QST

April 1973
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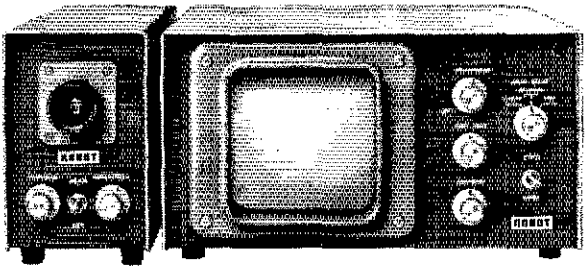

Operating SSTV is easy.
☐ True or ☐ False

How much do you *really* know about the newest activity in amateur radio? Take this 3 minute TRUE-FALSE quiz and see.

		T	F
1	A slow scan television picture is similar to that projected on TV.	☐	☐
2	Motion can be portrayed on slow scan television.	☐	☐
3	To broadcast slow scan television just add a Robot monitor and camera to your present station. No other equipment is necessary.	☐	☐
4	Slow scan occupies no more space on the band than an audio signal.	☐	☐
5	Any licensed amateur radio operator, except Novice, may operate SSTV.	☐	
6	$295 each for a Robot SSTV monitor and camera is the lowest price in the world for SSTV equipment.	☐	
7	Robot guarantees your satisfaction with all Robot equipment, or your money will be refunded.	☐	
8	New SSTV operators all suffer from lack of sleep.	☐	

ANSWERS:

1. **False.** The slow scan television picture is a greenish-yellow color which takes 8 seconds to transmit. Like radar, the image should be viewed in a darkened room for best results. Also like radar, as the picture progresses it has the appearance of being painted onto the screen by a bright writing line except that the line moves from top to bottom. 2. **False.** Motion results in a blurred picture. 3. **True.** Robot equipment is compatible with all brands of amateur radio equipment and antenna systems. 4. **True.** The SSTV signal contains frequencies ranging from 1200 Hz to 2300 Hz. Therefore, it is comparable to an audio signal. 5. **T** 6. **True,** as far as we can determine. 7. **T** 8. **True.** New SSTV operators are so en siastic about the fun of operating slow s television, they hate to quit.

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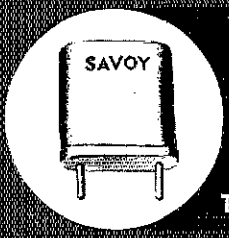

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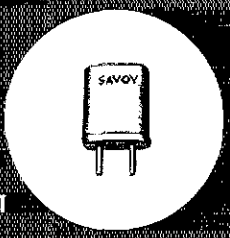

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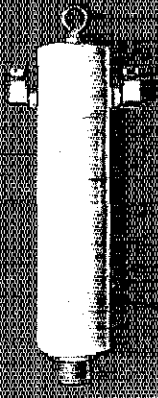

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OUR COVER

Bob Artigo, W6GFS, puts the smoke test to his new solid-state 2-meter amplifier. For circuit details see page 28 of this issue.

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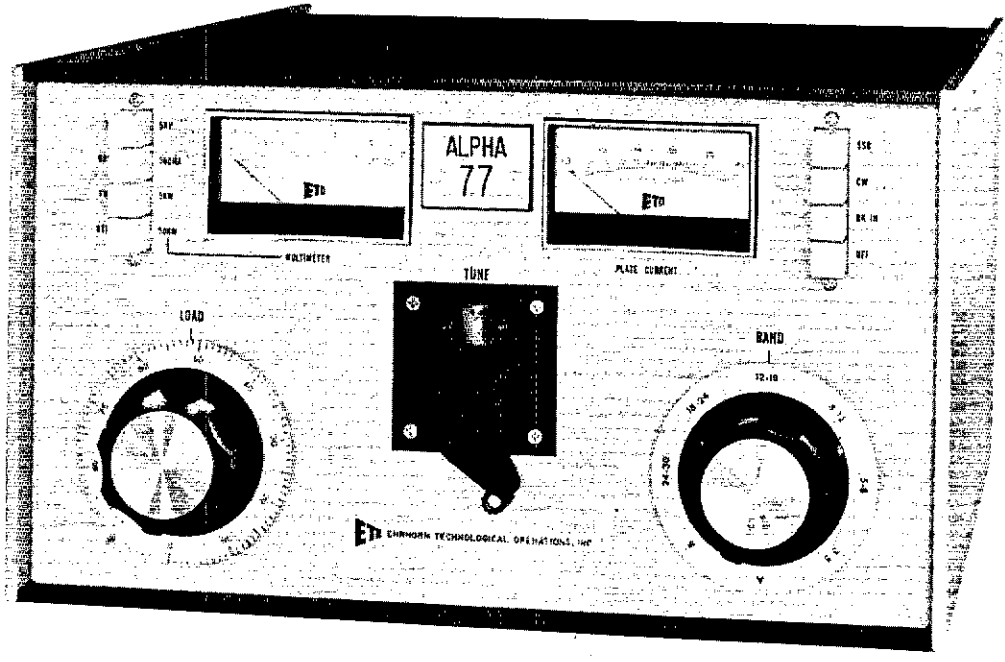

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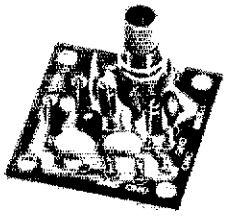

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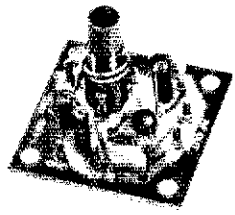

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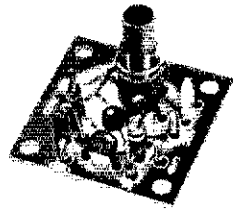

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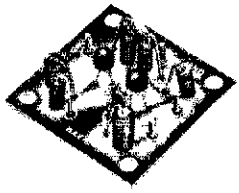

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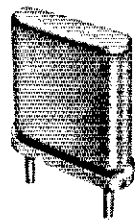

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It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors.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

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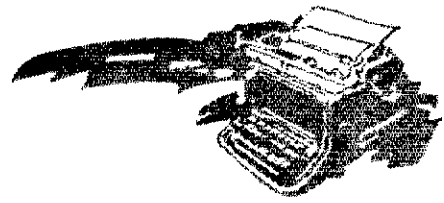
* Member Executive Committee

"It Seems to Us..."



6013041B

AFTER SEVERAL MONTHS of preparing membership lists in the transition to electronic data processing, we've gritted our teeth, crossed our fingers on one hand, and pushed the "start" button with the other. Thus labels for mailing this issue of *QST* are expected to come out of the craw of a computer.

Most of 'em, that is. In a couple of geographical areas the quantities of output in our extensive test comparative runs didn't check closely enough with our old-fashioned mechanical count to give us confidence to go all across the board. So some of you will still have the old yellow label, while we do some specialized double-checking.

To be quite honest, some of you may not get the magazine at all, first time around. Computer types tell us an error factor of 2% during transition is pretty good performance. But that means 2,000 copies of *QST* which *could* go astray (if indeed they get addressed at all!) and 2,000 potentially unhappy members. On top of the erratic service provided these days by the Postal Service, we're digging in for a tough month of April.

A computer is a very impersonal thing, so don't be disturbed by the fact that to it you are just a number – the one you will find on the top line of the address label. We had contemplated using call signs as the locator index, but of course that wouldn't work for several thousand members not yet licensed. And call signs come and go, as you move to another district, or get a 2-letter job, so a number is the only permanent reference.

It is not necessary to use this identification number in routine correspondence with Hq. But for any official change in your record, such as Associate to Full classification, or a change of address or call sign, please always include a label from a recent *QST* wrapper with your request. It will save time for both of us.

Another reference you'll find on the label is a membership classification. F is obviously for Full Members, and A for Associates. F0 (that's a zero) is regular Full; F1 is Charter Life; F2, Life; F3, a Life applicant paying in installments; F4 is a Family member. Similar numerals identify similar classes in the Associate tabulation.

E.d.p. has good points and bad ones. Most of the latter will be evident at the start, until things get shaken down. For a while, at least, lists of special groups, such as CD appointees, will remain on the old mechanical system. Membership lists for publicity purposes, such as a club announcing a hamfest, or a director candidate campaigning for votes, will still be available but on somewhat different bases than before – the normal computer output is labels, not envelopes or postcards. And we'll need plenty of notice, so as to combine such special runs with a major *QST* addressing job, to keep computer time cost (to us and to you) to a minimum.

Shortly, too, we expect to have a new form to announce upcoming expiration of your membership and process its renewal. Later there will likely be a re-design of the membership certificate, or perhaps a limitation to only a card for annual renewals.

But we're getting ahead of ourselves. Meanwhile, please bear with us. By all means advise of any discrepancies in the mailing label – errors in your name, address or call sign. But allow more time than usual for corrections to be made, in the initial stages at least (it is likely a second month's labels will already be in process before corrections are received). Our apologies in advance for any inconvenience, whether of human or electronic origin. By June we hope to be pretty well out of the woods, back to normal working hours, and sleeping soundly again. QST

League Lines . . .

Three cheers! -- a count of League membership as of the end of 1972 shows the largest totals in our history, surpassing the previous peak year of 1962.

Toward the end of February, copies of March QST arrived (in good time) in parts of the east coast; but many others (such as on Long Island) still hadn't received the February issue! Guess the U.S. performance is not unusual; in late February we received Christmas greetings from the South African Radio League -- postmarked December 8.

Finally! -- the first special repeater license under the new rules, WR9AAA, was issued to the Gypsy Amateur Radio Society of Joliet, Ill.

The International Telecommunications Union has job openings from time to time for telecommunications experts in overseas posts. Frequency managers, telephone plant instructors, communication consultants, microwave engineers, are typical assignments. Information available from the UN Personnel Policy & Recruitment Staff, Department of State, Washington DC 20520.

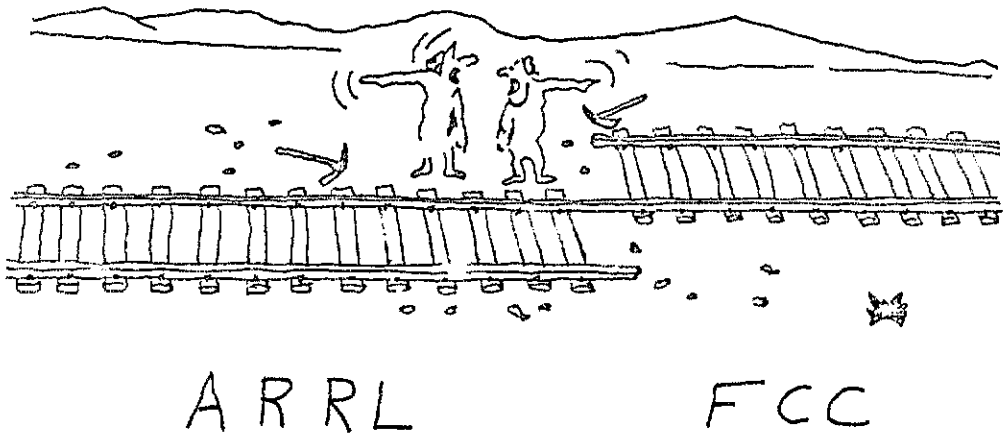
It's that time again -- for nets to get current operating info to Hq. for inclusion in the net directory now in preparation. See ARPS column this month for details. Remember, too, May 1 is the deadline for repeater registrations.

Use of the Oscar 6 satellite is setting records all over the place. K7BBO has had around 1200 QSOs; VE2BYG, some 40 states; G3IOR, more than 30 countries; KL7MF, four continents. And 30 hams have already qualified for the Satellite DX Achievement Award.

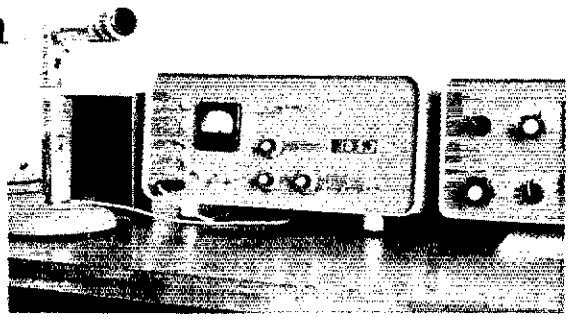
We're most pleased to have formal advice from the Internal Revenue Service that, after several years of investigation of League activities (as they've also done with thousands of other non-profit societies around the country), ARRL has been given a completely clean bill of health and tax returns accepted as originally filed.

The filing dates for comment on FCC fee proposals have been postponed a couple of weeks, giving us all a bit more time. Accordingly, a summary of the League's opposition was not ready for this issue, but will appear next month.

The "Correspondence" section this month carries views of members and clubs towards the issue the League has raised concerning recent FCC regulatory actions. This contribution, received via W2IHA, is worth the proverbial 1,000 words:



A Solid-State SSB Generator with Digital Readout



BY ALBERT D. HELFRICK,* K2BLA

FOR THOSE WHO like to roll their own, here is an all-solid-state 2.955- to 3.155-MHz ssb exciter using many surplus components and featuring a frequency counter as an "electronic dial." It has Collins S-line compatibility, integrated circuits, operational amplifier circuits, and liberal use of the FET.

Circuit Description

The ssb generator is a 455-kHz filter-type affair using a popular Collins mechanical filter. The 455-kHz ssb signal is mixed with a 2.5- to 2.7-MHz VFO to supply the desired 2.955- to 3.155-MHz output frequency, which must be mixed again to translate it to the proper amateur band. The author uses separate tube-type mixers and amplifiers for each band, the local oscillator being provided by a Collins 75S-3B receiver. The separate mixer-amplifier for each band is analogous to the utopian practice of separate kW final amplifiers, and offers similar advantages. Mixer and amplifier circuits may be found in any recent edition of *The Radio Amateur's Handbook*.

Speech Amplifier and VOX

The speech amplifier is an RCA CA3020 multipurpose amplifier with bandwidth reduction added. With the indicated values of coupling and bypassing capacitors, the bandpass is about 300-3000 Hz. Since the speech amplifier serves as the VOX amplifier as well, transformer coupling is used to supply a low output impedance in order to minimize distortion caused by the VOX rectifier. The CA3020 operates at fixed gain and will show clipping only when the operator is talking very loudly into the microphone.

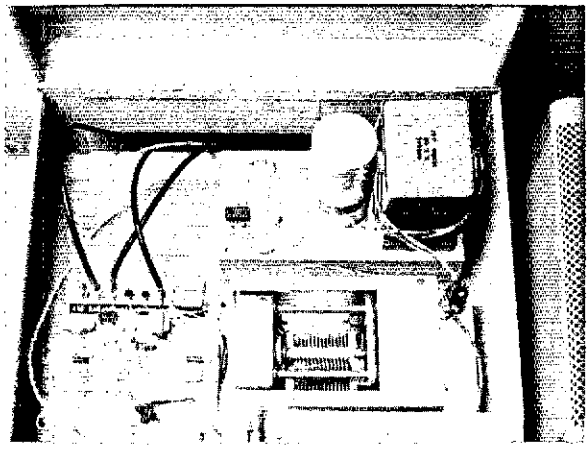
A voltage doubler rectifies the audio from T1 and provides dc to the relay drivers, Q1 and Q2. Three silicon diodes clamp the control voltage to stabilize the VOX time constant. Audio voltage from the station receiver is rectified for anti-VOX.

Oscillator and Modulator

The separate carrier oscillators evolved from the desire to obtain sideband selection without switching crystals. The oscillator collectors are common and feed an FET source follower. Switched base bias is used for oscillator selection.

The balanced modulator is of the four-diode ring type which offers circuit simplicity, low cost, and reasonable carrier supression. An RCA CA3019 integrated circuit was selected to obtain matching between diode characteristics. T2 is an inexpensive transistor-radio i-f transformer. Check the transformer for built-in decoupling capacitors to ground, which would destroy the balance.

* Powerville Rd., RD 1, Box 87, Boonton, NJ 07005.



The rugged surplus capacitor used in the VFO is mounted near the center of the cabinet. Perf-board construction is used for much of the exciter. The power supply can be seen in the right rear corner.

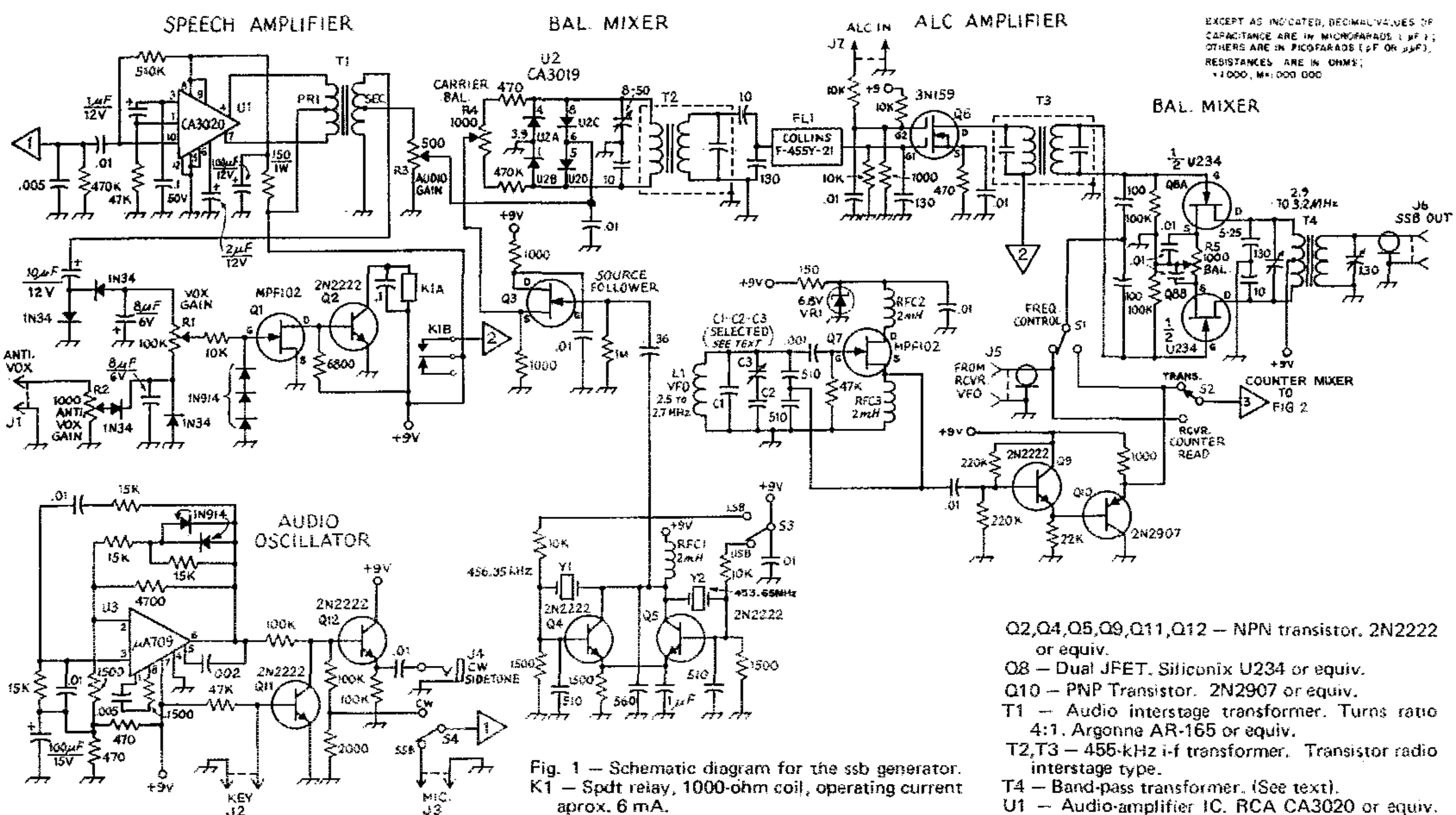


Fig. 1 — Schematic diagram for the ssb generator.
K1 — Spdt relay, 1000-ohm coil, operating current aprox. 6 mA.
L1 — 30 μH, J. W. Miller 4407 or equiv.
Q1, Q3, Q7 — JFET, MPF102 or equiv.
Q2,Q4,Q5,Q9,Q11,Q12 — NPN transistor, 2N2222 or equiv.
Q8 — Dual JFET, Siliconix U234 or equiv.
Q10 — PNP Transistor. 2N2907 or equiv.
T1 — Audio interstage transformer. Turns ratio 4:1. Argonne AR-165 or equiv.
T2,T3 — 455-kHz i-f transformer. Transistor radio interstage type.
T4 — Band-pass transformer. (See text).
U1 — Audio-amplifier IC. RCA CA3020 or equiv.
U2 — Diode-array IC. RCA CA3019 or equiv.
U3 — Operational amplifier IC μA709 or equiv.

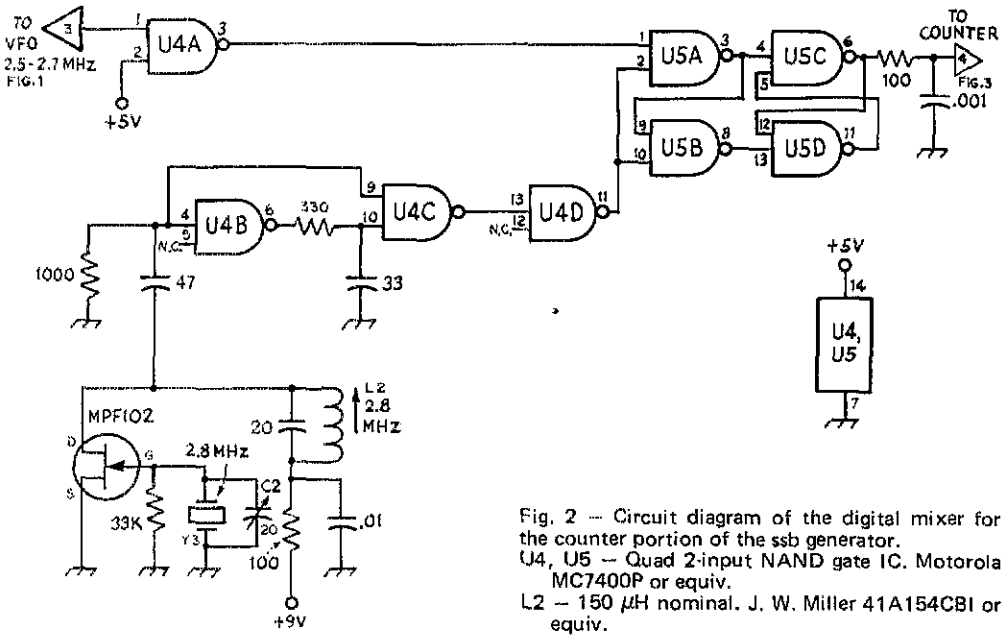


Fig. 2 — Circuit diagram of the digital mixer for the counter portion of the ssb generator.
U4, U5 — Quad 2-input NAND gate IC. Motorola MC7400P or equiv.
L2 — 150 μH nominal. J. W. Miller 41A154CBI or equiv.

CW Oscillator

Cw operation is obtained by injecting an audio frequency (about 1 kHz) into the speech amplifier. It is essential that the audio from the oscillator be free of distortion since distortion would produce spurious sidebands.

An *RC* phase-shift oscillator was tried but after hours of experimenting the distortion could not be reduced to acceptable levels. In lieu of the phase-shift oscillator, a low-distortion Wien bridge *oscillator was designed using a 709 operational* amplifier. The traditional tungsten filament bulb in the feedback loop has been replaced with a nonlinear resistor and diode combination.

The audio output is keyed with a shunt transistor switch. The transmitter may be keyed directly from +5-volt logic levels and should mate well with solid-state keyers without the need for relays.

VFO and Frequency Counter

The basic frequency of the VFO is 2.500 to 2.700 MHz, designed to work with the Collins S-line equipment. It contains no variable trim capacitors. This approach avoids excessive drift because of temperature changes. The VFO is trimmed with fixed-value silver-mica capacitors. Only two frequencies must be trimmed. Maximum capacitance must provide approximately 2.490 MHz and minimum tuning capacitance should give 2.710 MHz. Since a digital frequency counter is used for frequency readout, *no adjustments need* be made for dial tracking. It is suggested that a precision gear-driven capacitor be used for ease of tuning. (A surplus ARC-5 capacitor should work well — the author used a very fine cast-aluminum *capacitor from an old frequency meter.) It is also* suggested that the builder have a large number of mica capacitors on hand for trimming. A surplus "jumbo" pack is a good investment.

The frequency counter is unusual and will be carefully explained. The VFO "kilohertz" dial should read from 0 to 200 with reasonable over-travel, for instance – 10 to 210, representing a VFO frequency of 2.710 to 2.490 MHz. Since a *digital frequency counter cannot resolve "negative* frequency" and since the FCC frowns on out-of-band operation, it is necessary to use logic circuitry to determine a VFO frequency of greater than 2.7 MHz. In the digital mixer, the VFO frequency is mixed with energy from a 2.8-MHz crystal, producing a difference frequency of 100 to 300 kHz. This frequency is gated into the MC4050s. Instead of the normal 000.0, the counter is reset to −100 kHz. The 1000th gated pulse (a frequency greater than 100 kHz) to the MC4050 counters extinguishes the "minus" and the "one" lamps. The "minus" remains off until the next reset pulse, *whereas the* "one" comes on *after 1000* more gated pulses occur (a frequency greater than 200 kHz).

The Motorola MC4050P circuit is a decimal counter, 4-bit latch, and 7-segment decoder/driver all in one package. The cost of the MC4050P is about $12. The indicator is about $3.60 from Shelley Associates or Luminetics.[1,2]

[1] Shelley Associates Inc., 111 Eucalyptus Drive, El Segundo, CA 90245. Part number 3015F-CN.

[2] Luminetics Corp., P. O. Box 1943, Pompano Beach, FL 33061. Part number 9004.

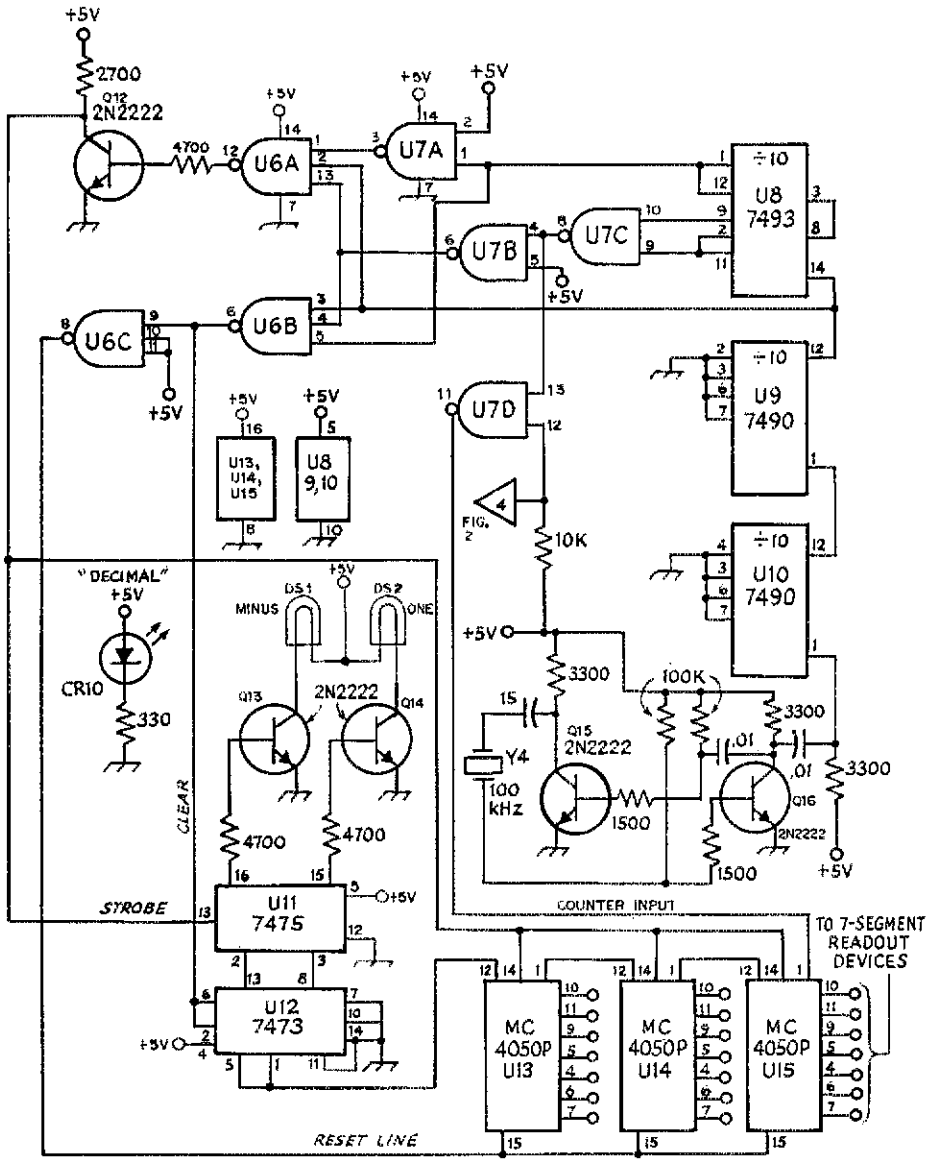


Fig. 3 — Circuit for the time base and display driver of the digital frequency readout. Any of several available types of LED seven-segment display devices may be used with the MC4050P decoder/driver ICs.

CR10 — LED used as decimal point indicator. May be part of seven-segment readout if available.

DS1, DS2 — Low-voltage incandescent bulb assemblies. Available from Arrow Electronics Inc., 900 Broad Hallow Rd., Farmingdale, NY 11735 (Muralite PTL6/12 for "minus," PTL20D/12 for "one").

Q12-Q16, incl. — NPN transistor.

U6 — Triple 3-input NAND gate IC. Motorola MC7410P or equiv.

U7 — Quad 2-input NAND gate IC. Motorola MC7400P or equiv.

U8 — Binary counter IC. Motorola MC7493P or equiv.

U9, U10 — Decade counter IC. Motorola MC7490P or equiv.

U11 — Quad latch IC. Motorola MC7475P or equiv.

U12 — Dual Flip-Flop IC. Motorola MC7473P or equiv.

U13, U14, J15 — Counter/latch/decoder IC. Motorola MC4050P or equiv.

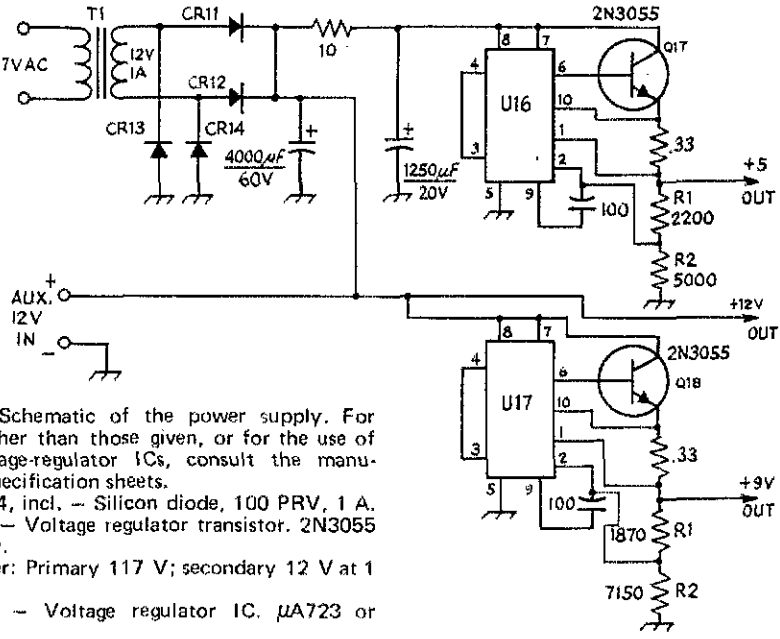


Fig. 4 — Schematic of the power supply. For voltages other than those given, or for the use of other voltage-regulator ICs, consult the manufacturers specification sheets.
CR11-CR14, incl. — Silicon diode, 100 PRV, 1 A.
Q17, Q18 — Voltage regulator transistor. 2N3055 or equiv.
T5 — Power: Primary 117 V; secondary 12 V at 1 A.
U16, U17 — Voltage regulator IC. μA723 or NE550.

Since the actual operating frequency is determined by the carrier-oscillator frequency and the crystal-controlled high-frequency oscillator (in the author's case supplied by the station receiver) there must be some method of calibrating the counter readout. The carrier oscillators were less than 100 Hz in error, so inaccuracies from that source were neglected. The high-frequency crystal oscillator may have considerable error (as compared to 100 Hz) so a variable capacitor is used to pull the 2.8-MHz crystal frequency for calibration purposes.

The calibration procedure is as follows: Tune in the 100 kHz marker on the receiver. Put the *counter read* switch in the *rcvr* position and adjust the counter calibration capacitor until the counter reads 00.0 or 100.0. This is analogous to moving the cursor on a mechanical dial.

ALC Amplifier and 3-MHz Mixer

The alc amplifier is a straightforward dual-gate MOSFET amplifier with about 10 dB maximum gain. Reverse bias is supplied by the final amplifier. Exercise caution when working with the MOSFET, since potentials of greater than 50 volts (even rf voltage) can destroy them.

The 3-MHz mixer is a dual-FET balanced mixer. The 455-kHz ssb signal is mixed with the VFO to supply the 2.955- to 3.155-MHz output signal. Approximately 200 mV of peak rf output voltage is available across a high impedance load.

The output transformer used by the author in the original version was a broadband toroidal affair, similar to those used by Lowe in his solid-state linear amplifier. It is described in *QST* for December, 1971, and in Chapter 6 of *The Radio Amateur's Handbook*, both forty-ninth and fiftieth Editions. Subsequent revisions in the exciter described here made use of a 2800-kHz i-f transformer from a surplus ARC-5 receiver. It was found that either the toroid or the surplus i-f transformer performs well.

