistor value – figure it out for yourself. And to be able to calculate your own component values gives new spice to that most honorable of ham arts, "home-brewing."

But strong measures are necessary to drive the mathematical spooks from the castle of the amateur mind. There's no place here for ivy'd-hall refinement or classroom niceties; axe and crowbar are needed. Theorists may twinge, and purists pout, but that's how it is.

Empty Precision

For instance, first we must *get rid of that passion for excess precision* that hours of academic discipline has engendered within most of us. In the word of the algebra textbook and with classical rule and compass, all things are possible. But practical electronics is a disordered kingdom, especially as the amateur knows it. We seldom can be sure of the value of ordinary electronic components closer than about twenty percent of the marked value. Amateur current and voltage measurements, for the most part, are scarcely better. Since it is a truism that no calculation can possibly be better than its data, why all the fuss? So, instead of striving toward empty precision, let us adopt the motto of the man who has work to do: "Be only as precise as it pays to be." Therefore, let us commence by ruthlessly *rounding-off all values to two digits*, or less, excluding zeros. For us, it's right to travel light.

Next, let's dig-out and *use the easily-managed forms of the equations*. Although many textbooks present only the fundamental forms, replete with arithmetical gristles, easier forms do exist and may be found. We will introduce you to several here; try 'em, see how much more palatable they are.

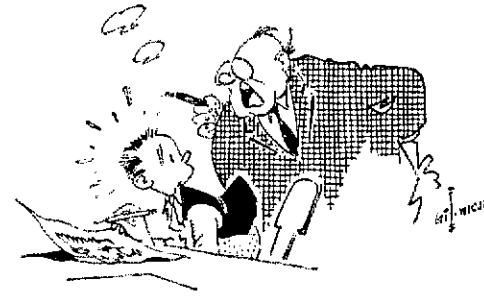
Thirdly, forget all that gruesome old long-division and long-multiplication that you suffered with at school. If you set things up properly, short methods will do – or frequently an educated guess will suffice. If you have a slide rule, use it of course. "Setting-up" will largely consist of *breaking big numerals down to easily-handled factors*. We will then apply what we used to call "cancellation," when the math teacher wasn't around. You'll be surprised at how much easier this makes things.

But abbreviation definitely does *not* mean sloppiness. Teachers have found that much of the normal student's mathematical difficulties are purely organizational; he loses track of where he's been and where he's going. We can bypass these troubles by following an orderly operating procedure. Not fancy, but orderly. With an orderly technique, many problems almost solve themselves, it seems. Besides, if we blunder (and everyone does at least once in a while) it's so much easier to find and fix the trouble. It's easy to be orderly; just write down each step so clearly that if you were to come upon this work twenty years from now, it would be just as clear to you as it is right now. Such trifles are a bit more work, but worth it.

Really, that's all there is to this business: A little thought, a little care, a little technique.

Some Specifics

Now, let's get to specifics. We cannot present all of electronic math in this small space. Rather, let us consider three topics basic to amateur radio: *Ohm's Law, reactance calculations* and *the resonant circuit*. These may well serve as a springboard, from which the diligent may plunge into deeper waters as they wish.



"Strong measures are necessary to drive the mathematical spooks from the castle of the amateur mind"

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I. Using Ohm's Law:

Ohm's Law is usually given in three forms, using the units of volts, amperes and ohms. But since the greater part of amateur work involves currents in the milliampere range, we will adopt our formulas to accommodate this condition. We then have:

$$I = \frac{1000 \times E}{R}, \quad E = \frac{IR}{1000}, \quad R = \frac{1000 \times E}{I}$$

Remember: E is in volts, R in ohms, and I is in *milliamperes* here.

As stated, our method here will include (1) Rounding-off all numerals to two digits or less, excluding zeros; (2) Breaking these down into small, easily-handled factors; then (3) "Plugging-into" the relevant formula; and finally (4) Resolving by "cancellation" and reasonable estimation. Let's try some examples.

Example No. 1 : The screen grid of a certain rf power tetrode requires 200 volts at five milliamperes. This is to be supplied by a power source delivering 450 volts. What shall be the value of the screen dropping resistor, in ohms?

First we recall that it is the *difference* between the supply and screen grid voltages which must be developed across the dropping resistor. This difference is the voltage to which Ohm's Law applies. So: $E = 450 - 200 = 250$ volts

$$R = \frac{1000E}{I} = \frac{1000 \times 250}{5} \times 10 = 50{,}000 \text{ ohms}$$

(In application, we would choose the commercially-available 47K value.)

See how easy it is! Let's try another:

Example No. 2 : An amateur makes a dc voltmeter by connecting a 220K-ohm carbon resistor in series with a 0-1 dc milliammeter. When this combination is connected across the output terminals of a power supply, the meter reads a current of 0.8 milliampere. What is the output voltage of the power supply?

At the amateur level, we may ignore the internal resistance of the meter, since it is so small compared to the value of the series resistor. Also, unless a high grade resistor is used, "220K" may well mean anything from 200K to 240K ohms. So we round it off to 200,000 ohms. Then:

$$E = \frac{I \times R}{1000} = \frac{8 \times 20 \times 10^4 \times 1000}{10^3 \times 1000} = 160 \text{ volts}$$

This value is usually close enough for amateur use.

Example No. 3: A transistor amplifier stage uses a 470-ohm resistor in series with the emitter. In operation, the dc voltage across this resistor is measured as 1.5 volts. What is the dc current flowing in the emitter circuit?

In this example we may round-off the 470 to 500 ohms for reasons given. Also, transistors and circuits are notoriously non-uniform with respect to published data anyway. So:

$$I = \frac{1000 \times E}{R} = \frac{10^3 \times 1.5}{5 \times 10^2} = 2 \times 1.5 = 3 \text{ mA}$$

These examples should introduce you to Ohm's Law without tears. Gain more practice by making-up some more yourself. Or better, make some measurements in your ham gear and work these up.

II. Reactance of Inductors and Capacitors:

When an ac current of sinusoidal waveform passes through a capacitor or an inductor, a voltage drop is developed across that component. The ratio of this voltage drop to the ac amperes flowing is called the *reactance* of the component. (This neglects any resistance present, but this is most often justified in amateur radio work.)

When the component is an inductor, this ratio is called *inductive reactance*, and is measured in ohms. Its value is found from the following expression:

$$X_L = 6.3 fL, \text{ or } L = \frac{X_L}{6.3f}$$

On the other hand, when a capacitor is in use, this ratio is called *capacitive reactance*. It is measured in ohms, and found by using the expression:

$$X_C = \frac{16 \times 10{,}000}{fC}, \text{ or } C = \frac{16 \times 10{,}000}{f X_C}$$

Some may notice that this is not the form usually given in most textbooks, but is obtained from the fundamental form by using a little manipulation. It will be found to be much more convenient for practical work. The question often arises as to the proper use of units. The fundamental form, familiar to most of us, requires the use of farads and hertz. The resulting arithmetical difficulties often drive an amateur right up the wall, so to speak. But we bypass these neatly here. The equations above are arranged to use the units most familiar to radio amateurs.

We have arranged two unit-systems, presented in the table below. The "low-frequency system" is most convenient for audio frequency and power supply circuitry. The "high-frequency system" applies directly to the most-used amateur radio frequency range.

Quantity	*Low-frequency system*	*High-frequency system*
f	hertz	megahertz (avoid kilohertz)
L	henrys	microhenrys (avoid millihenrys)
C	microfarads	picofarads

As long as we confine ourselves to *one* of the vertical columns, the correct result will be obtained. But be very careful not to "jump the fence" between the columns, or trouble will surely follow. Where one runs into the excluded units of kilohertz or millihenrys, these should first be converted to hertz, megahertz or microhenries by using one of the formulas below:

$$\text{megahertz} = \frac{\text{kilohertz}}{1000}, \quad \text{hertz} = \frac{\text{kilohertz}}{1000},$$

$$\text{microhenrys} = \text{millihenrys} \times 1000,$$

$$\text{henrys} = \frac{\text{millihenrys}}{1000}$$

Again, examples are in order. Since amateur circuitry is replete with unknown, stray inductance and capacitance, extreme precision is not called

for. In addition, most amateurs do not know the exact values of their components in any case. So:

Example No. 1: Find the reactance of a ten-henry filter-choke coil at 120 hertz.
We will use the "low-frequency system" in this example.)

$$X_L = 6.3 f L = 6.3 \times 1.2 \times 10 \times 10 = 756 \times 10 = 7600 \text{ ohms}$$

(The approximation of 8000 ohms would probably suffice in many cases.)

Example No. 2: In a proposed transistor audio amplifier, the emitter bypass capacitor should have a reactance of 200 ohms at 50 hertz. What value of capacitor should be used?
(Again we use the "low-frequency system" of units.)

$$C = \frac{16 \times 10000}{fX} = \frac{6 \times 16 \times 1000}{8 \times 18 \times 2 \times 100} = 16 \mu F$$

Example No. 3: The rf choke coil in the plate circuit of a proposed rf power amplifier should have a reactance value of ten thousand ohms at a frequency of 7 megahertz. What value of inductance is called for?
(Here we use the "high-frequency" unit system.)

$$L = \frac{X_L}{6.3f} = \frac{100 \times 100}{6.3 \times 7} = \frac{10^4}{44} = 230 \mu H$$

Example No. 4: What is the reactance of a 500 picofarad capacitor at 3.5 megahertz?
(Use the "high-frequency" system.)

$$X_C = \frac{16 \times 10000}{fC} = \frac{46 \times 100 \times 100}{35 \times 5 \times 100} = \frac{4.6 \times 100}{5} = 92 \text{ ohms}$$

(In many cases we call this 100 ohms, with little harm done.)

III. Resonant-Circuit Calculations:

Next to finding signs of a rattlesnake in the hayloft, probably nothing strikes such stark terror in the heart of most hams as the prospect of a resonant circuit calculation! With the form of the resonance equation as usually presented in the textbooks, this may be understandable. In the usual form, this equation requires the use of the unwieldy farad, henry and hertz. At amateur frequencies, these tend to have values that are either astronomic or sub-microscopic. The poor decimal point becomes hopelessly lost, among other things, and the arithmetic becomes excruciating.

But this need not be. By using the unit-system, previously proposed for reactance calculations, and by using the much handier equations below, we may pull the fangs of this beast. Thus:

$$f = \frac{160}{\sqrt{LC}}, \quad L = \frac{25 \times 1000}{f^2 C}, \quad C = \frac{25 \times 1000}{f^2 L}$$

Here, everything will be expressed in the units best-known to the amateur, as arranged in the aforementioned table. Stay in one vertical column, keep your work orderly, and there's nothing to it.

But at this point, squares and square-roots rear their horned heards. We can't help this; that's how nature works. Squaring a number – multiplying it by itself – is not so much of a problem. But, by classical methods, square-roots often are stinkers. (Heaven perish the old-time "long square-root" method, a torture-tool to put the best efforts of the Inquisition to shame. Let's forget about *that* quick!) To make things easier for you, a pair of graphs relating simple numbers and their square-roots is included here. A slide-rule does a good job, too. In many cases, you can "bracket" your number between two "perfect-squares" whose roots you know, and often make a useful guess. (Sometimes, as in FCC tests, the choice of answers presented is such that an approximation is all that's needed to pick the correct one.)

Now let's see how this works through some examples:

Example No. 1: To what frequency will the combination of a ten-microhenry inductor and a 100-picofarad capacitor be resonant?
(Use the "high-frequency" unit system.)

$$f = \frac{16 \times 10}{\sqrt{10 \times 100}} = \frac{16 \times 10}{3.2 \times 10} = 5 \text{ MHz}$$

Example No. 2: How many microhenrys of inductance are needed to make a circuit resonant to 14 MHz, when the capacitance is 50 pF?

$$L = \frac{25 \times 1000}{f^2 C} = \frac{25 \times 10^3 \times 100}{2 \times 100 \times 5 \times 10} = 2.5 \mu H$$

(Actually, the square of fourteen is equal to 196. But at this level, rounding-off to 200 is justified.)

Example No. 3: How many picofarads will we need to tune a five-microhenry inductor coil to resonance at 7 MHz?

$$C = \frac{25 \times 1000}{f^2 L} = \frac{25 \times 10^3 \times 100}{5 \times 10 \times 5} = 100 \text{ pF}$$

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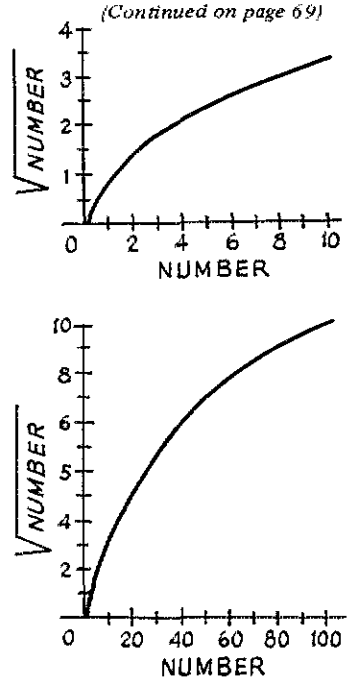

CURVES FOR ESTIMATING SQUARE-ROOTS

Some QST Abbreviations used in Text and Drawings

A – ampere
ac – alternating current
A/D – analog-to-digital
af – audio frequency
afc – automatic frequency control
afsk – audio frequency-shift keying
agc – automatic gain control
alc – automatic load (or level) control
a-m – amplitude modulation
anl – automatic noise limiter
ARC – amateur radio club
AREC – Amateur Radio Emergency Corps
ARPSC – Amateur Radio Public Service Corps
ATV – amateur television
avc – automatic volume control
bc – broadcast
BCD – binary-coded decimal
bci – broadcast interference
bcl – broadcast listener
BFO – beat-frequency oscillator
BPL – Brass Pounders League
CB – Citizens band
CCIR – International Radio Consultative Committee
ccw – counterclockwise
c.d. – civil defense
CD – Communications Department (ARRL)
CMOS or COSMOS – complimentary-symmetry metal-oxide semiconductor
coax – coaxial cable, connector
COR – carrier-operated relay
CP – Code Proficiency (award)
CR – cathode ray
CRT – cathode-ray tube
ct – center tap
CTCSS – continuous tone-controlled squelch system
cw – continuous wave (code), clockwise
D/A – digital-to-analog
dB – decibel
dc – direct current
DF – direction finder
DOC – Department of Communications (Canadian)
dpdt – double-pole double-throw
dpst – double-pole single-throw
dsb – double sideband
DTL – diode-transistor logic
DX – long distance
DXCC – DX Century Club
EC – Emergency Coordinator
ECO – electron-coupled oscillator
ECL – emitter-coupled logic
EME – earth-moon-earth
emf – electromotive force (voltage)
FAX – facsimile
FCC – Federal Communications Commission
FD – Field Day
FET – field-effect transistor
FF – flip-flop
fm – frequency modulation
FMT – frequency measuring test
fsk – frequency-shift keying
GDO – grid-dip oscillator
GHz – gigahertz
GMT – Greenwich Mean Time
gnd – ground
H – henry
hf – high frequency
HFO – heterodyne frequency oscillator
Hz – hertz
IARU – International Amateur Radio Union
IC – integrated circuit
ID – inside diameter
i-f – intermediate frequency
in./s – inch per second
IRC – International Reply Coupon
ITU – International Telecommunication Union
IW – Intruder Watch
JFET – junction field-effect transistor
k – kilo
kc – kilocycle
kHz – kilohertz
kW – kilowatt
LED – light-emitting diode
lf – low frequency
LMO – linear master oscillator
LO – local oscillator
lsb – lower sideband
LSB – least-significant bit
LSD – least-significant digit
LSI – large-scale integration
luf – lowest usable frequency
mA – milliampere
MARS – Military Affiliate Radio System
Mc – Megacycle
mf – medium frequency
MG – motor-generator
mH – millihenry
MHz – Megahertz
mic – microphone
mix – mixer
MO – master oscillator
MOSFET – metal-oxide semiconductor field-effect transistor
MOX – manually-operated switching
ms – millisecond
m.s. – meteor scatter
MSB – most-significant bit
MSD – most-significant digit
MSI – medium-scale integration
muf – maximum usable frequency
MUX – multiplex
mV – millivolt
mW – milliwatt
nbfm – narrow-band frequency modulation
n.c. – no connection
NC – normally closed
NCS – net control station
NO – normally open
npn – negative-positive-negative
NTS – National Traffic System (ARRL)
OBS – Official Bulletin Station
OD – outside diameter
OO – Official Observer
op amp – operational amplifier
OPS – Official Phone Station
ORS – Official Relay Station
osc – oscillator
OVS – Official VHF Station
oz – ounce
PA – power amplifier
pc – printed or etched circuit board
PEP – peak-envelope power
PEV – peak-envelope voltage
pf – picofarad
PIV – peak-inverse voltage
pk – peak
pk-pk – peak-to-peak
PL – private line
PLL – phase-locked loop
pm – phase modulation
pnp – positive-negative-positive
pot – potentiometer
PRV – peak-reverse voltage
PSHR – Public Service Honor Roll
PTO – permeability-tuned oscillator
PTT – push-to-talk
RACES – Radio Amateur Civil Emergency Service
RCC – Rag Chewers Club
revr – receiver
rf – radio frequency
rfc – radio-frequency choke
RFI – radio-frequency interference
RM – Route Manager
RM-(number) – FCC rulemaking
rms – root-mean-square
RO – Radio Officer (c.d.)
RST – readability-strength-tone
RTL – resistor-transistor logic
RTTY – radio teletype
s.a.e. – self-addressed envelope
s.a.s.e. – stamped s.a.e.
SCM – Section Communications Manager
SCR – silicon-controlled rectifier
SEC – Section Emergency Coordinator
SET – simulated emergency test
S.M. – silver mica (capacitor)
SNR – signal-to-noise ratio
spdt – single-pole double-throw
spst – single-pole single-throw
SS – Sweepstakes (contest)
ssb – single sideband
SSTV – slow-scan TV
SWL – short-wave listener
SWR – standing wave ratio
sync – synchronous, synchronizing
TCC – Transcontinental Corps
TD – transmitting distributor
TE – transequatorial (propagation)
tfc – traffic
tpi – turns per inch
T-R – transmit-receive
TTL or T^2L – transistor-transistor logic
TTY – Teletype
TV – television
TVI – television interference
UJT – unijunction transistor
usb – upper sideband
uhf – ultra-high frequency
V – volt
VCO – voltage-controlled oscillator
VCXO – voltage-controlled crystal oscillator
VFO – variable frequency oscillator
vhf – very high frequency
vlf – very low frequency
VOM – volt-ohm-milliammeter
VOX – voice-operated break-in
VR – voltage regulator
VTVM – vacuum-tube voltmeter
VXO – variable crystal oscillator
W – watt
WAC – Worked All Continents
WAS – Worked All States
wbfm – wide-band fm
wpm – words per minute
ww – wire wound
wv – working voltage
xtal – crystal
μ – micro (10^{-6})

QST

There is a right way to do any job, and this certainly applies to the installation of coaxial cables and rotor-control wiring. KH6IJ offers some practical advice on how to rig the antenna tower so that good life expectancy can be had for the feed line and rotor cable.

Coax-and Indicator-Cable Supports for Beam Antennas

BY KATASHI NOSE,* KH6IJ

IN THE USUAL amateur installation, the matter of supporting coax and indicator cables from the tower is an afterthought and anticlimax to the excitement of getting the beam into the air. However, as most experienced hams know, coax and indicator cables get wrapped around the supporting mast and become abraded, resulting in all kinds of intermittent troubles which can be difficult to localize.

The quick (but unsatisfactory) method of supporting a coax line is to tape it to the mast or tower with electrician's tape. However, unless the cable is anchored at the top, it is likely to slip ghrough the taped section because of the sheer weight of the cable. Try hanging one hundred feet of coax cable from one of its ends with a piece of electrician's tape. In effect, this is what most of us do when we use tape.

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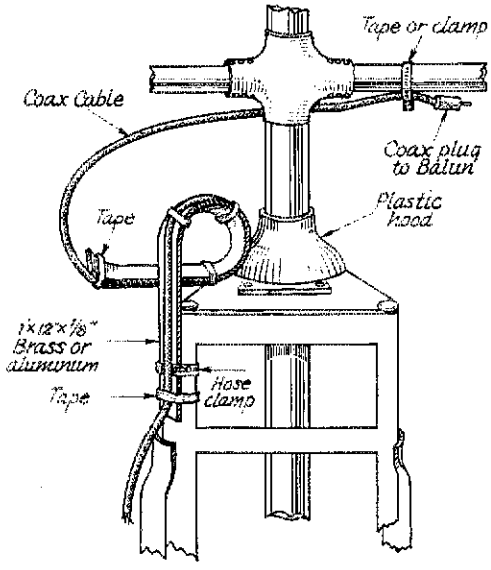
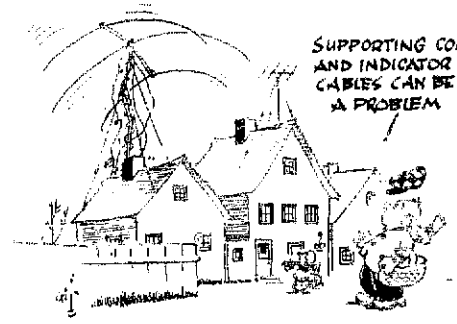


Fig. 1 — Method for anchoring coax and indicator cable to the top of a tower.



Take a tip from the telephone companies and CATV systems who use specialized hardware for this purpose. However, in the absence of specialized hardware, we can use readily available material, i.e., strips of aluminum or brass, and hose clamps.

As shown in Fig. 1, a strip of brass, copper, or aluminum is bent into the form of the script letter "e" to serve as a top anchor by being fastened to the top leg of the tower by means of a hose clamp. The coax and indicator cable is taped to the *outside* of the "e." The tension on the cable then makes the cable hug the "e" harder.

The outer portion of the "e" serves to hold the coax away from the tower so that it clears the tower when the beam is rotated. Most manufacturers recommend a minimum turning radius of 8 inches to prevent "cold flow" of the RG-8/U, but

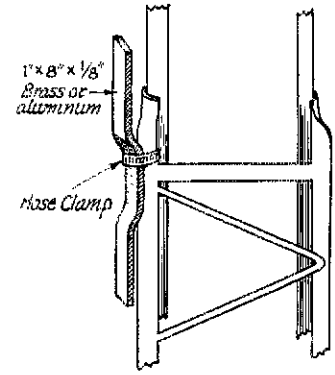


Fig. 2 — Mid-section anchor for cable.

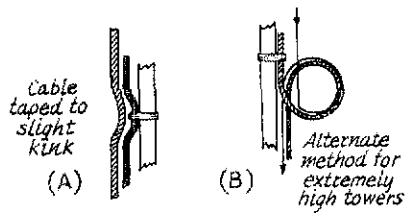


Fig. 3 — Details on mid-section cable anchors. The slight kink in the method at "A" provides additional gripping of the cable. At "B" is a good method for extremely high towers.

bear in mind that this method becomes more efficient as the size of the "e" is made smaller. You may test the effectiveness of this method by temporarily holding the "e" in a vise, taping the coax to it, then putting your weight on the cable.

Fig. 2 shows a method of supporting cables from the middle sections of crank-up towers. The dent in the strip increases the friction and at the same time provides a convenient means of taping coax to the strip and the strip to the tower. Alternatively, for extremely tall towers, the method shown in Fig. 3 may be used. In this case the cable must be taped to the inside, and then worked around to the outside, as shown in the drawings.

Fig. 4 shows a method of positioning the "e" with respect to the mast so that a minimum of coax coiling around the mast is needed.

Fig. 5 shows a method of waterproofing the top bearing. A plastic gallon jug is cut with a razor to the desired size for a tight fit against the upright mast. The plastic skirt can be reinforced by a metal band if necessary. The hole left by the hollow handle can be plugged with a rubber stopper if the handle is not cut off flush with the surface of the jug.

Crank-up tower cable should be coated with rust preventive paint and lubricant. A highly

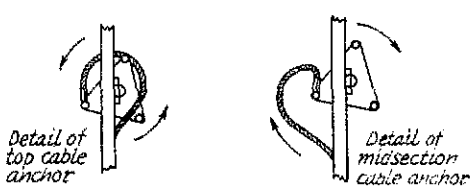


Fig. 4 — Method for mounting cable at top of the tower to permit antenna rotation.

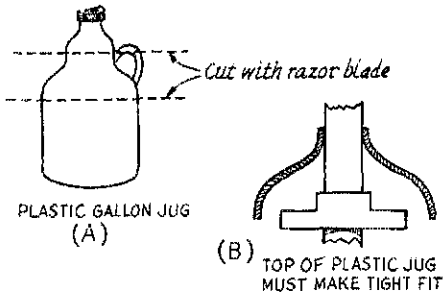


Fig. 5 — A simple method of protecting the top bearing from weather effects.

satisfactory method of accomplishing both jobs simultaneously is to use Krylon No. 1322 Open Gear and Cable Lubricant, which sells for about a dollar a can. This is a thick grease which is put up in a pressurized aerosol can. The grease looks like "Foamite" fire-fighting compound as it leaves the can, and penetrates throughout the strands of the cable, but eventually dries into a thick "gunk," which effectively prevents rusting. This grease is effective for coating nuts and bolts, and is superior to ordinary rust-preventive materials because of its penetrating action. The aerosol feature makes it convenient to work with when at the top of the tower. QST

Modern Advances

(Continued from page 63)

Anyway, I plan to market the device soon, at a very reasonable price. So if you have never had enough time for ham radio, this machine is your answer. You can be on the air working DX all day long, even though you personally are at the salt mines earning the bread to pay for all this madness. And so what if you can't really talk to the other guy. When was the last time you had anything different to say, anyway? My ultimate goal is to see one cybernetic station talking to another. When this happens, we will have crossed over into a new era of amateur communications that will offer untold opportunities for spare time and recreation. Why, while two automatic stations are talking to each other, the owners of the stations could be out playing golf together, in automatic electric golf carts, of course.

So here I sit, listening to the hum and soft whirring of my robot operator, thinking about how far we have advanced, and what a great hobby ham radio is.

But you know, somehow, it just doesn't seem to be as much fun as it used to be. . . . QST

Oh, Math . . .

(Continued from page 66)

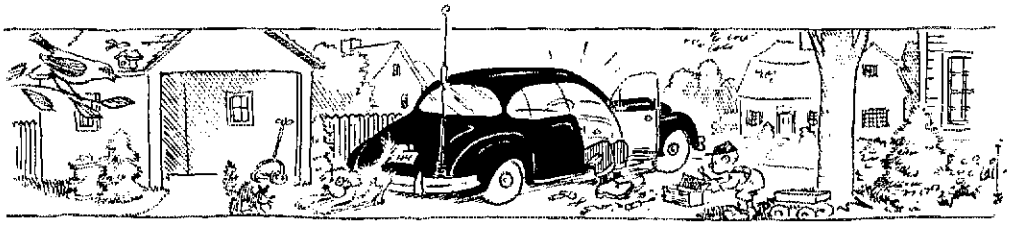
(Again seven squared equals 49, but we can call it 50 with little harm.)

Example No. 4: In a proposed radioteletype converter, it is desired to resonate an 88-millihenry inductor to about 800 hertz. About how much capacitance will be needed?

(In this one, we choose the "low-frequency" unit system as most convenient; 88 millihenry may be written as $\frac{88}{1000}$ henrys.)

$$C = \frac{25 \times 10^6 \times 100}{64 \times 10^2 \times 1000 \times \frac{88}{1000}} = \frac{25 \times 100}{56 \times 1000} = \frac{25}{56} = 0.45\ \mu f$$

As with everything else, it's easy when you know how. These techniques are the stock-in-trade of every professional engineer or physicist, freeing their minds for the *creative* work they do. But few people have bothered to reveal these Golden Goodies to amateurs. As a result, too many of them think that electronic calculations are impossibly hard. But now *you* know better QST



The Fine Art of Mobile Radio

BY GEORGE L. FISHER,* WB6MKV

HAVING FINISHED 12,500 miles of mobiling from Los Angeles to Miami, to Athens, Georgia, back to Key West, then to Daytona Beach, to Montreal, Canada, to Bozeman, Montana, then Los Angeles via Las Vegas, I speak with some experience about mobiling — not in a technical atmosphere, but just as an everyday ham wishing the challenge, fun, and excitement of mobile ham radio across the U.S.A.

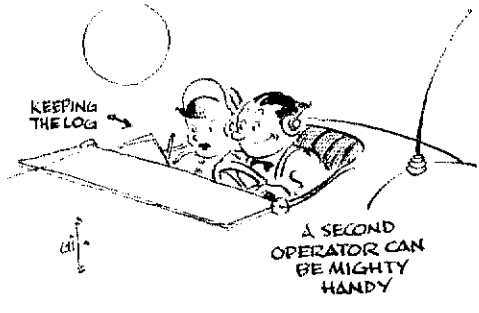
First, of course, comes the installation of your equipment in the car which is painstaking and exacting if you expect to have a trouble-free trip. My rig operates from a 12-volt power supply and uses a multi-band antenna which can be manually adjusted for 80 through 15 meters, all installed in the cab section of an Alaskan Camper. I also installed another 90-ampere hour battery for additional power.

It may come as a surprise to some of you to learn that, excluding the freeways, U.S. roads are not always very good roads. They are on many occasions narrow, rough, poorly paved, poorly marked, and mismapped. For an experience some day, get off of the freeway, or main arterials, and see how soon you run out of good driving road! Some of the roads to camp areas and sightseeing byways are rough indeed, with gravel washboard and chuck holes which can really vibrate a truck camper and all that is in it. Sound indeed is the rig which can stand 12,500 miles of juggling over bumps and rough pavement to say nothing about the sway, start, stop of a camper traversing all kinds of byways and freeways, tunnels, underpasses, and ferry boats.

A very important item involves notification of FCC of your planned itinerary, your date of visit and other required information. The ARRL will send you a supply of forms (S-43a) for this purpose which substantially reduces the time and paper work for this part of the project. A few spare forms will accommodate one or two changes of plans. Otherwise, write your own notification letters to the District FCC Engineer in charge at the addresses shown in the *ARRL License Manual*. Don't forget also to notify the FCC Engineer in your district of your proposed itinerary and expected time of return.

A must for the mobile trip is a copy of the ARRL WAS (worked all states) Map which is essential for area designations to properly identify your area from 1 through 0 which is necessary to properly identify your station by call sign. Without the map you may have problems identifying the change in radio call districts. Read the newest *License Manual* for the latest station identification regulations.

*Box 1658, San Pedro, CA 90733.



Keeping a Log

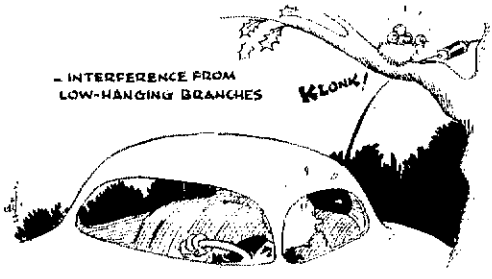
Station logs posed a problem for me. There is a choice of the ARRL Mini log, the standard ARRL Log Book, or any other log book of your choice. The important thing is to carefully enter all calls. This was a new experience for me and was most difficult in a moving vehicle while operating either cw or phone. I devised a system of my own, first because it is difficult to write while driving, and second because the log book was always lost under a pile of maps, clothing, or other miscellany which accompany the passenger on a trip. I used an ordinary clipboard and numbered the sheets on the board which was always stowed on the dashboard. I memorized the log format and scrawled (by feel without looking at the sheet) in large writing all the data necessary for the log on a single large 8 1/2 X 11-inch sheet. This technique permitted me to keep my eyes on the road constantly, never looking at the log page even for a second. Turning your eyes from the road to a log book or to tune is very dangerous. I would set my transceiver for the center of the desired band and then tune only by feel both sides of the center. With a bit of practice you will be surprised at your proficiency. Remember at 60 miles per hour, a second or two can put you off the road.

Time was from a watch set to GMT, another must for the mobiler. The instant a contact is made get the time down, then the call of the other station and your frequency and mode. With the large sheet of paper on the clipboard these notes can be made (without looking) by writing in large letters the information for later entry into the log. After the contact the numbered sheet was removed, folded, and placed on the dashboard for entry into the log at a later time. This makes for a much neater log and a more accurate one. Of course if you have a rule of no driving while hamming the log is kept by the usual process.

Another approach takes advantage of the relatively new reduced logging requirements for mobile work. You can enter the time, band, mode, and power before the beginning of an on-the-road stretch. Then have a grease pencil on the dashboard or hanging perhaps from the rearview mirror; use it to write call signs on the windshield or side window. These can be transferred to the log at the next stopping point (along with a time-out entry), and the window wiped clean for the next stretch. It isn't necessary currently to enter a time in and time out for *each* station when you're mobile.

Other Hints

Getting in and out of service stations, driving along tree-lined streets, and driving under wires across streets are all constant threats. The antenna height becomes critical between the West Coast and the Atlantic coast. Clearance in the West is generally 15 to 16 feet for underpasses and bridges; however, in many places in the East, clearance is limited to 13 or 14 feet. You must be constantly alert for the overhead crossings, low tree branches, and overhead wires. The overall measurement of my antenna was 14', 2" from bottom of the tires to the top of the whip.



Many times when on divided highways or other low-density traffic roads I found that communication could be accomplished with safety; but if you enjoy tailgating, turn off the rig. We stayed way back of the traffic and when we got into heavy traffic we would just stop everything until a rest area or turn-off road became available. Safety has to be the first consideration at all times.

Almost two thirds of my calls were cw while my wife was driving. This was great fun and relieved me from the cares of the road. Most of the other third was voice, both while I was driving and when my wife was driving. I also made a few calls while parked or camped on both cw and phone. Most of these contacts were to show off the rig and ham radio to youngsters. Generally, though, it was early to bed and early to rise with the hamming done on the run. It is most helpful to have a piece of plywood large enough to hold your note paper under a clip and also have room for the key and arm rest when sending or receiving cw. You can purchase clipboard clips separately and affix to the larger boards for use on your lap.

Those who have made the transition from handkey to automatic paddlekey will find that going back to the handkey may be some problem. However, if you will slow down and concentrate on perfect code, the old key will surprise you with very nice readable code in spite of the bumps. With a little practice you will find you can get a compliment or two with the handkey.

It is real easy to get mixed up with call signs so special care must be taken to be certain you have the right call recorded. The unusual distractions of driving and outside noise can cause mistakes in the calls. I used headphones when a passenger, which helped some. Generally I would tune for CQs slowly over the band and contact the CQ caller or listen in and call one of the hams after the other had signed.

Schedules and Nets

A schedule with the family and friends at home is difficult but is a pleasure and is most helpful for special contacts. Schedules are sometimes demanding and most always arrive at the most inconvenient time for your plans. The time difference poses many difficulties. You will soon have different meal times, bed times, and getting up times, and you will soon find you are out of touch with the home pad so don't tie yourself to too tight a schedule. The once-a-week kind are much easier when you can be comfortably located on a nice high spot by a clear stream with a cool drink alongside. From here you can get your business done, make a few social contacts, and enjoy hamming.

One real benefit of mobile is the knowledge that you are always ready to raise help or assistance if needed. Nothing close to an emergency occurred for us — but we were ready. It is interesting to observe the skip in the radio signal and how it changes as you move from place to place. Ham radio won't help you much with hotel reservations at a fifty-mile distant village. However, there are MIDCARS and EASTCARS, companions to WESCARS, across the continent. There are numerous nets on all bands which you might break in for more local assistance. The ARRL Net Directory would be a valuable document to have along if your trip is to be extensive. Another by-product is the ability to keep abreast of weather conditions ahead and plan accordingly. The nets are choice sources of current actual weather conditions.

Repairs and maintenance are very difficult and few small cities have much in the way of ham parts, equipment, or service and, of course, it seems that you make all large cities on Saturday or Sunday or when the stores are closed.

The job of sending QSL cards is a big one when you get home but it is better, I think, than trying to QSL when you are making camp, getting dinner and other things unless your wife does all the work — and mine doesn't.

This article is not for all the old expert mobileers with special equipment but for those who haven't strayed too far from the shack and would like to try mobiling. So many of my contacts expressed a wish that they could do the same that this should be of some interest to those with the heart to make a nice trip with a rig in the car. It is really very simple and with care can be very safe. It is really great fun. I don't think I will ever make a trip again without a rig in the car. QST

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.

AMATEUR RADIO PUBLIC SERVICE

NTS RACES AREC

In the Public Interest, Convenience, Necessity

CONDUCTED BY GEORGE HART,* W1NJM

PERSONAL PREPAREDNESS

IN FEBRUARY *QST* we talked about an emergency check list. Shortly after the issue was in circulation, comes a letter from the field saying, in effect, "Yeah, that's dandy, but what good is all that truck if the guy collecting it is numb between the ears as far as knowing how to use it is concerned?"

Our correspondent has a *very* valid point! Perhaps we are all to anxious to look at the material side of things, like building fancy highways with all kinds of safety features but paying very little attention to the kind of nitwits driving on them with those lethal weapons known as automobiles. Like putting up a field full of rotary beams and rhombics and a row of kilowatts but not knowing how to snag a rare one on a crowded band. What good is it if the guy who has it isn't personally prepared to use it?

So how are you fixed for *personal* preparedness? It's just as important as having the gear and accessories. Maybe more so, because someone without all that stuff could do *some* good if he had experience and training, whereas someone without either could do *no* good even though superbly equipped otherwise.

Do you believe that? Probably not, most unprepared operators don't. Joe Blow, who never showed up for a drill, never handled a message, never operated in an emergency, reports into an emergency net wanting to "help." He doesn't know the procedure, so he breaks in out of turn and seconds go by as the NCS tells him to stand by. After a while he gets impatient at being ignored and breaks in again, this time explaining that he has emergency power and wants to help, and maybe describing some of his equipment. After being told again to stand by and again being ignored, he eventually goes up the band, gets hold of someone and tells him what a crumby emergency net is in operation down the band – maybe on top of another emergency net operating on *that* frequency, or on top of an isolated station calling for help.

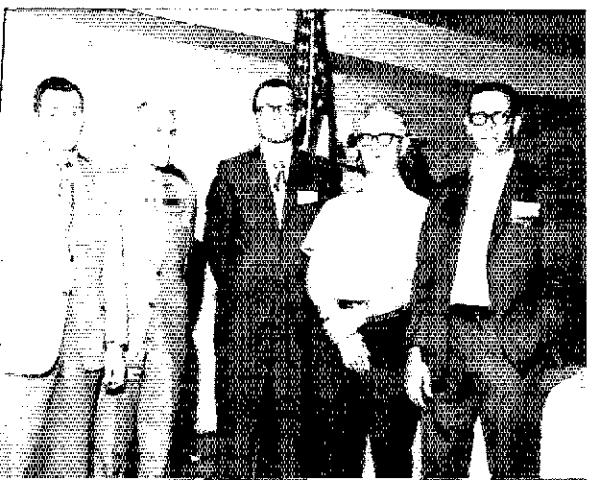
Come an emergency and the band is full of Joe Blows, usually with all the best intentions in the world but simply unable to supply the kind of operating know-how needed in such a situation. This takes participation, involvement, regular familiarization.

So how are you fixed for *personal* preparedness? Do you spend *all* your time on the air chewing the rag, chasing DX, hammering away in contests, hunting for awards? If you have a local AREC group organized, get in it, at least often enough to know your place, your function, and some of the basics of emergency net operation – at least enough so the rest of the gang will recognize you and treat you as one of them rather than an intruding outsider.

What do you do if your microphone goes bust? Punt? Skill in handling cw is a part of emergency personal preparedness. Enough skill just barely to pass the license test (then forget it as fast as you can) is not enough. In an emergency, you should have enough skill to report into an emergency net by cw if needed, or to copy someone else reporting in by that mode. (Add a telegraph key to the Feb. *QST* list!)

What, no local AREC unit? Isn't it about time you (or your club) got together with the other local hams and organized something? Are we going to let the CBers do it instead? If no one in the group qualifies for EC, organize anyway, under some name (RACES, maybe?). Do it now, not when the emergency situation occurs.

*Communications Manager, ARRL.



This group of ARRL officials was photographed during the NTS meetings at the ARRL Southeastern Convention held in Miami, Fla. on Jan. 21. Left to right are: S4SHJ, 4RN Manager; W4ILE, E. Fla. SCM; W4RKH, W. Fla. SCM; W4UQ, EAS Chairman; and W4SQQ, Asst. Manager 4RN. *(Photo by W4IYT, E. Fla. SEC)*

W1AW Preparedness

Another letter received asks us to what extent W1AW is prepared to participate in emergency operation, either locally or over a wider area.

This has already been documented, but our correspondent nevertheless feels that it is not generally known. W1AW is fully equipped for emergency power by means of a 20 kw. generator in the basement capable of running the entire station, building accessories and all. Not even normal W1AW services would need to be curtailed if we had a power failure. The generator is fueled by propane gas contained in two storage tanks capable of close to 24 hours continuous running without refueling. Regular tests on emergency power are run.

In an emergency, national requirements of the station would of course take precedence over any local activities. Nevertheless, W1AW participates regularly at section level in both the Conn. Phone Net (CPN) and the Conn. CW Net (CN), and there would be no dearth of experienced operators to man the station if needed.

Yes, W1AW is QRV for emergency!

Pictures?

A picture may be worth 10,000 words, but it certainly takes up a great deal less space. Or would you rather have the words? Thought not. In that case, how about some pictures? Only two this issue, both taken by the same person at the same place.

You may leave us no alternative but to get out our cameras and start taking pictures of ourselves again! – *WINJM.*

Traffic Talk

Some of you will have noticed that there is now before FCC a petition for rulemaking to prohibit collect landline delivery of amateur traffic. We predict this petition won't get to first base (unless you consider its being given a RM number a base hit), but it does point up a discrepancy in our traffic procedures that can be both annoying to the recipient of a delivery and injurious to our image with the public we are trying to serve.

To begin with, let's admit that in many cases, maybe a majority, the recipient will be glad to pay the toll charge, especially if the message is from a member of the family in the service. There *is* an HX prosign authorizing collect landline delivery (HXA), but this may not always be trustworthy because the authorization, although ascribed to the addressee, must be given by the originator. In other words, Joe College may assume that Dad will pay for the telephone call (or maybe just not give a hoot), but when you call Dad he may have different ideas, especially if he has already heard from Joe by mail or telephone on the same subject. Does he blame Joe? Usually, he blames *you* as the representative of a service that is lousy and has just cost him money.

Of course, he can always refuse to accept the charge. Few people will do this; they'll accept it first, then get mad if it's not justified. It's logical enough to want to know what the message is before you accept a charge to receive it. Unfortunately, the telephone company wants to know who's paying before it puts the call through, and thus an impasse. The telephone company wins, you lose.

So what's to do? Only one thing – don't deliver messages by collect landline unless you are reasonably sure that the charge will be willingly

Public Service Honor Roll January, 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 delineation 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)*	
Max. Pts.	*10*	*10*	*12*	*12*	*12*	*20*	*3*	–	*5*	*Totals*
W3EZT	10	10	12	12	12	8			5	69
WB4KDI	10	10	12	12	12		3	3	5	67
WA3OGM	10	10	12	12	12	2	3		5	66
WA8ETX	10	10	12	12	12	2	3		5	66
WB2AEH	10	10	12	12	12				5	61
W3FCS	10	10	12	12	12				5	61
WB4SVX	10	10	12	12	12		3	2		61
WØLRW	10	10	12	12	12				5	61
VO1CA	10	10	12	12	12				5	61
K3ZNP	10	10	12	12	12	3				59
WB4SVH	10	10	12	12	12		3			59
W7HQ	10	10	12	9	12				5	58
WB8RMV	10	10	12	6	12		3		5	58
WB4SON	10	10	12	12	12					56
WB5DEK	10	10	12		12	7			5	56
WAØVYV	10	10	12	12	12					56
WA8UPI	10	10	6	12	12				5	55
WAØVAS		10		12	9	20	3			54
WA3FRV	10	10	12	9	12					53
WB4JMH	10	10	12	9	12					53
WA2EPL	5	10	12		12	10	3			52
KØONK	10	10	12		12		3		5	52
VE3ERU	10	10	10		12		3		5	52
W4SBD	10	10	9	9	12	1				51
WA8JEI	10	10	12	3	12					47
VE3GBR	10	10	12	12	6					50
W2MTA	10	10	12		12				5	49
W5SBM	10	10	12		12				5	49
WA6IVA	10	10		12	12				5	49
WB8CWD	10	8	12	9	12					49
KØMRJ	10	10	12		12				5	49
WAØTWM	10	10	12		12				5	49
WB6MKM	10	10		12	12	6				48
W7MCW		10		12	6	20				48
W7OCX	10	5	4	12	12				5	48
WB8DXE	10	10	9	4	12		3			48
W8OMI	10	9	12		12				5	48
WB1IKL	10	10	3	12	12					47
K6GYK	10	8	9		12		3		5	47
WAØZTW	10	10	3	12	12					47
KØBAD/4	10	4	12	6	12	2				46
WA5VJW	10	5	12		12	3	3			45

W2BU	44	W2RUH	39	WA2AFL/4	34
WA2ICU	44	WA3FPU	39	WA2FLO	34
WA2VLS	44	W4LOS	39	W4OKN	34
WA3NAZ	44	W4NEM	39	W4YA	34
K3OIO	44	WB4PNG	39	WB4KSL	34
W4NOG	44	WA8VKE	39	K6YBV	34
WSEDT	44	WØHH	39	WB6ALU	34
K5ROZ	44	WØIII	39	VE3AWE	34
W8LT*	44	VE3DPO	39	W7PI	32
WA8NOQ*	44	WB2NOM	38	W1CE	32
WØBV	44	WA6AAW	38	WA3PJG	32
WAØJFC	44	W6DEP	38	K4FAC	32
WØLQ	44	W6NH	38	WB4SZS	32
WØMA	44	VE3DV	38	WB4VOS	32
WAØSIG	44	W4TN	37	WA6IDN/3	32
VE3BXI	44	WB4THU	37	W9HRY	32
VE4EA	44	K2KTK	36	WAØYGQ	32
WAØKUH	43	W5RBB	36	WAØYIH	32
WAØVYB	43	K6NQW	36	VE3BPC	32
W7GHT	42	WA2CCF	35	VE3DQZ	32
WBØBIY	42	W4TQ	35	VE4FQ	32
WB4EKJ	41	K4UWW	35	WA7EMO	31
WBØCAU	41	WA4PFH	35	W8IHX	31
W6MNY	40	K1SXF	34	K8MLO	31
W2ER	39			VE3CQT	30

*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 liaison, 3 points each; (6) Legal phone patches, 1 point each; (7) Making BPL, 3 points regardless of traffic total; (8) Handling emergency traffic directly with a disaster area, 1 point each message; (9) Serving as net manager for entire month, 5 points.

accepted at the other end. This means, for all practical purposes, don't deliver by toll call at all unless you are willing to pay the charge. And don't forget, if the called party refuses the charge and you then agree to pay it, the charge is higher than if you had dialed direct.

What, then, cancel the message, assuming you can't get it any closer by radio? No, mail it. Kick in the six cents. For ten bucks a year you can mail over 165 messages. If that's too much money a year to spend in pursuit of your hobby, you're really in bad shape; and rare is the traffic man who will find it necessary to mail that many messages in a year. – *WINJM.*

National Traffic System. The EAS chairman (W4UQ), the EAN manager (K2KIR) and the 4RN manager (W4SHJ) attended the Southeastern Division Convention in Miami in January for the purpose of establishing better rapport with the active Florida NTS contingent. W4UQ reports that the mission was highly successful, that there is a great deal of traffic interest in the Gator State and support of NTS is high – but Floridians have always felt themselves sort of out in left field as far as NTS is concerned, far from the scene of most of the action in the Eastern Area, largely neglected as NCS prospects for EAN and as prospects for TCC functions, torn between two regions (4RN and RN5). And yet, here is a pocket of intense traffic activity and avid NTS support. Our Eastern Area staffers spent many hours before and during the convention discussing the full gamut of NTS topics, fully accomplishing the intended mission of seeking better NTS contact with the Floridians. An added benefit was an improved impression of Florida's place in the overall NTS picture.

January Reports. Comments are very scarce this month from the net managers. W3NEM sez "It is a sad note to see an entire net operation fold except for the NCS and EAN liaison men when a simulated power failure hits the entire third region." Other managers reported that the SET went smoothly although the emergency power requirement left some nets short handed.

January Report Summary

Net ..... *Sessions*	*Traffic*	*Rate*	*Avg.*	*Rep.%*
EAN 34	2365	1.451	69.5	98.0
CAN 33	1465	1.144	44.4	100.0
PAN 33	1538	1.054	46.6	100.0
1RN 66	904	.469	13.7	91.2
2RN 67	721	.664	10.8	98.8
3RN 66	635	.456	9.6	97.8
4RN 58	892	.536	15.4	86.7
RN5 58	496	.387	8.5	91.4
RN6 62	874	.452	14.1	100.0
RN7 62	455	.370	7.3	63.0
8RN 68	908	.512	13.3	92.6
9RN 66	705	.516	10.8	92.9
TEN 58	487	.422	8.4	84.9
ECN 56	244	.330	4.3	89.0
TWN 51	166	.172	3.3	62.4
TCC Eastern ....124[1]	1096			
TCC Central ....102[1]	877			
TCC Pacific ....132[1]	1097			
Sections[2] 2633	17905			
Summary *3471*	*33830*	*EAN*	*18.6*	
Record *3665*	*38538*	*1.590*	*19.1*	

[1]TCC functions not counted as net sessions.

[2]Section nets reporting (72): AENR, AENB, AEND, AENM, AENO (Ala.); OZK (Ark.); CN, CHN, CCN (Colo.); SCN, SCNT, NCN (Calif.); CN, NVHF (Conn.); WFPN, GN, OFTN, QFN, VFN, FMTN (Fla.); GSN, GTN (Ga.); ILN (Ill.); LAN (La.); QMN (Mich.); PAW, NSN, MIN, MSPN (Minn.); ECTN (N.J.); NLI, NYS (N.Y.); NMRTN (N.M.); NHVTN (N.H.); CNL (N.C.-S.C.); SC2FM, BN, OSSBN, APRMN (Ohio); EPA, PFN, PTTN, KSSN, WPA, (Pa.); RIPOM (R.I.); PARN, TEX, TTN (Tex.); BUN (Utha); NHVTN (Vt.); WSSN, WIN, SW2RN, WSBN, BWN, BEN (Wis.); WSN, NSN, PSEN (Wash.); WVCD75, WVN, WVNN (W.Va.); VN, VSBN (Va.); WMN (Mass.); APSN (Albt.); MTN (Mant.); GBN (Ont.); WQVUHF (Que.).

Transcontinental Corps. W7DZX reports all going smoothly with TCC Pacific. Jack is filling in for W6VNQ who is on vacation. TCC Eastern had at least four stations on emergency power during the SET. W3EML reports a fairly good traffic total for the month of January.

Area	*Functions*	*% Successful*	*Traffic*	*Out of Traffic*
Eastern 124		92.0	2841	1096
Central 102		97.9	1802	877
Pacific 132		93.2	2194	1097

The TCC Roster: Eastern Area (W3EML, Dir.)-W1s BJG EJI NJM QYY YNE, K1SSH, W2s FR GKZ, WA2s ICU UWA, WB2RKK, W3EML, K3MVO, W4s SQO UQ, K4s KNP VDL, WB4NNO, W8s PMJ RYP, K8KMQ, WA8PIM. Central Area (WØLCX, Dir.)-W4s OGG ZJY, WB4KPE, W5s QU MT S8M, WB2UFG/5, W9s CXY DND YB, WA9VZM. WØs EII INH LCX ZHN, KØAEM, WAØIAW. Pacific Area (W6VNQ, Dir.)-W5RE, K5MAT, W6s BGF EOT IPW MLF MNY RSY VZT, WA6s OEI LFA. W7s BQ FM KZ PI DZX EKB GHT, WØLQ, KØJSP.

Independent Net Reports

Net ..... *Sessions*	*Traffic*	*Check-ins*
Early Eighty Free 30	214	256
Eastern Area Slow 25	60	180
All Service 7	30	70
Mike Parad 27	185	378
20 Meter Interstate SSB Traffic 21	2034	434
North American SSB Traffic ..26	197	490
7290 Traffic 46	766	2042
East Coast Teenage Traffic ...28	124	277
75 Meter Interstate SSB 31	212	1108
Northeast Traffic 31	296	428

Public Service Diary

On Oct. 8, WA3RLX was traveling on the Washington-Baltimore freeway when he noticed a man being dragged from a car parked on the shoulder of the road. Stopping to investigate, WA3RLX learned that the man had suffered a near fatal heart attack. WA3RLX then put out a call for medical assistance on the WA3DZD repeater and was answered by K3GEG who notified authorities. WA3RLX then spotted a passing car with medical license plates and flagged it down. In the meantime K3USG had arrived on the scene and took over the communications duties. Confirming that a serious emergency situation existed, he called W3FDU who in turn requested an ambulance from the state police. K3USG was notified that a helicopter was being dispatched and should arrive in a matter of a few minutes. The amateurs attention then turned to stopping traffic and clearing a landing place for the helicopter. By the time the helicopter arrived a space had been cleared for the landing. The patient was placed on a stretcher, given oxygen, and loaded on the waiting helicopter. As it departed WA3RLX and K3USG turned the five mile traffic jam over to the police. – (W3CU)

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On Oct. 23, K1KBQ was driving through Hartford, Conn. when he came upon a car-motorcycle accident. Using the WA1KHK repeater, WA1ELA was advised of the situation and was requested to notify the proper authorities. Within minutes an ambulance was on the scene treating the injured. – (K1KBQ)

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While mobiling on Route 189 near Concord, N.H. on Dec. 14, K1CIG came upon an automobile

E. Fla. SCM W4ILE (left) and 4RN Manager W4SHJ discuss the possibility of a daytime NTS at the ARRL Southeastern Division Convention in Miami, Fla. on Jan. 21. *(Photo by W4IYT, E. Fla. SEC)*

accident. A call on the W1ALE repeater was answered by W1BYS who phoned the State Police with details of the accident. Within five minutes police had arrived and the situation was under control. – (W1SWX)

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While driving along Raleigh Road in Wilson, N.C. on Dec. 23, W4RIZ noticed smoke coming from an automobile directly in front of him. After determining that the car was actually on fire W4RIZ, who was already in communication with WA4ZLJ and WB4NXS via 2 meter fm, asked WB4NXS to notify the fire department. W4RIZ remained at the scene to provide communications until police and fire units arrived. – (WB4NXS EC Wilson Co., N.C.)

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On Jan. 7 WB4GYX was traveling along Highway 85 in Okaloosa Co., Fla. when he came upon an auto that had rolled off the road and pinned the driver inside. WB4GYX called for assistance on his 2 meter fm mobile rig and was answered by W4ROM. W4ROM learned the details of the accident and then called the police. Within six minutes police and an ambulance were on the scene. The victim suffered only minor injuries but if it hadn't been for the timely arrival of WB4GYX the victim could have died of shock. – (K4CLM EC Okaloosa Co., Fla.)

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On Jan. 20 and 21 a severe snow and ice storm hit the Pacific Northwest. One of the hardest hit areas was the Fraser Valley in southern British Columbia. In Boston Bar, B.C. all connections with the outside had been cut off. VE7BBC was the only means of communications in Boston Bar. Operating on emergency power he informed the rest of B.C. of the situation in Boston Bar via the B.C. Amateur Public Service Corps Net on 75 meters. A number of health and welfare messages were handled for stranded motorists as well as communications for the RCMP and the highway department. Other participating amateurs included VE6AAV, VE7s AMW, AHC, BBC, AXH, FB. – (VE7FB, SCM B.C.)

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On Jan. 22 the St. Louis, Mo. area amateur radio operators were called to assist in the search for a young man who was missing from the St. Louis State School and Hospital. The young man was partially blind and retarded.

Initial efforts to locate the youth were spearheaded by a group of volunteers from a local youth association. After 24 hours of search without a clue the county police were contacted and a request for walkie-talkie radios was made. Police radio supervisor KØAHD was on duty at the time and he immediately contacted members of the St. Louis Repeater Club to request their cooperation.

KØDCQ and WØKUJ instituted call up procedures and within thirty minutes a dozen hams equipped with mobile and portable transceivers were headed for the search area. WAØQAH established a radio command post to coordinate the search groups.

On the morning of Jan. 23, the mobile operators visited area churches and homes to inform the public of the missing youth. A short time later the youth's body was found and the search was terminated. A total of twenty amateurs took part in the search. – (KØAWM)

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On Jan. 31 WA5OUD received a call from WA5EQW on the Enid repeater. WA5EQW advised that he was on IH-35 north of Oklahoma City, Okla. and that there were a number of high voltage

(Continued on page 95)

BRASS POUNDERS LEAGUE

Winners of BPL Certificates for Jan. Traffic

Call	*Orig.*	*Recd.*	*Rel.*	*Del.*	*Total*
W3CUL/4	240	1276	1149	16	2681
KØONK	157	744	695	18	1614
W7BA	18	564	505	52	1139
K3NSN	8	448	440	8	904
KØZSQ	–	440	–	440	880
W3EML	37	433	325	5	800
WAØVAS	102	308	46	262	718
WA5VJW	286	233	135	36	690
WØZWL	–	391		288	679
W3VR/4	205	239	212	4	660
WØLCX	15	352	262	9	638
WB8GVI	29	279	271	24	603
WA8ETX	76	272	249	3	600
WB9BJR	210	198	180	10	598
WA3OGM	54	305	217	17	593
WA3QOZ	145	236	147	54	582
W1EIW	38	321	213	3	575
K5TEY	1	286	283	1	571
W4SQQ	43	261	239	9	552
W6RSY	20	275	234	14	533
K2KDQ	84	281	141	16	512
K3BHU	43	250	187	25	505
WA7JQS	9	248	229	16	502
WA2EPI(Dec.)	734	1581	1429	95	3838

BPL for 100 or more originations-plus-deliveries

WA2EPI	276	K6UYK	145	WA3QFN	114
WB4HML	255	W3IN	141	WAØLLC	114
WA4VEK	247	WB4PSP	141	WA2EEK/1	113
WA8WPQ	244	W8QCU	138	W4BAZ	113
W7TYN	210	W2OE/4	130	WA3MDY	112
K8ONA	209	WB4FJK	127	WB4SVX	112
WB6VTK	202	WB8DXF	127	WAØYVT	112
K9VEA	183	WA1KVI	125	K1VXX	111
KØYTK	167	WA3NAZ	124	W4ILE	108
K2DQT	155	WA8NDY	122	WB4KDI	108
W8IBX	151	WB4SVH	120	VE3ERD	108
WA8COA	148	WAØSUE	119	W3MPX	100
		KØBXF	117	WA1KZE(Dec.)	103

More-Than-One Operator Station

W9JWC 186
K1NQG(Dec.) 231
VA2UN(Dec.) 144

BPL Medallions (see July, 1968 *QST*, p. 99) have been awarded to the following amateurs since last month's listings: WB2LTW, WB4SVX, W6INH, K6UYK, WA7AVI, WA9OBR, K9TXJ.