Power Supply

The power supply uses two inexpensive ($1.19 surplus) integrated-circuit voltage regulators and external pass transistors. The voltage regulators respond so quickly that they actually decrease the filter-capacitor requirement. However, rf bypassing is still mandatory. The power supply operates well from about 90 to 130 volts ac. For mobile and portable enthusiasts the unit should perform well on a 12-volt system.

Conclusion

The foregoing is not intended as a step-by-step construction article nor is it intended for beginners. Although the circuits represent little compromise for performance, many of the circuit elements were chosen on the basis of their availability to the author, and therefore may not represent the most economical approach for the reader.

Many of the circuits may be extracted for use in other systems. For example, the VFO and frequency counter could be packaged together to form a remote VFO console for a KWM-2; the output of the cw oscillator and keyer may be plugged into the microphone input of an ssb-only transmitter to convert that unit to cw operation; or the crystal in the frequency counter may be changed to use the counter for any other VFO. QST

• *Beginner and Novice*

A Band-Edge Marker Generator

Been looking for a simple construction project? If so, this useful piece of test gear should be ideal.

BY KI NEGORO,* WN6QJP

THE RECENT FCC rules changes allowing VFO control of Novice transmitters are welcome improvements. With crystal control, it was no real problem for the Novice to be sure he was in his assigned band segment. Now, however, the Novice must have a means to assure that his signal *is* within the band. Subpart C, section 97.75 of the regulations requires that sufficient equipment be available to assure that the amateur is operating within his assigned band. The calibration of the VFO or the transmitter frequency is *not* considered sufficient. Independent means must be used. The station receiver, however, can be used to check the VFO frequency if the receiver is calibrated *accurately*. The receiver can be calibrated with a marker generator.

* 325 E. Madison Ave., Montebello, CA 90640.

What It Is

The device described in this article is simply a crystal-controlled oscillator that has sufficient signal radiation to be picked up by the station receiver. Nearly all crystals are reasonably accurate as far as a frequency determining element is concerned. Knowing the frequency of the crystal, it becomes a simple matter to use the signal from the oscillator to set the receiver dial. While it isn't necessary that the crystal frequency falls at a Novice band edge to calibrate a receiver, such frequencies are the most useful in letting the Novice know when he is getting near dangerous territory. The signal generator also has uses as a signal source for checking crystal activity, and for aligning and calibrating receivers.

The Circuit

Fig. 1 shows the circuit of the oscillator, a series-tuned Colpitts type. Either 80- or 40-meter

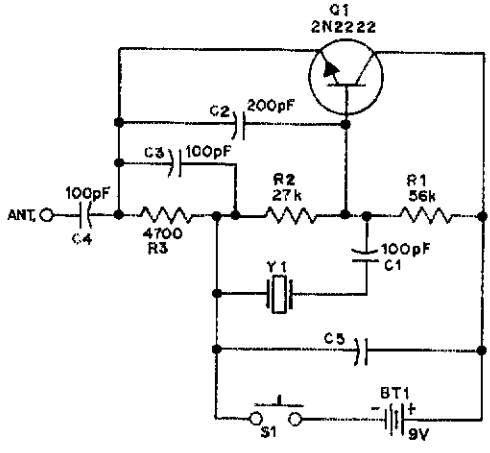
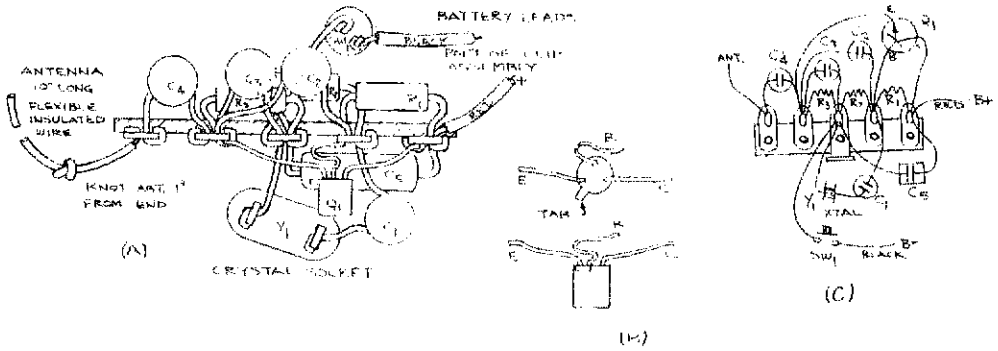


Fig. 1 — Circuit diagram and parts list for the signal generator. Note that all the components are available from Allied Radio Shack. All of the part numbers in parenthesis are their numbers.
BT1 — 9-volt transistor-radio battery (23-464).
C1, C3, C4 — 100 pF (271-123).
C2 — 200 pF, 15 V (272-124).
C5 — 0.25 μF, 15 V (272-1058).
Q1 — Npn transistor, type 2N2222 (276-2009).
R1 — 56,000 ohms, 1/2 watt (271-000).
R2 — 27,000 ohms, 1/2 watt (271-000).
R3 — 4700 ohms, 1/2 watt (271-000).
S1 — Spst, push button, spring return, normally open (275-1537).
Y1 — See crystal specifications; surplus crystal catalog available from JAN Crystals, 2400 Crystal Drive, Ft. Myers FL 33901.



crystals can be used. An npn transistor, type 2N2222, is used in the oscillator. Power for the signal generator is obtained from a 9-volt transistor-radio battery. The total current drain of the circuit is so low that one can expect a battery life almost as long as the normal shelf life.

Construction

The "works" are assembled on a terminal strip which is held in place, on the inside of the plastic box, with a No. 4-32 × 1/2-inch long machine screw and nut which also is the hold-down screw for the crystal socket. Fig. 2A shows the parts placement and wiring.

Fig. 2C is a drawing with the parts arranged as in Fig. 1. The transistor is shown out of position. See Fig. 2A for the actual location. The logic of the symbols used in schematic drawings and the improvement over a pictorial drawing are apparent. It is suggested that the schematic drawing be used to double check the wiring as the construction progresses.

Assemble all parts except the transistor, switch, and crystal socket. Solder all wires at the terminal tabs. Prepare the transistor by bending the leads as shown in Fig. 2B. Solder transistor in place, using Fig. 2 and photographs for guidance. Be sure to hold the transistor lead halfway from the end with long-nose pliers and solder the end to the proper terminal tab. Hold for fifteen seconds after the soldering iron is removed from the joint. The pliers serve as a heat sink, bypassing the heat to the body of the pliers, thus reducing the heat conducted to the transistor.

Using The Generator

Connect a piece of insulated wire about 10 inches long to one side of C4. This will be the antenna for the oscillator. Place the antenna near the station receiver antenna input. Plug a crystal in and turn on the unit by pressing and holding S1. Next, tune your receiver to the amateur band you want to calibrate. Scanning up and down the band you should quickly spot the marker signal. Note the receiver dial reading and compare that with the crystal frequency. The two readings should agree.

Fig. 2 — Wiring details for the marker generator.

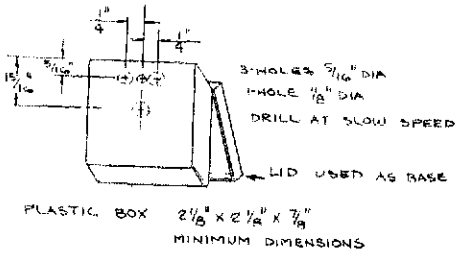


Fig. 3 — Hole locations for the crystal socket and terminal strip.

We won't attempt to tell you how to realign the receiver because there are too many different types. If you have a ham friend who understands the workings of a receiver you might ask him to adjust the receiver circuits so that the dial reads correctly. However, it is just as simple to take the dial error into account when using the receiver.

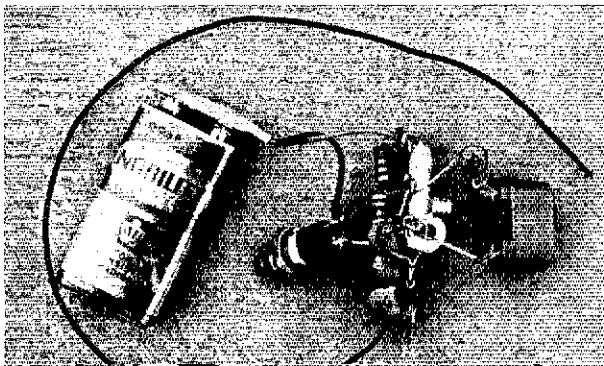
With appropriate crystals both band edges can be "markered" — meaning that any signal between the markers is inside the band.

Crystal Specifications

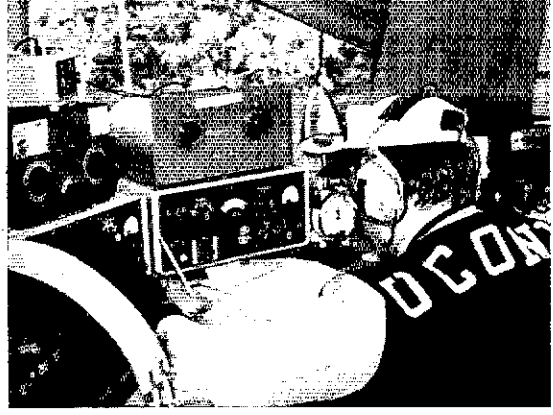
Allowances for crystal tolerances and circuit variables are included. Inexpensive FT-243 types with ± 1-kHz selection are adequate. See ads in *QST*.

Additional Notes

The prototype was constructed in a plastic box which originally contained a roll of plastic tape. Fig. 3 shows details. The battery clip was nipped out of a discarded transistor bc receiver. It pays to save junk! QST



This photo clearly shows the arrangement of the components.



The 40-meter helical resonator is positioned on top of the receiver at a typical Field Day activity. Shown here is K1VTM at the controls of W1ARR/1. *(Photo by K1THQ.)*

FIELD DAY FILTERS

Helical Resonators for HF Band Use

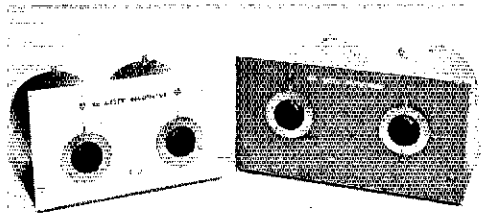
BY ROBERT M. MYERS,* WIFBY, AND CLARKE GREENE,** WA1JLD

IMAGINE A TYPICAL Field Day operation. A group of friends might set up a transceiver in a tent, bring along lots of food, and operate on several bands between the "picnics." A more ambitious group would operate two or three transmitters and test the ability of a radio club to set up an emergency communications center. An even more energetic club could conduct this activity as a contest and literally "go out for blood." Large temporary antennas are mounted atop various and sometimes quite-high supports! A hilltop location might be borrowed from some local private or governmental agency, and as many as twenty-two transmitters piled on top of each other for the purpose of running up a high tally. Adding to the normal problems of nonmating connectors, stubborn generators, rain, and all the rest of the unexplained things which plague Field Day groups, another problem pops up very frequently: interference from a transmitter operating on one band to the receiver being used on another. More specifically, the 20-meter phone receiver "jumps" every time the 40-meter cw operator keys his transmitter.

Many Field Day groups resort to the use of exotic techniques such as tuned stubs and opposite polarization of antennas, attempting to achieve adequate rejection for out-of-band signals. While some of these tricks of Field Day provide a degree of solace, none seem to do the job completely.

Vhfers have similar problems at repeater installations when a transmitter and receiver are operated in the same band, at the same time, and usually on one antenna. A repeater complex must be well designed with effective shielding of both the transmitter and receiver. There is a long list of standard procedures which must be used if receiver desensing is not to be a problem. Heading the list of accessory equipment considered to be the ultimate in terms of providing receiver and transmitter isolation is a device many fm enthusiasts call the duplexer. Duplexers can be built in any number of ways, such as with lumped inductance (called a helical resonator), or as a tuned-line coaxial cavity. The *Q*s of these devices can be extremely high, ranging from under a thousand for the helical resonator to more than several thousand for the tuned cavity. Since a coaxial-tuned cavity would be physically impractical for amateur use at

* Assistant Technical Editor, *QST*.
** 187 Stafford Ave., Forestville, CT 06010.



The 40- and 20-meter resonators.

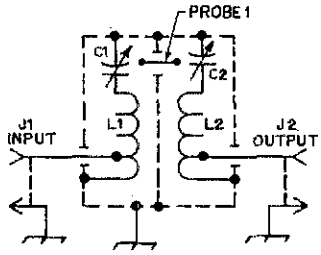


Fig. 1 — Circuit diagram for both the 40-meter and 20-meter resonators. J1 and J2 are phone jacks. See Table I for component values.

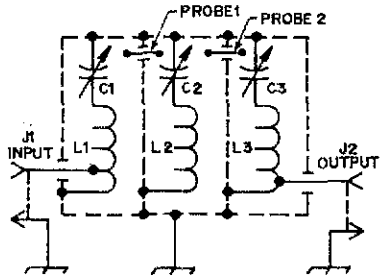


Fig. 2 — Circuit diagram for the 15-meter helical resonator. See Table I for component values. J1 and J2 are phono jacks.

hf, it was decided to construct several models of isolation devices using lumped inductances. While the helical resonator yields hf performance far below that which can be achieved at vhf with resonant cavities, the level of performance which can be attained at hf makes the difference between almost no cross-band interference and the antagonizing situation of one's receiver reacting uncomfortably when a nearby transmitter is performing its duty.

The Helical Resonator

Helical resonators have been described in *QST* earlier and the serious builder should consult these references if more information is desired.[1, 2, 3] The resonators described here provide about 25 dB of rejection to out-of-band signals and just a few dB of rejection to signals at the opposite end of the same band. A Q of 700 is not adequate to offer much selectivity over several hundred kilohertz at a frequency such as 7 MHz. It is quite sufficient, however, to achieve selectivity on a two-to-one frequency excursion.

[1] Moler, "Taking Out the 2-Meter Garbage," *QST*, June, 1972.

[2] Bilodeau, "A Homemade Duplexer for 2-Meter Repeaters," *QST*, July, 1972.

[3] *The Radio Amateur's Handbook*,, Fiftieth Edition only, Chapter 9.

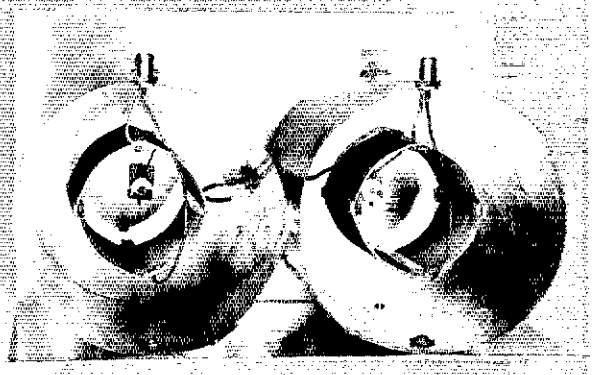
The helical resonator can be described as a coil or series of coils, each surrounded by a shield, operating at its lowest self-resonant frequency. One end of the coil is grounded to the shield as directly as possible. The other end is left, ideally, in an open-circuit state to afford the highest possible Q. With some sacrifice in Q, a small-value capacitor may be inserted between the open end of the coil and the shield (ground) to provide a means for tuning the system to a narrow segment of the spectrum. A high-grade capacitor must be used at this point in order to maintain circuit Q. The E. F. Johnson capacitors listed in Table I give adequate performance and no others are recommended unless the builder knows the Q versus frequency of the capacitors selected. A Q of slightly more than 700 is possible with each of the resonators described here.

The quality of the shield and the coils is of utmost importance if high Q is to be maintained. The shield must extend beyond the end of the coil for best efficiency. Additionally, the extended shield reduces the possibility of unwanted coupling between resonator sections. The top and bottom may be left open with no loss in efficiency.

Resonators are used typically in groups of two, although more can be placed in series to obtain additional selectivity. Prohibitive insertion loss may result with more than four or five, however,

Table I Helical Resonator Component Values

Component	*Helical Resonator Band*			*Component Manufacturer*
	40 Meters	*20 Meters*	*15 Meters*	
C1, C2, C3	0.4-1.2 pF miniature variable	Same as 40 meters	Same as 40 meters	E.F. Johnson 160-102 (modified per text)
L1, L2, L3	39 turns, 3 inches dia., 10 tpi, tapped 2-1/4 inches from the cold end.	26 turns, 2-1/2 inches dia., 6 tpi, tapped 2-1/2 turns from cold end.	19 turns, 2 inches dia., 8 tpi, tapped 2-3/4 turns from cold end.	Barker and Williamson 3035 for 40 meters; 3029 for 20 meters; 3026 for 15 meters.
Shield	Telescope tubing 6 inches dia., 8-3/4 inches long.	Copper flashing 5 inches dia., 7 inches long.	Sheet aluminum each compartment 3-1/2 inches by 3-1/2 inches, 5-1/4 inches long.	——



Inside view of the 20-meter model. Copper flashing provides the shielding. The seam must be carefully and thoroughly soldered to reduce the possibility of system loss.

and the increased selectivity is not significant for ht-band operating purposes. Obtaining the first 25 dB or so of rejection is not much of a problem if proper techniques are followed. The next five or ten dB come with great difficulty. The three-coil model developed for 15 meters did not show enough improvement in performance to warrant experimentation with four or five sections.

Coupling between the resonator sections may be accomplished in several ways. Loop, probe, and aperture coupling all have been employed successfully at vhf. The authors chose probe coupling since this technique is quite simple, mechanically. Aperture coupling (cutouts in the shields) is mechanically practical with square shields only, and could prove to be very difficult to adjust correctly.

A probe is merely a single wire suspended in the field of both coils. Input and output connections are made directly to the coil at the 50-ohm point. The correct position was determined with the aid of a Lightning Calculator and the reactance chart given in Chapter Two of almost any edition of *The Radio Amateur's Handbook*. The calculated point of connection proved to be optimum in each of our three models. Probes of stiff bus wire are placed in close proximity to the coils, to provide the necessary coupling of the electromagnetic fields.

Construction

The 40-meter resonator was the first one built because that band is probably the most popular on Field Day. Additionally the 40-meter phone and cw segments are close to each other (in terms of frequency percentage). Results with this model were sufficiently encouraging to justify building the 20- and 15-meter versions.

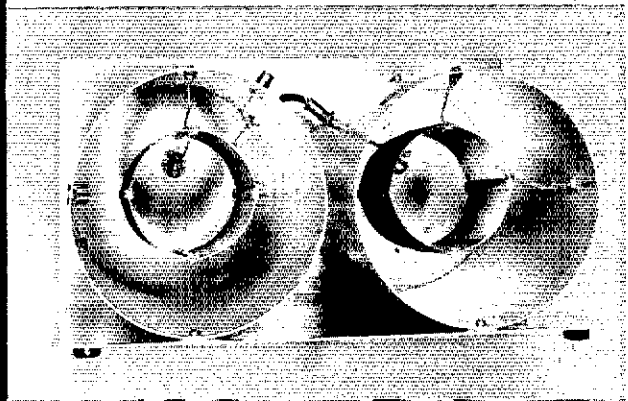
The shields for the 40-meter resonators are constructed from six-inch diameter aluminum telescope tubing available from some scientific supply firms. Telescope tubing, while somewhat expensive, offers the feature of being seamless: Seams in the shield directly contribute to loss and should be avoided, according to most authorities on the subject. The authors purposely used a seamed shield for the 20-meter unit, and a square shield (plus seam) configuration for 15 meters to determine if loss would be a problem. Neither the 15- nor 20-meter resonators exhibited any detrimental characteristics which could be related to the shield properties.

The capacitors are standard E. F. Johnson units available from some electronics parts dealers. All but one rotor and stator have been removed to provide a low amount of minimum capacitance. Since the Q and the inductance of the coil are quite high, a very small amount of capacitance change at the hot end of the coil produces a rather significant change in resonant frequency. The resonators described here tune both the phone and cw segments of the bands for which they are designed.

The 20-meter resonator uses copper flashing for a shield. Flashing is generally available from large hardware stores and plumbing shops. The seam was carefully soldered (with a 350-watt soldering iron) to form a cylinder, and the solder joint was smoothed with a file and rubbed with steel wool to provide what might be called a seamless fitting. The 15-meter helical resonator makes use of a square enclosure and includes three coils and three capacitors. The selectivity characteristics of this model were similar to those of the 40- and 20-meter versions.

Operation

The helical resonators described here are to be connected between the receiver and the antenna. No attempt should be made to run power through the resonators, since extremely high voltages would result. This presents some problems for the transceiver owner since a separate receiver antenna



Inside view of the 40-meter resonators. Aluminum telescope tubing is used in this model. The capacitors are mounted to a front panel made from an aluminum sheet. The coils are supported by their leads.

input connection is necessary. Additionally, an antenna relay is needed. An alternative plan would be to use a coaxial (or open frame) relay to switch the resonator out of the antenna line during transmitting periods. The "antenna relay" jack on the rear apron of most transceivers could provide a connection point to control the externally mounted relay, since its normal function of activating a linear amplifier is not used on Field Day. If separate receiver and transmitter combinations are set up, the helical resonator should be mounted as close to the receiver as possible.

Final adjustment of the resonators should be made before Field Day operating begins. The best plan is to determine which transmitters are causing problems to specific receivers before the activity starts. If the resonators are tuned (or peaked) at the frequency of operation, the rejection to signals on the next higher or lower band will be approximately 25 dB. Slightly more than this figure can be obtained by tuning the resonators off frequency in a direction away from the frequency of an offending transmitter. Most receivers have plenty of overall gain to make up for the reduction of signal strength created by detuning the resonators. If the interfering transmitter is on the same band (such as 40-meter ssb upsetting 40-meter cw operation), "mistuning" the resonator to a point below 7 MHz is certainly in order.

The prospective builder is cautioned against believing the helical resonator to be the "sure-cure" for all ills of a multi-transmitter operation. It is not! The resonators, however, when operated in conjunction with some of the techniques listed here, provide a sufficient amount of *additional* rf selectivity to the receiving system to allow relative freedom from annoying interference. The resonator *will not* prevent harmonic output from a nearby transmitter from reaching the receiver, nor will it attenuate spurious output energy such as key clicks or splatter. The helical resonators serve only to help prevent the output of a transmitter on an adjacent band from causing cross modulation and overloading in a particular receiver created by too large an undesired signal being present at the receiver antenna terminals.

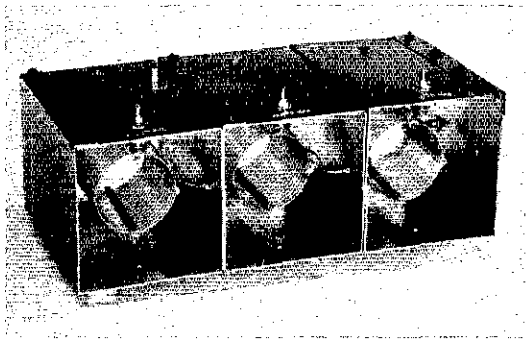
Other Interference-Reducing Techniques

The resonators above provide additional selectivity for the receiver front-end circuit. Other tricks, highly recommended for a Field Day multi-transmitter setup, are:

1) Maximum separation between transmitters is desirable. If it is necessary to operate more than one transmitter at one position, select harmonically unrelated bands such as 75-meter phone and 20-meter cw for that point.

2) When possible, orient the antennas at right angles to each other. Separate receiving antennas installed quite low and well removed from the transmitting position help in reducing overload problems.

3) Many times, interference between segments on 40 meters can be eliminated by using a vertical antenna at one position and a horizontal dipole at the other. More ambitious groups using quads and Yagis for the higher bands may find opposite-polarity systems very effective.



The 15-meter helical resonator is similar to the other models (electrically) except that a third coil has been added for increased selectivity. Square shields are employed here. The coupling probes are visible in the left and center compartments.

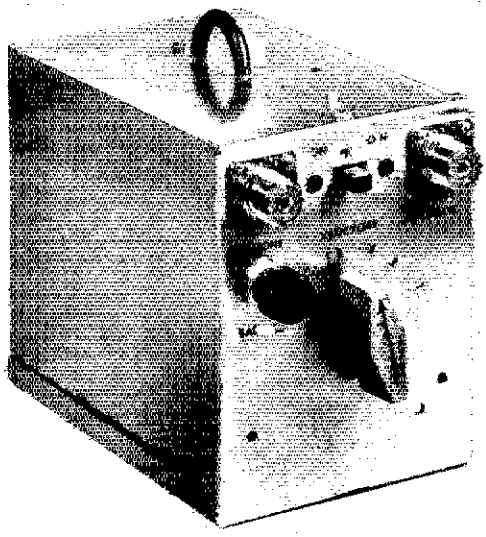
4) If vhf operating is to be a part of the Field Day setup, assure that all hf transmitters are equipped with low-pass filters. The use of high-pass filters is appropriate on all receivers operating above 50 MHz.

5) Many Field Day groups overlook the desirability of a Transmatch on all of the hf transmitters, even if they are operating into a coaxial-fed antenna. Transmatches can provide as much as 25 dB attenuation of harmonic and spurious output and could be very beneficial to the overall operation. Two Transmatches connected in series are considered by some amateurs as being about twice as good as one in terms of reducing interference problems.

6) Shorted coaxial stubs for reducing unwanted energy are in common usage by many amateur groups. An electrical quarter-wave length of coaxial cable shorted at the far end (RG-58 is fine for this application) connected to the receiver antenna terminals will introduce essentially, no attenuation to signals on the designed frequency of operation. At double the frequency, however, the coaxial cable is electrically a half-wave long. Since the impedance at the end of a cable repeats every one-half wave, the short at the end of the stub also appears at the receiver antenna terminals where it provides a very low impedance path to ground. This technique is effective for removing 20-meter energy from the 40-meter receiver antenna terminals.

While none of the items mentioned above offer an absolute solution to cross-band interference problems, a combination of tricks is usually effective. The authors participated with a Field Day group in 1972 consisting of 12 transmitters operating simultaneously within a 300-foot-diameter circle. The only problem that was not solved was cross modulation of the 20-meter ssb receiver by 20-meter cw operation. Reducing the power of the transmitter made it possible to live with, however. QST

Combination High-Stability Two-Tone Generator and Calibrator



BY RAY COLVIN,* WIBCM

TWO-TONE GENERATORS for checking ssb systems have been around for some time. Most of them utilize tubes for generating the two basic frequencies required. These types also require an ac power supply and quite a few discrete components for their construction, and are somewhat critical in adjustment. They also require a warm-up time to stabilize, and usually do not provide any sync output for locking the horizontal time base of an oscilloscope.

It was concluded that a more stable device, using RTL IC circuitry rather than tubes, might be in order. These could provide instant operation, square-wave output for scope sync, stable and accurate frequencies, no hum problems, and the ability to set up the two test tones on the scope prior to inserting them into the equipment to be tested.

For the frequency calibrator portion of the test unit, the simple frequency calibrator here discussed by Pattison in *QST*, March, 1969, was used, and four more flip-flops were added to obtain a 2-kHz and 1-kHz readout. The added flip-flops were driven by the 10-kHz output of the calibrator to obtain a division ratio of 5 and 2. We now have 2-kHz and 1-kHz testing frequencies in the form of square waves. They must be converted to sine waves before they can be used for transmitter testing. The 1-khz square waves are taken from the calibrator kHz switch (S2 at point 6), passed through an isolating resistor to a high-Q resonant circuit L1-C4 and converted into sine waves of approximately one volt in amplitude. R5 and R8 form a voltage divider to reduce this level to 100 millivolts. The 2-kHz output is picked up from position E, passed through R6 (balance control) and fed to calibration J1 through R7. Energy for receiver calibration and sync energy for the scope when using the two-tone test set-up are available at J2.

C4 and C5 should be 100-volt mylar. The target value for C4 is 0.57μF and 0.142 μF for C5. A higher value (0.15μF) will suffice for C5. However, for C4 several values in parallel are required. With the scope probe connected to the "hot" side of L1, add or subtract values of capacitance until maximum signal is obtained. The two signals should have equal amplitudes. If not, reduce the higher signal by increasing the value of its 4700-ohm isolating resistor.

The μL914 oscillator parts are mounted along the outer edge of one side of a 3 × 3 × 1/16-inch perforated board. The outer edges of the other three sides are occupied by the μL923 flip-flops, leaving the center of the board clear for mounting a 1-inch high spacer. All ground leads are tied to a common bus and grounded only at J1. The case size is 4 × 5 × 6 inches with two size D cells strapped to the top. Total current consumption is 40 mA at 2.8 volts.

Adjustment

1) Apply the two-tone test signal to the vertical input of an oscilloscope. Adjust the vertical gain, vertical position, and balance control to

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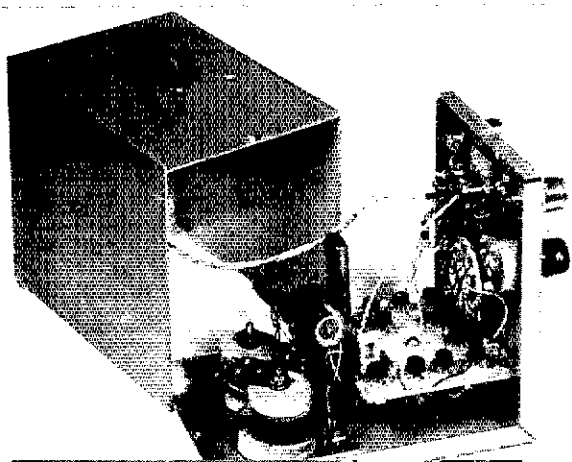


Inside view of the test unit. The crystal is shown at the center with the toroid inductors to the left.

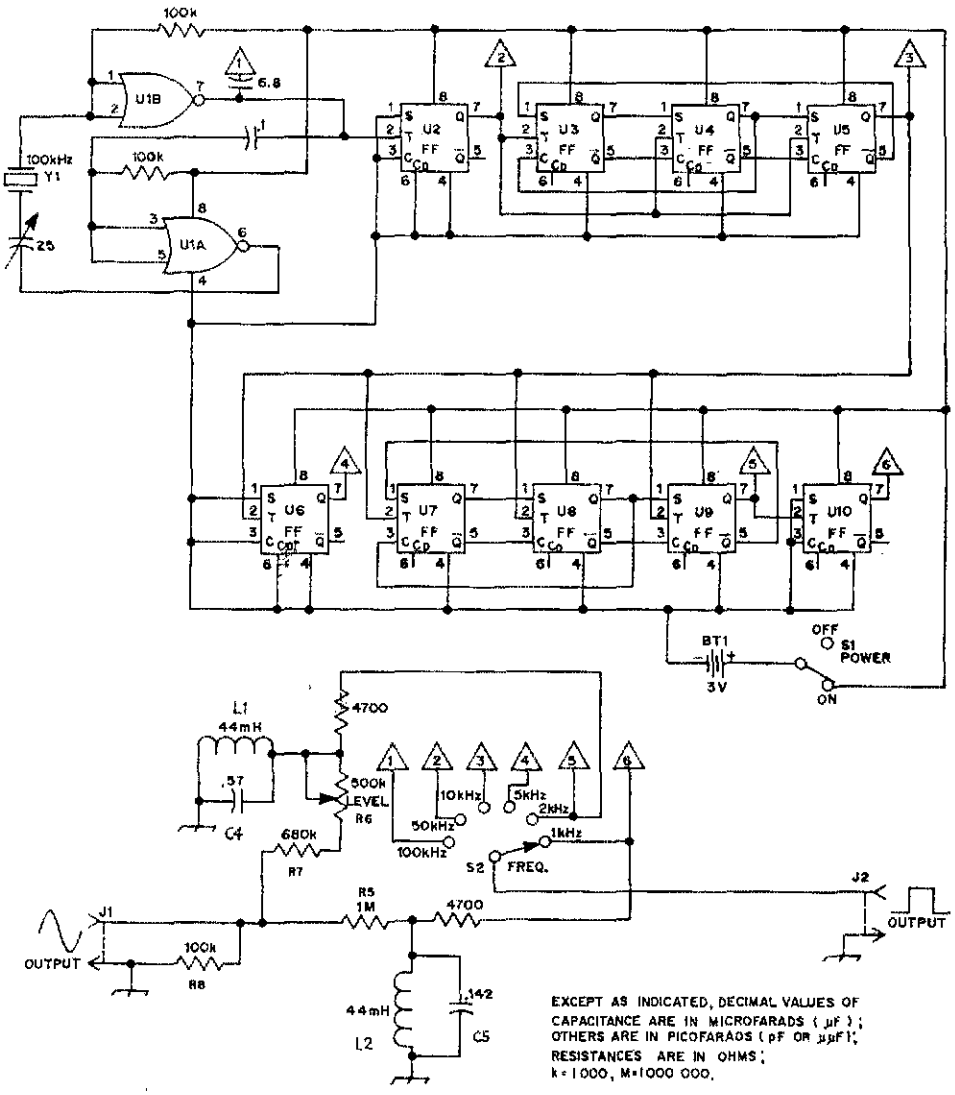


Fig. 1 — Circuit diagram for the two-tone generator. See text for details of operation and selected component values.

produce a pattern as shown in Fig. 2A. Connect the calibrate output to the external sync input of the scope. Place the frequency of the calibrator at 1 kHz.

2) Inject the two-tone test signal into the microphone input of an ssb transmitter, and connect the output of the transmitter to a dummy load and the scope. The pattern display will be similar to the one shown in Fig. 2B. A slight readjustment of the exciter bias may be necessary.

Adjust the transmitter tuning controls for maximum output and set the rf-pickup sensitivity to allow for a full-sized display on the scope. Voice peaks should not exceed the height of the two-tone pattern. Suitable circuits to sample rf from the transmitter for oscilloscope display may be found in *The Radio Amateur's Handbook*.

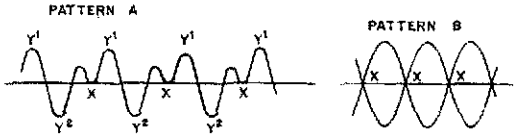


Fig. 2 — Typical oscilloscope patterns using the two-tone generator. See text for details.

The two-tone test procedure for tuning the station transmitter allows adjustments to be made at about half the average power input thereby reducing the dissipation requirement for the amplifier tubes. This procedure prolongs the life of the tubes, an expensive item these days! QST

Calculating Vertical Pattern of Repeater Antennas

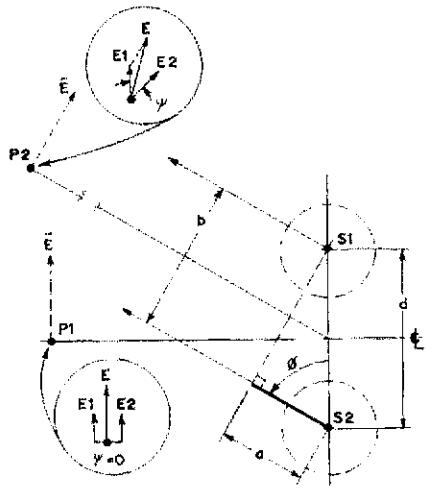


Fig. 1 — 2-element collinear array with omnidirectional antenna patterns as shown by dotted lines. The arrows inside the balloons (solid lines) are instantaneous time representations of the two fields (scalars) and the dotted arrows show the magnitude and direction of the far field (vectors). The equations are discussed in the test.

BY TONY DORBUCK,* W1YNC

RADIATION PATTERNS: *Include an explanation of how the patterns were determined. This may be either mathematical computation; range measurement or both.*" This is an excerpt from recent FCC requirements for repeater licensing, and the one that most concerns amateurs who have designed and built their own antenna systems for repeaters. Radiation patterns are three dimensional, and accepted practice is to break them down into horizontal and vertical components. Since the horizontal pattern is relatively easy to measure, range measurement is the simplest solution.

Vertical patterns lend themselves to mathematical computation, and a simplified approach is presented here. Many books give data on the subject, but in the author's opinion the most comprehensive and lucid treatment is given in *Antennas*,[1] by Dr. John Kraus, W8JK. It is written for senior and first-year graduate students in engineering, but contains some excellent methods and tables for computing vertical-array patterns.

Some basic theory, using common amateur terms, will be followed by a "cookbook" method for using the tables, along with an example taken from *FM and Repeaters for the Radio Amateur*, by the ARRL headquarters staff. The example selected is the 4-element array of phased half-wave collinear vertical dipoles shown on page 96 (Fig. 6-11). This array is a common one used in repeater installations.

1) $a = d\cos\phi$ (length)
2) $T = a/c$ (seconds)
30 $\psi = 360° (fT)$
4) $\psi = 360° d/\lambda \cos\phi$
5) $\cos\phi = a/d$
6) $\sin\phi = b/d$

Basic Discussion

There are various definitions of the term "gain" when referring to antenna measurements and theory. It is common practice among amateurs (and many manufacturers) to refer the increase (or decrease) in field strength of the test antenna to a half-wave dipole with the *same power input*. For example, in a 2-element collinear array consisting of two identical dipoles fed with equal-amplitude voltages which are in phase, [2] the field at a point broadside to the array will be twice the field of one of the dipoles taken alone.

It would be tempting to say that the gain of the array is 6 dB, since the field and voltage ratio are both 2.[3] However, since the power splits between the two dipoles, they are 3 dB down in power (and voltage) from the half-wave reference dipole and the gain is actually 6 – 3, or 3 dB. Generally, the maximum gain is always increased by 3 dB every time the number of dipoles is doubled in the vertical plane. *Isotropic* and *omnidirectional* are two terms that sometimes cause confusion but can be considered to mean the same thing for the purposes of this article.

One difficulty that causes no end of confusion is the fact that phase-shift angle, ψ, is in terms of the cos ϕ, where ϕ is an angle in space. *Even those familiar with trigonometry trip over this one*, since it is not very common to find an angle in terms of the cosine of another angle, except in antenna theory. The reader is urged to compute the angle ψ, for various values of ϕ, with different spacings, λ such as $\lambda/2$, $3\lambda/2$, and λ. Equation 4 in Fig. 1 gives the relationship between ψ and ϕ, and of course, don't forget to try the spacing for the repeater antenna being submitted!

Actually, only a few points need be computed accurately, these being the pattern nulls, lobe maxima, and the –3-dB beamwidth points of the main lobe. A few other points in between will help in plotting.

How the Patterns are Formed

While not entirely necessary in using the antenna plots, knowing some simple theory helps

* Editorial Assistant, *QST*.

[1] Kraus, *Antennas*, 1st Edition, 1950, McGraw-Hill Book Co., Inc.

[2] All antenna voltages discussed in this article will be assumed to be of equal amplitude and time phase unless otherwise noted. This is sometimes referred to as "uniform illumination."

[3] *The Radio Amateur's Handbook* (36 through 50th editions), Fig. 2-36.

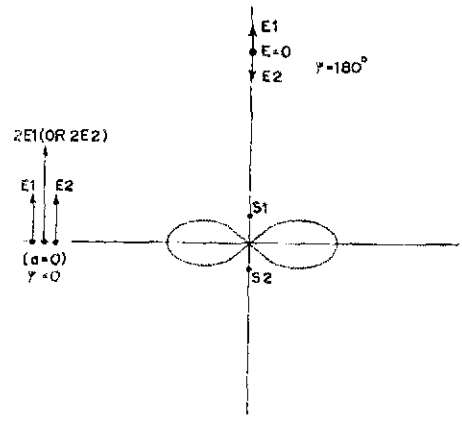


Fig. 2 — Vertical pattern of 2-element array with half-wave spacing.

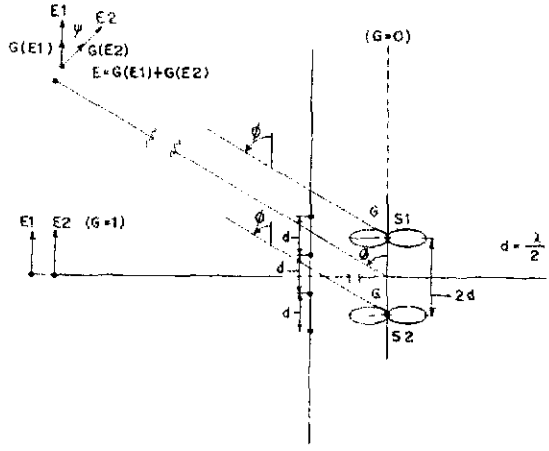


Fig. 3 — The array with the 2*d* spacing shows effect of the "gain," and is equivalent to a 4-element array with half-wavelength spacing.

in seeing how they come about. It can also give an insight into the extension of some of the ideas presented here.

Consider the two sources, S1 and S2, which have omnidirectional field patterns in the vertical plane[4] as shown in Fig. 1. If a point (P2) is selected which is far enough away from the antenna, rays from the sources can be considered parallel, with little error, even though the rays actually form the sides of a triangle.

In general, the distances from each source to a given point will not be the same, but will differ by the distance *a*, as shown in Fig. 1. Notice that when the angle ϕ is equal to 0, the distance *a* is just equal to the spacing *d*. If ϕ is equal to 90 degrees, or at a point broadside to the array, the distances from each source to the point are the same, and the distance *a* is zero. For angles between 0 and 90 degrees, a table of the cosine is necessary. Equation 5 shows how *a*, *d* and ϕ are related.

Since the speed of a radio wave is so fast (186,000 miles/sec) it might seem at first that this tiny distance would be insignificant. However, there is going to be a delay between the time it takes one wave to reach the point from one source, and the wave from the other one. This delay is given by Equation 2 in Fig. 1, where *T* is the delay time, *a* is the difference in distances, and *c* is the speed of light. Converting the time delay to a phase shift is accomplished by multiplying the delay by 360 degrees as given by Equation 3 in Fig. 1. Using the fact that *c* is equal to $f\lambda$ and combining Equations 1 and 3 gives Equation 4, the phase shift in terms of the wavelength, spacing and direction (ϕ).

In going through the literature, the reader should make the distinction between a vector quantity and a scalar one. This distinction is shown in Fig. 1 at points P1, and P2. The plots of E1 and E2 shown in the balloons are scalar quantities, and represent the magnitude, or the amplitude of the two fields at any instant of time. For example, at P1, the phase shift is zero (and the two fields merely add), while at P2, the phase shift is not zero, and the amplitude would have to be determined in a manner similar to that used for getting the impedance from the reactance and resistance. *The arrows shown in the balloons do not indicate the direction of the field in space however, only the amplitude and time phase.* In what is often referred to as the *far field* of the antenna, the field lines are always at right angles to the rays as indicated by the dotted lines. To indicate this, a bar is sometimes drawn over the top of the letter, or put in bold face (E, H). All quantities in this article are in terms of scalars. The direction of E is important in determining the wave polarization, but since the elements in most repeater arrays are identical in polarization, this can be neglected when determining the vertical patterns.

Going back to the 2-element array, assume that the spacing *d* is equal to 1/2 wavelength. This means that the term in front of the cosine in Equation 4 will be 180 degrees. At a point over the top of the array (ϕ equal to zero), the cosine is 1, the phase shift is 180 degrees, and the fields cancel. At 90 degrees, the cosine is zero, the phase shift is zero, and the fields add. This is shown in Fig. 2,

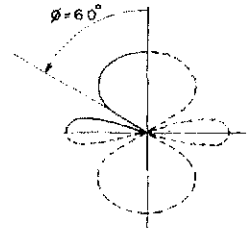


Fig. 4 — 2-element collinear array with 1-wavelength spacing.

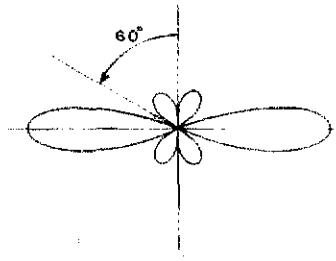
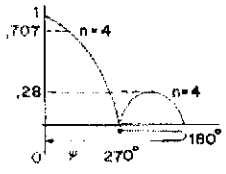
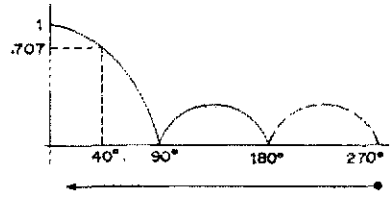


Fig. 5 — Vertical pattern of 4-element array obtained by combining the patterns in Fig. 2 and Fig. 4.



(A)

Fig. 6 — Using the Universal Field-Pattern chart.



(B)

and a very simple antenna pattern has been plotted.

Next, consider the 4-element array shown in Fig. 3 again with half-wave spacing. We could derive the pattern for this array by adding up the fields from each one (which is done in *Antennas* for deriving the general formulas) but an easier method suggests itself. Since we already have the pattern for the 2-element array (Fig. 2), let's consider that we have another 2-element array with 1-wavelength spacing, and instead of omni-directional antennas, ones with the vertical pattern of Fig. 2. All we have to do is multiply the fields from the new array, by the "gain" of the old one, as shown in Fig. 3. Here gain is set in quotation marks to emphasize the fact that it is *not* the maximum gain, but that along the ray.

With 1-wavelength spacing, the factor in front of the cosine term is 360 degrees, and the plot is shown in Fig. 4. At ϕ equal to zero, the phase shift is 360 degrees, and the fields add this time. The cosine varies slowly at first, but when ϕ reaches 60 degrees, the value is 0.5, and the phase shift is 180 degrees, which means the fields cancel (null occurs). As the cosine starts to reach 90 degrees, it starts to vary quickly, and a narrower lobe results. Once the curve is plotted for one quadrant, it can be extended to the other ones by symmetry as shown by the dotted lines.

Multiplying the patterns in Figs. 3 and 4 gives the pattern shown in Fig. 5. This is the method used to derive the vertical pattern of a repeater antenna. The patterns for the individual elements are found, and then multiplied by an array factor taken from either a set of tables, or a set of curves.

Using the Curves

The spacing of the 4-element array in *FM and Repeaters* is 60 inches (5 feet). The wavelength at 146.94 MHz can be found from the formula *length in feet* = 984/*f* MHz, which is 6.7 feet. The spacing in wavelengths then is 3/4, and going to Equation 4 in Fig. 1, the term in front of the cosine is 270 degrees. Since for ϕ equal to zero the cosine is 1, and since at 90 degrees it is zero, the value of ψ varies from 270 degrees down to zero as ϕ goes from 0 to 90 degrees.

The next step is to determine the array factor from the chart (Fig. 4-20, page 78 of *Antennas*). Look for the value of 270 degrees on the horizontal axis, which happens to be a pattern null for *n* (the number of elements) equal to 4. Notice that for decreasing values of ψ, the curve first moves to the right, and then back to the left. This is shown

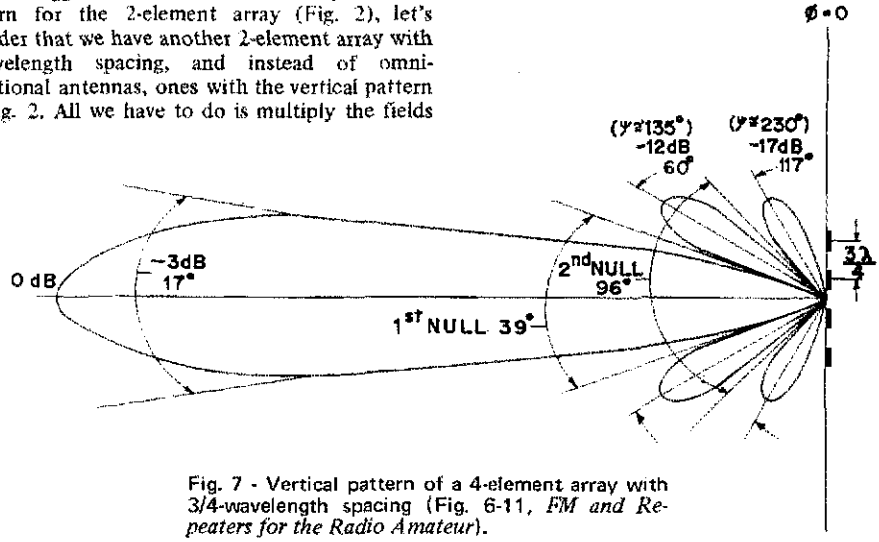


Fig. 7 - Vertical pattern of a 4-element array with 3/4-wavelength spacing (Fig. 6-11, *FM and Repeaters for the Radio Amateur*).

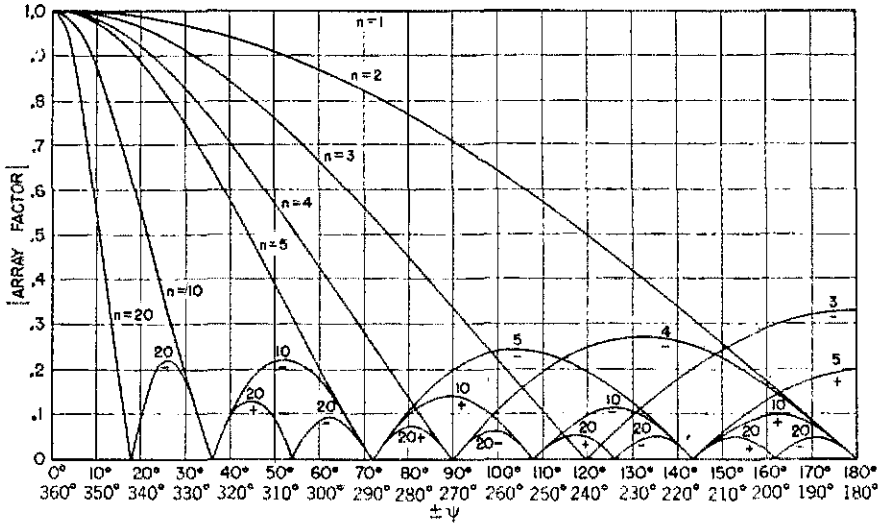


Fig. 4-20 – Universal field-pattern chart for arrays of various numbers n of isotropic point sources of equal amplitude and spacing. Reprinted from *Antennas*, by John D. Kraus, Ph.D. Copyright 1950, McGraw-Hill Book Company. Used with permission of McGraw-Hill Book Company.

in Fig. 6. The next step is to find the values of ψ for the pattern nulls and maxima, and the value of 0.707 in the main lobe which gives the −3-dB point to a good approximation. Once the values of ψ are determined, the values of ϕ can be found, and some sample calculations are shown in the appendix.

Dipole patterns are given in numerous publications[4] including *Antennas* (Fig. 5-9A, page 142). An exact formula is given for the pattern (5-84, p. 142), but a simple approximation is just $\sin\phi$. Once the values of the minor lobe maxima are determined, they have to be multiplied by the sine of ϕ at those values. This is shown in the sample calculations in the appendix. For the −3-dB point, and the major lobe maximum, a value of 1 for the dipole pattern is assumed. The final pattern is shown in Fig. 7.

Conclusions

The method outline above should give reasonable accuracy in determining the vertical patterns of most repeater arrays. The −3-dB beamwidth for the one calculated above was 17 degrees. The value obtained when 17 degrees was substituted in more exact computations was −3.25 dB.

In practice, of course, the plots would be modified slightly by the coupling effects between the dipoles (usually very small) and other factors, but very good agreement between the calculated and measured patterns should exist, especially when the array is placed high up (60 feet) on a tower.

[4] *The Radio Amateur's Handbook*, Fig. 21-5, 49th and 50th editions, Fig. 14-5 in earlier ones. This defines the vertical plane for our discussion, and shows the vertical pattern for a half-wave dipole (sin ϕ).

APPENDIX

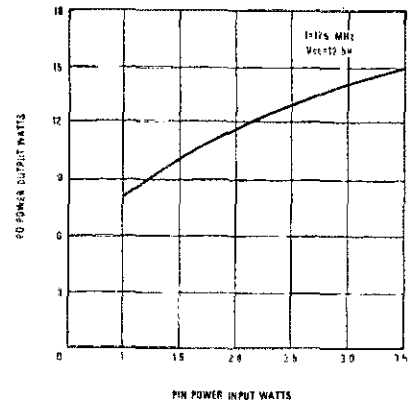
The 3-dB point from the chart in *Antennas* gives a value of ψ for $n = 4$ of approximately 40 degrees. Using Equation 4 gives:

$$\cos\phi = 40/270 \text{ or } 0.148$$

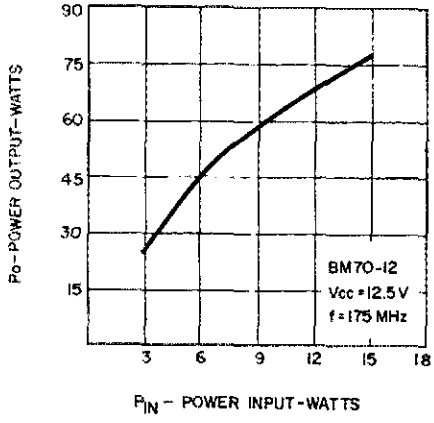
Looking up 0.148 in the cosine tables gives ϕ = 81.5 degrees. For values of ϕ greater than 45 degrees, it is convenient to measure the angle up from the horizontal axis, so 81.5 must be subtracted from 90 degrees, and is 8.5 degrees. Since the pattern is symmetrical about the horizontal axis, 8.5 must be multiplied by 2, giving 17 degrees, which is the −3-dB beamwidth.

The first null occurs at ψ = 90 degrees, and cos ϕ = 90/270 gives a value of ϕ = 70.5 degrees; 90 − 70.5 = 19.5, and the beamwidth of the first nulls is 39 degrees.

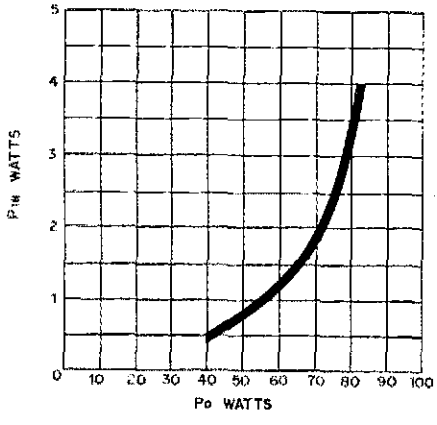
The first minor lobe maximum occurs at approximately ψ = 135 degrees, and the array factor has a value of 0.28. Cos ϕ = 0.5, and ϕ = 60 degrees. This must be multiplied by the dipole factor which is the sine of 60 degrees, and is 0.866. The product (.866) (.28) gives 0.242, or −12 dB. Since 90 − 60 = 30, the first minor-lobe maxima are 2 times 30, or 60 degrees apart. QST



(A)



(B)



(C)

Fig. 1 — Power input-output curves for the B12-12 (A) and BM70-12 (B and C) transistors. Curves A and B are for 12.5 volts and 175-MHz operation. With 13.5 volts, and at 146 MHz, performance improves as shown in Curve C.

Many excellent low-power portable transceivers are being used on two meters. These rigs have receivers that are as good as most fixed installations. The only problem with the little rigs is their low power. This article gives the operators of such equipment something to think about.

Fundamentals of Solid-State Power-Amplifier Design

Part III

BY J. J. JOHNSON,* ex-K4WYQ,

AND R. R. ARTIGO,* W6GFS

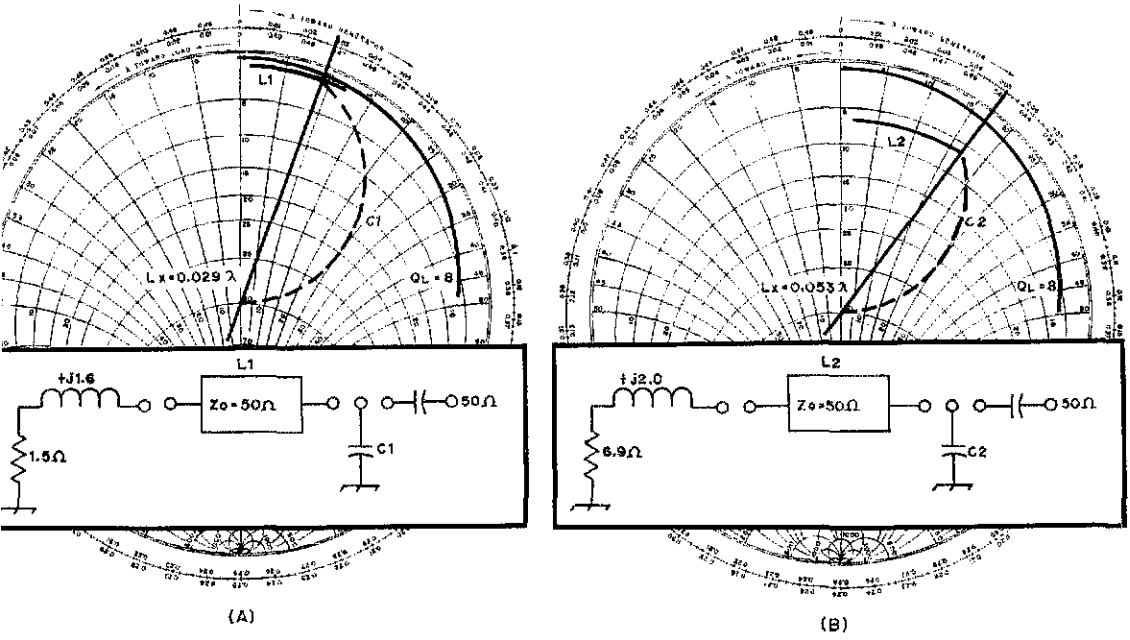
TO ENCOURAGE as much interest as possible, this article will cover amplifiers for two different power levels. The first will operate with drive levels from 1 to 4 watts, to deliver an output of up to 15 watts. The second amplifier takes from 5 to 15 watts of drive and will give up to 80 watts of output power. Each amplifier has 50-ohm input and output circuits. The two amplifiers can be connected together as shown, to give up to 80 watts of output power, when driven by most hand-held transceivers. An rf-activated relay circuit is provided for use with either or both amplifiers.

Design Objectives

Design a power booster for a hand-held transceiver. This power booster must be capable of reliable operation in mobile service and meet the following requirements;

1) Supply voltage: 11.5 to 14.5 V dc.
2) Drive level: 1 to 4 watts.
3) Output power level: 50 to 80 watts.
4) Automatic switching.

To meet our design objectives we must first select a transistor designed specifically for land-mobile applications. In this case we have selected the CTC B12-12 and the BM70-12. The B12-12 is a standard device used as a driver or predriver in commercial applications. The BM70-12



(A) (B)

Fig. 2 — Design information for the input and output circuits for both 144-MHz amplifier stages. Curves A and B are for the driver stage, using the B12-12 transistor. Curves C and D are for the BM70-12. A and C are for the input circuits and B and D are for the output circuit. See Figs. 2C and 2D on next page.

is a new device representing the latest technology in rf power transistor design.[1]

Let's first review the power input/output curves for the two devices. From the 12.5-volt 175-MHz curves, Figs. 1A and 1B, we see that a nominal 2 watts into the B12-12 will yield from 10 to 12 watts output. Applying this power to the BM70-12 will result in approximately 70 watts output, with a 12.5-volt dc power supply. In mobile applications with up to 13.5 volts on the collector, and at 146 MHz, we can expect up to 80 watts of output power, as in Fig. 1C. This represents a 15-dB boost, which will make a substantial improvement over the 2-watt signal, in work over other than purely local paths.

[1] Technical Topics, Feb., 1973, *QST*.

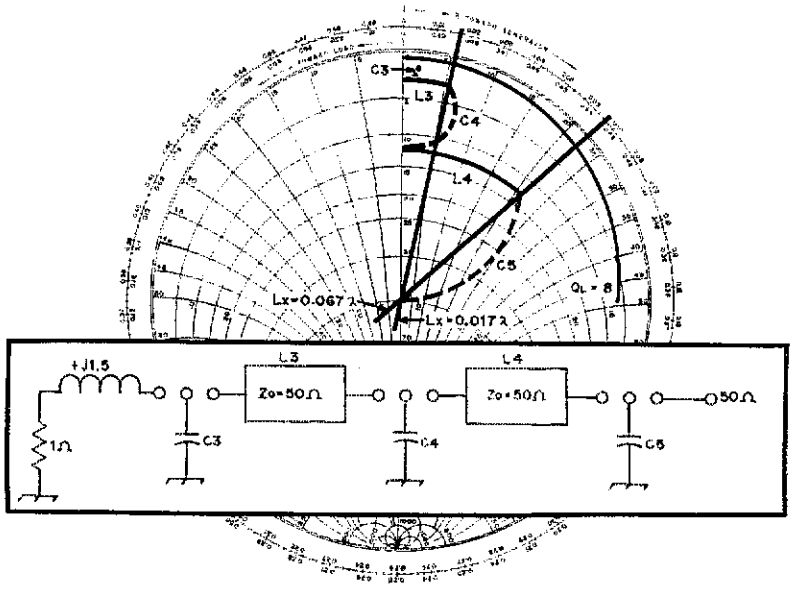
By selecting devices designed for mobile applications, we now need only to refer to impedances and typical efficiencies to ensure a proper design. All other parameters are designed to exceed minimum requirements set by the manufacturers of land mobile equipment. The amplifier will use all microstrip-line technology, with fixed-tuned elements. This technique was chosen because of its ruggedness and reliability.

Circuit Design

A step-by-step design of microstrip-line circuits was covered in earlier parts. Therefore, this section will be devoted to the design accuracy of this technique. Detailed design information can be found on the Smith charts, Fig. 2, for those who

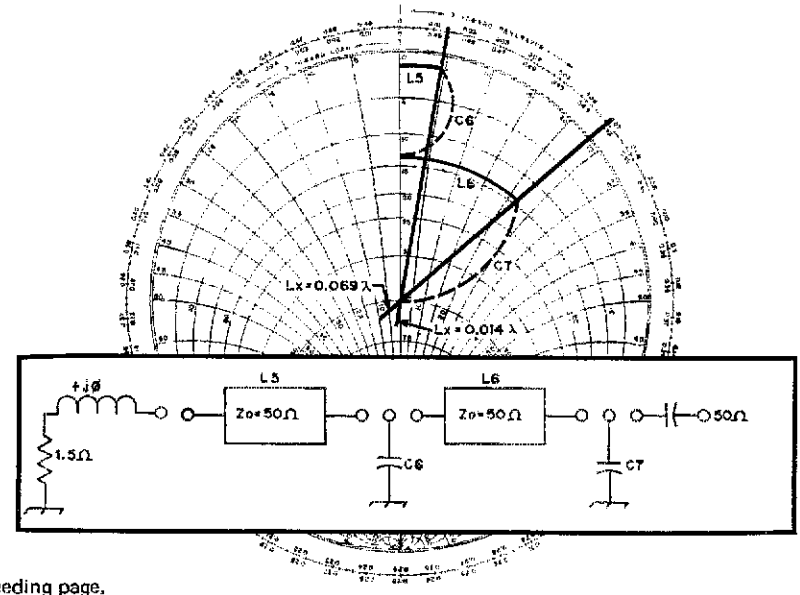
Table I — Comparison of Design Values With Actual Circuit Values After Tuning

Circuit	*Component*	*Design Value*	*Post Tuning Value*	*Error*
B12-12	C1	110 pF	100 pF	−10%
input	L1	1.10 inches	1.40 inches	+21%
B12-12	C2	57 pF	47 pF	−19%
output	L2	2.00 inches	2.70 inches	+25%
BM70-12	C3	510 pF	400 pF	−22%
input	L3	0.64 inches	0.54 inches	−15%
	C4	150 pF	136 pF	−09%
	L4	2.50 inches	2.60 inches	+04%
	C5	36 pF	33 pF	−08%
BM70-12	L5	0.50 inches	0.68 inches	+25%
output	C6	210 pF	200 pF	−05%
	L6	2.60 inches	3.02 inches	+14%
	C7	35 pF	47 pF	+25%



(C)

Fig. 2C



(D)

Fig. 2D

See caption on preceeding page.

are interested. The values of the components on the schematic do not reflect the design values, but rather are the values after tuning. Table I compares design values to post-tuning values. A discussion of resulting errors follows:

1) *Error in Capacitor Design Values:* If we eliminate the extreme values and average the rest, we find a net error of 10 percent on the low side. This error is mostly due to the narrow selection of components available and their tolerances (± 10 percent). This sort of error is difficult to compensate for in future designs; however, our accuracy can be improved if we use an admittance overlay chart with available capacitor values drawn in. This overlay chart will aid us in determining desired line lengths for each particular capacitor selection. An admittance overlay with these guide lines becomes necessary if the capacitor selection is very limited.

2) *Error in Microstrip-line Lengths:* The two largest errors in line lengths can be found in the networks determining the load for the power transistors. This is primarily the result of the load impedances given on the data sheet representing optimum load for optimum gain. In most cases the

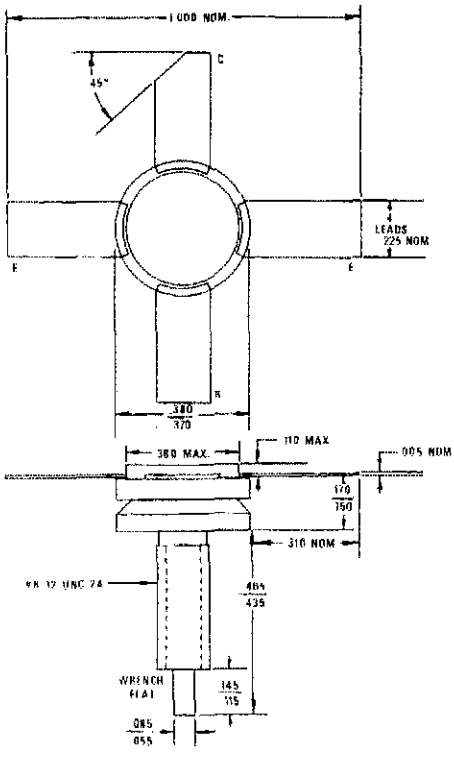
The W6GFS amplifier in actual operation, showing 1-1/2 watts drive at the left; approximately 9 amperes power drain, center; and 70 watts output, right.

load can be adjusted to improve efficiency by 10 or 15 percent, while sacrificing only a few tenths of a dB in gain. In this case the load was adjusted for a 10-percent improvement in efficiency. Another error of interest can be found in the B12-12 input circuit. This is most likely due to the reactance introduced by the relay and switching circuit.

From Table I we see that it is possible to design a two-stage fixed-tuned amplifier and be fairly close the first time around. A Smith chart, reactance slide rule, and basic knowledge of microstrip-line techniques are all that is necessary.

Rf-Activated Relay

Booster amplifier operation requires that the amplifier be automatically switched in the line when the transceiver is keyed. This is a must, since few transceivers have an external keying circuit available. A second problem encountered with booster amplifier operation is the quality of the match between the transceiver and the external amplifier. This is a particularly difficult problem with imported equipment. These rigs require sensitive mismatch detection circuits to protect their power transistors. This protective circuit will not permit the transceiver to key with the slightest mismatch.



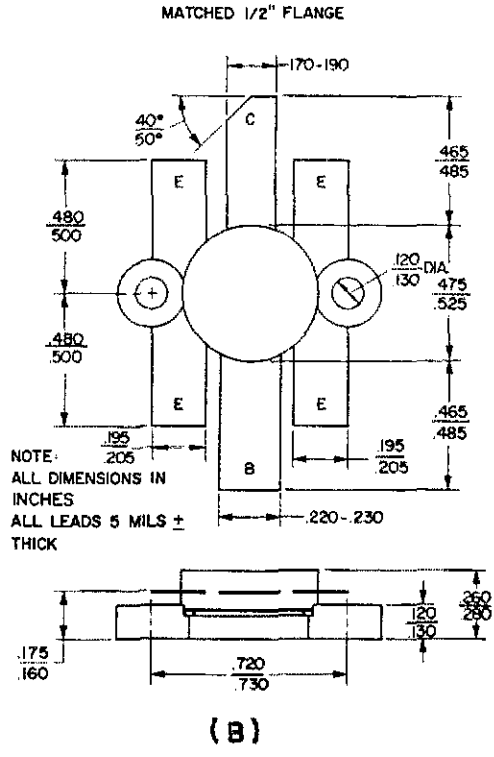


Fig. 3 – Mechanical details of the amplifier transistors, B12-12 (A), and BM70-12 (B).