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.

Hamfest Calendar

Alabama – The Birminghamfest is Sunday, May 7, at the Exhibition Hall, Alabama State Fairgrounds near Five Points, West in Birmingham. Contests, net meetings, eyeball QSOs, and fun for the entire family. More information from the Birmingham ARC, W4CUE, P.O. Box 603, Birmingham, AL 35201.

California – The Fresno Hamfest is April 28, 29, and 30, at the Fresno Hilton Hotel.

California – The annual Navy-Marine MARS picnic, swap meet, auction, and hamfest is 16 April at the Adobe De Polomares, Pomona. Displays, auction, kiddie activities, talk-in, and more. Bring your own lunch and drinks. Bar-B-Q pits on the grounds. Fun begins at 10 A.M., auction at 2 P.M.

California – The Sacramento Valley Ham Get-Together will be May 20, from 9 A.M. to 5 P.M. at Carmichael Park, Carmichael. For information, write Stuart Churchon, W6OMK, 1031-34th St., Sacramento, CA 95816.

Connecticut – The Tri-City ARC 23rd Annual Hamfest will be held at the Crocker House Hotel in New London on April 29. Tickets are $8 which includes a steak dinner and the registration. Full day of activities starting at 0900. Big swap and shop tables, technical talks, MARS, ARRL forum, CD meetings, CN/CPN, DX info., and repeaters. Registration and information available from the General Chairman, Robert York Chapman, W1QV, 28 South Rd., Groton, CT 06340.

District of Columbia – Potomac Area Hamfest at Westminster, Sunday, April 30, 9 A.M. to 5 P.M. Registration is $2 and includes flea market or tail-gate sales. Professional food and beverage catering. Parking for 400 cars. All the customary hamfest activities. Information from K3LNZ, K4LHB, or W3EVF per *Callbook* address, or K3LNZ at 202-562-9763. Talk-in on 146.94 MHz.

Florida – The St. Petersburg ARC (SPARC) will hold its annual Hamfest on May 7, 9 A.M. to 3 P.M. at Lake Maggiore Park, 9th St. & 38th Ave., So., St. Petersburg. Registration is $1. Swap tables provided. Free parking, covered shelters, and treats for the kids. Bring the family and your lunch.

Georgia – The Columbus ARC Hamfest is April 9. Information from CARC, 1158 Tate Drive, Columbus, GA 31906.

Illinois – The Kishwaukee ARC Hamfest is May 7, at Hopkins Park on Illinois 23 in DeKalb. Advance tickets $1, $1.50 at the park. Talk-in on 146.94 and 7.253 MHz. Plenty of food and parking. For more information contact Greg Ordy, WB9CTH, 1421 Suburban Apts., DeKalb, IL 60115.

Illinois – Moultrie Amateur Radio Klub, 11th annual Hamfest, Wyman Park, Sullivan, Illinois, April 30, 1972. Indoor-outdoor market. Ticket donation $1.00 in advance, $1.50 at the gate. Open 8:30 A.M. W9BIL-146.94 mHz. M.A.R.K. Inc., P.O. Box 327, Mattoon, IL 61938.

Iowa – The 3900 Club Annual Spring Get-Together is April 15 at the Holiday Inn at Okoboji. Program begins at 4 P.M., then dinner, then another program session. More information from Dick Pitner, WØFZO, 2931 Pierce St., Sioux City, IA.

Louisiana – The Baton Rouge ARC 8th Annual Hamfest is May 6 and 7, at Father Colbert's Camp, just east of Baton Rouge off Greenwell Springs Rd. The banquet Saturday night is $5 ($6 at the door), reservation deadline is April 24. The Jambalaya picnic on Sunday, $1.50. Send check payable to BRARC Hamfest, P.O. Box 53194, Baton Rouge, LA 70805.

Maryland – See District of Columbia.

Massachusetts – The USAF MARS Region 1 Convention is May 19-21, at the Statler-Hilton Hotel, Park Square, in Boston. All are welcome, MARS members or not!

Missouri – The Third Annual Northwest Missouri Hamfest is May 7, from 1000 to 1600 local time at the U.A.W. Hall, Claycomo (U.S. 69 ALT across from Ford Motor Plant northeast of Kansas City). Complete program including white elephant sale for XYLs. Talk-in on 146.94 and 3.925 MHz. Advance tickets $1, $1.25 at the door. Information from PHDARA, P.O. Box 11, Liberty, MO 64068.

New Mexico – The Mesilla Valley RC of Las Cruces annual Bean Feed Hamfest on April 30, at the Volunteer Fireman's Park, La Mesa. Starts at 11 A.M., Bean Feed at 1 P.M. Information from MVRC, Box 207, Messila Park, NM 88047.

New York – The Rockaway ARC Spring Auction and FMers Get To-gether will be April 28, at the Hall of Science, 111th St. and 48th Ave., Carona (the old World's Fair Grounds). Doors open at 6 P.M. Two dollar donation includes free refreshments. Information from Al Smith, WA2TAQ, P.O. Box 341, Lynbrook, NY 11563.

Ohio – The 21st Dayton Hamvention will be held at the Hara Arena and Exhibition Center on April 22. Large exhibit of the latest amateur equipment. Technical sessions and forums covering such subjects as vhf, DX, ARRL, ARPS, RTTY, antennas, ATV, MARS, and more – hidden transmitter hunts, program for the ladies, net meetings, contests. Free parking at the Arena Friday night and Saturday. Free bus service from downtown Dayton via motels and hotels. Self-contained trailers and camper units will be permitted to park overnight in the parking area. Advance ticket sale closes April 20. Registration in advance is $2.50, $3 at the door. Advance banquet registration is $7, $7.50 at the door (banquet only $4.50, ladies luncheon $2.50). Additional information and map from Dayton Hamvention, P.O. Box 44, Dayton, OH 45401.

Tennessee – The Greater Knoxville Hamfest/Flea Market is Sunday, April 30, at 1 P.M. at Chilhowee Park, off I-40 East. For a map and details contact Bronce Fitzgerald, WA4ZCX, or RC of Knoxville, P.O. Box 10453, Knoxville, TN 37919.

Texas – The annual picnic and get-together of the 7290 Traffic Net will be April 28, 29, and 30, at Bastrop State Park, Texas. Camping sites, cabins, and motel rooms are available. Registration is $2. Mail to Bill Biehunko, 1508 E. Warren St., Victoria, TX 77901.

Washington – The Skagit ARC of Washington State will hold its 19th Annual Hamfest and Banquet at Bryant Grange Hall on April 22. An all-day program is planned, with Northwestern Division Director Thurston and other ARRL officials on hand. Special activities for the women and a tour of the Navy's million-watt radio station at Jim Creek are planned. For further information and advanced registrations contact Norman Ray, W7LFA, 14005 132nd Ave., Kirkland, WA 98033.

COMING ARRL CONVENTIONS

May 28 – Virginia State, Vinton, Virginia

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.

Strays

Trans-Canada on Bicycle and Ham Radio – 1972

Ron Samchuk, VE4SR, is organizing a bicycle trip along the Trans-Canada highway with other young hams this summer. The aim is to promote and stimulate public interest in amateur radio. All gear will be carried on bicycle. Application has been made for a special call and special QSLs will be issued for contacts; an informative brochure is planned for hand-out to the public along the way. Average travel is expected to be 50-100 miles per day and radio operating will be during the evening hours. *(From the Canadian Amateur Radio Federation Newsletter* – February 1972)

K1RGQ Attacked by *QST!*

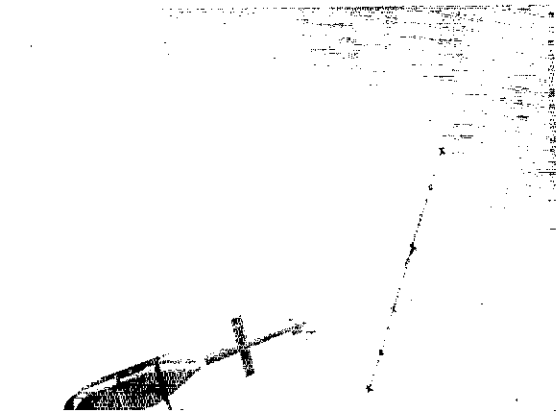
K1RGQ was viciously attacked by *QST* magazine recently. However, showing true heroism and amateur spirit he rescued his equipment, sustaining an injury to his arm in the fray. John is now fully recuperated.

While tuning up for a local repeater, John saw his homemade bookshelf, containing many, many years of back issues of *QST* magazines, beginning to topple toward the operating table. Anticipating damage to his gear, John threw himself over it; the magazines and bookshelf landed, throwing him to the floor and pinning him there. Alone in the house, it took him nearly an hour to extricate himself. He is happy to report that his arm is fine now and that none of his gear was damaged! – *WA1NQJ* (from *The Squelch Tale*, published by the Northern Berkshire ARC)

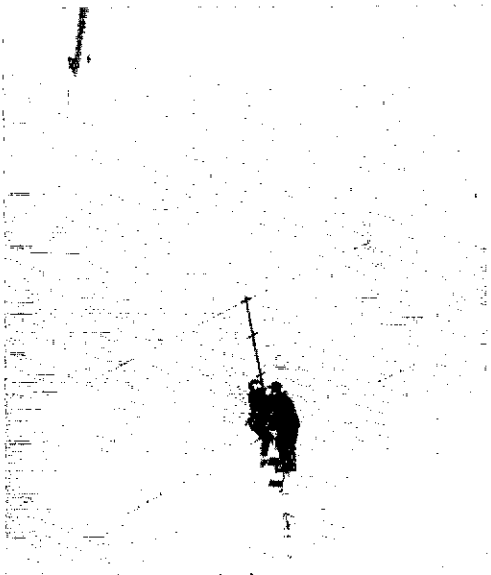
The beam's ready to go . . . Everything's ready at the top of the tower . . . All set, start the "chopper."

Jim Price, W8FXP, sent us these exciting photos. The action took place at the QTH of Andy Lippens, ON4OB, of Melsbroek, Belgium, about 3 miles from the Brussels Airport. If you want to see the finished installation, you'll have to work ON4OB. . . the final shot is on his QSL card!

Heads up, here she comes.



Hook it on quick!



Happenings of the Month

FCC Picks K3BNS

ARRL Fights EIA's 220 CB Idea

New Leaders, Hudson Division

VE3AW Gets Canadian Medal

K3BNS GETS FCC POST

John B. Johnston, K3BNS, of Levittown, Pennsylvania, has been appointed as Chief, Rules and Legal Branch, Amateur and Citizens Radio Division FCC. The post has been filled by a non-amateur on an "acting" basis only, since Bill Grenfell, W4GF, retired from it last year. John will be working for Prose Walker, W4BW, Chief, Amateur and Citizens Radio Division, and one of his principal duties will be drafting responses to the many petitions for rulemaking (RMs) which await FCC action.

The new chief holds a BS in Electrical Engineering from Ohio University, 1951, and since that time he has been doing research and development in satellites, analog and digital computers, microwaves, radar, missiles, infrared, and electromagnetics for such firms as Fairchild Industries, Sperry Gyroscope, RCA, and General Electric.

K3BNS is a past president of the Frankford Radio Club and of the Penn Wireless Association and is the 1970 holder of PWA's "Buck Award." He has had articles published in *QST* and other radio magazines and won an ARRL Communications Department article award in March, 1966 ("A New Year's Resolution," page 97). A former assistant director (1970-1971) of the Atlantic Division, John's a Life Member of ARRL, active on the hf bands on cw RTTY and phone – particularly in Sweepstakes, the ARRL DX Contest, and, with the W3SK crew, in Field Day. His new job began February 14, and he now resides in Durwood, Md.

QST VISITS DETROIT IEEE MEETING

Advances in solid-state technology have fostered development of electronics for automobiles, a subject which bears watching by amateurs because of our propensity for putting relatively high-powered rigs in our cars. Accordingly, Doug Blakeslee, W1KLK, assistant technical editor of *QST*, attended the annual conference, Vehicular Technology Group of the IEEE at Detroit.

The high point of the meeting was a symposium moderated by Dr. Lester Hogan, president of Fairchild Camera and Instrument, and including representatives of General Motors, Ford, and Chrysler. Among the interesting points developed was the view that ignition noise in automobiles is now under control; no further improvement program is under way. Radio-frequency interference with electronic braking systems was discussed: a telephone company employee reported several cases of trouble when 150-MHz gear was operated from cars with the anti-skid systems. He also mentioned the unhappy response from automobile owners who found warnings against the use of radio sets pasted in the trunks of their cars. It was stated that in the cases investigated by General Motors, the problems were caused by improper installation of the radio equipment.

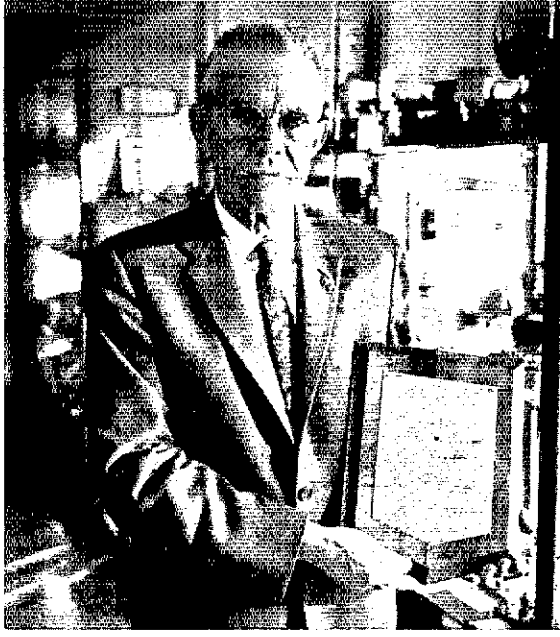
Fairchild's Dr. Hogan – a computer on a chip

Dr. Hogan, in his favorite role as visionary of the semiconductor industry, predicted that "charge-coupled devices" will allow as many as 100,000 semiconductors to be fabricated on a single silicon chip. Thus one or two ICs would suffice for a complex computer. Hogan is noted for the accuracy of his predictions – in every aspect except the time needed to complete development.

Other papers presented covered such subjects as cell-system repeaters for mobile radio; digital applications in radio communication; a repeater system using the same input and output frequency; and recent advances in Gunn-diode microwave devices. Manufacturers' displays showed a wide range of tone and digital devices intended to replace voice for mobile communications.

ROLAND B. BOURNE, W1ANA

It is with great sadness we report the death of Roland B. Bourne, W1ANA, on February 8 at the age of 77. Since 1963, Roland has been curator of the ARRL Museum at headquarters, not only in the sense of guardian, but restorer, completer, rebuilder of antique equipment. His work here has twice earned the commendation of the ARRL Board, and in 1969, he was voted Outstanding Member of the Year by the Antique Wireless Association.



From the past . . . W1ANA, the 1969 Antique Wireless Association plaque, and a part of the League Museum.

R.B. was a marine wireless operator from 1912 through 1914, served in the Signal Corps in Europe 1917-1919, and graduated from Rensselaer Polytechnic Institute in 1920 as an electrical engineer. He served RCA as an engineer at Riverhead, N.Y. from 1919 to 1924, was chief engineer for the C. D. Tuska Company, 1924-1925, and then for the next 35 years served the Maxim Silencer Company variously as vice president for acoustic research, treasurer, and director. He held 72 patents; was a pioneer in radio control of gliders; wrote both technical and general articles for *QST* (his "I Can't Be Bothered," July 1932 is considered a classic by many OTs); was a familiar voice on the air, especially at 3999 kHz; and was one of the founding members of the Old Old Timers Club. Outside of amateur radio, he had a deep interest in optics, astronomy, photography, and lapidary arts. He leaves his wife, Emma, two daughters, and seven grandchildren.

ZAK, DIEHL GET HUDSON POSTS

With the election of Harry J. Dannals, W2TUK, as president of ARRL (reported here last month) and his subsequent resignation as director from the Hudson Division, Stan Zak, K2SJO (who has been vice director since 1965) has become the director effective January 26, 1972. Stan lives in Port Chester, N.Y., is 44 years old, and is a supervising engineer for the New York Telephone Company. Long active in radio organizational work, Stan is past director, past secretary, and past editor, Westchester Amateur Radio Association; chairman, Durland Scout Center Radio Explorer Post; secretary, past president, past vice president, past director, Hudson Amateur Radio Council, and member of its call-letter license plate and K2US/World's Fair committees; co-chairman, 1964 ARRL National Convention and chairman, 1966 Hudson Division Convention; and communications chief, Port Chester-Town of Rye Civil Defense. First licensed as a Novice in 1956, Stan has worked up through Technician and General for his present Advanced Class license. His present term as director ends at noon, January 1, 1973.

George A. Diehl, W2IHA, of Chatham, N.J., has been appointed by President Dannals as vice director from the Hudson Division for the remainder of the term ending January 1, 1973. George is an engineering department chief for Western Electric, working at the Bell Labs in Whippany, N.J. After hours, he's served as assistant director from the Hudson Division 1962-1972; trustee, past president, past activities manager, past secretary, Tri-County Radio Association, Inc.; president, past vice president, past secretary, past director, Hudson Amateur Radio Council; and coordinator for K2US/World's Fair; chairman, 1970 ARRL Hudson Division Convention; first licensed in 1935 as W3FVZ. Not all of George's spare time goes to ham radio: he's been active at local, county, state, and national levels in Board of Education work, including service on the Policy Committee of the National School Board Association.

QSL BUREAU CHANGES

Karel Tettelaar, VE6AAV, has resigned as ARRL QSL manager for Alberta, effective March 1, 1972. The new manager is Dunc Davidson, VE6TK, 1108 Trafford Drive NW, Calgary 47, AB. A hearty "Thanks" to Karel and his wife, Margaret, VE6ABP. "Welcome aboard" to Dunc!

Another slight change: to the address used for Ed McVittie, VE4OX, the Manitoba QSL manager, please add the new postal code R3N OE8.

Our new president, new Hudson Division director, and new Hudson vice director all spoke at a meeting sponsored by the New Providence ARC of Murray Hill, N.J. (l. to r.) Barry G. Cohen, W2PDG, club president; Vice Director Diehl, W2IHA; President Dannals, W2TUK; and Director Zak, K2SJO. *(W2KFO photo)*

"A Solid-State SSTV Monitor" won the March, 1971, plaque for its author, Robert Tschannen, W9LUO (left). Presentation is by L. O. Shaw, president, Wheaton Community Radio Amateurs. *(W9PYG photo)*

Last July VE postage rates went from 6 to 7 cents for an ounce of first-class mail, and the U.S. rates went from 6 to 8 cents. The Canadian rate rose again the first of the year, from 7 to 8 cents. If there's a chance your envelopes on file with the QSL manager have the wrong amount, how's for sending him some 1- or 2-cent stamps to bring yours up to date?

COVER PLAQUES FOR 1971

Each month the directors of ARRL select by mail vote the best article of the month contributed by a volunteer (staff articles are not eligible). The award itself consists of a zinc printing plate of the front cover, mounted on a walnut board.

Winners of 1971 plaques were:

January: "Compact-A-Test," by Bob Palmer, G5PP
February: "The ATR-166," by William J. Hall, K1RPB
March: "A Solid-State SSTV Monitor," by Robert F. Tschannen, W9LUO
April: "The Five-Finger Keyer," by R. H. Turrin, W2IMU
May: "Simple Arrays of Vertical Antenna Elements," by James L. Lawson, W2PV
June: "New Life for the All-American Five," by Larry Lisle, K9KZT
July: "A Solid-State Noise Blanker," by Frank N. Van Zant, W2EGH
August: "A Technique for Burst Two-Tone Testing of Linear Amplifiers," by Bob Buus, WA2HVA
September: "Custom Design and Construction Techniques for Linear Amplifiers," by Merle B. Parten, K6DC
October: "Voltage Multipliers," by Jack Althouse, K6NY
November: "A WWVL Receiver," by Eugene Pearson, W3QY
December: "A Forty-Meter DDRR Antenna," by W. E. English, W6WYQ

Have you a project which would make a good *QST* story? We have a technical editing staff who can pretty up the words, should they need it – ideas are more important for *QST* articles than a finished writing job.

TECHNICAL MERIT AWARDS

An annual award is made, too, for a major contribution to the technical side of amateur radio – The ARRL Technical Merit Award. The 1970 Award, by the Board at its May, 1971, meeting, went to Louis N. Anciaux, WB6NMT; Paul J. Snyder, K2CBA; and Lester L. Whitaker, W7CNK, for their unusual skill and steadfast determination which resulted in the first 220-MHz earth-moon-earth QSO.

The 1971 Award, by the Board at its January, 1972, meeting recognized the outstanding studies and contributions to the advancement of knowledge of *E*-layer propagation in the vhf range by Melvin S. Wilson, W2BOC/W1DEI, author of articles in the December 1970 and March 1971 issues of *QST* on the subject.

Nominations for the 1972 award can be made any time, up to mid-December, by letter to Honorary Vice President W. M. Groves, WSNW, 1406 West 12th Street, Odessa, TX 79760.

GOVERNMENT HONORS VE3AW

Governor-General Roland M. Michener in December awarded the Medal of Service of the Order of Canada to David S. Lloyd, VE3AW. This award is made for "Excellence in all fields of endeavour in Canadian Life." For Dave, it is particularly in recognition of his efforts in helping the blind to become radio amateurs. (Dave had earlier received the Christopher Columbus Gold Medal for 1970 from the International Institute of Communications in Genoa, Italy, and the 1968 Ontario Amateur of the Year award from the Radio Society of Ontario.)

Governor Frank Licht (right) presents the proclamation for Rhode Island Amateur Radio Week, December 5-11, to John Good, K1HZN, 1971 President of the Providence Radio Association, celebrating its Fiftieth Anniversary of ARRL Affiliation. Among the points touched on in the document: amateur contributions to the advancement of technology, development of international good will, and provision of vital communications services in emergency.

David S. Lloyd, VE3AW

VE3AW is a pioneer amateur, holding Certificate of Proficiency - Amateur No. 1, granted in July, 1920, by the Department of Naval Services, and is a Life Member, ARRL. After retirement from business in 1967, Lloyd became active in training blind amateurs at the Canadian National Institute for the Blind and the CNIB Amateur Radio Club. Since then some hundreds of amateurs have been involved in the project as sponsors of blind students, converters of radio equipment, or donors of funds for equipment to be loaned to blind hams – some $65,000 has been gathered for this purpose! By December 20, 1971, there were 144 licensed blind amateurs in Canada, more than 1 percent of the total ham population.

Not only is the Medal of Service an honor for VE3AW, but it is a recognition of the value of amateur radio, especially for the handicapped, by the Government and people of Canada.

ARRL OPPOSES EIA PETITION ON 220

The League has filed its "Opposition to Petition For Rulemaking" in RM-1747, the Electronics Industries Association's request to take 220-222 MHz from the Amateur Service for a new Class E Citizens Radio Service. The timing of the document is unusual, in that the League customarily withholds comment until a "Notice of Proposed Rulemaking" has been issued by FCC. In part, the early filing was motivated by published statements that "FCC officials said amateur radio users are not greatly opposed to losing the frequencies because they are not used very much."

This last statement can be more effectively refuted if all amateurs currently at work on 220 MHz or actively preparing to operate there will furnish full details to the ARRL General Counsel, Robert M. Booth, Jr., W3PS, 1150 Connecticut Avenue N.W., Washington DC 20036. If and when a Notice of Proposed Rulemaking is published, W3PS will need more concrete facts to counter any such argument.

The text of the ARRL remarks follows:

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

In the Matter of	)	
Proposal to Amend Part 95	)	
of the Commission's Rules to	)	RM-1747
Establish a New Class E	)	
Citizens Radio Service	)	

To: The Commission

OPPOSITION TO PETITION FOR RULE MAKING

The American Radio Relay League, Incorporated, with more than 85,000 licensed amateur radio operators in the United States and Canada as members, by its General Counsel, respectfully requests (1) that the Petition of Proposed Rulemaking filed by the Electronic Industries Association, Industrial Electronics Division, Citizens Radio Section, on February 5, 1971, which proposes reallocation of 2 megahertz (MHz) of the 220-225 MHz band from the Amateur Radio Service to the Citizens Radio Service for use by proposed Class E stations, be denied or held without action, and (2) that the Commission issue a notice of inquiry inviting suggestions and proposals for increasing the efficiency and effectiveness of the Citizens Radio Service.

In support whereof, the following is respectfully submitted:

1. The Citizens Radio Service, established in March 1949 for the purpose of providing a personal and business communication service for those not eligible for licensing by other services,[1] is essentially a mobile communication service operating on frequencies allocated for mobile operation by the International Radio Regulations to which the United States is a signatory. In 1958, to encourage the growth of the service, the Com-

[1] Section 95.1 of the Rules describes the basis and purpose of the Citizens Radio Service as follows:

> These rules are designed to provide for private short-distance radiocommunications service for the business or personal activities of licensees, for radio signalling, for the control of remote objects or devices by means of radio; all to the extent that these uses are not specifically prohibited by this part.

Section 95.83(a) lists prohibited uses, including (1) "engaging in radio communications as a hobby or diversion, i.e., operating the radio station as an activity in and of itself." In a Report and Order, Docket No. 12987, released February 12, 1960, 19 RR 1548, the Commission again said that

> ....the Citizens Radio Service was created to provide a means of transmitting the substantive and useful messages related to either the business activities or personal convenience of private citizens who may not be eligible in any other radio service except the Amateur Radio Service . . . While it was contemplated that there would be unlimited possibilities for use, there was no intention to create a service paralleling the Amateur Radio Service nor was it intended that citizens radio stations be used as a hobby in itself, for technical radio experiments or for general "contacts" of a random nature. . . .

Bob Buus, WA2HVA, of Holmdel, New Jersey, won the August, 1971, *QST* Cover Plaque award with his article, "A Technique for Burst Two-Tone Testing of Linear Amplifiers." At left, presenting the award, is past Hudson Division Director Harry J. Dannals, W2TUK, now ARRL president.

mission reallocated the 26.96-27.23-MHz band from the Amateur Radio Service[2] to the Citizens Radio Service for a new class of stations (Class D) operating on 23 channels with maximum power output of 4 watts.[3] Problems encountered with the Class D service have been the subject of a number of rule making proceedings over the years,[4] and are well known to all licensees in the service and to the Commission. The almost universal use of amplitude modulation (a-m) transmitters with the resultant heterodynes,[5] use of powers in excess of the 4-watt output – 5-watt input permitted by Section 95.43,[6] engaging in hobby type communications including long distance contacts, ignoring the time limitations on duration of transmissions of Section 95.91(b), and widespread unlicensed operation have had the combined effect of severely limiting the efficiency and effectiveness of the service. The Class D service has been described as an "uncontrollable monster."

2. EIA's proposed solution to the Class D dilemma is to establish a new Class E service in a higher frequency band 2 MHz wide. Although both the International Radio Regulations and the Commission's Table of Allocations, Section 2.106 of the Rules, provide for mobile service in a number of vhf bands where long distance F_2 layer propagation is virtually non-existent,[7] the EIA appears not to have considered any such bands when looking for a home for the proposed Class E service. For example, the 216-220 MHz band is allocated by the Radio Regulations, Geneva, 1959, to fixed, mobile, and radiolocation services, and by the Commission's Table of Allocations (Section 2.106 of its Rules) to Government radiolocation on a primary basis and to the Industrial Radio Service (Part 91 of the Rules) for mobile telemetering only on a secondary basis.[8] Further, the 225-267 MHz band is allocated by the Radio Regulations for fixed and mobile service and by the Commission to Government service. Instead of proposing to use frequencies specifically allocated for mobile service, EIA proposes to appropriate 2 MHz of the 220-225 MHz band, which the Amateur Radio Service shares on a secondary basis with Government radiolocation, even though none of the 220-225 MHz band is allocated for mobile service by either the Radio Regulations or the Commission. It is this aspect of the EIA proposal which has prompted this opposition.

3. *The EIA proposal to reallocate 40% of the* 220-225 MHz amateur band for a new Class E citizens service apparently is based upon the fallacious premise that amateurs have little use for the band. The actual facts are that amateur use of the band is increasing rapidly with (1) occupancy of the 144-148 MHz amateur band already approaching the saturation point in heavily populated areas of the United States, e.g. the Los Angeles-*Southern California, the New York-New Jersey,* and the New England areas; (2) the increased use

[2] The primary allocation of the 26.96-27.23 MHz band was to the fixed and mobile services. The secondary allocation was to the Amateur Radio Service.

[3] Second Report and Order, Docket No. 11994, released August 4, 1958, 17 RR 1607.

[4] Report and Order, Docket No. 12987, released February 12, 1960, 19 RR 1548; Memorandum Opinion and Order in Docket No. 12987, released May 9, 1960, 19 RR 1554; Memorandum Opinion and Order in RM-169, released December 20, 1966, 20 RR 1128; Memorandum Opinion and Order, Docket No. 14843, released July 29, 1964, 4 RR 2d 1519; Memorandum Opinion and Order, Docket No. 14843, released March 1, 1965, 4 RR 2d 1538; Memorandum Opinion and Order, RM-661, 703, 1212, released April 29, 1969, 15 RR 2d 1613, Report and Order, Docket No. 18625, released Novemb er 21, 1969, 17 RR 2d 1663; Report and Order, Docket No. 18705, released April 27, 1970, 18 RR 2d 1814.

[5] Use of single sideband emission with reduced or suppressed carrier was clarified and expressly permitted by the Memorandum Opinion and Order, *Docket No. 14843, released March 1, 1964, 4 RR* 2d 1538.

[6] Advertisements of linear amplifiers with power inputs up to 1 kW appear in magazines directed primarily to the users of the Citizens Radio Service. Although the advertisements indicate that the amplifiers cover certain of the amateur radio bands, primarily the 28.0-29-7 MHz band, they seldom appear in the amateur radio journals and magazines.

[7] Most long distance communications on frequencies below 30 MHz are the result of reflection of the signal by the F_2 layer, the ionization density of which varies with solar activity, the highest frequencies being reflected at the peak of the 11-year sunspot cycle. The maximum usable frequency (muf) for F_2 reflection also follows other well defined cycles, daily, monthly, and seasonal, all *related to conditions on the sun and its position* with respect to the earth. The muf rarely goes above 50 MHz, and usually is much lower. At the present time, the muf is above the 26.96-27.23 MHz Class D band only for a few daylight hours each day. It is the F_2 layer reflection, and at times *sporadic-E layer reflection, that* makes possible long distance communications at times between Class D stations and causes long distance interference at times to Class D stations. – *The Radio Amateur's Handbook*, pp. 395-396.

[8] The mobile telemetering allocation was made only a few months ago after the EIA petition was filed. Report and Order, Docket No. 18924, adopted May 12, 1971, effective June 30, 1971, 21 RR 2d 1738.

The Okinawa Amateur Radio Club in December expressed their thanks to Ken Hinderleiter, K7HQF, of Phoenix, Arizona, for eleven years of phone patches at the rate of a thousand a month. Ken and his wife were invited to the island by the U.S. Assistant Secretary of Defense/Public Affairs, where Ken received an honorary membership in the club from Bill Countryman, KR6BL (right), while Gordon R. Hale, KR6RH, club president (left), and Mrs. Hinderleiter look on.

for control links for repeaters operating in the 144-148 MHz band; (3) what may be unique and little known propagation characteristics that differ from the propagation characteristics of the 144-148 MHz and 420-450 MHz amateur bands; (4) the recent availability on the market of high quality, low cost receiving and transmitting equipment for 220-225 MHz operation; and (5) the increasing availability of surplus equipment capable of modification to 220-225 MHz. It is expected that the entire 220-225 MHz band will be most heavily occupied by amateurs and virtually saturated in some areas of the United States within the next 5 years with further development of new techniques, operations, and services, and with changes in licensing policies and requirements now being considered by the Commission. For example, an explosive increase in vhf repeater operations, and their control by radio links, is inevitable just as soon as the Commission issues new rules now under consideration in Docket No. 18803.[9] The implementation of the provisions for the establishment of an Amateur Satellite Service created by the World Administrative Radio Conference held in Geneva just last summer (1971) may bring about a shift of present and future terrestrial operations from 144-146 MHz to 220-225 MHz. Amateur interest in television is increasing, but with no vhf spectrum space for operation with bandwidths from 3 to 200 kHz and higher except in the 220-225 MHz band. The elimination of knowledge of Morse code for operators on frequencies above 144 or 220 MHz, now being considered by the Commission, will attract a large number of technically minded persons to the amateur ranks according to the proponents of such rules. Retention of the entire 220-225 MHz band for the Amateur Radio Service is absolutely essential if the basic purposes and objectives of the service are to be realized in the years ahead.[10]

4. Another most important consideration overlooked by EIA is the reservoir of frequencies available for use by the Government in times of grave peril or disaster.[11] Past experience has proven that amateur operations can be brought to a halt within the matter of hours and that amateur operators, because of their high technical ability, operating skills, and dedication to adherence to law and regulation, will be available to actively assist the appropriate governmental authorities. On the other hand, there is absolutely no reason to believe

[9] In contacts with various members of Congress and Government departments and agencies, EIA spokesmen have stressed the economic benefits that would flow from the sales of a large volume of Class E equipment. Unfortunately, EIA has given little or no consideration to the volume of present and future sales of amateur equipment and the resultant impact on the economy. Even a casual glance at the League's journal, *QST*, and at various amateur radio publications will show a large number of United States manufacturers turning out vhf amateur equipment. It is common knowledge that an extremely high percentage of Class D citizens radio equipment sold in the last few years has been manufactured outside the United States, even though bearing the name of a United States manufacturer.

[10] Section 97.1 of the Rules is as follows:

Basis and purpose. — The rules and regulations in this part are designed to provide an amateur radio service having a fundamental purpose as expressed in the following principles:

(a) Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications.

(b) Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.

(c) Encouragement and improvement of the amateur radio service through rules which provide for advancing skills in both the communication and technical phases of the art.

(d) Expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts.

(e) Continuation and extension of the amateur's unique ability to enhance international good will.

[11] The entire 220-225 MHz band is available throughout the United States without restrictions for the Radio Amateur Civil Emergency Service (RACES). A 40% reduction in the band can only adversely affect such an all important emergency service.

The June, 1971, Cover Plaque Award went to Larry Lisle, K9KZT (right), for his article, "New Life for the All-American Five." ARRL Central Division Director Phil Haller makes the award. *(Photo by K9PKQ)*

that frequencies occupied by a Class E citizens service could be cleared in any reasonable period of time. Few technically skilled operators would be available as absolutely no technical or other knowledge whatsoever is required for a citizens radio license. There is no assurance that the history of unlicensed and otherwise unlawful operations in the Class D citizens band would not be repeated in a Class E service. The obvious advantages of retaining the entire 220-225 MHz band for the Amateur Radio Service must be weighed against the risks and dangers inherent in a reallocation of even a small part of the band to the Citizens Radio Service.

5. The radio spectrum is a priceless asset to the United States as well as to all peoples of the world. The policy of the United States has been to conform its domestic allocations to the international allocations developed so painstakingly by the nations of the world. If orderly use of the spectrum is to continue, the United States must lead the way. Operations in derogation of the Radio Regulations, as proposed by EIA, should not be authorized except under the most compelling circumstances.[12] No such circumstances now exist.

6. The League seriously doubts that the solution of the many problems of the Class D citizens service lies in the creation of a new class operating in another portion of the spectrum as proposed by EIA. What assurance is there that unlicensed operation will not be just as widespread in a new Class E service as in the present Class D service? What assurance is there that hobby operations in violation of the rules will not be just as widespread in a new Class E service as in the present Class D service? EIA gives none. Before other priceless spectrum space is made available for such uses and abuses, a reappraisal of the present Class D operations in the 26.96-27.23 MHz is a prerequisite. Any such reappraisal will undoubtedly prove that the principal reasons for the present Class D dilemma are (1) the use of a-m, (2) the limited number of channels, (3) the refusal of some operators to adhere to the Commission's Rules prohibiting hobby operations, (4) operation with powers far in excess of the permitted 4-watts output – 5-watts input, and (5) unlicensed operation. Long distance communication and interference from distant stations are minor, not major problems, and contribute little to the problems now existing.[13]

7. The solution to the Class D problems may be relatively simple. Consideration should be given to (1) requiring the use of only single sideband suppressed carrier emissions by an early date,[14] (2) requiring all equipments to be capable of instantaneous selection of either lower or upper sideband,[15] (3) incorporating in all transmitter sections an automatic timer to limit the length of transmissions, (4) incorporating in all transmitter sections an automatic digital call sign transmission device to operate at frequent intervals to assist the Commission in its monitoring and enforcement activities,[16] (5) requiring each manufacturer of linear amplifiers advertised in publications directed primarily to citizens radio operators to register the name and address of the purchaser with the Commission and to pay a fee with the registration to cover in-site inspection by a regular or contract employee of the Commission,[17] and (6) providing

[12] The effect of domestic allocations and operators in derogation of the Radio Regulations upon operations in neighboring countries must be considered most carefully. The Canadian Government has been requested by Canadian amateur groups to allocate frequencies other than in the 220-225 MHz amateur band to a new class of General Radio Service stations. It is understood that the 218-220 MHz portion of the 216-220 MHz mobile band has been suggested.

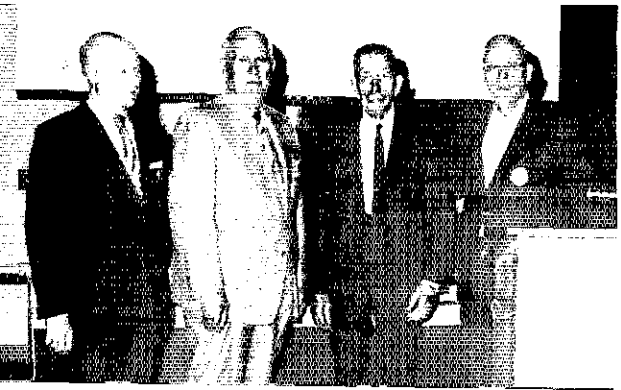
[13] Amateurs throughout the world make heavy use of the 28.0-29.7 MHz amateur band and are fully aware of the long distance propagation characteristics and openings in the 26.96-27.23 MHz citizens band. Over the entire 11-year sunspot cycle (see footnote 7, above), long distance propagation occurs during only a very small percentage of the total hours.

[14] A shift to ssb would eliminate the destructive heterodyne interference caused by a-m and would provide the boost to the economy relied upon so heavily by EIA. The effective date for mandatory ssb would be progressive by channels.

[15] The ability to select either lower or upper sidebands with suppressed carrier will greatly increase the number of usable communication channels.

[16] Only an extremely short burst would be sufficient. The manufacturer would be required to register the transmitter and identifying signal with the Commission in a manner similar to the registration procedure proposed by EIA. The license would show the identifying signal. The cost of this and other suggested refinements in techniques and equipment probably will be less than the cost of new fm 220 MHz equipment.

[17] Unless the purchaser is an amateur operator licensed to operate in an amateur band covered by the amplifier, the inspector would apply a seal to prevent further unauthorized use and the Commission would initiate appropriate action. A variation would require the manufacturer to apply a seal with instructions that it not be broken until after inspection.



Old Timers Night at the Dayton Amateur Radio Association (sponsors of the famous Hamvention coming up on the 22nd of this month): Wesley G. Duckwitz, W8IPT, vice president DARA; Al Michel, W8WC, ARRL Great Lakes Director; Old Old Timers Club President Andrew L. Shafer, W8TE; and William G. Biddle, K8UZ, club historian.

additional channels by expansion on one or both sides of the present 26.96-27.23 MHz band.[18]

8. A notice of inquiry inviting suggestions from all interested persons and parties as to how to improve the efficiency and effectiveness of the Citizens Radio Service appears to be the most practical and expeditious way to proceed. If the notice is broad and is given extensive publicity in citizens radio publications and the manufacturing industry, many worthwhile suggestions most assuredly will be received. Suggestions beyond those set forth in the preceding paragraph most certainly will be received. Consideration of establishment of a new service in higher frequency bands should be considered only after such a broad and sweeping analysis of the present Class D service has been made. The notice should provide at least 90 days to permit widespread publication.

Wherefore, the premises considered, the Commission is respectfully requested to (1) deny or hold without action the Petition of Proposed Rulemaking filed by the Electronic Industries Association on February 5, 1971, and (2) issue a notice of inquiry inviting suggestions and proposals for increasing the efficiency and effectiveness of the Citizens Radio Service.

Respectfully submitted,
THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED
225 Main Street
Newington, Connecticut 06111
By Robert M. Booth, Jr.,
Its General Counsel
1150 Connecticut Ave., N.W.
Washington, D.C. 20036
February 16, 1972 QST

18 The Radio Regulations, Geneva, 1959, allocate 26.1-27.5 MHz to fixed and mobile services. The Commission's Table of Allocations (Section 2.106) allocates 26.1-26.48 MHz to the land mobile for use by remote pickup broadcast stations, 26.48-26.95 to land and mobile Civil Air Patrol Stations, 26.95-26.96 to the International Fixed Public Service, 27.23-27.28 to fixed and mobile, and 27.28-27.54 MHz to land mobile in the Industrial Radio Service. It is believed that little use is made of these bands at the present time. New channels can be made available in relatively short time for use only by ssb transmitters equipped with timers and automatic digital identification. With ssb equipment already on the market, only relatively minor modifications, including crystals for new channels, can provide the relief sought by EIA in a matter of months and at less cost than development and manufacture of 220 MHz equipment.

Strays

Typo. of the week (W7PBV SCM report for Jan.) "SAROC has been proclaimed by exhibitors and delegates as the number one convention and is now registered with the U.S. Patient Office."

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

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.

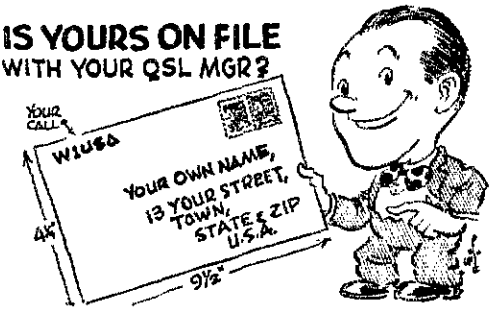
Cards for stations in the United States and Canada should be sent to the proper call area bureau listed below. Recent changes are in bold face.

W1,K1,WA1,WN1[1] – 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.
WA4,WB4,WN4[1] – 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,WN6[1] – No. California DX Club, Box 11, Los Altos, CA 94022.
W7,K7,WA7,WN7 – Willamette Valley DX Club, Inc., P.O. Box 555, Portland, OR 97207.
W8,K8,WA8,WB8,WN8[1] – 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.
WØ[1] – Reggie Hoare, WØOYP, P.O. Box 115, Mitchellville, IA 50169.
WAØ[1] – Lloyd Harvey, WØQGI, P.O. Box 7, Attica, IA 50024.
KØ,WBØ,WNØ[1] – Dr. Phillip D. Rowley, KØZFI, 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, CZ.
KH6,WH6 – John H. Oka, KH6DQ, 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 663, 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, VE5JI, 2328 Grant Road, Regina, SK.
VE6 – D. C. Davidson, VE6TK, 1108 Trafford Dr. NW, Calgary 47, AB.
VE7 – H. R. Hough, VE7HR, 1291 McKenzie 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.

[1] These bureaus prefer 5 × 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.



I.A.R.U. News

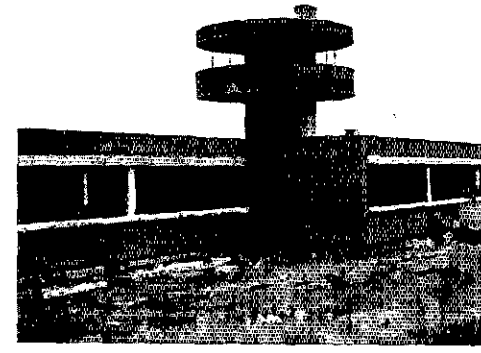
INTERNATIONAL AMATEUR RADIO UNION, THE GLOBAL FEDERATION OF NATIONAL NON-COMMERCIAL AMATEUR RADIO SOCIETIES FOR THE PROMOTION AND CO-ORDINATION OF TWO-WAY AMATEUR RADIO COMMUNICATION

REGION 1 CONFERENCE

IARU member societies in Region 1 (Europe and Africa) will meet at Scheveningen, Holland, commencing May 15 for their triennial conference. The four-day meeting, hosted by the Dutch society *VERON*, will deal with many amateur radio organizational matters of both regional and worldwide concern. During the period of the meeting, a special amateur station will be in operation from the Hotel Kurhaus, the conference site.

The conference will be opened by International Telecommunication Union Deputy Secretary R. E. Butler. Region 1 Secretary G2BVN reports that since taking office at Geneva in 1968, Mr. Butler has given every encouragement to the representatives of amateur radio. He has participated each year in the convention organized by the International Amateur Radio Club, whose station 4U1ITU is located in the ITU building. Before coming to Geneva, Mr. Butler served as Assistant Director-General of the Australian Post Office. He is well known in the field of telecommunications, having participated (as deputy leader of the Australian delegation) in the ITU Plenipotentiary Conference, Montreux, 1965, and UN Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 1968, and also participated in the negotiations which led to the agreements for the International Telecommunications Satellite Consortium.

JA8IOC operated from Sapporo, site of the 11th Winter Olympic Games. The commemorative QSL shown was provided by W1MLM, NBC vice president for sports affairs and first U.S. amateur licensed to operate the special *Japan Amateur Radio League* station.



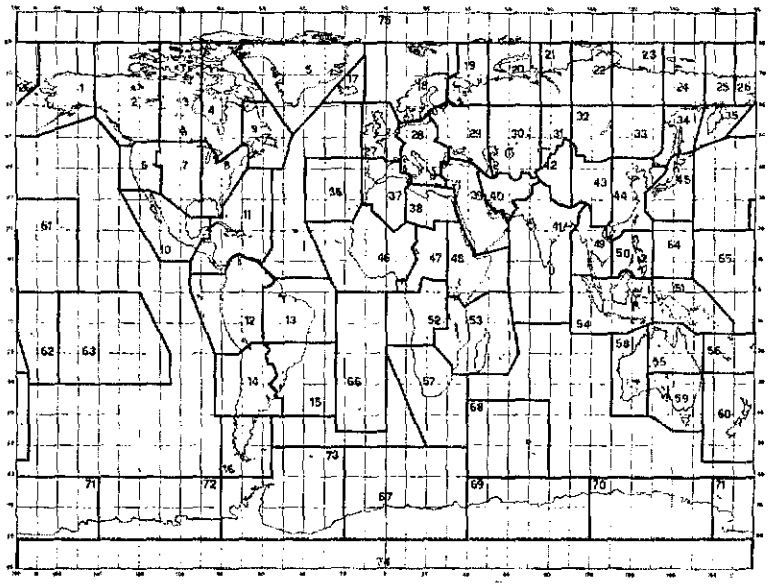
The new home of the *Deutscher Amateur Radio Club* is shown in construction. As the society's headquarters takes on a new look, their official publication acquires a new name, *CQ-DL* (formerly *DL-QTC*) with the January 1972 issue.

NOTES

The *Jamaica Amateur Radio Association* reports that the licensing of Americans under the new reciprocal agreement is going along well. *JARA* requests, however, that applicants allow a minimum of six weeks processing time after filing application with the Post & Telegraphs Department.

Updating the "QSL Bureaus of the World" listing which appeared in the December 1971 column, we have the following new addresses: *Rwanda* – RAR QSL Bureau, Box 663, Kigali. Kenya – RSEA QSL Bureau, P.O. Box 30077, Nairobi. *Australia* – VK4 QSL Officer, P.O. Box 638, GPO, Brisbane, QLD, 4001; VK5 QSL Bureau, c/o George Luxon, 27 Belair Rd., Torrens Park, SA, 5062; VK7 QSL Bureau, P.O. Box 371D, GPO, Hobart, TAS 7001; VK8 QSL Bureau, c/o R. Jones, 23 Landale St., Box Hill, VIC 3128. France – REF QSL Service, BP 70, 75 560 Paris Cedex 12.

The *Experimenterende Danske Radioamatorer* is interested in discussing extended licensing reciprocity with the Danish authorities, and would like to hear from any amateurs who have been refused a license in Denmark. Correspondence should be sent to *EDR*, PO Box 79, 1003 Copenhagen K., Denmark.



World-wide International Telecommunication Union zones as shown in map are used for scoring in the World Telecommunications Day Contest sponsored by the Brazilian Ministry of Communications (see Operating Events, page 105).

DX OPERATING NOTES

Reciprocal Operating

(Bold face type indicates changes since last list.)

United States reciprocal operating agreements exist only with: Argentina, Australia, Austria, Barbados, Belgium, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Finland, France*, Germany, Guatemala, Guyana, Honduras, India, Indonesia, Ireland, Israel, Jamaica, Kuwait, Luxembourg, Monaco, Netherlands*, New Zealand, Nicaragua, Norway, Panama, Paraguay, Peru, Portugal, Sierra Leone, Sweden, Switzerland, Trinidad and Tobago, United Kingdon*, Uruguay, and Venezuela. Several other foreign countries grant FCC licensees amateur radio operating privileges on a courtesy basis; write League headquarters for details.

Canada has reciprocity with: Belgium, Bermuda, Dominican Republic, France, Germany, India, Israel, Luxembourg, Mexico, Netherlands, Nicaragua, Norway, Peru, Portugal, Senegal, Sweden, Switzerland, United Kingdom, U.S., Uruguay, and Venezuela.

Third-Party Restrictions

Messages and other communications – and then only if not important enough to justify use of the regular international communications facilities – may be handled by U.S. radio amateurs on behalf of third parties *only* with amateurs in the following countries.** Argentina, Barbados (only U.S. stations /8P), Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Greenland (XP calls only), Haiti, Honduras, Israel, Liberia, Mexico, Nicaragua, Panama, Paraguay, Peru, **Trinidad & Tobago,** Uruguay, and Venezuela. Permissible prefixes: CE CM CO CP CX EL HC HH HI HK HP HR LU OA PY TI VE VO W or K/8P XE XP YN YS YV ZP 4X 4Z and 9Y4. Canadian hams may handle these same type third-party messages with amateurs in Bolivia, Chile, Costa Rica, Dominican Republic, El Salvador, Honduras, Israel, Mexico, Peru, U.S., and Venezuela. Permissible prefixes are: CE CP HI HR K OA TI W XE YY YV 4X and 4Z. QST

* Agreement includes overseas entities.

** By special agreements, third-party traffic is also permissible with Australian amateurs for traffic regarding amateur satellites, and with 4U1ITU.

At the recent *ARRL* Southeastern Division Convention are (from left) TG9MP, Sociedad Internacional de Radio Aficionados president WA4ZZG, IARU president WØDX, YN1JMA, and SIRA secretary HK3CAB.

Correspondence From Members-

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

ORIGIN UNKNOWN

● I would be delighted if someone would disclose, through *QST*, the origin of the term "HAM." I have been one for about four years, but haven't been able to ascertain exactly what the true definition is of that which I profess to be, nor have I found a bona fide solution to my question from other "HAMs" contacted. — *Jack Myers, WB6WGX, China Lake, CA*

[EDITOR'S NOTE: We would be delighted to disclose the origin of the word "ham" if we could find a bona fide source. There have been a number of stories (including one very clever and complicated one involving the first initials of three names, Hyman, Almy, Murray: in case you run into this story, it doesn't check out!). It seems fairly certain that when "ham" was first applied to amateurs, it was not complimentary, being applied by old-time landline telegraphers to inexperienced Morse operators. The passage of time has changed all that, and now the term means a licensed radio amateur — and that is complimentary, indeed!]

LOWERING THE PRICE

● My letter in January "Correspondence" ("The *Price of Admission*") *was very poor because it was* emotional rather than logical. For this I apologize. I don't know why you would publish a letter from a nut in the first place! Seriously, I do think I have a couple of valid points; and I will try to present *them logically.*

I have been in CB since 1969 and a ham since 1970. Most of the CBers I have met have been very interested in amateur radio, but they have told me they would not try to become a ham because (1) the exam was too tough (especially were they frightened of the code), or (2) they were discouraged from becoming a ham because of the ham's purported antagonism toward CBers. It does seem there is some factual support for this latter charge. It appears to me that as amateur radio can always use new members it is foolish for hams to assume an attitude which cuts off the best source of this *new membership — CB radio. Most of the CBers I* know are law-abiding. It is a very small minority that causes a majority of the trouble. . . . — *Benny R. Copeland, WB5BCA/KBX4026. Denton, TX*

● . . . 220 MHz CB? NO! I say! The 11-meter band was given up several years ago for their use or misuse, whichever term you like. It seems to us that misuse fits, since more skip is worked in one night on "11" than on 10 meters in a month!

A recent publication is calling for increased antenna height and other changes to help CBers cause more "air polution." FCC should clean up the mess that has been made rather than spreading it elsewhere. . . . — *Clayton Brantley, WB4UKF, Clinton, TN*

● . . . About the ARRL's opposition to 220-MHz CB, I think the September 1971 editorial sums this up very well. But this also brings back the part concerning qualified radio operators. Try listening to 11 meters sometime! And also on *QST's* "snide remarks" about CBers — I wonder if *Dr. Copeland reads CB-oriented magazines and the* snide remarks about hams. . . . *Jeffrey Brooks, WN8KEW, Kalamazoo, MI*

● Copeland, "No Restrictions," radio as a hobby without a set of restrictive admissions requirements is a good example of 27 MHz today, particularly in this geographic area. There appears to be no regard for regulations, simple as they are, on Citizens Radio Service. In this locality DX100s, Valiants, 32V3s, and 500- to 1000-watt linears are common. There is no regard for frequency tolerance, proper call signs, good operating practices or even obtaining a license. The word illegal seems to have no meaning on 27-MHz Citizens Radio Service.

The industry caught the FCC napping when they promoted 27-MHz CB with the thought in mind of increasing their income. The FCC now has a "tiger by the tail" on 27 MHz which they cannot control. I am confident FCC will not make the same mistake twice without remembering what happened the first time a proposal of extending *Citizens Radio Service was approved.* — *Wm. M. Coopman, K9CHZ, East Moline, IL*

● After reading the cocky note written by WB5BCA, something exploded inside of me. Although I have been a ham for less than one year, I feel sure that Mr. Copeland has the wrong idea about ham radio and I believe that the League is better off without him. . . .

As for CB, it was designed to be used for business and inter-group communications, not for general rag-chewing. And as for his opinion of the "snide remarks" about CBers in *QST*, I'm not sure *that they don't deserve them with as much illegal* CB operation as there is today. I know of quite a few CBers with a "kilowatt" in the attic. . . . — *Ty Garland, WN4VUB, Tazewell, VA*

● I am against CB getting the 220-MHz band because I do not think CBers deserve the rights and privileges of the hand. The CB laws are the most violated radio laws around. CBers operate above power limits, use improper language, operate skip, operate without a license, use improper calling procedure, not using call signs, etc. An example of breaking the rules was shown in "League Lines" on page 10 in December, 1971, *QST*. Here more than 20 people were indicted for violations of FCC *rules. So I can understand why anyone would* make "snide remarks" about CBers. . . . — *Edward A Urbanik, WN3QLG, West Chester, PA*

● EIA's proposal is purely for profit and when I *listen to the CBers, they don't need more space but* better habits. Just to think of it makes me shudder. There would be so much bedlam on the bands that it would drive everyone that knows the old amateur bands off! Anyone who wants to operate the frequencies without any restrictions or tests to prove his efficiency at operating is just plain lazy and has no incentive to operate at all! — *Douglas E. Bosco, WN9GPS, Chicago, IL*

● After reading Benny Copeland's letter in the January *QST*, I wondered if he thinks the rivers and streams belong to the citizens to do as they please. This attitude has caused our waters to become polluted just as the Citizen Band frequencies have. With stricter laws and self-policing we might clean up both. – *William Robert Cooper, WN9HVJ, Carthage, IN*

● I agree completely with the League's stand on 220-MHz CB. Anyone that has listened to the utter chaos on the present "citizen's band" will probably agree that the original purpose of the band has been lost. I once tuned in 27 MHz and heard a guy bragging about his 5-kilowatt linear. Rather than create a new place for confusion, the FCC should spend more time cleaning up the miserable mess on 11 meters! – *Bruce Baker, WN7SBP, Boise, ID*

[EDITOR'S NOTE: We appreciate the flood of comments taking strong issue with the proposal to lower amateur standards, including those from WA3LTA, WA5WDB/0, WB6MKV, WN6IHE, K7DCC/3, WA7RBC, W7FNE, WB9CYY, and WN9s HHW, HWE, and HXD, for which there simply isn't enough space.]

LINGERING RESULTS!