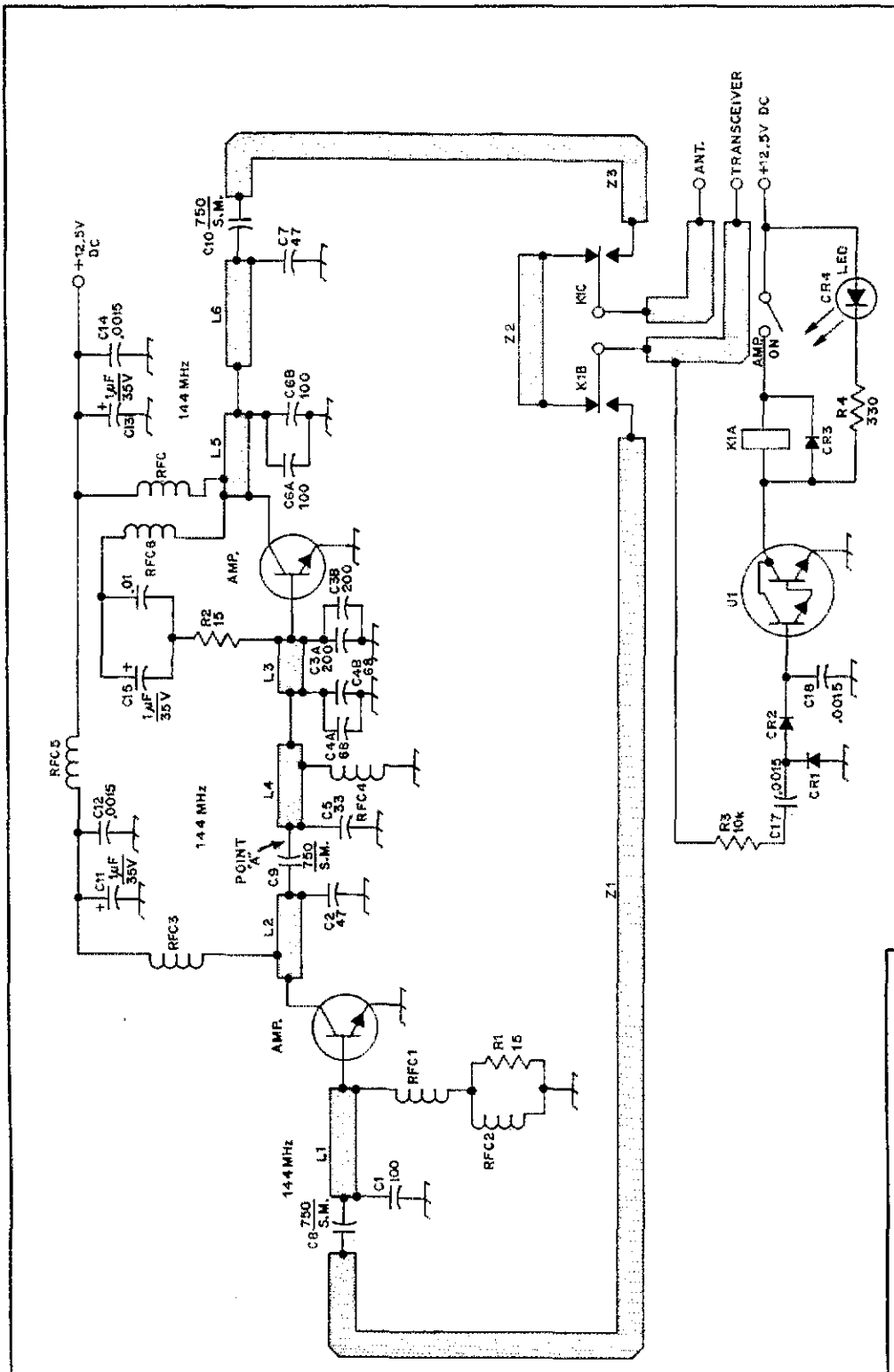

+12.5V DC
C14 .0015
C13 1μF 35V
144 MHz
RFC
L5
L6
C10 750 S.M.
C7 47
C6B 100
C6A 100
AMP.
C3B 200
C4B 68
C3A 200
C4A 68
RFC4
C5 33
POINT "A"
C9 750 S.M.
C2 47
L4
L3
L2
RFC5
C12 .0015
C11 1μF 35V
RFC3
R2 15
.01
RFC6
C15 1μF 35V
AMP.
RFC1
R1 15
RFC2
L1
144 MHz
C1 100
C8 750 S.M.
Z1
Z2
Z3
K1C
K1B
ANT.
TRANSCEIVER
+12.5V DC
AMP. ON
CR4 LED
R4 330
K1A
CR3
U1
C18 .0015
CR2
CR1
C17 .0015
R3 10k

Fig. 4 — Schematic diagram and parts list for the 2-meter amplifiers. Unless otherwise indicated, capacitor values are in pF. All resistors are 1/2-watt, resistance is in ohms. Information on L1 through L6 is given in Table I.

C1 — 100 pF.
C2, C7 — 47 pF.
C3A, B — 200 pF (2 required; see text).
C4A, B — 68 pF (2 required; see text).
C5 — 33 pF.
C6A, B — 100 pF (2 required; see text). C1 through C7 are available from Underwood Elec. & Mfg. Co., 148 South 8th Ave., Maywood IL 60153.
C8, C9, C10 — 750-pF silver-mica.
C11, C13, C15 — 1-μF 35-volt.
C12, C14, C17, C18 — .0015 μF (Aerovox Skycap).
C16 — .01-μF 50-volt disk ceramic.
CR1, CR2, CR3 — 1N914 or equiv.
K1 — Dpdt relay, Type 79, 12-volt coil (Datron Systems, Inc.)
L1 through L6 — Microstrip lines; see Table I.
LED — Light-emitting diode, panel type, Draws 25 mA.
Q1 — CTC B12-12.
Q2 — CTC BM70-12.
U1 — HEP S9100 or MPS-13A (Motorola).
RFC 1 — 330 nH.
RFC2 — 10 μH.
RFC3 through RFC6 — Printed-circuit rf choke, between 150 and 500 nH.
RFC — 5 turns No. 16, 3/8-inch dia, spaced wire dia.
Z1, Z2, Z3 — Microstrip connecting lines. Part of pc board. (See text).

A number of good circuits have appeared in in recent publications.[2,3,4] These circuits used open-frame relays and generally require modifications and special circuit considerations to tune out the reactance introduced. The amplifier circuits designed in this article use microstrip-line techniques, with limited variable elements or compensation for the reactance introduced by the relay and its interconnecting leads. For this reason, we must use a good-quality relay, which is strip-line compatible, and a high-impedance sensing circuit. All connections made between circuit and relay use 50-ohm strip-lines.[5] The input VSWR of the circuit used in this article was better than 1.2:1 for the entire 2-meter band.

The circuit introduced by Hejhall in May, 1972, *QST* was used for rf sensing. The Motorola HEP S9100 was used in place of the MPS-13A without noticeable change in performance. A 10K-ohm resistor was used in the input to set the keying level for an rf drive level of 500 mW or more. The level is adjustable to less than 100 mW by using a lower value of resistor.

Construction Hints

Standard G-10 glass-filled epoxy printed circuit board was used for this assembly. Only this kind of pc board can be used for this design. The circuit-board layout is available for those interested in etching their own boards.† This can be done with any pc board etching kit found in most electronic stores. Check the instructions carefully before starting. After the board is completed, the microstrip-line width should be checked. This line as 125 mils wide, (1 mil = .001 inch), and it can vary ± 10 percent without noticeable effect on circuit performance.

All holes shown from the top side of the board should be drilled out by using a No. 48 drill. Device mounting holes should be cut into the board by using the small center holes for guides. Refer to the package drawing for hole size. All holes shown from the back side of the board are used for mounting components and can be drilled out with a No. 56 drill. Use the four corner holes for mounting the pc board with No. 4 machine screws.

Connections between the top and bottom surfaces of the board are made through eyelets. (USECO No. 5609.) One eyelet is installed in each remaining No. 48 drill hole. To install the eyelets, use a Keystone No. 1714 eyelet punch. After all eyelets have been installed, carefully solder them on both sides of the board to ensure good connections.

The printed circuit board must be mounted 100 mils above the heat sink. This will allow the transistors to be mounted directly to the heat sink and have their leads lie flat on top of the pc board. Most No. 4 flat washers are 25 or 50 mils in thickness, and will serve well as spacers. Provisions are included on the board for activating or de-activating the rf sensing circuit. An additional circuit is included for an indicator lamp if desired.

Capacitors C_3, C_4, and C_6 in the circuit diagram represent two capacitors each. One is mounted on each side of the microstrip-line, as shown in the photograph. Solder all these Underwood capacitors as close as possible to the microstrip without shorting it out.

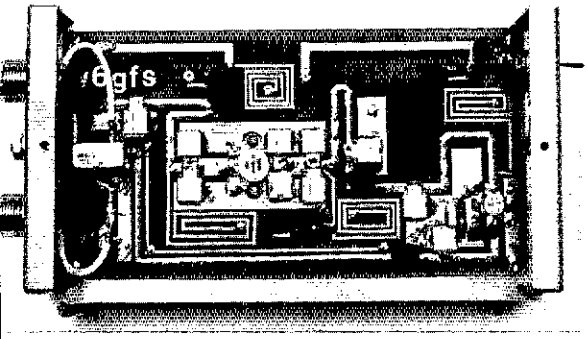
[2] Hejhall, "50-Watt 2-Meter Solid-State Power Amplifier Circuits," May, 1972, *QST*.

[3] Johnson-Artigo, "Fundamentals of Solid-State Power Amplifier Design," Part II, November, 1972, *QST*.

[4] Orr, *Radio Handbook*, 19th Edition 19-8.

[5] Dimensions for microstrip lines of 50-ohm impedance are given in Table I of Part II, *QST* for November 1972, page 18.

† Pc board layout and parts placement guide is available for $1, from Power Kits, P O Box 693, Cupertino CA 95014.



Top view of the 2-meter amplifier. The driver stage is in the lower right corner, the final stage just left of the center of the picture.

Tuning The Amplifier

The amplifier was built as designed. With 2 watts of drive, the output power level was around 40 watts and the reflected power on the input side was 500 mW. The best place to start optimizing the circuit is with the input. Capacitor C1 was moved 250 mils away from the dc blocking capacitor. Again the performance was checked. This time the reflected power was up to 900 mW, so the capacitor was moved in the opposite direction. After C1 was moved a second time, the reflected power was down to 50 mW, and output power was up to 55 watts. This procedure can be used throughout the amplifier to improve performance.

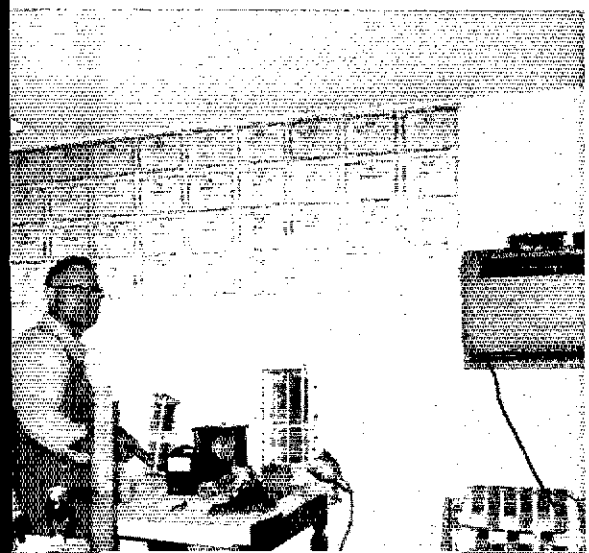
In the event that the tuning is way off, it is best to separate the two amplifiers at their 50-ohm interstage point (point "A" in Fig. 4), and work with each one separately. This can be accomplished by using a piece of RG-58/U cable soldered to the dc blocking capacitor at the end of the line. The braid must be soldered to a ground point near the end of the line to complete the circuit.

The amplifier should be tuned while working into a good 50-ohm load. After the amplifier is working well, a directional wattmeter should be placed in the antenna load and the antenna adjusted for minimum reflected power.

Conclusion

This amplifier will draw nearly 9 A of current, when delivering 70 watts of output power. Serious damage can occur to the automobile electrical system if power for the amplifier is obtained from an inadequate circuit. If necessary, check with your automotive electrician for a recommended circuit if you are not sure. In all cases, the amplifier dc line must be fused for just above the maximum current level expected. In this case a 10-A instantaneous fuse should be used.

Another problem with high-power amplifiers in mobile applications is the power dissipated in the heat sink. Always try to locate the amplifier in a well-ventilated area, away from combustible materials. In hot weather and long operating cycles, it is possible for the heat sink to approach 212 degrees Fahrenheit. This would cause a serious burn if accidentally touched, or it could possibly start a fire. A properly installed amplifier can be used safely and dependably for a long time. High-power amplifiers of this type will greatly improve 2-meter mobile simplex communications and work through repeaters over greater than normal distances. A list of available amplifier components as well as the complete amplifier can be obtained from Power Kits, P. O. Box 693, Cupertino CA 95014. QST



Strays

Recent 25-year pin recipient W6GCM sends along this photo of his collection of ARRL membership certificates. Clarence says that this picture was taken three years ago — he now has 39 certificates. How many amateurs can top that?

QST for

This article is the first in a series of *QST* "Extras" discussing the various facets of the operation of rf transmission lines — transmission-line theory, if you will. Close attention and study of the material, rather than a casual reading, will be rewarding for those interested in gaining a further knowledge of the subject. Some background in complex algebra will aid the reader in understanding the presentation, although the discussions hinge on simple algebraic expressions and manipulations of the Smith chart. In later parts of the series, the author, M. Walter Maxwell, uses a method of presentation which is much more vivid than the conventional way of simply showing vector combinations for a complex load.

Licensed as W8KHK in 1933, Mr. Maxwell's professional antenna experience includes participation from 1940 to 1944 in building antenna farms at FCC monitoring stations in Hawaii and at Allegan, Michigan. With a BS degree from Central Michigan University, he has been an engineer with the RCA Corporation since 1949, and a charter member of RCA's Astro-Electronics Division. Since 1960 he has been in charge of the antenna laboratory and test range at RCA's Space Center, Princeton, N.J. More than 30 earth-orbiting spacecraft have antenna systems designed solely by Mr. Maxwell, including Echo I and all Tiros-ESSA weather satellites. There are many others to which he contributed design assistance. He assisted in the design of Apollo's lunar-rover (moon buggy) earth-link antenna, set up its test-range facilties, and performed many of its pattern, gain, and impedance-matching measurements. He also engineered the prelaunch spacecraft-checkout (ground station) antenna systems at Cape Kennedy for the Tiros and Relay projects, and had complete engineering responsibility for the rf portion (receivers, transmitters, and antennas) of the five ground-station complexes used in Project SCORE, the orbiting Atlas which broadcast President Eisenhower's "Christmas Message from Space" in December, 1958.

Even though Mr. Maxwell's profession deals with far-out space communications, he is very much a down-to-earth amateur. Now licensed as W2DU, he still holds his original call, W8KHK, as well. In addition, he is the trustee of K2BSA, the station of the National Headquarters Radio Club, Boy Scouts of America.

Another Look at Reflections

Part I — Too Low a VSWR Can Kill You

BY M. WALTER MAXWELL,* W2DU/W8KHK

JUDGING BY WHAT we hear on the air, nearly everyone is looking for a VSWR of one-to-one. Question why, and the answer may be, "I'm not getting out on this frequency because my SWR is 2.5:1. There's too much power coming back and not enough getting into the antenna," or, "If I feed a line having that much SWR, the reflected power flowing back into the amplifier will burn it up," or still, "I don't want my feed line to radiate." Any of these answers shows misunderstanding of reflection mechanics, and are symptomatic of the current state of education on this subject. Rational and creative thinking toward antenna and feed-line design practice has been absent for a long time, having been replaced with an unscientific and thought-inhibiting attitude, as in the days before Copernicus persuaded the multitudes that the universe did not revolve around the earth. This situation originated with the introduction of coaxial transmission lines for amateur use around the time we got back on the air after World War II,

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and has gained momentum since SWR indicators appeared on the scene and since the loading capacitor of the pi-net tank replaced the swinging link as an output-coupling control. We are in this state because so much misleading information has been, and is still being published concerning behavior of antennas which are not self-resonant, feed-line performance in the presence of reflections when mismatched to the antenna, and especially the meaning and interpretation of the VSWR data.

Articles containing explicitly erroneous information and distorted concepts find their way into print, become gospel, and continue to be propagated with chain-letter effectiveness. These include such gems of intuitive logic as (1) always requiring a perfect match between the feed line and antenna; (2) evaluating antenna performance or radiating efficiency only on the basis of feed-line SWR – the lower the better; (3) pruning a dipole to exact resonance at the operating (single) frequency and feeding with an exact multiple of a half-wavelength coax – no other length will do; (4) adjusting the height – perhaps just lowering the ends into an inverted V – to make the resistive component equal to the line impedance; or (5) subtracting percent reflected power from 100 to determine usable percentage of transmitter output power (nomographs have even been published for this erroneous method). As a result of these misdirected concepts, we have been conditioned to avoid any mismatch and reflection like the plague. One-to-one all the way! Sound exaggerated? Not if the readers' receivers are tuning the same amateur bands as the author's! In the current vernacular, one could say we have a severe SWR hangup! In many instances, from the viewpoint of good engineering, this hangup is inducing us to concentrate our impedance-matching efforts at the wrong end of the transmission line. *(See reference 16.)*[1]

It is ironic that we should be in this situation, because the amateur is generally quite practical when it comes to following theoretical considerations. In this case we have been following the perfect-match theory down the narrow path because many of the aforementioned articles have misled us to believe that all reflected power is lost, with never an inkling that, properly controlled, reflections can be turned to our advantage in obtaining increased bandwidth which we are presently throwing away.

That so much misinformation gained foothold is surprising in view of the correct teachings of the ARRL *Handbook (ref. 1)*, the ARRL *Antenna Book (ref. 2)*, the works of Grammer *(refs. 3, 4, and 5)*, Goodman *(ref. 7)*, McCoy *(refs. 8 through 13 and 41)*, Drumeller *(ref. 14)*, Smith *(ref. 15)*, and especially two articles addressed to a subject nearly identical to this one, by Grammer *(ref. 6)* and Beers *(ref. 16)*. One objective of this article, therefore, is to identify some of the many erroneous notions concerning reflection principles with sufficient clarity to challenge the reader to question his own position on the subject. Once we correctly understand mismatch and reflections we can obtain improvement in operational antenna flexibility, similar to going VFO after being rock-bound with a single crystal. And when we discover how little we gain by achieving a low SWR on the feed line we will avoid unnecessary and time-consuming antenna modifications, often involving hazardous climbing and precarious operations on a roof or tower, which can result in injuries or even death. Let's kill SWR misconceptions – not ham operators!

[1] For this and all subsequent references, see the bibliography given at the end of this article.

Open-Wire Versus Coax Feed Lines

The theory behind the transmission of power through a feed line with minimum loss by eliminating *all* reflections – terminating the line with a perfect match – is equally valid, of course, for open-wire and coaxial lines. But in the days of open wire, prior to our widespread use of coax, it was tempered with practical considerations. Open-wire line was and still is used with high VSWR to obtain tremendous antenna bandwidths with high efficiency. This is because all power reflected from the line/antenna mismatch which reaches the input source is conserved, not dissipated, and is returned to the antenna by the "antenna tuner" (transmatch) at the line input. But, although the loss from reflections and high SWR is not zero, this additional loss is negligible because of the low attenuation of open-wire lines. If the line were lossless (zero attenuation) no loss whatever would result because of reflections.

The error in our thinking, that standing waves on coaxial line must always be completely eliminated, originated quite naturally, because the permissible reflection and SWR limits *are lower* than in open wire. When using coax for truly single-frequency operation it makes sense to match the load and line to the degree economically feasible. But it makes no sense to match *at the load* in many amateur applications where we are chiefly interested in operating over a band of frequencies; single-frequency operators we are not, except as our misguided concern over increasing SWR restricts our departure from the antenna resonant frequency.

Many authors are responsible for perpetuating the unscientific and erroneous viewpoint that the coax-fed antenna must be operated at its self-resonant frequency, by continually over-emphasizing the necessity for its being matched to the line within some arbitrary, low SWR value to preserve transmission efficiency, and by implying that efficiency equals 100 minus percent reflected power. The viewpoint is unscientific because it neglects the most important factor in the equation for determining efficiency – line attenuation. And it is also erroneous because efficiency does not relate to reflected power by simple subtraction. Setting an SWR limit alone for this purpose is meaningless, because the amount of reflected power actually lost is not dependent on SWR alone. The attenuation factor for the specific feed line must also be included because *the only reflected power lost is the amount dissipated in the line because of attenuation – the remainder returns to the load.* These authors have so wrongly

conditioned us concerning what happens to the reflected power that many of us have overlooked the correct approach to the subject. It is clearly presented in both the ARRL *Handbook* and the *Antenna Book* that transmission efficiency is a *two*-variable function of both *mismatch* and *line attenuation*. With this knowledge and by using a graph of the function appearing in these ARRL books, presented here as Fig. 1, the amateur can determine how much efficiency he will lose for a given SWR with the attenuation factor of each specific feed line. He can then decide for himself what the realistic SWR limit should be.

Unimportance of Low SWR Values

In our efforts to obtain low feed-line SWRs of 1.1, 1.2, or even 1.5 to 1, we have gone far past the diminishing-returns point with respect to efficient power transfer, *even for single-frequency operation*, for the same reason one would not install a No. 4 or 6 wire in a house wiring run where No. 12 is sufficient. Reference to the basic transmission-line equations, which have always been readily available in engineering texts and handbooks *(refs. 1, 2, 17, 18, 19, 33)*, will verify this analogy in addition to making it clearly apparent that authors who simply insist on low SWR or find 1.5 or 2 to 1 objectionably high have failed to comprehend the true relationship between reflected and dissipated power. From the viewpoint of amateur communications, it can be shown mathematically and easily verified in practice that the difference in power transferred through *any* coaxial line with an SWR of 2 to 1 is imperceptible compared to having a perfectly matched 1.0-to-1 termination, no matter what the length or attenuation of the line, and that many typical coaxial feed lines that we use in the hf bands with an SWR of 3 or 4, and often as high as 5 to 1, have an equally imperceptible difference. When feed-line attenuation is low, allowing such higher values of SWR permits operating over reasonably wide frequency excursions from the self-resonant frequency of the antenna with the imperceptible power loss just described, in spite of the popular impression to the contrary.

The relative unimportance of low SWR when feed-line attenuation is low is demonstrated rather vividly in the following two examples of spacecraft antenna applications. First, in the Tiros-ESSA-Itos-APT weather satellites, of which the entire multifrequency antenna-systems design was the work of the author, the dipole terminal impedance at the beacon-telemetry frequency (108 MHz in early models) was 150 - *j*100 ohms, for a VSWR of 4.4, reflected power 40 percent. Matching was performed *at the line input*, where it was fed by a 30 *milli*watt telemetry transmitter. (We can't afford much power loss here!) The feed-line and matching-network attenuation was 0.2 dB, and the additional loss from SWR on the feed line was 0.24 dB (5.4 percent), for a total loss of 0.44 dB (9.6 percent). On the prevalent but erroneous assumption that all reflected power (40 percent) is lost, only 18.1 milliwatts would reach the antenna, and efficiency, determined on the same erroneous basis, would be only 60 percent. But 27.1 milliwatts were measured; of the 2.9 milliwatts lost in total attenuation, only 1.6 milliwatts of it was from the 4.4:1 VSWR. So the real efficiency would have been 95.5 percent if perfectly matched at the load, but reduces to 90.4 percent by allowing the 4.4 VSWR to remain on the feed line. Second, in the Navy Navigational Satellite (NAVSAT), used for precise position indications for ships at sea, the antenna terminal impedance at 150 MHz is 10.5 - *j*48 ohms, for a VSWR of 9.8, reflected power 66 percent. Also matched at the line *input*, flat-line attenuation is 0.25 dB, and the additional loss from SWR is 0.9 dB, for a total system loss of 1.15 dB, approximately 1/6 of an S unit. This is an insignificant amount of loss for this situation, even in a space environment where power is at a premium. Why did we match at the line input? Because critical interrelated electrical, mechanical and thermal design problems made it impractical to match at the load. Line-input matching provided a simple solution by permitting the matching elements to be moved to a noncritical location. This design freedom afforded tremendous saving in engineering effort with negligible compromise in rf efficiency, in spite of SWR levels many amateurs would consider unthinkable.

Another factor which contributes to misunderstanding is the confusion between two distinct, line-usage conditions — one of constant incident *voltage*, and the other of constant input *power (for relative amplitudes, see ref. 19, Fig. 1.3, page 6, and Fig. 3.6, page 29)*. Laboratory and ex-

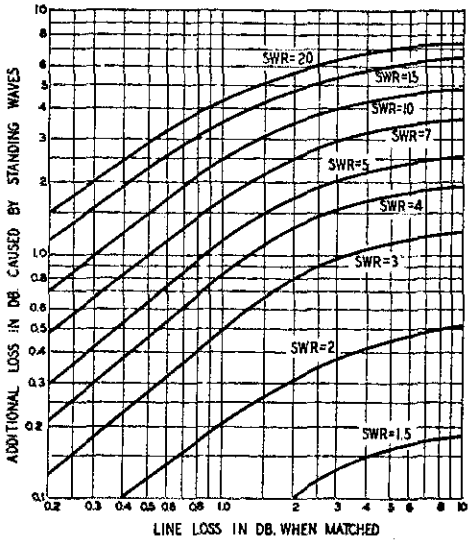

Fig. 1 — Increase in line loss because of standing waves (SWR value at the load). To determine the total loss in decibels in a line having an SWR greater than 1, first determine the loss for the particular type of line, length and frequency, on the assumption that the line is perfectly matched. Locate this point on the horizontal axis and move up to the curve corresponding to the actual SWR. The corresponding value on the vertical axis gives the additional loss in decibels caused by the standing waves.

perimental work often requires holding incident voltage constant with variation in loading. A constant-voltage source is usually obtained for this purpose by inserting a pad having 15 to 20 dB attenuation between the generator and the line to absorb the reflected power, preventing it from reaching the generator where it would alter the line coupling and cause the generator output voltage to vary. Because of the absorption of the pad, the generator sees a nearly perfect match for all load conditions and all reflected power is lost -- but these are laboratory control conditions required to obtain valid test data.

When we amateurs make a change that alters line loading, which in turn alters the transmitter-to-line coupling because of returning reflected power, we can readjust the coupling, returning the line-input power *(not forward power)* to its previous value regardless of the reflected power *value.*[2] *We amateurs can adjust coupling for* changes in loading – in the laboratory this is not convenient. We amateurs use low-attenuation lines to conserve reflected power -- laboratory setups insert attenuation to *dissipate* it. Confusion over these distinctions has helped perpetuate the erroneous "lost reflected power" concept.

As a result of these various misunderstandings, many amateurs never even wonder whether there are any benefits to be gained by not matching at the line-antenna junction. Many now even shun the use of open-wire lines (not the OTs), completely missing the joy of a QSY to the opposite end of the band with only a simple change in transmatch tuning, because the fear of reflections engendered by the exaggerated application of the theory to coax has crept into the thinking concerning *any* form of mismatched connection. Adding still further to the confusion is the old-wives' tale that the reflected power is dissipated in the transmitter, causing tube and tank-coil heating and all kinds of other damage. This myth developed out of ignorance of the true mechanics of reflections and became the easy, but fallacious, explanation of what seems to be abnormal behavior in the transmitter when feeding a line with reflections. What really happens at the transmitter is simply a change in coupling, which will be explained in detail in a section to follow. Then we may understand how to operate with absolutely no danger of damaging the amplifier while feeding into a line with high SWR.[3]

Engineering an Amateur Antenna System

Engineering is the process of making workable compromises in design goals where theories guiding different aspects of the design are in conflict, making it impossible to optimize all the goals. *Good* engineering is simply recognizing the correct choices in the compromises and relaxing the right goals, as in the spacecraft antenna design mentioned earlier. We amateurs spend many hours building and pruning antenna systems. Wouldn't it be worthwhile spending some of that time learning how to engineer the design in order to make correct trade-off decisions among related factors instead of letting King VSWR dictate the design?

FIRST, we need to improve our knowledge of reflection mechanics and transmission-line propagation to understand

1) why reflected power by itself is an unimportant factor in determining how efficiently power is being delivered to the antenna.

2) the effect of line attenuation (to discover why it is the KEY factor which will tell us when and how much to be concerned with reflected power and when to ignore it).

3) why *all* power fed into the line, minus the amount lost in line attenuation, is absorbed in the load *regardless of the mismatch at the antenna terminals.*

4) why reflection loss (mismatch loss) is canceled at the line input by reflection gain *(ref. 19, p. 38, and ref. 25, part II, p. 33).*

5) why a low SWR reading by itself is no more a guarantee that power is being radiated efficiently *than a high SWR reading guarantees it is being* wasted.

6) why SWR is not the culprit in transmitter-loading problems – why the real culprit is the change in line-input impedance resulting from the SWR, and why we have complete control over the impedance without necessarily being concerned with the SWR.

7) the importance of thinking in terms of *resistive and reactive* components of impedance instead of SWR alone, and why SWR by itself is ambiguous, especially from the viewpoint of the selection and adjustment of coupling and matching circuitry.

SECOND, we need to become aware that with *moderate lengths of low-loss coax, such as* we commonly use for feed lines, loss of power because of reflected power in the hf bands can be insignificant, no matter how high the SWR. For example, if the line SWR is 3, 4, or even 5 to 1 and the attenuation is low enough to ignore the reflected power, *reducing the SWR will yield no significant improvement in radiated power because all the power being fed into the line is already being absorbed in the load.* This point has especial significance for center-loaded mobile whips, because of the extremely low attenuation of the short feed line.

THIRD, we should become more familiar with the universally known, predictable behavior of off-resonance antenna-terminal impedance *and its correlation with* SWR. This knowledge provides a *scientific* basis for evaluating SWR-indicator readings in determining whether the behavior of *our system is normal or abnormal, instead of* blindly accepting low SWR as good, or rejecting

[2] Forward, or incident power equals line-input power plus reflected power. Line-input power and incident power are equal only when the line is perfectly matched at the load, for zero reflected power.

[3] Transmitter manufacturers could easily have helped put an end to this myth by including two or three short paragraphs in their instruction manuals explaining the maximum and minimum coupling limits of the pi network, and how to extend them with an external capacitor, instead of the terse, uninformative "WARNING — DO NOT EXCEED 2:1 VSWR," and so forth.

high SWR as bad. The following two examples emphasize the importance of this point by showing how easily one may be misled by a low SWR reading:

1) A ground system having 100 properly installed radials has negligible loss resistance *(ref. 20)*. Many a-m broadcast stations use 240 radials, while the FCC requires a minimum of 120. With such a ground system the terminal impedance of the average quarter-wave vertical is 36.5 + *j*22 ohms, and approximately 32 ohms when shortened to resonance. When fed with a 50-ohm line, the SWR at resonance will be close to 1.6, rising *predictably* on either side of resonance. But a 15-radial ground system will have approximately 16 ohms of ground-loss resistance with this antenna. If we remove a few radials at a time from the 100-radial system, the increasing ground resistance, added to the radiation resistance, increases the total line-terminating resistance. The terminating resistance comes closer and closer to 50 ohms, reducing the SWR. When enough radials have been removed for the loss resistance to reach 18 ohms, the terminating resistance will be 50 ohms for a *perfect one-to-one match!* But while the SWR went down, so did the radiated power, because now the power is dividing between 32 ohms of radiation resistance and 18 ohms of ground resistance!

Ground systems having from two to four radials may have a loss resistance as high as 30 to 36 ohms, so now the resonant-frequency SWR will be around 1.4 or 1.5. But instead of rising from this value, as it should at frequencies away from resonance, the ground loss holds the off-resonant SWR to low values. The low SWR simply indicates that the line is well matched, but it offers no clue that approximately half the power is heating the ground.

2) Some amateurs who employ a one-to-one balun believe that "one-to-one" means it will provide a one-to-one match between the feed line and the antenna. This is a serious error because "one-to-one" only specifies the output-to-input impedance *ratio* – no matter what impedance terminates the output, the same value is seen at the input. Nevertheless, these amateurs are convinced the baluns are "matching," because the SWR sometimes goes down dramatically when the balun is inserted. Often with a balun the SWR is less than 2:1 over the entire 75-80 meter band, where somewhat over 5:1 is normal at the band ends.

Off-resonance SWR is reduced here because the ferrite core of the balun saturates while attempting to handle the reactive current, which now exceeds the maximum core-current level. Thus, the full excursion of the reactive component of antenna impedance is prevented from appearing at the balun input. All power above the saturation level is lost in heating the balun, while the low SWR is deceiving the unsuspecting amateur.

The true SWR will be unchanged by a 1:1 balun with a core capable of handling the current without saturating (if it has no significant leakage reactance).[4] However, the SWR indicator *may not* show the true SWR without the balun if antenna current on the outside of the coax is present at the SWR meter *(ref. 36)*.

So it is important to know approximately what SWR to expect – if it is low, determine whether it should be. Don't assume that a low SWR indicates success, or guarantees a great system! Be especially suspicious if the SWR remains low or relatively constant over a moderate frequency range, unless specific broad-banding steps have been performed on the radiating system. This knowledge is elementary and routine for the antenna design engineer, but too little information in this area has been available for the amateur, considering the degree of his involvement with antennas. While antenna-terminal impedance behavior with frequency is shown in the ARRL *Antenna Book (ref. 2, Fig. 2-7)*, correlation of the impedance change with SWR will be covered in detail later, to enable us to predict normal SWR, within limits, with a nonresonant antenna terminating the feed line.

FOURTH, we need to reexamine the use of open-wire lines as tuned lines *(refs. 3, part III, p. 20; 10; and 21, p. 23)*, to discover that the principles used there are exactly what we have been discussing. Remember, with tuned lines we completely ignore the mismatch at the antenna end, and compensate for the mismatch with the tuner at the input end, over the entire frequency range of the band. The SWR may run as high as 10, 15, or even 20 to 1, but the power reflected from the mismatch is rereflected back to the antenna by the tuner. Tuning for maximum line current simply adjusts the phase of the reflected wave to rereflect down the line in phase with the forward wave, again reaching the antenna. Thus the reflection *loss* from the mismatch is canceled by the reflection *gain* of the tuner.

Many of us amateurs know from age-old practice that a 600-ohm line made of two No. 12 wires on six-inch spacing would work every time. We had little incentive to learn how they worked – why they transferred power *efficiently* with such high reflected power and SWR, or that adjusting the reflected-wave phase to rereflect in phase with the forward wave was just another way of viewing the reactance cancellation required to obtain maximum line and antenna current. Hence, our misunderstanding of the similarity between open-wire and coaxial-line operation with mismatched loads. The principle is the same in both, only the degree is different. In other words, for many applications, *coax can be used as a tuned line in precisely the same manner as open wire.* The spacecraft systems mentioned earlier are examples.

Thus, coax connected directly into the antenna may be operated with substantial mismatch. In this case, the SWR limits while operating away from the self-resonant frequency of the radiator are determined entirely by power lost because of line attenuation. Voltage breakdown and current heating should not be a problem at our legal power limit with RG-8 or -11/U, or with RG-58 or -59/U at lower powers, because voltage at an SWR maximum is only $\sqrt{SWR}$ times the matched value. The line-input impedance will no longer be 50

[4] Many baluns have high leakage reactance, and thus cannot provide a true one-for-one impedance transfer. This reactance inserted between the antenna and its feed line can either improve or worsen the match, depending on the magnitudes and signs of the leakage and antenna-terminal reactances.

ohms, but depending on the magnitude of the mismatch and length of the cable, we may determine whether the output tank of the transmitter has sufficient impedance-matching range (surprisingly high in some rigs, none in others) to permit feeding the line directly *(ref. 4, part III)*, or whether an intermediate matching device (transmatch, or other type of tuner *(refs. 9-12, incl., 22)* will be required to adjust for correct coupling between the line and the transmitter. (Balun and filter use will be discussed later.) The important point we are emphasizing is that, within the limits mentioned, *all required matching may be transferred back to the operating position instead of forcing the match to occur at the antenna feed point – without suffering any* SIGNIFICANT *loss in radiated power.* The use of this technique, which may come as a surprise to many, does not contradict any theory. It is actually an embodiment of the fundamental principle of network theory called *conjugate matching, (refs. 17, p. 243; 19, p. 38; 35, p. 49)* which is the basis for all antenna tuner, or transmatch, operation with either open-wire or coaxial lines.

After learning of the benefits obtained with line-input, or conjugate matching in the two spacecraft examples described earlier, it is interesting to compare the results using this same input matching technique in typical 80- and 40-meter situations. Eighty meters is the widest amateur band in terms of percent of center frequency and thus suffers the greatest SWR increase with frequency excursion to the band ends. A dipole cut for resonance at 3.75 MHz will yield an SWR in a 50-ohm feed line somewhat above 5:1 at both 3.5 and 4.0 MHz. As shown in Fig. 2, in a 100-foot length of nonfoam RG-8/U, an SWR of 5:1 adds only 0.46 dB loss to the matched (i.e., flat line)

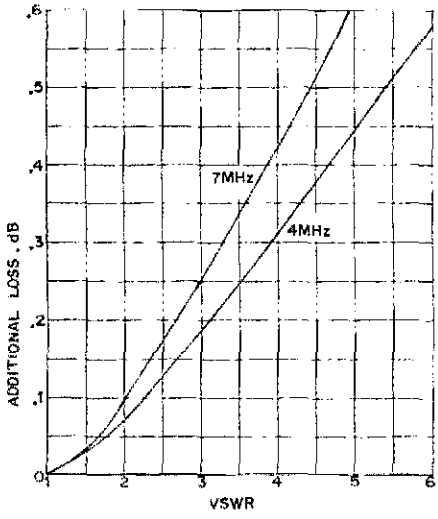

Fig. 2 — Effect of standing-wave ratio on line loss at 4 and 7 MHz. The ordinates give the *additional* loss in decibels over those for a perfectly matched 100-foot length of RG-8/U line for the SWR values shown on the horizontal scale.

loss of 0.32 dB at 4.0 MHz. So out almost to the band ends, less than 1/12 of an S unit is lost because of the SWR, an imperceptible amount. This further verifies the principle and proves that full-band, coax-fed dipole operation on 80 meters also is practical. Even with the high SWR at the band ends, the loss cannot be distinguished from what it would have been had the SWR been a perfect one-to-one! At 40 meters, with the dipole resonated at 7.15 MHz, something is amiss if the SWR exceeds 2.5 at the band ends. And from Fig. 2 it may be seen that this SWR adds only 0.18 dB to the matched loss, which at 7 MHz is 0.44 dB for 100 feet of RG-8/U coax.

Nonreflective Load Versus Conjugate Matching

Now is perhaps a good time for the reader to contemplate the conflict between the no-reflection perfectly matched load theory and the conjugate-match theory. It is amply evident from the standpoint of good engineering that as long as SWR does not exceed the value above which one cannot afford to compromise further power in exchange for improved operating flexibility, the convenience and increased bandwidth afforded by conjugate matching at the line input is obvious.

But is also presents a real challenge to learning more about complex impedance, because the line-input impedance now has resistive *and reactive* components, both of which vary with changes in line length and with frequency in the presence of reflections. Thus, we need to understand *complex* impedance in order to choose and adjust correct conjugate matching circuitry to couple the transmitter to the line, or to adjust the transmitter directly to the line if sufficient matching range is available. Practically all problems encountered while attempting to obtain proper coupling or loading to a line with reflections can be traced simply to not understanding the correlation of line length and relative phase of the incident and reflected waves with the resulting complex impedance seen at the input terminals of the line.

A detailed discussion of reflection mechanics and feed-line propagation will be presented in subsequent installments. Included will be a novel means for explaining impedance transformation along the line in direct relation to incident and reflected waves, which will simplify the understanding of what does and does not happen when a line length is changed, and how to select the correct length for given conditions. The relation of line attenuation to permissible SWR while using conjugate matching techniques, along with details on how to obtain proper coupling and loading of a transmitter to a line for which the input impedance has changed because of reflections, will also be presented.

Part II of this series will appear in a subsequent issue of *QST*. QST

Bibliography

1) *The Radio Amateur's Handbook*, any recent edition.

2) *The ARRL Antenna Book*, 10th edition, pp. 70-80 and 90-136. [EDITOR'S NOTE: Page numbers in the more recent 11th and 12th editions will not be significantly different for discussions of pertinent subjects.]

3) Grammer, "The Whys of Transmission Lines," *QST*, in three parts; Part I, January 1965, p. 25; Part II, February 1965, p. 24; Part III, March 1965, p. 19.

4) Grammer, "Simplified Design of Impedance-Matching Networks," *QST*, in three parts; Part I, March 1957, p. 38; Part II, April 1957, p. 32; Part III, May 1957, p. 29.

5) Grammer, "Antennas and Feeders," *QST*, in three parts; Part I, October 1963, p. 30; Part II, November 1963, p. 36; Part III, December 1963, p. 53. [EDITOR'S NOTE: Any published references to a Part IV of this series are erroneous.]

6) "Standing Waves — Good or Bad?", Technical Topics, *QST*, December 1946, p. 56.

7) Goodman, "My Feedline Tunes My Antenna!", *QST*, March 1956, p. 49.

8) McCoy, "Choosing a Transmission Line, *QST*, in two parts; Part I, December 1959, p. 42; Part II, February 1960, p. 40.

9) McCoy, "Antennas and Transmatches," *QST*, October 1964, p. 18.

10) McCoy, "A Versatile Transmatch," *QST*, July 1965, p. 58.

11) McCoy, "A Completely Flexible Transmatch for One Watt to 1000," *QST*, June 1964, p. 39.

12) McCoy, "A Transmatch for Balanced and Unbalanced Lines," *QST*, October 1966, p. 38.

13) McCoy, "When is A Feed Line Not A Feed Line?", *QST*, August 1965, p. 37.

14) Drumeller, "The Mismatched RF Transmission Line," *73*, November 1969, p. 68.

15) Smith, "The 'Mega-Rule,'" *QST*, March 1969, p. 24.

16) Beers, "Match, or Not To Match?", *QST*, September 1958, p. 13.

17) Everitt, *Communication Engineering*, 2nd Edition, McGraw-Hill, New York, 1937.

18) Johnson, *Transmission Lines and Networks*, McGraw-Hill, New York, 1950.

19) Smith, *Electronic Applications of the Smith Chart in Waveguide, Circuit and Component Analysis*, McGraw-Hill, New York.

20) Brown, Lewis, and Epstein, "Ground Systems as a Factor in Antenna Efficiency," *Proceedings of the IRE*, June 1937, p. 753. [NOTE: Discusses ground resistance vs. number of radials — a classic work on which FCC standards for a-m broadcast ground systems are based.]

21) Smith, "Getting the Most Into Your Antenna," *QST*, July 1952, p. 21.

22) "Impedance Matching With an Antenna Tuner," Technical Topics, *QST*, October 1946, p. 38.

23) Ferber, "Coaxial Cable Attenuation," *QST*, April 1959, p. 20.

24) Leo, "An Impedance-Matching Method," *QST*, December 1968, p. 24.

25) Hall, "Smith-Chart Calculations for the Radio Amateur," *QST*, in two parts; Part I, January 1966, p. 22; Part II, February 1966, p. 30.

26) Cholewski, "Some Amateur Applications of the Smith Chart," *QST*, January 1960, p. 28.

27) Amis, "Antenna Impedance Matching," *CQ*, in two parts; Part I, November 1963, p. 63; Part II, December 1963, p. 33.

28) Fisk, "How To Use the Smith Chart," *Ham Radio*, November 1970, p. 16. (Also see ref. 29.)

29) Maxwell, "Correspondence on How to Use The Smith Chart," *Ham Radio*, December 1971, p. 76 (for corrections to ref. 28).

30) Smith, "L-Type Impedance Transforming Circuits," *Electronics*, March 1942, p. 68.

31) Gordon, "L Networks for Reactive Loads," *QST*, September 1966, p. 30.

32) Schultz, "Broad-Band Balun," *CQ*, August 1968, p. 66.

33) *Reference Data for Radio Engineers*, 4th Edition, Federal Telephone and Radio Co., p. 564.

34) "Antenna and Transmission Line Quiz," *QST*: Questions, July 1965, p. 19; Answers, August 1965, p. 55.

35) Slater, *Microwave Transmission*, McGraw-Hill, New York, pp. 7-69.

36) Orr, "Broad Band Balun For A Buck," *CQ*, February 1966, pp. 42, 45.

37) King, *Transmission Line Theory*, McGraw-Hill and Dover Publications, Inc., pp. 77-83.

38) Bruene, "An Inside Picture of Directional Wattmeters," *QST*, April 1959, p. 24.

39) Radio Research Laboratory Staff, Harvard University, *Very High-Frequency Techniques*, Vol. 1, Edition 1, McGraw-Hill, pp. 10-15.

40) Hall, "Accuracy of S.W.R. Measurements," *QST*, November 1964, p. 50.

41) McCoy, "The Ultimate Transmatch," *QST*, July 1970, p. 24.

Strays

At the opening session of a code class sponsored by the Antietam Radio Association of Hagerstown, Maryland, class instructor K3MVL and Atlantic Division Director W3SW presented students Jeff Daniels and Sharie Keller, both 11 years old, with copies of the League's *Learning the Radiotelegraph Code*.

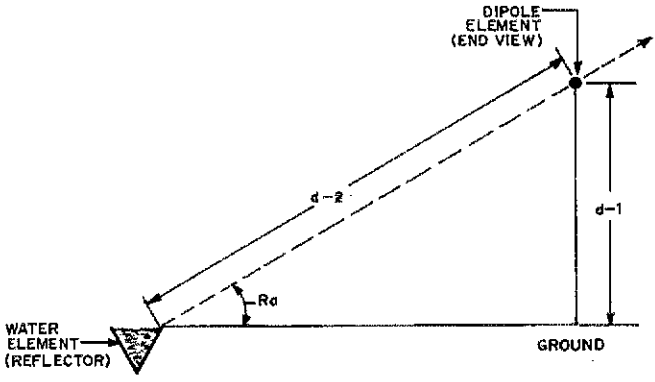

Fig. 1 — Side view of array.

Organic Reflective Elements for the Simple Dipole

BY G. T. WALCZYK,* WA2FCC

BECOMING increasingly excited after reading Dr. Karl Reiner's thought provoking book, *The Behavior of Radio Frequency Energy Upon Organic Matter*, I succumbed to the possibility of utilizing materials other than those of the inorganic variety (metal, etc.) to construct a directive array for the radio amateur.

Of course, the first design parameter of this array to be determined would have to be the specific material to use in its construction. Dr. Reiner, as most of us would already have assumed, rates the reflective properties of water as amongst the best, relative to all other elemental substances. Excellent, I thought to myself. Why not use water, which is quite cheap and quite available in most areas of this country, to erect some type of reflective element for a dipole antenna? Yes, it would be slightly impossible for most of us to suspend a horizontal column of water of sufficient diameter and length to be useful as an rf reflector. So the next best thing to do would be to trench the water in back of and below the dipole element at such a distance as to reflect and reinforce the radio frequency energy at a specific vertical angle of radiation. Therefore, the three factors involved in the design of this rather simple antenna are Ra, D-1 and D-2, where Ra is the desired angle of vertical radiation, D-1 is the height of the driven dipole element above ground, and D-2 is the distance between the dipole element and the reflective element, which is located at ground level.

Now looking at the formula:

$$D\text{-}2 = \frac{Ra \times D\text{-}1}{Ra + D\text{-}2} \times 20,$$

we can see that it is possible to design an uncomplicated but effective beam antenna for a desired angle of vertical radiation. This is not to say that a dipole up 15 feet using the water reflective element will give you a better signal at a take-off angle of 30 degrees than a straight dipole up 75 feet. But from tests made, it appears that the gain of the water element antenna at the desired angle of radiation is somewhere between 5.57 dB and 8.89 dB over the same antenna at the same height, without the organic element.

So if you can't find the height for your ole' 40 or 20 meter dipole to give you decent low angle radiation, you can, with the aid of your back, come up with a very productive DX antenna.

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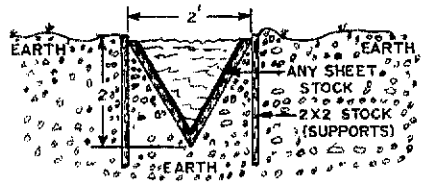


Fig. 2 — Trough construction.

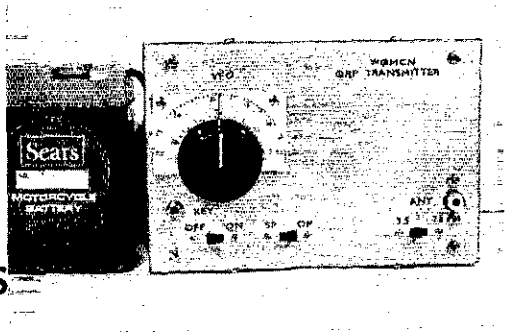
Construction of the Reflector

For my antenna, a 40-meter dipole at a height of 30 feet, I constructed a water trough 2-feet wide at the surface. The trough "hull" is vee shaped and has an overall depth of 2 feet.

Placing the trough at 30 feet behind the dipole element gave me a reinforced take-off angle of

(Continued on page 59)

The Dual Six -- A QRP Transmitter for 40 and 80 Meters



Here is the completed QRP transmitter.

BY CARL J. HEINEN,* WØMCN

THROUGH THE YEARS, I have had several experiences with low-power transmitters. Included were a 59 ECO, running about 5 watts, and also a 30 Hartley oscillator that was powered by a slightly under-par 45-volt battery (these are tubes and circuits from the 1920 era.) The Hartley ran about one-third-watt dc input. I managed to work four states on 40 with this rig but it required a tremendous amount of calling and ideal daytime conditions. Many years later I built a 1U4 VFO 3Q4 final rig for 80. This model ran three watts input and was powered by a 2-volt wet cell and a vibrator supply. I was so pleased with the performance of this transmitter that I built a similar model for 40. Audio power transistors were entering the scene about then. I acquired a pair, built a companion modulator and put the three watter on 75 phone. QSOs out to 150 miles were possible during the day.

The recent surge of interest in QRP transistorized rigs aroused a desire for another low-power effort, but this time with a little more than 3 watts, which in my case seemed a marginal level for really satisfactory QSOs.

Circuit Details

It seems that a ham need only mention to his friends that he's planning to build a transmitter, and he's flooded with suggestions and offers to supply any needed components. WØHGH presented me with a D27C1 transistor that had promising specifications for a 6-watt final. The first experimental transmitter used the D27C1 along with a crystal oscillator and a driver stage. It gave good output on 80 and also on 40 by doubling in the final. Further experimenting showed that I could pick up another watt of output for the same power input by running the final straight through.

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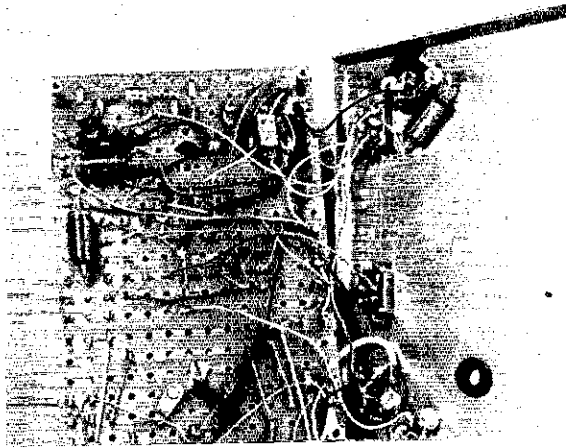
I tried several bipolar and FET VFO circuits before settling on the FET Colpitts type, Fig. 1. It was necessary to add some isolation between the VFO and driver to remedy a chirp condition. On 80, an isolation resistor followed by a Class A stage worked best. On 40, running the VFO into a frequency doubler produced satisfactory isolation. Following conventional driver stages are unconventional final circuits, the result of considerable experimental evolution in licking the TVI and second-harmonic problems.

It would have been possible to band switch the circuits but because the parts are small and relatively inexpensive, I decided to make a dual rig with separate sections for each band. This reduced the band-switch function to switching only the antenna and dc power. Having separate VFOs made it easy to adjust their tuning ranges to spread each band over the entire VFO dial swing.

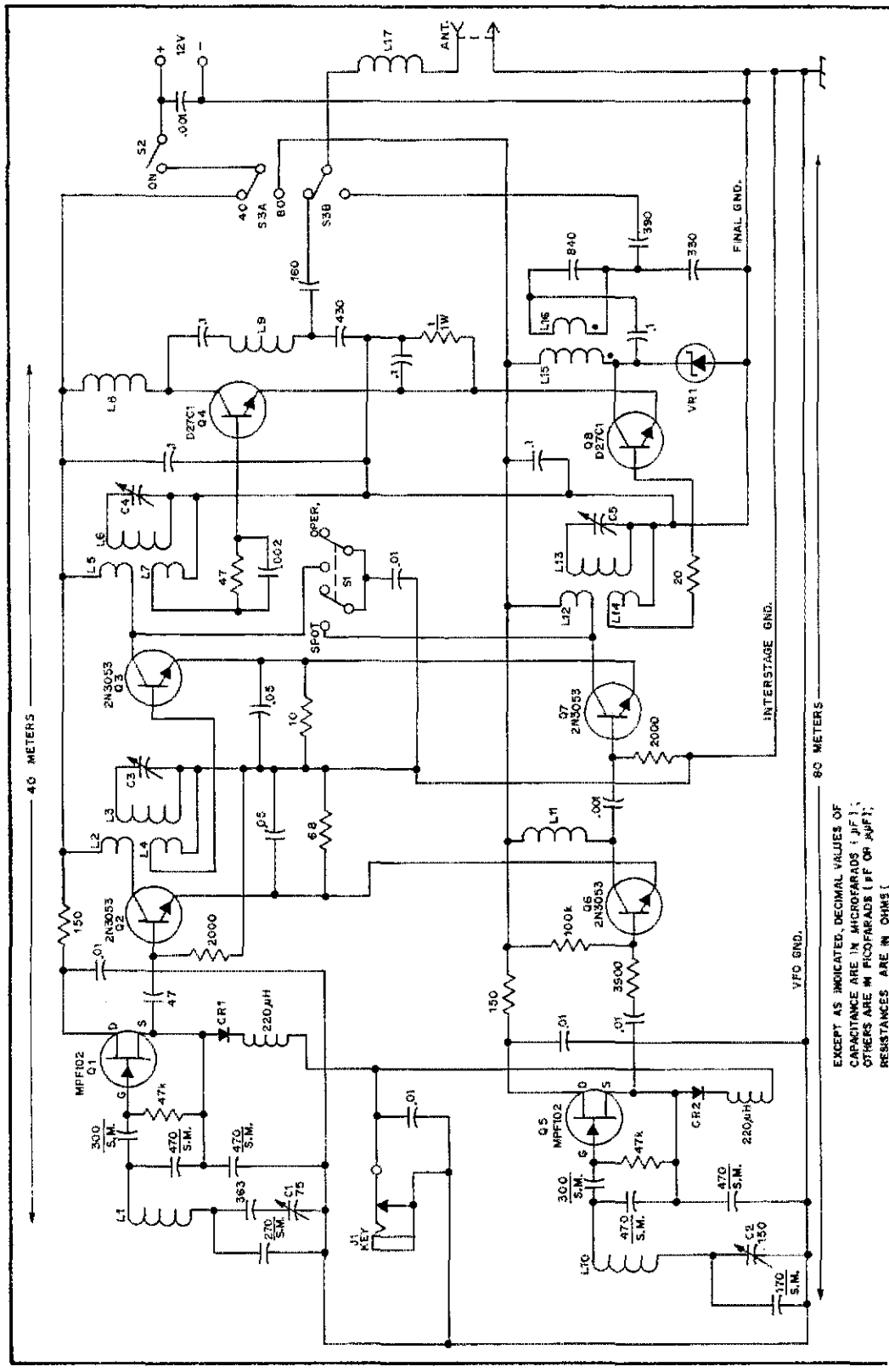
When I tried keying the dual circuit for the first time it wouldn't function. It took some disconnecting of components before I finally discovered that the transmitter section of the band not in use was forming a devious current path. This kept the VFO of the active section oscillating with the key open. The two diodes, CR1, CR2, in the FET source leads, remedy the situation by back biasing to the unwanted current path.

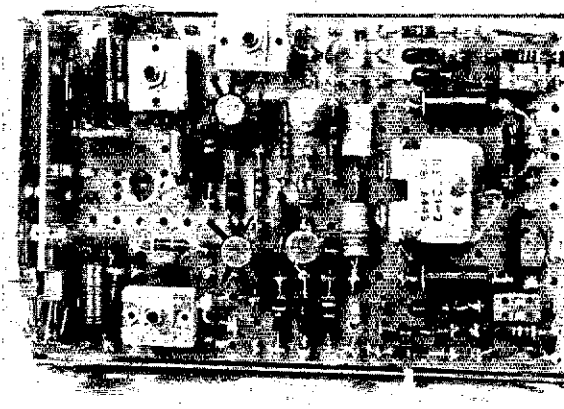
The Coils and Winding Tips

In the course of experimenting I tried big and little air-wound coils, coils on ferrite and ceramic



All of the wiring, the 40-meter interstage coils, the Zener diode, and the capacitors for the finals are on the back side of the board. The coil mounted between the switch and antenna jack is L17.


40 METERS
80 METERS
INTERSTAGE GND.
VFO GND.
FINAL GND.
ANT.
12V
ON
S2
40
S3A
80
S3B
SPOT
OPER.
S1
KEY
J1
MPF102
2N3053
D27C1
D27C1
VR1
CR1
CR2
EXCEPT AS INDICATED, DECIMAL VALUES OF
CAPACITANCE ARE IN MICROFARADS (μF);
OTHERS ARE IN PICOFARADS (pF OR μμF);
RESISTANCES ARE IN OHMS (



As can be seen, the mounting of components is simple with the use of the terminals and the Vectorbord. The D27C1 output transistors bolt to their heat sinks which are supported on brackets made from modified brass chain links. Push-on heat sinks are used on the 2N3053 driver transistors.

Fig. 1 — Circuit diagram of the QRP transmitter.
C1 — 100-pF variable; see C2.
C2 — 150-pF variable (C1 and C2 are two sections of a transistor-radio tuning capacitor, Poly Paks 92CU617).
C3, C4, C5 — 20-250-pF compression trimmer.
CR1, CR2 — 1N34A or equiv.
(All coils except L9 and L11 are wound on 2-watt carbon or composition resistors. No. 32 or 33 enamel-covered wire is used except as specified. All windings are close wound. If resistor leads are used for terminating main windings, use 1 megohm or higher for L1 and L10, 20,000 ohms or higher for other coils).
L1 — 70 turns (if No. 32 is used it will require a short second layer.)
L2 — 11 turns wound over hot end of L3.
L3 — 45 turns.
L4 — 6 turns on ground end of L3.
L5 — 9 turns over hot end of L6.
L6 — 45 turns.
L7 — 7 turns on ground end of L6.
L8 — 60 turns.
L9 — 18 inches No. 22, 1/4-inch dia, self-supporting.
L10 — 70 turns.
L11 — 5 feet of No. 32 or 33 scramble wound on a 20,000-ohm 1/2-watt resistor.
L12 — 15 turns over ground end of L13.
L13 — 60 turns.
L14 — 7 turns over L12.
L15 — 60 turns.
L16 — 18 turns No. 30 over L15. L5 and L16 must be wound in same direction; observe phasing.
L17 — 34 turns of No. 26.
Notes:
The 220-μH choke values are not critical. They can be replaced with any value from 100 μH to 1 mH. The switches used are the miniature slide type. The battery I used consists of two 6 V, 2 ampere-hour, type JA-1 units in series. These are available from Sears. Their number is 44315.

forms and also on homemade toroids as suggested by VE2IB.[1] All these and the coils wound on two-watt resistors gave similar results in whatever stage I tried them. More important was the optimizing of the impedance-matching windings. Many an hour was devoted to putting on and taking off turns trying to find what was optimum. I liked the easy mounting feature of the two-watt resistor forms — merely solder them to the lugs. The ends of the main windings are terminated directly to the resistor leads. Therefore, relatively high ohmic values were used to avoid resistive swamping of the inductances — 1 megohm for the VFO coils and 51,000 ohms for the other coils. These values are probably higher than necessary. Normally a low-impedance link is wound at the ground end of a tuned circuit. However, the best energy transfer and tuning of the 40-meter coils was obtained by locating the collector links near the hot end and the base links near the ground end. The 80-meter interstage coil performed best with its links at the ground end in traditional style. A two-watt resistor is just barely long enough to accommodate the 70 turns of No. 33 wire required for a VFO coil. If No. 32 wire is used it will be necessary to have a short second layer. Except for a slight change in tuning it didn't matter which way the collector and base windings were phased. The 80-meter output circuit did have a phase preference as shown in the schematic diagram.

It seemed easier to cast the turns around the resistor rather than turning it. The turns are wound over an upside-down strip of masking tape about 1/8-inch wide. About 1/16-inch of the strip is folded over the wire where it starts to form the first turn. The next few turns cover the fold and anchor the beginning of the winding. After the winding is complete the other end of the tape strip is folded over the final turns to anchor them.

Construction Details

Initial planning indicated that the components should fit nicely on a 4 × 6 Vectorbord. With these

[1] Lamontagne, "The SSB Mark 1," *QST*, Aug., 1968.

dimensions in mind I bought a Bud AC-1405 box. Unfortunately the lips on the box prevented me from using as big a board as was planned and the box wasn't quite deep enough. By the use of two pieces of wood, clamps, a vise, and some indescribable activity, I managed to straighten out the lips. This provided the needed access area and depth but meant making a special cover. Fig. 3 shows the dimensions of the cover before bending. Note that the edges that come together after bending are filed to a 45 degree bevel. This isn't necessary but it only takes a minute or two and results in fine-looking corners. Bending was done over a steel bar with the piece sandwiched between the bar and a piece of wood in a vise. I bent the long-dimension lips first. The vise jaws were wide enough to handle the short dimension lips. Then some work with a hammer shaped the corners into place.

The components are mounted on a piece of AA Vectorbord, actual dimensions 3-13/16 × 5-7/8 inches which gives a 14 × 22-hole matrix. The terminals are Alden type 651T squeezed with pliers after insertion so they wouldn't require so much solder. The Vector T-9.4 terminals are also suitable for this type of board. All the wiring and a few of

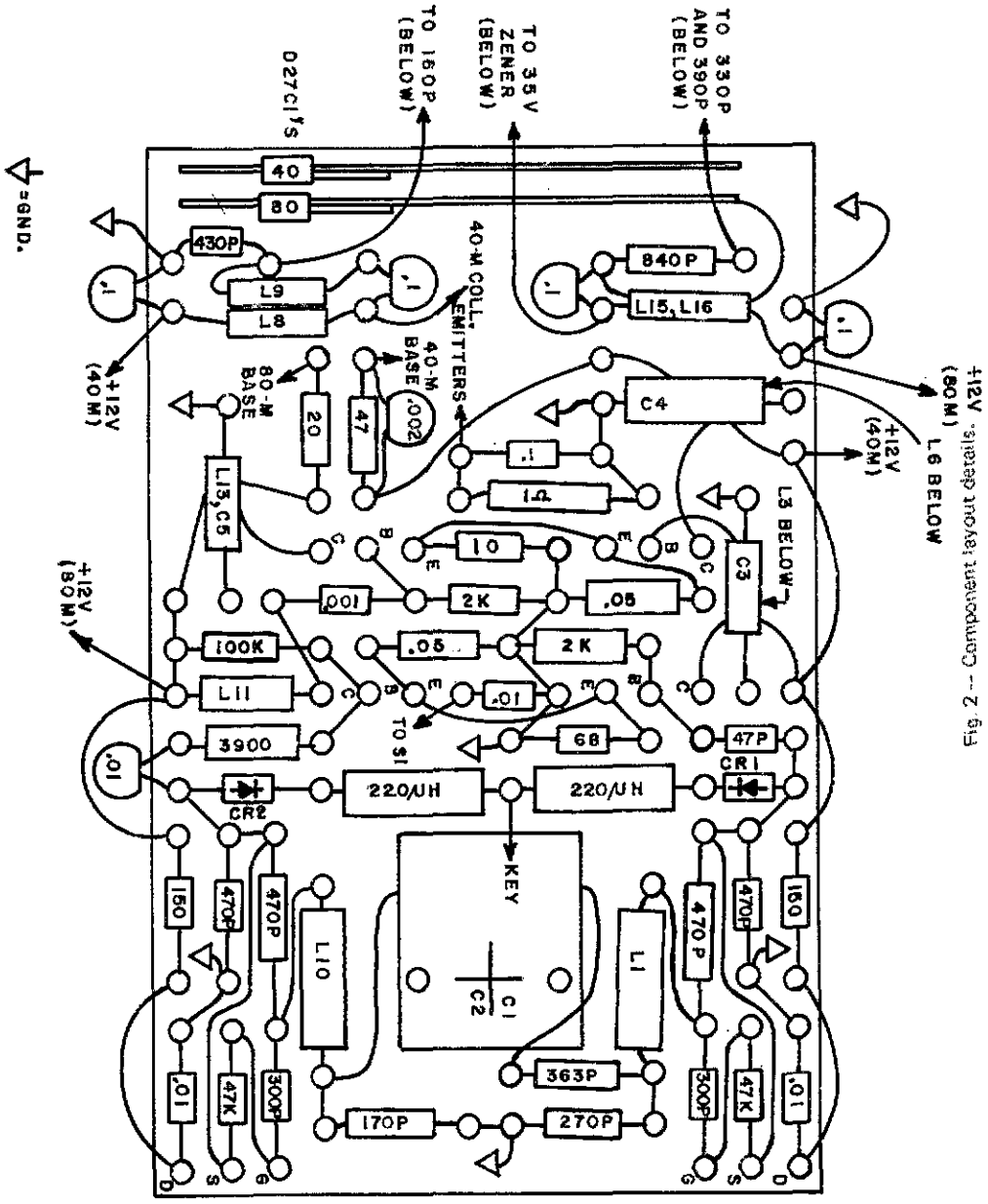


Fig. 2 -- Component layout details.

the parts are on the back side of the board. The component board is mounted to the panel by 5/8-inch spacers. The output circuits are positioned diagonally opposite from their VFOs to provide isolation.

Equipping the VFO tuning capacitor with an extension shaft was a problem. The capacitor shaft apparently had a metric thread but would accommodate several turns of a No. 2-56 screw. I drilled and tapped a 1/4-inch rod accordingly and coupled it to the capacitor with a stud made from a beheaded screw. A rubber grommet in the panel furnishes extra support for the resulting long shaft.

The D27C1 heat sinks are made of 1/16-inch aluminum and measure 7/8 × 5/8 inches. The heat sinks are bolted to brackets made out of brass chain links. Part of a link is trimmed away leaving an eye with a tail. The tail is threaded through two adjacent holes on the board and crimped. It is necessary to file notches in the 80-meter heat sink to make clearance for the tails of the 40-meter brackets. This bracket idea is a suggestion from WØYFZ who has found many problem-solving uses for chain links.