● Glad to see hams experimenting with organic semiconductors as in "The Eyes Have It," by Lew Fitch, W4VRV (January *QST*). I tried much the same thing recently with a garlic clove. I didn't get anywhere near as much gain, but the effects lasted longer. – *Gene Hartquist, W8JTZ, Columbus, OH*

BACK IN THE FOLD

● W3RXM is back after about 10 years off the air. In January I went down to Philadelphia and passed (to my surprise) the General, Advanced, and Extra. Hadn't touched a bug for ten years or so but after a few night's listening on 3520 kHz, the dits and dahs came back. Thanks for W1AW's code practice. – *Al Bienert, W3RXM, Elverson, PA*

FILLING THE GAP

● In January "Correspondence," letters from W7FNE, W5DVL, and K6RY were critical of the nature of present *QST* articles. Their comments were typical of many this writer has heard over the years. These gentlemen are evidently missing a critical point. Although the League has a technical staff, *QST* is not totally its creation. Rather than simply a magazine, *QST* is essentially a membership Journal and as such depends upon League members for contributions. While the Hq. technical staff can generally respond to popular trends, staff time is limited by editorial chores and they cannot be expected to generate an "intelligent research" type article every time some ham requests it. This is equally the responsibility of the membership, including the critics mentioned above. If a reader finds the journal lacking in an area, he should investigate that area and fill in the gap himself. Similarly, those experimenters who are doing unique and innovative work should realize that any knowledge they might gain is useless unless it is communicated. – *Wes Hayward, W7ZOI, Beaverton, OR*

● I agree with K6RY's point made near the end of his letter concerning the lack of beginner-oriented articles.

ARRL bemoans the trend to appliance operating, yet for the whole of 1971, only one *QST* article dealt with an easy-to-build Novice transmitter ("A 10-Watt, One-Tube Transmitter," March, 1971). With inspiration like this, what else *can* a beginner do but become an "appliance operator"? – *Edward P. Swynar, VE3CUI, Oshawa, Ontario, Canada*

[EDITOR'S NOTE: He can, as we recommend, choose from a multiplicity of beginner equipment designs in *How to Become a Radio Amateur* and *Understanding Amateur Radio*.]

● I find myself much disturbed by the letter from W7FNE for two reasons.

First, he feels that *QST* should print only what he wants, with utter disregard for the wishes of the rest of the membership. Secondly, he appears to want to establish a generation gap, something we in amateur radio can certainly do without. By the following deductions I must conclude that he is a youngster: his reference to nostalgia as senility, the *Callbook* seemingly to indicate that he is not the original holder of the call, and that he needs the type in *QST* to be large like an infant's picture book.

Let me state that I am 71 years old and first joined the League over 50 years ago. My aging eyes have no difficulty with the *QST* print. I read and enjoy "Beginner and Novice" as well as the nostalgic items, although the first thing I turn to each month is "Silent Keys" to see if I have lost any old friends along the way. As a Boy Scout Radio Merit Badge counsellor over 25 years, I have been close to many youngsters and have helped most of them through Novice and General. There are times when my shack looks like Boys Town. But I am proud to have helped in my own little way to keep the so-called generation gap closed.

I don't necessarily read everything in *QST*. But it has always had something for everybody even though it is not easy to please everyone. But some day, with the grace of God and my prayers, Ben will become an Old Timer. He will then learn how pleasant it is to sit back and reminisce on the "good old days," like when they used to transmit with something called single sideband. And that won't be senility. – *Ernest C. Mann, W2MTD, Brooklyn, NY*

POETIC LICENSE?

● After reading "The Ham in Hamlet" (page 58, February, *QST*), with great interest, I noticed that the author's theory had one inconsistency. In his translation of Hamlet's famed line, "To be, or not to be," as "Tube, or not tube," he wrongly assumed that "To be" was originally meant as one word. Of course, Shakespeare wasn't all that bad at spelling. Also, as is commonly known, tubes are called valves in England. My own translation is "Two B, or not Two B." Obviously, he was debating what kind of receiver to buy. – *Jeffrey Mogul, WN1PAZ, Newton, MA*

● "Tube or not tube –," indeed!

"It is a tale
Told by an idiot, full of sound and fury,
Signifying nothing."

Macbeth (V,iv)

– *Gabriel P. Rumble, K4JL, Forsyth, GA*

The World Above 50 Mc.

CONDUCTED BY BILL SMITH,* KØCER

Tropo and CAT

MANY TYPES of weather conditions produce extended coverage on the vhf/uhf bands. Most are well understood and predictable, but some are not. Ray Nichols, W5HFV, of near Tulsa, Oklahoma, spends many hours observing 144 MHz and has some interesting theories on what may produce tropo-type signals from highly localized areas over short and long paths. As we approach warmer weather and a return to more favorable tropo conditions, it may be interesting to explore Ray's theories and how they may coincide with a hazard to aviation called "clear-air turbulence" or CAT.

CAT refers to very small areas of severe turbulence that develop in otherwise clear, smooth air. Having apparent sharp boundaries, CAT is capable of flipping an aircraft upside down or tearing it apart, and is a possible explanation of air crashes otherwise unexplained. Predicting these areas seems impossible, although aircraft radar apparently detects some CAT. Obviously the aviation industry wants to learn more about CAT. Not being predictable, its usefulness as a propagation mode is limited, but CAT might explain some rare propagation encountered on our vhf/uhf bands. W5HFV's thinking is that if the boundaries of CAT are as sharp as they appear, the bottom surface might act as a reflector. Ray writes the following.

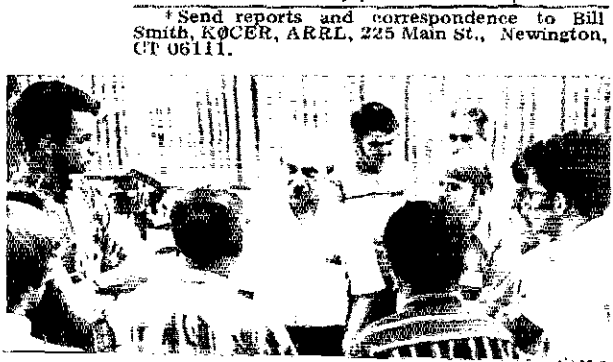
On February 4, 1967, we had what I call "extended local" conditions. Low-powered signals out to 150 miles or so were fair. I worked WA5JYK, Houston, who runs fairly high power, but heard no other DX signals and conditions to the south were not really good. A short time later I heard a loud CQ from W5VUY, about 40 miles SSW of Baton Rouge, some 460 miles from Tulsa. He was running no more than 8 watts. Except for the contact one hour earlier with WA5JYK, and at about the same distance, no other unusual signals were heard. From close observation of 2 meters for several years, averaging well over 1000 hours per year, I can say that the general conditions that evening were only slightly above normal and that this was a case of a very peculiar limited path.

The next case is much more obvious and was the one which really started me wondering about an explanation for such events. In June, 1967, I began a series of nightly schedules with W8TIU, Michigan, at 0230 GMT running two 3-minute sequences each way. For over one month we heard the usual random meteor pings and short bursts over the 825-mile path. Then on July 6, at 0246, near the end of his second sequence, his signal abruptly came in quite loud. Thinking it was a meteor burst, I quickly sent calls, a report, and broke. W8TIU calmly came back and asked what happened. We kicked it back and forth several times and after ten minutes he signed to meet another schedule. Neither of us heard anything else unusual that night. The signals did not exhibit the characteristics of a meteor burst, but were more like tropo. There was some QSB, but not fast and regular Fresnel zone fading. The abrupt signal development is indicative of something small but intense, moving into the right position between us.

My interest fully aroused by then, I continued to run as many schedules as possible and spent much time monitoring and calling CQ in all directions. Of course, this is not very productive, even if these paths develop, unless this sort of activity is widely practiced.

The next outstanding example was a May 23, 1968, contact with the late W5MCC at Galliano, La., about 50 miles southwest of New Orleans and 575 miles from me. A note in my log says W5ML and someone else in northwestern Louisiana were heard weakly at 0110 GMT in local QSO, but I was unable to break them. The distance to W5ML is about 280 miles. A number of CQs brought no response, and no other signals were heard until, at 0133, a loud CQ from W5MCC. We worked until 0151 when Ben asked that I listen above 145 MHz for several well-equipped stations in his area. I spent the next 1-1/2 hours listening, but nothing was heard. There is no actual proof of a sharply defined path because there was no opportunity to schedule a station a few degrees to the left or right, or closer or farther than W5MCC, but the odds against a total lack of other activity are great enough to make it circumstantially a very convincing case.

But now study carefully, with the aid of a map, what I consider the outstanding case, and the real "clincher." In August, 1968, I began routine evening schedules with WA8TYF in Cincinnati. As with W8TIU, we heard the normal meteor activity scheduling between 0220 and 0230 GMT. On August 29, at 0200, I ran a 15-minute schedule with K2HLA. I don't know if WA8TYF was listening or not. If so, he heard nothing worth telling me. At 0218 I caught what I thought was a meteor burst, "WA9QKB de W8IDU." I logged it



Always a focal-point of vhf gatherings, Mel Wilson, W2BOC/W1DEI, talks his favorite subject, sporadic *E*. Mel is the winner of the ARRL's 1971 Technical Merit Award. *(WBØAFL photo)*

*Send reports and correspondence to Bill Smith, KØCER, ARRL, 225 Main St., Newington, CT 06111.

What would appear to be elements in this WA6HXW EME array are actually 6-foot booms, 32 of them, each with 11 432-MHz elements. Harley (left, WB6MQG, right) has heard his own echoes solidly for two hours at a time, and is looking for 432-MHz EME schedules. More on the antenna and feed system in an early issue.

as I normally do such things and then ran the schedule with WA8TYF getting only normal results. Afterwards on 75 meters I happened onto W8IDU talking with several of the vhf gang and told him what I had heard. He said his beam had been west, but that he would look southwest for me. It had been 45 minutes since I had first heard him on 144, but by the time I turned up the gain on the 2-meter receiver, there was W8IDU, quite loud, calling CQ. At 0310 we worked, 549 both ways. Art then tried to work WØDRL, Topeka, who had been listening on 75, but called me again in a few minutes to report nothing heard from Kansas. We signed at 0335 and went back to 75 meters. Art and I were the only ones hearing anything on two as far as we could determine, though other 2-meter operators were involved in the QSO on 75 and must surely have checked 144.

From Tulsa to Cincinnati it is 674 miles at 69 degrees, Tulsa to Carsonville is about 750 miles at near 69 degrees, and from Topeka to Carsonville is about 750 miles at near 69 degrees. The four points form a near parallelogram. The several attempts made show no path along either side of this long rectangle, but a path along the diagonal for nearly 1-1/2 hours. Why?

It is both intriguing and challenging to me, and I hope to others. Get on, listen, and call.

That is W5HFV's story. He would like to hear from others having similar experiences. Certainly some interesting happenings go unreported because "who would believe them?"

W2BOC Wins Technical Merit Award

Melvin S. Wilson, W2BOC/W1DEI, of Pittsford, N.Y., was selected winner of the 1971 ARRL Technical Merit Award at the annual ARRL Board of Directors meeting in January. Wilson won the recognition for his study of *E* propagation extending over more than 35 years. During that time, W2BOC has been a frequent contributor to this column and has authored *QST* articles on *E*. The most recent appeared in the December 1970 and March 1971 issues.

A complete review of Mel's work and accomplishments would require this entire column, at least. In short, he has contributed much and has won the admiration of the vhf fraternity everywhere. W2BOC is in demand as a speaker at vhf gatherings throughout the country where his soft-spoken presentations hold audience attention.

The ARRL award is Mel's second of 1971. In August the Central States Vhf Society gave him its John T. Chambers, W6NLZ, Memorial Award.

Congratulations Mel!

The ARRL Board and Vhf

The League's Board of Directors took several actions of importance to vhfers at the annual meeting in January. One was a vote to petition FCC to permit Technician, Conditional, and General Class licensees to use cw in the 50- to 50.1-MHz segment of the 6-meter band. Presently cw operation in this segment is reserved for Advanced and Extra Class licensees.

The Board also voted to establish a special committee, under the direction of ARRL's new president, W2TUK, to "plan, guide, and coordinate" the growth of the Amateur Satellite Service created by the 1971 World vhf beacon stations.

In other action, the Board said that the Vhf Repeater Advisory Committee should prepare recommendations establishing regional frequency coordinating committees and that the General Manager investigate establishing Vhf beacon stations.

And the Board formally recognized Edward P. Tilton, W1HDQ, for his more than 25 years service as Vhf Editor of *QST*. Ed, by the way, is scheduled to retire from Headquarters later this year.

Editor's Note

With this column we begin our sixth year as editor of "The World Above 50 Mc." Our first column appeared in the April, 1967, issue of *QST* and since then, more than 8000 pieces of correspondence have been handled in preparation of your column.

Much credit is due my wife, Betty, WBØAFL, for her time helping with correspondence and copy, and to W1HDQ at Headquarters. While the editorship of this column is not a fulltime occupation, without their assistance, preparation would be difficult.

And to you who have contributed, both information and criticism, to help fill these pages monthly with timely material — thank you!

OVS and Operating News

50 MHz was not too productive during early 1972, but the summer *E* season is just around the corner. Around the country by call area, W1HDQ, Conn., says there was good *E* into Florida Jan. 16. K1GYT, Vt., caught the same opening, also hearing 5s and 8s. January 30, Andy heard KP4s briefly and the following day worked VE1 to Florida during a 1-1/2 hour opening. K1GYT noted aurora Jan. 11 and 30. WA1DFL, Mass., likewise reported the Jan. 16 and 30 *E*. WB2IHL, N.J., had his first taste of *E* Jan. 19 working Florida. WB4BND, Miami, called the Jan. 16 session "a dandy" as Hoppy worked all call areas except 6 and 7 for five hours. Hoppy caught other openings on Jan. 28 and 29, working 3s, 4s, and 8s.

Ray Clark, K5ZMS, San Antonio, ex-KR6RI, worked *E* Jan. 6, 12, and 27, mostly 4s and 8s. Ray looks for scatter contacts days on 50.11.

WB6FVO, Culver City, worked Oklahoma and New Mexico Jan. 13. K7ICW, Las Vegas, caught the Jan. 13 *E* and another the 9th, both to 5s.

Other *E* reports covering December openings were received from WA5IKU, WA5IYX, K5ZMS, K9OXY, WB9EDP, and WAØZLL.

Tom French, KG6JBG, writes from Guam that he worked Japanese stations Nov. 25, 27, and Dec. 18. He is active between 0300 and 0500 GMT daily, but says there is no Guam 2-meter activity.

VK5ZNJ reports from Australia 16 beacon stations operate 50 MHz in his country and elsewhere in the Pacific. Steve also lists eleven 144-MHz beacons in Australia and New Zealand. Anyone interested in the list may write KØCER. Steve says many VK stations now operate ssb, but use transceivers so they must be worked on their own frequencies. Popular down-under frequencies are 52.01, 52.20, and 52.525.

A well-known 6-meter man of the 1960s was killed December 27 in a Thailand auto accident. He was Bill Vestal, KØIJJ, of Grain Valley, Mo. Bill had been in Thailand since 1969 working on the Southeast Asia scatter circuit. KØIJJ was an avid vhf contester and several times led Midwest Division scoring. Bill was the brother of Mike Vestal, WØYZS, active on 432.

144-MHz news this month is headlined by recent moonbounce activity. VE7BQH, Vancouver, worked VK3ATN, Australia, early the morning of January 1, giving Lionel his first VK on 144. K6MYC worked VK3ATN at the same time. In addition to the VK, Lionel worked KØMQS three times in December, had many contacts with SM7BAE, Sweden, and heard signals from F8DO, France, and DK1KO, Germany. This is 2 meters? SM7BAE and DK1KO reported hearing meteor scatter of VE7BQH's EME signal, but Lionel says this is not uncommon when antennas are pointed on the horizon.

K6MYC also heard something from DK1KO's four small Yagis, but could not get a signal report exchanged. Mike did work the same stations as VE7BQH, and ran schedules with K5PJR and K5BXG, both Oklahoma. K5PJR runs 850 watts and 40-element collinear. K5BXG was using the 44-element Yagi array pictured last month. Mike says he may be able to work both Oklahoma stations with the aid of ground-reflection gain.

DL3YBA, Germany, reportedly is getting good echoes. ZL1AZR, New Zealand, expects to be active again later this spring with an array of long Yagis, and W6UOV should have his 160-element collinear system operational at this time.

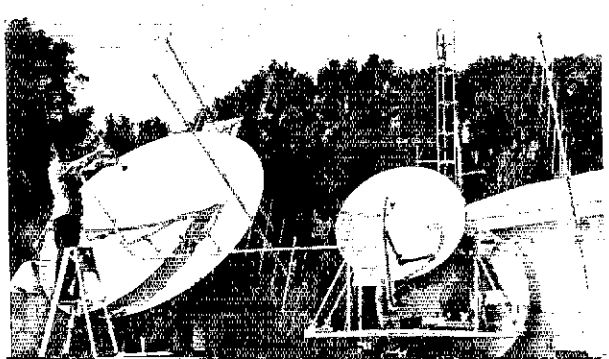
Still on the topic of DX, XE1XA writes from Mexico City that he ran December Geminids schedules with W5WAX and K5BXG, both Oklahoma, and while no contacts were made, he did hear both stations. XE1PY participated in the schedules. Max says a group of Mexico City vhfers plan some "volcano topping" this summer to Nevado de Toluca, a 14,000-foot volcanic peak about 80 miles from Mexico City. Stateside stations interested in schedules should write XE1XA.

VE2DFO updated his 2-meter activity, adding 3 states to his total, reaching 33 worked. Over the past several months Don has done much meteor scatter work keeping schedules with KØMQS. In four months of Saturday and Sunday morning schedules they had 44 contacts for a 95 percent completion rate. Don says scatter results on 2 meters out to 1000 miles are similar to 50 MHz, if high power and large antennas are used. Hourly random counts on KØMQS were typically 100 and sometimes near 200. Shower activity reduced the count but added longer bursts. Results between VE2DFO and WØLER, Minneapolis, were similar. Also from Canada, VE3DSS says K4IXC, Florida, has an excellent scatter signal into Toronto on Sunday mornings, and that VE3DXJ is active with 600 watts and a 15-element Yagi. Dana says the Toronto gang are planning an all-out effort for the June contest.

Lance, WA1JXN/WA3GPL, continues active from both his school location in Vermont and at home in Pennsylvania, from where he has 21 states worked. He has 15 worked from Vermont, where he runs 600 watts and a 15-element Yagi. WA2PMW reached 22 worked on a fall tropo contact with W4LSQ, Alabama. K5ZCO, Dallas, reports Jan. 23 tropo to Alabama, Missouri, and states in between. Steve, WN6HOC, Burbank, says he likes to build his gear but finds contacts difficult in the Novice segment of 144. He expects to have his Technician license soon. Kelly has retired K2ZAT/8 in favor of W8KPY and now has 41 states worked from Dayton, to top all 8s in states worked on 144. He is working on an array of eight 13-element Yagis for summer moonbounce activity. K9KQR recently finished an amplifier similar to that in February, 1971, *QST*. Dick says it worked fine on the first test. WØRLI, Minneapolis, reported short-haul aurora Jan. 12, 23, and 29, but all under 300 miles. Hank has 31 states worked on 144.

What happened to all the other 2-meter reporters this month?

220 MHz, according to K4GGI/1 and K9AQP/1, is again approaching activity levels of 5 or 6 years ago in the northeast. K4GGI/1 says he thinks the League is right in promoting the development of 220 fm as the quickest way to build activity and take some of the pressure off 2 meters. K1OJR, Mass., is now running 10 watts but plans higher power soon. Paul says other Mass. stations active on 220 include W1QXX, W1OOP, W1GAN, K1MUC, K1SRZ, W1JVL, and WA1IED. WA3MCK, Philadelphia, is working on a 6360 rig. W4UCH has converted a Hallicrafter HA2 to 220 and has worked 9 states. Bob says the conversion is simple, and he will furnish details for a stamped, self-addressed envelope. From Cleveland, W8FAZ



Bill Saxton, K4AFC, of Clearwater, Florida, is one of a growing number of vhfers interested in NASA's moonshots. Bill used this dish, obtained through his local telephone company, to hear Apollo 15's 2200-MHz signals from the moon's surface. *(WA4LVW photo)*

writes of much activity including W8WHJ, W8ORB, WA8GYP, and K8ZES. All are active around 220.05. Also active in Ohio, according to Joe, are WB8JSD, WA8PKB, W8PER, and W8LJI.

WB8IDD, who started the *Mid Michigan 220 News* several months ago has found his subscription list and free gratis service getting somewhat out of hand. The publication is excellent and from it we learn of much new activity. K4JBV, Kentucky, is on ssb with a pair of 6-element Yagis. WAØQLP, S.D., wants schedules into Michigan and Illinois on meteor scatter. Tom runs a kilowatt and four 8-element Yagis. He heard calls for K7ICW, Nev., during a Jan. 4 meteor scatter schedule. W9DJ represents Wisconsin with 100 watts and a pair of 11-element Yagis. W8WVS, Dayton, is new with 7 elements and a 6360. Two-twenty oldtimer W9OVL, Hammond, Indiana, has been on the band at least 20 years and now runs 70 watts and stacked 10-element Yagis. Others active in that general area include K9HMB, WA9MJJ, W9CYT, and K9ZEL.

What is happening elsewhere?

432-MHz reporting has been limited the past several months, but warmer weather should improve band conditions *and* reporting. K1OJQ, Mass., says he'll soon be on 432. W4FJ, Virginia, is building two more Yagis similar to the WØEYE design but with three more directors, apparently for meteor scatter work. Ted tells K8RPL the Yagis will be spaced about 104 inches vertically to sharpen the vertical plane, and widen the horizontal, compared with side-by-side stacking. K8DEO is using a similar array, but spaced about 150 inches and reportedly is pleased with the results. W4ISS, Ga., is rebuilding for 432, aiming for a 4X150 amplifier.

There is no apparent lack of 432 interest in California. W6FZJ sent a list of 23 active stations. About one-third favor collinear arrays and the remainder Yagis. Most of the California group run 100 to 1000 watts, and WA6HXW is moonbounce operational. Harley is running EME tests with VE7BBG and W9WCD, and both hear him 5 to 7 dB above the noise. W9WCD happened across the signals of WA6HXW accidentally, when both were testing for their own echoes. George has copied Harley for an hour or more at a time on several occasions since.

K5ZCO and WB5CEV, Dallas, are operational on 440 ATV. K7ICW, Las Vegas, reports good tropo contacts with WA6EXV and WA6HXW on Jan. 29.

In the Midwest, tongue-in-cheek WØDRL says he'd like to reach 30 states this summer, and he is looking for someone to schedule in Tennessee and Louisiana, which he feels should be "easy pickings" from Topeka. WØDRL kept successful schedules with KØCER, S.D., during the winter months even though sub-zero weather held signal levels low. WØDRL also scheduled W5ORH, with ssb and a kilowatt, at Oklahoma City with excellent signals. WØENC, Rapid City, S.D., is available for schedules. Bob runs about 200 watts output to a 64-element 1-slot array. WØEYE, Boulder, Colo., has a new kilowatt amplifier ready for summer tropo. Don monitors five TV station video carrier frequencies as propagation indicators. Sioux City, Iowa's channel 14 KMEG-TV is constantly heard at more than 500 miles.

1215-MHz fans are looking forward to warmer weather and the coming tropo season with hopes of lengthening the current home-station DX record of 350 miles. Elsewhere in this column you have no doubt seen the new 1215-MHz standing box. Fourteen stations are listed, with four sharing the 350-mile record. Competition should be keen before the year is out, extending the DX record and aiming toward WA2LTM's number-one ranking — 10 states worked. Anyone else desire a 1215-MHz listing?

Potential users of the 1215-MHz band frequently query regarding converters and easy-to-get operating rf sources. The latter can generally be answered with one of the common 2C39 or varactor tripler designs, but the converter has been more of a problem. Many potential builders – and you have to build to get on 23 cm – don't relish the metal work required by the popular W6GGV

1215-MHz Standing

K9AQP/1	5	3	–
WA2LTM	10	4	290
K2JNG	7	4	220
WA2VTR	5	3	190
K2YCO	2	2	350
K3IUV	7	4	320
K1SFF/3	7	4	260
K4QIF	3	2	290
K4NTD	2	1	350
W4VHH	1	1	350
W8YIO	4	3	350
W9JIY	4	3	300
WA9HUV	3	2	220
W9JTP	3	2	165

Listing compiled April 1972

Repeater Update

Area	*Call*	*In*	*Out*	*Access*
Cape Cod, MA	WA1GGR	50.90	51.90	COR
Worcester, MA	WA1KRJ	146.37	146.97	COR
New Haven, CT	WA1KGD	146.11	146.61	COR
		449.80	444.80	COR
Bridgeport, CT	WA1KGK	146.22	146.76	COR
Mt. Beacon, NY	W2CVT	146.37	146.97	COR
Hempstead, NY	K2KDA	441.70	446.70	COR
		441.80	446.80	COR
Long Island, NY	WA2PDJ	146.445	147.36	COR
Long Island, NY	K2SS	146.85	146.85	COR
NY, NY	WA2SUR	146.19	146.73	COR
Hempstead, NY	WA2UYP	221.94	224.94	COR
Memphis, TN	W4BS	146.22	146.76	COR
		444.00	449.00	COR
Lenoir, TN	K4RSV	146.46	147.06	COR
Pheuix City, AL	WB4QFR	146.28	146.88	1800 Hz
Charleston, SC	WB4QGK	146.34	146.94	1477 Hz
Tulsa, OK	WA5LVT	146.34	146.94	COR
		146.28	146.88	COR
		52.68	52.525	COR
Austin, TX	W5FIT	146.34	146.94	COR
		449.10	146.94	COR
Dallas, TX	W5NSO	146.22	146.82	COR
Arlington, TX	WA5TKU	449.2	444.2	COR
Mt. Otay, CA	WB6WLV	146.34	146.85	PL or 2100 Hz
		445.25	449.50	COR
Ann Arbor, MI	WB8CSC	146.37	146.97	COR
Ashtabula, OH	K8HRS	146.34	146.76	COR
Muskegon, MI	K8WNJ	146.22	146.82	COR
Butler, OH	WA8WMU	146.37	146.97	COR
Genoa, IL	WB9ADW	146.34	146.76	1650 Hz
Chicago, IL	WA9EAE	146.46	146.88	1800 or 2000 Hz
		146.28	146.88	PL
Western Springs, IL	WB9HWS	146.04	146.64	2000 Hz
Anderson, IN	WA9WVC	146.22	146.82	COR
Appleton, WI	WA9ZEF	146.34	146.76	1800 Hz
Omaha, NE	WØEQU	146.34	146.94	COR
Castle Rock, CO	WØJGL	146.07	146.67	COR
Hennepin Co., MN	WØPZT	146.985	146.46	COR
		146.985	53.64	COR
		53.64	146.46	COR

converter described in the ARRL *Vhf Manual*. This converter has been duplicated many times and works well, especially with the assistance of a preamp such as that described by WA2VTR in the June, 1971, issue of *Ham Radio*. Noise figures of 4 to 5 dB are obtainable with the WA2VTR preamp, but the Nippon V766B or V766A devices are expensive, costing $18 and $26 respectively from California Eastern Laboratories, 87 Terrace Hall Avenue, Burlington, MA 01803. (For those of you having difficulty in locating single lot purchases of Texas Instrument devices, K4PKV advises that the only apparent source is Kieruff Electronics, 3969 East Bay Shore Drive, Palo Alto, CA 94303.)

From several persons who know, we are told there is now another converter, more easily built and without metal work required, designed by DL9JU and DC8XB and described in the August, 1971, issue of *VHF Communications*. The magazine is printed in Germany, but one stateside source is WØENC from whom the issue is available for $1.25. The converter features a hot-carrier diode, is built on a printed circuit board, and has a 144-MHz i-f. Complete construction information including a template is given in the article. The converter by itself has a noise figure in the 8-dB region, and can be built in a couple of evenings. Complete parts kits are also available. WØENC has the details. This converter and WA2VTR's preamp now appear to be the easier path to reasonable 1296 reception. While the cost is not low, if all parts are purchased new, low-noise reception does not come cheaply on 23 cm.

K9AQP/1, Mass., has worked five states with a collinear similar to that pictured in the February column and has a 4-foot dish ready to put up, when the weather breaks, to compare with the collinear. Earlier WA2LTM speculated that W8YIO and some W/K2 should break the 350-mile record, but now Doug says W1GAN, Mass., and K4QIF, Virginia, have a good chance at 500 miles over a mostly water path. Doug believes this will be bettered by year's end, possibly out to 600 miles. K1PXE, Conn., coholder of the 432 DX record, got on 1296 in November, with 25 watts and 6 to 8 dB horn antenna. Even with the limited antenna gain, Pete had good signals over a 110-mile path to WA2LTM during the winter months. Pete plans a larger antenna this spring. By the way, those who say it is difficult to get on 23 cm take note: K1PXE is blind, but builds his own equipment! WA2LTM has been corresponding with W3BSV, Maryland, and W4JFU, Virginia, and both expect to become active on 1296 soon.

K2JNG has 7 states worked with a best DX of 220 miles, running 30 watts output to a 5-foot dish. K1SFF/3, Penna., on 1296 about one year, has worked 7 states with 35 watts and 29-inch dish having a dipole-and-splasher feed. Tony is net control of the Monday, 10 P.M. EST, 1296 net of the Mt. Airy Vhf Radio Club.

Jack, K4NTD, Oakland, Florida, has 2 states and 350-mile DX to W4VHH, S.C. Jack is looking for across-the-Gulf DX into Texas this year. He says W4LEY, Melbourne, Florida, was active late last year. K4PKV, S.C., hopes to be active soon, and in addition to W4VHH, W4NUS is active with a pair of 2C39s. K7ICW, Las Vegas, is working on 1296 receiving equipment.

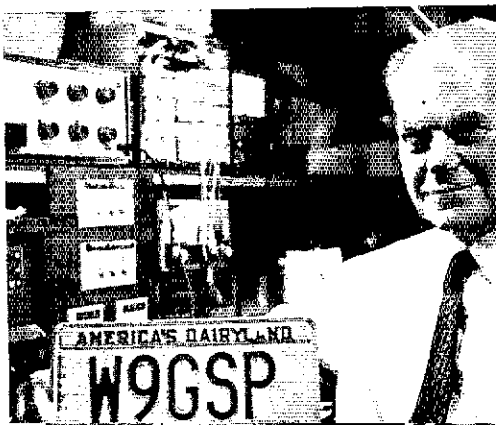
From Indianapolis, W9JIY writes he and WA9HUV schedule twice a week over a 180-mile path, with signals varying from S3 to needle-pinners. Normal signals are S5 to S9 and exhibit much flutter fading, probably due to scattering. W9JIY gets 75 watts from a pair of 7289s, feeding a 7-foot dish at 45 feet. Later this year the dish will be raised to 70 feet on the prodding of WA9HUV.

Going to 2304 MHz we learn that K2JNG and WA2LTM exchange signals each night over a 50-mile path. K2JNG gets up to 17 watts from a circuit designed by K2GRI. W9JIY is working on a 7289 final for 2304 MHz and has a horn feed mounted in his 7-foot dish. WA9HUV is operational with a similar set-up. Norm and W9JIY hope to contact before summer's end. QST

Strays

Jim Fenton, WA1LNF, 14-year-old honor student at Wachusett Regional High School, got the amateur radio bug early in life from his father, W1JH, who has also earned his Extra ticket. Jim passed the Novice exam in June 1969, the General in December 1969, Advanced in August 1970, and his Extra in December 1971. – *W1KC*

There'll be a lot of 73s showing up on license plates next year but some of the boys in Wisconsin have the jump on us. Herbert Baker, W9GSP, sent this photo of himself and the plates just issued him . . . they expire in January 1973.



Silent Keys

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

W1ANA, Roland B. Bourne, West Hartford, CT
W1EVK, Grace E. Crory, Harwich Port, MA
W1GDW, Samuel A. Wood, Ridgefield, CT
Ex W1IL, Dr. Franklin S. Huddy, Cranston, RI
W1MC, Ernest L. Corby, Trumbull, CT
W1TNG, Raymond H. Zeek, Hamden, CT
W2AEP, Edward W. Stroetz, Bellmore, NY
K2BN, Arthur G. Caster, Washington, NJ
Ex-W2CAH, Walter L. Shepard, New Brunswick, NJ
W2DS, Leo M. Schrader, Utica, NY
W2HK, Richard C. Goine, Plainfield, NJ
K2KQI, Forman W. "Tex" White, Hampton, NJ
W2MWP, Alfred W. Leek, Jr., East Northport, NY
WA2NWH, Victor D. Plower, Brooklyn, NY
K2ONF, Lucien T. Huntington, Schenectady, NY
W2QP, Charles A. Piltz, Clifton, NJ
W2SBX, Harry Shulman, Long Island City, NY
W2TK, Richard A. Frank, N. Bergen, NJ
WA2VJO, Carl A. Magnell, Greenwich, NY
WA3AKH, George R. Stoneburner, Coraopolis, PA
W3OXB, Lawrence T. Cisek, Creighton, PA
W3TO, Walter E. Oldfather, Edmonston, MD
W3WAN, Louis P. Killmeyer, Glenshaw, PA
W4DDC, Lemuel V. Banks, Atlanta, GA
WB4ETS, John Aitkenhead, Greensboro, NC
K4EVZ, Howard A. Scholz, Holiday, FL
W4FD, Donald L. Leiphart, Virginia Beach, VA
W4FFC, Philip N. McKay, Marietta, GA
W4MI, Joe A. Shannon, Cottondale, AL
W4VZ, Harold D. Perry, Oklawaha, FL
K5ACI, Larry D. Adkins, Walters, OK
W5CSP, Calvin W. Gilfillan, Tyler, TX
W5CZA, Lee M. Whittaker, Oklahoma City, OK
W5KEE, Earl A. McDowell, Abilene, TX
W6CCT, William H. Phelps, Manhattan Beach, CA
W6CK, Comdr. Forrest L. "Pappy" Phippeny, Idyllwild, CA
W6DSP, Richard M. Ambrosch, La Crescenta, CA
W6ERP, Fred J. Roth, North Sacramento, CA
K6GPH, Edward V. Downs, Santa Monica, CA
WB6LHH, Daniel T. Alfiche, Richmond, CA
W6LN, Thorus E. La Croix, La Canada, CA
W6LSC, William D. Howe, Napa, CA
WA6OXE, Edward G. Miller, San Mateo, CA
K6PWO, Irving F. Hunter, Glendora, CA
W6TDM, Eddie "Tap" Tapscott, Los Angeles, CA
W6UN, James M. Tasker, San Carlos, CA
W7CQT, Jones Scott, Nampa, ID
W7IEV/Ex-W3ANP, Joseph B. Stone, Las Vegas, NV
W8DF, William F. Schele, Battle Creek, MI
WB8FDB, Lawrence N. Domann, Cleveland, OH
W8LSG, Clyde H. Walters, South Charleston, WV
W8QQN, Lewis O. Brewer, Wayland, MI
W8ZQJ, Wilbur E. Dodd, Zanesville, OH
K9EOM, George A. Weimer, Frankfort, IN
W9FZL/WA4WHP, Kenneth L. Dragoo, Long Point, IL
W9JKQ, Leroy B. Monosmith, Rockford, IL
K9MYD, John F. Scarpelli, Villa Park, IL
W9NAK, Ferrel P. Smith, Monona, WI
K9VHY, William L. McArthy, Logansport, IN
W9VKX, Gilbert M. Wilson, Fort Wayne, IN
WØGFI, Martin H. Dreesen, Norfolk, NE
WØQW, Samuel B. Weidner, Jr., Ottawa, KS
WØVYO, Charles J. Kapfer, Oakville, MO
WØYMN, Raymond C. Baughman, Marion, IA
VE4NT, Leonard H. Claydon, Winnipeg, MB
VE7TU, E. A. Gilbert, Summerland, BC
G2HT, L. W. Airton, Lytham St. Annes, Lancs, England
G2IC, G. A. "Tony" Chapman, Westgate-on-Sea, Margate, Kent, England
G2LT, Edgar Walker, Sheffield 8, Yorkshire, England
G2XG, J. M. Davie, Chingford, London, England
Ex-G4DS, T. S. White, Sutton-in-Ashfield, Notts, England
G5CT, A. C. Taylor, Portsmouth, Hampshire, England
G6AY, James H. Chapman, Falmouth, Cornwall, England
RAEM, Ernst-Krenkel, Moscow, Russia

ARPS

(Continued from page 75)

power lines down on the highway. WA5OUD alerted the Highway Patrol and the power company. Within minutes the proper authorities had arrived and repairs were begun. — (WA5FSN SEC Okla.)

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During the heavy rains on Dec. 26 and 27 in the Carpenteria, Calif. area there was extensive flooding and land slides which resulted in the closing of many roads including Highway 101. WB6VGC, who was traveling in the area, was unable to get any information from public officials as to when the road would be opened. Contact was made with WA6ZRH, K6YLQ, K6VCO, and other amateurs along the affected route. Excellent reports on road conditions were obtained from these stations utilizing 2 meter fm. — (WB6VGC, Asst. EC San Luis Obispo Co., Calif.)

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Thirty-Four SEC reports were received for the month of January with an indicated AREC membership of 10,973. This is the lowest reported total in some time. Sections reporting: Ala, Alta, Colo, Conn, ENY, Ind, Iowa, Kan, Mari, Mich, Minn, Mont, Neb, Nev, NNJ, NTex, Ohio, Okla, Ont, Ore, Sask, SD, SDgo, SNJ, SV, Tenn, Va, Utah, Wash, WFla, WMass, WNY, WPa, WV.

During 1971 a total of 467 SEC reports were received from fifty-three different sections. Both of these totals are down from last year's mark of 511 reports from fifty-seven sections. Twenty-three sections had perfect reporting records in 1971. They are: Alta, Ariz, Colo, Conn, EFla, EMass, Ind, Iowa, Kan, Mich, Mont, Neb, Nev, Ohio, Org, Sask, Tenn, Wash, WMass, WPa, WVa. On the other side of the coin we find that nineteen sections were not heard from at all during 1971. Some of these are low population sections but then again a lot of them aren't. Those included in this category are: AK, BC, CZ, Del, EBay, Ga, Ida, Ill, Me, Mant, Miss, NH, RI, SC, SCV, Vt, WI, Wis, Wyo. QST

Strays

If you are an early riser, an insomniac, or slightly crazy, then the Early Eighty Free Net is for you. On weekdays it meets at 6:15 A.M. EST (EDST) and on weekends at 7:15 A.M. on a frequency of 3733 kHz. Any queries should go to the Net Manager, WA3QOZ.

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KH6HIF operates the optical clinic at Tripler Army Medical Center. When you drop in to see him you REALLY have an eyeball QSO. *(from KH6BZF's SCM report for Jan.)*

YL news and views

CONDUCTED BY LOUISE RAMSEY MOREAU,* WB6BBO

The YL Who Understands

AN OM once said, "It's nice when the wife is a ham, too." He paused and added wistfully, "She understands." He couldn't have been more correct, for we do. Our reason for understanding is that we want to be on the air just as much as our husbands, and to get there we have more fun and more crazy experiences than could have happened if we did not have a license because, in our understanding, we have a pretty good idea of the results.

We are a "third hand" as we take the place of a vise to hold two components that are to be soldered. We are the lady with the lamp standing like a statue as we direct the beam of a flashlight into the innermost parts of a piece of gear, making sure there are no shadows as a wire is placed and fastened and soldered, and we hold the light a little longer, while the rosin fumes come up under our noses.

We become a walking "memory bank" of the tool box, and have learned to react as quickly as a nurse in an operating room to a peremptory request. And we have by experience become adept enough that the request of "wrench" does not require any description; we automatically hand the right one.

When the contests are scheduled we understand that means we may as well plan dinner without the head of the family being present, and that we will have plenty of "the makings" for him when he comes up for air. Being contest conscious ourselves with the YL contests, we are able to know just why he will not put in an appearance if extra special visitors drop in while the band is hot. We are also able to rejoice or sympathize with him later as he tells of the ones that got away, or the rare one he caught when someone else with a blockbuster of a signal was trying to break.

We are the labor gang of the construction crew and we are, willingly, because that new antenna on which we are breaking our fingernails is for our use, too. We stand on a ladder supporting a mast in a sleet storm when the rungs and the pole we are holding are covered with ice. Our gloves are soaked, but we hold it with numb fingers as he fastens the guy wires of the new ground plane. We know only too well that the greater the discomfort when it goes up, the better it will work. And oddly enough it does.

We help mix the cement for a base or hold a guy wire taut, and we are not averse to walking around the yard with a fluorescent globe at night or jumping in the car and driving a few miles to listen for the new rig's signal. And we can be found carrying meters, pliers, extra insulators as the pack mule of the experiment with a new type of antenna.

We can make coffee and whip up a snack when we were sure there wasn't a thing to serve if a club member drops by to discuss Field Day plans. We are the secretary and volunteer assistant to log when a contest is in session. We can sit and listen to the conversation and know just what they are saying in that queer foreign language that *is* amateur radio because we use it ourselves.

We know how to sort the mail so that those coveted QSLs, or the envelope that obviously has the new certificate, are on top. And we sit at the ARRL division or national convention and glow with excited pride when he receives an award, because we do understand. We know the hard work that went into the earning of it, and we have a little brighter glow because we *were* a part of it and can share the pleasure without its having to be explained.

Of course we understand. We've been there ourselves and know exactly what is going on. We know that the heights and the depths and the pride of amateur radio operation is twice as much fun when we can share it.

* YL Editor, *QST*. Please send all news notes to WB6BBO's home address: 1036 East Boston St., Altadena, CA 91001.

Esther Given, W6BDE, presenting a "Key to the World" from BAYLARC to Roberta Baldwin, WB6DFN, President YLRC/LA on the occasion of the Club's 25th anniversary meeting. *(Photo from W6CEE)*

G2YL, Nell Corry (left) and Martha Edwards, W6QYL, met in a restaurant in Tehran, Iran, last September. Martha, a YLRL Past President, is a member of YLRC/LA. *(Photo from W6QYL)*

6th International YLRL Convention

The Sixth International YLRL Convention will be May 26-28, 1972, at the Edgewater Hyatt House in Long Beach, California, with the YLRC/LA membership as hostesses for this quadrennial affair.

The present program of activities has been planned around the theme of a YL "cruise" and will be accenting DX. Join the YL crew in tours of your interest including the *Queen Mary*, Jacques Cousteau Museum, the Los Angeles area, Disneyland, and others to be arranged later. Plans include a YLRL Forum, the 33rd YLRL Birthday Luncheon, "Eyelash QSOs," an Aloha Hour, and a Luau Banquet on Saturday evening with Darleen, WA6FSC, as the speaker to tell of her adventures in DX-land. As always there will be special activities for those OMs who accompany their ladies to these conventions.

The YLRC/LA club call, W6MWO, has been selected because it was the call of Helen Cook, a former YLRL president in 1947-48, and now a Silent Key.

A new look has been added with the plan of "Pic-swaps" so be prepared to swap pictures of yourself with the other gals who will be attending.

It is a good time for newly licensed YLs to get acquainted and for all of us to meet the gals we have worked on the air, becuase you do not have to be a YLRL member to attend. YLRC/LA and YLRL extend a very warm invitation to all women amateur radio operators to join the crew for a cruise with the distaff side of amateur radio. See you there.

Because this is a holiday weekend, there will be extra tours or activities planned for those from out of the state who wish to remain in the area following the convention.

For registration information write: LA YL Convention, Box 3092, Long Beach, CA 90803.

YLRL Membership

Each month requests come to this column about membership in YLRL. All women holding a current amateur radio operator's license, no matter what class, are welcome to join this oldest worldwide club for women only.

Membership applications may be obtained from any of the three membership chairmen. In the eastern United States from Marge Campbell, K4RNS, 65 North Arbor Drive, Ormand Beach, FL 32074; western United States from Beth Taylor, W7NJS, 14367 S.E. Fair Oaks Avenue, Milwaukie, OR 97222; DX YLs from the International Correspondent, Gretna Longware, WA2WHE, Box 426, New Russia Road, Elizabethtown, NY 12932.

Emma Candler, 8NH

It's too bad that every gal who was one of the first women in her country to become an amateur radio operator is not well known. Too often these women are unknown and exist only as names on a list.

8NH, Emma Candler. *(Photo reproduction from QST, May, 1917)*

The February, 1972, *QST*, "YL News and Views" has resulted in a number of letters regarding Emma Candler, 8NH, one of the best-known YLs who operated in the days when spark was king. When Emma was granted her call in 1915, she was the 6th YL in the United States to qualify for an amateur radio license, and if we add those who were operating before government licensing was required, was the 10th in the world to bring the feminine touch to amateur radio.

Many OMs have written to tell about 8NH's low-pitched rock-crushing spark that was heard from coast to coast and in practically every state in the union. Emma was famous for her relay work and for her traffic handling in the days when a signal could be monitored three different ways: by sight, as the blue spark jumped across the electrodes; by sound that could, in transmitters like hers, be heard half a block away; and from the smell of the ozone in the shack.

OOTC YLs

Oscar Wilde's character who declared "After my 40th birthday I became 35 permanently," would never qualify as a member of the Old Old Timer's Club, for membership in that organization, like "life," begins with 40 years in amateur radio.

W3CDQ – Liz Zandonini, K4GBZ – Eunice Thompson, W4UF – Dot Saunders, W6SH – Sophie Heintz, G6YL – Barbara Dunn, and VK3YL – Austine Henry, make up the YL members in this organization that includes so many of the people who remember amateur radio in its formative years.

1972 Powder Puff Derby

It isn't too early to plan to be of help in communications during the 26th Powder Puff Derby, July 7-10, 1972. This year the 2600-mile

WA4RLS, Minnie Levine, received the "Outstanding XYL" Award at the Hollywood Amateur Radio Club annual banquet in Hollywood, Florida. *Left to right:* WB4WTX, *Georgia;* WB4CKX, *Joy;* W4RLS, Minnie; WN4RPW, Arlene; WB4MPG, Wanda.

Mollie, ZE1JE, met Annette Thompson, W4LKM, at the Salisbury, Rhodesia airport. Annette (left) managed to work in a 45-minute chat with Mollie before taking off to continue a tour of Africa.

route of the women fliers will include San Carlos, California; Winnemucca, Nevada; Ogden, Utah; Rock Springs, Wyoming; Scotts Bluff, Nebraska; Sioux City, Iowa; Moline, Illinois; Fort Wayne, Indiana; Latrobe, Pennsylvania; Toms River, New Jersey.

If you wish to help in covering this all-YL affair, write to Carolyn Currens, W3GTC, who will be glad to have all the assistance she can get.

WA6ISY, Myrtle Cunningham

For almost 3000 years women have been very busy helping to make communications history, and one of the hardest workers of these history-making YLs has been WA6ISY in her work in space communications.

Licensed since 1959, she is part District Chairman Sixth YLRL District, past President of YLRC/LA, and was communications chairman for the terminus of the Powder Puff Derby in 1967 at Torrance, California, and again for the take-off in 1968 at Van Nuys. She is a member of ARRL, YLRL, YLISSB, Colegas y Amigos, Mexican Amateur Radio Group, The Flying Samaritans, Armed Forces Communications and Electronics Assn., and many local clubs. Myrtle has been employed by Hughes Aircraft Company for nearly 20 years and has worked on all projects, from the old fire control system, Minuteman, Surveyor, Phoenix, SERT II, Condor, and ATS communication satellites. Her biggest thrill was working in production control on the world's largest commercial communications satellite, Intelsat IV. Parts of this 1500-pound, 18-foot-high satellite were built in various countries and then put together at Hughes. Myrtle kept track of all parts and units from breadboard until the satellite left for Cape Kennedy. It is now in synchronous orbit over the south Atlantic and the second stage, another of Myrtle's responsibilities, brought us the Winter Olympic Games from Japan.

OM Tom, W6PIF/W7CUK, has been licensed since 1930. They have 2 sons and 6 grandchildren. This busy gal is also a stamp and picture-postcard collector and, at present, is the Prize Chairman of the 1972 YLRL Convention. QST

Myrtle Cunningham, WA6ISY

Strays

Howie Ryder, W1WQH, notes that as of January 1, 1972, the FCC will not relicense a-m *marine-band transceivers. These ship-to-shore units* (estimated to number 2 million) make excellent 160-meter transceivers and probably can be picked up at a bargain from boatyards or marine radio distributors. Almost all units operate from 12 volts dc.

Dr. Karl Doebel, ex-HB9OO, now a U.S. citizen on the way to a W license, draws a sharp contrast between amateur licensing here and in many other countries including Switzerland. He says he once allowed a visiting U.S. ham to talk to the States; the visitor set up a phone patch and talked for 27 minutes. HB9OO later received a bill for $200, the cost of the phone call had it been made through the Swiss telephone facilities (government owned) and a stern warning against any more patching! *Incidentally, a license there costs* 100 Swiss francs *per year*, about $28 U.S. — as against 1/2 cent a day here in the U.S. Quite a difference in official attitude - and a prime reason why amateurs here should exercise the highest self-discipline in use of their equipment, so as to make sure this healthy government view continues!

How's DX?

CONDUCTED BY ROD NEWKIRK,* W9BRD

How:

Much QRM always has been caused by amateurs trying to squeeze the very last mil from perspiring power amplifiers or groping about for the exact bottoms of broad dips. As if a few watts piled atop two or three hundred could make much difference! W5ACL offers some guest statistics this month to help meter-watchers relax. . . .

This is a comparison of two transceivers on one antenna, the latter a TA-33 up about 65 feet. The transceivers were used *alternately* for 174 and 160 DX QSOs respectively over a period of six months from May to November, 1971. The DX QSOs were all outside the U.S. and Canada, and more than 98 percent were outside North America. Contacts ranged as far east as the Seychelles, west to VK6, Thailand, Hong Kong, and UAØ, south to KC4-land, and north to Greenland. Following is a summary of the results, cw work only:

Approximate power output	*470 watts*		*100 watts*	
Frequency (MHz)	*21*	*14*	*21*	*14*
DX stations called	50	116	126	118
DX stations replying	33	74	66	58
Percent replies to calls	66	64	52	49
Calls of CQ DX	26	47	45	45
DX stations replying	14	23	13	6
Percent replies to calls	54	49	29	13
TOTAL CALLS	76	163	171	163
Calls from DX on signing	19	11	13	4
TOTAL DX QSOs	66	108	92	68
Percent DX QSOs to calls	87	66	54	42
Reports under R5 (all R4)	1	5	6	7
Average S report	6.1	7.0	6.0	6.0
S9 reports	6	8	3	8
S9-plus reports	0	1	0	1

While other bands and other modes were used during the preceding comparison's six-month run, observations are restricted to cw on 20 and 15 meters because these QSOs account for more than 75 percent of station activity during those months.

As would be expected, the higher power proved superior in the percentage of replies to calls. However, the results obtained with lower power were not poor by any means. It just happened that during the period studied three new countries were worked (HS, 1S1, and TU) all on the smaller transceiver.

This comparison may partly answer the questions in the minds of some hams using modest power and wondering just how worth while an increase might be. The opinion I've formed following this six-month test is that while you work a bit harder to snag them with lower power the greater pleasure makes it worth the extra effort. There is undoubtedly more thrill in catching a rare one in a pile-up that includes several kWs!

— *M. E. Lawson, W5ACL*

That power difference of roughly five to one is about 7 dB worth, or a couple of S-meter units. It's obvious that the S in RST reports is as shadowy a formality as "R5 when in the clear." W5ACL's analysis should help convince would-be power freaks that physics laws and ratios still hold. If your kilowatt gets only "five dB over S9" from AC4ZZ while your buddy's gallon is getting ten-over, you'll have to go all the way to 10 kW to get a mere 5 dB edge on him. Hardly worth risking your ticket.

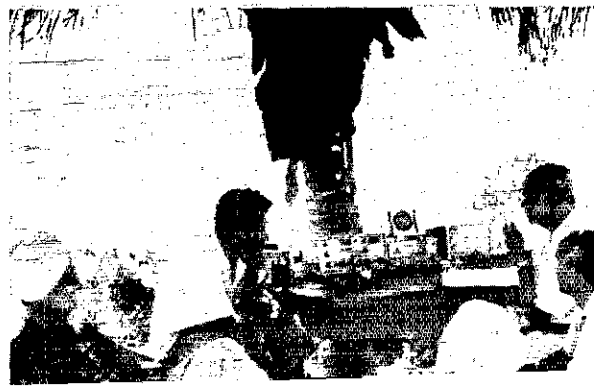
† † †

What:

For the past half dozen years Novices nipped by the DX bug could grab almost all the fancy QSLs they wanted just by firing up on 21 MHz. Indeed, with rare WN-style DXCCs very possible there actually was some minus incentive in rushing into General status. More DXciting to hold with 15 and see if those last few needed countries would come along! But alas, all things end, at least for a while, and we're recycling back to where things stood in the early 1960s. Gone for the most part are those all-day into-the-night all-continent DX breakthroughs that make 21 MHz such a delightful DX playground through the sunspotty years.

Long-haul fun and surprises still abound on the band, make no mistake, but it's getting to be an in-and-out proposition, great one day, flat the next two. Less frequent and shorter DX contacts are the rule, risking QSB chop-off all the while. Make 21-MHz DX hay while ye may, lads, and while the rare ones still have the 15-meter habit. Later on when those good openings do come along, fewer and fewer DX stations will be on hand to pay off. In this day of fast bandswitching softening conditions are highly degenerative that way.

We'll still get improved action with the arrival of spring and fall, though, and such an equinox is now at hand. Let's tune in on the World Just Above 21,100 kHz, granting that these postal WN



VU7US, a Laccadives lark by Amateur Radio Society of India members VU2s CK QM HV KM and RK a year or so ago, offers a pleasant seaside QTH of the Month. Local circumstances permitting, ARSI may sponsor another promised DXpedition at any time. *(Photo via W1GL)*

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

comments come from fellows who may already have turned in their Ns for greener DX pastures on lower frequencies. . . . Just got my first DX confirmation, a card from DL1GN. (WN3RBN) . . . I was W1AIB from 1920 to 1936, finally back on again in retirement. (WN5ERI) . . . Worked a 9M8 when the band sounded "dead." (WN4TDV) . . . My indoor wire works out great toward the west. (WN4WLK) . . . I rarely find 15 open to Europe anymore. (WNØELM) . . . Band's still interesting in Oregon. (WN7RTA) . . . Collected twenty Japanese QSOs and other DX before passing my General. (WN7PIB) . . . Twenty DX contacts so far and 42 states with a Challenger and SX-110 plus dipole. (WNØDAS) . . . Enjoy trying the

MP4TEA (right) likes a daily go at 14,290 kHz around 1800 GMT. Pete's guest, who supplies this photo, is W5MVP. MP4TEA becomes G3LVD when home on leave from Dubai.

contests between DX hunts. (WN4RGQ) . . . Fifteen's very exciting even though we've passed the sunspot peak. (WN9GIT) . . . Conditions improve toward the end of each month with exceptional twilight openings. (WN5EBC) . . . Every new QSO and QSL are thrills! Extra crystals in the lower portion of the 21-MHz Novice band surely help. (WN2PWS) . . . I found fifteen fantastic last summer. (WN3PMT) . . . May have to settle for more VEs on 40 and 80. (WN5CMX) . . . WN8IWQ and I still enjoy fine 15-meter openings. (WN8JEF) . . . Especially good results from South America and the Caribbean on 21 MHz. (WN9FBG) . . . Managed more than forty countries on just a dipole. (WN4UKA) . . . KV4EN helped me break in my new vertical. (WNØCTQ) . . . What will we do when the sunspot count is at its low? (WN2SXD) . . . Dream and remember, Hank. (W9BRD)

DX specified as worked by WN correspondents includes COs 2QR 7AI, CTs 1RK 2AZ, CXs 3RP 5AH, DK3MT, EAs 2FQ 9AI, ELs 2NO 9C, F9IQ, GM3s ANO DYF, HI8FED, HK4AJF, IRØXPS, JAs 2INL 2YEE 2LL 3NXF 4BGN 7EUP 8AGA 8KWG, JR1EEY, KH6s BYZ/KP4 HKZ UL, KZ5s NA ODN PTN YMN, LA7KK, LUs 7DQA 9FAN, OEs 1KD 2BSL, OH2VB, OKs 1APV 1KCP 2BEJ, ON4CM, OX3MQ, PJØDX, PY5ASN, SMs 2COL 3ALR, SP9BPQ, VKs 3BZ 5FM 6AI, VP2LY, W5ZID/YV1, WH6s HJE HLW, WP4s DGN DHD DIW, XEs 1PSU 2HN, YVs 1ALD 4BR, ZL3JO, ZP1AX, 7Z3AC, 9J2MA, 9F3USA, and 9Y4LP. This is roughly one-fourth as much DX as the WN gang turned in a year ago (p. 100, April '71 *QST*) so it looks as though we've had it. Better grab General Class quickly to keep those colorful QSLs rollin' in!