The rim of the VFO knob was drilled and tapped for 0-80 screws to provide a means for fastening on the 1/16-inch Plexiglas pointer. The hairline is a scribed line filled by rubbing a black felt marker over it.

Choice of Components

Except for the capacitor values in the tuned circuits, the overall circuit was so tolerant that it was hard to find an optimum condition. Most resistor values could be changed by 50 percent and most bypass capacitors changed from .005 to 0.1 μF with no difference in performance. There was some benefit from using the 0.1-μF values in the final +12-volt lines and emitter bypass capacitors. Values from 100 μH to 1 mH can be used in the FET sources in place of the 220 μH shown. Silver-mica capcitors are used throughout the VFO section and for tuning the final tank coils. All other capacitors are disk ceramic. An air-dielectric variable capacitor was selected for the VFO because of a feeling that it would result in best stability although a plastic-spaced one gave fine results in early VFO experiments.

Grounding Techniques

Chirp, instability, "snap-action" tuning and TVI plagued my newly completed transmitter. After suspecting things like improper bypassing and coil-to-coil feedback, I finally got around to looking for ground loops. I had picked up the various ground points with a piece of No. 20 solid wire and terminated it at one of the panel spacers. This resulted in the final rf current going through a short stretch of wire that was common to all the other circuits, a poor practice. I broke up the ground system into three parts – the VFOs, the interstages, and the finals, and brought three separate ground lines to a ground lug on the panel spacer near the antenna jack. This cleared things up, except for TVI.

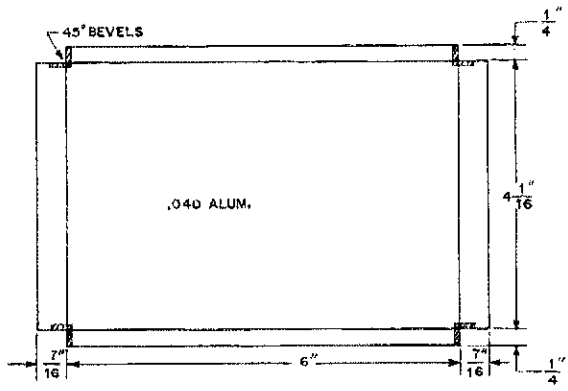


Fig. 3 – Dimensions for special cover before bending.

Tackling the TVI

It's disconcerting to look at the wave forms of a transistorized transmitter with a borrowed $1500 oscilloscope. The nice-looking sine wave present at the tuned circuits are turned into badly clipped, harmonic-rich waves. Many times, wild screams from upstairs curtailed my experimental work until a certain TV program was over. I thought that after the transmitter was nestled in its metal box the TVI would disappear. Not so.

I soon had the circuits so loaded with ferrite beads, isolation resistors and low-pass filters that performance was severely impaired and yet the TVI persisted. This led to the removal of the original output stages which used tuned circuits tapped for collector matching. Some pi-network experiments followed that developed into the circuits finally used. But it was the addition of the series-tuned circuit going to the antenna jack that eliminated TVI complaints completely and happily ended my many hours of struggling with a seemingly unsolvable problem.

Tuning Up

The usual technique of tuning the circuits with a grid dipper before applying power didn't work. The transistor junctions loaded the circuits heavily and it was difficult to couple to the coils. An effective procedure was to use the dipper in the wavemeter mode by tuning it to the desired frequency, placing it close to a 72-ohm dummy output load and tuning all circuits concerned for maximum output indication. The trimmer-capacitor values I ended up with were 93 pF for the 80-meter driver, 41 pF for 40-meter driver and 58 pF for the 40-meter doubler. The circuits tune broadly enough to cover the cw portions of the bands with practically no fall-off. Phone-band operation would require a retuning for best output.

VFO coverage is adjusted by selecting specific values of fixed-value capacitors associated with the tuning capacitors. This probably would be a good

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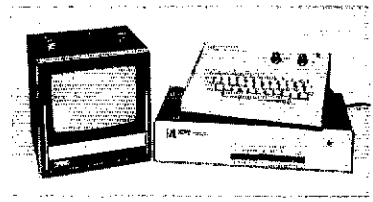
Recent Equipment

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

The HAL Communications RVD-1002 RTTY Video Display Unit and the RKB-1 TTY Keyboard



ONCE UPON A TIME there was a member of the Headquarters staff (now retired) who said, "The mere sight, sound, and smell of RTTY turned me off years ago!" The HAL Communications Corporation (formerly HAL Devices) video-display RTTY system pictured at the upper right might very well have been developed just for that statter, for gone is the oily smell, gone is the noise, and gone is what some might consider an unsightly mechanical monstrosity. In contrast, the HAL RTTY system is compact and fully solid state, employing the latest in modern integrated circuits. Using digital logic instead of selector-bar mechanisms and using memory capability which would have been totally impractical for amateur use a few years ago, the RVD-1002 video unit and associated display is unlike any teleprinter most amateurs have ever seen. It accepts teleprinter pulses of the normal 5-unit start-stop variety alright, but then it processes them to provide video which may be displayed on an ordinary television monitor. The monitor shown in the picture in the upper right is available from HAL, and is a commercially made one for use in a closed-circuit TV system. However, the RVD-1002 output is also compatible with the video requirements of an ordinary TV receiver, and the user may, if he chooses, perform a simple modification on a TV set and use it for his TTY monitor. The RKB-1 TTY keyboard shown in the photo completes the complement of equipment, and there may be seen a system which has all the capabilities of the ordinary mechanical page printer and keyboard. Add to this the desirable features of making speed changes at the mere flick of a couple of switches and the ability to receive copy off the air *in absolute silence* (receiver speaker disabled), and you have a TTY system with capabilities which surpass anything ever before available to the amateur.

The Display

The video output of the RVD-1002 follows the U.S. television standards – 262.5 lines per field, two fields per frame (with interlaced lines), and 525 lines per frame. The line rate is 15.750 kHz, the field rate 60 Hz, and the frame rate 30 Hz. Video bandwidth is slightly less than 4 MHz. The RTTY characters are displayed as white letters and figures on a black background, up to 50 characters per line and 20 lines for the complete display. The question immediately asked by those who first see the HAL system in operation is, "How in the world do they do that?" There are some clever techniques employed, to be sure.

The total display, a "page" of copy, may contain as many as 20 × 50 or 1000 characters. Each character of the display is formed by a pattern of white dots, arranged in a 5 × 7 format. See Fig. 1. The frequencies used in deriving the display are obtained from a crystal-controlled master oscillator, the "clock," which operates at 8.064 MHz (2^9 or 512 times the horizontal scanning rate). The duration of each dot (related to its horizontal width) is equal to the time between successive pulses from the master clock. Spacing between adjacent characters is equivalent to two dot widths. Seven horizontal scan lines are used to display a character, and three scan lines provide the vertical spacing between lines of characters. To develop the required pattern of dots for the various characters which are to be displayed, a custom-programmed character-generator static read-only memory (ROM) is used. Because the dot pattern for a particular character may vary depending upon the scan line of that character, the ROM is instructed not only as to what character to produce, but also what scan line of that character is being generated. A scan-line counter provides this latter information. As one can readily understand, the size of the characters will depend upon the screen size of the monitor in use. With a 9-inch rectangular tube (diagonal dimension), the character size is approximately 3/32 × 5/32 inch. This display can be read comfortably from a distance up to 4 or 5 feet away. The teleprinter characters are of a permanent nature, i.e., they appear continuously and with almost imperceptible flicker. The display is changed only by the writing of new information (or removal of power). New

information is written as it is received, along the bottom line of the display, and a cursor indicates where the next character will appear. When the line contains 50 characters (including spaces), or when a line-feed function is received, all lines of the display shift up by one line. The cursor automatically returns to the left of the bottom-line area. This continues with each line until a full "page" of 20 lines is displayed. When the next line feed is received or when the bottom line is full, all lines again shift up one. The earliest information received, the top line of the display, disappears when this happens.

Most teleprinters are adjusted to display from 66 to 72 characters per line, sometimes as many as 75. Amateurs generally type nearly to the margin limits of their machines. The received copy with the RVD-1002 from such transmissions is therefore a full line (50 characters) followed by a half line, a full line and a half line, and so on. The 50-character line was likely chosen by HAL engineers for economy reasons, as this permits them to use standard IC memories for line and page information, and also simplifies the control requirements. "Carriage return" and "line feed" are automatic after 50 characters appear on a line, and frequently a word will be broken at the end of the line, with the final few letters appearing at the beginning of the next line. One soon becomes accustomed to this, however.

Machine functions, such as carriage return (CR), line feed (LF), letter shift (LTRS) and figure shift (FIGS), do not appear on the display. In fact, carriage-return functions are ignored completely by the RVD-1002. A received line-feed function serves to return the writing cursor to the left as well as to shift the lines up one. Unshift-on-space is available by depressing a locking push switch on the front panel, and defeated by pushing it again. Characters are displayed in accordance with the U.S. military communications keyboard arrangement, including a slant zero (∅). A FIGS J function displays an apostrophe. Because TV monitors have no signal bell, a received FIGS S function doesn't make any noise. Instead, a little picture of a bell appears on the display. . . HAL seems to have thought of everything.

Circuit Operation

The input section of the RVD-1002 video unit accepts the incoming teleprinter pulses, which arrive in a serial or time-sequence manner. An opto coupler at the input provides isolation of the TTY loop from the remainder of the RVD-1002 circuits. The input will handle a full 60 mA of loop current, but will operate with less. A bridge rectifier type of circuit at the input makes it unnecessary to observe voltage-polarity precautions.

The Baudot code contains a space start impulse, five selector pulses (either mark or space), and a stop pulse (mark). All pulses are of equal duration for a given speed of operation, although the stop pulse may be longer. Clocking of the input section is controlled by a crystal oscillator. Operating speed selection is made simply by switching crystals – 5.9578 MHz for 60 wpm, 6.5536 MHz for 66 wpm, 7.4599 MHz for 75 wpm, and 9.7306 MHz for 100 wpm. Each of these crystal frequencies, when divided by 2^{17}, equals the baud rate for the appropriate speed. Depressing the proper push switch on the front panel selects the desired speed.

Once a space start pulse is received by the RVD-1002, the unit waits for approximately half the normal duration of the impulse and then samples the input. If the space condition is no longer present, the impulse is considered to be a transient, and is ignored. If the space is still present, then the pulse is considered a valid start signal. This cute trick eliminates much of the garble such as that appearing on mechanical printers as a result of static crashes and bursts of QRM.

Once a valid TTY character is received, the five selector pulses are clocked into a 5-bit shift-register memory. From here they are extracted in parallel format, all five bits simultaneously. These five bits plus a case bit – one which indicates whether the character is upper or lower case – are passed to the page memory. The block diagram of Fig. 2 shows the point of data entry into the memory, in the lower left section of the drawing. The page memory itself is six independent 1024-bit dynamic shift-register MOS IC memories operating in parallel. The first IC contains up to 1000 TTY-character first selector-pulse bits, the next contains second selector-pulse bits, and so on. (The extra 24-bit capability of these memories is not used; these bits are "clocked through" during the time between frames of the display.) The information of the page memory is recirculated, and new information is entered near the end of the frame, always on the bottom line of the display. This is done by opening the feedback loop and inserting fresh data in place of the old. This function is performed by the data-entry control circuits. Thus, the display is unchanged unless new information is received.

To develop the display itself, information is transferred into the line memory as it is being recirculated in the page memory. This transfer

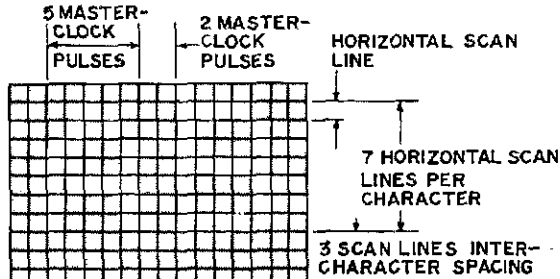


Fig. 1 – The scheme used for character presentation on the video monitor with the HAL Communications RVD-1002 Video Display system.

takes place a line at a time, 50 characters. Clocking of the page memory is stopped while a line of information is being written on the display. The line memory consists of six independent 50-bit memories operated in parallel, each memory being half of a dual-memory IC (three ICs total). As the line memory is clocked, the data bits are recirculated and simultaneously appear at the input of the character-generator ROM IC. The output of this memory is five bits in parallel – those five dots (or lack of dots) to be written on the display for a particular scanning line number for a particular character. These bits are transferred simultaneously to a 5-bit output shift register, where they are clocked serially to a video combiner and are available in the proper sequence at the video output. The information of the line memory is recirculated time after time, reading each TTY character into the character generator as each scan line of the displayed signal is produced. Thus, to form a complete line of characters on the display, the line-memory bits are recirculated seven times. Once a complete line has been written on the display, clocking of the page memory is resumed and the next line of data is clocked into the line memory. Synchronization of all the various clocking operations with that of the video sync data and the insertion of updated characters is controlled by the 8.064-MHz crystal oscillator.

The RVD-1002 provides no permanent record of received copy. For those who enjoy swapping RTTY pictures or for those handling message traffic by RTTY, this would be a great disadvantage. On the other hand, think how nice it would be after a several-hour on-the-air session not to have yards and yards of paper strewn all over the floor. For that matter, with the RVD-1002 the paper-procurement problem is solved permanently.

The RKB-1 RTTY Keyboard

The HAL RKB-1 keyboard is similar in many respects to a keyboard-operated Morse-code keyer. Coding of key-switch pulses into the proper Baudot format for RTTY transmissions is accomplished by transformer coupling – wires leading from the key switches are threaded through appropriate toroid cores. The technique is the same as that used in Touchcoder II.[1] There are five toroids, one for each selector pulse of the Baudot code. Appropriate data bits are transferred in parallel into a 5-bit shift register. Start and stop impulses are added, and the code is then clocked out of the register serially. A switching transistor keys the output loop current, and voltage polarity must be observed for proper keying of external circuits.

Four operating speeds are available from the RKB-1 – 60, 66, 75, and 100 wpm. A rotary switch which is positioned above the key switches on the keyboard is used to select the desired speed. Speed changes are accomplished by changing the clock rate. The clock oscillator or pulse generator is a UJT relaxation type of oscillator. One of four calibration controls is selected in each position of the speed switch, the resistance of the control determining the frequency of oscillation. These controls are set at the factory, and provide for selector-pulse durations of 22, 20, 17.57, and 13.47 ms for the four speeds. Actually the maximum transmission speeds are slightly less than the four given above because the duration of the stop pulse from the RKB-1 is twice that of the selector pulses, e.g., 44 ms at 60 wpm. Thus, the actual maximum speeds are 56.8, 62.5, 71.1, and 92.8 wpm, although the selector-pulse durations are standard for the 60, 66, 75, and 100 wpm speeds respectively. These slight speed differences would likely never be detected in on-the-air operation, and are mentioned here only for those interested in the fine points of the technical details.

There are a number of differences between the RKB-1 and a mechanical keyboard. The RKB-1 has 51 keys plus a space bar, whereas there are 31 keys and a space bar on a mechanical counterpart. Four of the 51 keys are unused. Of the remaining 47, 26 are for letters, 10 for figures, 5 for punctuation, and one each for carriage return, line feed, blank, and repeat (when depressed simultaneously with any other key). Some of the numeric and

[1] See Bryant, "Touchcoder II," *QST* for July 1969, p. 11.

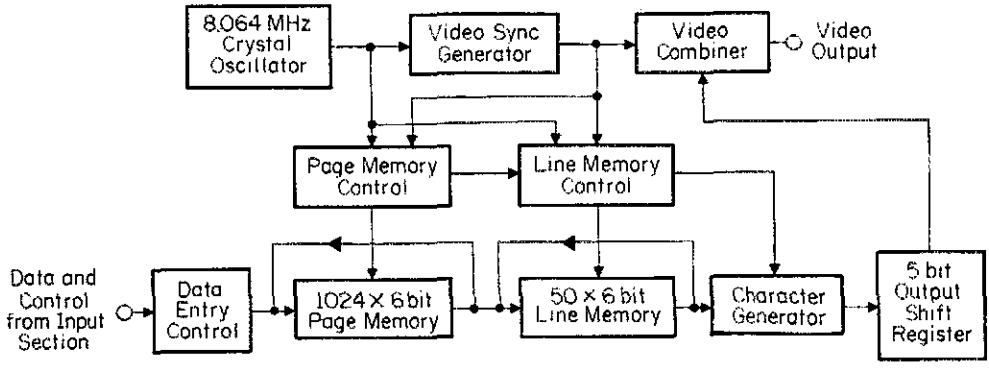
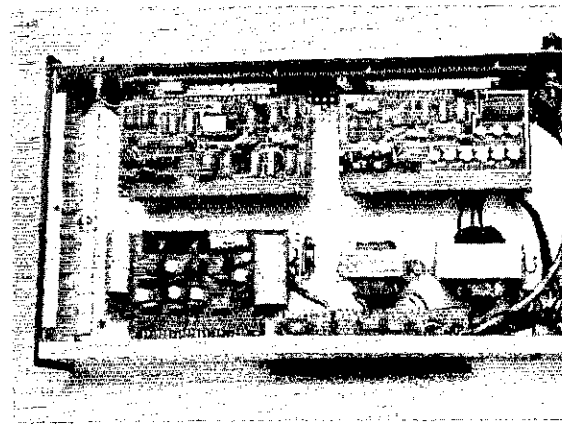


Fig. 2 – Block diagram of the memory and display sections of the RVD-1002.



The working parts of the RVD-1002 are mounted on five circuit boards. Shown here at the lower left is the power supply board. The page-control board appears at the upper left, and the character-memory board at the upper right. Hidden beneath the boards at the top of the chassis are the input-control board and the character-control board. The complete RVD-1002 contains 73 integrated circuits and several transistors.

punctuation keys serve a dual function, controlled by either of two "shift" keys. The shift keys do not send a code to shift the carriage of the receiving printer from letters to figures, as on a mechanical keyboard. Instead, a shift key must be depressed and held while another key is struck to activate a "shifted" function. For example, the dollar sign ($) is located on a dual-function key with the number 4. If the 4 key alone is struck, the keyer will emit the Baudot code for a number 4 (space mark space mark space). But if a shift key is depressed and held while the 4 key is struck, a $ will be sent (mark space space mark space).

There are no letter-shift nor figure-shift keys on this keyboard, *per se*. The keyer has a flip-flop memory which "remembers" whether figures and punctuation or letters are being sent. An appropriate code, either FIGS or LTRS, is inserted and sent preceding the character whenever a change occurs. To send W1AW, for example, the W, 1, A, and W keys are struck in sequence. The keyer inserts a FIGS function appropriately ahead of the 1, and a LTRS function ahead of the A. When transmitting groups of figures, there is an automatic unshift-on-space function. Typing 73 (space) 73, for example, results in the code sequence FIGS 7 3 LTRS SPACE FIGS 7 3 and so on. Similarly, an automatic unshift on carriage return is supplied when the keyer is sending figures.

With this keyboard it is quite difficult to send the CR CR LF LTRS format which has become an end-of-line habit for most RTTY operators. Although certain manipulations of some of the keys will send the code for a letters shift, it doesn't appear as if the keyboard was designed with this function alone in mind. If a receiving printer without an unshift-on-space feature inadvertently gets hung up in the figures position of the carriage because of QRN or QRM, it is conceivable that several lines of meaningless punctuation and figures would appear on the copy. In normal manipulation of the RKB-1 keys, no letters-shift function will be sent until after the typist sends a figure or punctuation character and then resumes the typing of letters.

The key switches are noiseless. When this is coupled with the fact that there are no mechanical restraints on the keys, such as there are on mechanical counterparts, it is easy to understand why one can "crowd" the keyboard, punching keys faster than characters can be generated. When this happens, characters which were punched while another is being sent are lost. Rapid typing of NOW IS THE TIME at a somewhat nonuniform rate therefore comes out something like NOWIS TE TME, or whatever. The combination of differences in key locations and key functions, plus this feature of easy "crowding," all add up to one fact – for a person who is a touch typist on the old-fashioned 31-key keyboard, some relearning is going to be necessary before he becomes proficient in the use of this one. – *KIPLP*

HAL Communications Solid-State RTTY System

RVD-1002 Visual Display System:

Dimensions (HWD) and Weight: 3-3/4 × 17 × 10 inches, 9 pounds.
Power requirements: 120V ac.
Colors: Two-tone gray.
Price class: $525 (available assembled only).

Panasonic Solid State TV Monitor, model TR-910MN:

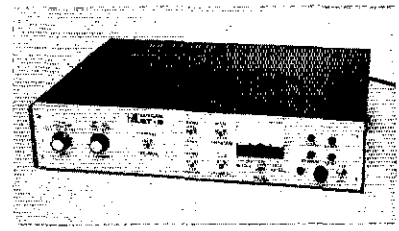
Dimensions (HWD) and Weight: 10-3/4 × 9-1/2 × 9-1/4 inches, 13 pounds.
Power requirements: 120 V ac, 60 Hz, or 12 V dc, 12 W.
Colors: Flat black, aluminum trim.
Price class, $140.

RKB-1 TTY Keyboard:

Dimensions (HWD) and Weight: 4-1/2 × 12-1/2 × 9-1/2 inches, 7-1/4 pounds. Top panel is sloping.
Colors: Two-tone gray; keytops are gray with white letters.
Price class: $275 (available assembled only).

The Panasonic monitor is manufactured by Matsushita Electric Industrial Co., Ltd., in Japan and is available directly from HAL. Manufacturer of all other equipment listed above: HAL Communications Corp., Box 365A, Urbana IL 61801.

The HAL ST-6 RTTY Demodulator



Another item of RTTY equipment offered by HAL Communications is the ST-6 demodulator. The ST-6 accepts frequency-shifted audio tones from the station receiver and converts the information into the dc pulses required to operate the teleprinter (or the RVD-1002 video display). A power supply is built into the ST-6 to provide the 60 mA loop current that is required in most TTY loops.

Basically the HAL ST-6 is the deluxe solid-state RTTY demodulator which was designed by Irv Hoff, W6FFC, and which has been described in *Ham Radio*.[2] A couple of other options have been included which make the HAL version of the ST-6 a truly flexible instrument. In addition to offering switch selection for copying either 850- or 170-Hz shift as Hoff did, HAL has also incorporated a third discriminator designed for copying 425-Hz shift. Although most amateur RTTY operation takes place with shifts of (or close to) either 170 or 850 Hz, there are many stations to be heard outside the amateur bands using 425-Hz shift. Thus, for the cost of a few extra parts, HAL is able to offer the ST-6 at an attractive price to commercial users.

Also available for inclusion in the HAL ST-6 is Hoff's AK-1 afsk oscillator. Information on the AK-1 has also been published.[3] Operating with an input from the loop-current portion of the ST-6, the AK-1 section provides amateur-standard audio tones, 2125 Hz for mark, and either 2295 or 2975 Hz for space, depending on whether the shift-selector switch is set for 170 or 850 Hz. (With the switch set at 425 Hz, a steady mark tone only is emitted.) The afsk output may be keyed with an external keyboard connected into the loop, and it is also keyed by a signal being received.

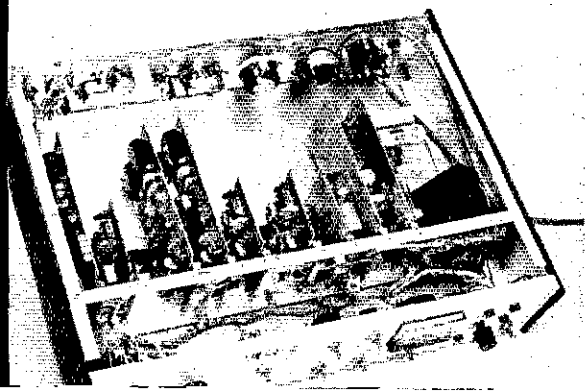
Hoff's afsk circuit was designed with the primary objective being to provide harmonic-free tones with no switching transients in the mark-space transition. The output of the AK-1 section is "clean," and may be fed directly into the microphone input of a vhf a-m or fm transmitter for A2 or F2 RTTY operation in those bands. A number of users of the AK-1 circuit are feeding the tones into the microphone jack of an hf ssb transmitter to obtain frequency-shift keying. This method does provide a satisfactory means of obtaining F1 operation with properly designed and constructed ssb equipment which is correctly adjusted, but there are a few precautions to be observed. Hoff discusses these precautions in some detail.[4] The user should make certain that carrier and unwanted sideband suppression of his ssb rig are not present to the degree of causing interference in receiving equipment of good engineering design. Too, he should make certain that the rig can withstand the higher-than-average power from that handled with ssb, concerning both the PA tubes and the final plate-supply transformer. In general when using ssb equipment for RTTY operation, the dc input power to the final stage should be no more than twice the plate-dissipation rating of the PA tubes.

Other features of the ST-6 include a normal-reverse switch for ease in copying those stations which transmit "upside down" from amateur convention, autostart, (including motor control), and antispace circuits. A front panel meter provides a tuning indication, and at the flip of a switch indicates the amount of current flowing in the loop. Another switch offers selection of an efficient limiter circuit, or limiterless (sometimes called two-tone) operation. In limiterless operation, a special threshold corrector circuit is

[2] Hoff, "The Mainline ST-6 RTTY Demodulator," *Ham Radio*, January 1971, p. 6, and "Troubleshooting the ST-6 RTTY Demodulator," *Ham Radio*, February 1971, p. 50.

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

[4] See footnote 3.



A peek inside the ST-6 shows that all active components are mounted on nine circuit boards, each with its own edge connector and mating socket. From left to right the boards contain parts for the AK-1 audio oscillator, 850-Hz discriminator, 850-Hz input bandpass filter, 170-Hz bandpass filter, 170-Hz discriminator, 425-Hz discriminator, slicer and loop keyer, antispace and autostart, and power supplies.

employed in connection with the discriminator circuit. This circuit also enables copy to be made from mark-only or space-only signals.

The ST-6 is available from HAL either wired, adjusted, and tested, or as a package of parts. Although a rather comprehensive instruction booklet is included with the parts package, HAL cautions that this is not a kit in the sense that detailed assembly instructions are provided. Instead, the kit is offered to provide the experienced RTTY enthusiast with a package of quality parts at a reasonable price.

A proliferous amount of information has been published on both the ST-6 and the AK-1 circuits, and even portions of that information need not be repeated here. Suffice it to say that the ST-6 is probably one of the best RTTY demodulators ever devised. When used as a companion unit with the RVD-1002 video display and the RKB-1 keyboard described earlier, an attractive and compact system results, providing the amateur with everything he needs to add RTTY capability to his existing station. And the flexibility of that system really becomes apparent when one tunes to frequencies *outside* the amateur bands. With manipulation of the normal-reverse switch and the 170/425/850-Hz shift switch on the ST-6 demodulator, and of the 60/66/75/100-wpm push switches on the RVD-1002 video display unit, intelligible copy can be had from just about any RTTY signal one tunes. — *KIPLP*

ST-6 RTTY Demodulator

Dimensions (HWD) and Weight: 3-3/4 × 17 × 13-1/4 inches, 12 pounds.
Power requirements: 120 V ac.
Colors: Two-tone gray.
Price class: Wired and tested, with AK-1 and three shifts, $360; kit without cabinet, $135.
Manufacturer: HAL Communications Corp., Box 365A, Urbana IL 61801.

QST —— QST —— QST

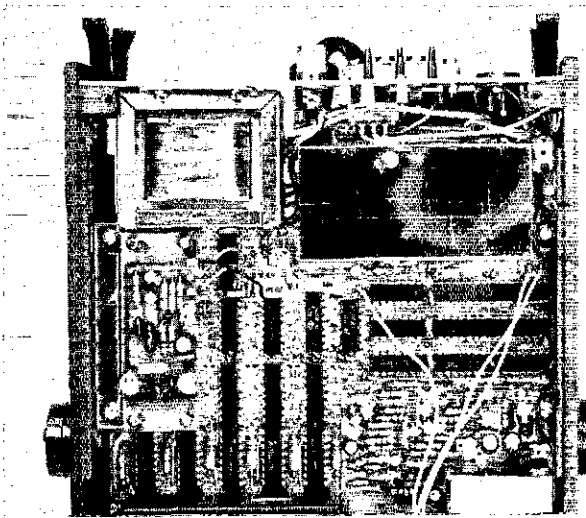
Digipet-60 Frequency Counter and Digipet-160 Converter

WHEN HERE FOR testing, the Miida frequency counter, and the petite companion converter (prescaler), were quite in demand around the lab. The author, once in the instrument industry himself, can vouch that few higher compliments *than that* are required. Versatility, novel circuit design, practical and attractive packaging; these are the important factors in instrument design, and ones in which the Digipet-60 counter and the Digipet-160 frequency converter rate very high.

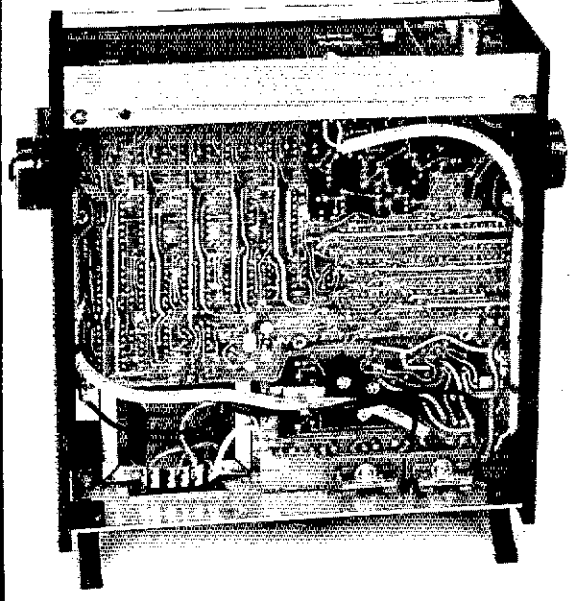
Design Features

A combination of noise and extraneous frequency components can often cause errors in making measurements with a frequency counter. Adequate rejection of error-producing signals is accomplished by the circuit shown in Fig. 1, along with a good high-pass filter in the converter.

By limiting the sensitivity, or by using the 50-ohm input, signals are processed by the input circuit (Fig. 1) *before* getting to the subsequent gating circuits. Since the gating circuits are designed to trigger only on signals above a certain level, noise (or other low-level spurious energy) will not affect accuracy, when sufficient attenuation is used. Three sensitivity ranges are available (50 mV, 0.5 V, and 5 V) with the Digipet-60 counter. The 50-ohm input contains a simple high-pass filter with a cut-off frequency of 5 MHz, which eliminates any undesired low-frequency energy.



Top view of the Digipet-60 (note shielding).



Bottom view of the counter.

The latter problem becomes more important when vhf circuits are considered. In multiplier chains, subharmonics of the operating frequency can be quite strong. For example, the tuned circuits of a 2-meter exciter may have inadequate rejection for energy at the fundamental frequency, and erroneous counter readings could result.

The high-pass filter in the Digipet-160 converter (*fc* is approximately 130 MHz) rejects any submultiples below 130 MHz.

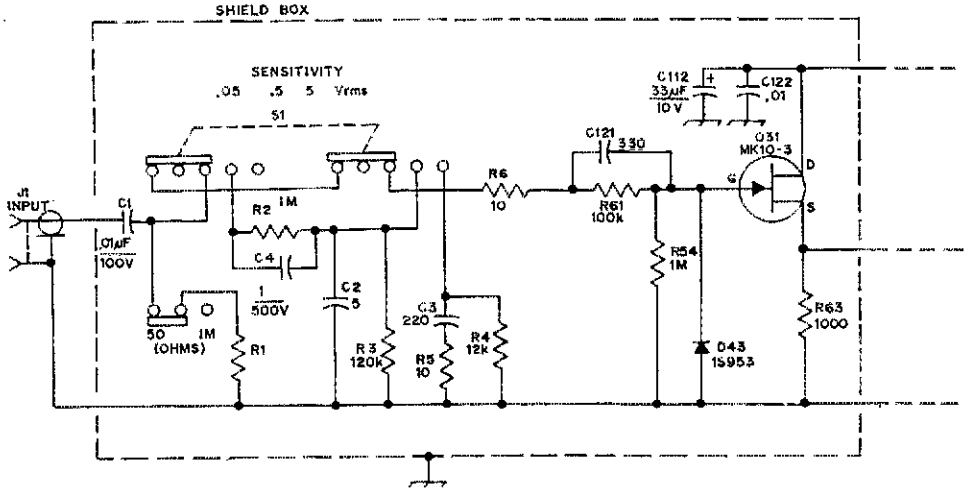
Mechanical Packaging

Test equipment seldom leads a pampered existence, so the author went on a fault-finding tour. On the back panel, he spied a 117/12-V switch, and reached for the "rejected" stamp. But victory was frustrated; it was recessed far enough to prevent accidental tripping. The converter tucks under the counter as shown in the photograph, but it can be mounted permanently on the bottom plate. The carrying handle folds down and can be used to tilt the counter at a comfortable viewing angle. Since the middle of the handle is rubber-covered, this counter doesn't have the annoying habit of sliding around.

RFI Susceptibility

As many amateurs unhappily know, the advent of low-voltage, solid-state devices has caused some nasty RFI problems in poorly designed circuits. Since the Miida unit is basically an rf instrument and uses mostly solid-state components, a few checks in the presence of strong rf fields were made. For example, when placed approximately six inches from a voltage-fed antenna (1.8 MHz) used with an ARC-5 transmitter, no indication resulted with the input jack disconnected. However, a 1-inch piece of wire used as a probe provided enough pickup of energy to drive the counter. Similar tests were performed near the antenna couplers at W1AW during code-practice transmissions with the same results. Generous use of rf shielding and filtering is evident throughout the unit. While the above tests are hardly as thorough as those required by the armed forces, for example, if the counter does start reading with the input disconnected, the author advises getting out of the room fast. That's a *big* signal! – *W1YNC*

(Continued on page 101)



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

Fig. 1 – Schematic diagram of the input circuit of the Digipet-60 counter.