W h e r e :

ASIA – BV2AB, licensed in January, has QSLs handled through my address. Bob is former TJ1AZ. (K4ASI) . . . I will confirm the contacts I made from AC3PT last October. (EA4JL) . . . HS3ACR (KØIJJ) died in a December auto accident. Bill's brother, WØYZS, will conclude his QSLing. (KØCER) . . . WA3OTK tells us he has no Pakistan QSL connections. (WØWO, K2HYM) . . . Jordan's prefixes still go JY1, King Hussein; JY2, Princess Muna; JY3, advanced; JY4, class A; JY5, class B; JY6-7, club; JY8, tourist; and JY9, other visitors. (WCDXB) . . . VU2KV emphasizes that QSLs to VUs who are not ARSI members should not be sent to that bureau for relay. (FDXC) . . . An extraordinary quantity of UJ8 cards is reported now clearing the bureaus. (LIDXA)

AFRICA – I'm still sending out QSLs for ex-TJ1AZ who now signs BV2AB. Those needing Bob's Cameroon cards should send self-addressed stamped envelopes, or s.a.e. plus International Reply Coupons, to me promptly as I intend to close this service at the end of the year. (K4ASI) . . . No logs having been received since August I no longer act as QSL manager for 9J2GE. Three airmail inquiries have gone unanswered. (W2GA) . . . WA2RZB disclaims QSL arrangements with TU VP 6W or other DX stations. (WØKMN) . . . By February FB8XX QSL aide F2MO had received Kerguelen logs for QSOs to November 21, 1971. (DXNS) . . . Business pressures cause GW3AX to yield 9L1RP QSL chores to G3LQP. (DXNS) . . . 5Z4KL stresses that the RSEA QSL bureau address is Box 30077, Nairobi. (WCDXB) . . . The NARS bureau and 5N2AAJ can relay incoming QSLs to Togo amateurs but they cannot accept responsibility for 5V replies to same. (5N2ABG) . . . Europeans may QSL CR4BC via CT1UE. (DXNS)

OCEANIA – As of mid-February all FOØTG QSLs have been dispatched. Everyone in my Moorea and Bora Bora logs who sent a card should now have one in return. Anyone who did not receive a deserved QSL should drop me a line. (WA6IVM) . . . That C2Ø prefix is used by C21s on Nauru national holidays. (DXNS) . . . KH6BZF still stands by to answer QSLs for QSOs in the KH6EDY Kure Island logs he holds but these date only up to last September. (WCDXB) . . . Still no mail service to Macquarie Isle so VKØRC will tackle QSLing on return to Australia. He formerly signed VK9YR. (LIDXA)

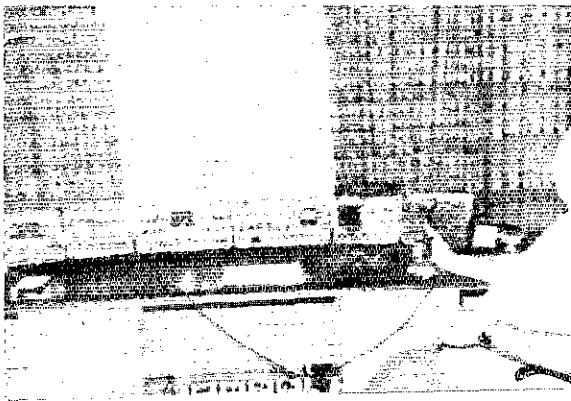
EUROPE – With only 37 United States confirmed of 46 worked toward WAS I protest lax QSLing by certain Arkansas, Colorado, Hawaii, Montana, Nebraska, New Mexico, South Carolina, and Wyoming stations. When a due QSL does not arrive via bureau within a year I follow up with direct airmail request. Please realize that a QRP G3 who says PSE QSL really wants your card! (G3HB) . . . SM4DHF is another who pleads for better QSL response from the U.S.A. Over the years his W/K returns have averaged only about thirty percent. (WA9UES) . . . Note that most DL2 calls now are held by German nationals and such should be QSLd via DARC. Likewise for DL4-5 calls soon to be issued to nationals. Also, re last December's *QST*, there is no DL2QBZ. (DL2QB) . . . As a nonmember of DARC please QSL my HBØXHW contacts direct to me or via ISWL. (DJ6SI) . . . Courteous requests addressed to the Central Radio Club secretary, Box 88, may jar loose tardy pasteboards from rarer Russion regions. (LIDXA) . . . 5N2ABG, after years of DXing, reports receipt of his first directly mailed U.S.S.R. QSL. (NARS) . . . SM1CNS may be of assistance toward obtaining SK1-SL1-SM1 confirmations. (DXNS) . . . F9IE, who signs C31BC each August, cannot confirm QSOs by usurpers of that call at other times. (WA9UEK)

VU2IN gets out well on 20 cw with this home-grown 6AG7-807s outfit. Mulla plans a quad skyhook to help keep shrinking paths open to W/K-land. *(Photo via VQ9N)*

HEREABOUTS – VP2A QSLs may be obtained via my address. All non-W/KWVE contacts have already been QSLd via bureaus. (W4DQS) . . . W2CTN, retired QSL manager de luxe, is reported heard again on 20. (WCDXB) . . . Avid contester XE1LLS promises 100-percent QSL. (WB6KUC) . . . CT1s AQ AQA, DU1EN, EP2SW, FØBF, FM8s BF WG, GM3CES, HKs 1BQR 4BSW 4BUC 4BZQ, HL9WI, HP1s RC XHG, KA8AN, KG6AAY, KJ6CF, KP4s AOD DEX, KR8BY, KZ5KB, MP4BIN, PAØSNG, SPs 3DOI 5PWK 6BZ, 1G9ND, VP2s AP AAP AZ LDD, VR2ER, 4Z4JW, 6W8BD, 7Xs 2AD ØWW, 9V1QJ, and 9X5CC have their QSLs handled through my facilities. We have set up a W2CTN Award trophy to be presented yearly to a deserving QSL manager. (WA5UHR) . . . We should all be more careful in making out those QSLs and envelopes, fellows. I keep receiving mail that could be misread as "WA9VEK." (WA9UEK) . . . Make your move if you still need VP2EZ's QSL for contact in '71 because WA9VQL wants to close the books. (WCDXB) . . . "QSLers of the Month" applauded for especially quick confirmation comebacks this month include CR6IP, CT1ID, CX5BJ, F9RW, FG7s TG XL, HKØBKX, K4BZH/VP7, KG4EQ, KJ6BZ, KQØNEB, KSs 4CJ 6DY, KV4AM, LA9CM, OAs 4PF 8V, OE6MKG, TG9DX, VK8TH, VP2s DAE LAW LY, VQ9s SM WF, VR1s AA W, W2GKH/VP9, XE1IG, YN1AW, YS2CEN, YV5CVE, ZDs 3D 8JK, ZF1s AA RH WE, ZK1CF, ZLs 1CO 3ABC 3PO/c, 7Q7AA, and 9X5AB, plus QSL tenders Ws 4NJF 4VPD 9GFF, Ks 2OLS 3RLY, WA7QCN, VE3BMV, JAØCUV/1, and ZL2AFZ, all nominated in "How's" correspondence from W8YMB, Ks 1NOK 8PYD 8RXD, WAs 1JSD 6BWJ, WBs 2JBJ 4TUP 5FIU 8FOS 8FRE, VE7s BAF and BZY. You know other unsung commendables? . . . Help! WA9UES would welcome suggestions on running down VS9AJM '67, 5N2AAK; WBØCAB ditto re W6DDM/KB6; and VE3FME likewise toward some OX5AT wallpaper. Any 'alp? . . . I.m ready to serve as QSL manager for overseas ops in need. (WA2GZC)

SOUTH AMERICA – Regarding unconfirmable CEØAE QSOs, I operated on Easter Island as legitimate CEØAE from May, 1970, to March of '71 and did not usually do phone-patching. Other CEØAE QSOs, apparently all by USAF personnel, occurred from about 1966 to January, 1971, but I have no connection with that activity. (K2BUJ-CEØAE/CE6) . . . HC1RF helped me hunt down a QSL for QSO with HC8AA in 1970. (K4AUA) . . . VP8LK of Stonington Island maintains weekly schedules with QSL manager G3NOM on 20 cw for transmission of log data. Poor radio conditions may therefore cause some QSL delay. (NNRC) . . . Now a rundown on specifics found in the mailsack but be aware that each item is necessarily neither accurate, complete, nor "official." Be our guest:

C2ØED, J. Matchett, C21TL, Box 32, Republic of Nauru
C31EF, BM/W4WFL, London, WC1, England
CR8AK, P.O. Box 60, Dili, Timor
DL5BR, J. Briggs (WA2CLQ), P.O. Box 875, NSGA, FPO, New York, NY 09514
EA9EO, G. Perea, Ienienta Arrabal 2, Ceuta, N. Africa
FL2DF, via P. McMillan, WA9ZAK, Box 11, Annawan, IL 61234
FØAEE, BM/W4WFL, London, WC1, England
FK8KAA, Box 28, Noumea, New Caledonia
FL8DA, Box 481, Djibouti, T.F.A.I.
FL8NP, Box 11, Djibouti, T.F.A.I.
HI3XAM, via D. Manfre, WA2NDP, P.O. Box 294, West Islip, NY 11795
IC8CQF, P. Cerrotta, via S. Francesco 26/A, I-80073, Capri, Italy
K6LZQ/VP7, C. Touw, AUTEC, Box 438, FPO, New York, NY 09559
KC4AAD, J. Katsufrakis, 324 Durand Bldg., Stanford, CA 94305
KC4DX, P.O. Box 11555, Atlanta, GA 30305 (or via W4GKF)
KC6CD/KX6, R. Aliven, P.O. Box 285, Majuro, Marshall Islands, 96960
OX3BO, P. Andersen, ITT/ASI, Box 722, DK-3790, Dundas, Greenland
SVØWU, c/o U.S. Embassy, VOAR, APO, New York, NY 09253
TJ1AV, P.O. Box 156, Douala, Cameroon
TJ1BA, P.O. Box 509, Yaounde, Cameroon
TU2DI, P.O. Box 208, Adzope, I.C.R.
VP2MZ, P.O. Box 45, Plymouth, Montserrat, W.I.
VP2SBH, P.O. Box 603, Kingstown, St. Vincent, W.I.
VQ9s DH DM N NEW W, via FEBA, Box 234, Mahe, Seychelles
W4WFL/DL/LX, BM/W4WFL, London, WC1, England
W9UCW/HKØ (to W9UCW)
WB9AOX/HKØ (to WB9AOX)
XE1SSC, P.O. Box 584, Leon, Gto., Mexico
XT2AE, K. Ganahl, P.O. Box 140, Ouagadougou, Upper Volta (or to DJ9KR)
YN1ZBD, J. Mason, Jr., Aptdo. 4098, Managua, Nicaragua



9G1DY increased his availability this season and finds Ghana in greater DX demand than ever. Norm sends this picture via QSL aide WA2GZC.

YV4NS, via D. Manfre, WA2NDP, P.O. Box 294, West Islip, NY 11795
ZF1WE, Box 440, Grand Cayman, W.I.
ZP5TQ, P.O. Box 1743, Asuncion, Paraguay
5T5DY, Y. Dezaele, P.O. Box 42, Nouadhibou, Mauritania
5W1AU, P.O. Box 1069, Apia, Western Samoa
6D4s EB FFCJ (to XEs 3DB 1FFC 1J)
7Q7AM, 8R1AE, via D. Manfre, WA2NDP, P.O. Box 294, West Islip, NY 11795

A5TY (to AC5TY)
AC3PT (see text)
BV2AB (via K4ASI)
CEØAE (see text)
DFØMOD (via DJ8ZU)
DL4WJ (to W4UVV)
EA8HA (to DK4QL)
EL2BW (via WB9CGJ)
EP2PR (via W4BBP)
EQ2MJ (to EP2MJ)
FYØBF (to F6AOU)
GD3WJN (to G3WJN)
HK1QQ (via W4DQS)
HS1AEY (via STAR)
HS3ACR (to KØYZS)
HS4AFT (to W5WJQ)
HTØHSM (via WA8TDY)
JA3LUK (via WA9TSG)
JD1ACH (to JA3GZN)
JTØAE (via OK1AQW)
OE2ZRN (to W9BVK)
OMØEE (to OK3EE)
SVØWUU (via W3HNK)
ex-TA2BK (to DJØUJ)
ex-TG9NJ (to K4UQC)
VP2A (via W4DQS)
VP2AJI (to W2BJI)
VP2GVW (via W3GJY)
VP2LAT (to WA9UCE)
VP9AF (via RSB)
VQ9N (via W6IAE)
VQ9WF (via W4NJF)
VS5PW (via DK2JA)
YJ8DS (via ZL4NH)
YN8AJC (via WA9TSG)
YNØYN (via CREN)
ZD7BB (via WAØWKW)
ZD9GA (via ZS2RM)
ZL2BIX (via WA9TSG)
ZL4ND/c (via ZL2AFZ)
ZS6YK (via WB2JYM)
5R8AB (to G3WRN)
5Z4MX (to DK3LR)
7P8AD (via VE2JH)
9J2GE (see text)
9L1RP (via G3LQP)
9Q5LC (via ON5PQ)
9Q5LW (via WA2GZC)
9X5MS (to 9X5SG)

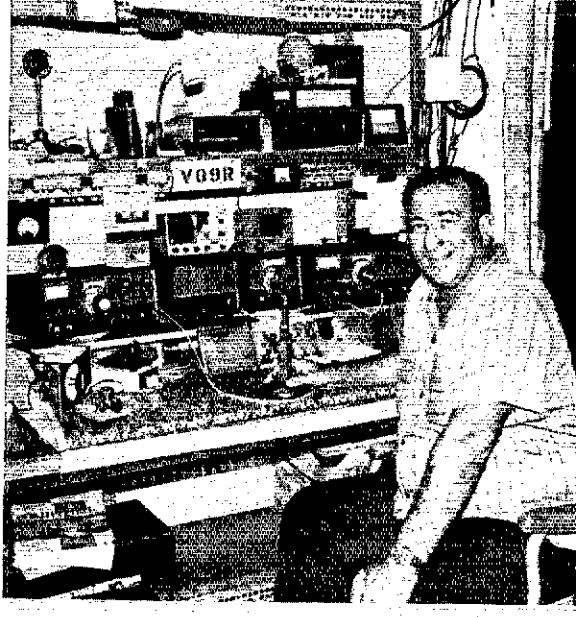
The preceding postal pointers are provided by generous Ws 1ZW 6AM 9UCW, Ks 1NQK 4AUA 4SD 8PYD ØCER, WAs 1JSD 6IVM, WBs 5FIU 6NSJ 8FRE, VE7s BAF BZY, Columbus Amateur Radio Association *CARAscope* (W8ZCQ), *DX News-Sheet* (G. Watts, 62 Bellmore Rd., Norwich, N72T, England), Far East Auxiliary Radio League (M) *News* (KA2LL), Florida DX Club *DX Report* (K4KQ), International Short Wave League *Monitor* (E. Chilvers, 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, IL 60104), Nigeria Amateur Radio Society *News* (5N2ABG), North Texas DX Association *Bulletin* (W5SZ), Northern California DX Club *DXer* (Box 608, Menlo Park, CA 94025), Southern California DX Club *Bulletin* (W6EJJ), UBA's *On the Air* (ONs 4AH 5VA), VERON's *DXpress* (PAØs FX INA LOU VDV WWP XPS), and West Coast *DX Bulletin* (WA6AUD). Good show, chaps!

LG5LG, installed in the Radio State of Morokulien for the benefit of the LA5LG Aid Fund for Invalid Radio Operators, is manned here by visiting W9LDX. Phil, who has signed such calls as 5A1TV and 9Q5PU, particularly enjoys repairing and adjusting the stations of disabled hams during constant travels. *(Photo via LA1Q)*

Whence:

OCEANIA – Slow-scan television interest increases in Australia and I've been called upon to display my gear and lecture. All kinds of surplus equipments of potential SSTV value are being uncovered. Recent video contacts here include HR2HH, KH6BAS, KL7DRZ, KX6DR, SM5RQ, VKs 3ABM 4NP 6ES, XW8AW, ZL1s AOY DW, 6Y5PB, 9Q5BG, VEs 3GMT 7JA, and some forty W/Ks. (VK5MF) . . . With K6RM's assistance my mobile 240 and Hustler worked ZL2BT on 3803 kHz in December. (K4CRB) . . . ZL2OD hunts Delaware, his last State, on 40 cw. (W9EY) . . . VK9DR retires from Christmas Island in favor of Queensland but VK9s XI XK and XX remain. (W2GHK) . . . VK5KO's fifty-foot vertical scored 51 DX contacts on 160 last summer. (W1BB) . . . More Pacific patter via aforementioned clubs and groups: Mellish Reef may be a six-day multiband operating objective of VK3JW and KH6GLU next month or next. . . . VR4BS gives Solomons to 5B-DXCCers on 40 and 80 . . . ZL2AFZ's DX doings are QRS due to the XYL's hospitalization . . . After five thousand VR1AB QSOs Art will probably start signing KB6DB from the same location. . . . That was C21TL signing special C2ØED from Nauru in January. . . . ZK2AF forsakes Niue for New Zealand but ZK2AE hangs on. . . . ZL3PO/c's scheduled QRT this month will rarify the Chathams once again. . . . VE8RA may still be an FK8 or FW8 briefly this month. . . . KH6EDY's new mikeman may keep Kure comin' daily in 21,400-kHz net activity around midnight GMT . . . VR5FX, expecting a three-year Tonga tour, favors (cw) 3515, 7015, 28,035; (phone) 3690, 3890, and 7090 kHz when not on 15 or 20. . . . ZM7AG's retirement from the field leaves Tokelaus up to replacement ZM7AH. . . . 5W1AR planned departure from Apia last month but 5W1AU lingers. . . . Idaho and North Dakota will complete VK6KK's WAS, 14,210 kHz at 2330 GMT. . . . The Pacific DX Net is alive and well, 1600 GMT Fridays on 14,265 kHz plus 14,295 on Tuesdays with VK4UC sometimes at the helm. . . . Ex-VR2FT rediscovers a mundane DX world as G3HZG after Fiji frivolity.

ASIA – BV2AB's half kW and dipole usually hit 14,240 kHz at 1500 GMT. (K4ASI) . . . OD5CS says several new hams may soon be licensed in Lebanon after the annual exams. (W5QPX) . . . JARL advises that QSOs with six dozen Hokkaido stations plus 11th Winter Olympics special JA8IOC may qualify DXers for a "Sapporo '72" certification. (K6ARE) . . . Are conditions still that good? (W9BRD) . . . Two wonderful DX years as YA2HWI/1. Worked all States but haven't counted countries yet. More than a thousand SWL cards resulted. (K9HWI) . . . JA6MWE, a Buddhist priest, has a tribander mounted atop his temple. (W7FCD) . . . Some Turkish stations still operate under cover. We hope the ham situation will be improved there in the near future. (DJØUJ-TA2BK) . . . EP2PR will be active until August. (W4BBP) . . . JA1BK, top DXer in the orient and recent XU1AA operator, visited here in January. (W6AM) . . . JH1LKH has nine countries and numerous U.S. west coast QSOs to his credit on 160. Minokazu worked W7DL on ten watts. (W1BB) . . . JA1BAR and XYL are heard signing HS1AEY on 20 sideband. (WA6IVM) . . . Orient-ations courtesy the clubs press.



VQ9R, probably Mahe Island's most active ham, is widely worked on voice and code. A cubical quad, Yagi, and dipoles are fed by this layout. Carl is a satellite-tracking engineer when not tracking amateur band DX. *(Photo via VQ9N)*

EP2DX knocked off after 5B-DXCC, WAS, and twelve kiloQSOs in 22 months. Rich now signs WA5VKJ/2 in New Jersey. . . . YK1KAS is an Iraqi operator training station reported on 20 cw. . . . Choice on voice is 9M2DQ around 3797 kHz, 2300 GMT. . . . VE7IR and JA1KSO spearhead efforts to revive Burma's QSO output. . . . 9V1QJ heads International DX Amateur Radio Association nets Sundays on 14,300 kHz at 1600 GMT, also 21,360 at 1630. . . . OK3CBY made a flock of multiband cw DX pals as YK1OK this winter. . . . AP2AR schools at the University of Kentucky while HS1JN pursues knowledge at our Navy's Treasure Island base near San Francisco. . . . The Southeast Asia Net convention at Penang in January produced two dozen members from ten countries. They'll do it again in Bangkok November 10th. Check 14,320 kHz at 1230 GMT or earlier; 4S7s AB and PB often preside. . . . WA5VTU totes an ARRL DXCC Countries List while sailing the Far East in his 36-foot trimaran. The Spratly Islands tempt him.

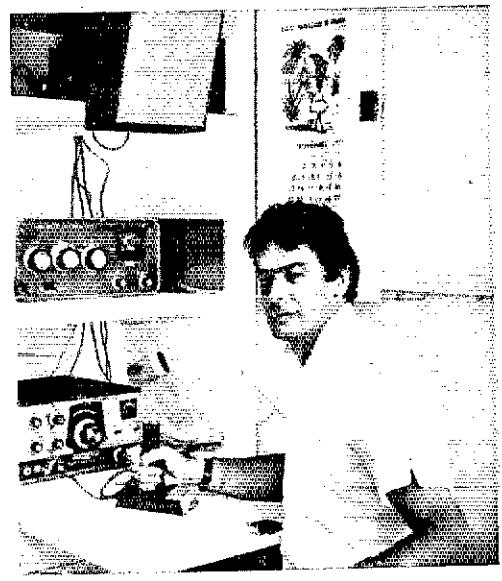
AFRICA – The biggest hamfest in the history of Seychelles amateur radio occurred this January when eleven VQ9s assembled in Mahe over a barbecued piglet. I have a remarkable QTH on the side of a steep mountain overlooking the sea. My trusty little homespun 6AU6-6973 35-watter with VXO can be found on 14,007-14,015 or 14,044-14,052 kHz at 1500-1800 GMT radiating with a vertical on short and long paths. Under current conditions you can't tell which path will be best from one night to the next. I think more W/Ks should discover the thrills of QRP DXing. My peanut-tube rig gets S6 from the States, S8s from Europe, and S9 on shorter skip. After 24 years of ham radio I didn't really try QRP till six months ago. It's a whole brand new hobby! (VQ9N) . . . ZD9BM tells me he's tuning for W/K signals on 160. (K1NOK) . . . Marriage may curtail ZS6YK's 7- through 28-MHz QSO output. (WB2JYM) . . . I'll be off to east Africa this summer. Couldn't swing an Ifni ticket, though. (WA6IVM) . . . Africa addenda thanks to DX-inspired periodicals: 5X5NA offers an elaborated QSL to those who work him on five bands. . . . FB8XX is particularly popular with 5B-DXCC types on 7003 kHz at midnight GMT or so. . . . Distaff DXing in Mauritania is led by 5T5YL, wife of 5T5AD, on 14,235 kHz at 0800 GMT. . . . CR4BC is reported on 7228 and 3795 kHz at 0800 and 0100-0700 GMT respectively. . . . TJ1AW, back from the body shop after fall injuries, resumes multiband mike and key till August. . . . FL8MM is select 5B material near 3800 kHz at 2100 GMT. . . . The first 6542 QSOs by ZD3Q featured 1192 on 28 MHz, 1266 on 7, and 579 on 3.5 MHz. . . . Thanks to 9J2XZ Zambia is available on 3505 kHz at 0400, 7004 at 1900. . . . 9L1VW is nice cw DX on 7028 kHz at 2330 GMT, also 3800 sideband at 0645 or so. . . . 5Z4KL plans an overland trip to Europe in midyear, a jaunt to take him through delicious DXCC territories. . . . FB8XX has fresh operators and a new rhombic to go with its SB-102, GT-550, and remote VFO. Watch 3507 and 7005 cw, 3798 and 7083 voice, also 28,080 and 28,575 kHz. . . . ET3ZU and friends still aim for Kamaran QSOs. . . . Marion Islander ZS2MI, with occasional assistance by WA2HSU, mades the weekend scene on 14,220 kHz at 2100 GMT. . . . Su1IM and daughter SU1MI frequent 14,050 kHz on the key, 1500-1600 GMT. . . . EL2s BA P, 5V7GE, 9G1s BF FF FV and 9L1VW inaugurated a Sunday Africa net on 7060-kHz sideband at 0800 GMT. . . . A West Africa Net may be meeting Mondays and Wednesdays on 21,300 kHz at 1930 GMT with expansion in prospect. . . . New Hampshire is the last WAS holdout for FR7ZN's 20-meter ssb. . . . 6W8DY tempts 5B-DXCC seekers on 40 and 80 again after a four-month hiatus. . . . Difficulties with Nigeria license issuance still persist but NARS hopes for a breakthrough in '72. Lower frequency bands were a disappointment here as the year opened. Long skip was there but QSOs difficult. (5N2ABG)

EUROPE – HB9s will be working the world in the annual Helvetia-22 DX Contest on the 15th-16th of this month, an excellent chance to qualify for USKA's H-22 certification. (HB9AAA) . . . I visited several hams in their Leningrad and Moscow homes this winter. Friendly folk! (W7QYA) . . . Working pretty good stuff on 20 with my new German ticket after 225 countries from K9YHB. One observation: We should all listen longer before hitting the mike or key again after signing off QSOs. Some good DX or old friends may be calling. (DA2FR) . . . I'll reply to s.a.s.e. with details on the DD39-Jura DX award issued by our local REF section. (F1AIH) . . . Back on from Kentucky now after closing down DL4WJ in January. (W4UVV) . . . Sorry I have no rig to QSO the many W/Ks I'm hearing on 160 in Bremerhaven. W1s BB HGT, K1PBW, and W2EQS were running in that order by signal strength in late January. Others logged: Ws 1GBG 1WQC 2AZQ 2HXI 2UEZ 3IN 4YWX 5OG 8ERA ØDRE/1, Ks 2LWR 8RNE, WA1PID, and VE3BMV. KV4FZ also hits S8 here. Local DL9KR really knocks 'em off, 1829 to 1801 kHz. I receive on an R-390A and rhombic favoring South America. (DL5BR) . . . You have until 1973 to qualify for the Munich Olympic Diploma, inquiries welcomed. (DJ8ZU) . . . For reciprocal licensing in Austria one should apply at least one month in advance of intended operation. (OE2ZRN-W9BVK) . . . Collected W-100-U cw award No. 3353 and R-100-O No. 921 from Central Radio Club. After further survey of my QSL file I'll try for other Russian sheepskins. (K5CDA) . . . In the opening ARRL DX Contest cw weekend I used 150 watts and dipoles on 80 and 40, a three-element rotary for higher bands. (HBØXHW-DJ6SI) . . . Continental items via

publications: There's a Russian voice net working 3620-3630 kHz around 2100 GMT. Net controls include UA6LO, UB5WJ, UK3ABO, and UW3IN with check-ins from rarer U.S.S.R. regions. Yes, they sometimes tune up past 3800 kHz. . . . CT2BC likes 7025-7030-kHz code from 0800 on Mondays, Tuesdays, and Wednesdays, also 3525-3530 kHz on other days. . . . OHØMA keeps Market Reef an elusive QRP cw target near 3513 or 3520 kHz mornings and evenings. . . . 4U1ITU got a 160-meter workout when WA4PXP visited Geneva in early February. . . . Rhodes is possible on 7086 kHz with SVØWU radiating at 0730 and 1900 GMT. . . . UF1FAA is the expected replacement for UA1KED in Franz Josef Land. . . . The Commonwealth Net, G3LQV usually officiating, followed the sunspots from 21 MHz down to 14,300 kHz. . . . PAØINA replaces retiring PAØTO on the editorial staff of VERON's *DXpress*. . . . An additional QUAX net frequency of 28,650 kHz is suggested for international monitoring as the muf dives lower, especially around 1000 and 1500 GMT. Beacons GB3SX, DOØs 1GI and AR radiate test signals on 28,185, 28,200, and 29,000 kHz respectively. *Use ten for your local nets!* (G3DME) . . . International Short Wave League, a durable combine of very active hams and short-wave listeners based in Britain, commences its 25th year.

SOUTH AMERICA — Made several hundred 160-meter QSOs as W9UCW/HKØ in early January, also about a hundred contacts as HKØBKX. HKØAI should soon be on 1.8 MHz regularly. En route home we visited HK1QQ, installed a 160-meter skywire and made about thirty QSOs from Herman's place. HK1QQ will be on top band as soon as he receives an *L*-network tuner. (W9UCW) . . . Used only a barefoot FT-200 and verticals on Easter so I'm quite proud of 5B-WAS No. 46. I have an NCX-1000 and rotary beam in Boston which I will import when circumstances permit. (CEØAE/CE6-K2BUI). . . . PZ1AN says he leads safaris on lion hunts. (K2QHT) . . . I operate from USCG icebreaker *Staten Island* almost daily on 14,290 kHz, 0100-0800 GMT. (KC4USI-WA7HOR) . . . HC8GG operation took place from Academy Bay, Santa Cruz Island, last summer. Conditions on 20 and 40 were great, 15 fiar, but 10 and 80 yeilded very little. Thanks to HC8FN's equipment we managed 2000 contacts. (K9YBC) . . . Mike of KC4AAD, 14,322 kHz at 0420 GMT, tells me it's a brank new installation at Siple station operated by Navy and Stanford University personnel. (K4AUA) . . . More southern tidbits courtesy the publications: KC4s AAB USA USV and USX keep Antarctica loud on 20 sideband, 0100-0700 GMT. . . . WA6FSC wandered off on the DX trail again with South American stops. . . . 4M5ERA radiated from a Venezuelan electronics convention in January. . . . CE9AR puts Deception Isle on 14,065 kHz at 0100 GMT. LU1ZC is also reported active there. . . . VP8ME, 14,256 kHz at 0230 GMT, may emit South Orkneys QSOs into 1973. . . . VP8LK's Stonington Island skyhook is the base flagpole augmented by radials. Designed to function as a 14-MHz ground-plane, it also loads on 40. Hamming is possible there only when the battery-charger generator is running, sometimes only for two or three hours per day. (NNRC)

HEREABOUTS — I'm an American residing in Nicaragua and have recently acquired a YN Novice license good for any mode on 7 MHz. Since YNs need no cw for licensing they're somewhat scarce on code. But being an ex-Army radioman I've wanted to get back on the key. Surely enjoy working the W/K gang on 40. My sincere regrets to DXers who patiently stand by only to hear me QRT before we can get together. If they bear with me I'll be more than happy to QSO and QSL one and all, time and conditions permitting. (YN1ZBD) . . . Our group has been assigned the Navassa call KC4DX and our target date is May 12th, 10 through 160 meters, ssb and cw. In general we'll operate the highest ssb subband open to the U.S., cw on the next lower band, a three-day 'round-the-clock effort. Our plan is to transceive until QRM requires working by call area or off frequency. (W4GKF) . . . I'll try a Caribbean DXcursion primarily for 160-meter work from the 5th to about the 26th of this month to include St. Vincent, St. Lucia, Montserrat, and, if possible, Dominica and French Islands. Drake gear and lots of skywire will go along. (W2BP) . . . Caught eight new countries in the opening ARRL Test weekends but a General ticket isn't much good in the phone brawl. (WB5FIU) . . . Raised nineteen cw countries in January contest activity on 160, then tried 1.8 MHz in the first ARRL Test phone weekend at W3AU. His 140-foot vertical scored single-sideband QSOs with G3XVY, GW3UCB, KH6RS, KV4FZ, KZ5ZZ, VP9s BO and FW. (W3IN) . . . I'm leaving Guatemala for K4UQC this month. (FG9NJ) . . . Local notes in the DX press: Long Island DX Association members were saddened by the passing of club president W2WMG in early February. . . . A North Carolina DX roundtable is mentioned, Mondays and Fridays at 0200 GMT on 3845 kHz. . . . VP2LY offers weekend St. Lucia QSOs on 80. . . . KP4AN still oversees DX action on 3803 kHz at 0100 and 1000 GMT daily with periodic QSY to 3855. Typical check-ins are HKØBKX, PJ2CW, 8P6CX, and 9Y4VU. . . . OX3BO (OZ4IA) haunts 3798 kHz with Drake line and dipole. . . . VE7TAR has Collins gear and a six-element 14-MHz spinner going in the Queen Charlotte Islands. . . . Floridians threaten St. Kitts output this month or next. . . . W6AM's cw kW on wheels nears the in-motion 200-country mark. . . . KG4CS is determined toward Navassa, possibly later this month. . . . In the ARRL Test FDXC found 28 MHz light on Europeans but heavy with Caribbean and South American stuff plus a fair showing from Africa and Oceania. President W4BJ, veep W4HOS, secretary-treasurer WA4MSU, and *DX Report* editor K4KQ are newly elected brass. QST



9X5YG is a Rwanda regular on DX voice subbands. Yvan works with the national university staff at Butare. *(Photo via K2QHT)*

Operating Events ..... *de W1YL*

APRIL

1-2 ***Florida QSO Party***, sponsored by Florida Skip, open to all amateurs. Fla. stations may work each other. A club category new this year, replacing the multiop. category for Fla. stations. Periods: Sat. 1500-2000, Sun. 0000-0500 and 1400-2359; all times GMT. Suggested freqs.: cw, 1807 3572 14072 21072 28072; phone, 1817 3972 7272 14317 21317 21372 28572 kHz. No power restrictions or time limits. Stations may be worked once on each phone and cw band. Cw and phone are separate entries and may be summed ONLY for Florida Club aggregate entries. Fla. stations count 1 point per QSO times the no. of states/provinces/countries, DC counting as Maryland. Other Fla. stations may be worked for contact points, not for a multiplier. Maximum mult. = 72 (49 states, 12 provinces and 11 DX countries; the maximum allowable DX multiplier. Fla. clubs may total their member's single-op. cw and/or phone scores and enter this total in the club aggregate category. Each single op. score may appear in the single op. categories and in only ONE club aggregate entry. The special club trophy must be won 3 times for a club to retain permanent possession. Non-Fla. stations count 1 point per QSO times the no. of Fla. counties (67 maximum). Appropriate trophies for high single ops. (both modes) in and out of Fla. and high Fla. club aggregate; additional certificates will be awarded. Logs must be postmarked by April 30 and go to Florida Skip Contest Chairman, Box 501, Miami Springs, Florida 33166. Include a summary with your name, call, address, claimed score, category and the usual declaration. Messy entries (yes, that's what the man said!) will not be considered. Scores will be published in the June issue of Florida Skip. Enclose an 8-cents stamp with your entry for a copy. *SP DX Contest*, p. 110 March.

2 ***Samuel F. B. Morse Contest***, p. 110 March.

5 ***W6OWP Qualifying Run*** (W6ZRJ, alternate) at 0500 GMT on 3590/7129 kHz, 10-35 wpm. This is 2100 PST the night of April 4. Underline correct minute of highest speed copied, certify copy made without aid and send to ARRL for grading.

8-9 ***7th World Orchid Conference Contest***, organized by the LCRA, the Colombian Society. HK4 stations will be working the world 80-10, phone only. 5J4LR and 5K4LR will be on the air. Multiops, not permitted. HK4 stations will send RS plus power; others send RS plus a serial no. starting with 001. Stations in No., Central or So. America count 3 points per HK4 QSO, 5 points per QSO with 5J4LR or 5K4LR. The same station may be worked on each band for multiplier credit. Final score: multiply total points by the no. of bands worked. Special trophies and certificates. Log 20 QSOs per page and use separate sheets for each band. Include a summary showing scoring and other pertinent info. Mailing deadline June 9. Send to LCRA, Seccional Medellin, Apartado aereo 51900, Medellin, Colombia, S. A.

11 ***WIAW Qualifying Run*** 10-35 wpm, at 0230 GMT on 1.805 3,580 7,080 14,080 21,080 28,080 50,080 and 145,588 MHz. This is 2130 EST the night of April 10. 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.

15-16 ***CD Party*** cw. This is a quarterly event for League appointees and officials, notified separately by bulletin. Check with your SCM (page 6) to see if YOU can qualify for an appointment. The July Parties are open to all ARRL members. ***11-22 Contest***, p. 110 March.

22-23 ***Bermuda Contest*** phone, p. 110 March.

24 ***Special WIAW Qualifying Run*** (weekend) at 0230 GMT. This is 2130 EST the night of April 23 (Sunday evening, locally). Additional details under the April 11 listing.

29-30 ***New York State QSO Party***, sponsored by the LEAR ARC (WB2OZC). Periods are 1700 April 29 to 0500 April 30 plus 1200-2359 April 30. Phone and cw are the same contest and stations may be worked once on phone and once on cw each band. NY stations may work other NY stations. Exchange QSO no., report and QTH (counties for NY, sections for others). Suggested freqs.: cw, 1810 3560 7060 14060 21060 28060; phone, 3975 7275 14285 21375 28875; novice, 3725 3975 21115; 6 and 2 meter activity encouraged. Try phone on the even GMT hours. Score 1 point per contact 80-10, 2 points for contacts on 160-6-2 meters; times no. of multipliers (ARRL sections, 74, and countries for NY; NY counties for others - 62 maximum). Logs must contain date/time, band, mode, stations, numbers, QTHs. Number the first contact for each new multiplier. A check sheet is required if more than 50 contacts are made. Multiops, must note the calls of all participants. Appropriate certificates. Logs plus comments, etc., no later than June 1 go to the LERA ARC Contest Committee, Jeff Ronner, WB2AFO, 35 Gottlieb Dr., Pearl River, N. Y. 10965. For results, please include a no. 10 s.a.s.e. Stations planning operation in N. Y. are urged to contact LERA to aid in planning full coverage of all NY counties.

MAY

4 ***W6OWP Qualifying Run.***

6 ***World Telecommunications Day Contest*** cw, sponsored by the Brazilian Ministry of Communications. Object for each amateur is to make the highest possible number of contacts with the various ITU world zones (see IARU News, this issue). The cw event runs the full 24-hour GMT period. Phone occurs May 13. All band operation 160 through 10 meters is permitted. Send RS(T) and ITU zone. Contacts with stations in the same country on any band = zero points, in another country in your same ITU zone 10-40 meters 1 point, 80-160 meters 2 points. Contacts in another ITU zone on the same continent 10-15-20 meters = 2 points, 40 meters = 3 points, 80 and 160 meters = 4 points. On another continent 10-15-20 meter = 3 points, 40 meters = 5 points and 80 or 160 meters 6 points. Final score is the sum of all QSO points multiplied by the number of different ITU zones worked. Repeat QSOs on additional bands permitted although the zone may count just once. A trophy will go to the country earning the highest number of points, the trophy to be held for a year, unless the country wins for 3 consecutive years. Medals to high scorers, plus certificates. Send separate logs for each mode, postmarked no later than 30. Send to: DENTEL, P. O. Box 1219 ZC-00, 20000 Rio de Janeiro, GB, Brazil.

6-7 ***Bermuda Contest*** cw, p. 110 March.

10 ***WIAW Qualifying Run.***

13 ***World Telecommunications Day Contest***, phone (see above). ***Frequency Measuring Test***, open to all, starts with a callup at 0130 and 0430 GMT May 13. (Remember, this is the evening before, local time!) The periods for measurement start at 0137 (80 meters), 0145 (40 meters) and 0153 (20 meters); for the late run, 0437, 0445, and 0453, respectively. Each measuring period lasts 5 minutes. Submit your average for each 5-minute period which will be compared with the umpire's average during the same period (the ump is a professional frequency measuring laboratory). Tell how many readings you took to form your averages. Approximate frequencies for the early run are 3542, 7043 and 14,108 kHz. Late run frequencies are 3540, 7062 and 14,082 kHz. Your report must be RECEIVED by May 24 to qualify for the QST report of the competition. W1AW will start transmitting the official readings May 25. The next FMT is scheduled for September. Full rules will appear in the August issue.

13-15 ***Connecticut QSO Party***, sponsored by the Candlewood AR Assn., open to all amateurs. It starts 2300 GMT May 13 and ends 0400 GMT May 15. Each station may be worked once on each band and mode. Conn. stations send QSO no., RS(T) and county. All others use ARRL section or country for QTH. Score 1 point per QSO. Conn. stations use the sum of sections and countries for multiplier, all others use Conn. counties (total of 8). Suggested freqs.: cw, 3540 7040 14040 21050 28040?; phone, 3925 7275 14300 21300 28880; novice, 3740 7175 and 21125 kHz. Appropriate certificates. Logs must show date/time (GMT), band, mode, numbers, RS(T) and QTH. Send all logs before June 15 to Conn. QSO Party, c/o Don Coltart WA1LKM, Box 121, Washington Depot, CT 06794. Include an s.a.s.e. for results. ***Georgia QSO Party***, sponsored by the Columbus ARC, starts 2000Z May 13 and ends 0200Z May 15, no time or power restrictions. Contacts may be made once on phone and once on cw on each band with the same station. Ga.-to-Ga. contacts permitted. Exchange QSO no., report and QTH (county for Ga. stations, state/province/country for others). Score 2 points per contact. Ga. stations multiply QSO points by the total no. of different states/VE provinces worked, DX stations may be worked for QSO points but do not count as multiplier. Out-of-state stations use the no. of Ga. counties for multiplier (possible total of 159). Appropriate certificates/plaques. Suggested frequencies: cw, 1810 3590 7060 14060 21060 28060; ssb, 3975 7260 14290 21410 28600; novice, 3718 7175 21110. Try 160 at 0300Z, 10 on the hour and 15 on the half hour during daylight periods. Logs must show date/time in GMT, stations, exchanges, bands, emissions, multipliers. Check lists would be appreciated. Include the usual declaration and mail by June 17 to the Columbus ARC, attention John T. Laney, K4BAI, P. O. Box 411, Columbus, GA 31902. Enclose an s.a.s.e. for a copy of the results. ***Montana QSO Party***, sponsored by the Eastern Montana College Sparkgap Soc. and the Butte ARC, starts 0100Z May 13, ends 0100Z May 15. It is open to all. Montana hams send QSO no., report and county. For location, outside stations send state/province or country. Stations may be worked once on ssb and once on cw, in the appropriate bands. No power or time limitations. Mont. hams may work each other. Mont. hams score 1 point per

(Continued on page 158)

Operating News

GEORGE HART, W1NJM
Communications Manager
ELLEN WHITE, W1YL
Deputy Communications Mgr.
ROBERT L. WHITE, W1CW; *DXCC*
GERALD PINARD, *Training Aids*
ALBERT M. NOONE, WA1KQM; *Contests*

QRM. Not a new subject in this column, but this time we are inspired by a piece in *The Flyer*, bulletin of the Handi-Ham System of Minn. and the Rochester Amateur Radio Club, written by W@CRO, and a letter from W4IIA, treating the subject of QRM in a similar manner but from opposite directions. Nothing like being bi-directional about these matters.

By a "similar manner," we mean that both treatments are from the standpoint of someone's ego, and by different direction we mean that in one case it's a matter of ego on the part of the person causing the (presumably deliberate) interference, and in the other it's a matter of ego on the part of the person being interfered with. In both cases, the effect nullifies any tangible or beneficial results.

All of us take a crack at psychology at one time or another, in one way or another, and both OMs mentioned above are doing so in well considered pieces of writing. One (we won't mention who says what, nor make any exact quotes) states the case from the standpoint of the QRMing person, whose sick mind is intent on attracting attention to *himself in this manner. Just as the deliberate* interference is irritating to those affected, deliberate and studied ignoring of it is irritating to the person doing it. At first this will result in making it worse, as the maniac intensifies his efforts to call attention to himself. Ignore him; that is, don't even mention his presence on the air, don't even admit that you are hearing him. Creeping frustration will result and eventually, if you are patient and stick to your guns, he will go away, possible to cause QRM elsewhere, where he *can* get some attention -- or perhaps ride naked down the street on a motorcycle.

The other comment derides the ego response of the persons on the receiving end of the QRM. The QRMing operator is called an idiot, a moron, an *imbecile, is threatened, vilified and in every way* possible let know that his efforts to disrupt the net are being successful – this by stations on the net who want to call attention to *them*selves. One example, a station asks NCS for the frequency so he can tell the QRMer off; another invites the QRMer to call him landline collect; still another offers to pay the QRMer so much an hour to stay on the air so FCC monitors can triangulate. This delights the QRMer (i.e., satisfies his ego) and makes the others feel big also (because they are *doing* something about it), but it sure does make all us hams look silly.

No individual amateur and no net has a prior or exclusive right to any frequency in any amateur band. *If someone accidentally (or even in*cidentally) QRMs you or your net, no harm in asking for his cooperation, but he has as much right to the frequency as you have and does not *have* to move. And there can be considerable question that he is violating any regulation if he declines to do so, although his ethics can be challenged. But if someone (or some*thing*) gets on for the avowed and admitted purpose of causing QRM, there are only two ways to get rid of him (or it). First, by ignoring him. If that doesn't work, perhaps FCC monitors can be brought into the act. Neither of these methods is instantaneous, and neither is foolproof; so the *third* thing to do is simply to grin and bear it and remember that it takes all kinds of people to make a world – and ham radio!

Courtesy. Another time-worn subject, about which some of the more levelheaded amateurs are becoming more concerned. More and more, the amateur bands at times sound like the Citizens Band at its worst. K3FDL proposes to do something about it in the way of preachments, and submits a couple of sample boxes. Guess this is the "operating preaching" department, so this is the place for it, and we reproduce K3FDL's first contribution (somewhat condensed) herewith. Preaching is about all we can do, and there is some question about the effectiveness of this, but we have to try. Won't you please observe the rules of common decency and courtesy on the air, to make ham radio more pleasant for everybody, including yourself? – *W1NJM.*

It Doesn't Cost a Derned Cent

You can't buy it because it can't be sold; in fact, you gotta *give* it away before it works. It requires little or no effort or brainwork. I am referring, of course, to good old-fashioned ham courtesies on the air.

There are now more of us confined to condensed frequencies, thus, the greater need for common sense operating practices to keep the "fun" in ham radio. Take, for example, testing, tuning or calling CQ. A dummy load can eliminate a lot of problems, but merely checking the frequency often prevents unnecessary QRM. It's really just that simple. Before transmitting, ask if the frequency is in use (IF on cw). On the CQ itself, use short calls; send CQ three or four times followed by your call, then listen. If there is no reply, try again, or call someone else's CQ.

You say this stuff is "old hat"? You bet it is. However, the every-day practice of these basic fundamentals would make ham radio a lot more enjoyable, and isn't that why all of us are in it? – *K3FDL.*

W1AW 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 29, July 4, and September 4.

Times/Days *GMT*	*Sunday*	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*	*Saturday*
0000	.....	← CW BULLETIN[1] →					
0020-0100[4]	.....	.....	3.7 Nov.[5]	14.080	14.080	7.15 Nov.[5]	14.080
0100	.....	← PHONE BULLETIN[2] →					
0105-0130[4]	.....	.....	3.990	50.190	145.588	1.820	21.390
0130	← CODE PRACTICE[1] (35-15 wpm TThSat, 5-25 wpm MWFSn) DETAILS BELOW →						
0230-0300[4]	.....	.....	3.580	.....	1.805	.....	3.580
0300	RTTY BULL.[3]	.....	← RTTY BULLETIN[3] →				
0310-0330[4]	.....	.....	3.625	14.095	7.095	14.095	3.625
0330	PHONE BULL.[2]	.....	← PHONE BULLETIN[2] →				
0335-0400[4]	.....	.....	7.290	3.990	7.290	3.990	7.290
0400	CW BULL.[1]	.....	← CW BULLETIN[1] →				
0420-0500[4]	.....	.....	3.7 Nov.[5]	7.080	3.990	7.15 Nov.[5]	3.580
1300	← CODE PRACTICE[1] (5-25 wpm MWF, 35-15 wpm TTh) DETAILS BELOW →						
1700-1800	.....	21/28cw[7]	21/28ssb[8]	21/28cw[7]	21/28ssb[8]	21/28cw[7]	.....
1800-1900	.....	14.290	14.080	14.290	14.080	14.290	.....
1900-2000	.....	7.080	7.290	14.095	7.290	7.080	.....
2000-2030	.....	21/28ssb[8]	21/28cw[7]	21/28ssb[8]	21/28cw[7]	21/28ssb[8]	.....
2030	.....	.....	CW BULL.[1]	.....	CW BULL.[1]	.....	.....
2100-2130	.....	7.15 Nov.[5]	21.1 Nov.[5]	7.15 Nov.[5]	21.1 Nov.[5]	7.15 Nov.[5]	.....
2130	.....	.....	RTTY BULL.[3]	.....	RTTY BULL.[3]	.....	.....
2200	.....	CPN[6]	7.095[4]	3.625	14.095[4]	CPN[6]	.....
2300	.....	.....	6N[6]	RTTY BULL.[3]	CN[6]	.....	.....
2330	← CODE PRACTICE (10-13-15 wpm) DETAILS BELOW →						

[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] W1AW 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, 21.390, 28.590 MHz.
Maintenance Staff: WIs, QIS, WPR, YNC.

W1AW CODE PRACTICE

W1AW transmits code practice according to the following schedule. Approximate frequencies are 1.805 3.58 7.08 14.08 21.08 28.08 50.08 and 145.588 MHz. For practice purposes the order of words in each line may be reversed during the 5-13 wpm transmissions. Each tape carries checking references.

Speeds	*Local Times/Days*	*GMT*
10-13-15	7:30 PM EST dy 4:30 PM PST	0030 dy
5-7½-10- 13-20-25	9:30 PM EST SnTThS 6:30 PM PST	0230 MWFSn
5-7½-10- 13-20-25	9:00 AM EST MWF 6:00 AM PST	1400 MWF
35-30-25- 20-15	9:30 PM EST MWF 6:30 PM PST	0230 TThS
35-30-25- 20-15	9:00 AM EST TTh 6:00 AM PST	1400 TTh

The 0230 GMT practice is omitted four times a year on designated nights when Frequency Measuring Tests are sent in this period. To permit improving your fist by sending in step with W1AW (but not over the air!), and to allow checking the accuracy of your copy on certain tapes, note the GMT dates and *QST* practice text (from the issue 2 months previous) to be sent in the 0230 GMT practice on the following dates.

Apr. 12:	It Seems to Us
Apr. 20:	Correspondence
Apr. 24:	League Lines
May 2:	ARPS

The subject of practice text for the following sessions is *Understanding Amateur Radio*, First Edition.

May 3:	R.F. Voltage, p. 261
May 5:	Frequency Measurement, p. 263

JANUARY QD PARTIES

High-Claimed Scores

The following are high-claimed scores; they read, from left to right: appointee, total score, number of QSOs, number of sections. Final adjusted scores will appear in the April QD Bulletin in *QST*.

CW

W6MAR	316,400-	897-70	
WA6DKF	316,050-	896-70	
W2FZK	279,055-	826-67	
W8SH (K7NHV, opr.)	277,200-	785-70	
W6QAT	270,980-	790-68	
W8UM (WA8YVR, opr.)	255,990-	733-69	
W3IN	254,890-	712-71	
W9EWC (WB9BJR, opr.)	205,160-	608-67	
WB6ZVC	191,955-	568-67	
WB9AWY	177,820-	523-68	
W4UQ	171,185-	504-67	
W4NQA/4	166,980-	500-66	
WA2MEO/7	162,690-	493-66	
WA9AUM	159,575-	485-65	
K1ZND/1	159,075-	498-63	
W1EOB	157,740-	471-66	
W1BBY	157,440-	486-64	
K6OCX	151,200-	474-63	
K7LTV	150,415-	442-67	
K4EU	146,880-	452-64	
WB8BHN	145,700-	466-62	
W2SZ (WA2EUX, opr.)	140,910-	487-61	
WB8BPY	134,230-	433-62	
W7GHT	129,675-	393-65	
WB4SGV	129,465-	411-63	
W1DAL	127,400-	385-65	
VE7TT	125,400-	374-66	
WA1PID	122,560-	380-64	
WB4QNP	121,240-	372-64	
W1AX	116,025-	350-65	
K1QED	115,840-	358-64	
WW2TPV/Ø	115,375-	348-65	
K1VTM	114,975-	360-63	
K1SSH	111,510-	372-59	
W5RE	111,510-	347-63	
WBØCOJ	111,150-	338-65	
WA1OLD	111,020-	364-61	
WA2MPC	110,920-	372-59	
W5QGZ	110,880-	345-63	
VE3GEN	109,935-	349-63	
W3GRM	108,190-	344-62	
WØIYP	107,360-	345-61	
WA3OGM	106,800-	351-60	
K4SXD	106,560-	327-64	
WØEDR	105,710-	336-62	
WB4KVE	102,855-	349-59	
WAØURW	102,785-	331-61	
W9YB (WB2RKK, opr.)	102,300-	324-62	
W4KFC	101,115-	314-63	
K4BSS/1	101,100-	330-60	
WA3MJB (WA3IYS)	100,130-	318-62	

PHONE

W5RSZ	153,280-	479-64	
W5QGZ	105,000-	343-60	
WA3JKO/3	100,800-	331-60	
WA3PLP	92,055-	319-57	
WA3QFN	86,140-	290-59	
K4EU	83,870-	267-61	
WB4QNP	81,200-	273-58	
WB4JSK	78,820-	256-59	
WBØCQF	73,470-	249-58	
WA8MCR	64,320-	187-67	
WA7MJJ	60,200-	213-56	
WB9EAY	59,540-	224-52	
W2TPV/Ø	56,928-	200-55	
WB2EEH/8	54,590-	200-53	
K3HXS	53,560-	206-52	
WA2MEQ/7	53,295-	187-57	
W1AX	52,360-	180-56	
W9YB (WB2RKK-WB4EAE)	84,700-	301-55	
WA1JQC (WA1JYP)	68,600-	242-56	

DXCC Honor Roll Pin. Minute 42 of the January 1972 ARRL Board of Directors meeting authorizes a lapel pin to be provided at cost for anyone who *ever achieved a place on the DXCC Honor Roll.* We have been proceeding at a good clip on design and fabrication of this item and (hopefully) next month can formally announce its availability. We'll restrain ourselves at this point from describing the pin, but can say that it seems to be a "natural." Mechanics? Well, we are envisioning requiring an applicant to furnish a *QST* page reference (the last *time* he appeared on the Honor Roll), the fee decided upon (yet to be determined but guaranteed to be modest), and a *legible* name, call and address. More, we hope, next issue in a DXCC note. — *WIYL.*

DX CENTURY CLUB AWARDS

Radiotelephone listings follow the general-type "New Member" and "Endorsement" listings.

January 1-31, 1972

New Members

WA2HSU	284	LA2S	132	K5OEU	110	I5IAR	104	OH6ZH	101	W2BDF	100
W5FL	242	WB6VUZ	132	WB4OGW	110	K1VII	104	WA3KGJ	101	W2USJ	100
JA5GZ	208	*WA1JMP*	125	WØBGX	109	WB4SIJ	104	WA4KFY	101	W2YGC	100
KP4DKY	191	WB4SIJ	125	HB9AQF	108	G3DPX/W6	104	W5AMZ	101	WA3LFU	100
VE6IK	189	SM7DMT	124	OH2DN	108	WA2BAV	103	YU1HQR	101	W6SYD	100
JA1BA	186	*W6WDH*	122	*K4FJC*	106	WA9TLG	103	9V1QJ	101	WB6NSI	100
W5SBX	175	JH1OHW	119	W3AU	106	DJ1XT	102	K3FMF	100	W7VCB	100
K5CWS	149	K2DEB/3	119	YU2BQR	106	K8KRN	102	K5JZN	100	WA9NNA	100
W4KNW	138	WA1LKX	118	YU2ZR	106	K3YWJ/9	102	K9WRL	100	WA9ZWL	100
PAØGIN	135	*JA1BNZ*	116	*W1SPK*	105	WB2AQC	102	KA7CW	100	WAØTLT	100
JA1WLO	132	DJ4EJ	113							WAØTOE	100
WA2SHU	278	W3CUP	124	W6HM/8	112	HB9AQF	106	I6DRF	102	WB2NRU	101
W8GMX	185	W8HXZ	120	JA8EAT	110	DK2BM	105	K3YWJ/9	102	WA5SKP	101
VE6TK	178	YV4AFG	116	VE3EEX	110	WA4HHW	105	OA4W/W2	102	W8FXZ	101
W5FL	162	DL2CQ	115	VE3ZT	110	W4KNW	104	WA5FVI	102	WB9EAQ	101
K7PJF	145	W5PBZ	113	VK3AKZ	110	W5SBX	104	W7KT	102	W2OVC	100
KA2VT	132	KØZFL	112	F6ACB	109	HS5AFJ	103	W2SEL	101	WA8VXF	100

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.

DL1KB	340	WØIDW	300	DJ4PJ	250	W3BBQ	220	K9ZXG	180	K8YQW	140
K9LUI	330	K4HPR	290	I2IR	250	W3IRF	220	LA9OI	180	WA3NNA	140
W7QK	330	*K6ZIF*	290	*F2QQ*	250	*WA4DRU*	220	*OE1HOW*	180	*WB4PUD*	140
DL1HH	325	W2AWK	290	K2ZRO	250	W5BQM	220	VE1AL	180	W6RQ	140
OH2QV	325	OK2BI	280	K9POG	250	W9DDL	220	VU2VAE	180	W8HGH	140
OK3MM	320	W2FR	280	W1ESN	250	K4LDR	200	W2FCR	180	W9KDX	140
YV5BPJ	320	W3CRE	280	W4JD	250	K4PFK	200	W7KOI	180	WØNQ	140
W9NLJ	315	W5KYD	280	WA8IND	250	K7GYA	200	WA7CGR	180	WAØUAV	140
DL1OF	310	W5RU	280	KØPMZ	240	K9LDI	200	JH1HWN	160	JA3HEG	120
SM5AZU	310	ZS6IW	280	KL7BZO	240	K9ZPI	200	K2BDG	160	JA8AQX	120
VE3NE	310	K8PYD	270	W1JH	240	PAØLRK	200	K6DR	160	KX6GD	120
W6KNH	310	W1BGD	270	WA2CFE	240	VP9BK	200	K7DXI	160	KØIKZ	120
W9LKJ	310	W3ZUH	270	WB2NUO	240	W2AXZ	200	PY2DRP	160	W1AOP	120
KØBLT	305	W8BQV	270	WA5VSL	240	WA2AUB	200	SM6EOC	160	W2RHK	120
OH2BC	305	W9DF	270	WB8EUN	240	W4LBP	200	WB4LDT	160	W3CY	120
W2AZX	305	K2KGB	260	WA8GKW	240	WA6LLY	200	W8OQL	160	W3DS	120
I1EVK	300	KØGXR	260	WA9QAM	240	WØODV	200	W9IA	160	WB4JYB	120
K4RTA	300	VE2DCY	260	WA9UCE	240	WØLPA	200	W9QKJ	160	WB4QPH	120
KØBUR	300	W2FB	260	K4CDZ	220	K4JS	180	WA9UEK	160	W7JAC	120
OK1MP	300	W5DRW	260	VE2AG	220	K6RSY	180	K4LBJ	140	WA9ZAK	120
OZ6MI	300	W6OL	260	VE4XJ	220	K8BGZ	180	K5AYA	140	ZL3ADF	120
WA3IKK	300	WB6APX	260	SM5BZH	220	K8JLJ	180	K6UJS	140		
W6AAQ	300			W2UBJ	220			K7NHV/8	140		
G5VT	340	I1EVK	290	K7YWZ	240	WA9VGY	220	W6BDI	180	FY7AE	140
ON4DM	340	W2YYL	290	K9POG	240	K1OKW	200	W6ITS	180	HP1H	140
K9LUI	330	WA2HSX	290	VE3GNM	240	K4QPR	200	W7KOI	180	W2EWI	140
DL1KB	325	WA3IKK	290	W5KYD	240	K7GYA	220	Z56ACK	180	WA2AUB	140
YV5BPJ	320	OK2BI	280	W7VRO	240	KC6WS	200	I1ADN	160	W3QND	140
YV5BBU	315	OK1MP	280	UR4BS	220	OD5AU	200	JH1HWN	160	WB4APP	140
SM5AZU	310	W4EIB	280	CX3BH	220	WB8EUN	200	K2BDG	160	W7BRU	140
W5KGX	310	WB6DXU	280	K8PYD	220	W9LAX	200	K6RSY	160	DL7PW	120
W6KNH	305	W7QK	280	VE4BJ	220	JA1BA	180	K8BGZ	160	EA1IM	120
W9HPS	305	K2POA	260	VE4JE	220	K6SVL	180	K9UIH	160	HC1RF	120
I1KN	300	VE2DCY	260	W1ESN	220	K8LUH	180	KH6FOE	160	JA3ED	120
K4RTA	300	W2AWK	260	WB2MWW	220	KØPMZ	180	WA1JPF	160	W1KSN	120
VE3NE	300	W3CRE	260	WA4DRU	220	KP4DKY	180	W5DRW	160	W4PWB	120
W5RNB	300	WB6GKK	260	W9DE	220	W1BGD	180	WA6LLY	160	WB4INC	120
W6QOG	300	K7PXI	240	W9DDL	220	W2FCR	180	W8BQV	160	WØMBR	120
W6ZBS	300									WA9ZAK	120

SCM ELECTION NOTICE

To all ARRL members in the Sections listed below.