Technical Correspondence

TIPS ON TELEFAX TRANSCEIVER CONVERSION

Technical Editor, *QST*:

After having been involved with the conversion of several Western Union Telefax machines[1] for operation on 6 m, I have compiled a brief list of tips others might find helpful. Let me add that what may be the first two-way A4 QSO via sporadic-*E* skip took place on Dec. 3, 1972 at 0100 Z between WB9CAG and WB4QMI; in spite of some fading, readable copy was received on both ends during this brief 6-m opening.

1) A new stylus holder can be easily constructed from a small piece (about 1/4 by 3/4 inch) of copper-clad board, appropriately drilled to be secured in the stylus armature bracket (suggested by WB9FRG). The carbon steel wire for the stylus can be easily soldered to the board (it is almost impossible to solder it to the original holder).

2) Paper can be purchased from some local Western Union offices; for about $7 we obtained a roll from which about 1200 sheets were cut.

3) The light pipe needed for the positive picture conversion can be constructed from a piece of spaghetti and several lengths of 10-mil fiber optics (available from Radio Shack). A better null can be obtained in the output amplitude if *both ends* of the light pipe are adjusted. Also, the No. 14 wire that W7QCV specified is a "must," as smaller diameter wire will not hold the light pipe securely.

4) Tests show that the "gray motor" induces only a few millivolts of ac on the output transformer (called the line transformer by W7QCV) — far below the amplitude of the modulated output. Therefore, it may not be necessary to move this transformer (which necessitates cutting away some of the skirt on the cover).

5) Adjustment of the output level is critical if good copy is to be sent. It is most convenient to set the transmitter mic gain control for the normal voice level and then adjust the FAX gain control to the proper level. This should be done using only black (if the positive conversion has been done — use white if not) and by bringing the modulation to about 90 percent as viewed on a scope. It is possible to set the level if one's relative output indicator normally responds to voice: note the peak deflection of the meter during voice operation and then set the FAX output to obtain about the same deflection. While this will produce a usable output, it's still better to use a scope (either at the transmitter or on a receiver).

I hope the above information will be of some help to you. — *Thomas M. Whittaker, WA9RSB, 1611 Reetz Rd., Madison, WI 53711.*

[1] King, "Conversion of Telefax Transceivers to Amateur Service," *QST*, May, 1972, p. 23.

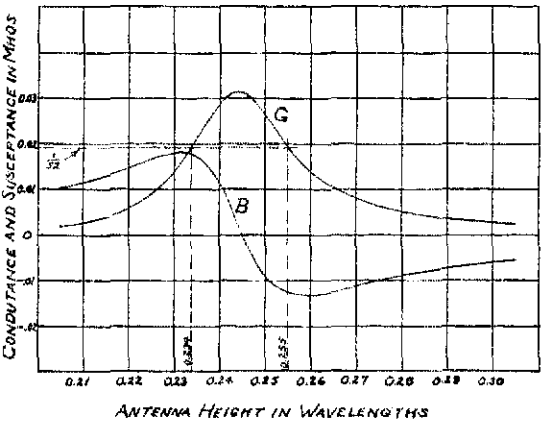


Fig. 1 — Conductance and susceptance of a vertical antenna over a perfect ground, or a quarter-wave ground plane remote from the earth (data from ARRL *Antenna Book*, for an antenna length-to-diameter ratio of approximately 1000).

ADMITTANCE MATCHING THE GROUND-PLANE ANTENNA TO COAXIAL TRANSMISSION LINE

Technical Editor, *QST*:

About 25 years ago when I was becoming interested in getting a signal on the two-meter band, I saw an article by Hasenbeck[2] on the design of a ground-plane antenna with a tuning and matching stub used as part of the supporting structure. Such construction was interesting because the whole thing was electrically connected, thus at ground potential (except at frequencies close to that for which it was tuned). Consequently, it could be permanently grounded for protection against lightning. Also, the ground plane acts like a shield to prevent feed-line radiation from induced rf currents flowing on the outer conductor. I didn't fully understand the design principles.

In 1952 another article on the same subject was published by DeCamp.[3] In it a precedure was described by which one could determine the lengths of the antenna and coaxial stub to match a given coaxial cable. I didn't understand that one either, although I could follow and use it. Recently I reread both articles but still don't understand them. However, something in the Hasenbeck article suggested a key to the solution of the problem.

In these designs the antenna is shortened from the $\lambda/4$ resonant length. This introduces enough reactance (capacitive in this case) to transform the input resistance from about 25 ohms to the characteristic impedance of the coaxial cable. Then the resulting reactance is tuned out by a short-circuited coaxial stub connected in parallel to the base of the antenna. The parallel combination then presents a pure resistance of the desired value to the transmission line.[4]

[2] Hasenbeck, "Design Procedure for Ground-Plane Antennas," *Electronics for Engineers*, edited by Markus and Zeluff, McGraw-Hill, New York.

[3] DeCamp, "Matching Coax Line to the Ground-Plane Antenna," *QST*, September, 1952, p. 18. This information also appears in condensed form in recent editions of *The ARRL Antenna Book*, Chapter 3, Transmission Lines.

[4] [EDITOR'S NOTE: This same principle is used in the hairpin matching arrangement. See Gooch, Gardner, and Roberts, "The Hairpin Match," *QST*, April, 1962, p. 11.]

The key to the easy solution of this, and other problems involving impedances in parallel, is the use of admittances instead of impedances. The admittances of components in parallel are additive. Stubs for tuning and matching are always in parallel with the line or the antenna. Series stubs are conceivable on parallel-wire lines but are impracticable on coaxial lines.

The problem is to find the lengths of an antenna and a stub, so the parallel combination presents a purely resistive load of the desired value to the coaxial transmission line. Since the conductance and susceptance of a vertical antenna are complicated functions of the length, the only practicable procedure (other than experimental) for finding these lengths is graphical.

As an example of the procedure, data taken from figures 2-78 and 2-80, page 61 of *The ARRL Antenna Book* (10th edition), were converted to conductances and susceptances (discussed later). The resulting values were used to plot graphs as functions of antenna height (length) in wavelengths. These are shown in Fig. 1.

To match a 52-ohm coaxial cable an input conductance of 1/52 mhos is needed. In Fig. 1, a horizontal dashed line is drawn at this level. It may be seen that there are two heights for which the conductance has the desired value, 0.234 λ and 0.255 λ. In the shorter one the susceptance is positive (capacitive), and in the longer it is negative (inductive). So far as radiation is concerned, one is as good as the other. The shorter one is considered the more desirable however, because the shorted coaxial stub for balancing the susceptance is less than a quarter-wavelength long.

The value of the susceptance to be balanced may be read from the susceptance curve, *B*. In this example, at $h/\lambda = 0.234$, the susceptance is $B = 0.0178$ mho. The length of the shorted coaxial stub to balance this may be computed by:

$$\frac{L}{\lambda} = \frac{1}{360^{\circ}} \text{ arc cotangent } \frac{B}{Yo}$$

where *Yo* is the characteristic admittance (1/Zo) of the stub (not the feed line), and *B* is the susceptance to be balanced (the change of sign has been accounted for).

The results obtained in this example agree with those computed by DeCamp's procedure within the accuracy of the data.

The data from *The ARRL Antenna Book* were the only ones accessible when the above example was computed. Unfortunately they are for a length-to-diameter ratio of approximately 1000. They would be applicable if one wanted to make a two-meter antenna of number 24 wire, or a twenty-meter one of number 5. This is unlikely; consequently these results are rather impractical.

In order to present some useful data, a design has been prepared for a two-meter antenna made from one-half-inch rigid copper water pipe (outside diameter = 5/8 inch), which is easily obtainable. The data used for this were taken from the work of Ronold W. P. King.[5] Graphs for *G* and *B* for this case ($\lambda/d = 129$) are shown in Fig. 2.

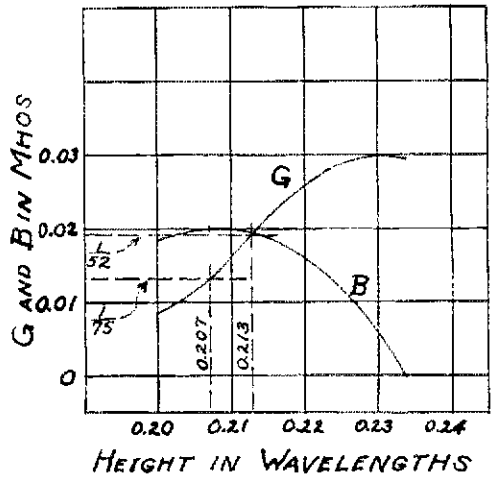


Fig. 2 — Conductance and susceptance of a vertical antenna for which the ratio of wavelength to diameter is 129. This corresponds to an antenna for the two-meter band made of 1/2-inch rigid copper water pipe (5/8 inch OD).

To match 52-ohm cable, the antenna length (height) is 0.213 wavelength. The corresponding susceptance, to be balanced by the stub, is 0.0194 mho. To match 75-ohm cable the antenna length is 0.207 wavelength and the susceptance is 0.200 mho.

The upper end of the antenna tube should be closed by a copper disk soldered on, since King's data are for solid cylinders rather than hollow ones (the end effects are different). This antenna, if designed for the middle of the two-meter band, should give a low SWR over the whole band. Its broad tuning is indicated qualitatively by the broadness of the curves in Fig. 2 compared to those in Fig 1, since the scales are in the same increments.

The length of the ground radials, from their outer ends to the inside of the coaxial stub should be one-quarter wavelength.

A drawing showing the construction of a ground-plane antenna supported by the matching stub is shown in Fig. 3. A single piece of rod, tubing, or pipe forms both the antenna and the inner conductor of the coaxial stub. The outer conductor of the stub supports the ground-plane structure.

It would be better if the feed cable were attached through an elbow instead of as shown in the figure. That would reduce the coupling between the antenna and the feed line, thus reducing induced antenna current on the outside of the line. This is important because radiation from the feed line raises the angle of maximum radiation.

Four radials are usually considered sufficient. However, the shielding of the feed line and the pole from the induction field of the antenna would be improved by additional radials. The diameter of the radials is unimportant aside from consideration of sufficient rigidity.

Admittance is defined as the reciprocal of impedance, thus:

$$Y = G + jB^{\dagger} = \frac{1}{Z} = \frac{1}{R + jX}$$

[5] King, Mimno, and Wing, *Transmission Lines, Antennas, and Wave Guides*, Dover Publishers, 1965, pp. 98-103. These are new data, not contained in the older McGraw-Hill edition.

† I prefer $Y = G + jB$. Some authors use $Y = G - jB$. King, Mimno, and Wing have converted, in the Dover edition, to the definition shown in the text.

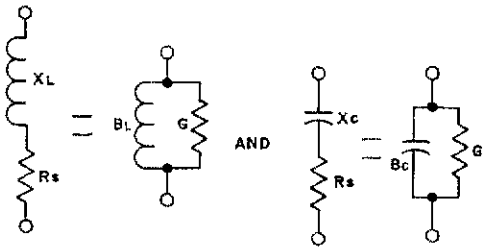
Conversion formulas are:

$$G = \frac{R}{R^2 + X^2}, \qquad B = \frac{-X}{R^2 + X^2},$$

and

$$R = \frac{G}{G^2 + B^2}, \qquad X = \frac{-B}{G^2 + B^2}.$$

Thus:



The values of the equivalent G and B are, of course, dependent upon the frequency. For components in parallel:

$$Bc = \omega C, \quad BL = -\frac{1}{\omega L}, \quad G = \frac{1}{Rp},$$

and $$Y = \frac{1}{Rp} + j\left(\omega C - \frac{1}{\omega L}\right).$$

– Robert E. Stephens, PhD, W3MIR, 4301 39th Street NW, Washington, DC 20016.

"TUNNEL" PROPAGATION AT HF?

Technical Editor, *QST*:

Past issues of *QST* contain articles concerning "delayed echoes," reported by several amateurs and seriously researched by some.[6] I never have experienced a delayed echo, but working VKs and ZLs with two receivers hooked up to different antennas can create some fun in the shack. This, of course, will be nothing new to many hams. But how about hearing and working a station 13,000 miles away and discovering that he is the *only* station on the band – from top to bottom? Why was it that I could work him 599 with the same report from him and someone across town couldn't even hear him?

During the winter of 1957, at approximately 11:15 P.M. EST, I was slowly tuning the 15-meter band. Normally, nothing at all would have shown up at that hour on 15. Above my house, 41 feet off the ground, was a 40-meter dipole fed with coax. I was using it on 15 meters. I was using crystal control for a homemade rig, with an 807 running about 40 watts. The receiver was a National NC-300, set for its 500-hertz selectivity. With the XYL watching TV (it was quite a novelty in 1957), headphones were *de rigueur*. BLAM!! A crystal-clear whale of a signal sliced through that shook the phones on my head. That rotten kid next door? Not at that hour. I was stunned to read his call . . . ZL2RS! My first thought was like those of so many hams who hear a real DX station and think it might be a pirate. Consider the circumstances – this wasn't 20 meters. It was dead-and-gone 15, and there on cw was ZL2RS banging out CQ! My second thought occurred while noting the call in the logbook – run upstairs and wake up my son, W1JWZ. I squelched that urge, waiting on an answer to my call. Back came ZL2RS, his signal flailing away at my thin wire up there. "RST 599, xlnt kyg," and so on. That's when I woke up W1JWZ. Together, we could only sit and stare at the receiver. After a solemn promise to QSL promptly, we signed and sat back to hear the expected pileup on the 21-MHz frequency. Not a sound. We tuned the receiver dial back and forth, fully expecting to hear pandemonium – but nothing. The entire contact, from start to finish, lasted more than twenty minutes. Surely that ZL's signal must have been heard somewhere near us. We spent more than half an hour slowly tuning the band for just one more signal that would give us some idea of the extent of the opening. Still nothing.

For the next three weeks, we were in suspense about the whole episode. After some twenty days had passed, we were convinced we had been "taken." But on the next day, two beautiful, authentic QSL cards came in the mail from New Zealand. And ZL2RS noted that he had not worked anything else during that period. We have no explanation for this. W1JWZ and I took to calling it "tunnel" reception – some strange quirk of the ionosphere that put our respective signals together at that particular moment in two particular places and nowhere else. Does anyone have an answer? – *Morton I. Blender, W1KGR, 60 Broadway, Providence, RI 02903.*

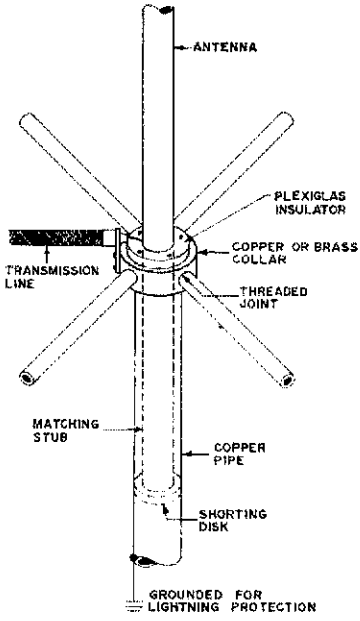


Fig. 3 – Construction of a ground-plane antenna supported by the tuning stub.

[6] Recent articles on the subject of long-delayed echoes, greater than one or two seconds, appear in the following issues of *QST*: May 1969, February 1970, May 1971, and November 1971.

FEEDBACK

L. H. Vale, VK5NO and author of "OAKEY – An Op-Amp Electronic Keyer" (*QST* for October 1972) mentions that Q1 in Fig. 4B should be shown as a pnp type, rather than npn. He mentions further that if the circuit of Fig. 4B is used with a

transmitter which shorts the keying terminal to ground for ssb (or a-m) operation, a diode should be added to the circuit to protect Q1 from the transient which develops because of the accumulated charge on C5 (erroneously referenced as C1 in the text). The diode may be silicon, and should be connected between the base of Q1 and ground, cathode side grounded.

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WA1IED mentions that he has completed the construction of WA1BYM's memory keyer (Riley, "An IC Keyer with Programmable Erasable Memory," *QST* for February, 1973), and it plays "beautifully" with two 2527V IC memories as suggested at the end of the article. There is one error in the schematic diagram which might befuddle other builders, though. Input pins for U9A, a 4-input gate, are 1, 2, 4, and 5, instead of 1, 2, 3, and 4, as shown. Improved noise immunity will be obtained for the MOS memories if pin 2 of U4 (pin number omitted on diagram) is connected to +5 V through a 10,000-ohm "pull-up" resistor. Similarly, a 10,000-ohm resistor should be connected between pin 5 of either U4 or U5 to +5 V.

Frank Van Zant, author of "160, 75, and 40-Meter Inverted Dipole Delta Loop," *QST* for January 1973, informs us that we should have included the following information. An additional refinement would be to add a variable capacitor instead of a short circuit in series with the 75/80-meter switch position so that the loop can be tuned higher in frequency. The capacitor should be a 500 pF maximum value. Since the position of the capacitor is at a current point in the antenna, a low power transmitting type of capacitor should work fine. An extremely high voltage capacitor is not needed. The author wishes us to mention that his address is now 1142 H. Street, Anchorage, Alaska 99501.

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In *QST*, Oct. 1972 in the article "A High-Permormance Solid-State Receiver for the Novice or Beginner," on page 15, Fig. 4, the scale template and parts layout L5 should read L4 and L6 should be changed to L5. Also, the text should be changed to read "check to see that L4 and L5 are wound in . . ."

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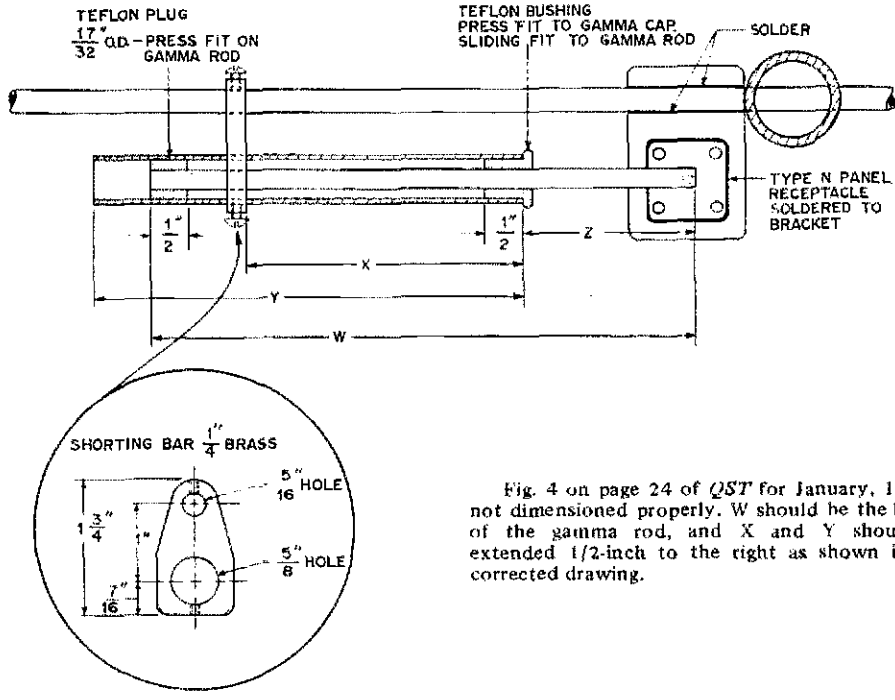


Fig. 4 on page 24 of *QST* for January, 1973 is not dimensioned properly. W should be the length of the gamma rod, and X and Y should be extended 1/2-inch to the right as shown in the corrected drawing.

Strays

As Assistant Chief Engineer at WJBK-TV, Channel 2, in Detroit, part of my duties involve investigation of any TVI complaints. I recently received a written complaint taken by our switchboard operator during the evening hours. It read as follows: "Mr. Smith complained of ham operator interference, and he knows who the operator is: His call letters are CQ-CQ 6." — *WA8ESP*

Stolen Equipment

Stolen in Wisconsin Rapids, Wisconsin on February 12, 1973: Regency HR-2A, serial number 04-07148 with Topeka FM 6-channel add-on transmit deck.

Anyone knowing the whereabouts of this equipment, please contact Edward W. Voigtman, W9GSS, 4050 Crestwood Court, Wisconsin Rapids, WI 54494.

Stolen from VE7XV on February 5: FT-DX 400, serial number 9011505, speaker and microphone. Contact Jack Dobell, 317 Princess Avenue Chilliwack, British Columbia.

Organic Elements

(Continued from page 42)

approximately 28 degrees. It is not necessary to make the trough any longer than 1/2 wavelength as we are interested only in the reflective properties of the water, not in the phasing of the rf currents within the water element itself. I used quick and easy wood construction for the water trough vee and then lined the trough with self-sealing tar paper.

At my location I have two water elements; one at the 30-foot distance, for longer haul work — 1,000 to 5,000 miles, and the other at the 15-foot mark, for short haul rag chewing. However, I should mention here that only one water element can be used at any one time: using both elements as co-reflectors cuts the fundamental gain of the system severely.

To overcome this problem I pump water from one trough to the other, using an old washing machine pump (ask your friendly washing-machine repairman if he has one laying around his shop). The pump is driven by an old air-conditioner fan motor (ask your air-conditioner man about this one). Two of these pump units are used at my QTH. One to pump the water from trough A to B, and the other to pump the water from trough B to A.

Even though this particular arrangement provides only unidirectional capabilities, other hams interested mainly in DX may wish to construct one water element on each side of the dipole element (at a distance calculated for low angle gain) to provide bidirectional capabilities. Note: Add suitable quantities of anti-freeze to prevent winter freeze up.

Other Reflective Elements

Dr. Reiner also points out the excellent rf reflective properties of sulphiamide diagolite

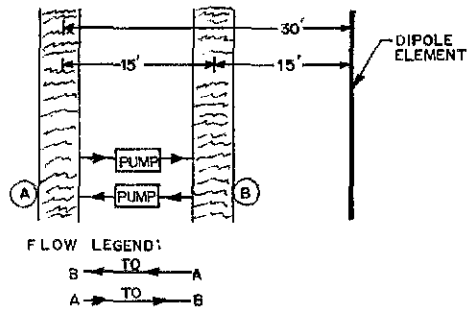


Fig. 3 — Water flow chart for dual water elements.

crystals (Also known to most druggists as Fogarty's powder). These crystals are water soluble, so it would be an easy task to mix a concentrated solution of this reflective chemical, and power spray it onto existing foliage such as a clump of trees or bushes, which might be located broadside to your dipole antenna. PRESTO-CHANGO, you now have created a truly organic reflective element for the ordinary dipole. Unfortunately, this type of organic reflective element would be more effective in the spring and summer months, when the foliage is lush and leafy. However, the ability of the organic element should still be more than substantial during the barren winter months.

One other item: the resonant frequency of the antenna may change from season to season, but this should prove to be no problem for the ham with a reasonably adequate matchbox. It's up to you . . . only the active imagination of the individual experimenter will limit the inherent possibilities of the organically assisted radiating system. QST

Bibliography

The Behavior of Radio Frequency Energy Upon Organic Matter, Dr. Karl Reiner, Melody Technical Series/Melody Press, Dunlevy, Idaho.

The Dual Six

(Continued from page 47)

spot to include some trimmer capacitors, but I was richly endowed with silver-mica capacitors from a couple of grab-bag purchases and had no trouble finding values that established the desired tuning ranges. For the 363- and 170-pF values it was necessary to parallel capacitors.

Some Observations and Results

It is a common practice to connect a Zener diode from collector to ground in the power-amplifier stage to absorb voltage peaks that exceed the collector breakdown point. After an unexplained D27C1 failure in the 80-meter section, I installed the 35-volt Zener. The Zener runs quite hot and unquestionably lowers the efficiency of the stage so I avoided inserting one in the 40-meter section which has never had a transistor failure.

For a while the VFOs were equipped with 10-volt Zeners diodes, but the battery voltage was so solid that they didn't appear to be needed. When the transmitter starts to chirp and drift during a transmission, it's time to QRT and charge the batteries.

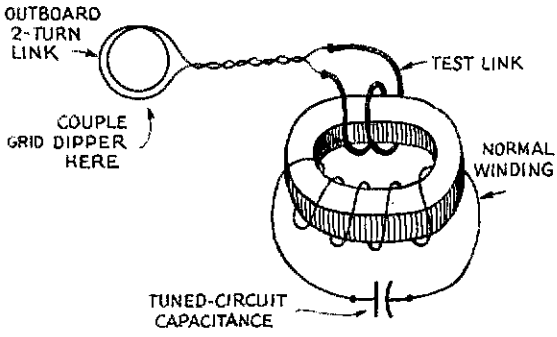
Total current drain is slightly over 0.6 ampere. The final amplifier takes about 0.5 ampere. The output across a 72-ohm resistive load measures 4.5 watts on both bands. A charge of the batteries gives 6 or 7 typical one- to two-hour operating sessions. Coast-to-coast contacts on both bands and many lengthy ragchews indicate that this is a good power level to consider for pack-set equipment. Compared to the results I had with 3-watt operation the improvement from doubling power seems almost magical. No special credit can be given to the antenna system, which consists of multiple dipoles up about 25 feet and fed with 72-ohm twin lead. With its single-dial tuning, spot-operate switch, and ease of changing bands, the little outfit is a delight to use. QST

Hints and Kinks For the Experimenter

GRID-DIPPING TOROIDAL-WOUND INDUCTORS

Because of the self-shielding properties of toroid coils, it is either difficult or impossible to check for resonant frequencies with a "dipper." In some instances it may be possible to obtain a reading on the dipper by virtue of stray capacitive coupling, but the dip will be rather broad and difficult to discern. The accompanying drawing shows a simple way to check tuned-circuit resonance when working with toroidal inductors.

The toroid coil under test is connected to its circuit points, and whatever series or parallel *C* it is used with should be included in the circuit. A one- or two-turn link is looped through the toroid core, then connected to an outboard link of the same number of turns. The dipper is then coupled to the outboard link to obtain a resonance check. — *WICER.*



PIGGYBACK ANTENNA FOR THE TEN-METER BAND

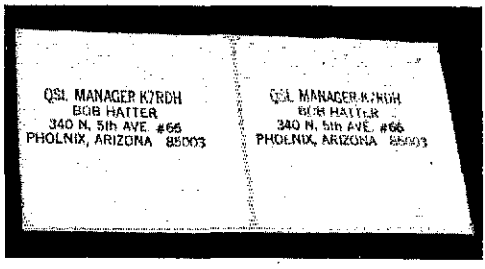
Most amateurs from Novices on up use dipole antennas for the eighty- and forty-meter bands. In many cases, these two antennas were all the Novice needed since the fifteen-meter band could also be covered with the forty-meter dipole.

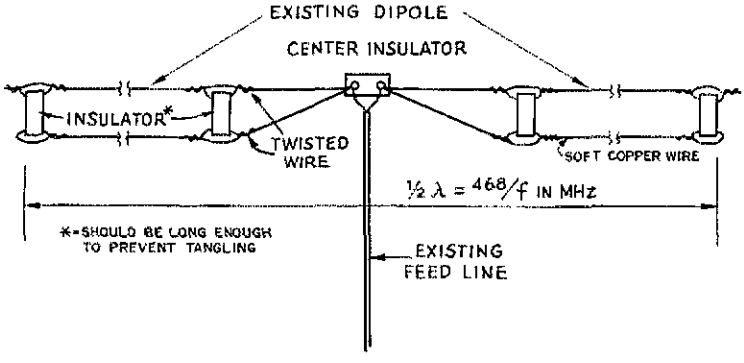
However, with the advent of the new ten-meter subband for Novices, a simple and inexpensive method of getting the needed coverage is to use a "piggyback" antenna. It can be easily added to an existing dipole, eliminating the need for additional supports or feed lines. Also, it will have no effect on either an eighty- or forty-meter dipole.

Of course, performance will not be as good as that obtained with a beam, but it should not be sold short either. A KH6 was worked during a recent contest with a power output of 1.8 watts. — *Robert M. May, II, WA4DEG.*

QSL RETURN ADDRESS LABELS

Having been on the DX end of operations and QSLing from DL4PS, LX3PS and XEØRDH, I have looked for quite some time for a quick and simple address label to send along with the cards to speed the QSL function and improve returns. Most good stationery stores carry a line of self-adhesive, inexpensive labels, in a wide variety os sizes, that suit this return-address problem perfectly. The sample shown is made by Avery, and is called "Self-Adhesive Kum-Kleen Unprinted Labels." An





identical line of unprinted labels is made by Dymo (of label gun fame).

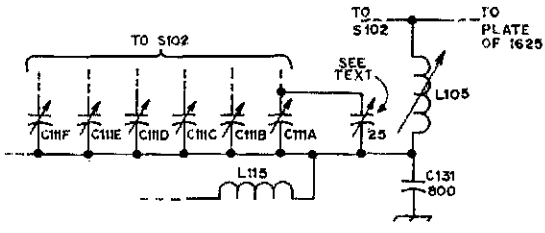
The procedure is simple: Have a return-address rubber stamp made. Then measure the area it occupies. Select the size label that will fit the stamp impression. Leave the *backing intact* cut the labels apart, stamp the address on each, and mail with each QSL card. The recipient simply peels the backing from the label, then applies it to his own envelope, or, if he chooses, directly to his QSL card. All that is left to do is fill the card out, and mail it. -- *Bob Hatter, K7RDH/XEØRDH.*

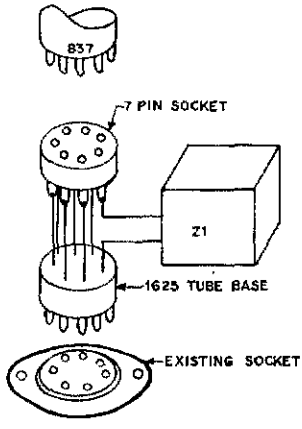
ART-13 ON 160 METERS

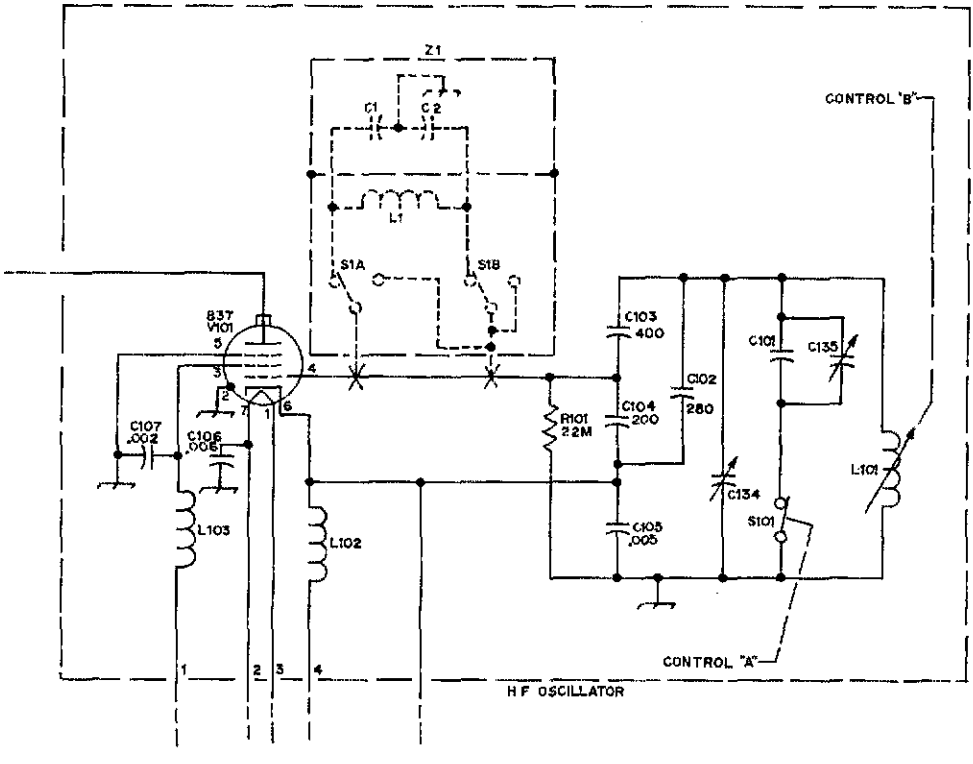
When the Collins AN/ART-13 transmitter is operated on 2.0 MHz, the 837 Colpitts VFO is on 1 MHz. Adding external capacitance across the VFO lowers its output faster than it does the frequency. Since 1800 to 1850 kHz is a common allocation, the modifications shown are necessary for operation of the unit in this range.

With the ART-13 control "B" set to 00.0, and control "A" set to 1, C1 and C2 are adjusted until the output of the VFO is on 900 kHz. The trimmer capacitor that was added in parallel with C111-A is then peaked up for maximum output.

Except for wiring in the capacitor, no other existing circuit changes are necessary. The plug goes into the 837 VFO tube socket in the ART-13, and the 837 is mounted horizontally with a lead from the plate cap going to the existing plate clip in the unit. The dpdt switch allows the VFO to be switched between 160-meter and normal operation. A random-wire antenna between 22 and 64 feet in length should be used, with the original CU-24/ART-13 shunt capacitor. -- *Allen W. Porterfield, W2ISL.*







RESULTS, 12th RTTY DX

WORLD-WIDE "MAPLE LEAF SWEEPSTAKES"

COMPILED BY GWEN BURNETT,* VE3AYL

REPORTS FOR THE 12th annual RTTY Sweepstakes (October 14-16, 1972) varied from different parts of the world, but all agree that the first day was the best. The green RTTYers were amazed at the amount of QRM but to the old timers with contest experience it was just part of the game. We found that more stations, more *countries, more points, more DX, more logs – in* fact, more of everything – made this contest, without doubt, the best one CARTG has ever sponsored. Narrow shift was used almost 100%, with only two stations reporting on 850.

The 133 logs received (115 single op., 2 multi-op., 7 SWL and 9 check logs) represented more than a 10% increase over last year. In this year's contest 58 countries were represented.