You are hereby notified that an election for Section Communications Manager is about to be held in your respective sections. This notice supersedes previous notices.

Nominating petitions are solicited. The signatures of five or more ARRL full members of the Section concerned are required on each petition. No member shall sign more than one petition.

Each candidate for Section Communications Manager must have been both the holder of amateur Conditional Class license or higher (Canadian Advanced Amateur Certificate) and an ARRL full member for at least two years immediately prior to receipt of petition at headquarters. Petitions must be received on or before 4:30 P.M. Eastern local time on the closing dates specified. In cases where no valid nominating petitions were received in response to previous notices, the closing dates are set ahead to the dates given herewith. The complete name, address, and Zip code of the candidate and signers should be included with the petition. It is advisable that a few extra full-member signatures be obtained, to insure that it will be valid.

Elections will take place as soon after the closing dates specified as full information on the candidates can be obtained. Candidates' names will be listed on the ballot in alphabetical order.

The following nominating form is suggested. (Signers should be sure to give city, street address and Zip code.)

Communications Manager, ARRL (Place and date)
225 Main St., Newington, Conn. 06111

We, the undersigned full members of the . . . . ARRL Section of the . . . . . Division, hereby nominate . . . . . as candidate for Section Communications Manager for this Section for the next two-year term of office.

You are urged to take the initiative and file nominating petitions immediately.

George Hart, W1NJM, Communications Manager

Section	*Closing Date*	*Current SCM*	*Present Term Ends*
E.N.Y.	4/10/72	G.G.Berry, Sr., K2SJN	6/10/72
Iowa	4/10/72	A.Culbert, KØYVU	6/10/72
La.	4/10/72	J.A.Swanson, W5PM	6/10/72
W.Pa.	4/10/72	R.E.Gawryla, W3NEM	6/11/72
E.Mass.	4/10/72	F.L.Baker, Jr., W1ALP	6/15/72
Wyo.	4/10/72	W.M.Moore, W7CQL	6/25/72
S.C.	4/10/72	L.Y.Miller, W4ELP	6/26/72
SCV	4/10/72	*J.A.Hauser, WA6LLA	3/10/73
S.F.	5/10/72	K.S.McTaggart, K6SRM	3/10/72
Ga.	5/10/72	A.J.Garrison, WA4WQU	3/26/72
Que.	5/10/72	L.Unsworth, VE2ALI	7/10/72
Ariz.	6/9/72	G.M.Hamman, W7CAH	8/9/72
W.N.Y.	6/9/72	R.M.Pitzerine, K2KTK	8/17/72
SJV	6/9/72	R.Saroyan, W6JPU	8/20/72
Mont.	7/10/72	H.A.Roylance, W7RZY	9/9/72
Minn.	7/10/72	E.H.Halstead, KØMVF	9/10/72
N.Tex.	7/10/72	L.F.Harrison, W5LR	9/12/72

* Acting SCM

SCM ELECTION RESULTS

Valid petitions nominating a single candidate were filed by members in the following sections, completing their election in accordance with applicable rules, each term of office starting on the date given.

Ind.	W.C.Johnson, W9BUQ	1/11/72
Vt.	I.H.Viele, W1BRG	3/1/72
Ohio	W.E.Clausen, W8IMI	3/29/72
Conn.	J.J.McNassor, W1GVT	4/11/72

Balloting results: In the NYC-LI Section of the Hudson Division, Mr. Fred Brunjes, K2DGI and Mr. Arthur M. Malatzky, WB2WLT were nominated. Mr. Brunjes received 922 votes and Mr. Malatzky received 255 votes. Mr. Brunjes' new term of office began January 13, 1972.

Meet Your SCM

Virginia SCM Bob Slagle, K4GR, has been licensed since 1929 and formerly held W5OU and W1OU. Bob is a graduate of the U.S. Naval Postgraduate School, Rennsalear Polytechnic, and holds an MS in Aeronautical Engineering from MIT. Presently K4GR is a Sonar Engineer with the Naval Ship Systems Command. Bob particularly enjoys traffic handling on 80 and 75. He's a member of MARS and operated in the Antarctic (Deep Freeze 4) putting KC4USX on the air.

FEBRUARY 13 FMT RESULTS

The February 13, 1972, ARRL frequency Measuring Test brought in a total of 146 entries representing 1642 individual measurements. Entries received *after* the announced closing date of February 24 are not listed (WIAW began carrying the official results as of that date). The umpire's measurements for the early run checked out at 3539.829, 7028.800, and 14089.884 kHz. The late run measured at 3538.981, 7074.084, and 14102.012 kHz. Interested in an Official Observer appointment? Check with your SCM (page 6) and plan now to participate in the May 13 FMT. Details in full in the Operating Events section, this issue.

HONOR ROLL

This top listing is the standing of the frequency measuring leaders. In consideration of the minimum possible error due to doppler and other unavoidable factors, we accredit as of equal merit all those reports computing 4/10ths parts per million (or higher) accuracy. A participant must submit a minimum of 2 measurements to qualify for this listing.

W1BGR K1BWR WA1JQA/2 W1PLJ W2FWK WA2KSB W2YYW W3CPR W3PT W4ATO WB4SXG W5JJW W5QLO W5UJF WA5UNA/4 WB6AAL W6RFW W6CBY W6NBS K6QMT W6RQ K6TW W6MDL W6NWU W9BCY W9CAA W10UFN K9WGN K9WMP KØTOV KØVQM VE5DP XE1HHX Ireland.

In the following tabulation, error percentage can be determined by moving the parts-per-million decimal point (the figure shown in parentheses) 4 places to the left. Class I OOs must demonstrate an average accuracy of better than 71.4 ppm. Class II OOs must show at least 357.2 ppm.

(.6) K4BF W5DKK K6TR W7FNA, (.7) WA1NIG W5TAR W6FXH/1, (.8) W3BFF K3DYU K3LPP WB5ASD/Ø W6BYR W9IGV, (.9) WAØIYK, (1.0) W5DPW KØZQD, (1.1) W6ME K6MZN W9BBF, (1.4) WB4SJL W5RSZ, (1.6) WA4YVQ, (1.7) WA2CCF W7WM, (1.8) WB7MPZ W6CBF, (2.0) W3CSZ, (2.4) W6FB, (3.0) WB6LCI KØBRS, (3.2) WAØEFV, (3.7) W9REC, (4.0) W3GEX, (4.2) W1DDO W4HU, (4.8) W3EYK WB6SLG, (5.6) W4UCL, (5.7) W5CQS, (5.8) WA1MKP, (6.9) W5PDG WØLYC, (7.2) W2EHA, (7.5) K1KQJ, (7.9) K1KMV, (8.0) W1YXE, (8.1) K6CL, (8.3) WA7SOL, (8.5) WA1LNF W9MNY KØRIS, (8.8) KØFIK, (11.5) K8YQW, (12.3) W3NNC, (12.6) WA5CBT W5NDW, (12.7) W4YOK, (14.5) WA5RIO, (14.8) WA8ETX, (14.9) W6CDF, (15.6) WAØVDX, (15.8) WA2AJI W8RU, (16.5) KØJPJ, (17.2) W7FIS, (18.1) W5IBX, (18.2) WØFDJ, (19.0) KØPFV, (19.2) W6OCP, (20.4) WA6NDA, (20.9) W4FDJ, (21.4) W1IG, (22.4) WA3RDU, (23.5) WA2LLF, (25.0) WA1UJR, (25.2) K5PCW, (26.6) W4VON, (27.5) WA3BGC, (28.8) VE6MJ, (33.1) KØCQA, (34.8) WA3ISZ, (35.9) W5ARV, (36.4) WB2CMO, (44.6) W3KEK W4WBK, (46.6) W9UC, (52.4) WB6BWZ, (54.8) KØQPH, (64.4) K6ASK, (70.6) WA7DUY, (70.8) K7JVK, (74.0) WB9ADQ, (74.8) WØPHY, (76.0) W6KI, (83.5) WA2AOI WB2NMH, (84.0) W5ADE, (85.3) KØLMU, (109.1) WB5BFV, (110.4) K3NEZ, (116.3) W7CHI, (117.8) WA7OBH, (118.1) WB5RSR, (141.6) W5PHW, (142.8) W9MKL, (212.9) K2HBA/4, (318.4) K7EFB, (538.7) W2JDC, (548.0) WA2GQT, (1064.5) Walling, Thomas E., (1533.0) VE3PYW, (3562.8) WØLQK. DST

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/SEC, Roger E. Cole, W3DKX — PAM: WA3GSM. RM: W3FBB. Code and theory classes are conducted by the U. of Del. ARC on campus and by WB2QDL/3 assisted by W3KFT and K3VWP at the Jewish Community Center of Wilmington. WA3HGV received 5BDXCC No. 135 and Idaho on 7 MHz provided his last contact for 5BWAS No. 92. Delmarva Repeater Assn. members handled emergency communications between a plane crash site near Cambridge, Md. and Dover AF Base through their Delmar, Del. repeater. W3ZNF reports 2-meter fm is wonderful! After the New Castle Co. SET operation using the K3GUW repeater, the SEC agrees. WA3KFR worked 180 miles with 180 milliwatts on 40-meter cw. Congrats to WA3FRV for making the PSHR. The Delaware and First State ARCs will hold a joint Swap-Shop and Trading Post at the County Engineering Bldg. 8 P.M. Apr. 12. Traffic: (Jan.) WA3GSM 132, WA3FRV 72, W3DKX 71, W3EEB 45, K3KAJ 11. (Dec.) WA3HGV 20, DJ1US/3 19, K3KAJ 4.

EASTERN PENNSYLVANIA — SCM, George S. Van Dyke, Jr., W3HK — SEC: W3FBF. RMs: W3EML, W3MPX, K3MVO, WA3AFI, K3PIE, W3CDB. PAMs: K3BHU, WA3PLP. OBS reports from K3BHU, WA3AFI, WA3JKO, WA3LWR, W3CBH. OVS reports from W3ZRR, K3VAX, W3CL, WA3MCK. OO reports from W3BFF, K3RDT, K3OIO, K3NSN, W3KEK/W3TXG, K3EMA. PSHR: K3OIO, WA3OGM, W3MPX. BPLs: K3NSN, W3EML, WA3OGM, K3BHU, W3MPX, WA3QEN, WA3QOZ. WA3JSU/1 is taking over EASN.

Net	*kHz*	*Operates*	*QNI*	*QTC*	*RM/PAM*
PTTN	3610	6:00 P Dy	143	85	WA3AFI
PEN	3960	5:30 P M-F	911	516	K3BHU
EPA	3610	9:45 P Dy	479	476	W3MPX
EPAEPTN	3917	6:00 P Dy	436	341	WA3PLP

W3EML reports the SET looked good at all levels. W3MPX reported the emergency power phase was "a flop." WA3OGM made the cw CD even though he was down with the flu! W3MPX is trying to maintain traffic into NTS and back out same night and needs help particularly on the late sessions of EPA. WA3QEN is new EC for Delaware Co. Contact him for plans if you are in his Co. WA3ATQ will be operating from Poconos new QTH. K3VAX having fun on 2-meter fm with 100-MW rig and repeaters! W3EU reports the Intruder Watch is busy and could use some help. W3EU also votes for the day time nets, anyone else tell Hq. how they feel about them? W3GMK would like to see more RTTY in NTS, any comments? WA3RCA making trips to Blue Mt. for DX and as practice for Field Day! Nice bulletins were issued by W3MPX "EPA 1971," WA3PLP EPAEP&TN News, WA3QOZ "Early Eighty Free Net." The Early net 6:15 A.M. daily is growing, if you are up that early check in. Delmont Radio Club officers for 1972 are WA3INW, pres.; WA3EAA, 1st vice-pres.; W3HKZ, 2nd vice-pres.; WA3DTA, treas.; K3DEY, secy. Any individuals or clubs that are now conducting code classes or training for ham licenses should register with ARRL. Also any one or club that would like to take on such a job should register. This way ARRL can steer newcomers to local clubs or stations for help. It doesn't matter how little you can do just register! Traffic: K3NSN 904, W3EML 800, WA3OGM 593, WA3QOZ 582, K3BHU 505, W3MPX 402, WA3QEN 229, K3OIO 178, WA3PLP 159, K3PIE 154, WA3GUK 126, K3MVO 119, WA3AOP 88, W3HK 88, WA3AFI 53, W3VAP 53, WA3LWR 52, WA3ATQ 49, WA3JWF 41, WA3PBM 36, W3ADL 35, W3BNR 28, W3BUR 16, W3OY 16, K3KTH 15, W3AIZ 12, WA2HUR/3 12, WA3PGT 12, K3VAX 12, WN3QLG 11, W3CBH 10, W3CL 10, WA3JKO 8, WA3KKM 7, W3DMV 6, WA3PLC 6, W3OML 5, WA3BJQ 2, W3CDB 1, WA3EJO 1, K3EMA 1, W3EU 1, K3FOB 1, W3GMK 1, W3KEK 1, WA3OVZ 1, W3ZRR 1.

MARYLAND-DISTRICT OF COLUMBIA — SCM, Karl R. Medrow, W3PA — SEC: K3KMO. RM: W3PZT. PAM: W3FCS. W3TN takes Jan. BPL to start the new year. The SET uncovered lots of latent traffic men. W3CIX becomes our first RTTY ORS. WA6IDN/3 is a new ORS. New ECs are K3ANA and WA3EHK. WA3GVP renews his OO job. W3JZY, the ole man of the mountain, keeps his certificates updated. Find our six PSHR leaders at the top of the list! W3LQY is editor of the Two Meter Termite Log. WA3PJG is getting the upper hand on his new keyer. WA6IDN/3 received some good compliments on his SET NCS duties. WN3RLC put up a new sky wire and found a whole new world. WA3EOP manned W3CWC in the SET, and expounds on the virtues of the Itchycoo Park VHF Society, a new member of EAR in Washington. Imagine our SEC K3KMO on emergency power using an inverter with his VW battery and a long extension cord. WA3GXN sports a brand new 31-ft. Airstream. K3ORW now airs the old rig of K3GZK who is going modern for that new keyer. WA3OHF, in the 9th grade at the Lock Raven JHS reports a new member WN3RIE. How's that for starting young, and not only that keeps regular skeds with FastGuns. K3BA has 100 watt ssb on 2 meters to show for 2 months work. SET Emerg. Power men were W3CWC, K3LED, K3TNM, K3KMO, W3OMN and W3PA. W3CRE learned that 5BDXCC. W3QU says the EAN NCS stations are fantastic as he braves it again. K3ANA is getting Bowie in line for emergencies. W3EOV reports Murphy after 12 years hit everything at once. W3HXF keeps WA3NAN going and tried the VHF test. W3ZSR is back after a rebuilding siege. W3CDQ had QSOs with VK3YL and VK3KS. WA3LFU got that 100th QSL for DXCC between semesters. MEPN held 21 sessions with 527 check-ins and 137 messages. MDCTN had 16 sessions, 39 messages and 258 check-ins. MDD had 642 check-ins in 64 sessions with a message total of 642 including the SET. WA3NUH was the big help to K3KMO as they made the rounds during the SET. Traffic: (Jan.) W3TN 292, W3OKN 285, K3KMO 137, K3BA 118, W3EZT 112, W3FCS 112, K3GZK 89, W3QU 89, W3GRM 79, K3LED 79, WA3EHK 76, W3IA 74, WA6IDN/3 70, W3PZV 59, WA3NAN 53, WA3PJG 40, W3HXF 28, W3CIX 25, K3ORW 23, WA3IIV 21, WA3LFU 19, WA3IIW 18, W3ABC 17, WA3RDU 17, WA3EOP 15, W3LQV 14, WA3GXN 14, K3ANA 10, W3ZNW 9, WA3MJF 7, W3CRE 6, W3ZSR 4. (Dec.) WA3MSW 22, W3CIX 7.

SOUTHERN NEW JERSEY — SCM, Charles E. Travers, W2YPZ — SEC: W2LVW. PAMs: WB2FJE, W2YPZ, WB2HMU. RM: W2JI.

Net	*Freq.*	*Time(PM)/Days*	*Sess*	*QNI*	*Tfc.*	*Mgr.*
NJPON	3925	6 Su	5	134	55	WB2FJE
EPTTN	7290	5 M-F	28	277	124	WB2HMU
MCoVHF	145.9	8 F	4	12	7	W2YPZ

Another SET has come and gone. Results are anticipated with interest. We are happy to report that WA2KWB received a National Science Foundation Fellowship which will carry him through his final college semester. Another honorable mention goes to dedicated operator WB2FJE who is NCS for the NJEPTN and the NJPON as well as NCS on Sun. mornings for the NJEPTN. He recently completed his term as pres. of the Gloucester Co. ARC. Best wishes for your continued success, Bill, and we will be listening for you on 2 meters fm with your new Gladding 25. New officers of the Gloucester Co. ARC are WB2JZX, pres.; WA2PVH, vice-pres.; WB2WAK, treas.; W2AFZ, corr. secy.; WA2SEA, rec. secy. A recent OBS appointee is WA2NZJ, a very active operator on all modes including RTTY. Traffic: WB2VLJ 275, WB2YVV 151, WA2NZJ 86, WB2FJE 80, W2ZQ 48, WB2HMU 42, WA2KWB 22, WB2SFX 10, W2YPZ 9.

WESTERN NEW YORK — SCM, Richard M. Pitzeruse, K2KTK — Asst. SCM: Rudy M. Ehrhardt, W2PVI. SEC: W2CFP. RMs: W2FR, K2KTR, W2MTA, W2RUF. PAMs: K2KQC, WB2YFM.

Net	*Freq.*	*Local Time/Days*	*Mgr.*
NYS	3675	1900&2200 Dy	W2MTA
NYPON	3912	1645 Dy	K2KQC
NYSPTEN	3925	1800 Dy	K2VCZ
NYPONCW	3697	1830 Dy	W2KQF
NYSCN	3677	1945 MThF 1000 Su	W2RUF
ESS	3590	1800 Dy	WA2VYS

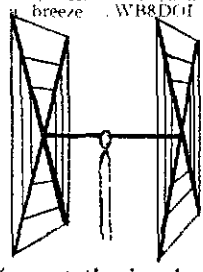
W2CXM is now operating an open repeater, 146.34/146.94 from Ithaca. The College Net meets on MWF at 2000 EST on 3850 kHz. SEC W2CFP is on the lookout for ECs in areas which presently do

AHA! YOU THOUGHT GOTHAM

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 DK4VJP, SM7DLH, XE1AB, DM4SEE, FL8SR, FoAUM, HK7VB in few hours. Instructions a breeze. WB8DOI



CUBICAL QUAD ANTENNAS— these two element beams have a full wavelength driven element and a reflector(the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount; uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a foolproof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!

10/15/20 CUBICAL QUAD SPECIFICATIONS

Elements: A full wavelength driven element and reflector for each band.

Frequencies: 14-14.4 Mc.; 21-21.45 Mc., 28-29.7 Mc.

Dimensions: About 16' square

Power Rating: 5 KW.

Operation Mode: All.

SWR: 1.05:1 at resonance.

Boom: 10' × 1¼" OD, 18 gauge steel, double plated, gold color.

Beam Mount: Square aluminum alloy plate, with four steel U-bolt assemblies. Will support 100 lbs.; universal polarization.

Radiating elements: Aluminum wire, tempered and plated, .064" diameter.

X Frameworks: Two 12' × 1" OD aluminum 'hi-strength' alloy tubing, with telescoping ⅞" OD tubing and dowel insulator. Plated hose clamps on telescoping sections.

Radiator Terminals: Cinch-Jones two-terminal fittings.

Feedline: (not furnished) Single 52 ohm coaxial cable.

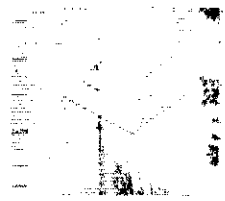
Now check these startling prices — note that they are much lower than even the bamboo-type:

10-15-20 CUBICAL QUAD	$37.00
10-15 CUBICAL QUAD	32.00
15-20 CUBICAL QUAD	34.00
TWENTY METER CUBICAL QUAD	27.00
FIFTEEN METER CUBICAL QUAD	26.00
TEN METER CUBICAL QUAD	25.00

(all use single coax feedline)

BEAMS

"Just a note to let you know that as a Novice, your 3-El. 15 Beam got me R1 Section Winner and New England Division Leader in Novice Round-up. See June QST, p. 57 for picture of ant. (below). Tnx for a fine working piece of gear. 73s, Jay, WA1JFG"



Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history! Each beam is brand new! full size (36' of tubing for each 20 meter element for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅜" and 1" aluminum alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

2 El 20	$21	4 El 10	$20
3 El 20	27*	7 El 10	34*
4 El 20	34*	4 El 6	20
2 El 15	17	8 El 6	30*
3 El 15	21	12 El 2	27*
4 El 15	27*	*20-ft. boom	
5 El 15	30*		

ALL-BAND VERTICALS

"All band vertical!" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, TI2FGS, W5KYJ, W1WOZ, W2ODH, WA3DJT, WB2-FCB, W2YHH, VE3FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1-MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2-KWY, W2IWJ, 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, SM5BGK, G2AOB, YV5CLK, OZ4H, and over a thousand other stations!**

V40 vertical for 40, 20, 15, 10, 6 meters $14.95

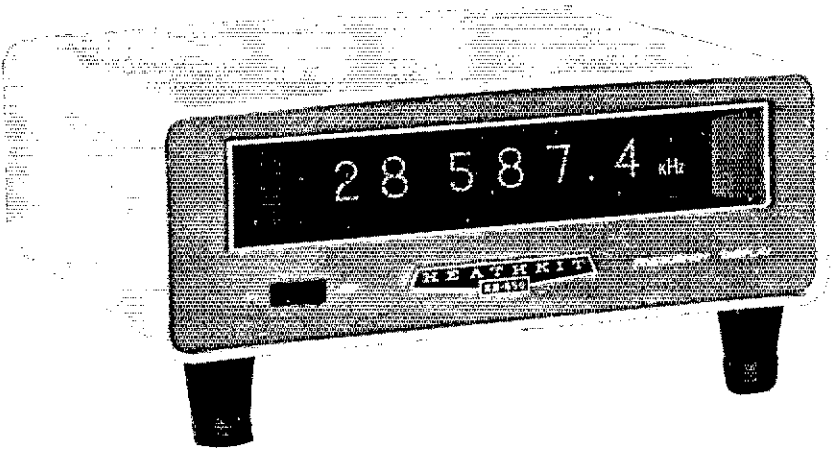
V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters $16.95

V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters . . . $18.95

How to order: Send 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

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.

179.95*

- 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 Heathkit 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.

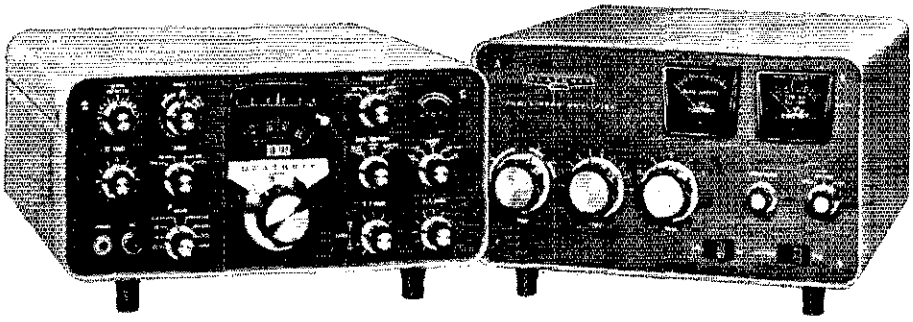
Your SB-650 assembles in just four to five hours ... because IC's and display tubes plug into sockets on the double-sided glass epoxy board. And because there are no tuned circuits, only four easy internal adjustments are needed to get your "650" peaked up and ready to go.

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 5 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 uV 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:** 3½" H x 10" W x 10" D.

meets its match in the Heathkit "Maxi-Rig."



team the new Heathkit SB-650 Digital Frequency Display with the SB-102 Transceiver and SB-220 Linear for the ultimate in computer-age communications.

Here's exceptional stability and dial linearity — made possible by an all solid-state linear master oscillator with 1 kHz calibration. The SB-102 stabilizes itself in a fast 10-minutes, drifts less than 100 Hz per hour after initial warm-up. The receiver section delivers an S+N/N ratio of less than 0.35 uV for 10 dB — with front-panel selection of built-in 2.1 kHz SSB crystal filter or optional 400 Hz crystal filter. And there's a dial resettable to 200 Hz; 180 W PEP SSB input, 170 W CW input; switch selection of upper or lower sideband and CW; built-in sidetone for monitoring; built-in 100 kHz crystal calibrator; triple action level control to reduce clipping and distortion; built-in VOX, and complete metering.

The SB-102 is the value leader because you build it yourself to save on initial investment and service. Simple circuit board/wiring harness construction gets it all together. Order your round-trip ticket to the world now — the famous Heathkit SB-102 SSB/CW Transceiver. Combine it with the new SB-650 Digital Frequency Display, shown at left, for the ultimate in positive station identification.

Kit SB-102, 24 lbs. **385.00***

Kit SB-600, 8 ohm matching speaker with mounting space for AC supply, 7 lbs. **19.95***

SBA-301-2, 400 Hz CW crystal filter, 1 lb. **22.95***

Kit HP-23A, AC supply, 19 lbs. **51.95***

Kit HP-13A, DC supply, 7 lbs. **69.95***

SBA-100-1, mobile mount, 6 lbs. **15.95***

The Heathkit SB-220 is the linear amplifier that the competition tries to measure up to. Two conservatively rated Eimac 3-500Z's in a grounded grid circuit offer up to 2000 W PEP SSB input, or a full 1 kW on both CW and RTTY. The broad-band pretuned pi-input delivers maximum efficiency with low distortion over 80-10 meters. Only 100 watts of driving power is needed to produce full-rated input.

SB-220 features include a built-in solid-state 120/240 V power supply; circuit breaker protection; zener diode regulating operating bias to reduce idling current for cooler running and extended tube life; a large quiet fan; ALC to the driving unit to prevent overdriving; front panel switch selected monitoring of grid current; relative power and high voltage. The SB-220 offers a clean, compact design with the liberal use of internal shielding for extra strength and component isolation. Its green table-top cabinet complements all your SB-series gear.

Kit SB-220, 69 lbs. **369.95***

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☐ Enclosed is $_____, plus shipping.

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Prices & specifications subject to change without notice.
*Mail order prices; F.O.B. factory AM-265

not have one. If you are unaware of ARES activity in your area and would like to get a unit organized, contact W2CFP. NYS reports 1009 check-ins handled 559 messages in Jan. WA2NPQ is transmitting bulletins MWF at 1500 EST on 7270. WA2ELD uses a 400 cycle 110 volt generator for emergency power – Don has to wedge the relays shut with Q-tips in order to use the higher frequency generator. The Amateur Radio Association of the Tonawandas elected WB2MBG, pres.; WB2QKC, vice-pres. and treas.; WB2UXY, secy. WA2MPC worked number 1001 for DXCC with his new all band antenna. K2EQB, K2KOC and WB2JBO are the new officers of STARS. WB2NFD, WA2MSV and WA2LGW are the newly elected officers of BARA. K2DWI is starting a net on 160, 1835 kHz Mon. at 7 P.M. local time. W2GBK constructed a 2-meter readout frequency meter. New officers for the SUNY at Buffalo Amateur Radio Society are WA2EAJ, pres.; WB2HDM, veep; WN2UAS, treas.; WA2CHV, secy. Congratulations to WA2SIR "dropping the N." WNY hamfest at Rochester promises to have new ARRL Prexy Harry Dannals W2TUK in attendance. Traffic with * indicating PSHR: W2FR* 464, WA2ICU* 347, WA2ELD* 309, W2RUF* 283, W2OE/4 256, W2MTA* 200, K2JBX 172, K2KTK* 147, W2FZK 118, WB2IKL* 117, W2ROF 103, W2BU* 89, K2QIW 80, W2HYM 76, W2MPM 76, K2DNN 74, WN2PUU 39, W2PVI 39, WA2HSB 36, K2UIR 33, W2DBU 31, WA2ICB 28, WA2TLB 28, WB2AFS 24, WA2ITJ 23, WN2OMN 20, W2PNW 20, WA2MPC 19, K2OFV 19, K2IMI 13, W2CFP 12, WN2SIR 11, K2BWK 10, WA2KAT 10, WN2AOG 9, WA2LUF 9, WB2QAP 7, WA2HSB 6, WA2EAJ/2 4, WB2JNW 4, WA2NPQ 4, WA2GLA 2.

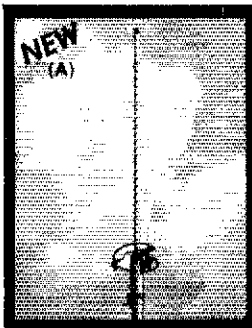
WESTERN PENNSYLVANIA – SCM, Robert E. Gawrvla, W3NEM – SEC: W3KPI. PAM: K3ZNP. RMs: W3LOS, W3KUN, WA3LPU. WPA CW Net meets daily 3585 kHz at 7:00 P.M. KSSN meets Mon. through Fri. at 6:30 P.M. on 3585 kHz. All times local. It is with deep regret we record the Silent Key of W3PIY. The Etna ARC reports their new officers for 1972 are K3VYO, pres., K3HZL, vice-pres.; W3TZW, secy.; WA3CHC, treas.; K3HZL, trustee. Radio Assn. of Erie announces the Erie repeater, W3ZLO is one year old. The RAE will hold their big auction Sat. Apr. 8 in Erie. Inquiries to P.O. Box 844, Erie, Pa. W3LOS was saluted as RAE Ham of the Month. The Presque Isle ARC has set the date for their annual Tri-State Amateur Radio Banquet for May 20 in the Erie area. Inquiries to P.O. Box 1021, Erie, Pa. PARC also announces the following new Novices to the area: WN3RWA, WN3RWJ, WN3RXZ, WN3RYA, WN3RZJ. A total of 19 new hams resulted from their recent code and theory classes. The McDowell ARC, WA3GMV, is constructing a new shack in the school's electronics lab. The Greater Pittsburgh VHF Society announces the following officers for 1972: K3FIW, pres.; W3IQH, net mgr.; K3QBI, secy.; W3EWV, treas.; W3BWU and K3WNZ, trustees. Steel City ARC honored K3VSL as member of the Month for Jan. WA3NCH has a new Extra Class license. WPA traffic net had 37 sessions, 474 stations and 485 messages for Jan. KSSN for the same month had 20 sessions, 54 stations and 94 messages. Public Service Honor Roll for Jan.: K3ZNP 59, WA3NAZ 44, W3LOS 39, W3NEM 39, WA3IPU 39, W3YA 34. BPL awarded to WA3NAZ and WA3MDY. Traffic: W3NEM 337, W3ATQ 250, WA3NAZ 214, WA3MDY 212, WA3IPU 192, W3LOS 189, W3YA 144, K3ZNP 138, W3KUN 129, W3SN 64, WA3PXA 61, W3MJ 59, K3HCT 49, WA3HSR 37, K3SMB 23, WA3IYA 2, K3SJN 2.

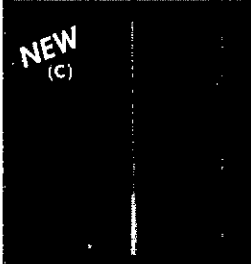
CENTRAL DIVISION

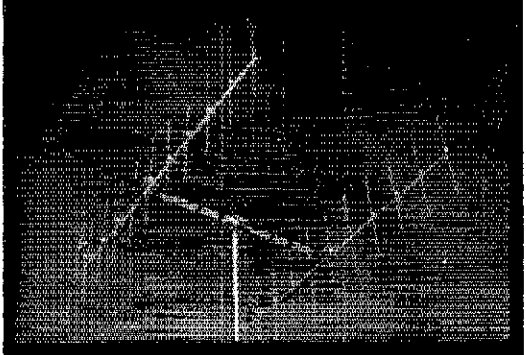
ILLINOIS – SCM, Edmond A. Metzger, W9PRN – SEC: W9RYU. PAMs: WA9CCP and WA9PDI (vhf). RM: WA9ZUE. Cook County EC: W9HPG.

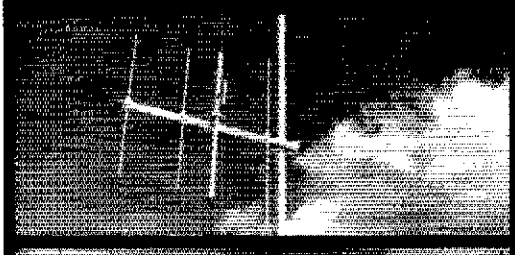
Net	*Freq.*	*GMT/Days*	*Ftc.*
IEN	3940	1400 Su	
ILN	3690	0030 Dy	192
NCPN	3915	1300 M-S	118
		1800	
Ill PON	3915	2245 M-F	603
		1430	
Ill PON	145.8	0200 MWF	19
Ill PON	50.28	0200 M	4

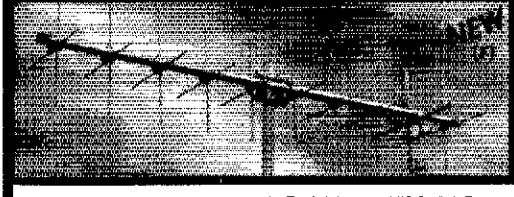
The newly elected officers of the Elk Grove Amateur Radio Club, WB9FZN, are W1GYQ/9, K9VIG, W9WSK and WN9ISU. The Lincoln Wireless Assn. has become more active and those in the Lincoln area are asked to contact WA9BOT for further details. The 10th annual Wheaton Community Radio Amateurs Hamfest was very well attended. This is the first Hamfest in Ill. We are very sorry to announce the passing of W9KI and W9VWI. Frank was former editor of the Chicago Tribune and Richard was a former phone act. mgr. of the Ill. section. Our deepest sympathy to their families and many friends. The McHenry County Amateur Radio Club celebrated their first anniversary Jan. 22. An Fico 753 was sent to 3B8DA by the Northern Ill. DX Assn. WB9ADQ's XYL, a new Novice, is now











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AFM-4D	1000 watts	146-148	MHz	**$42.50**
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(D) 11 ELEMENT YAGIS: The standard of comparison in VHF communications, now cut for 2 meter FM and vertical polarization.

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(E) 4 ELEMENT YAGI: A special side mount 4 element FM yagi can be fixed or rotated—good gain and directivity.

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on the air with an Eico 720. The Bradley University (Peoria) Amateur Radio Club recently acquired a new shack and is becoming active in the traffic nets with 6 members checking in. W9LLX has moved to Cincinnati, Ohio. K9ZTV's new QTH is Peoria and is operating 160 through 10 meters with the Drake four line. W9LNQ won the Ill. division in the recent Post Office Net exercise. WN9IYP is a new Novice in the Cirmi area. The York Radio Club's format on their new club publication "Circuit Board" is an FB paper. Their editor Carl Zaruba is to be complimented. The DeWitt County Amateur Radio Club has a Novice class of 10. The Lee County RACES Net holds drills seven nights a week on 146.94 at 0030Z. K9VFA and W9JWC are BPL recipients for the month. Traffic: (Jan.) K9VFA 313, W9IWC 279, W9NXG 277, WA9ZUE 276, K9AVQ 170, WA9OBR 115, WB9EBK 101, W9IXV 94, WA9LDC 52, W9LNQ 41, K9KKN 40, WA9RTB 40, WB9AWY 29, WB9ELP 28, W9PRN 22, W9HPG 21, W9HOT 8, WA9NZT 6, WA9LHU 2, W9TAT 2, WB9FDP 1, W9LEX 14. (Dec.) W9ELF 86.

INDIANA – SCM, William C. Johnson, W9BUQ – SEC: W9EC. RMs: WB9ANI, W9IC, W9HRY, WA9ZKX. PAMs: K9CRS, WA9OHX, (vnf) W9HWR, W9PMT.

Net	*Freq.*	*Time(Z)/Days*	*Ckn.*	*Mgr.*
IIfcN	3910	1430-2300 Dy 2130 M-S	420	WA9QHX
QIN	3656	0000 Dy 0400 Dy	235	WB9ANT
PON	3910	1245 Su 1830 S-S	79	WA9UMH
PONVHF	50.2	0200 C-T 0100	284	K9APH
	50.7	0200-0400 Dy		
Hoosier VHF			52	W9PMT
PON CW	3740	2400 C-T	18	WA9UMH

With deep regret I report W9SOW, WA9HSM, W9QID and W9GAD as Silent Keys. Bloomington ARC elected K9EYQ, pres.; WB9AKG, vice-pres.; WA9WWI, secy.-treas. Indianapolis RC – W9IGZ, pres.; W9PSE, vice-pres.; W9EL, secy.; W9AI, treas.; WA9YCA, ch. op.; W9ISU, W9DNQ, dir. Gibson ARC – W9HWR, pres.; WN9OGU, vice-pres.; WA9DBK/WB9EPV, secy.-treas. Purdue ARC – K3YWJ/9, pres.; WB9DAY, vice-pres.; W5LPS/9, treas., WB2RKK/9, secy., K9LIH, trustee. Ind. ATV & UHF Club – W9AEV, pres.; WA9BXM, vice-pres.; W9HRO, treas.; WA9NZO, secy.; W9NTP, prog.chmn.; W9JIY, tech. chmn. At the ATV-VHF meeting held Jan. 8, WA9YJZ gave a talk on the amateur TV Camera Project by the Bloomington ARC. K9BCP talked about the PC board for the Camera and W9NZK told us about the ATV repeater they are trying to put in operation. Gary Davis of Columbus demonstrated the Jap ½ inch tape. WA9AOP and WA9KYL entered military service. The Indiana Traffic Net 25th Anniversary was held in Jan. 1972; calling the roll at the first meeting were W9ACW, W9EGV, W9EFL, W9IDZ, W9JDW, W9KJL, W9MHM, W9PHV/W9DOG, W9POL, W9PMT, W9SWH, W9UGH, W9VDB, W9ZNC. Silent Key W9BKJ, W9CLF, W9IOK, W9MVZ, W9PIQ, W9YVS; old Timers still active, were W9PMT, W9SWH, W9UGH, W9VDB, W9ZNC. Indianapolis Red Cross ARC – WB9AWK, pres.; K9OXA, vice-pres.; WB9AWI, secy.; WB9CCO, treas.; WA9BVS, chief op. New Novices in the club are WN9IVR, WN9IWG, WN9IVG, WN9IVS, WN9IVO. IRCC Spring meeting Apr. 9, at the Indiana School for the Blind. QIN Honor Roll: W9QLW 22, W9EL 59, WB9ANT 49, WB9LAY 43, K9QPL 40. Amateur radio exists because of the service it renders. Traffic: (Jan.) W9HRY 293, WB9LAY 291, WA9WJA 272, W9QLW 248, WB9ANT 233, W9BUQ 113, WA9QHX 104, K9IQY 101, WA9KAG 94, K9APH 75, W9EL 59, K9CBY 52, W9IWH 52, WA9TJS 51, K9QPL 46, WA9CHY 30, WB9CUK 29, W9KWB 25, WB9AHI 23, W9CNE 20, K9RPZ 20, WA9UEH 20, K9YBM 18, W9DZC 15, K9DLY 14, K9ILK 14, W9LG 14, W9PMT 14, WA9NQA 10, WA9OAD 10, WA9AXF 9, W9BDP 8, K9UFY 8, W9YYA 8, WB9EBR 7, WA9OKK 2, W9HWR 2, WA9BVL 1. (Dec.) W9HRY 89, K9QPL 12, WA9AUM 6, WA9YXA 4, WB9CUK 3.

WISCONSIN – SCM, Joseph A. Taylor, W9QMT – SEC: W9NGU. PAMs: K9IHI, WA9DAY, WA9OKP, WA9PKM. RMs: W9KQB, E9KSA.

Net	*Freq.*	*Time(Z)/Days*	*QNI*	*QTC*	*Mgr.*
WSBN	3988	2300 Dy	1498	197	K9IHI
WIN	3662	0115 Dy	578	122	W9KQB
BFN	3985	1800 Dy	917	284	WA9QKP
BWN	3985	1245 M-S	460	300	WA9DAY
WSSN	3662	0200 T-TS		8	E9KSA
SWBRN	145.35	0230 Dy	190	5	WA9PKM
WI-PON	3925	1801 M-F	544	108	W9EMC
WRN	3620	0130 Su	19	13	K9GSC

The big news of the month is the 1972 SET. Reports indicate that this was the biggest year yet. If you are not yet registered with AREC contact your EC, SEC or SCM. Stronger signals can now be

CW or RTTY, whichever way you go,

HAL HAS TOP QUALITY YOU CAN AFFORD!

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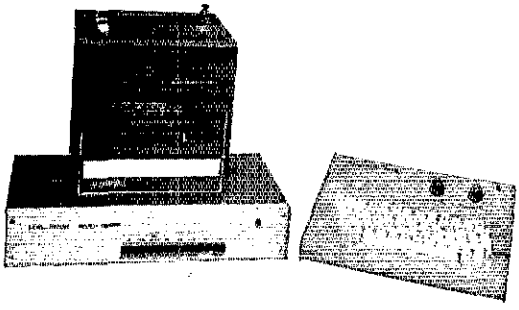
Mainline ST-5 TU Kit	$ 50.00*
Mainline AK-1 AFSK Kit	$ 27.50*
HAL RT-1 TU/AFSK Kit	$ 51.50*



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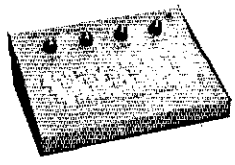

TOP QUALITY... WITH THE HAL MKB-1 MORSE KEYBOARD. As easy as typing a letter—you get automatic CW with variable speed and weight, internal audio oscillator with volume and tone controls, internal speaker, and audio output jack. Smooth operation; completely solid-state, TTL circuitry using G10 glass boards, regulated power supplies, and high voltage transistor switch. Optional automatic ID available. Assembled MKB-1, $275.00; in kit form, $175.00. *

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*Above prices do not include shipping costs. Please add 75¢ on parts orders, $2.00 on larger kits. Shipping via UPS whenever possible; therefore, street address required.

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heard from W9EWC who just put up twenty-two elements on 2 meters 100 ft. up and from W9RQM who has a new quad for 20 through 10. Don't know how he can improve much on his DXCC total of 316. WN9CDV is with the Navy in the Far East. Both the WSSN and WIN now publishing bulletins. K9KSA talked on the SET and traffic at Jan. WVRA meeting, K9MIX on feed lines and tuners at the Feb. meeting, K9EVA starting a WVRA Club newsletter. We are looking for more qualified stations for ORS, OPS and OVS. If interested contact your PAM, RM or SCM. Would also like to see more activity during the CD QSO parties. Check QST for the Apr. dates and you appointees join in on the fun. The July Parties are open to all League members. New or renewed appointments to WB9CII and WB9DXK as ORS and OPS; W9KXK as OPS; W9RQM as OPS, ORS and OVS; K9ZYS OVS. Traffic: WB9BIR 598, K9CPM 390, WB9CIL 378, W9DND 302, K7RSQ/9 126, k9EHI 105, W9ESJ 87, W9KQR 85, W9UCR 78, W9ZBD 67, WB9ABF 63, K9KSA 58, WA9OAY 41, K9JPS 40, WA9MCC 36, WA9ZCM 33, W9HHW 28, W9RTP 28, W9KRO 27, K9LGU 23, WA9ZBD 21, K9GSC 20, W9BCH 19, W9WJH 15, WB9DXK 13, WA9PKM 12, K9UTQ 10, WB9CMD 8.

DAKOTA DIVISION

MINNESOTA – SCM, John H. Halstead, KØMVF – SEC: KØLAV. RMs: WØZHN, WAØYAH. PAMs: KØFLI, WAØHRM. MSTN (Minn. Six Meter Net) is holding sessions at 0330Z, 2130 CST. Please note the new time. Your SCM is looking for a PAM for MSTN. WBØDSJ has a new Tempo One and is active in MJN. Steve will be putting up an antenna for 75 soon and expects to check into MSPN. WØMBD, WAØNBC and WAØNJR report seven new Novices in St. Cloud. Gary's YL is the only one to receive her call WNØGMB. SEC KØLAV reported high activity on the recent SET exercise. The response was gratifying. KØUOZ is home from the hospital and back on the air. KØWXH is back on the phone nets operating portable from Perham. George's rig was severely damaged by lightning about a year ago. Traffic: (Jan.) WAØVAS 718, WØZHN 290, WAØIAW 250, WAØGRX 248, WAØYVT 228, WBØDZA 146, KØZRD 113, WAØEPX 101, KØMVF 88, WAØTFC 86, WBØCNM 75, WØWFA 74, WAØYAH 72, WBØCGT 63, WAØRKV 57, WAØVYV 55, WBØBRG 54, WBØDYZ 54, KØLAV 53, WAØSGJ 44, KØFLT 40, WØWAS 35, KØZBI 31, KØICG 25, WAØYWA 25, KØSRK 21, WAØVYR 20, KØPIZ 19, WBØDDH 17, WØFDM 15, WAØUWT 14, WBØDHQ 13, WØATO 11, WØOBB 11, WAØPZY 11, WBØDSJ 9, WAØYGE 9, WNØGBX 7, WNØFMR 5, WAØATR 4, WAØOEF 3, KØLWK 2. (Dec.) KØZXE 22.

NORTH DAKOTA – SCM, Harold J. Sheets, WØDM – SEC: WAØAYL. OBS: WBØATB. OO: WØBF. It is with deep regret I report the passing of RM WAØRSR who joined Silent Keys in late Jan. Our sympathy to the family. One of the most interesting events was the International Snowmobile Race from Winnipeg to St. Paul with over 300 entrants. WAØSDQ and WAØWBU were mobile while WASWDB/Ø manned the base station at Crookston operating WBØCCK/Ø the first day and leg. WØHNV, WAØRWM, KØGGL, WAØGRX with WAØAAD/Ø also helped out along with WØDM. WAØJZF a new outlet in Jamestown has acquired the first 5-band WAS for the state. WAØSJB and WØBHT went to Ariz. WAØRWM has been helping with the YL WX net as well as WØFFJ who spells off his XYL WAØMND. WBØATJ reports a very good turnout and activity for the SET held in cooperation with the CD Hq. of N.D. WBØATJ reports 175 messages were handled by a large group of reporting members. WBØATJ reports working WAØUKD, who went to NC, on 21400, Tue. and Thur. at 1730 CST. WA8WNZ/Ø is a new call in Gwinner. WAØELO is still batting out a few on TEN. Congrats to WAØSUF who made BPL for the second time this year. WNØEEC has been transferred to Sioux Falls. Mark the calendar for the International Hamfest at the Peace Garden July 8, 9.

Nets	*kHz*	*CDT/Days*	*Sess.*	*QNI*	*QTC/Mgr.*
Goose River	1940	0900 Su	5	75	2WØCDO
PON	3996.5	0900 Su 1830 S-S	15	434	138WAØSJB
YL WX	3995	0730 M-F	21	446	417WAØGRJ WAØMNI
RACES	3996.5	1730 M-F 1830 M-F	42	856	71WBØATJ

Traffic: WAØSUF 216, WAØELO 138, WAØRWM 100, WØDM 62, WAØJPT 55, WØWWL 46, WBØBUF 38, WAØSJB 32, WBØCCA 30, *KØPYG/Ø 21, WB4AYN/Ø 20, WØCDO 20, WBØFFH 19, WAØRWI* 13, WAØAAD/Ø 12, WØMXF 9, WØHSC 2.

SOUTH DAKOTA – SCM, Ed Grav, WAØCPX – Your SCM attended the Jan. board meeting as Vice-Director for the Dakota Division and sat in on all sessions with other Vice-Directors. He also visited headquarters and operated WIAW. WAØUFS and KØHUI from South Dakota was worked. The South Dakota Late Net could

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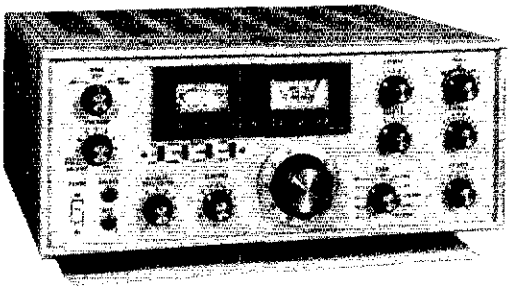

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Last but certainly not least is the power: 560 watts PEP SSB, 500 watts CW input power.

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he heard from Newington very well. New General licensees are WBØCRP and WBØBFP. WBØGMU, formerly WB6WQV has recently moved to Sioux Falls. Net reports: WX net average 25 check-ins NJQ – 620 QNI and 5 QTC; Early Evening Net – 790 check-ins and 23 formals. Late Evening Net – 1409 check-ins and 62 formals; SDN CW – 202 check-ins and 67 QTC. Traffic: WØZWI 679, WØMZ 429, WØHOJ 115, WAØTNM 114, WAØUEN 64, WØDVB 28, WAØBZD 25, WØCAS 25.

DELTA DIVISION

ARKANSAS – SCM, Jimmie N. Lowrey, WA5VWH – SEC: W5RXO. PAM: WA5QMQ. RM: WA5TLS. WA5TLS now has a Swan 500-CX transceiver and is using a 75-S1 receiver. WA5VRC has a new Swan FM-2X and linear on 2 meters. The OZK picnic is set for Apr. 9 from 10:00 A.M. until 4:00 P.M. at Pavilion No. 7 Burns Park, North Little Rock. A hamfest is planned for Sun., Sept. 24 at WA5ZKE's QTH on Hwy. 62, 5 miles east of Green Forest, Ark. W5KI has completed continuous ORS activity of 36 years and still has ORS party log of 1936! WN5FWH has completed WAS as a Novice. WN5FWH and OM, WB5CFL have a new TH6-DXX up 64-ft. WA5QMQ is now operating portable from Conway.

Net	*GMT/Day*	*Freq.*	*Mgr.*
Razorback	0030 Dy	3995	WA5QMQ
DX Info	0045 F	3995	W5QVH
OZK	0100 Dy	3790	WA5TLS
CAREN	0200 Th	146.34/94	W5RXO
Ark Phone	1200 M-S	3957	W5VFW
Ark PON	2130 M-F	3925	W5QFO
Ozark	2330 Dy	3995	WA5ZKE

Repeaters: Fayetteville WA5SNO 52.550/53.020; Fort Smith WA5YUT 146.34/94; Forrest City WB5EKF 146.16/76; Jonesboro W5RHI 146.34/94; Little Rock W5DI 146.34/94. Traffic: W5NND 127, WA5EVW 105, WA5ZKE 69, WA5TLS 37, W5SOO 20, W5KL 8, W5BED 3.

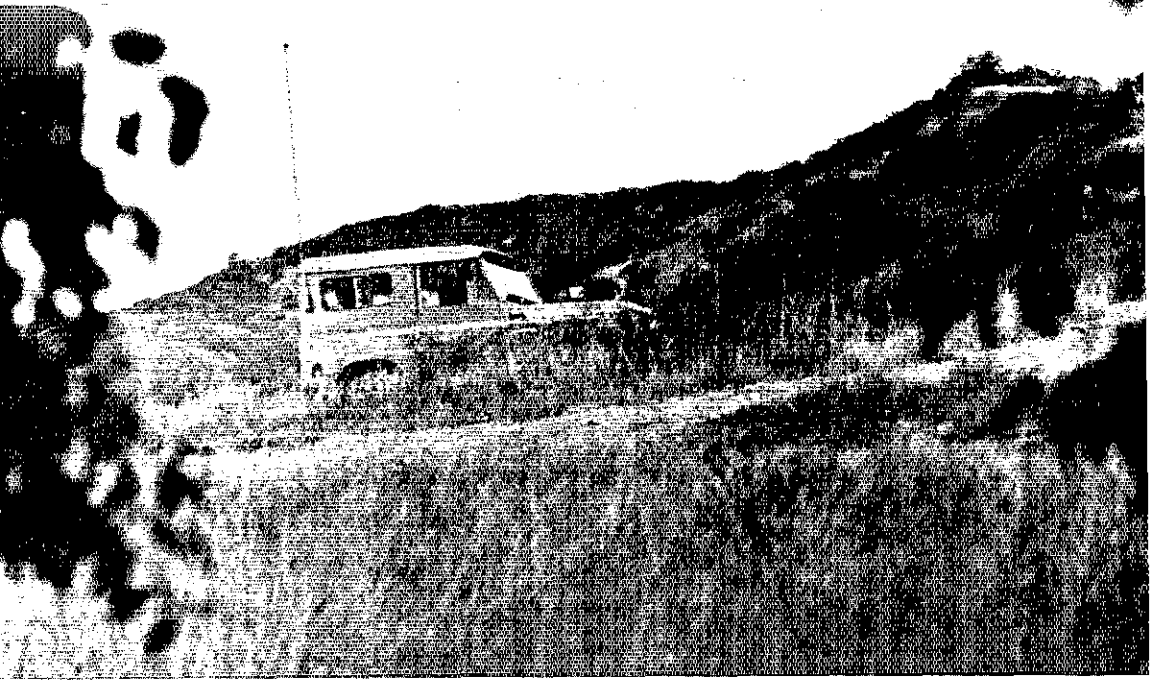
LOUISIANA – SCM, J. Allen Swanson, Jr., W5PM – SEC: W5OB. RM: WA5QVE. PAM: WA5NYY. VHF PAM: WA5DXA. A reminder – the Baton Rouge Hamfest will be held the week end of May 6 and 7. Sat. Hospitality Room at Father Colbert's Camp Ditto with the banquet Sat. night. Sun. some location. Talk-in freq. 3910 kHz and 146.94 MHz. The Camp is located off the Greenwell Springs Road. The SWARC SET was literally washed out this year! WA5VQL had plans for LAN in the SET in everyone's hands a week before the exercise. A terrific volume of traffic was handled. WN5EXQ passed his General after an absence of 42 years from Hamdom and now is W5YN. His license arrived New Year's Eve and he celebrated by working many of the Ole Timers in Straight Key Night. The Annual La. QSO party was a terrific success. Results later. WA5EID has a remotely tuned vertical going great guns. W5OB is now active in Navy MARS. Fellows by the time you read this nominations for SCM will be about due at Hq. The GNOARC will assist in radio control of Mardi Gras parades on 2-meter fm units. We understand that this will be a CD exercise. WA5YFQ is an Asst. Dir. The GNOARC is the recipient of a Mate gourd, medallion and other gestures of friendship from the Argentine Radio Club. The presentation was made by LU3FHT. Traffic: WA5WBZ 47, WA5EID 24.

MISSISSIPPI – SCM, Walker J. Coffey, W5NCB – SEC: WA5JWD. RMs: WA5YZW, WB5DEK. PAMs: W5JHS, WA5KEY, K5MDX. Novices, please check into the Novice Net.

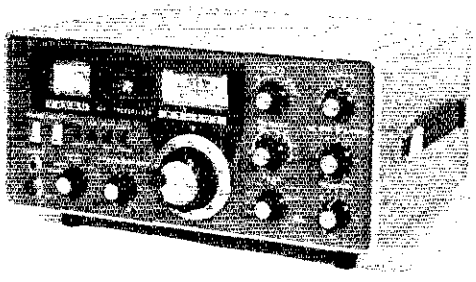
Net	*Freq.*	*Time(Z)/Days*	*QNI*	*QTC*	*Mgr.*
MTN	3665	0045 Dy	186	157	WA5YZW
MNN	3733	0000 MWF	46	24	WB5DEK
GCSBN	3925	0030 Dy		–	W5JHS
CGCHN	3735	0100 Dy	1639	60	WA5LZB
MSBN	3987.5	0015 Dy	1309	335	WA5JWJ

Our nets serve your community. Check in often. Congrats to every station participating in the SET. MTN held 6 extra sessions and MSBN was in session 20 hours handling traffic. ECs also exercised their plans. Welcome to new hams WN5s FSB, FTQ, FXM, FWX, FXR, FZX, GAV, GAW, GAY, GCH, GCI, GCJ. WA4ICF/5 is now WB5EXA. Welcome to WB5ALB and WB5LPX with his General Class. W5RUB has some real down to earth information on 40- and 80-meter DX antennas. WN5GAV had his rig impounded by the OM following some report card problems. W5EDT, W5SBM and WB5DEK again made PSHR. Appointments: ECs: WA5MPQ for DeSoto County; K5ZFM for Newton County. Traffic: WA5YZW 290, W5SBM 268, WB5DEK 261, W5EDT 124, W5NCB 116, K5TYP 74, W5WZ 68, K8YUW/5 67, WA5UBH 64, WA5BNH 48, WB5BUF 35, WA5GOH 28, WB5EIN 26, W5BW 22, WA5KEY 20, W5AMZ 17, WB5RKM 17, K5YTA 16, K5KTL 4, WA5JTB 3.

TENNESSEE – SCM, O.D. Keaton, WA4GLS – SEC: WB4ANX. PAMs: W4PFP, K4MOI, WA4EWW. RM: WB4DAJ.



Man's favorite sport



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Net	Freq.	Time(Z)/Days	Sess.	QNI	QTC	Mgr
TPN	3980	1245 M-F 1400 S-Su	31	1782	95	W4PF
ETPN	3980	1140 M-F	21	566	29	WA4EW
TCN	3980	0200 Th	4	40	0	WB4MF
TN	3635	0100 Dy	31	291	160	WB4DA
KVHFN	50.7	0200 T	4	32	0	WB4MF
MTTMN	28.8	0200 T&F	6	62	0	W4PS
ETTMN	28.7	0200 W&F	7	37	6	WA4QX
IHARCN	7268	0130 W&F	8	77	3	WB4QN
ETVHFN	50.4	0100 TTh&S	10	78	0	WB4IO
ETVHFN	145.2	0100 W&F	8	31	0	WB4IO
TSSBN	3980	0030 M-S	26	1692	108	K4MQ

The newly elected officers of the Kingsport *Amateur Radio Clu* and Bays Mountain Radio Club for 1972 are WA4BXZ, pres WB4FVM, vice-pres.; KARC – WA4EWW, secy.-treas. BMRC WB4MPJ, secy.-treas.; WB4ANX, act. mgr. Please send me an information and/or leads that will help establish the history o amateur radio in Tenn. Commendations are in order for all thos *who made the 1972 SET an overwhelming success. Traffic: W4ZJ* 216, W4DMS 207, WB4DAJ 159, WB4DYJ 146, WA4GLS 70 W4PFP 56, WA4YFG 56, WB4NIR 54, WB4USG 50, K4AMC 47 W4RUW 42, WB4MPJ 37, K4MOA 36, WB4MSS 33, W4IGW 25 WB4NEG 23, W4TYV 23, WA4ANX 21, WA4EWW 20, W4WBK 20 WB4TPS 19, W4CYL 16, WB4BZC 10, K4UMW 6, K4SJV 5.

GREAT LAKES DIVISION

KENTUCKY – SCM, Ted H. Huddle, W4CID – SEC: K4YZU Endorsements: WA4AGH, WA4WWA, WB4HTN and WB4JBO a ECs, WA4FAF and WB4HTN as OPSs. WA4GHQ as OVS. BPLs W4BAZ and WB4PSP

Net	QNI	QTC	Net	QNI	QTC
KRN	379	21	KYN	415	41
MKPN	621	79	ECATN	60	
KTN	2095	811	KNTN	359	17
KPON	96	46			

Star performer in net activity continues to be KNTN under th guidance of WB4PSJ. ECATN is in need of an official net manage WB4RLA has been serving unofficially but must resign because o business pressures. Any volunteers? The Louisville SET meetin attracted 31 participants from all over the state. *Statewide SE* activity was pretty good with the Owensboro group surpassing las year's score on Sat. afternoon. WA4JQS has a new SB-220 an W4CID has a new 2-meter rig. WB4UQC is a new 2-meter station i Somerset. Traffic: W4BAZ 293, WA4JQS 263, WA4VZZ 248 K4HY 221, K4PW 203, WB4PSP 195, WN4WCM 165, WA4GH *161, W4OXM 149, K4UNW 143, WB4UGU 141, K4TXJ 137* WB4PSJ 116, WB4AUN 110, WB4PVC 106, K4MAN 96, W4BT 92, WB4TPF 84, WB4KPF 73, WA4AGH 66, WB4EOR 57, W4OY 57, W4CID 56, K4DZM 54, K4TRT 43, WA4DYL 34, K4AVX 33 WB4MQR 32, WB4ILF 27, WA4ENH 19, K4LOL 18, K4VAI 18 WA4AVV 16, WA4FAF 12, W4CDA 11, WA4HLW 9, WB4IBO 9 WB4MQS 9, WA4MXD 8, K4OHZ 6, K4YCB 5, WB4GCV 3 WN4WKF 3.

MICHIGAN – SCM, Ivory J. Olinghouse, W8ZBT – Asst. SCM R. Peter Treml, W8KBZ. SEC: W8MPD. RMs: W8JYA, W8WV W8RTN, K8KMQ, WA8DUL. PAMs: WA8TAN, K8MJK, K8PV *VHF PAMs: K8AEM, WA8WVV.*

Net	Freq.	Time/Days	QNI	QTC	Sess.	Mgr.
QMN	3663	2300 Dy	1179	616	96	W8JY
WSSB	3935	0000 Dy	889	136	31	K8PV
BR/MEN	3930	2230 S-F	909	104	26	WA8TA
UPEN	3920	2230 Dy	502	68	31	K8MJ
GLETN	3932	0230 Dy	359	33	24	W9KT
PON	3955	1600 Dy	1128	419	31	K8LN
PON/CW	3645	2400 M-S	159	42	26	VE3DP
Mi.6M	50.7	0000 M-S	328	26	24	WA8LR

Oakland Co. AREC Net reports 4 drills with QNI 58, QTC 6. SW M *2 and 6M nets report 15 sessions with QNI 224 and QTC 3. Silen* Keys: W8LSQ and W8SEW. 1972 officers for the Saginaw Valle ARA are W8KIN, pres.; W8IZ, vice-pres.; K8BWC, secy.; K8LNR treas. CMARC elected WA8LAY, pres.; WA8MVH, vice-pres W8KCJ, secy.; W8TJQ, treas.; W8QOL and K8ILF, dir. 197 officers for DARA are W8FBH, pres.; WA8WFI, vice-pres.; WA OXL, secy.; K8DYI, treas. W8SWI holds daily skeds with DJØNI (ex-W8RLT) on 21300 kHz. W8AP and W8FX were presente plaques by DARA for loyal and outstanding service to amateu radio. W8BZ now is WØMS. W8BW now is W4JM. K8IIN is locate at Fort Myers Beach with the call K4GWW. Delta Co. has a ne HW-100 for their club station. Their code and theory class has 1 students. WA8ZCO and WA8VTK had a 2-way QSO on RTTY o 1240 MHz on Jan. 1. Is this a first? PON Amateur of the Month K8GOU and the Special Award goes to K8WRJ. WA8WMT an WA8WNT are new Generals. WB8HPO now has Tech. Clas

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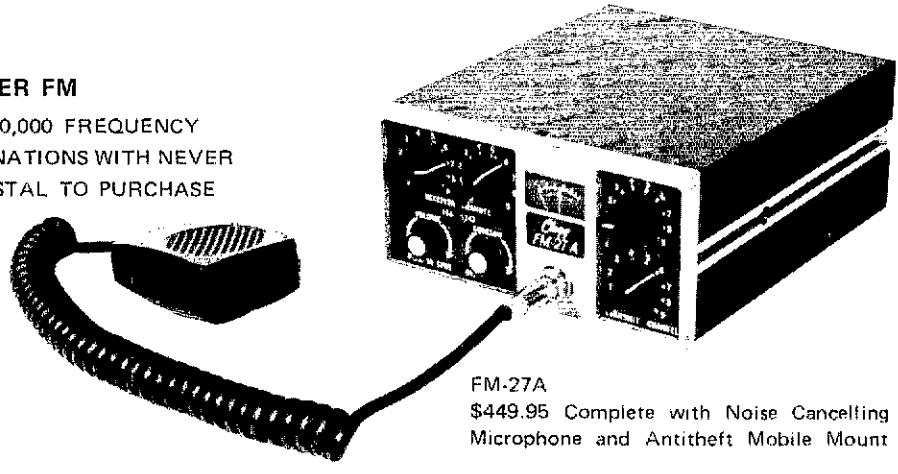

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WB8LTP has a new tower. WB8DKO has a new HD-15 phone patc
Traffic: (Jan.) K8ZJU 380, W8FBX 353, K8KMQ 353, WA8PI
261, W8SH 229, WA8SQC 190, WB8BPY 157, WA8LXY 15
W8GLC 144, WA8PII 93, WA8DUL 90, WA8ZAV 89, W8NOH 8
W8JYA 70, WB8LBG 63, W8NJM 63, WB8AXI 59, K8JLD 5
K8LNE 54, W8MO 48, WA8WVV 45, K8DYI 43, K8PVC 4
W8WVL 43, W8TZZ 40, WB8BYB 39, WB8IMI 39, W8DF 3
W8PZ 37, W8RLN 36, K8MJK 35, WA8OJI 31, WA8VNZ 3
K8WRJ 31, K8CPW 30, WB8DTJ 28, WA8VHA 25, WB8BJJ 2
WA8KHB 21, WB8AIZ 20, W8TBP 20, WB8ZL 18, WB8HPZ 1
WB8EZ 17, W8IUC 17, WB8ICU 16, WB8JYX 15, W8ACW 1
W8LME 13, WA8ONZ 13, WA8EXR 12, WB8JYP 12, WB8IXK 1
K8MXC 11, WA8VOU 11, WB8DKQ 9, W8EX 9, K8IHA
W8IKL 8, W8VXM 8, WA8AAP 7, WB8ELU 7, K8KCF 7, WB8B
6, WA8MDK 6, K8WJE 6, WB8RIY 5, WB8DTK 5, K8GOU
W8UM 5, W8DCN 4, WB8VWY 4, K8HGA 2. (Dec.) W8IZ 16
WA8VBY 68, W8DT 67, K8MJK 33, W8DCN 28, W8TBP 15.

OHIO — SCM, Richard A. Egbert, W8FTU — Asst. SCM: R
William Clausen, W8IMI. SEC: W8QUU. PAM: K8OBK. VHF PA
WA8ADU

Net	*QNI*	*QTC*	*Sess*	*Freq.*	*Time(Z)*	*Mg*
OSSBN	3750	2058	98	3972.5	1530/2345	K8QB
BN	776	840	66	3580	0000/0300	W8IM
OhioMtrN	579	168	67	50.61	0000	WA8AC
				50.16	0200	
BN RTTY	367	193	34	3605	2300	WA8YU
OSN	228	68	29	3580	2325	WA8WA

WB8GVI, WA8EIX, K8ONA, WA8WPO, W8OCU and WA8CC
earned BPLs in Jan. WB8IET is a new ORS and W8MOK a
WA8EQC are OPSs; OSSBN certificates went to WB8BLH, W8DH
WA8EIW, W8IGW, W8WSK, W8BZR, W8ERR, WB8HIL, WA
KPN, WA8WWM, WA8YRU, WA8ZYF and WA8ZTV. Congratu
tions to newly ARRL affiliated Kent State University AR
Northern Ohio ARS and Brookhaven High School RC. T
University of Akron ARC's new officers are WA8ZLB, station mg
WA8UPI, chief op.; WA8IDP, tech. supervisor; WB8EIG, sec
treas. Harrison/Jefferson Co. EC W8ERR reports his ARFC activi
produced five "plugs" on broadcast radio, two spots on TV and tw
newspaper stories. InterCity RCs Bulletin tells of a new 2-met
repeater fired up in Crestline. The Lake Erie Auto Start Club's 19
leaders are K8ZYX, monitor; K8VPM, vice-monitor; K8NQW, sec
OVS WA8KPN reports good 6-meter openings to W4 and W5 duri
Jan. OO K8IEX advises that 6- and 2-meter enthusiast W8ANE h
moved to Irving, Tex. Congratulations to new Advanced Cl
K8VPV and K8BC. Another SET has come and gone. By the sou
of things, our section did its usual excellent job. We went out in t
snow with our local ARFC group, and took part for a while in t
NTS section. The Key City concept of operation seems to be gain
ground, was given a good workout in some areas this year. Trave
took us to an enjoyable meeting with the Tri-County Alliance
ARC in the company of Asst. SCM W8IMI, and to a fine dinn
meeting with the Steubenville ARC. WA8COA takes over EC duti
for the Southwest Ohio Counties of Brown, Butler, Clermon
Hamilton and Warren. RM W8IMI reports that WA8WAK assume
mgr. responsibility for Buckeye Net in Feb. Traffic: WB8GVI 60
WA8EIX 600, WA8NOQ 454, WA8EQC 449, W8CUT 377, K8ON
348, W8LT 347, W8PMI 309, W8QUU 304, W8RYP 298, WA8WE
295, W8JMD 285, W8QCU 285, W8MOK 268, W8IMI 26
WB8ALU 259, W8GRG 225, WA8COA 221, WA8UPI 182, WB
HUP 180, W8GVX 179, W8CHT 166, W8RET 166, W8OP 16
K8NOW 161, WB8DQU 147, K8UBK 140, WA8YXB 140, WB
GED 137, WA8HGH 130, WA8QEK 128, WA8WAK 128, WA8ZL
128, W8BCWD 125, WA2ASM/8 120, WA8DWL 120, WA8E
109, K8RPX 97, WB8EXD 94, K8LEI 92, W8ID 90, K8DHD 7
W3EAF/8 74, W8UDG 69, WA8MIH 67, WA8SED 65, WB8BLH 6
K8MLO 60, WA8VAE 60, W8RIE 58, WA8TYF 54, WA8MCR 5
K8OYR 50, WA8VWH 50, W8FTU 47, K8LXA 45, WA8ADU 4
W8FRR 41, WA8AJZ 38, WA8YUB 38, W8UPD 36, W8GOE 3
WA8ZNC 30, WB8AZH 28, WB8AJC 25, W8GNL 25, WA8SHP 2
WA8SSI 25, WA8KPN 24, W8ARW 21, K8DHJ 21, WB8AKU 2
W8NAL 20, WB8CKI 19, WA8YIB 19, W8PBS 18, WB8AZN 1
WA8EIX 16, K8BXT 15, K8BYR 15, WA8JEH 15, K8ZYX 1
WA8ORO 12, K8CKY 11, WB8KKI 11, W8WEG 11, WA8ICQ 1
K8MPR 10, K8KXD 10, WB8ENC 9, W8MGC 8, K8VPM 8, W8LZ
7, WA8LAM 5, W8CHT/M 4, WB8EOI 4, K8PHD 3, WB8EWX

HUDSON DIVISION

EASTERN NEW YORK — SCM, Graham G. Berry, K2SJN
Asst. SCM: Kenneth Kroth, WB2VJB. SEC: W2URP. RM
WA2VYS. PAM: WB2VJB. VHF PAM: WB2YOU. Nets: ISS 2300
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NYSPT&EN 2300Z daily at 3.925. EC's Sun. 1800Z on 3.980. C
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☐ SN7405N	Hex inverter, open collector	0.39
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☐ SN7490N	Decade counter	1.40
☐ SN7491N	8 Bit shift register	1.25
☐ SN7492N	Divide by 12 counter	1.25
☐ SN7493N	4 Bit binary counter	1.25
☐ SN7494N	4 Bit shift register	1.25
☐ SN7495N	4 Bit right shift left shift reg.	1.25
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☐ 711C	Memory, Sense, Amp***	.59	2 for 1.00
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☐ TVR-2000	Hi-power 723 ***	1.59	3 for 3.95
☐ 741C	Freq. Comp. 709***	.95	3 for 2.50
☐ 748C	Freq. Adjustable 741***	.95	3 for 2.50
☐ 709-709	Dual 709's (DIP)	1.49	3 for 4.00
☐ 741-741	Dual 741's (DIP)	2.25	2 for 6.00
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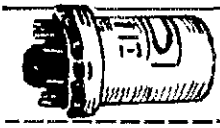

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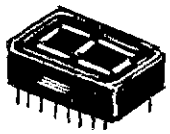

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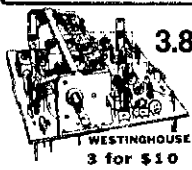

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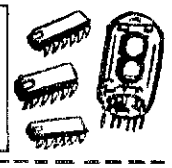

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heard W2BHM from N. Jersey DX Assn. on operations of the W2-K2 QSL Bureau. Congratulations to longtime WARA member K2SJO on becoming Division Director and to his predecessor W2TUK on being elected ARRL pres. Harmonic Hills RL reports 4 new members and course in cw/theory headed by WB2UYD. Albany ARA officers for '72 - WB2VJB, pres.; WB2KLY, vice-pres.; W2CDQ, secy.; WB2OHQ, treas. Schenectady ARA heard Joseph Erkes from Dudley Observatory on 22-year sunspot cycle. Jan. speaker at Harmonic Hills was W1GEY on TV casts on astronaut recovery missions. LERA ARC is again sponsoring NY State QSO Party Apr. 29, 30; details in QST or from WB2FAG, contest committee head. Communications Club of New Rochelle had new officers and directors sworn in by Mayor Frank Ganto, heard W2TUK in pre-ARRL Board discussion. If your club isn't listed here, it's because your newspaper/meeting bulletin didn't get to the SCM. Individual station activities: WB2JLR to Extra Class. WA2TUJ new General in Albany. K2DN reports meeting JA8BI at IARU Hq; also is trying to start up RTTY net on 3.646 at 2030 local time. Westchester Co. EC WA2JWL reports 508 stations active in SET. New YL harmonic for K2JQB at month-end. WA1OFP, WA2KXM, WB2KHZ, W2WRF and WA2ROT all on 220 via repeater on 220.150/224.300 and 14 active to date on new 146.46/145.68 WA2KXM 2-meter fm repeater. FB jobs for one club - Harmonic Hills. WB2HHH used K2AE repeater to report accident to police and receive first aid instructions from W2DOO, an MD who was on frequency. WA2MID served as relay to police. WA2RAU made it to Africa this month, talked to section as 7S2A. WA2HHO home from W4 college long enough to get involved in SET. WB2WWD's new antenna OK, but mast took a bend in windstorm. Traffic: (Jan.) W2URP 233, WA2VLS 148, K2SJN 68, WA2HHO 59, WA2EAH 55, WA2TUJ 41, WA2LXI 35, WB2VJB 30, W2SZ 28, WB2JLR 26, WA2WGX 18, WA2FBI 12, WA2QCY 10, K2DN 1. (Dec.) WB2IYO 15.

NEW YORK CITY AND LONG ISLAND - SCM, Fred J. Brunjes, K2DGI - SEC: K2HTX. RM/PAM: WA2UWA. VHF PAM: WB2ROF.

NLI*	3640 kHz	1915/2200 Nightly	WB2LZN Mgr.
NLI Phone*	3925 kHz	1600 Dy	WA2UWA PAM
Clear House	3925 kHz	1100 Dy	WA2VYT Mgr.
Mic Farad	3925 kHz	1300 Ex Su	
East U.S.	3685 kHz	0001 Nightly	
All Svc.	3925 kHz	1300 Dy	W2GF Mgr.
NYSPTN	3925 kHz	1800 Dy	WB2HLV Mgr.

*Section nets; all times local. As you will note, some changes have been made in the heading this month. After many years of service to the section as SEC, K2OVN has resigned this post due to heavy personal schedule. My thanks to John for his fine service as ARLC chief these many years. K2HTX former EC for Suffolk County, and Huntington Town, will serve as SEC. I ask all to give K2HTX their cooperation in his endeavors to make our ARFC system the finest in the League. Our section nets have also experienced a change, with WA2UWA serving as both PAM and RM, and WB2LZN as NLI Net Mgr. These changes will hopefully improve the efficiency and coordination of our section nets. The NLI VHF net has been temporarily de-activated until additional liaison and station outlets can be established. The traffic nets require outlets primarily in the 5 boroughs of the city. If you have an interest in traffic handling and providing a public service, announce yourself on one of the section nets as being interested in traffic activity, and you will receive a complete rundown on techniques. I regret to announce W2WMG as a Silent Key. K2SHU has received the ARRL SSTV WAC award with certificate No. 3! Congratulations! WB2FJX reports a new amateur in the family, his dad WB2DED! WA2TAQ reports the Annual Rockaway Amateur RC Spring and FMers get-together will be held on Apr. 28 (Fri. evening) at the Hall of Science Bldg. (World's Fair grounds) 111th St. and 48th Ave., Corona. Doors open at 6 P.M. Further details contact WA2TAQ, chmn. at P.O. Box 541, Lynbrook, N.Y. 11563. WA2COE reports a tough fight to be active from 5th floor apartment in the middle of Manhattan! After service with the U.S. Coast Guard, K2PNW has returned to join the QRM of 2 Im and the DC bands. WB2WEJ has graduated Stony Brook "U." Accolades to one of our own who made it to the top! ARRL Pres! Our own W2TUK. Heartiest congratulations! WA2PLI reports starting a Local and Internation ARS Slow Speed Net on May 6 at 1600 GMT on 14.075 MHz. My thanks to those volunteers at the Hall of Science helping to make their Novice course one of the most successful in the area, and giving amateur radio a real "shot in the arm" in the N.Y. area. Traffic: WB2LZN 578, WB2WFJ 346, W2EC 255, WA2PLI 79, WB2YIG 60, WB2CHY 36, WA2LJS 18, W2OBQ 9, W2PF 8, K2JTL 5, WB2HWI 4.

NORTHERN NEW JERSEY - SCM, Louis J. Amuoso, W2ZZ - SEC: K2KDQ. RMs: WA2FAF and WA2BAN. PAMs: K2KDQ and WA2TAF. New appointments: WA2JNO as EC for Clifton and

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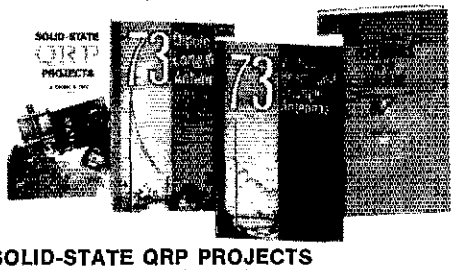

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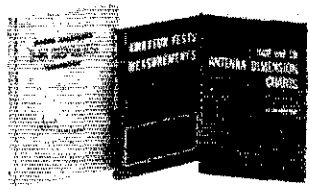

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vicinity and WB2LTW as EC for Jersey City and vicinity. WA2JNQ is the new Net Mgr. for PVETN. A big thank you to WA2BAN fo the great job he did as Mgr. of NJN. Good luck to K2RXQ the new Mgr. and lets all give him the same cooperation we gave the others Congratulations to our former Director W2TUK who became Pres of ARRL, also to K2SJO who moved up to Director of the Hudsor Division and to W2IHA who has been appointed the Vice-Director WB2TFH is on reserve duty aboard the USCGC Unimak. K2EQI reports his old RAL7 finally went west after 20 years. Good luck to W2ECO who is retiring and moving to the WNY section. W2CVW WA2UDT WA2QKR and WA2PKY were all in the recent VHF contest. WA2UDT reports he is working hard on his ssb exciter for 2 meters. Club officers for the Ridgewood ARC are W2MOP, pres. WB2AXY, 1st vice-pres.; W2DVB, 2nd vice-pres.; WA2LLS, treas. WB2ZBI, secy. This group meets on the second Wed. of every month in the Ridgewood Red Cross Building and will help those interested in obtaining their Novice Class ticket. WB2KNS has a new Dycomm Amplifier on 2-meter fm. W2TPJ sent in his usual fine OO report. WN2BBM is a new ham in Fairlawn. K2OWR and WA2JLE both on 2-meter fm. WB2CXO new harmonic is his 6th YL WB2ZYP is out of the hospital and doing fine. SEC K2KDO spoke at the Bellville RC. WA2FQG is the newest member of NJDXA WA2SRQ and WA2UOO operated /W4 in Fla. New club officers for the NJDXA are W2OM, pres.; W3RGV, vice-pres.; W2JEH, treas. W2ZTV, secy. Our SEC reports the SET operation a big success with all EC's reporting and traffic totals at a new high. Thanks to everyone who helped. Traffic: (Jan.) K2KDO 512, WA2EPI 377 WB2RKK 346, K2RXQ 325, K2DQT 316, WB2AEH 245, K2DEL 201, WB2YPQ 136, WA2NLP 110, WB2NOM 110, WA2FVH 64 WA2CAK 60, W2CU 58, WA2QNT 36, WA2SRQ 34, WB2KNS 30 W2CJC 26, W2ZEP 25, WA2CCF 24, WA2EUO 23, WB2WNZ 17 K2ZPI 13, W2CVW 12, K2EQP 10, W2ZZ 8, K2JSJ 4, WB2TFH 3 (Dec.) WA2EPI 3838, K2EQP 43, WB2YPQ 25.

MIDWEST DIVISION

IOWA – SCM, Al Culbert, KØYVU – SEC: KØLVB. Two new OO appointees are KØLKH and WAØVDX. The OO appointment i becoming one of the more popular field organization appointment and deserves our support as well as the League's "Intruder Watch." Congratulations to the Kirkwood Community College ARC of Ceda Rapids in becoming an ARRL affiliate WAØJCF and his XYL WAØUPS are sporting a new Slow-Scan TV rig on 6 meters. Sorry to note the passing of WAØLOC. I wish to point out to clubs and net within the section, that it takes 3 months lead time for inclusion o material in QST, so advise your SCM or Hq. plenty early if you are planning an activity for which you wish advanced publicity in QST The 3900 Club-of-the-Air had 64 present for their dinner meetin Jan. 29 at Storm Lake. On Jan. 30, WØFZO (the sparkplug of the 3900 Club) was hospitalized for surgery. The next 3900 Club dinne will be held Apr. 15 at Okoboji, Iowa. At first glance, it appears tha our overall SET activity was below our norm, with the exception o a few bright spots. It seems that 160 meters is not low enough, some are experimenting QRP on 178 kHz.

Net	*Freq.*	*Time(Z)/Days*	*QNI*	*QTC*
Ia 75-meter	3.970	0000 M-S	1175	3
IECN (cw)	3.560	0030 Dy	173	9
Ia 75-meter	3.970	1830 M-S	1556	90

Traffic: (Jan.) WØLCX 638, KØDDA 229, KØAZJ 130, WØMOC 121, WAØAUX 64, KØOOD 57, WØWSV 49, WØIO 30, WAØZID 24 WAØYJW 21, KØYVU 20, KØJGF 16, WAØVZH 15, WBØAVW 9 WØBW 8, KØLKH 8, KØCNM 4, WAØEFN 2. (Dec.) WØWSV 4.

KANSAS – SCM, Robert M. Summers, KØBXF – SEC: KØLPE RM: KØMRI. PAM: KØJMF. VHF PAM: WAØTRO. The 1972 SE is over and reports are good. KØLPE reports that we now have 585 AREC members. The Kans. weather men of the month are WAØUX and KØUHU. Zones 1,2, 3,4,5,7,9 and 14 reported net activity vi the SEC this past month. KØMRI reports 29 active stations handlin the cw end of the SET activity. EC WØGUR mobiled to Tex KØAYO has completed his 5BWAS and needs 150 counties for tha award, next. WØCHJ is retiring his Viking I to 160 meters and wil give KØMRI some competition with an SB-401. WAØTRO reports new repeater in the Concordia area soon with antenna atop a 170-ft tower. Salina club announces their Hamfest June 4 with a dinne meeting the Sat. evening before. Midstates Mobile Monitor Service 3920 kHz daily reports Jan. 1372 QNIs including 53 mobiles handling 44 phone calls or patches and 61 QTC. WBØBCL is acting net mgr.

Net	*kHz*	*Time/Days*	*QNI*	*QTC*	*Sess.*	*Mgr.*
QKS	3610	7 P.M.& 10 P.M. Dy	645	246	60	KØMRI

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KPN	3920	6:45 A.M. MWF 8:00 A.M. Su	213	35	17	KØJMF
KSBN	3920	6:30 P.M. M-S	1448	96	27	KØJMF
KWN	3920	6:00 P.M. Dy	671	22	31	WAØLLC
KEC	7278	1:00 P.M. Su	85	7	5	KØLPE
HBN	7280	12:05 P.M. M-F	626	49	21	WAØUPA

Traffic: KØBXF 277, WØHH 258, WØINH 258, WAØLLC 241, KØMRI 162, WØCHJ 107, KØLPE 91, WAØYXK 79, KØJME 75, WAØZTW 75, WØMA 59, WAØLBB 55, WAØJEC 50, WAØOZP 50, WBØBIY 46, WAØUXI 46, WØPB 41, WØMCH 38, WAØYPB 38, WØGUR 31, WBØCZR 26, WØBGX 24, KØEXN 22, WAØSRQ 22, WØGCJ 21, WAØOWH 13, WAØSFV 13, WØFDI 11, KØPSD 10, KØFPC 5, KØZHO 4, WBØBCL 3, WØNYG 3, WØFCL 2.

MISSOURI — SCM, Robert J. Peavler, WØBV — SEC: WØENW. With deep regret I report WØAYQ and KØIJJ as Silent Keys. New appointments: WØRWS and WAØVBG as OBSs, WAØJOG EC for Stone and Taney Counties; KØLVR EC for Callaway County; WØLVB EC for Barton County.

Net	*Freq.*	*Time(Z)/Days*	*Sess.*	*QNI*	*QTC*	*Mgr.*
MoPON	3963	2300 M-S	25	720	72	WAØTAA
MEN	3963	2330 MWF	13	365	17	KØKUD
MoSSB	3963	2400 M-S	25	1313	58	KØRPH
WEN	3980	0130 M	7	21	30	KØBIX
PHD	50.45	0130 T	5	130	10	WAØKUH
MON	3585	0100 Dy	37	248	167	WØHH
MON2	3585	0345 Dy	28	139	57	WØHH
MNN	7040	1900 Dy				WØHH
MoCD/CW	3531.5	1500 Su	6	27	17	KØRPH
MSN	3703	2200 Su	15	69	40	KØBIX

Most of these nets will meet one hour earlier GMT with the shift to Daylight Saving Time. MNN started on Feb. 1 with WØHH as mgr.; Don invites the participation of all who cannot make evening net schedules. Novices! MSN is the net for you; KØBIX assures you that the net will slow down to anybody's speed. WBØBZP reports that a 6-meter cw net is being formed in the St. Louis area to help all who want to raise their code speed or study for a higher class license. Congratulations to: KØIPL, who led Missouri in the 8th QSO Party, closely followed by WAØVEF and WØQWS; to WBØDTF, who was named to the National Honor Society at his high school; and to new Novices WNØGKO, WNØGMX (daughter of WAØDHR), WNØGON (XYL of KH6GQK/Ø), and WNØGPH. My thanks to the many operators who made the SET a big success in Missouri. Traffic: KØONK 1614, WØHH 244, KØRPH 180, KØYBD 166, WØBV 129, KØBIX 97, WBØARH 74, WAØKDE 42, WAØHTN 40, WAØTAA 30, WAØWOC 22, WAØKUH 12, WØCBL 2, WBØCKC 1.

NEBRASKA — SCM, V.A. Cashon, KØOAL — Asst. SCM: Velma Sayer, WAØGHZ. SEC: KØODF. Renewed appointments: WØNIK, WAØJUF, WAØGHZ, WAØLOY as PAMs; WAØJKN and WAØJIH as OPSs; WØCXH, WAØEEI, WAØIBL, WØIRZ, KØJFN, WØWKP and WAØLLQ as ECs.

Net	*Freq.*	*GMT/Days*	*QNI*	*QTC*	*Mgr.*
NSN I	3982	0030 Dy	1562	30	WAØLOY
NSN II	3982	0130 Dy	1092	30	WAØLOY
Neb. 160	1995	0130 Dy	572	403	WAØCBI
NEB	3590	0300 Dy	117	31	WØTQD
NMN	3982	1330 Dy	1384	47	WAØJUF
WNN	3950	1400 M-S	660	18	WØNIK
AREC	3982	1430 Su	256	0	WØIRZ
CHN	3980	1830 Dy	1271	30	WAØGHZ
DEN	3980	2100 M-F	384	6	WAØAUX

Ak-Sar-Ben ARC officers for 1972 are WAØRDZ, pres.; KØLUG, vice-pres.; WAØVEE, secy.; WAØUZX, treas. KØSFA is in Fla., and WAØJIH is in Israel. Congratulations to new ARRL Pres. W2TUK. Box Butte County 2-meter AREC net reports QNI 23 and QTC 1. Clubs or individuals who hold class instruction are urged to register with the ARRL Instructor Corps, p. 104, Jan. '72 QST. Traffic: WØEWF 159, WØLOD 146, WAØSCP 114, KØKJP 60, WBØCAU 52, WØHOP 47, WAØCBJ 31, WØLWS 31, WØTQD 28, WAØYGZ 26, WØNIK 25, KØODF 21, WØFQB 20, WAØIXD 20, WØSGA 19, WAØBOK 18, WØVEA 17, KØOAL 15, WAØQEX 15, WØDMY 14, KØJFN 13, WBØEJL/Ø 12, KØFJT 12, WØWKP 10, WAØFII 8, WBØGAK 8, WAØJKN 8, WAØPCC 8, WAØMHW 7, WAØRFT 7, WØVYX 7, WAØAES 6, WØGEQ 6, WAØJIH 4, WAØNKZ 4, WAØYGI 4, WAØLOY 3, WAØVIT 3, WØAGK 2, WØDJO 2, WAØGAT 2, WAØGHZ 2, WAØHQQ 2, KØPTK 2, WØSWG 2, KØUDW 2, WØZNI 2, WAØJUF 1, WAØLRQ 1, KØSFA 1, WØYFE 1.

NEW ENGLAND DIVISION

CONNECTICUT — SCM, John McNassor, W1GVT — SEC: WIHHR. RM: K1EIR. PAM: K1YGS. VHF PAM: K1SXE.

Net	*Freq.*	*Time/Days*	*Sess.*	*QNI*	*QTC*
CN	3640	1900 Dy 2200	66	711	64

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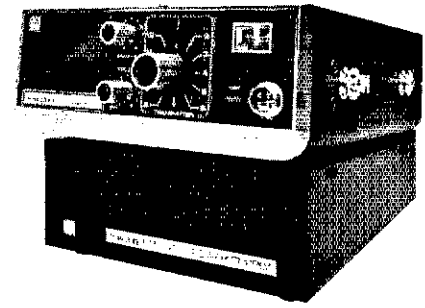
George, W6OGM

(G. W. McGinley, executive vice president and general manager, Swan Electronics)



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VHF 6	50.6	2100 M-S	20	90	10

High QNI: CN — W1KV, WA1GHH, W1MPW and W1CTI. CPN — W1GVT, W1MPW, WA1OPB and K1SXF. SEC W1HHR notes greater activity during SET this year. Bristol EC W1DGL with largest AREC unit got fine newspaper coverage. Complete reports from W1DGL and W1BKI. Navy MARS very busy during SET. K1FIR had special SET bulletin for CN and W1EFW sent SET information to 1RN members. Director W1QV extends thanks to all appointees in his Annual report and requests club secretaries to circulate the Club Letter sent to all Clubs — Tri-City Hamfest will be held in New London on Apr. 29. With sincere regret we add W1ANA to the list of Silent Keys. Active clubs have excellent bulletins: Danbury CARA; Trumbull TRUARC News; Tri-City Monthly; Hamden HARASCOPE and the Murphy Message — exchange your bulletin with these and others. Murphy's Marauders meet 8 P.M. Thurs. on 3860 kHz. Congratulations to: W1EFW for Jan. super BPL; WA1KVI Jan. BPL; W1MPW for High QNI on CN and CPN; W1ZKQ for Boy Scout Service Trophy; WA1MRT for A1 certificate and to WA1EQN for Hamden Ham of the Year Award! It will be my pleasure to serve another term as SCM — sincere thanks to all who have made it so enjoyable. W1HHR, K1EIR, K1YGS and K1SXF deserve full credit for keeping Conn. section rolling! Traffic: (Jan.) W1EFW 575, W1NJM 265, WA1KVI 237, K1SXF 189, W1MPW 183, W1AW 178, WA1GFH 164, WA1NES 164, W1CTI 141, WA1NTR 106, WA1SUO/1 101, W1GVT 94, WA1JZC 93, WA1GGN 76, WA1HEW 75, K1YGS 71, W1DGL 62, WA1OPB 45, W1KV 43, W1BDI 28, W1DQJ 24, WA1PHF 22, W1QV 17, W1RML 11, WA1NYU 10, W1CUH 9, WA1LMV 7, W1YBH 7, WA1JGA 3, WA1KGD 3, WA1PAJ 1, WN1PAL 1, WN1PEB 1, WN1PJV 1, WN1PMH 1. (Dec.) WA1NES 80.

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, W1ALP. The SET is over and I wish to acknowledge some 100 messages. New YLs: WN1s POB, PPU; WA1s PRO, PQS, K1KBB. W1s RUD, LR, ALP attended meeting of the Mass. Emergency Communications Commission in Boston. Congrats to W2TUK, new pres. of ARRL; to W1DEE/W2BOC on receiving ARRL's Technical Merit Award. W1PA is on 10. W1BMH, K1NES are on 2. WA1CIM on 75. W1TWG is vice-pres.; WA1IEB, net mgr. and K1HHN, dir. of FCARS. Pea Soup Net on 50.4 MHz daily at 10 P.M. South Shore ARA holding an auction in Apr. New officers of the Massasoit ARA: W1WLZ, pres.; W1ECK, vice-pres.; WA1MPZ, secy.; W1LJH, treas. They have a 10-meter net on 28.7 at 8 P.M. Tue. 6MCBN had 12 sessions, 41 QNIs. W1FRX had a nice write-up in his local paper. K1TNQ on 2. Waltham RC has a dial-a-bulletin telephone 894-0180 for club activities and ARRL bulletins. FB. WA1LDA is a Silent Key. WA2KZV/1 was on SET with emergency power. WA1MWN worked 6, Fla. and Ala. on 6. WN1ONH has WAS. W1JNV has 339 for DXCC. W1QFN doing a lot of phone patch work with the South Pole. W1NF says that SOWP and MTC celebrate S.F.B. Morse Centenial in Apr. W1VRK spoke on Slow-Scan TV at the South Shore ARC. WA1JED is on 2. K1EPL reports NEEPN had 134 QNIs and 13 traffic. WA1NSF and W1EQH are in AREC. New officers of Malden ARC: WA1HPS, pres.; W1BHD, vice-pres.; W1KSB, secy.; W1NXG, treas. The FEMARA will hold its next ARRL Convention Sept. 29, 30, 1973 at the Sheraton-Hyannis on Cape Cod! EM2MN held 25 sessions, 179 QNIs, 145 traffic. K1NOK has an HW-100 four-element beam up 60-ft. W1SSA has an HT-46 and a vertical. K1BRE on 20 with a Telrex and 1 kw. W1BAB is new EC for Malden. New appointments: WA1MSB as ORS; WA1NNL ORS OPS; WA1LKX OBS; WA1NDM OPS. Endorsements: WA1IRY a ORS; WA1LXE OPS, OBS; W1BHD EC, OBS, OVS; W1ABC ORS WA2KZV/1 ORS, OVS; W1YYZ, K1s WVW, NFW ECs. W1UOE now in Newport, R.I. OOTC chapter met at Valle's in Braintree Framingham RC now meets 2nd Wed. of each month. WA1IGI working in Conn. WA1OMM works DX on 10. W1HHN in EMN W1FJN has vfo on 6. K1UAF has Gonset G-28 for 10. WA1LKX putting up a quad. W1AEC in the SET. Officers of So. Eastern Mass ARA: K1BR, pres.; WA1FNM, vice-pres.; W1LAZ, treas. WA1CCM, secy.; K1VJP, WA1GXV, dir. WN1PDM DXing on 15. WA1NDM has HT-41 and three-element beam. WA1KTY gave a talk on the Box (TV) at Middlesex ARC. WN1OTE was seen on channel 2 TV. Officers Capeway RC: K1IPB, group mgr.; K1DYU, asst. mgr.; WA1NLX, treas.; W1QD, secy. WA1OEZ teaching in Acton area. WA1IZS has a rig on the air in Boston. W1ALP attended the banquet of the Cape Cod and Island ARA in Hyannis. Traffic: (Jan.) W1QYY 359, WA1EYY 344, W1QJM 306, WA1MSK 305, W1PEJ 249, W1CE 223, WA1OMM 201, WA1OWQ 194, WA1NNL 130, WA1MWN 102, W1DOM 89, K1PRB 76, WA1MYK 71, W1HHN 6, W1FJN 49, W1UX 43, W1AEQ 33, W1LE 25, W1EMG 22, K1UAF 19, W1DKD 17, WA1IFE 16, W1ATX 13, WA1DJC 13, WA1LKX

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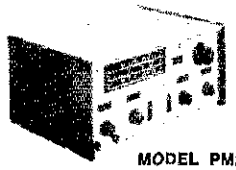

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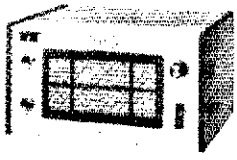

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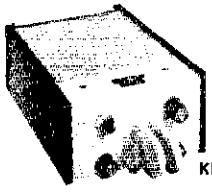

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KR5

MODEL KR5. Keyer. Self-completing. Optimum weighting. Single paddle. Speed 6-60 wpm. Operates from 6 or 12 volts DC. Size 4" W × 2" H × 6" D. Weight 1 lb. 6 oz. **Price $34.95.**

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12, WA1ENM 11, K1QJQ 9, W1AEC 8, K1EPI 8, W1ALP 6, WN1PDM 6, W1PJ 4, WA1NDM 2, WA1DFL 2. (Dec.) WA1KZE 202, W1EMG 112, W1FIN 33, WA1NRV 20.

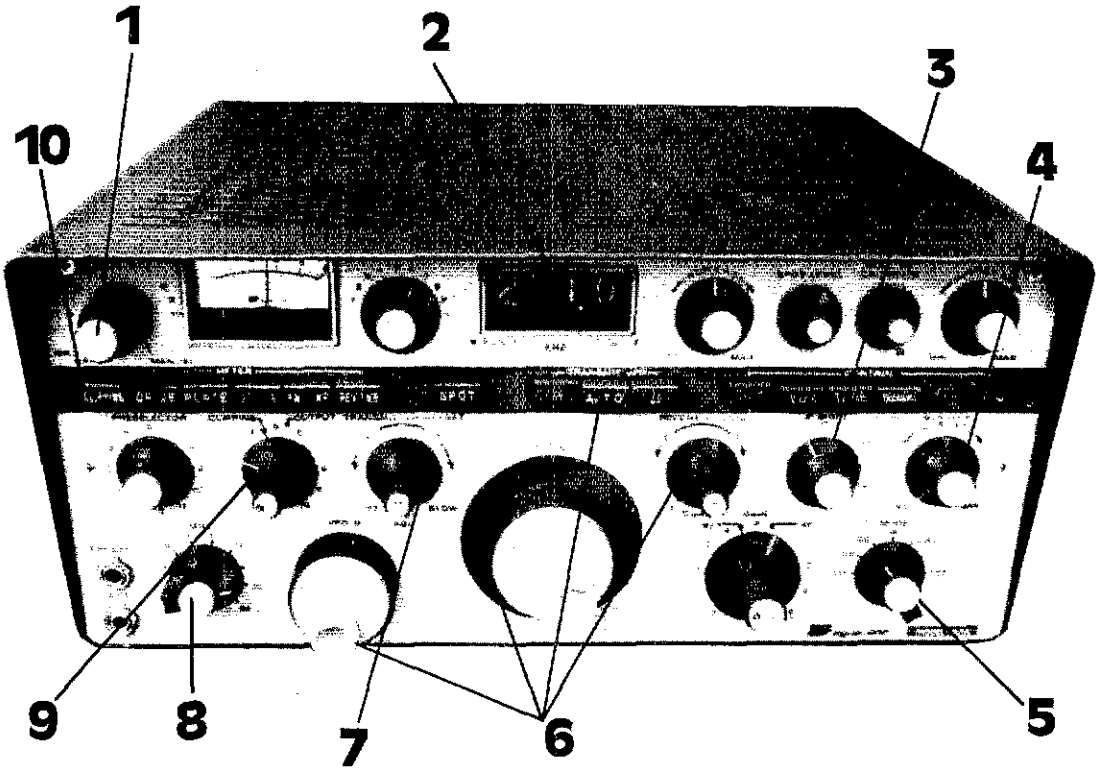
MAINE – SCM, Peter E. Sterling, K1TEV – SEC: K1CLF, PAM: WA1FCM, RM: W1BIG. W1FBJ and XYL have had a bout with the flu and are slowly recuperating. K1MUU reports 10-meter activity is picking up in his area. K1CHP is on ssb with an HW-12 and doing an FB job. I want to thank all who participated in the SFT. Everyone did an FB job on handling traffic and we had very good coverage throughout the state. The Northeast Area Barnyard Net reports 637 check-ins and 3 pieces of traffic for Jan. Seagull Net certificates were issued to K1SRM, W1VLU. New hams in Maine are WA1PPB, WN1PPH, WN1PQO, WA1POM, WA1PPZ, WN1PQH, WN1PRG, WN1PRB. Congrats, K1IVJ, in the hospital three weeks is now recovering nicely. The Sea Gull Net operates Mon. through Sat. on 3940 kHz at 1700. The Pine Tree Net meets daily on 3596 kHz at 1900. Traffic: (Jan.) WA1FCM 359, K4BSS/1 96, K1TEV 51, WA1PEN 7, WA1JCN/1 3. (Dec.) K4BSS/1 165.

NEW HAMPSHIRE – SCM, Robert C. Mitchell, W1SWX. SEC: K1RSC. RM: W1UBG. Endorsements: WA1GCL, WA1JTM and DJ1US/W1 as ORSs; W1IB/W1APK as OO. OBS and OPS; W1RCC as EC Hillsboro Co. Welcome back to K1RSC as SEC for NH. WA2EFK/1 is now WA1PFF and W8GLX is now W1GBP. New appointee: WA1MAR as EC for Cheshire Co. W1JB is converting a commercial rig for 2-meter repeater operation. K1GMW received his 30 wpm code endorsement. K1SIU is attending Lowell Tech. W1UBG reports 186 check-ins and 253 traffic with a welcomed increase of Vt. stations. K1ACL is fixing up a PE-75 for emergency power. Congrats to K1VXX and WA2EFK/1 on BPLs. CW comes through again! Welcome to WA1PML, WN1PNC, WN1PON, WN1PPF, WN1PQF, WA1POI, WA1PQP and WA1PQQ. WA2ELK/1 announces the formation of the Kearsarge Mountain Radio Club. Traffic: (Jan.) K1GMW 350, K1VXX 290, DJ1US/W1 260, W1UBG 210, WA2EFK/1 144, K1BCS 99, W1MXT 95, K1WQV 64, WA1JTM 63, K1RSC 55, W1SWX 14, W1MHX 12, W1BYS 5, K1ACL 2. (Dec.) W1BYS 3.

RHODE ISLAND – SCM, John E. Johnson, K1AAV – SEC: W1YNE. RM: W1YKQ. PAM: W1TXL. VHF PAM: K1TPK. RISPN reports 31 sessions, 536 QNI, 62 traffic. The W1AQ Club of Rumford reports that the following officers were elected at their annual meeting. K1AGA, pres.; K1IXQ, vice-pres.; WA1CVF, secy.; W1DK, treas. WA1ICO of the club is working on a more efficient power supply for his HT-41. He's also working 6-meter cw to help all Techs improve their code speed so that they can qualify for General. WA1MNQ has been working 6-meter cw with him. W1CCU is on the air again after a long absence. He is using some equipment from W1OLR. The K1NQG club of Cranston held a successful exhibit at a nearby shopping mall. WA1NUM is working on what he calls his "big rig" which he will run a kw in almost any mode. Many members are working hard to upgrade their licenses. More are building home brew rigs and antenna tuners. The club has moved from 3.715 MHz to 21.371 MHz for their net which meets Thur. at 2030 EST. W1TXL and W1DK were recently appointed Asst. Directors by W1QV. Traffic: (Jan.) W1YNE 121, WA1HBW 9, K1QFD 5, K1VYC 4. (Dec.) K1NQG 232.

WESTERN MASSACHUSETTS – SCM, Percy C. Noble, W1BVR – SEC: WA1DNB. CW RM: W1DVW. PAM: WA1MFB. VHF and UHF PAM: W1KZS. Sun. morning WM Emergency Net, QNI 45 and traffic 16. During SFT QNI 42 and traffic 33. All sessions had liaison with WMN, WMN, QNI 166, traffic 107. Top five in attendance: W1BVR, W1TM, WA1LNE, WA1OSK, WA1EBL. During the SFT WMN had QNI 24, traffic 24. Liaison with IRN was had on all SFT sessions. Under the direction of W1KZS the new 2-meter repeater ARFC net (via K1PFK on Mt. Greylock) is going great guns (Sun. at 2:00 P.M.). 22 QNIs first session! RM W1DVW is recuperating very well from an operation. New ORS: WA1MJE. With regret we report the passing of K1PYX. Any of you who have given instruction or examinations to prospective amateurs (or who would be interested in so doing) are asked to register with the proposed ARRL Instructor Corps. (Write ARRL Hq.). CMARA reports club members helped WN1OPN (both deaf and blind), who now is on 7161. HCRA is celebrating its 25th anniversary. Jan. speaker was W1SL from ARRL. WA1EBL, WA1PDJ and ET3USF are new members. MARC reports ham licenses in Mass. are Novice 639, Tech. 2936, Conditional 565, General 3962, Advanced 2053, Extra 476. Speaker at Jan. meeting was W1OKX. See previous QSTs for list of active West. Mass. nets. Traffic: (Jan.) K1SSH 212, W1BVR 141, W1TM 129, WA1LPJ 101, WA1LNE 81, WA1DNB 47, WA1MJF 40, WA1EBF 29, W1STR 19, W1KZS 16, WA1MFB 8, K1VPN 4. (Dec.) W1KZS 4.

Somebody once said there's no price for perfection.



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NORTHWESTERN DIVISION

IDAHO – SCM, Donald A. Crisp, W7ZNN – W7FRL is back in Salmon and repairing a damaged linear. WA7OIG reports 2-meter fm is catching on in the Idaho Falls area. A new 2-meter repeater has been installed on Gem's mountain near Driggs using frequencies 146.34 - 146.94. The Idaho Falls gang are using 146.76 for local contacts. *The Eagle Rock Club provided communications for a 101* mile snow mobile race. Members participating were W7DQU, K7PGG, WA7MPS, WA7JJC, WA7BVA, K7ENF and W7AXL. WA7OQL lost his 60-ft. tower in 84 mph winds. K7QCH is the new MARS youth training dir. W7IWU was elected pres. of the Boise chapter of the Idaho Society of RA. Other officers are W7FTN, W7JMA. W7HZL is moving to Emmett. WA7JCP is the new Lewiston-Clarkston club pres. and WA7LRP secy.; WA7CTS, vice-pres. W7DWE is NC for a new 2-meter fm net which meets each Tue. at 8 P.M. MST using the Orian peak repeater, 146.94 receiver and 149.94 transmitter. FARM Net reports 31 sessions, 982 check-ins, 89 traffic handled. Idaho P.O. Net, 14 sessions, 116 check-ins, 47 traffic. Traffic: W7GHT 288, WA7BDD 56, W7ZNN 37, W7AXL 12, W7IY 8.

MONTANA – SCM, Harry A. Roylance, W7RZY – Asst. SCM: Bertha A. Roylance, K7CHA. SEC: W7TYN. PAM: WA7IZR. The annual Butte Amateur Radio Club installation was held Jan. 22 with 170 people in attendance. Montana Post Office Net meets at 7:30 P.M. Montana held one of the best ever SET's this year. Congratulations to all who participated. The Missoula repeater is operating at present on 16-76. K7EKB handled a lot of the SET traffic by RTTY. Congratulations to WA7JOS on making BPL. Montana Traffic Net for Jan., 997 check-ins, 81 formal traffic with 21 sessions. More interest is being shown in the section with some 6-meter fm. Two meters is still growing. Traffic: WA7JOS 502, W7EKB 401, W7TYN 255, WA7IZR 31, W7RZY 13, W7IBK 11, K7CHA 6, WA7OBH 6.

OREGON – SCM, Dale T. Justice, K7WWR – SEC: W7HHF. RM: K7GGO. PAM: K7ROZ. WA7GTX reports for the AREC net for Dec. check-ins 336, traffic 15, contacts 26, maximum counties 14; Jan. – check-ins 292, traffic 15, contacts 24, maximum counties 14. WA7KIU reports for the OSN for Jan. – sessions 22, *check-ins 130, traffic 79. WA7ESO is portable at Severn, Md., and* keeps a sked with WA7KIU in his home town. WA7FTN made 316 phone patches to S.E. Asia during Jan. W7ESI is on 2-meter RTTY from Bend. High water in several areas occured not once, but twice during the month. Several stations were active and the state capitol station was standing by. K7EZP had his ORS renewed and is active on two and six. Traffic: K7ROZ 327, K7QFG 170, K7NTS 149, K7OUF 110, WA7IFS 40, WA7BYP 35, W7HLF 33, K7WWR 32, WA7MOK 26, WA7NWV 20, WA7KRH 8, W7LT 4, W7GUH 3.

WASHINGTON – SCM, Arthur Henning, W7PI – SEC: W7UWT. RM: W7GYF. PAMs: W7GVC, W7MCW. VHF PAMs: K7BBO, K7LRD. *New appointments: WA7MEO, WA7MJJ, WA7OXQ as* OPSs. Regret to say W7HCJ and W7SJX became Silent Keys.

Net	*Freq.*	*Time(Z)*	*QNI*	*QTC*	*Sess.*	*Mgr.*
WSN	3590	0245	359	140	30	W7GYF
NSN	3700	0300	304	80	31	WA7OCV
AREC	1930	1800 Su	117	225	6	W7UWT
NWSSB	3945	*0230*	*1009*	37	31	K7KPC
NTN	3970	1930	1535	196	31	K7VAS

Walla Walla Club annual Auction will be held Apr. 9. SET week end had weather had deterrent effect on some planned activities but all agree this was our most successful and smoothly run SET exercise. Liaison functions were FB between vhf and 75-meter ARLU groups and also between AREC and state section nets for intrastate and out-of-state traffic. Both 2- and 6-meter AREC nets had tremendous success in SET. FAX played a part in 2-meter SET too. New frequency of local FAX net is 145.80 MHz 9 P.M. Mon. Contact NCS W7OCV. Don't forget Skagit ARC Hamfest at Bryant Grange Hall Apr. 22. OCWA Section II Dinner meeting is Apr. 29, Lewis and Clark Hotel Centralia. W7USO visiting son in Belgium will be back May 1. Clubs having training programs, and instructors working individually are urged to register with ARRL Instructors Corps. See Jan. QST page 104. K7JRL is Contest Chmn. for QRP ARC *International. New OPS WA7MJJ worked about 200 stations* in Jan. Phone CD Party. Traffic: (Jan.) W7BA 1139, W7PI 347, W7KZ 266, W7DZX 264, W7BQ 245, W7GYF 156, W7UWT 132, W7GVC 131, WA7DZL 125, K7CTP 106, W7MCW 97, W7QCV 97, K7VAS 87, WA7KNW 83, W7AXT 79, K7OZA 76, WA7OCV 66, K7BBO 61, K7OXL 56, W7IDY 52, W7UMX 46, WA7HCL 45, K7WTG 42, W7IEO 34, W7APS 31, W7BUN 31, K7NZV 30, WA7PLI 26, W7USO 25, W7FOF 20, W7AIR 19, WA7GVB 12, K4ZDK/7 12, K7OKC 11, WA7OBC 10, WA7LMO 9, W7RXH 9, K7GSF 8, W7ZHZ 5, WA7LQV 4, WA7AVI 3, WA7MJJ 2. (Dec.) K7OKC 16, K7NZV 1.

PACIFIC DIVISION

FAST BAY – SCM, Paul J. Parker, WB6DHH – RMs: W6IPW, WA6DIL. Much work was done by MDARC this year's SET. Good Red Cross liaison. WA6DIL and WA6LYB have been very busy at school. WA6LYB has new inverted "V" for 80 meters. W6IPW really worked this year during SET. Congratulations to W6TTS on receiving 5BWAS award. W6ZF put up new tower and antennas. W6CBF made 96100 points in CD Ione contest. W5YK/6, ex-k6TX will be leaving for Tex. in June. WA6LTH is going great with his new General Class, averaging 10 students. Traffic: (Jan.) W6IPW 456, WB6VEW 38, WA6LYB 8, W5YK/6 5, W6ZF 1. (Dec.) WA6LYB 5.

HAWAII – SCM, Lee R. Wicaf, KH6BZF – Asst. SEC: KH6BZF. RM: KH6AD. PAM: KH6GJN. VHF PAM: KH6GRU. QSL Mgr.: KH6DQ. ECs: KH6s GPQ, BAS, GKD, GLU, HHG and BZF.

Net	MHz	Time(Z)/Days
Confusion (patches)	21.360	0001 All
Friendly	7.290	2030 M-F
Pacific Interisland	14.335	0830 M-W-F
Micronesia	14.345	0800 T-Th-S-Su
S.E. Asia	14.320	1230 All
Islander	21.111	0600 M-W-S
PACDXNET	14.265	0600 T&F
Playboy After Dark	3.950	1900 All

W6SAT is KH6ADR when he's on Maui! W6BWJ/KH6 and XYL were on Maui for sun and surf. They met KH6FL and KH6FY and had a pleasant visit. KH6HIB operates the optical clinic at Tripler Army Medical Center. When you drop in to see him you really have an "eyeball" QSO! In the 2-meter base station dept.: At a recent gathering in Waienae and KH6DXB's the mobile gang decided that the proposed new Tripler Hospital repeater would be assigned 146.20/.80 presently used at Diamond Head repeater and Diamond Head would be 146.28/.88 to keep 'dem Haoles from 'da Mainland from screaming. Diamond Head will continue to be linked to Mt. Haleakala, Maui. Good show fellas. WSQQQ/KH6 came through Honolulu on his way to JA-Land. The Army MARS repeater is up and working. Get your reports to me by the first of each month.

NEVADA – SCM, Leonard M. Norman, W7PBV – SAROC has been proclaimed by exhibitors and delegates as the number one convention and is now registered with the U.S. Patent Office. The next big convention in the west is the Sierra Hamfest held annually in Aug. by the Reno gang. QSL to K7ZAU for details. W7ILX, ex K2AAS was presented a plaque at SAROC by W2CFP for his outstanding public service handling traffic in New York State. K7ZOK is looking for NH contact on 6 meters for WAS. WA7ECT and W7ILX are top cw traffic handlers in Nevada. WA7DSP and K7ZOK have new fm handie-talkies. K7YVN and K7ZAU have a new Tristao Tower. Mobiling in the west try WCARS-7255 and WPSS-3952 and of course 34/94. Traffic: W7ILX 29, WA7ECT 4.

SACRAMENTO VALLEY – SCM, John F. Minke, III, W6KYA – The Lassen Amateur Radio Club lists 17 charter members, 13 of which are licensed and 10 of whom are ARRL members. Officers of the club include K6OM, pres.; W6GQT, vice-pres.; W6WMF, secy., WA6POF, act. mgr. As a club project, the group is working on the purchase of an HW-12A kit and will assemble it for a fellow amateur who is blind. Now is the time to start planning for Field Day. If your preparations are made with care it will be an enjoyable event. Traffic: (Jan.) K6YZU 40, K6KWN 30, WA6JGU 8. (Dec.) W6LNZ 6, W6NKR 4. (Nov.) W6NKR 16. (Oct.) W6NKR 4.

SAN FRANCISCO – Acting SCM, Hugh Cassidy, WA6AUD – Acting SEC: W6HLD. W6KVQ passed away suddenly in Jan. San Francisco, Marin, Sonoma and Humboldt Counties were active in the Jan. SET with possibly the best showing ever. W6RQ was active in the last CD Party and believes that he was the only one in the section who was active. WB6JQP is again outbound for the Orient and Australia. The new officers for the Eureka Radio Club are W6SLX, pres.; W6RNL, vice-pres.; WA6ASQ, treas.; W6BWV, secy.; WA4GBR/6, act. mgr. W6SLX forwarded twenty five reports on the weather net during Jan. W6JJJ was in Hawaii on vacation during Jan. W6NUT was at the Fresno International DX meet along with WA6DJL. WB6ZUC with DXCC nailed down, all on cw, has gone for one of those programmed keyers to improve her speed in getting more of the rare ones. Lightning hit the multi-use tower on which K6GWL has its repeater antenna. Considerable damage to the commercial installations there but the repeater escaped with minor damage. WA6AUD was awarded a Certificate of Merit at the Pacific Division meeting in Dec. by ARRL Director W6ZRJ. The Feb. meeting of the PT&T Radio Club at San Francisco had WA6NDZ speak on VHF antennas. W6RQ was in there for the Feb. EMT, continuing his unbroken string which is getting close to the twenty year mark. W6MTJ and W6UM are puzzling around with some

facsimile gear. Traffic: W6WLV 70, WB6JQP 25, W6SLX 25, W6BWV 19, WA6AUD 18, W6CYO 2.

SAN JOAQUIN VALLEY – SCM, Ralph Saroyan, W6JPU – You still have time to send for your pre-registration tickets for the Fresno Amateur Radio Hamfest, May 29, 30 at the Fresno Hilton (FARC, P.O. Box 783, Fresno, Calif.). On June 2, 1972 FM West will be held at the Tropicanna Motel, in Fresno. Reservations go to WB6OSH. The Annual Northern Cal. and Southern Cal DX clubs convention was held in Fresno Jan. 22, 1972. There were 325 in attendance along with W6GRV, K6QPE, K6PKO, WA6WXP, W6KTW, K6RPH, W6BJI and W6JPU. WB4DHA is active on 2 meters fm. W6OBJ and WB6OGO are on 2 meters fm. WB6KUO, WB6JRL and OH2BMD, visitor, were also at the DX convention. K6QPE and WB6OSH hold Novice classes in the Sanger Library, every Mon. night. W6OWL holds code classes for Novices also. K6OZL, operator at K4CG, attended the DX convention in Fresno. WA6WXP has a five-element beam on 20. K6QPE has an antenna farm with a five-element 20 and five-element 15 beam. WB6JAX has a 71-ft. tower with a 20-meter beam. W6KOE also attended the DX convention. K6IXA is located in Yosemite with Ma Bell. WA6AUZ is in YU2-Land. WB0NMT is in HC-Land. WB6QQF is again mobile in a new car. Traffic: WA6JDB 16, WA6CPP 7.

SANTA CLARA VALLEY – SCM, James A. Hauser, WA6LFA – SEC: WA6KKB. RM: W6BVB. W6BVB is manager of NCN. W6AUC is running phone patches to El Salvador. W6DEF is active with new 2-meter gear. W6ZRJ and W6VZT went to SAROC. W6RFF is again active on NCN. WA6DKF is new pres. of Northern Calif. Contest Club, and also went to the Fresno DX Convention. WA6RXB reports that groups in Redwood City, Palo Alto, Mountain View, San Jose, Los Gatos and Saratoga areas participated in SET. W6RSY is active on FCC. Many thanks to W6VZT for a fine job as SCM and his help in getting me started. Traffic: W6RSY 533, W6YBV 322, W6BVB 216, WA6LFA 176, W6NW 141, W6AUC 137, W6DEF 74, W6ZRJ 17, W6OIJ 11, W6RFF 11, W6IOU 10, WA6DKF 5, WA6RXB 2.

ROANOKE DIVISION

NORTH CAROLINA – SCM, Chuck Brydges, W4WXZ – SEC: W4EVN. PAM: WB4JMG. RM: WB4PNY. The banner activity for Jan. was the SET, thanks to all who took part. Our operation "Deep Freeze" was very successful and traffic flowed in a very smooth manner. W4EVN is to be commended for this thought provoking exercise. WA4KWC had fun in the CD phone party and is a new OVS. K4GOS has 18 AVT/WB going and continues to be a fine OO. Mecklenburg ARS reports W4BFB in Red Cross bldg. active in SET. Other happenings in Charlotte include a 6-meter net, the Charlotte Hornet, on 50.4 am. WA4WZQ, OVS in Valdese, hooked 12 states on 6 during vhf Sweepstakes. Asheville repeater WA4BVW radiates from Mt. Pisgah on 16/76. While in Ga. W4AFM/M clicked into Asheville on 2. Fayetteville ARC prexy W4EHF reports a message service for the Veterans Hospital, also a 6-meter repeater on 50.48/53.45. Cumberland County EC WB4MTG had his troops very active in SET. K4GLP and K4HDO were given ARRL Service Award for their efforts during Ginger. The Carteret-Craven ARC had a club auction and K4JLW continues to write the "Short Circuit." The Raleigh ARS had a series for ham radio on Ch. 11 in Durham. RARS also was active in SET and covered the Capitol, led by Wake County EC W4FMT, and Bert reports 2-meter and 10-meter nets going. WB4TOP, holding Tech., is alternate NCS for the National Jr. College Net on 14.317, Thurs., at 1800Z. New hams in Charlotte: WN4YNC, WB4ULP, WB4YOH and WN4YDJ. Heard in Novice Round-Up were WN4TMD, WN4VSA, WN4WOG and WN4WUD. Traffic: (Jan.) WB4WZB 265, WB4PNY 261, W4EVN 205, W4PCN 120, W4WXZ 76, WA4VNV 61, K4COG 39, WB4NRZ 19, W4ACY 18, K4EZH 14, WA4KWC 8, W4TYE 6, WB4HGS 3, WA4WZQ 1. (Dec.) WB4WZB 21.

SOUTH CAROLINA – SCM, Elizabeth Y. Miller, WA4EFP – SEC: WA4ECJ. Asst. SEC: W4WQM. PAM: W4MTK. RM: K4LND. W4DX rebuilding 2-meter and 430 MHz antennas. W4BOE building 15- and 2-meter arrays. W4EOZ recovering from illness. W4HDO new QTH is Camden. W4EZF and YL W4GUZ recently celebrated 26th wedding anniversary. WA4VZQ hitting the books for his Master's. W4ZIZ teaches private kindergarten. Margaret was imaginary hurricane that swept across state in SET, with suspenseful excitement for 53 ham stations and 12 participating broadcast stations! Yes, our BC brethren were invited in on the act as final link in our chain of communications to the public. The SSBN operated continuously 8 hours in SET, handling 82 messages and "dispatches." Correcting net time errors in last month's report, SCSSBN meets daily on 3915 kHz at 0000Z. Early CN is 0000Z; late CN is 0300Z, both on 3573 kHz. Late session is training net. All

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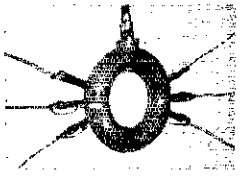

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stations invited to participate. SCPN meets on 3930 kHz Mon. through Sat. at 1700Z, and on Sun. at 1330Z and 2030Z. SSBN 214, *CN(E) 171, Traffic: W4NJO 22, W4RMZ 15.*

VIRGINIA – SCM, Robert L. Slagle, K4GR – Asst. SCM: A.L. Martin, Jr., W4THV. SEC: WA4PBG. Asst. SEC's: WA4JJF, WB4CVY. PAMs: WA4FGC, WA4YXK. RMs: WA4EIO, WB4NNO, W4SIJ. Congrats to Central Va. Contest Club, K4JM, secy., on ARRL affiliation. Jan. VSBN QNT 1025, QTC 455. WB4FIK spent week at K4KDJ. WB4SIK's flu took precedence over BPL. W8VDA/4 lost keyer for the last night of SPT. SLI appears to have gone off very well in Va. KØPIV/4 trying to get RTTY net going. W4YZC reports great fun in 160 contest. Director W4KFC attended Board meeting in Hartford; took part in CW CD, 160 contest and SLI. WB4KBJ still collecting stuff for the projects he intends to start. WB4EAE/9 in CW CD Party. WB4NNO now Extra Class. W4DM had a little SPT action. WN4WLK is a new member of *SEVWA. W4JUJ on the over 2500 county plateau, I don't have an* update from WA4WQG this month; also, Charlie is mobile. Congrats to WB4DRB for article in Hints & Kinks in Feb. issue. Studies competing with traffic at WB4RNT; Mark has also been accepted at Rensselaer Poly Inst. Pleased to have K4MLC, long time VSN RM, back in action. W4OP in and out of hospital. WA4JHK and WA4NJG talking big with new SR-2 'Us. WA4JJF off south and west until mid Apr. with XYL.

Salt Mine Net	3947	0730/1630 M-F
VSBN	3935	1800 - 2200 Dy
VSN	3860	1830 Dy
VN	3860	1900 Dy
VFN	3947	1930 Dy

Traffic: (Jan.)W4SOQ 552, WB4FJK 409, WB4SIK 395, WB4KSG 233, WB4SGV 217, W4UQ 178, W8VDA/4 176, WA4PBG 168, WB4KIT 128, WA4JGC 82, KØPIV/4 75, K4HSS 69, WB4JMD 56, W4YZC 54, WA2BEX/4 51, K4GR 44, WA4JJF 44, WB4RDV 44, WB4KBJ 42, W4KFC 42, WB4EAE 38, WB4EDT 29, W4LQO 25, K3VIV/4 21, K4CGY 20, WB4PCK 19, W4THV 19, WA4WQG 19, *W4DM 13,* W4OKN 13, K4LMB 10, K4JM 9, W4MK 6, K4MLC 6, W4OP 4, WN4WLK 4, W4JUJ 1, W4KX 1. (Dec.) WB4RNT 226, K4KA 102, WA4PBG 56, W4OKN 15, K4MLC 12, W4OP 8, W4JHK 6.

WEST VIRGINIA – SCM, Donald B. Morris, WBJM – SEC: WA8NDY. RM: WB8BBG. PAMs: W8DHW, W8IYD, K8CHW. Phone Net Mgr.: WA8POS. CW Net Mgr.: WB8CYB. CW Net, daily on 3570 at 0000Z and new frequency for the WVN Phone Net, 2300Z on 3989 kHz. W8HZA made 98 contacts in the 160-Meter Contest. K8CFT, W8UDB, W8OQC, K8RGM and K8BJH worked in CD drill in Fayette County. WA8NDY has three-element quad up 45-ft. on new tower for 2-meter operation. WB8EVL, new OVS, reports Wood County EC Net on 50.250 each Sun. at noon. W8JZN, ex-W8IBF, active again from Parkersburg. WB8BMW has new KW linear for 75 ssb. *WVN RACES Net meets twice each Sun., 1300Z* and 1800Z on 3996.5 with WA8NDY as NCS. WVN CW Net 130 stations handled 54 messages and the Phone Net with 472 stations handled 127 messages. Novice Net in 4 sessions with 14 stations passed 24 messages. WA8POS operating from Madison, Boone County. W8DUV active in the 14 MHz YLSSB Net. WBJM visited Wheeling area amateurs at club meeting. W8HAX enjoys 50 MHz *and installing new tower. WB8DXF and WB8BMV made PSHR.* WB8LIW has new 2-meter beam and likes WVN cw operation. Look for WVN Phone Net on 3989 kHz. Traffic: WB8DXF 388, WA8NDY 229, WB8CYB 224, WA8WCK 191, K8OLW 128, WB8BMV 74, WB8EMG 64, WBAEC 52, WBJM 48, WB8EKG 24, WA8LEW 22, W8DUV 20, K8CFT 16, WB8EZP 12, WB8LIW 12, WB8AKQ 10, W8LBT 7, WN8LGF 7, WA8YTP 7, W8HZA 6, W8JWX 6, WA8OKG 6, WN8IFU 3, WN8III 3, WA8POS 3, WN8JRI 2, WB8AQX 1, K8BCF 1, W8CKX 1, WB8CPU 1, WB8IHA 1, W8KWL 1, W8LFC 1, WA8LFZ 1, K8OQL 1, K8ZDY 1.

ROCKY MOUNTAIN DIVISION

COLORADO – SCM, Clyde O. Penney, WAØHLQ – SEC: WAØQOY. RM: WØLRN. PAMs: WBØAWG, WØCXW, KØIGA, WØLRW. The Colo. SLI went very well with excellent coordination between AREC, RACES and NTS on TWN. WØSIN was busy with 164 different contacts from his home station during Jan. Congratulations to WAØSIG who passed his Extra Class exam. WØLCF is moving to Sidney, Nebr. where he will be teaching Electronics at Western Nebraska College. Newly elected officers of the Colo. YLs are WAØPYZ, pres., WBØCZL, vice-pres.; WNØDAQ, secy.; KØWZN, treas.; WAØWAD, historian. Congratulations to WØHEM who received a plaque in appreciation for her hard work as pres. of the Colo. YLs for three years. It is with deep regret that we add WØUPS and WØJFD to the list of Silent Keys, and also announce the passing of Ed Parmelee, long time active member of the Denver Radio Club.

Net traffic Jan.: Hi-Noon ONI 1168, QTC 79, informals 82, phone patches 16, phone calls 7, time of 960 minutes. SSN ONI 374, QTC 171, informals 55, time of 1170 minutes for 41 sessions. CTN ONI 291, QTC 30, informals 48, time of 620 minutes. Columbine (Dec.) ONI 989, QTC 56, informals 153, time of 1195 minutes. Traffic: (Jan.) KØZSO 880, KØYEK 334, WØWYX 279, WAØSIG 156, WØLQ 131, WØLRW 107, WØLLA 84, WØQUI 82, WBØCCB 77, WØLRN 74, WØSIN 66, W2TPV/Ø 62, WBØDLE 60, WØNZL 52, WAØZWA 52, WBØDNY 47, WØGAQ 39, WAØTRB 32, WAØYGO 20, WAØYHF 20, WØUAT 17, WAØNFO 14, KØIGA 13, WØBY 12, WØLCE 12, WØKFH 8, WAØTMA 7, WAØYLD 6, WAØHLQ 1. (Dec.) KØDSP 23, WØUAT 5.

NEW MEXICO — SCM, James R. Prine, W5NUI — The New Mexico Net resumed activity each evening 0230Z effective Feb. 1, on 3750 kHz with a good turn out. Additional participation is welcomed. W5SOI has worked all 50 states on 160 meters. WB5BIN has modified an HW-30 for mcw on 2 meters. W5RE is now active on the 2-meter fm repeaters and also 29.6 fm from the mobile. The installation of a new quad at UNM's club WB5AXC was completed with minor damage to the 80-meter dipole. Don't miss the famous green chile of K5ECQ at the Mesilla Valley Hamfest Apr. 30. W5PDY has a new Hornet beam and Ham M rotator. Traffic: K5DAB 241, K5MAT 144, W5MYM 66, W5RE 63, W5NUI 58, W5UH 28, WB5AXC 27, W5PDY 15, W5DAD 14, W5DMG 12, WA5MJY 6, WA5OIH 6.

UTAH — SCM, Carroll F. Soper, K7SOT — SEC: W7WKF. RM: W7OCX. The Beehive Utah Net for the period Jan. 1, 1950 through Dec. 31, 1971 had 4,525 sessions with 74,577 check-ins, 10,381 messages handled in 77,167 minutes. A total of 87 net certificates issued during this period. From these statistics it is indicated that this net provides a note worthy public service. WA7GWU has been called on a mission for the LDS church and will be in Billings, Mont. for awhile longer. WN7STQ, age 10, daughter of WA7MEL is on the air. Activity on 146.34, 146.94 MHz fm on the Wasatch Front still on the increase. A repeater for RTTY on 146.12, 146.82 MHz is in operation in the Salt Lake area and a repeater on 146.34, 146.94 MHz fm will be in operation in the Cedar City area shortly. W7RQT was selected president of the VHF Society. Participation by the Utah amateurs in SET was most gratifying. Traffic: W7FM 320, K7HLR 146, W7OCX 58, WA7HCQ 28, W7IOU 23, W7GPN 10, K7CLO 8, W7HKC 7, WA7MEL 2.

WYOMING — SCM, Wayne M. Moore, W7CQL — SEC: K7NOX. The 1972 SET went off very well with lots of activity this year. K7AHO is in Fla., WA7BDI in Mexico and W7VB went to the sunny southwest. W7TZK is putting out his usual good signal from his new home in Cokeville. K7TH suffered extreme damage to his home and vehicles during the Jan. wind storms in Shirley Basin. K4WOV is a new ham in Casper, WN7RRY moved to Saratoga. The Fremont County ARS had a very successful booth at the Lander winter fair. W7NKR, WA7OEC, K7VEW and K7WUR along with other members of the club did a very good job in manning the booth. Don't forget the hamfest on July 15, 16 in Thermopolis. W7VB has started work on it and it promises to be a good one. My term as SCM expires June 25 so, if you would like to nominate someone, watch QST for the deadline. Traffic: K7NOX 428, W7SDA 48, K7VWA 37, W7HNI 26, W7TZK 26, WA7AUV 13, K7WRS 5, W7YWW 5, W7BKI 2.

SOUTHEASTERN DIVISION

ALABAMA — SCM, James A. Brashear, Jr., WB4FKJ — SEC: W4DGH. RM: W4HFH. PAM: W4WLG. Congrats to W4AUP on winning first place in the section in the World Wide ARRL 160-Meter cw contest. W4AUP reports that the Montgomery ARC is going good with various activities and good attendance. W4DGH says he would have had higher SET traffic count except that rig trouble shut him down after 8 P.M. Sun. W4YNG was the only one heard on AENB using battery power and he was running 200 mw! WB4SXG enjoyed (?) a three-hour session on AENM which normally runs about 30 minutes. Helping to clear traffic were WB4THU, WA4VEK and WB9HZ/4. WB4NLK, WB4SVX, W4HDU and W4YNG were still clearing the last on AENB about 1030 P.M. Sun. WB4SVH almost got the 500 point BPL. WB4SON listed approximately 21 net affiliations on his Form 1 for Jan. WB4LNM at Auburn Univ. listed "studying" as his major activity on Form 1. K4AO/ reports his OBS activities promote very good relations between BARES members and ARRL. K4HJM recently installed a hybrid phone patch. K4JK still active working (and helping) some of the Novices each night. WB4AJT reports that much of the Auburn Univ. ARC gear was stolen last spring and have been operating the past few months with borrowed gear, but the loan period has expired. If you know of any used gear that is available,

they would appreciate hearing about it. See Hamfest section for details on the Birmingham fest. Congratulations to the most recent affiliated club – the Jeff Davis High School Amateur Radio Club in Montgomery. Don't be too surprised if you hear special events station WC4BCC on the air again. Appointment: WB4SON as ORS. Endorsements: W4DGH as SEC, W4JNU, WA4FYO and WB4JXE as ECs, WB4LNM as ORS, WB4KDN as OVS. Traffic: (Jan.) WB4SVH 449, WB4SVX 318, WA4VEK 213, WB4SON 233, WB4KDJ 231, WB4EKJ 133, W4DGH 119, W4HFU 119, WB4THU 81, K4AOZ 78, WB4JMH 77, WB4KSL 35, WA4SNU 23, K4HJM 17, WB4VKW 15, K4RY 8, WB4WUS 4, WB4LNM 2, W4MKU 1. (Dec.) W4DGH 11, K4HJM 7.

EASTERN FLORIDA – SCM, Regis K. Kramer, W4ILF – SEC: W4IYT. Asst. SEC: W4SMK. RMs: WB4OMG, K4EHY. PAMs: W4SDR 40, W4OGX 75. Congratulations to Dade RC on an FB Hamboree. Chmn. W4WYR reports attendance 2112, up 200 over 1974. QCWA activity in Fla. is booming – among others credit is due W4YK working through chapter chmn. and W4YPA for his hard work as NCS on Statewide Net, Sun. noon on 7254 kHz. Tops in club activity is the Hollywood ARC. Pres. WB4CKY reports membership at 105. WB4HML excels in the club Bulletin for HARC. Be ready for the Orlando Hamfest, May 29 and 31. Sixteen amateurs were initiated into the Royal Order Of The Wouff Hong at the Miami Hamboree. K4JWM, W4WYR and W4ILF participated in a two hour WIOD talk program. OPN Bulletin is now in it's 6th year and going strong. Congrats gang! The Fla. QSO Party takes place Apr. 1 and 2. WA4ZZG has been appointed asst. dir. working with the Spanish speaking group. K4QG won his battle to erect his 60-ft. tower in a St. Pete sub-division. NTS meetings at Miami Hamboree with W4SHJ, W4UQ, K2KIR and W4SQQ leading the way proved to be interesting and informative. New ORS appointees: WA2AFL/4, WA4NBT, WB4QVO, WB4SKJ, WB4PNG and W3FBN/4. WB4JSK is an OPS while W4GUJ is a new OVS appointee. Jan. PSHR recipients: WA2AFL/4, K4FAC, WB4VOS and WB4SZS. BPLs: W3CUL/4, W3VR/4 and W4ILF. W4RWM former RTTY RM became a Silent Key Jan. 30. The Fla. restructuring committee deadlocked 4 against and 4 in favor of resectioning Fla. WN4RGQ is looking for 2-meter mobile contacts on cw! W4BRB is at it again. He, WB4OUH and WB4TAF DXd to VP7 during recent DX tests. W4VJH reports ORL DXers using an isolated fm channel to coordinate DX info. K4IWT Red Cross station, Miami held an excellent SET. Six RC officials participated for 7 hours using SFFMA repeater WB4HAA to cover RC shelters. Asst. Dade County EC WA4OLZ coordinated these efforts. So. Miami ARC K4JVA manned the National Hurricane Center during the SET. Other club stations participating were W4OT, W4TJM, K4TFS and W4EHW. W4FPC, K4TFS and W4ILF handled SET RTTY traffic to W. Fla. WB4JSK made 72K in Jan. CD Party and is now NCSing for TPTN, FMTN and FAST nets. (Traffic: (Jan.) W3CUL/4 2681, W3VR/4 660, W4LDM 385, WA4SCK 363, WB4HML 354, W4ILF 303, WA4NBT/4 246, W4FPC 237, WB4OMG 226, WB4NCH 208, WB4SZS 158, W4LHW 155, K4IWT 155, WA4IJH 144, K4JWM 144, W4SDR 144, W4DOS 140, K4JVA/4 133, WB4PNG 122, K4FAC 117, WB4JSK 116, WB4HJW 115, WA2AFL/4 112, W4FFT 112, W4DVQ 91, WB4SMA 88, W4IA 71, WA4HDH 69, W8BZY/4 68, WB4VOS 65, WB4ELW 62, WB4RXJ 58, WA9JSX/4 54, WB4MIQ 54, W4BM 52, W4NGR 51, W4TJM 50, W4IYT 49, WB4PTH 47, WB4AID 44, WB4ADF 39, K4GJ 38, WA4BGW 35, W4SMK 34, W4GUJ 33, K4QG 33, K4SCE 32, W2UI/4 30, WA4CIQ 30, WB4RLD 30, WB4TAF 28, W4VMF 27, W4YPX 26, W4OT 24, W4NTE 23, K4KQ 22, W4IAD 21, WB4SKJ 21, W4GDK 20, K4EBF 17, K4EYN 16, WB4HKP 14, K4COO 13, K4LPS 13, W4OGX 13, K4BLM 12, K4TFS 12, W4EH 11, WB2NGI/4 10, WN4RGQ 10, W4BCZ 8, W4DDW 8, K4OER 8, W4LK 7, WA4UOQ 7, W4BKC 5, K4EJW 4, WB4QID 4, W4DFP 3, WA4KTZ 2, WB4IAA 2, K4SJH 1. (Dec.) W4VME 32, W8BZY/4 31, W4YPX 22, W4KGJ 3, K4HCG/4 1.

GEORGIA – SCM, A.L. Garrison, WA4WOU – Asst. SCM: John L. Laney, III, K4BAI. SEC: WA4VWV. RMs: K4BAI, WB4SPB. PAMs: K4HOI, W4LRR.

Net	Freq	Time(Z)/Days	QNI	QTC	Mgr.
GSN	3595	0000/0300 Dy	1047	545	K4BAI
GTN	3718	2399 Dy	176	51	WB4SPB
GaLSSB	3975	0100 Dy	1085	63	WB4DMO

The Georgia section was represented at the ARRL Board of Directors meeting in Hartford on Jan. 30, 31 by our new Vice-Director, W4DQD. The cw traffic handlers should be on the lookout for an early morning session of GSN on 3595 at about 0645 or 0700 (local) to start about Apr. 1. Your support will be needed to make it a success. W4LRR is going high power on ssb 2 meters. The Stone Mountain 2-meter repeater has gone "tone access." The GSC 2-meter net on Mon. at 1900Z on 146.940 is going strong with

40 to 50 stations checking in. Traffic: W4DOC 292, K4BAI 249, WB4QGN 195, WB4RUA 154, WB4KVE 146, W4PIM 116, W4EEP 108, W4AMB 99, WA4WOU 96, WB4SPB 90, K4NM 86, WB4IAQ 71, W4RNL 66, WA4RAV 56, W4CZN 34, W4JM 8, K4PIK 7, W4BFQ 5, W4REI 4.

WESTERN FLORIDA – SCM, Frank M. Butler, Jr., W4RKH – SEC: W4IKB. RM: K4LAN. RTTY: W4WEB. PAM: W4NOG. The 1972 SET resulted in a jump in station activity and traffic reports. I hope all FCs got reports in to W4IKB and ARRL Hq. Pensacola: New officers of the FM Assn. are WB4MUS, pres., plus WB4PKR, K4CFS and WB4PKW. WB4WQB was appointed OVS. WB4JHQ is trying out the DC bands – 75 meters! The CD radio group now meets every 4th Mon. evening. Milton: K4BDF works at the PJC Milton Center. Plans are to form a new club in the area; contact K4QOJ for details. Fort Walton: WA2ZKT was honored as "Airman of the Quarter" at Eglin. A C-V transformer installed at the WB4KLT repeater enabled the 250-watt transmitter to be put on the air again. Panama City: WN4YKV is a new ham, active on all Novice bands. W6DSD/4 attended the Miami Hamboree and picked up a new 2-meter fm HT. Port St. Joe: W4WEB handled much of the SET traffic between E. and W. Fla. on RTTY. Chipley: W4IKB received recognition from "Fla. Skip" for his photographic efforts. Tallahassee: TARC had an interesting program on slow-scan TV operation and theory. WB4GTY stays active on all modes. WA4ISJ and WB4LOQ get instructions from their ham XYLs via 2-meter fm mobile rigs. W4GBD graduated another ham class. Traffic: (Jan.) K4VFY 274, W4IKB 124, KØBAD/4 69, K4CLM 55, WB4SBD 53, W4RKH 32, WB4LEL 27, W4FDJ 25, WB9FUZ/4 23, W4NOG 22, WA4IZM 20, WB4JHQ 10. (Dec.) K4VFY 281.

SOUTHWESTERN DIVISION

ARIZONA – SCM, Gary M. Hamman, W7CAF – SEC: K7GPZ. PAM: W7UXZ. RM: K7NHL. Make your reservations now for the Southwest Ham Roundup in Tucson on Apr. 29 and 30. Technical sessions on Sat. at the Ramada Inn and Swap Meet at El Con Mall on Sun. An Open Forum with SW Division Director John Griggs is planned on Sat., and a banquet on Sat. night. Registration by Apr. 15 is $7.50 or $9.00 at the door. The Hamfest is sponsored by the Old Pueblo Radio Club, Box 6597, Tucson. The annual Winter Hamfest at Squaw Peak Park in Phoenix turned out over 350 people on Feb. 6. The major prizes went to southern Ariz. with K7CRO getting the Heath counter and W7AKU the FET voltmeter. The Hamfest was sponsored by ARCA with the Ariz. Repeater Assn. in charge of arrangements. Co-chairmen were WA7SCV and K7UDW. A new club in Kingman has been formed; the Hualapai ARC with K7ABW, pres.; K7ZMA, vice-pres.; WA7LEE, secy.-treas. Meetings are the 3rd Tue. at 1930 MST at DPS Hq. K7NTG is on a trip to Mexico. W7UXZ moved into his new home in Tempe. K7UGA/WA7UGA has SSTV equipment operating. Section Net Certificates were earned by K7EMM, WA7HIT, WA7JCK, WA7KQE, W7OUE, WA7QVN and K7RLT. Traffic: K7MTZ 96, K7EMM 79, W7CAF 42, K7NTG 28, W7PG 22, WB2HLI/7 16, WA7QVN 16, W7DQS 14, WA7KQE 6, WA7NQA 4, K7RLT 4, W7WGW 4, K7GLA 3.

LOS ANGELES – SCM, Eugene H. Violino, W6INH – SEC: WA6OZY. RMs: W6LYY, WB6ZVC. The SAROC 1972 was a big event with over 2000 present. All sections of amateur radio were there, WPSS, WESCARS, OCWA, SOWP. John Elwood and vice-pres. W. Brenman of SOWP had a nice display booth. The Associated Radio Amateurs of Long Beach had a wonderful installation banquet at the Long Beach Petroleum Club. Present were W6MLZ, and our local RI Lee Smith along with outgoing pres. W6QIL and incoming pres. W6LAE. The Palisades Radio Club had a tour of the TRW facility. The Crescenta Valley Radio Club had the Swan mobile unit at their last meeting. There are now over 11,400 Extra Class licensees, which means that incentive licensing is working. The JPL Amateur Radio Club meets the 2nd Wed. at noon. The Santa Clarita Club had WB6VPO as guest speaker. The Ramona Radio Club 2-meter fm net on 146.85 is very active. The Antelope Valley Club electing new officers. W7GAQ/6 is very active in that area. In our recent SET operation outstanding work was done by the SEC group WA6OZY, WB6TXX. WB6VYX had some very fine portable equipment. The NTS group led by WB6ZVC and W6LYY did their usual heavy work on 3.6 kHz. The SEC group had some very active mobile units in the field, a total of 120 units were activated. W6OYB mobiling around with a new FT-101. K6BUH still motorcycling in the hills. W6MAB had trouble with low line voltage. K6EA moving shack from upstairs to downstairs. WA6ZKI active in MARS. WA6DHM building flying spot scanner. K6UYK still making BPL. W6AM has 2 meters with 9 channels for emergency work. K6ASK handling traffic on SOCON along with WB6KGK. We are hoping to tie this net in with SCN for our local

outlets and pick their traffic up for long haul. WA6QQL putting up new beam for DXing. QCWA had their QSO Party the week end of Feb. 19, 20. W6MHI is replacing guys on antenna tower. WB6BBO putting up new vertical antenna. Asst. SCM W6LPJ has been appointed Asst. Dir. of the Southwestern Division, also chmn. of the Council of Radio Clubs. WB6KOL is the Net Mgr. for Western Public Service Net. WB6PKA active on SCN and vhf bands. Traffic: WB6PKA 468, W6INH 411, W6MLF 240, K6UYK 231, WA6QQL 172, W6QAE 90, W6USY 80, W6LYY 65, W6QEO 53, WB6KGK 31, W6BHG 28, WA6AAW 24, WA6ZKI 20, WB6YIZ 17, K6CL 12, WA6DHM 12, K6EA 10, W6IVC 7, K6QPH 7, W6AM 6, K6ASK 4, W6DGH 1.

ORANGE – SCM, Jerry L. VerDuft, W6MNY – SEC: WB6CQR. RM: WB6AKR. WB6VTK of 29 Palms made BPI again for origination + del. Chet also is a new ORS. A new OO is WA6NDA of Beaumont. Appointment renewals: WB6AKR ORS; WA6TAG, WB6WOO, ECs; WA6UGZ, W6WRJ, WA6FIT, OBSs; WA6YWS EC; W6GB OPS; K6GGS OBS. W6FB is now vice-pres. of OOTC and dir. of WSSBA. W6ISC has a new 80-meter inverted "V" for SCN. K6YNB operated in a snow field on Modjeska Peak during Jan. vhf SS while WB6ASR, WB6RAL and WB6RJV operated from Sierra Mountain. All reports indicate a very successful SET with all counties activated and reporting good participation. The SCM, W6CPB and EC K6GGS were guest speakers at the Victor Valley ARC installation of officers dinner in Jan. New officers of the So. Cal. VHF Club are WB6YIP, pres.; WA6BFH, vice-pres.; WA6ARC and XYL, secy.-treas. Riverside County ARC officers for '72 are K6EHV, pres.; K6SJA, vice-pres.; WB6YXA, secy.; W6KFE, treas.; K6QES, hosp.; WA6IHY, entr. Anaheim ARA officers are WB6CGG, pres.; WA6OAD, vice-pres.; W6NZD, rec. secy.; W6FXZ, corr. secy.; WA6VKL, treas.; K6JBG, W6IRD, W6IKP, WB6VJZ, WB6GWZ, dir. Some local amateurs known to have attended SAROC are K6IJA, WB6RVM, WB6HZS, WB6LUO, WB6AYU, K6SX, W6GFQ, WB6CZN, WA6RLD, K6KAE, W6TDL, W6VOZ, K6EHV, W6JDR, WB6AJW, WB6ZSX, WB6GAN, W6RCH, W1HJT/6, WB6GCN, WA6PQO, WB6CZO. Owens Valley ARC of Bishop has adopted by-laws and installed its charter officers. 15 Inyo county hams participated in SET which is a new record for Inyo county. Kudos to EC WA6YWS. Support your local AREC net and public service communication activities. PSHR: WA6TVA 49, W6MNY 40, WB6AKR 28. Traffic: WB6TVK 362, W6ISC 195, WA6TVA 132, W6MNY 84, WB6AKR 43, W6QBD 20, K6GGS 16, W6BUK 7, WA6YWS 7, WB6ZOK 3, W6WRJ 2, W6FB 1.

SAN DIEGO – SCM, Paul C. Thompson, W6SRS – Asst. SCM: Art Smith, W6INI. SEC: W6TAI. Installation of a new slate of officers for the San Diego County Amateur Radio Council was held in Jan. The Council is moving forward on many fronts, important to the San Diego section amateur. One special effort is to continue to promote the area oriented programs. Last month the SW Division Director, W6KW was the guest speaker. These meetings will be of the open forum type with all area amateurs invited. Clubs: Since last month's column the Palomar Club has changed their meeting location to Oceanside Savings and Loan, 699 Grand, Carlsbad, the 4th Thur. K6PKC has graduated 33 from his first licensing class. New calls are WN6s MXK, JSY, OZZ, PAJ, OZP, OZT, OZS, PAE and PAC. SDDX had 8 members at the Fresno DX meeting. North Shores saw a laser demonstration by WB6VKV. K6GKV gave a presentation on sunspots to El Cajon. SOBARS have plans for Field Day. SDFM saw slides of Otay Site. Station activity: W6VVM is providing communications for Gls. W6SO provided site for PRC repeater. New mobile for WA6HLA. W6MAR placed high in SS. PSHR: W6LRU 49, W6BGF 42. Traffic: W6BGF 404, WA6AMK 327, W6JOU 307, W6VNQ 253, W6LRU 236, W6YKT 46, W6TAI 43, W6SRS 28, W6DEY 24, W6QLJ 19, WA6HLA 6, K6PM 6, WA6COE 1, W6MAR 1.

SANTA BARBARA – SCM, D. Paul Gagnon, WA6DFI – SEC: W6ITA. RM: W6UJ. PAM: K6EVQ. The ARFC is slowly taking shape throughout the section. We have EC's in all areas but Simi Valley and local nets are growing in numbers. Contact me for AREC forms or the name of your local EC. WB6BWZ is active as OO during the Novice Roundup. WA6WWC reports the Canejo Valley Club had a good Feb. meeting with W6AQP of Swan. Armand was also active in the DX contest trying to add to his 86 countries. W6DM has installed a 40-meter rig in his camper pickup. W6CBD is now retired after 30 years in Civil Service. W6MJU has built a Discone antenna for 2 meters. K6CEJ lost all his antennas in the Jan. wind storms. A new ham in Camarillo is WB6EDG active on 75 and 40. W6MUL qualified as Class I OO with a 28.9 ppm error in the last FMT. John and K6VIE are Explorer scout advisors and have helped WN6FLI, WN6LXU, WN6KKC and WN6DUZ get their licenses. WB6BOQ is the new asst. EC for Thousand Oaks and is

active on 2 meters. I had meetings with the Cuesta Valley and the Santa Barbara Radio Clubs during Jan. A new AREC member in E.O. is K6LHA. K6AAK celebrated 52 years as a ham in Feb. Bill is past SCM and now is an Asst. Dir. W6KW was elected to the ARRL executive committee. W6UJ gave a talk at the Lompoc Kiwanis Club on the History of Amateur Radio. WA6PFF, WB6TFZ and W6HUJ recently took a second place ribbon for their antique radio showing at the Santa Barbara Hobby Show. K6YHK says don't forget the SW Division Convention in Santa Maria Oct. 21 and 22. PSHR: WA6PFF, WB6MXM, WA6DEI. Traffic: WA6DEI 337, W6JTA 289, WB6MXM 76, WB6BOQ 45, W6MJU 22, K6VBX 15, W6IDU 13, WA6PFF 11, WA6WYD 10, WA6JOX 8, WB6EDG 6, K6CFJ 3, K6PYF 3, W6CBD 1.

WEST GULF DIVISION

NORTHERN TEXAS — SCM, L.E. Gene Harrison, W5LR — Asst. SCM: Frank A. Sewell, Sr., W5FZU. SEC: WA5VJW. Asst. SEC: WA5KHL. RM: W5QGZ. PAM: W5BOO. Temple ARC new officers are W5WDW, pres.; WB4QKB/5, vice-pres.; K5BSW, treas.; W5AMK, custodian; WB5BPG, secy. W5NFO returned from Fla., worked SET, reported late as did W5CFJ/5 and W5HVF. The Cols. new QTH is Bandera Tx. W5AZX home from hospital. Cuprock officers are WA5UNL, pres.; WA5UVA, vice pres.; WA5TJU, secy.; WA5TTA, treas. Richardson WK1UO scored top program honors for No. Tex. this month with W4BW, ex-Dallasite as guest speaker. Attendance 100 plus. W5EYB plus NTex SCM attended. W5AIK has loud 2-meter signal heard in Dallas with his "ringo antenna." W4MUX, Pensacola, (ex-W5FLW) says hello to his many ex-Navy associates in North Tex. SEC WA5VJW received page 1 publicity FtWorth Press Jan. 3 re SEC job. WB4CWD wishes 6-meter contacts. Arlington ARC new officers WA5DCH, pres.; K5EOG, vice-pres.; K5ZEZ, secy. Membership 111 and ham-of-year award presented to WA5DCH. FB. WB5BKE reported from Vk-Land. K5LSP says people do QSL on 2 meters. WA5KHL's proposal Hq. ARRL re, FCC application fees forwarded to legal dept. via W5EYB, W1RW on Jan. 10. The "pink-ticket" idea of rules of road covering repeater operating on .34/94 gets the message across to those thick-headed "grey-headed" guys like your SCM! Some 300/400 hams use this repeater, so if you're gonna say it, then do so and get off. (hi – how about that!) WA5VPA, Ft. Worth KC club resigned due unforseen difficulties and increase in Keaddy Killowatt responsibilities. New FR-22s include WB5EIV, K5BIQ. K5ISR So.Tx OO interested in field reorganization. DARC elected new officers WA7PER/5, pres. W5IL in hospital. SEC WA5VJW made BPL with 690 messages. SET real test and proved NTex ready for emergency. FC endorsed for W5MBP, K5QKM, W5SHN, WA5PPL, W5ZNN, K5LZA, W5NGX, W5GWP. Arlington ARC Ham-of-Year award to WA5DCH, W5IZU reports trip to valley visiting W6HT, W5JQY and XE2PAY. Traffic: (Jan.) WA5VJW 690, W5QU 455, W5TI 220, WB5CPG 107, W5URD 97, WA5IOK 49, W5GY 46, W5HVF 46, W5NFO 40, W5LR 35, WB5BIX 26, W5PBN 18, WA5PFO 14, WN5EPI 4, K5EZA 2. (Dec.) W5NFO 26, WA5CJT/5 7.

OKLAHOMA — SCM, Cecil C. Cash, W5PML — Asst. SCM: Joseph M. Schlosser, WA5IMO. SEC: WA5FSN. RM: W5RB. PAMs: W5MEX, WA5WHV, K5DLE and WA5ZRU. I received a letter from Mr. Bill Cass, mgr. of the Okla. Co. Chapter of the Red Cross, assuring me that the Okla. City RC has an excellent working relationship with the local representatives of ARRL. Arizona's gain is Oklahoma's loss, K5LZF/7 now operating from Chandler, Ariz. New officers of the Okla. Central VHF ARC are WA5LBI, pres.; K5DLE, vice-pres.; WA5KFT, secy.; WA5NRJ, treas. The SET operation went off very nicely. W5LW spent a week in Oklahoma City on Grand Jury duty. Congrats to new Advanced K5LZG, WA5LBI, WA5RHM and WA5ZKN. Generals WA5BNQ, WB5EOJ and WB5DHZ. Novice, WN3BSH. W5CRH has a new Swan-270. K5LUJ has a new 50-ft. tower and quad. Congrats to W5IQ, even though retired takes time out to conduct regular code and theory classes and has produced several real active amateurs. The Silver Anniversary Banquet of the Lawton-Fort Sill ARC held at the Hotel Lawtonian Feb. 6 is history and all comments heard were very good. Everyone of the 140 plus in attendance seemed to have a real fine time. Check the ARRL net directory for nets. Traffic: K5TEY 571, WA5FSN 106, W5RB 58, W5CDG 51, W5PML 49, WA5ZOO 49, W5FW 42, WB5DXP 38, WB5CWX 34, W5FKL 24, WA5IMO 24, W5MEX 23, K5WPP 22, WA5OUV 21, K5ZDB 18, WA5QOP 12, W5ADC 9, WA5NZM 9, K5OCX 8, K5CAY 5, W5JJ 2, WA5WRC 2, K5LUJ 1.

SOUTHERN TEXAS — SCM, T. Lee Ilfrey, K5HZR — SEC: K5HXR. PAMs: W5FHA, W5KLV. RM: W5SSE. Congratulations to new OPS K5RVF. Renewed appointments: W5KLV as PAM; K5FFH, K5TOI, W5YCK, W5ZPJ as ECs; WA5BTO, K5HUA, WA5IQV, W5LPO, W5ZPJ, OBSs; WA5LFS, W5VW, OOs; W7-

WA4IJS ORS. ORS WA5MXY out of action in Houston hospital. Austin ARC elected W5RJA, pres.; W7WAH-5, vice-pres.; WA5ZBI, sec.; W5PPQ, treas.; K5EJL, act.; K5HWH, pub. San Antonio Repeater Organization agenda for 1972 includes conversion to solid state, tone control devices, rehabilitation, training of maintenance teams, property inventory and distribution. Texas Southmost ARC reports a passel of visiting hams hibernating for the winter. OO K5EJL out of town most of month. Victoria has new 28-88 repeater with call W5IDE. OPS WA5MUM just back from Indonesia reports 20 and 15 are a mass of broadcast harmonics over there. WA5YEA now NCS for HNN. Regretfully we report the passing of our friend K5AD. ORS OO K5HGB advises he's still trying to get a 2-meter rig going. Received OO reports from K5HHA, WA5MIN, W5NGW, W5RBB, K5TSR and W5VW. Congratulations to W5RBB and K5ROZ on PSHR. Welcome to newly-affiliated clubs Texas DX Society and Triangle Repeater Assn.

Vet	*kHz*	*Sess.*	*QNI*	*QTC*
TEX*	3770	58	421	402
HN*	3961	45	2149	543
7290 Llc	7290	46	2069	774

*NTS. Traffic: W5SNF 316, WA5YEA 266, W5VW 162, K5HZR 139, WA5ZJY 124, WB5CUR 90, W5RBB 81, W7WAH-5 75, W5NNK 69, WA5IJI 57, W5ARQ 47, WA5EJN 44, W5BGB 42, K5ROZ 38, WA5JIZ 36, WA5KYX 34, W5TRW 32, K5RVT 20, WA5YXS 15, W5HWY 14, W5ZPD 13, WA5MUM 11, W5UKN 10, W5AC 8, K5HUA 6, WA5CTI 3, WA5CBT 2, W5KLV 1.

CANADIAN DIVISION

ALBERTA – SCM, Don Sutherland, VE6FK – Asst. SCM: Donez Booth, VE6YL. SEC: VE6XC. Congrats to: Advanced Class licensees VE6AVV, VE6ABX, VE6AXH; Queens Counsel VE6ASK; newly married VE6TL and new baby boy VE6LH. Best luck to VE6HD now VE7NR, Victoria. VE6AMO is VE7BRM at Sidney and VE6AGO to Ft. Smith NWT. VE6YG, VE6AM and VE6JK all recovering from illnesses. Off to the south is VE6AOF; teaching in Ft. McLeod VE6AIK; putting up monster DX beam is VE6PI; VE6ADX is coaching jr. op. Gary for a ticket and during SFT VE6SB had his own emergency, in a snowbank. He says no redheads involved. Thanks to all who helped with the chores during SFT. The RTTY links Calgary-Regina, Calgary-Calgary. EMO were most successful. The Calgary RTTY groups were busy fitting machines for use by the deaf. APSN 3770 kHz 0130Z. Autostart 3632.5 kHz. Traffic: VE6YI 154, VE6XC 110, VE6EK 93, VE6IZ 26, VE6AVV 24, VE6AGZ 10, VE6YW 10, VE6ABV 8, VE6MI 7, VE6QY 7, VE6AFO 6, VE6AXH 6, VE6VF 4, VE6ES 2, VE6IV 2, VE6HB 2, VE6AST 1, VE6CK 1.

BRITISH COLUMBIA – SCM, H.E. Savage, VE7FB – OVSS: (vhf) VE7AKL, OO: VE7TT, EC VE7BXN Nanaimo has been working as asst. EC. BC FM Assn., meetings attendance are over the fifty mark and are a real busy group in engineering repeater stations for the Interior clubs. VE7AAV, Captain of our weather ship "Quadra" invited the Victoria club aboard and reports it's EB. East Kootenay ARC has set up a complete communication center which covers all our bands and includes cb. Beaver Valley Clicks fine paper and front cover art is good, always some good hints and improvements. Static from the Nanaimo ARC – they are the committee for the Vancouver Island Picnic '72, keep June 4 open, it's a date. QCWA meets in Victoria at the Lions week end of June 10. BC Public Service Corps Net 3755 kHz, VE7BOZ net's PR is always looking for help. Traffic: VE7LL 90, VE7BLO 69, VE7FI 32, VE7CI 7.

MANITOBA – SCM, Steve Link, VE4EQ – The newly reorganized ARPC appears to be meeting with success, and were active in the Jan. SFT. VE4WC is SEC and invites you to sign up with the EC in your area. Winnipeg, VE4HR; Elm Flon, VE4NW; Brandon, VE4DI; Dauphin, VE4NE. VE4ST has been elected pres. of CLARA for 1972 and VE4QF treas. VE4MG continues to rack up new DX on 20 cw when folks VE4TT and ST aren't using the rig. Don't forget our nets as listed below with Jan. summaries:

Net	*Freq.*	*Time(Z)/Days*	*Sess*	*QNI*	*QTC*	*Mgr.*
MTN	3660	0045 IW	30	174	266	VE4RO, RM
MEPN	3765	0100 Dy	31	1205	52	VE4QI, PAM

Reports or information for the column is always welcomed. Traffic: VE4LA 416, VE4RO 201, VE4FQ 137, VE4WC 66, VE4KQ 61, VE4DI 54, VE4HR 32, VE4JK 28, VE4NE 22, VE4EP 17, VE4CR 16, VE4HS 12, VE4WZ 12, VE4YC 11, VE4EO 9, VE4XN 8, VE4LN 7, VE4RL 7, VE4YO 7, VE4MK 5, VE4EJ 4, VE4IE 4, VE4EU 3, VE4PA 3, VE4QI 3.

MARITIME — SCM, W.D. Jones, VE1AMR — Asst. SCM: Clarence Mitchell, VO1AW. SEC: VE1HJ. *The VE1 contest 1972* showed increased interest over last year with more participating stations in both cw and phone sections. The '72 SET provided many local exercises. The VO1 Phone Net, Maritime Phone Net and APN also were active. Its nice to hear VE1PX and VE1MX back on 80. *VE1PX and VE1WG are holding training classes in Halifax.* VE1AUE is sporting a new rig. In Jan. the Greenwood Club held a "Brownie Jamborette on-the-air" with the able assistance of VE1AAB, VE1TK and others. The Jan. meeting of SONRA was held in the "Crows Nest," sounds interesting. The final report from Signal Hill indicates 2169 contacts from VB1MSA. The new pres. of ARCON is VO1CA. There are now four Air Cadet stations in Nfld. VO1AJ, VO1EU, VO1JI and VO1KA also two Sea Cadet stations, VO1DH and VO2JM. SONRA is planning a radio museum for Signal Hill, contributions would be appreciated. Because of the small number of amateurs in Goose Bay, the Worked All Goose Award now requires working only three Goose Bay stations. APN reports QNI 179, QTC 286, sessions 33. NTN reports QNI 74, QTC 36 in 25 sessions. Traffic: VO1CA 339, VE1ARB 247, VE1AMR 172, VO1GO 123, VE1RO 116, VE1DB 16.

ONTARIO — SCM, Holland H. Shepherd, VE3DV — I wish to extend my warmest congratulations to all who participated in SET '72. I only hope you enjoyed it as much as I did. A very sincere thank you to the RSOs "Ontars," under VE3BC and his capable NCSs for acting as the main cog on 75 meters; the retiring SEC VE3EWD for the long hours he put in; a very personal thank you to the enthusiastic gang of VE3STP repeater under VE3SB who acted as my personal liaison on ONTARS and the CW Traffic Nets; to VE3DPO and his gang on the Grey Bruce Net who were active in SET '72 from 0900 EST until 2200 EST on both days. There are of course, many more who played an important role at the local level but space just won't allow it. VE3DH an ORS for nearly 40 years, has himself a new transceiver in kit form and will be back on the bands as soon as he finds all the missing parts. Repeater activity is growing - on the weekly session of repeater VE2CRA (Ottawa) a total of 50 checked in! Traffic: VE3DV 304, VE3ERU 253, VE3DPO 211, VE3FQZ 144, VE3EWD 117, VE3FXI 103, VE3ATR 85, VE3AWE 66, VE3SB 61, VE3EGV 60, VE2SD 54, VE3GP 52, VE3EHL 50, VE3GBR 37, VE3BPC 35, VE3ASZ 32, VE3ERG 29, VE3GJG 23, VE2RO 23, VE3AAS 21, VE3YQ 20, VE3DEP 19, VE3FHF 19, VE3AGN 17, VE3DU 16, VE3GT 15, VE3DIW 10, VE3AVD 7, VE3BEB 7, VE3ASE 6, VE3BAP 6, VE3JA 5, VE3GNW 2, VE3BLR 1, VE3AIA 49.

QUEBEC — SCM, Joe Unsworth, VE2ALE — SET once again disappointment this section this year although VE2WM and VE2APP *tried very hard. VE2BVD* now Advance ticket in Jan. '73. VE2BML now active on 2 meters. VE2BLO setting an AR Club in Louiseville School. VE2DI and VE2IS heard on 15 meters talking to VE2AES/W6. Les Amateurs de L'Abitibi ont organise des activites l'occasion du temps des fets. OA4QJ/VE2 par en voyage en France et 73 aux amateurs VE2. VE2BXF-VE2CH et VE2CIA operent Kenwood TS-150. VE2CIA est Station club de L'Institut Aeronautique du Quebec. VE2KC sur croisiere de trois mois bord paquebot France. VE2CRM et VE2CSH tres actif. VE2AVU quitte pour quelques mois pour L'Afrique avec le Cardinal Leger regard pour lui sur 20 metres. VE2RM directors '72. VE2JO, pres. VE2BU, vice-pres.; VE2AWO, treas.; VE2APT, secy.; VE2BMQ tech.; VE2ALE, sales; VE2BRP, enter.; VE2DEA, prop. Operating time for QR net is 1930 Montreal local or winter time at 0130 GMT and summer time at 2330 GMT at changes of time. VE2DCW down in dumps re participation in the VE/W contest. Sorry to hear that VE2TD Editor MARC was sick during Jan. VE2DM has new ssb rig on the hf bands. MARC in possible planning for World Wide Ham convention in 1975. VE2XO very active on 20 meters daily. PSHR VE2APT 25. *Traffic: (Jan.)* VE2DR 76, *VE2EC 25, VE2RO 24,* VE2ALE 20, VE2APT 15. (Dec.) VA2UN 184.

SASKATCHEWAN — SCM, Barry Ogden, VE5BO — The "Bi News" was the excellent participation in the annual SET by a great many VE5s who suffered writer's cramp from copying all the traffic handled! VE5JI, our VE5QSL Mgr., needs all those who have postage due for cards in his file, to send the necessary 4¼ x 9½ SASE right away so he can see out the window again — OK? VE5YI and VE5FY have moved to PA. 75 meter band conditions obviously prompted the following remark; "Maybe we should make a deal with a ZL to call the net!" Perhaps we should have alternate net control stations in areas to take advantage of skip conditions. Remember the Hamfest is in Moose Jaw this summer! Traffic: VE5DN 37, VE5BO 29, VE5KZ 15, VE5ES 8, VE5HP 6, VE5FM 4, VE5FQ 4, VE5GF 3, VE5NX 3, VE5PB 3, VE5WB 3, VE5IT 2, VE5LK 2, VE5YR 2, VE5IM 1, VE5LN 1, VE5QO 1, VE5TS 1.[illegible]

HAM-ADS

(1) Advertising shall pertain to products and services which are related to amateur radio.

(2) No display of any character will be accepted, nor can any special typographical arrangement, such as all or part capital letters, be used which would tend to make one advertisement stand out from the others. No Box Reply Service can be maintained in these columns nor may commercial type copy be signed solely with amateur call letters. Ham-ads signed only with a post office box or telephone number without identifying signature cannot be accepted.

(3) The Ham-Ad rate is 50 cents per word, except as noted in paragraph (6) below.

(4) Remittance in full must accompany copy, since Ham-Ads are not carried on our books. No cash or contract discount or agency commission will be allowed.

(5) Closing date for Ham-Ads is the 20th of the second month preceding publication date.

(6) A special rate of 15 cents per word will apply to advertising which, in our judgement, is obviously non-commercial in nature. Thus, advertising of bona fide surplus equipment owned, used and for sale by an individual or apparatus offered for exchange or advertising inquiring for special equipment, takes the 15-cent rate. Address and signatures are charged for, except there is no charge for zipcode, which is essential you furnish. An attempt to deal in apparatus in quantity for profit, even if by an individual, is commercial and all advertising so classified takes the 50-cent rate. Provisions of paragraphs (1), (2) and (5) apply to all advertising in this column regardless of which rate may apply.

(7) Because error is more easily avoided, it is requested copy, signature and address be printed plainly on one side of paper only. Typewritten copy preferred but handwritten signature must accompany all authorized insertions. No checking copies can be supplied.

(8) No advertiser may use more than 100 words in any one advertisement, nor more than one ad in one issue.

(9) Due to the tightness of production schedules, cancellation of a Ham-Ad already accepted cannot be guaranteed beyond the deadline noted in paragraph (5) above.

Having made no investigation of the advertisers in the classified columns except those obviously commercial in character, the publishers of QST are unable to vouch for their integrity or for the grade or character of the products or services advertised.

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 384, 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.

ROCHESTER, N.Y. is again Hamfest, VHF meet and flea market headquarters for the largest event in the northeast, May 13th. Write WNY Hamfest, Box 1388, Rochester, NY 14603

21st Annual Dayton Hamvention will be held on April 22, 1972, at Wampler's Dayton Hara Arena. Technical sessions, exhibits, hidden transmitter hunt, flea market, and special program for the XYL. For information write Dayton Hamvention, Dept. Q, Box 44, Dayton, OH 45401

AUCTION time, NYC area hams, SWLs, CBers, Famous Annual NY Radio Club auction, Geo Washington Hotel 23rd St and Lex Ave Sunday aft, March 19th, 1 P.M. Bring gear and bring money. All welcome. Donation $1.

AUCTION, New Jersey area, biggest and best prizes, refreshments, parking, all afternoon Sunday April 23, 1972, 12 noon, Arbor Inn, 7th St. and Road Ave, Piscataway, Plainfield NJ line. Tri County Amateur Radio Association.

SOUTHWEST Ham Round-Up and Fiasco will be sponsored by Old Pueblo Club on April 29-30, 1971. Headquarters Ramada Inn, Tucson, Arizona. Banquet, technical sessions with ham applications and demonstrations. Ladies program, luncheons and tours. Swapfest, auction and other activities on the 30th. Plan to enjoy the hospitality and fun in the sun. Contact Al Summers, chairman, W7MGF, c/o O.P.R.C. Box 6497, Tucson AZ 85716.

EVANSVILLE Indiana hamfest 4H grounds (highway 41 north 3 miles) Sunday May 7, 1972. Airconditioned, auction, overnight camping, ladies' bingo, reserved flea market booths. Advance registration. For flyer contact Morton Silverman, W9GJ, 1121 Bonnie View Drive, Evansville IN 47715.

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 Mitting, 663 Spring, Wabash IN 46992.

MOULTRIE Amateur Radio Klub 11th annual hamfest, Wyman Park, Sullivan, Illinois — April 30, 1972. Indoor-outdoor market. Ticket donation $1 in advance, $1.50 at the gate. Open 8:30 AM. W9BIL, 146.94 MHz. M.A.R.K., Inc. PO Box 327, Mattoon, IL 61938.

QSL??? QSLS??? Personalized made-to-order!!! Samples 35c. DeLuxe and Regular 50c. Religious 35c. (Deductable.) Sakkers, W8DED, Box 218, Holland, MI 49423

TRAVEL-PAK QSL Kit — Send call and 10c; receive your Call sample kit in return. Samco, Box 203, Wynantskill, NY 12198

QSLS. Second to none. Same day service. Samples 25c. Ray, K7HLR, Box 331, Clearfield, UT 84015

PICTURE QSL cards of your shack, etc. from your photograph. 500, $12.50. 1000, $16.25. Also unusual non-picture designs. Generous sample pack 25c. Half pound of samples 50c. Raum's, 4154 Fifth St. Philadelphia PA 19140.

QSLs, samples 10c. Fred Levden W1NZJ 454 Proctor Av. Revere MA 02151.

CREATIVE QSL cards. Personal attention. Imaginative new designs. Send 25c. Receive catalog, samples and refund coupon. Wilkins Printing Box 787-1, Atascadero CA 93422.

SAMPLES 20c. Harry Sims, 3227 Missouri Ave. St. Louis MO. 63118.

QSLs 3-color glossy 100, $4.50. Rutgers Vari-Typing Service. Free samples. Thomas St. Riegel Ridge, Milford, NJ 08848.

QSLs 300 for $4.65, samples dime, W9SKR, Ingleside, IL 60041

RUBBER stamps $1.50 includes tax and postage. Clint's Radio, W2UDO, 32 Cumberland Ave., Verona, NJ 07044.

QSLs "Brownie," W3CJI, 3111 Lehigh, Allentown PA 18103. Samples 10c. Catalog 25c.

DELUXE QSLs, Petty, W2HAZ, PO Box 5237, Trenton NJ 08638. Samples 10c.

3-D QSLs — Far more spectacular, little more cost. Samples 25c (refundable). 3-D QSL Co., Monson 2, Mass. 01057

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

FRAME Display, and protect your QSLs with 20 pocket plastic holders. 3 for $1, 10 for $3. prepaid and guaranteed. Tepabco Box 198T Gallatin TN 37066.

QSLs — Thin dime brings samples. Alkanprint, Box 3494, Papago Station, Scottsdale, AZ 85257

QSL, SWL cards that are different. Quality card stock samples, 20c. Home Print, 2416 Elmo Ave., Hamilton, OH 45015

Excellent QSLs, reasonable, Samples 25c, W9CL Press, R.R. 1 Box 811, Carmel, IN 46032

QSLs, 3 color glossy, globe, eagle, straight key, ham with earphones on front, report form on back, 100 - $4.75 postpaid. Rusprint, Box 7575, Kansas City, MO 64116

NEW! QSLs professionally designed and printed. Every card original, exclusively for you. Samples 25c (deductible). W1FLX QSL Designs, 20 Britton St., Pittsfield, MA 01201

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100 gummed photo stamps, send glossy photo and $2.00 to L. M. Hamilton, Box 4373, Torrance, CA 90510

QSLs 300 for $5.00. Free samples. Mark, WB6NKO, 2534 Eltonas Way, Carmichael, CA 95608

WANTED: All types of tubes. Top prices paid for Varian and Eimac. P.O. Box 414, Orlando, FL 32802. Jaro Electronics Corp.

WE buy tubes. Maritime 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. Wycombe, Lansdowne PA 19050.

AMATEUR museum buying old radios, books, magazines, catalogs, parts. Selling QSTs and CQs. Erv Rasmussen 164 Lowell, Redwood City CA 94062.

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. Heliarc welded aluminum. Al's Antennas, 1339 So. Washington St., Kennewick, WSN 99336

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. Alltronics-Howard Co., Box 19, Boston MA 02101. (Tel: day or night 617-742-0048)

GREATER Baltimore Hamboree, Sunday April 9 at 10 AM, Calvert Hall College, Goucher Blvd, and LaSalle Rd, Towson, Maryland 21204 (1 mile south of Exit 28 Beltway, Interstate 695). Food service, flea market, $1.50 admission. No table charge or percentage.

A.W.A. National Historical Radio Conference, Smithsonian Institution, Washington, D.C., Sept. 23. Further details in August QST.

EXHIBITORS — Reserve space now for ARRL Hudson Division Convention, Oct. 21-22, Tarrytown, N.Y. Contact Hank Frankel, WB2DQP, Box 535, Bellmore, NY 11711. Phone 212 394-5257

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 size s.a.s.e. to K2AFY, Box 74, Massapequa Lt NY 11762

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.

ROCKAWAY ARC Spring Auction and Fmers Get To-Gether will be held Friday evening April 28, 1972, at 8:00 P.M. at the *Hall of Science, 111th St. and 48th Ave., Corona, NY at the old* World Fair Grounds. Come to the best auction in the New York area. Doors open at 6:00 P.M. to accept items for the sale. For further information write to Auction Chairman, Al Smith, WA2TAQ, P.O. Box 341, Lynbrook, NY 11563.

SRRC 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, Oglesby, IL 61348

FIFTH Annual Radio Society of Ontario Convention — Kitchener, November 3 and 4, 1972, Canada's biggest — excellent forums for OMs and XYLs. Write R. S. O. Convention, Kitchener-Waterloo Amateur Radio Club, Box 603, Kitchener, Ontario, Canada

VERY in-ter-est-ing! Next 6 big issues $1. "The Ham Trader," Sycamore, IL 60178

CLUBS: Send membership list for QSLs. World QSL Bureau, 5200 Panama Ave., Richmond, CA 94804

TRANSFORMERS rewound, Jess Price, W4CLJ, 507 Raehn, Orlando, FL 32806

PRIVATE collector wants old wireless *gear*. Buy, trade. Dick Sepic, 1946 E. Orangegrove Blvd., Pasadena, CA 91104

WANT wireless (early) magazines and equipment for W4AA historical library. Wayne Nelson, Concord, NC 28025

TOROIDS & teletype. Lowest prices anywhere. 40/$10 *postpaid. 32 KSR printer, reconditioned, $225. Mite DGC 41,* too! Model 14, 15, 19, 28, 32, 33! Many more bargains. List, stamp please! Van, W2DLT, 302Z Passaic, Stirling, NJ 07980

PREPARE for Amateur FCC exams! You need Posi-Check, Original, expertly devised, multiple-choice questions, covering all areas tested in FCC exams. Same form as FCC exams. Over 300 *questions and diagrams for each class. Keyed* answers, explanations, IBM sheets for self-testing. Basic questions duplicated where they apply. General Class $4.25, Advanced Class $4.50, Extra Class $4.75, including first class mailing. Add 25c each copy for air mail. Send check or money order to Posi-Check, P.O. Box 3564, Urbandale Station, Des Moines, IA 50322

CAPACITORS — Brand new aluminum electrolytics, 275ufd at 500wvDC. Ten for $19.50. K4IHP, 6835 Sunnybrook 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*

BUYING? Selling? Trading? Don't make a move until you've seen our new publication. Free sample copy! Six issues for $1. Ham Ads, PO Box 46-653C, L.A., CA 90046

CASH or trade for pre-1925 radios for personal collection. Carl Osborn, W6RXP, 13816 Calvert St., Van Nuys, CA 91401

FCC "Tests-Answers" — Original exam manual for FCC First and Second Class license — plus — "Self-Study Ability Test." Proven! $9.95. Satisfaction guaranteed. Command, Box 26348-T, San Francisco, CA 94126.

NOVICE Crystals. Free flyer. Nat Stinette Electronics, Umatilla, FL 32784

TELETYPEWRITER machines, parts, bought, sold. S.a.s.e. for list. Typetronics, Box 8873, Ft. Lauderdale, FL 33310

PRIVATE *collector wants early wireless and wire* communications gear. Teslacoils, books, magazines, etc. Quote mini price. Will Nangle, 761 29th St., Milwaukee, WI 53208

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.*

VHF/UHF receiver 38 MHz thru 1000 MHz with 3 tuning heads, i-f unit & demodulator with "S" meter, and matching 5-inch "panadaptor" — spectrum analyzer. All 120VAC 60 cycle; good working condx. Govt cost $3800. Sell $135. W4UCH.

BEAT rust-corrosion! Fine stainless, brass, other, threaded, washer, hardware fasteners. Guying accessories! Insulators. Lists 20c coin! Walt Straesser, W8BLR, 29716 Briarbank, Southfield, Mich. 48076

RECEIVING & Industrial tubes, transistors, all brands — bigge discounts. Technicians, hobbyists, experimenters — request fr giant catalog and save! Zalytron, 469 Jericho Turnpike, Mineol NY 11501

WANTED: tubes, transistors, equipment, what have you Bernard Goldstein, W2MNP, Box 257, Canal Station, New Yor NY 10013

TOWER: 39 foot Vesto plus all hardware. Never uncrate Worth $600, will take best offer over $400 and deliver 10 miles. WA6RWM, 4952 Santa Rita, Richmond, CA 94803

SELL: Collins 75S3B $550, Drake R4B $350, matchin speakers, L. Misch, 1390 W. 85, Cleveland, OH. Tel: (21 281-5550

COLLINS — Complete L-Line including 62S-1 in walnu President custom console. All Collins extras. Write for line-u Priced to sell. W5PVV, 116 Westshore, Richardson, TX 7508 Tel: 215-231-5556

TOWER *climbing safety belt/lanyard $21.50, prop pitch roto* $65. T/S 175 frequency meters $45, 2M handitalki $50, coax switches multiposition $16-$48. Free list. Link, 1000 Monro Tpk., Monroe, CT 06468

OX'ERS — Dig them out of the mud! New low noise dual ga MOSFET preamplifier. Nominal 20 dB gain. 13-30 MH *Complete with cabinet. $29.95. Dynacomm, 1183 Wall Rd* Webster, NY 14580

ATWATER Kent Museum pays top dollar for breadboard crystal, battery, spark, WWI ship, Marconi receivers, parts, an books. Atwater Kent Museum-Woods, Beaver Meadow Rd Higganum, CT 06441. 203-345-2044

"HOSS Trader Ed Moory" says he will not be undersold on cas deals! Shop around for your best price and call or write th "Hoss" before you buy! New Regency HR-2A two meter h transceiver, 15 watts, immediate shipment, amateur net $225 New dealer demonstrator National NCX-1000 transceiver, re $899, cash $709; In stock, new Drake, Galaxy, Robyn Digit 500 and more. New Rohn 50 ft. foldover tower, prepaid $249 New Mosley TA-33 and demo Ham-M rotor, $199. Use equipment: HT-37, $179; Ham-M, $89; TR-4 w/34NB, $495 T4-XB, $359, Moory Electronics Co., P.O. Box 506, DeWitt, A 72042. Tel: 501-946-2820

WANTED: RC-348, RC-375. State conditions, best prices. Le P.O. Box 440, New York 10013

SELL: KW-1 $600, 32V2 $100, HRO-50T1 $90, HO-13 $5 TR-108 with V-107 $75. Local pickup. J. B. Catlin, W9ZV 100 Grant, Neenah, WI 54956. Phone: 414-725-9330

SSTV Robot camera No. 25123, Robot monitor No. 29131 25mm fl.9, 25mm fl.4 Macro lens complete $850. SB-62 Hamscan $100. W3AVJ, 717-286-1151.

SELL: SB-303, cw filter, SB-600, exceeds factory specs, $32 WB4VQZ, John Williams, Apt. B102, 1300 Warren Hites Dr Augusta, GA 10901. *Tel: 404-722-5003*

INTERESTED finding French teachers, students, French-speaking hams willing to speak French on ham band with high school students. KT5PH, Box 4099, Tucson, AZ 8571

WANTED: Hallicrafters SR-2000, must be mint. Cash *WB0EAO, Box 203, Manson, IA 50563*

HAMMARLUND all band transmitter HX-50A, $325; HXL linear amplifier, $250; HQ-180AC with blanker, $350; S-20 speaker, $18; Clegg 22'er MK II, $225; HQ-215 all band soli state receiver, $250. All mint condition. Swan vertical, $3 Hy-Gain 2 meter "J" pole, $50, like new, Hy-Gain TH6DX good, $85. Request *list of Heath* test equipment. W2ERV, Bernice, Freehold, NJ 07728

FOR SALE: Drake TC-6, SC-6, CPS-1. Package deal, make offe will reply. K8JFX, Ted Balan, 5577 Waterbury Ave., Maple Hts OH 44137

SWAN 500-C w/ac, just factory overhauled 390.—. Swan MK linear 2000 W w/2 new finals 385.—, Hammarlund HQ-170 a/b factory overhauled 220.—, Mosley 10-15-20 cub. quad new used $75. Heath HM-10V watt meter 25.— Converting to Collin gear. W1FDA. 802-985-2843, Shelburne, VT

HAMMARLUND HX-50 ssb, a-m, cw exciter, $150 or best offe Jim Wilson, 202 Fowler, West Lafayette, IN 47906

FOR SALE: Hallicrafters SX-101A receiver, superb conditio w/speaker, $135; Hammarlund Super-Pro WWII receiv w/pwrpk, excellent, $95; Searer, 2403 Maclovia Ln., Santa F NM 87501

TECH Manuals — $6.50 each: R-388/URR, R-389/UR R-220/URR, URM-25D, SP-600JX. Hundreds more. W3IHI 4905 Roanne Dr., Washington, DC 20021

MAINLINE TT/L-2, with scope, $200. See picture April 197 RTTY Journal. WB4RKA. R. Wanat, 443 Atlas Dr., Madison, A 35758

RARE antique Weston model 533 tube checker with followi engraving on panel: Property of De Forest Radio Co. Serial N 3 — $75. K2GW, 100 Webb Ave., Ocean Grove, NJ 07756

FOR SALE: new 4-1000A tube, new Jennings vacuum variab *capacitor 10-300 pF at 10 kV and a 10 ufd 8 kV Sprague filt* capacitor. Make offer. Jack Colson, Rt. 3, Mount Airy, M 21771. 301-829-2004

MOVING, must sell. HX50 transmitter, $175. HQ170 receiv $180. Heath HW12A assembled, $80. HA10 linear $175. Can seen and picked up at Saginaw. C. K. Loomis, 4328 State R *Saginaw, MI 48603*

COLLINS 51J3, Model 28ASR, other equipment. Send for li VanVuren, 315 E. 20th, Grand Island, NE 68801

WANTED: Collins KWS-1. Advise condition and price. Within 300 miles. KØGCJ, 122 Blauvelt Rd., Grand Island, NE 68801

KWM2, Waters rejection & EVT tuning, 516F2, 30L1, 312B5, mint $1450. Kleinschmidt cw tape perforator, excellent $100 with spare parts. Boehme inked tape recorder, 4C amplifier and tape puller $130 — copy 100 wpm & over visually. 3-500Z, new, pair $50. Sockets $4. Mod 32ASR, very good, $300. Mod 33 $600. W2SR-callbook.

SB-200 $180, you pay packing and shipping. Bill Ellis. 813-392-8609

SELL, Globe Scout, HQ105TR $150. Eico 720 with 730 modulator $75. Henry Deslaurier, East Greenwich, RI 02818. 401-884-8289. WA1CQJ

FOR SALE: Johnson Viking Challenger a-m—cw transmitter $35, Heath VFO $15. Ken Graff, K8KUR/3, 5506 Roosevelt St., Bethesda, MD 20034. 301-530-4535

MOSLEY quad 2el-triband MCQ-3B, $65; Channel master rotator, $25; 86 ft. RG8U, $7. W1OZ, 83 Hammondswood Rd., Chestnut Hill, MA 02167. Tel: 617-396-8010

WANTED: Collins 455J-60 filter for 75A4. W1LA, 24 Linden St., Norwood, MA 02062

YAESU FT-101 one month old complete $440; 75A4 serial No. 2309 with 2.1 & 3.1 kc filters $360; HT-32 $160. Ship prepaid. Certified check or money order only. A. J. Rokosz, 3704 Sara Rd., Rio Rancho, NM 87124

DRAKE R4, T4, AC4, MS4 recently factory retubed and aligned. Excellent condition with manuals and cartons, $465. Drake TC6, SC6, and CP51, $225. Gordon Scallion, 1420 Hebron Ave., Glastonbury, CT 06033. 203/633-2489

AMECO preamp., Turner 254C mike, Hallicrafters S-40B. Others. Send s.a.s.e. for list. WA3LRJ, 1160 King George Ct., Pittsburgh, PA 15237

SELL: CE 200 V — original owner — packing crate, manual, no modifications, factory overhauled — excellent, $350. Dr. F. P. Potylicki, W8EMZ, 2223 Chestnut Rd., Seven Hills, OH 44131

DRAKE MN-4 antenna matching network and manual. Mint condition. Cost $101, sell $65. f pay postage. Tim Dolan, WN8KOA, 1439 5th Ave., Charleston, WV 25312

WANTED: Heathkit mike model HDP-21A; For Sale SX-42 owners manual, SX-42 speaker, both $12. 5 813s $8 ea., BC 610 Mod. xformer $15. Buyer pays postage. W6ZPR, 1571 9th St., San Bernardino, CA 92410

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 deal and to give you the best service, best price, best terms, top trade-in. Write for price lists. Try us. Henry Radio, Butler, MO 64730

YAESU Frdx 400 and Fldx 400, $375; Clegg 22er MK2, $175; HD 10 - keyer, $25; Unique long wire tuner, $40. All mint cond. K2UQC, 425 Parkinson Terr., Orange, NJ 07050

SELL: Mint condition Swan 350 perfect with PS117C original cartons $285 firm. k5PAC, No. 6 Evergreen Court., Little Rock, Ark 72207

MINT Drake 2NT and Xtals, best offer, you pay postage. WN2AQU, 12 Carey Rd., Great Neck, NY 11021

SELL: Hammarlund SP-600 general coverage receiver .54 to 54 MHz very good condition $300. Includes audio Z-matching transformers. David A. Moss, 38 East Main St., Trumansburg, NY 14886

SELL: QSTs, 1929, 1930, 1931, June 1928, Jan thru June 1932, Mar, Apr, June 1934, 1935, Feb to Dec 1936, 1937 to 1959, also complete set 1950 to 1970. Sell: CQs 1945 to 1947 partially complete, 1948 thru 1959. First cashier's check or money order for $100 takes all 774 issues FOB my shack. R. D. High, W2FVR, South Church St., Moorestown, NJ 08057

NECK ties, custom made and monogramed with your call. Dark blue, brown, or black. $5.75. WA6GDS, Jim Stockwell, 3622 Keystone Ave., Los Angeles, CA 90034

A Real ham's delight. Xtal controlled transmitter, perfect for 220 MHz. Needs power supply. Send $7 p.p. to: Steve Gavin, P.O. Box 105, Ridgefield, NJ 07657

FOR SALE HX 10 mint conditions used ten hours $200 firm. Gherardi, 306 Roseville Ave., Newark, NJ 07107

SWAN 500C, 17XC, VX-2 mint condition, $425. SR-46A, crystals, $70. Martha Fanning, 23 W. North Ave., Apt. 4, Northlake, IL 60164

SB-303/400 Hz cw filter /SP 600. Assembled, working, 3 mths old. Scope aligned. $350 and it's yours. WB6SFA, Dave Smith, 4094 Royce St., Riverside, CA 92503

WANTED: kilowatt matchbox, two-er for sale $30. W2WHK, 210 Utica St., Tonowanda, NY 14150

WANTED: defunct Hunter Bandit 2000C, no tubes, state price, condition first letter. Ernest Detwiler, 1151 N. Vancouver, Tulsa, OK 74127

WANT: 2 M fm. Selling tower, Gonset ssb communicator, ac supply. Swan 400, 406 VFO. Gabe, WA1GFJ, 17 Whitney, E. Hartford, CT 06118. (203) 569-2266

ALUMINUM mast sections, 9½' long X 2-63/64" dia X 3¼" dia at top (due to 6" long sleeve). Unused. Painted green. Each weighs 20 lbs. Extremely rugged mast for antenna. $10.25 each. Pickup preferred. K3MNJ, 8361 Langdon St., Phila., PA 19152. Tel: 215-RA5-2373

51-J4 late mod. No. 3333 mint cond. $595. WA6TFZ, 1409 S. Halladay, Santa Ana, CA 92707

2 KILOWATT balun, 1:1 ratio, 3-30 MHz, Teflon insulation, coax fitting and dipole connector, $8.95, postpaid USA, K.E. Electronics, Box 1279, Tustin, CA 92680

HEATH HW-32 2- meter transceiver with ac power supply and speaker, perfect, $130. Henry Klapholz, M.D., K2VBL, Tel: 212-231-7856. 3411 Wayne Ave., Bronx, NY 10467

SWAN 500C, ac power supply like new, $400. Art Rauch, W4CAZ, 10950 SW 105 Ave., Miami, FL 33156. 305-274-9709

WANTED: Collins PTO, 70 E, 13 2-4mc. W1EHA, 23 Shane Dr., Chatham, MA 02633

LATE model Robot monitor and camera. M. Marsley, 2242 Stevens Ave., Kalamazoo, MI 49008. 616 3428838

SBE 34 Wanted in top electrical condition, under $200. Jack Hood, 11424 Ohio, Los Angeles, CA 90025

COLLINS 75S-3B mint 550 firm Viking Ranger 11-175 Citizens Band Browning Drake mobile 23 channels 150 you pay shipping, certified or cashiers check. F. R. Stokes, WB2JAK, 14 N. Victoria Ave., Ventnor, NJ 08406. PH 609 822 1484 Eve

WANT: mint KWM-2 516F-2 PM-2 312 B-4, describe fully, quote lowest. Ralph, Box 3061, Midway, WA 98031

SELL: four new Mullard EL38 (6CN6) cartons open only to confirm contents. WB6ETR 93727

FOR SALE: like new, SB-303, SB-401, SB-600, HD-10, SBA-301-2, HDP-21A, TV-1000LP, $600. Going to seminary. Dennis Zeares, 438 E. 8th St., Bloomsburg, PA 17815

TRADE electric typewriter for HW-100. G. Wetzel, Coopersburg, PA 18036

CW audio filter $19; IC keyer $29. WB2VXR, 8760 Howard Dr., Williamsville, NY 14221

COLLINS: 30S-1 $950; KWM-2 w/waters Q mult. $650; 516 F-2 $95; 312 B-5 $275. All mint. J. Blackman (201) 871-4644

SWAN FM-2X with crystals for 12 popular channels. Will ship for $195. Certified. Mike Steuerwald, WA2IQH, 1817 South Ave., Rochester, NY 14620

WANTED: KWM2A mint condition details W3HZ

YAESU FT-101 xcvr excellent. Sell - trade. Can mail. Robert Woodburn, General Delivery, Agana, Guam 96910

WANTED: power transformer for Navy oscilloscope OS-8B/U; RCA part 10800-120, or Carol part No. CA-1104. Call collect (617)256-8578. W1OSN, 175 Mill Rd., Chelmsford, MA 01824

NOVICE transmitter — Drake 2-N T 100 watts input marked for Novice 75 watts covers 80 thru 10 meters. $110. Also Eico 722 VFO $30. Both like new condition. Les Hodges. WB8ETP

66 foot windmill tower with converted prop-pitch motor, selsyns, cable. 15 meter beam. All extra strong. Deliver reasonable distance. Dirks, WØMVO, Pawnee Rock, KS 67567

RTTY Model 19 excellent condition $150. QSTs 1945-59 $30. Hand letter press $25, located near Baltimore. No shipments. 301-531-6566 or write KV4AM

SELL Clegg Zeus $150. W4LAT, Rt. 1, Box 81, Sarasota, FL 33577

CDR rotator & mast, $25; Galaxy 3, dc supply, mike, ant. & coils, $100; BC221 & supply, $30; Polycom 6 & 2, $75; Codamite keyboard cw keyer, $75; Heath Mohican receiver, $50; Heath LCR bridge, $25; exposure meter, $5; xtal calibrator, $10; Boehme ink recorder, $25; Beckman counter, $50; Hycon color gen., $60; TIC pix gen., $20; 6V, 8A supply, $5; Tektronix 124 TV adapter, $25; Electro pulse gen., $25; Hickock tube tester, $25; Ballantine meter, $15; HP 410B VTVM, $45. W6JX, 14945 Dickens, Sherman Oaks, CA 91403

TRADE for ssb gear or full kW linear — Fluke 803 digital voltmeter, HP 521 counter, HP 130 B scope, R 390 receiver. W4OPR, 609 Carvell Dr., Winter Park, FL 32789

SELL: antiques! Amplifex loop, Murdock variometer, rheostat, variable and phone condenser, Amplion horn speaker, Baldwin phonograph reproducer and speaker driver. All new in original cartons. W6RXW, 341 La Mesa Dr., Menlo Park, CA 94025

COLLINS 75A4 Ser. No. 5764. Sell or will consider transceiver on trade. B. J. Tadlock, WB4TEI, 1010 Weant St., Andalusia, AL 36420

WANTED: a Horace G. Martin bug, with name-plate with patent No. before 1,300,000; by his daughter, Estelle Martin Voight, 10546 Wheatley St., Kensington, MD 20795

FOR SALE: Drake L-4B, MN2000, TV-1000LP $700; SPR-4, N.B., cal, MS-4 $475; Clegg 22er $150; Gonset UV and VFO $200, TX62 and VFO $150. George C. Walton, K2ABQ, 3469 Major Dr., Wantagh, NY 11793. (516-781-3996)

HOOSIER Electronics your ham headquarters in the heart of the Midwest where only the finest amateur equipment is sold. Authorized dealers for Drake, Hy-Gain, Regency, Ten-Tec, Galaxy, 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

GALAXY V 80-10 meter transceiver, speaker cabinet, ac supply $279. Ron Perry, Glen Ave., Fishkill, NY 12524. 914-897-5930

WANTED: Heath radio control GD 19 or similar, reasonable, good, complete gear. L. Daniels, W. Ridge, Lansford, PA 18232

SALE: Hammarlund HQ 215, absolutely mint condition, original packing, $275. RME 6900 with matching speaker - excellent, $130. Bob Slifka, 104 Mayfield Ln., Valley Stream, NY 11581. Tel: 516-825-3065

SELL mint Apache TX1 and SB10. On air now. Manuals. A-m ssb cw. 10 to 80. $150. or trade? W7FRV, 3834 W. Hayward Ave., Phoenix, AZ 85021. PH: 602-937-3785

CASH for mint Drake T-4XB, R-4B. Sell: excellent HQ180C w/spkr, original cartons $275; Collins TCS $25; RME 2/6/10m converter $10; beautiful Rolleicord III $75 or trade on Drake. Possible air delivery, pickup reasonable distance. W2MQB. (516)324-2546

HALLICRAFTERS transmitter HT-6 a-m phone and cw, band switching, coils on 2.5 - 4.5 mc. and 28 mc. 25 watt out. National rf stage type G-78 plug-in coil on 20 mtrs. Transformer — Amertran Pri 110v — 60 cyc. — approx. 1000 VA Sec. 500-350-0-350-500v. Sec. 12v. CB transceiver — tuneable — Allied Radio — Knight Mod. C-540 120v ac, or 12v dc operation. CB transceiver — 23 channel, xtal controlled. Knight Mod. Safari III, all solid state, — 12 v. dc operation, 20 mtr. — 3 element — wide spaced — all aluminum beam complete. Any of the above: best offer. FOB W2IDU, P.O. Box 103, Millburn, NJ 07041

NAVY teletypes with tables and loop supplies, Model 15, $100; MOdel 19, $250; antique two-level Morse perforator by Teletype, $30. WB4WZR, 8441 S.W. 142 St., Miami, FL 33158

FOR SALE: complete Hallicrafter ham trans. & receiver 2 years old. Loads of ham equip & old tubes cheap & for free. Florence Westwick, 5420 Main St., Skokie, IL 60076. PH: 312-966-6564

1 Signal Generator (AF-RF) approx 3 yrs old; 1 vac-tube volt meter approx 3 yrs old; 1 semi automatic key. Best offer acceptable. Call 734-5780 or write F. J. Quinn, 84 N. State St., Ansonia, CT 06401

DRAKE 2NT transmitter and manual mint condition $100. WB4QLK, 609 Sandy Springs Ct., Va. Beach, VA 23452

SWAP — have a new SB102 so will consider offers or swaps on my HBR13 (Oct. '65 QST) and Johnson Viking Navigator. Desire SB610 and SB630. Contact VE1ZT/W1, 17 Sokokis Circle, Topsham, ME 04086. Phone: (207)729-8192

"DON and Bob" guaranteed buys. Motorola HEP170 epoxy diode 2.5A/1000PIV 39c; Sangamo DCM600MFD/450V cap 4.95; Computer grade 10000MFD15V 1.95; 6.3VCT/600MA transformer 1.95; Ham-M 99.00; TR44 59.95; Mosley CL33 114.00; CL36 134.00; Tnex MW50 tower 229.00; Gladding 25, AC 256.00; Hy-Gain 400 rotor 148.00; Hyquad 99.00; Airdux 2408T coil 5.00; guaranteed used gear: 75A4(clean) 395.00; 51J4 350.00; SX115 250.00. Tempo Kenwood dealer. Prices collect. Write quote note. Mastercharge, BAC. Warranty guaranteed. Madison Electronics, 1508 McKinney, Houston, TX 77002. 713/2242668

WANTED: NC240D receiver. Must be clean and in good working condition. W1ER, 40 Groveland, Auburndale, MA 02166

SELL: Ranger I mint condition, $80. W2AGQ, Kenneth Taber, R.D., Milton, NY 12547

TRADE clean 75S-3B rcvr for a Swan 500CX or 500 C with ac power or a Yaesu FT101 or offers. Sell Hallicrafters SX117 rcvr, HT37 transmitter both $300. Real sharp Heath SB100, HP23, SB600, for $300. Collins 516F-2 ac power with speaker $100. Also have almost new National NCX 1000 not quite right $450. Richard Schark, 417 North Ferry, Ottumwa, IA 52501. Phone: 515-682-5741

SALE: Model 19 teletype $140 firm. No shipping. John Ferrara. 203-93309594

SELL: Heathkit SB301, SB401, $200 each. Arnold Levine, 410 Meadow Dr., Camp Hill, PA 17011

SELL: Perfect equipment. All like new. Henry 2-K2 $495. TR-4 $450, AC-4 $60, RV-4 $60, W-4 $25. Waters 3001 patch $25. Telrex 20M326B 20 meter beam with 26 ft boom $280. Hi-Gain 15 meter beam $80, both beams on the ground and perfect. Ham-M rotator $85. WA8LSO, 1112 Crown St., Kalamazoo, MI 49007. 616-344-2232 weekday eves.

WANTED Hallicrafters HT-30, must be in excellent condition. K9HFP, 3028 South 94th St., Milwaukee, WI 53227

SSB station: NCX-3 with NCX-A pwr supply, Shure model 444 dyn. mic, Vibroplex champion bug. Excellent condition! $229. William Lazzaro, Holland House, Apt. 29, 440 Viola Rd., Spring Valley, NY 10977

COMPUTER console, 3 wraparound racks with formica desk top, power strips, steel drawers, rear access doors and all mounted on wheels. $250. W6IVH

NCX-3 good condition needs realignment $150, w/ac/ps. Tom Jennings, 2148 Briarwood Ave., Sea Girt, NJ 08750

BUY or borrow for copy tech manual for Corps of Engineers, 5kW Engine generator unit, HOllingsworth Model EA-536, stock list no. SNL 17-4780. 525-25. Will pay premium. W5BOY, 365 West Saxet Dr., Corpus Christi, TX 78408

QST sale: 1956-1971 incl. Excellent. Complete years only. Reasonable offer. Harold Cerny, W6KAK, 3432 Borreson, San Diego, CA 92117

SELL: SB101, p.s., cw filter $345. 75A4 w/noise blanker, cw filter, spinner knob $345. HA1 keyer w/Vibro key $50. Mosley MCQ3B quad 60.00 (as new). 3 ele 20 mtr Hy-Gain beam (new) $50. 3 ele 20 mtr CushCraft beam $50. Newtronics CD4075 Cliffdweller (new) less control box $30. W9OHH, Zielinski 312 2798057

SELL: HW-16, SB-610, mint condition. New. S. Couch, WN0GAR, Route 1, Ottawa, KS 66067

EXCESS equipment bargains: GR bridge 916A 400 kHz - 60 MHz, $175. Millen 90651 GDO coils (3) 325-2000 MHz $10; Collins mechanical filter F455KO5 $15; WE RTTY filters 2125/2925/roof $25. Measurement Corporation standard signal generator model 84-TV with modulation and metered output, $75. All FOB, Thomas, W2UK, Juniper Pl., Colts Neck, NJ 07722

51J4 3 filters vernier cabinet speaker $425. (W6RQZ) 1330 Curtis, Berkeley, CA 94702 (415) 526-7345

COMPLETE station $125. Includes Multi-Elmac AF68a xmtr, 80-6, a-m—cw, 60W; PRM-8 rec; M1070 11-ac/6&12dc p.s. All cables, manuals. Perfect for Novice or traveler. S.a.s.e. brings full details. WB2TBW, Ken, 32 Owen St., Westbury, NY 11590 (516)334-1075

NEW Tri-Ex RBS-60 tiltover, ground post, rotor heap, coax and control cables — never used. Cost $825, sell for $500. Vesto 39' tower and Hy-Gain Hy quad (new) $150 FOB. Kruse, W4NYA, Box 593, Altamonte Springs, FL 32701. PH: (305)838-7254

COLLINS mint almost new 75S3B receiver serial 85305 latest model (round Collins emblem) $550; 31284 unit $135; old Collins 310B-3 cw transmitter mint $95; PM2 piggy back ac sply as new $95; DL1 dummy load $35; HA4 keyer $58; Heathkit 301 $210; 401 $265; Thor 6 $125; G50 Communitor $140; PollyConn 6 $90; Utica 650 with VFO $90. Some trades considered. F. Coble, 251 Collier Ave., Nashville, TN 37211

HEATHKIT station complete. Professionally wired by expert and guaranteed to surpass all specs. Forced to sell. SB-101 transceiver with ssb/cw filters, HP-23A power supply and SB-600 speaker. Linear amplifier Heath SB-200. Second receiver is SB-301 with ssb/a-m/cw filters and SB-600 speaker. Preamp Ameco PT. SB-610 Monitor scope. Homebrew antenna coupler equiv. to Millen Transmatch, solid-state keyer with El-key. All original owner and absolutely perfect condition. After 250 DXCC must leave air for awhile, will sell only entire package if the price is right. Make offer to WB2CGW, John Yearsley, 142A Wallworth Park, Cherry Hill, NJ 08034. 609-428-2531

SELL: DX-150A general coverage receiver. $95. Wanted: Allied Radio A-2516. Steve Wolf, 34305 Jerome, New Baltimore, MI 48047. 313-725-0098

WANTED: SX-42 in repairable condition. Send price and condition. K0KCV, 9827 6th St. N.E., Mpls., MI 55434

FOR SALE: Heath SB-10 sideband adaptor clean condition $60. Lafayette HA-410, 10 meter transceiver factory mint condition, $100. M. Heiman, K7BDY, Box 744, Showlow, AZ 85901

SELL: HW12 with HP23, mike and speaker. Like new. W2TPB, 111 South Crescent Dr., Rome, NY 13440

CREAM Puff SB-34 and SB2-LA linear. Three months old, VOX, SBE mic., manuals, hardward, etc., included. First $450 m.o. takes these beauties. Moore, RFD No. 3, Brandon, VT

WANTED: keyer HD-10 or equivalent, in very good condition, with schematics. Reasonable price. W3PFD, 2025 - 7th Ave., Beaver Falls, PA. PHone: 412-843-8244

SWAP complete TMC ssb station (see Dec. Ham Ads) for Crown SS tape deck. A Bruno, 24 Butternut Dr., New City, NY 10956

SB200 Heath kW amplifier, good condition, $180. Comdel speech processor, $75. Robert Myers, 225 Main St., Newington CT 06111

DRAKE SPR-4 new, in unopened carton, $410. Meredith Porter, 3 Ames St., Cambridge, MA 02139

PEARCE Simpson+ Gladding 25s 2MFM — 25 watts Hi Skan — 8 channel scanners — Bill's Radio, Wading River, NY 11792. 516-929-6118

SELL: 75S-3C, TX-1, MP-1, MN-2000, 18AVQ, MA-3, Waters 334A, mobile antennas. WA2PDY, R-29 Village Green, Baldwinsville, NY 13027. Phone: 315-635-3220

SELL: complete station: Heath DX60A, HR10, Dow key DK60-G 2C, Turner 454X, used less than six months. Also 40M dipole, approx. 100 feet RG58U, manuals. First $180. Greenbaum, 139 Highland, Worcester, MA 01609

POLYCOM 62B, 6&2 transceiver, VFO, clean, works well $75. K2QIL

SELL: Old QST, CQ, Radio magazines. Send for list. Ken Rhody, Patton, PA 16668

FOR SALE: 62S-1, $495, KWM-1, 516F-1, $275. Henry 2K $425. Wanted: T-504 (662-0157-00) for KWS-1. James W. Craig, 29 Sherburne Ave., Portsmouth, NH 03801

PROP-pitch rotator, mounted, w/ac, selsyns, $45; R-390 test set Hewlett-Packard nf indicator w/diodes, gas tube, 10-4000 MHz swap vhf/uhf s.a.s.e. W4API, Box 4095, Arlington, VA 22204

WANTED: electronics instructor. General, theory, workshops. Excellent opportunity at NY State camp. Minimum 19. Write Ed Shapiro, Camp Sequoia, 708 Back Ct., Westbury, NY 11590

MUST sell — TR3 — excellent. Will accept reasonable offer. J. B. Henrichsen, K0KOY, 431 Frank Ave., SE, Huron, SD 57350. 605-352-9267

WANTED: one Lincoln six meter transceiver with crystal and mick in good operating condition. Jon Dane, Rm 127, Fleming Hall, Menomonie, WI 54751

SELL: HRO60 $135, HW-32 $85, HW-30 Twoer $25, Sona DC-10 $40, WX-5 $8 (National) WA2CNT, Bob Harrison, 4 Hopewell Dr., Stony Brook, NY 11790

RANGER I, very good condx $85. HQ-100, good condx $70. Lou Milan, W2FOM, 13B Alpine Dr., Wapp. Falls, NY 12590. 914-297-4186

SB-101, cw filter, SB-600 with ac supply, mike. Excellent condition. Best offer over $275. Will deliver within 75 miles. Jack Riggsbee, 2632 47th Ave. West, Bradenton, FL 33507

SELL or trade extra clean Heath SB100, HP23, SB600, and SB200 linear complete $500. Nice National NCX5 and AC $300. Mint SX117 receiver and speaker $225. Sharp Hammarlund HQ145XC and speaker $150. Nice Collins 75S-3B, $500. Richard Schark, 417 North Ferry, Ottumwa, IA 52501. Phone 515-682-5741

HW-100 factory aligned, HP-23 $225. Ross Weber, WA0SHA, 910 South First Ave., Sioux Falls, SD 57104. 605-338-4353 weekends.

FOR SALE: Galaxy V xcvr, ac supply, speaker. 300 watt; mint condx, price $175. T. P. White, W4YPT, R3, Box 401, Charlottesville, VA 22901

COMPLETE Drake line, excellent condition, R4A receiver, T4X transmitter, MS4 cabinet with speaker and power supply, L4B amplifier and C4 station console. $1500. WA3FZX, Box 11, Glenside, PA 19038

DRAKE 2-B mint orig case manual 2AQ/2AC extra xtals $185. James Lee, 2059 Queens Ln., San Mateo, CA 94402

HEATH HW-30 5 watt two-meter xcvr $40. J. N. Nuzzi, 230 Lane St., Hamden, CT 06514

FOR SALE: Gonset GSB-100 xmtr, ssb, a-m, cw 100 watts PEP; new final, transformer, alignment, $150. A. Gilbert, W3KED, 6838 Westridge Rd., Baltimore, MD 21207

SELL: Collins station 75S-3, 32S-3, 516F-2 $950. Ameco PT preamp $50. Raytrack Audio compressor $45. Hallicrafters HA-1 keyer $40. No shipping. K6GLC, Manhattan Beach (213)545-3164

NOVICES: Heathkit HR-10 B receiver with crystal calibrator — $60. Excellent! Has QSO'd Alaska and Hawaii. You ship. Jim Chumbley, 8901 Frontage Rd., Space 18, Albuquerque, NM 87113

1PR. 52.525 crystals (new) for Motrac xceiver $7.50 (or trade); 1 Eico 753 20/40/80 meter xceiver with ac & dc supplies & 100kc oscillator built in. Just overhauled, A1 shape, $210 (or trade). Nick Swan, 4839 Beaune Rd., Ludington, MI 49431

SERVICE and parts for your Hammarlund receivers/transmitters. Contact C. Osteen, Box 152, Mars Hill, NC 28754. (704)689-2078

CRYSTALS airmailed: April QST "Novice Special." Be everywhere on the bands (not all at once) — Do it economically with active-accurate FT-243 C-W crystals. Five or more, (band mix OK) — Our frequency choice (scattered) 40M-15M $1.25 each, 80M $1.65. Your choice 40M-15M $1.39, 80M $1.69. Less than five 40M-15M $1.50, 80M $175. Postage — Airmail: 15c/crystal, 1st-cl 10c. General purpose: FT-243 .01% 3500-8600 kilocycles $1.90 (five @ $1.75 each), (nets, ten same $1.45), 1700-3499 $2.95, .005% add 50c/crystal. MARS, Marine—. Free listings. "Crystals Since 1933." Bob Woods, W0LPS, C-W Crystals, Marshfield, MO 65706

FOR SALE: SB10 $70, Hammarlund HQ110 with speaker $90; WA5PFS, P.O. Box 698, Hammond, LA 70401

VARIABLE cond. — Cardwell split stator 150 MMFD per/sec. 9000V. 10"L.7¼"W. Brass, beautiful, $9. K2EGI, 5 Stratford, Pl., N. Babylon, NY 11703

SUPER Sale: SX-101A $160. Heath HX-10 Marauder $140, HA-10 Warrior linear, $130. All in ex. cond. All recently aligned by expert. Pkg. deal $410. WB6ODJ, Tal: 714-626-8511, ex 2053 ask for Terry Chappell, or write callbook address.

SB-301, 401, trey on both, cables, a-m, cw filters, xtal pack, Ameco PCL-P included, all for $450. Bill Tavolga, WB2HBD, 60 Durie Ave., Closter, NJ 07624, 201-768-4190

COLLINS: latest series, round Emblems: 32S-3, 516F-2 $595; 75S-3B $470; KWM-2 516F-2 $795. Earlier series, long emblems: $520, $425, $670. Plug-in filters: 200 $69; 500 $39. Drake: R4B $295; T4XB, AC4 $425; all $690. Everything mint. Payne Radio, Box 525, Springfield, TN 37172. NIte s (615) 384-5643, days (615) 384-5573

WANTED: KWS-1, 75A4, must be mint condx. Johnson Matchbox, kW or 250 W, w/o coupler. Give price & serial No. K2CIP, L. W. Schubert, 73 Jefferson St., Bklyn, NY 11206. Tel: 212-456473

SWAN 500CX, 117XC p.s., 508 VFO, VX-2, Turner mike, Hy-Gain 12AVQ, SWR meter all mint hardly used, $595 plus postage. Wilber, WB6GNP, 5269 University, Santa Barbara, CA 93111

SB-101, HP-23A, cw filter, $349. WA1ABW 212-280-6386 mornings.

COLLINS 30L-1 linear, mint with UE-572B finals. $335 FOB WA5TNW (Zip 73036)

SALE: SB-301 mint condition. College expenses. $189. WB4NMY, 4803 Russell St., Richmond, VA 23222

SELL: Heathkit SB-101, HP-23, SB-600, cw filter, all in absolute perfect condition. Will ship. $375. Jim Meister, WA1FJU, 4 Weathervane Hill, Westport, CT 06880

SELL Proceedings IRE, May 1962, 50th Anniversary Historical Issue, 919 pages, perfect. Make offer. J. Sandberg, K6HE, 1138 Rustic Rd., Escondido, CA 92025. (714)745-6940

CONN — TX86 w/VFO, Gonset convertor & noise limiter in mobile console $100 or B.O. misc cabinets & components, 14AVS $15, TH4 beam $60. Want NC183D NBFM adaptor. J. Horner, 17 Abbott Ave., Terryville, CT 06786

SELL: 75S1, 32S3, 516F-2, $900; SX-101 MK II, $120; RTTY model 19 table complete, $100. All units are in perfect shape, No shipping. Bill, W0NNS, 715-344-0034 office, 715-341-0098 home. 1641 Clark St., Stevens Point, WI 54481

TO settle estate of W4QC: For Sale — 1 Hammerlund HQ110 receiver $100; 1 Meissner signal shifter model E X. Make me an offer. Both had only one owner. Mrs. L. Winstead, P.O. Box 365, Elm City, NC 27822

FOR SALE: Drake R4A MS4 with 4xtals $295; T4XB AC4 $425; HA-1 keyer with Vibro-keyer $70; LAB1 frequency marker $25; Johnson Matchbox/SWR bridge 275W $35; Shure No.444 mic $15. The whole station $840. Prefer pick-up deal, will consider delivery. WA2CKU, Carl Capista, 2640 Leslie St., Union, NJ 07083

TRADE: TX-1, SB-10, RX-1, for Xceiver such as SB101 or HX-50 and HXL-1. K1DUN, Box 2, Salisbury, NH 03268

FOR SALE: Hallicrafters HT-37 transmitter, Hallicrafters SX-101 receiver, speaker, mike, mike relay, balun coil, dipole antenna. Make an offer. J. G. Lee, 11 Deacons Ln., Wilton, CT. Tel: 203-762-8886

FOR SALE: New computer grade capacitors 630 MFD @ 450 V. 10 for $17.50. WB9EEJ, 13316 W. Prospect, New Berlin, WI 53151

COLLINS equipment, brand new, estate of WA2VJO: 75S3B, serial 30300. 32S-3, serial 30307. 516F2, serial 60602. 312B4, serial 70810. 30L1, serial 40973; $1,825. Drake TV 1000 filter, New, $13. Jones research monitor, new, $11. Deluxe Vibroplex, new, $25. Rohn tower HAX32HC, new $65. Mosley quad beam MCQ3B, new, $80. 300 ft RG8AU, new, $30. NCX3 with NCXA power supply, $195. NCX3 calibrator, new, $20. Johnson Matchbox 275 watt, $25. SB175 meteor transmitter and power supply, $10. Contact W2MPP, 8 Winding Way, Denville, NJ 07834

NEW capacitors 150/150 FP117 50c. PE101 Dynamotors $5 FOB new. Relays dpdt 6V 240-ohms dual coil telephone type, used, $1. Xcvrs 30W a-m 1.652 MHz Xtal used, write, WA5ECL, Joseph Bodjo, 1920 Alta Woods Blvd., Jackson, MS 39204

HEATHKIT HW-100 for sale with HP23-A power supply and Turner & 2 microphone. Price $290 completely assembled. Contact Mark Gerson, 3100 No. Flagler Dr., West Palm Beach, FL 33407

FOR SALE: Collins S Line complete 32S1, 75S1, 30L1 with power supply, $999. Yaesu FT-101 with mobile mounting bracket, never used $499. W2OJC, 54 Charles St., Clifton, NJ 07013. 201-471-3432

SALE: Galaxy GT550 with cal. RV-550 VFO, AC400 ac power, SC-550 speaker in factory cartons. All $400. 415-283-0659, Wayne Merryman, WB6WZV, 811 Topper Ln., Lafayette, CA 94549

SELL: QST Jan 1925 thru Apr 1926 and Jan 1930 thru June 1971. Best offer plus shipping. W9CWH, 706 N. Elmhurst, Mt. Prospect, IL 60056

QST 1939-1969, CQ 1947-1961. Some missing. Entire lot $75 or best offer, Write for list. Art Koch, 7748 Cecilia Rd., N. Syracuse, NY 13212

DRAKE 2B, xtal, calib., 10 mtr and WWV, $155, you pay shipping. WA9IPD/6, Alan Adler, 1622¼ Armacost, L.A., CA, 90025. Tel: 213-826-1658

TEXT: for sale, Hammarlund HQ215, Eico 753 with ac, Knight T60, excellent condition. Make offer. Steve, WB4TNQ, Travelers Rest, SC 29690

WANTED: Eddystone 898 slow motion dial, unmarked face prefered. Mark Lehr, WB5ALI, 8884 Larchwood, Dallas, TX 75238

WANTED: SB-200 linear. Tip top condition. Give details. W2YYL, 8 Oak St., Stony Brook, NY 11790

CANADIANS sell Johnson courier amplifier, 500 watts, like new. VE3OU, 790 Regent, Preston, ON

SELL: mint condition NC 300 receiver with 100 kHz marker, $125. Will ship. Floyd C. Stoddard, Box 667, Kalispell, MT 59901

APACHE, new amplifier tubes, $90. R-100A $90. Stephen Lloyd, 116 Osmun Pl., Ithaca, NY 14850, 607-273-6365

FOR SALE: mint SB-220. Prefer you pick up. Walter Knodle, c/o 211 Physics Bldg., Urbana, IL 61801

VALIANT I $90 or best offer, shipping extra. W2LQ, 15 Heather Hill Way, Holmdel, NJ 07733

HEATH SB-301 with cw filter and SB-600 $265. HDP-21A mike $20. HR-10B $45. All mint cond. Will ship. Fred Ligman, WB9BOK, 245 W. Main, Lake Zurich, IL 60047

NEW Alpha seventy at bargain, Waters 3001 coupler $50, Bug Ketcher mobile coils $21.95, NCL-2000 mint condition $375, General coverage Collins 51S-1 $895, Galaxy R530 with speaker $525, KWM-2 with ac supply perfect $695, Heath SB101 with ac supply $299, Swan 500 with ac supply excellent $385, SBE-34 like new $225, 2 meter Gladding 25 with ac and extra 28/88 $235, HT-2 Vantronics walkie talkie $200. Also all accessories including Hy-Gain, Mosley, CDE, Minibeam, etc. Call or write Douglas Electronics, 1118 South Staples, Corpus Christi, TX 78404

STANDARD and Sonar amateur and marine gear at discount. Fulllines available. State Model. Arena Sport. 1169 N. Military Hwy., Norfolk, VA 23502

DX Awards log. 150 page book lists contacts for over 100 major worldwide awards. Individual logs for each award for record of contacts and confirmation. Required over two years to prepare. $3.95 ($4.95 foreign). McMahon Co., 1055 So. Oak Knoll, Pasadena, CA 91106

COUNSELLOR — Penna. Brother-Sister Camp seeks Ham Radio college man with a General license. David Blumstein, 1410 E. 24th St., Brooklyn, NY 11210

Operating Events

(Continued from page 105)

QSO and use U. S. states, VE provinces and countries for multiplier. Outside stations score 5 points per QSO and use Montana counties for multiplier (possible total of 561. Suggested freqs.: phone, 3852.0 21370 14300 7260 3930; cw, 28040 21040 14040 7040 3540; novice, 3725 7125 21125 kHz. Appropriate awards. Logs containing date/time in GMT, numbers, counties, state, province and country should be sent to the society, c/o Box 73, Eastern Montana College, Billings, Montana 59101. Mailing deadline June 4.

20-21 Michigan QSO Party, sponsored by the Central Michigan ARC, starts 2100Z May 20 and ends 2100Z May 21. Same station may be worked on phone and cw. Michigan stations may work each other. Mich. stations send RSCTI, a serial starting with 001 and county. Others use state/province/country. One point per QSO. Mich. stations multiply by the total of states/provinces/non-W/VE countries (includes Mich.). Others use Mich. counties for mult. (83 maximum). Appropriate awards. Suggested freqs.: cw, 3560 7060 14060 21060 28560 (yes, 28560!); phone, 3925 7268 14290 21360 28560 50400 52525 145350 146940. Mich. stations are asked to be QRV on 21 MHz at 1600 and 1900Z and on 28 MHz at 1700 and 2000Z. Logs showing dates/times, stations, exchanges, bands, modes, location and final score must be mailed no later than June 30. Send logs to the CMARC, Box 73, Lansing, MI 48901.

JUNE

4 Minnesota QSO Party.

7 W6OWP Qualifying Run.

10-11 VHF QSO Party.

18 WIAW Qualifying Run.

25-25 Field Day.

28 WIAW Morning Qualifying Run.

September 9-10, VHF QSO Party.

November 11-12, 18-19, Sweepstakes.

December 9-10, 160-Meter Contest.

QST

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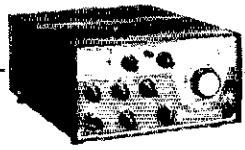
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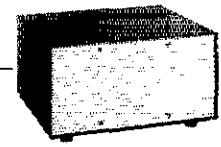
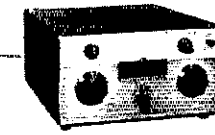

MS-4 SPEAKER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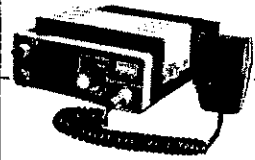
TR-22 2 METER FM TRANSCEIVER


ML-2 2 METER FM TRANSCEIVER


TC-2 2 METER XMTR CONVERTER


TR-6 6 METER TRANSCEIVER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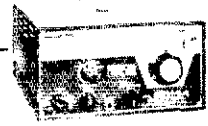
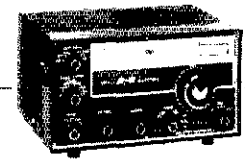

SW-4A SWL RECEIVER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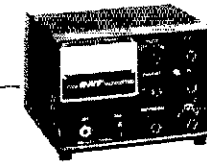
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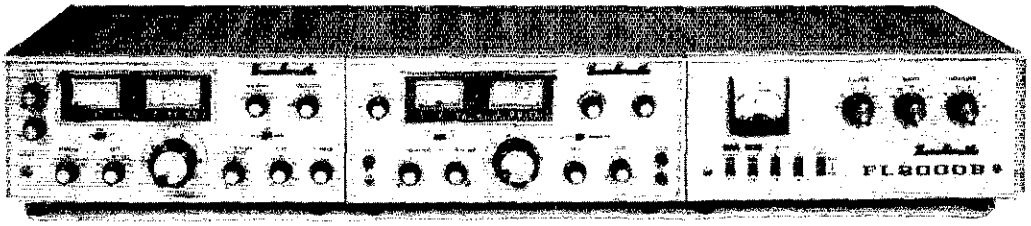

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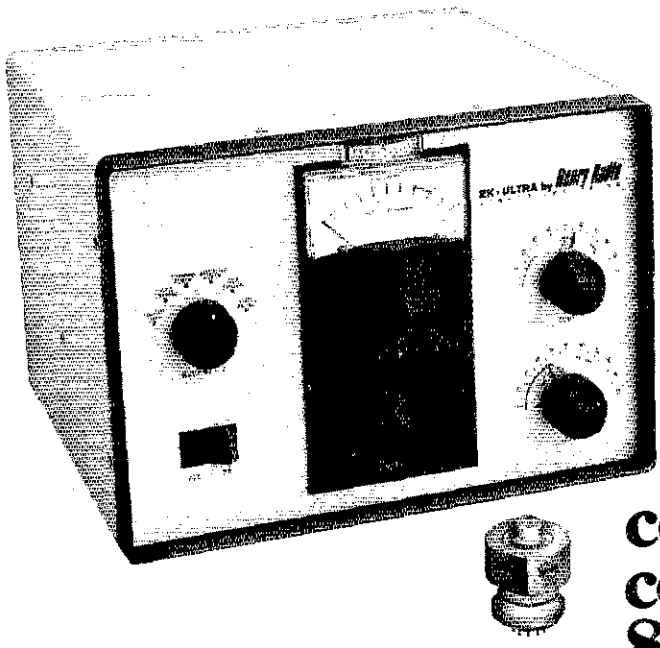

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