Plaque and medallion awards for single-operator stations were won by ZS3B, LU2ESB, YV5AS, *KZ5LF, KZ5BH, KH6AG, I5MPK, I1BAY,* SM4CMG, WA2YVK, VE7UBC, I5CLC, VP9GE and SWL Peter Boer, NL687. The multi-operator award was won by HA5KBF. Awards were mailed at the end of January. Many logs did not report power input although an award is given for low power high score.

For the success of this 12th Sweepstakes, CARTG wishes to extend thanks to all groups and magazines who gave such excellent publicity to our contest. Thanks also to the participants, without whom the contest could not survive, and to the enthusiasm and cooperation of everyone involved.

To receive a complete contest summary and statistical report send a large s.a.e. and IRCs to: CARTG, 85 Fifeshire Road, Willowdale, Ontario, M2L 2G9, Canada.

Contest Comments

Never did so well in a contest. – (ON4BX) A really FB contest and the activity was wonderful. – (W3KV) My first participation in a RTTY test. A very enjoyable weekend and would like to enter again. – (VP9GE) This was the best contest in years. DX participation and propagation were much better than in any recent contest. Worked over 30 different countries and heard 10 more. – *(W5EUN) I* am happy to say I made a triple WAC in one single day on one single band, 14 MHz that was. – (SM6AEN) As usual I was plagued with equipment problems, but in any case had a great *time.* – *(ZL2ALW) Low power in this* RTTY contest is very sportman's job but it is necessary to have much patience waiting until the pile up is gone and the DX can answer. – (I5CLC) The antenna rotor was broken so I got plenty of exercise and fresh air running to and climbing the tower to turn the antenna. – (VE7UBC) I just got my RTTY permit a few months ago and this is my first contest. – (DJ5PN) Very good contest and my first one in ten years of operating RTTY that I have had the chance of going into without too much interruption by harmonics. – (VK2EG) Eighty meters was good but missed the VE activity of last year. – (VE6ANE) Lost linear the first night and had to finish with the peanut whistle running about 80 watts. – (W5CEG) This was my first contest on RTTY and also my first month of operation on RTTY. After 43 continuous years of amateur radio it was a thrill to work so many hams with this excellent method of communications. – *(W7UX)*

*CARTG, 85 Fifeshire Rd., Willowdale, Ont., Canada.

SCORES

ZS3B*	4,454,284	K4VDM	430,424
LU2ESB*	2,682,618	WA6WGL	416,830
YV5AS*	2,300,580	PY2CYK*	405,060
KZ5LF*	1,871,580	K7MNZ/7	345,612
KZ5BH	1,805,720	DJ5PN	338,950
KH6AG*	1,718,956	W6JOX	332,912
I5MPK*	1,717,460	W5CEG	313,390
I1BAY	1,600,248	DJ9MJ	308,800
SM4CMG*	1,599,628	YA1OS*	281,574
WA2YVK*	1,554,904	W7IU	279,104
JA1BK*	1,509,100	ON4CZ	273,765
K4AGC*	1,404,232	ON4WG	258,594
I6CGE	1,369,906	SM6AEN	257,838
ON4BX*	1,365,028	WØMT*	254,748
W4YG	1,342,490	ZL2ALW*	254,360
G3OZF*	1,335,896	W5TZB	240,282
I5CLC	1,306,912	PAØSCH*	238,534
K2PAR*	1,113,952	W7LPM	237,576
K5ARH*	955,688	K4EYD	226,236
VP9GE*	940,540	HB9AKA*	216,175
KL7GRF*	930,876	HA5FE*	215,830
W2LFL	928,792	G3LDI	190,075
VE7UBC*	861,420	WØHAH	179,895
W4ODR	858,448	W7BCT	175,900
VP7NH	839,600	W7HFH	168,346
K6WZ*	831,532	OZ2CJ*	166,822
CE3EX*	724,800	SMØOY	158,700
W3KV*	679,246	I5CW	148,712
DK7AQ*	671,238	W3EKT	143,350
ZS6BBK*	661,830	HI8XRM*	139,140
I1EVK	648,920	VO2AF*	134,610
VK2EG*	612,154	PY1DCB	129,445
IS1AOV*	586,080	OK1MP*	111,520
XE1YJ*	585,584	W6AEE	110,940
FO8BO*	580,400	VO1EE	105,328
W5EUN	524,252	HK3SO*	104,230
DL1VR	507,682	*DL8RW*	102,520
W6CEO	498,328	VE5TO*	98,640
W1KJL*	470,680	PY2CBS	96,340
VK3DM	447,936	WAØTLT	90,660
K7BVT*	432,178	K2CY	86,650

(Continued on page 108)

A Primer for Novices

BY MARGARET S. KOERNER,* WBØBEM

WBØBEM told a most interesting tale in the February, 1971, issue of QST — *relating, as one Novice to a prospective Novice, the trials and tribulations (and successes) of the sometimes-rocky road to a ham ticket. In similarly engrossing style she here begins a series, to appear from time to time in future* QSTs, *to help the newcomer toward successful completion of his first FCC exam.*

WHAT IS A PRIMER? Pronounced with a short "i", the word means a beginning book, usually a beginning reader. Pronounced another way, with a long "i", it means the fluid used to start a pump or engine into action. This Primer for would-be Novices, and for Novices who would be General Class by now if they could only pass the theory examination, is written to serve in both capacities: as a beginning reading book, and as the primer for a pump. Hopefully, as new information and low-level explanations are poured on, and provided that *you* keep on pumping, there should eventually come a sudden rush of understanding. When that happens, you will find you are a Novice or whatever class of radio amateur you aspire to be.

There are two ways we could begin this Primer. We could start it in traditional primer style:

This is a *rig*.
See the pretty rig.
Jack owns the rig.
The rig will not work.

Or we could start it — and this is probably the better way — with some priming. So here are a few attitudes you should acquire if you are to succeed, some do-it-yourself learning aids, a brief discussion of the Primer's credentials, and a quick look at that all-important structure, the radio shack.

1. **Don't try to understand every term, explanation, and procedure mentioned in the *License Manual*, before you take the exam.** You are not working toward a degree in electronics, and this is not the point at which you should become a perfectionist. If you waited to apply for your driver's license until you completely understood every operation, system, and device in your car, you would travel to the license bureau in a wheel chair.

2. **Learn the FCC rules.** Approximately half of the questions in the Novice section of the *License Manual* concern these rules, and knowing the answers to them is essential for your physical safety and your future as a ham. Many of the total list of Novice questions in the manual are non-technical and their answers are easily understood. Answers to most of the other questions can be learned now with at least some understanding, and can be understood completely as you acquire more experience. A very few (the alpha and beta of transistors, for example) can be memorized now but without any promise (at least from me) that they will ever be completely understood.

3. **Remember that the FCC is not interested in the grade you make; all it asks you to do is to pass.** You would like, of course, to get a grade of 95 to 100 and chances are that you will. But your goal is to pass and you can miss several questions and still do that. *Which* questions you miss doesn't matter; it's *how many* you miss that counts. Even if you fail, it is no disgrace. Try again the next month, and again and again if necessary, but keep on until you make it.

* 2133 9th St., Boulder, CO 80302

Use The Library

4. **Don't be misled into thinking that studying the *License Manual* is all you need to do.** Get library books on radio and on electricity and read them. If you find they are too technical to read, you can at least look at the illustrations. Study *The Radio Amateur's Handbook* and other ARRL publications; read the ham magazines. If you can afford to do so, buy the books you find most helpful and start building up your own radio library.

5. **Keep lists of the questions that come to your mind as you read.** Find the answers to them.

"DON'T TRY TO UNDERSTAND EVERY TERM, EXPLANATION AND PROCEDURE"

"KEEP LISTS OF QUESTIONS THAT COME TO YOUR MIND"

Date the lists, so that later on you can look at them and be startled and impressed by how far you have come. Gradually, as you read and ask, facts will begin to interlock like pieces of a jigsaw puzzle; groups of facts will fit together, and suddenly a clear picture will emerge. So work at it. Your persistence and effort will pay off.

6. **Make some flash cards.** Buy fifty or more 4 × 6 inch cards, one for each question in the Novice or General exam. Put a question on one side of the card and its answer on the other. Trim the answer down to essentials, especially if it is a compound answer, and make it in the form of a list when possible so that it is more easily remembered.

Read the question on the card, decide on the answer (write it out if you are not sure whether you know it or not; it's easy to con yourself), and then turn the card over to find out if you are right. On cards containing formulas, study them both ways – starting with the question, and starting with the answer.

If your answer is correct, put that card aside and start working on the remaining ones. Carry two or three of them with you when you are riding on a bus, or if there is a possibility you will have to wait in the dentist's office. Prop them over your work area in the kitchen; put them on your bedside table.

As the number of cards that you can answer correctly grows, and the ones left to learn become fewer and fewer, you will find that your confidence has grown and your doubts have been reduced accordingly. Keep using them and you will find you are thinking more clearly and your attention span has suddenly increased. If your brain has become rusty and you have forgotten how to memorize, the cards will act like pads of steel wool and eventually you may discover that in some spots, at least, you are actually bright!

7. **While you are learning the theory, keep practicing the code.** Buy, borrow, or build a practice oscillator and key. Buy or borrow a code record or tape. Work with a friend. Listen to and try to copy the messages on the Novice bands, and progress from one word copied out of every ten, to an earth-shaking 10-word sentence. Listen to W1AW. Ask when and on what frequencies you can find its code practice sessions in your locality. These are for 5, 7-1/2, and 10 words per minute; or 10, 13, and 15 wpm. In preparing for a code test, work on copying the number of wpm just above the one you need, rather than stopping when you have conquered the minimum number. And when you are actually taking the test, particularly the 13 wpm test for your General license, don't jump the track by trying to make sense out of what you are writing. Don't even look at the paper. Just copy!

Perseverance

8. **Don't be a dropout.** The mortality rate of Novices and would-be Novices is very high, so see to it that you are not included in its statistics.

No one ever gets to be a Novice by aimlessly wandering along a trail of vague hopes. No one becomes a Novice, either, without actually taking the Novice exam, and here procrastination, perfectionist tendencies and fear of failure can stop you right at the port of entry. Other road blocks, too, will be found along the way. Knowledgeable people, taking too much for granted, can toss around technical words and phrases which have no meaning to a beginner but which sound as though they should have, and can create an atmosphere of discouragement in which progress is impossible. Family members can throw cold water on one's enthusiasms with deadly aim. Even the 2-year span now allowed a Novice for holding his license can be a hindrance, because procrastination can have a field day in that interval.

Once you have received your Novice license, *start working toward your General.* The Novice approach was designed as an access road to the main highway – the General license – so don't let it turn into an exit, instead. And if your goal (and your dream) is to be able to communicate on all the bands and with all parts of the world, don't let the Technician route become a permanent detour, either. Keep working at your code, keep studying the theory, and don't ever give up. Get your General. It is the well-marked highway that gives you a green light to *all* the bands, *all* the present and future possibilities, and *all* the joys of amateur radio.

9. **Be on the air as much as possible.** Answer the CQs you hear, but also be sure to send some of your own. And don't get into the habit of just having schedules or confining your contacts to hams in your home area. Inbreeding of QSOs can stunt radio growth.

10. **Don't be afraid of making mistakes.** Everyone, even the most experienced operators, makes them. Advance preparation and knowledge of proper procedures will eliminate a few (this Primer, in a later section, should give you some help), but the number of possible mistakes is endless. It is also phenomenal how many of them you will somehow manage to achieve. Just remember that Novice bands are practice bands and are full of mistakes. Forgetting one's own call, for example, is

a very common error, but hams are an understanding and forgiving group of people, so jump in with your own individual contributions. Being on the air is the only way you will ever become a good operator, and an *operator* is what your license permits you to be.

11. **As you read this Primer, be prepared for anything.** The subject of electronics is an extremely technical one, but the Primer is not being written in technical style. Comparisons, some of them actually stated and others merely implied, will be used in abundance. Roles may be switched without warning. You may find yourself a sheep herder in one paragraph, a cook in the next; a botanist, doctor, football player, or even the football itself in the paragraphs that follow. You may think some of the comparisons poor and obviously contrived. They are.

Credentials

There is a good possibility that some of you, knowing the limitations of my background, will question my qualifications for writing with any degree of helpfulness or accuracy. I therefore offer two things in my defense.

1. Lack of background can itself be a help, as I found out some time ago. I had been working with a Novice friend, helping him prepare for his General license exam. On the day he passed it, I overheard him say very earnestly to another Novice, who was feeling discouraged, "Get Margaret to help you. She doesn't know very much." It was meant as a compliment and I received it as such. I *don't* know very much, but because of my own recent struggle to learn what I *do* know, I can explain to others in terms that can be understood.

2. Each section of the Primer will be checked by at least three "authorities" who will make sure that all basic technical facts are accurate. Shielded by these authorities from the transmission of spurious information, we will discuss the basic pieces of equipment which make up the rig; the circuits in those basic pieces; the components of the circuits; the purpose of the components. This will make a House-that-Jack-Built sort of book, only the house isn't really a house. It's a *shack*.

The Radio Shack

Recently I asked five radio amateurs how they would define a radio shack, and I got – as I had anticipated – five different answers. (I also got an answer from one of their XYLs, but I cannot repeat what she said.) Only on two things were they all agreed: radio shacks are not necessarily buildings, and they differ from one another in amazing and wonderful ways.

A shack may be a small room, the top of the dining room buffet, or an unfinished, unfurnished, basement. It can be a walnut-panelled suite or a glorified broom closet. It may be one corner of its owner's bedroom (or all of the bedroom, for that matter, except for the bed, which will later on have to be replaced by a cot, to give more space); it may be a tent, or any other of a thousand usual or unusual places. Its equipment may range from practically nothing to practically everything; from a total investment of $50 or less, to a total of $15,000 or more, with the total changing abruptly when a necessary (suddenly) type of equipment appears in the ham ads.

Yet regardless of value of equipment, regardless of size, appearance, or place, each shack will be owned by a radio amateur, and will be equipped with what he considers his essential gear, otherwise known as his rig. In fact (and this is a difficult concept to explain) the rig may *be* the shack.

Radio shacks are all wired for frequency – radio frequency and frequency of use. Both kinds of wiring can and do create problems, but the one that causes the most trouble and involves the entire family is the frequency of use. No schematic diagrams are provided in counseling manuals to pinpoint this trouble area. Actually, none is needed; the problems pinpoint themselves very nicely, and each family must, of necessity, be its own clinic.

I do not like to admit it, particularly in print and to what may very well be a host of hostile witnesses, but love of amateur radio is a disease. Not a rare one, but one whose cause and cure are unknown. In pre-disposed people, no vaccine or immunization procedures that I know of are available, even on prescription. Lack of time, lack of money, lack of knowledge as to procedures, and lack of self-confidence have definite deterrent effects on the age of onset, but diagnosis is not at all difficult once the disease is in progress. Symptoms may be insidious in appearance, but eventually they become obvious to even the most uninformed observer. Even the patient himself, the amateur, knows when he has given in to the

(Continued on page 108)

"KNOWLEDGEABLE PEOPLE CAN TOSS AROUND TECHNICAL WORDS AND PHRASES."

Sweaty Palms at the Old Federal Building

BY JOEL M. ROSE,* W8GOE

THERE ARE twenty-three of us there in the room, sitting at linoleum-topped tables, staring dumbly at metal walls and windows which light comes through, but you can't see out. Well, twenty-two of us are staring. The twenty-third is whipping the cursor on a giant Pickett slide rule back and forth, whistling *Good King Wenceslaus*, and tapping out a CQ with his heel, on the wooden rail of the chair across from him.

There are twenty-two of us about to face the General Class moment of truth with clammy hands, shaking with fear, with rivers of perspiration dripping from forty-four armpits.

The twenty-third pauses from his whistling to chuckle out loud, obviously harboring a deep, dark secret that enables him to defeat the body's glandular processes. He peers sneeringly over the tops of his glasses, with their lenses that look like the bottoms of two coke bottles, and he pulls a handful of pencils out of a plastic pouch in his pocket; it's one of those pouches the radio store gives away, that says "TUNG-SOL TUBES" on it.

"If you are studying *that*, forget it . . . ."

It is "Tung-Sol" speaking, and directly to me, as I am furtively stealing a few final glances at my tattered and torn *License Manual* – a last chance to get a last look at a Colpitts oscillator before the examiner enters the room.

"Half the stuff isn't in that book anyway, hi-hi. I had a buddy who took this new test last week, and he said half the stuff isn't in there." He speaks with a voice that sounds like a sideband station, 40 cycles on the high side. "They have this new test, all about phase angles. My buddy says if you don't know phase angles, forget it. They leave it out of the book on purpose. It's part of the deal the ARRL and FCC have cooked up to flunk 60% off the top. Keeps the QRM down for the old-timers.

My heart begins to pound. I claw at the manual for something about phase angles. He's right. It isn't there. There's nothing in the manual about phase angles. I'm one of the sixty percent sacrificed by the beauracracy of amateur radio!!!!!

A giant curtain lowers itself over my mind; my brain goes as dead as fifteen meters at sunset. All of a sudden, I don't know anything at all. Months of study are swirling around and around, heading straight for the drain of failure.

Ohms law, what is it? I = ER. . . . No, that's not it . . . E = I/R . . . no, no, NO!!!! I look at my hands. They're not my hands anymore. They're somebody elses hands hooked up to my arms. Panic grabs my shoulders and shakes me, clanging my knees together. My ears are on fire, and I want to throw up, but it stops halfway up the pipe.

"My buddy who took the test said you better have 25 words-a-minute cold, I mean cold. They never run it at 13, you know. Always run it about twenty to separate the sheep from the goats, hi hi . . ."

Suddenly, the door swings open, and a rather large man with a fuzzy haircut that stands straight up on end is there, like John Wayne on the foredeck of an LST, giving the final word to Marines who are about to slosh ashore on Iwo Jima.

"Alright, you copy one minute solid out of five, you pass. You don't, you can come back after 30 days. If you pass the code receiving test, you can take the written. If you pass that, you get your license in six weeks, if not, you'll hear about it. Don't call here afterwards. We don't know nothin', any questions?"

One hand shoots up. It's "Tung-Sol." There must be something he doesn't understand. I am starting to feel better.

"Can we copy more than one minute solid sir. Is it alright if we do?"

I am sick again.

All of a sudden, there it is: ...— ...— ...— It doesn't sound like any cw I have ever heard before. Nothing like W1AW banging through on the S-38. This cw is louder, and has a funny hollow tinny note as it echoes off the walls. Missed one already. Should I go back? Fill it in? No, just keep going. One letter at a time. It doesn't look like a word. I must have made a mistake . . . . No, keep going, keep going, letter after letter . . . missed one . . . missed another one . . . never could tell an "L" from an "F" . . . faster, faster, faster, STOP!!!

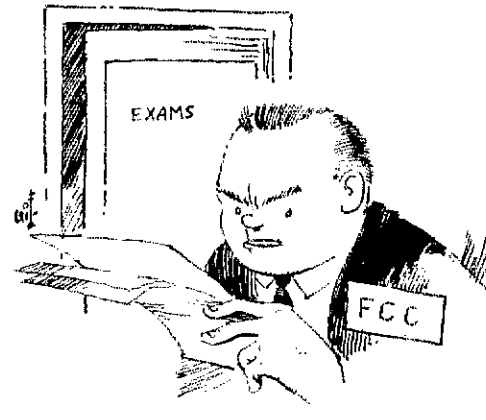
"Put your pencils down."

I drop my pencil. It's over. The lined paper looks like a dog with muddy feet danced the tango on it. There are letters, but they don't seem to make any words. There are holes with no letters at all in the spaces.

The truth comes in loud and clear, 50 over 9 . . . I HAVE FLUNKED OUT.

"Tung-Sol" is whistling again, getting more pencils out of the plastic pouch, ready to take the theory exam. The examiner is marking papers. Suddenly, he stands up . . . .

(Continued on page 101)



"I will call the names of those who have flunked, repeat, failed to pass . . ."

* 467 Letchworth Drive, Akron, OH 44303.

The Managua Earthquake—

IARU President/ARRL Vice President Robert W. Denniston, W0DX/YN1IU, rushed to Managua shortly after the devastating earthquake to observe and assist in the massive relief operations. OM Denniston's photographs and notes formed the basis for this article. Seldom has the value of amateur radio as an emergency communications service been so plain as it is in the aftermath of this tragedy.

A Christmas Tragedy

MANAGUA, NICARAGUA was a busy place on the evening of December 22, 1972. It is, after all, the capital of the largest Central American country, and it has a population of over a quarter-million. Besides, this was not an ordinary Friday night, but the beginning of a long Christmas holiday weekend; fewer Managuans than usual were retiring early, and the downtown area was thronged.

In their home overlooking the city from about five miles away, the Juan Castanera family was in bed before midnight. Manager of the NICASAT satellite ground station outside Managua, Juan has been a licensed ham since 1939 – K4FHV in Puerto Rico, then KP4CX, and now YN1CX. It was 12:30 A.M. local time (0630 GMT December 23) when the members of the family, along with tens of thousands of others, were awakened by a violent shaking of the earth. The house was not too badly damaged, but anything that had been on shelves was now on the floor. They found that the electric power and water supplies were cut off, the telephones were out of order and multiple fires were visible across the city.

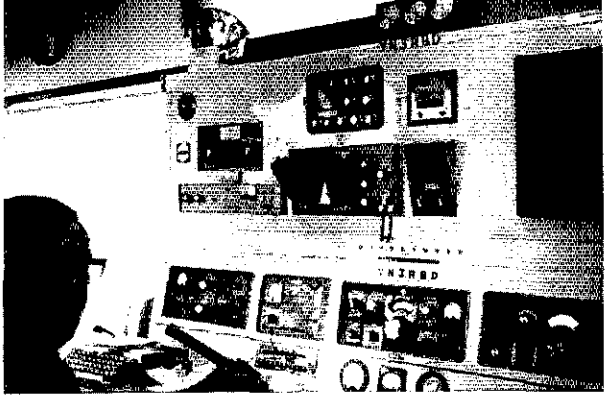
The First News

After tending to the immediate requirements of his family, Juan turned his attention to getting on the air to alert the outside world. Though his FT-101 transceiver had a built-in 12-volt dc power supply, he had never operated it mobile or even tried the supply. Juan managed to locate a set of battery cables amidst the debris in the ham shack, and hooked the rig to the electrical system in his Jeep station wagon; the receiver came to life immediately. After attaching the cable from the fixed station antenna to the transceiver, he tuned across 20 meters; by now it was 0830 GMT. He found a couple of W1s talking, but was unable to break in; so he moved up the band to about 14,310 and called "CQ Emergency USA."

At 3:30 in the morning it is an unusual ham who will be tuning a quiet 20-meter phone band; but that particular morning Don Wilkes, K3FHP, was sitting in his Bethlehem, Pa. home doing just that. It didn't take him long to respond to YN1CX's frantic CQ. Juan explained that he wanted to make a collect phone call to COMSAT in Washington, that there had been a big 'quake with fire and explosions. Signals grew weaker as the two stations maintained contact for the next 15 minutes, eventually to disappear into the noise; but the message had been passed to Don.

K3FHP wasted no time telephoning the COMSAT operations center. The word was then passed to Don Owen, WN4VHQ, of Fairfax,

YN1SIRA was one of the first radio relief groups to reach Managua. The Miami-based hams operated for five days from the airport, using hf for communication back to the U.S. and two-meter fm as a link to its mobile stations in the city. Shown here are WN4BFL and LU2DZ/W4; WB4TED was in charge of the seven-man team. *(Photo courtesy WA4ZZG)*



Over 40,000 Managua refugees were moved into Leon, about 50 miles northwest, where a census was taken to account for the survivors. Dick, YN3RBD, operated for many hours from the headquarters station, YN1NIC, before returning home to Leon to handle large quantities of health and welfare traffic for the refugees.

Virginia, who is director of operations for the Nicaraguan branch of COMSAT. Don in turn alerted Bill Hudgins, W3YY, who immediately went on the air and found Earl Moore, YN1DUX, searching for someone to handle traffic into Washington. In the next few minutes, despite a balky generator which put him off the air a couple of times, Earl managed to pass a message from the U.S. Ambassador to Nicaragua, Turner B. Shelton, to the Department of State. He also gave the Nicaraguan Embassy in Washington their first news of the disaster.

Next, YN1DUX managed to contact the U.S. military mission in Tegucigalpa, Honduras through a TG9 station. Within 30 minutes of hearing the news the mission had a relief plane in the air headed for Managua. The airport runway lights were out, so Earl drove the length of the runway to check for obstructions before the plane attempted a landing. By noon the next day, another dozen planes had followed.

In another part of Managua, Enrique Gabuardi, YN1EGL, spent the early-morning hours driving the streets of the demolished city, describing the scene to the world over the mobile rig in his truck. Through his reports, the news media received their earliest information as to the scope of the disaster. These reports brought the need for massive relief home to the peoples and governments of the Americas.

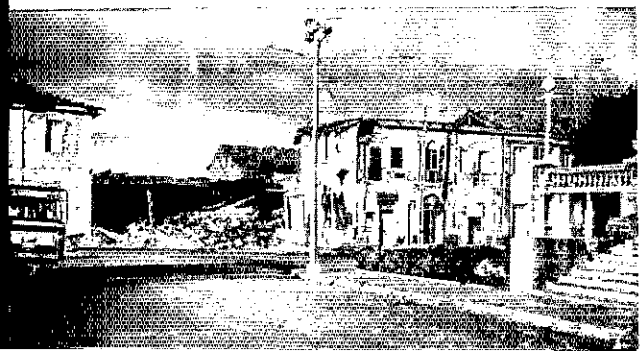
Thus did the world receive the first news of the Managua earthquake. In the early hours, the exact extent of the damage and deaths was unknown; but there was no doubt in the mind of anyone listening to the eye-witness reports of radio amateurs in the city that this was a disaster of major proportions. Later accounts added specifics: the 'quake had registered 6.25 on the Richter scale of intensity, had caused over ten thousand deaths and a billion dollars in damage, and had left hundreds of thousands of people homeless. Many of those who had spent the last Friday evening before Christmas doing their holiday shopping were now buried in the rubble of the downtown area.

After giving the first alarm to the outside world by amateur radio, YN1CX proceeded by foot down the access road to the satellite station. He was delighted to find that there had been no damage to the station and, except for the power failure which had taken it off the air, it was still available for service. Operating from its own emergency supplies, the station was able to restore continuous satellite communication with the U.S. within two hours. Unfortunately, since the land-lines in the city telephone system had been totally disrupted and the downtown communications terminal was badly damaged, the satellite link had very little traffic to handle; virtually the entire load of emergency communications remained on the shoulders of the amateurs in and around Managua who were able to get on the air with their own power generators.

The Relief Effort

As is nearly always the case under such circumstances, it took a while for the emergency radio system to be organized. The first day's operation from the stricken city was conducted largely by individual amateurs, using whatever equipment they could find that worked. Several had lost some or all of their personal gear when their homes collapsed; miraculously, nearly all of the antenna installations survived. Communications was most needed, though, in places where there were no permanent ham stations, so the majority of the operating was done from portable locations. After an earthquake few people feel safe inside a building, so nearly all equipment was set up in tents or in the open.

As the Managua hams were able to contact one another, either in person or on the air, an effective organization took shape. Emergency Command was located at "El Retiro," the residence of General Anastasio Somoza, former president and still an important figure in the government of Nicaragua. From here General Roger Bermudez,



In the hardest-hit 8.5 square-mile area of the city, four-fifths of the buildings were destroyed. Only in comparison with these figures could the damage in this scene be termed "moderate."

The great problem in disaster relief was not bringing food and medicine into Nicaragua, but distributing these supplies to the relocated population of the city. The Red Cross used amateur communications facilities largely to this end. These operators were from the *Club de Radioaficionados de El Salvador* and used the call sign YS1YS/YN1.

YN1RB, began operating on the morning of the 23rd with a KWM-2 and mobile-whip antenna mounted on the ground; initially, this was the only communications the government had. On Christmas morning, Dick, YN3RBD and another operator, Charles, arrived from Leon, a city about 50 miles northwest of Managua, and were able to lend their assistance. Soon the station at "El Retiro" was running full power and a beam with the call sign YN1NIC from tents pitched on the lawn. General Bermudez served as Coordinator of the National Emergency Committee and YN1NIC was the major outlet for official government traffic.

Distribution of food and medical supplies was coordinated from Los Brasiles, a small airport about 8 miles outside Managua. Here a team of operators from the *Liga Panamena de Radio Aficionados*, the national radio society in Panama, set up HP1LR/YN1. A similar operation from the Las Palmas distribution center was equipped and manned by operators from Guatemala using the call TGØAA.

Major parts in the relief effort were played by two Lexington, Mass. brothers, Hans (WA1NRV) and Roger (WA1KZE) Strauch, ages 15 and 16. Using Roger's call, they were quite active handling health and welfare traffic in the first days of the emergency and received nationwide publicity for this work. As a result of the publicity, they began receiving telephone calls from medical personnel volunteering to go to Nicaragua; from this, they were able to put together a complete medical relief team with the help of Drs. William Garcia and Guy Leveaux. Arrangements were made for a Boeing 707 provided by Pan Am to fly to Managua on December 27. Clearance for the flight was obtained directly from General Somoza and information on what supplies were needed was provided by YN1NIC. The plane carried 50 doctors, led by Dr. Garcia, and its cargo included 20,000 pairs of shoes, large quantities of food and medical supplies, and a kidney dialysis machine – largely arranged for by Roger and Hans. Their assistance did not end when the plane left the ground; through their efforts, and with the cooperation of YN4WLD, ten trucks were waiting at the airport to transport the doctors and supplies to the refugee center at Leon! The boys devoted their entire Christmas vacation to handling Managua traffic, aided by WA1NII and WA1JHQ.

Health and Welfare Traffic

In any emergency situation where regular communications have been wiped out, the highest-priority job for amateurs is to give the authorities whatever assistance they require in obtaining the needed relief supplies or in maintaining official communications links. Messages of this type can literally be lifesavers. Another vital service performed by amateur radio is what is commonly called "health and welfare" traffic, that is, messages from persons in the affected area to relatives or friends outside to advise them of their condition, or (with a somewhat lower priority) messages from outside the area inquiring of the status of persons within. It is indeed a tribute to the hams and authorities in Managua that, with so much to be done to coordinate the flow of hundreds of tons of relief supplies, health and welfare messages were handled with great dispatch. The value of this type of traffic can be fully understood only by someone who has had loved ones in a disaster area with no means of finding out whether they were still alive.

The national amateur radio society, *Club de Radio Experimentadores de Nicaragua*, set up its headquarters for health and welfare traffic at the Universidad Catolica Centroamericana, using the calls YN1UCA and YN1YN. With stations operating simultaneously on 40, 20, and 15 meters it was possible to handle large quantities of traffic. Operators included YN1s AMC FI HSM IAG IU KD RMP and VMD, and (from El Salvador) YS1s

The bulk of official traffic was handled from YN1NIC, operating from tents pitched on the front lawn of El Retiro, General Somoza's home and headquarters. Shown here is General Roger Bermudez, YN1RB (center), providing communications for officials of the Organization of American States.

FQM MBL and MV using YS1YS/YN1. Some 15,000 outgoing messages were handled at this station, of both an official and a personal nature.

Two-meter fm equipment was extremely valuable in maintaining coordination between the stations in Managua which were handling the bulk of the communications. The fm gear, largely Gladding 25s and hand-held units, was salvaged from ham shacks all over the city and set up at the message centers already listed as well as at CIFAN, the communications headquarters of the Nicaraguan Air Force. YN1s FI HSM and VMD retained their mobile capability on this band and were able to relay and deliver official and personal communications with a minimum of delay; another unit at YN1VA provided an additional hf outlet for traffic.

Two additional operations from Managua have come to our attention which deserve special mention:

Despite equipment failure and intermittent availability of power, Joan Parajon, YN1JMP operated almost continuously for the first two weeks (and on special schedules for weeks after) handling relief messages for the Evangelical Emergency Relief Committee in Managua, of which her husband YN1GPD is chairman. In addition, her message output included phone patches to the *United States Disease Center in Atlanta* and hundreds of welfare messages.

One of the first amateur radio teams to reach Managua from outside Nicaragua was a group representing the Sociedad Internacional de Radio Aficionados. SIRA, a Spanish-speaking group based in Miami, dispatched seven of its members for the purpose of handling welfare traffic. The team was almost entirely self-sufficient – an important consideration when sending personnel into an area where services are overtaxed or non-existent. Through the use of two-meter fm from their own jeeps, one loaned by YN1DUX, they were in five days able to pass some 1200 messages to an hf base station located at the airport for subsequent relay to the U.S. Operators were HK4BXY/W4, LU2DZ/W4, VE3DPQ/W4, WB4TED, WN4BFL, YN1AEO/W4, and Francisco Olano.

Nets

In order to handle the large volume of incoming and outgoing traffic, it was necessary to employ existing international traffic nets as well as new ones constructed around whatever YN stations were on the air. Twenty and fifteen meters handled the bulk of the traffic with the U.S. and Canada, but it was necessary to use forty meters for communication with nearby Central American countries and during the late evening hours, when twenty and fifteen were dead.

The International Mission Radio Association Net, long a fixture on 20-meter phone, was an important outlet for traffic from all parts of Nicaragua to the north. W5YOI acted as net control for the majority of the time, assisted by over a dozen other stations. The net operated from dawn to dusk or later every day during the emergency, handling over 1500 messages or phone patches.

Nets staffed largely by Canadians were operated on 14170 kHz by VE1ASJ and 14105 kHz by VE5BO; under their direction, some 1300 messages were handled on the two frequencies. These nets were able to relay much of this load to 75-meter nets in Canada to speed delivery; some of the southward traffic was picked up by Mexican and Colombian stations for later relay into Nicaragua.

A great deal of traffic was coming from and going to points south of Managua as well; KZ5USA was a key station in a net on 14102 kHz organized for this purpose.

While ssb was used for virtually all communications directly with the disaster area, YN1CW and YN1IU handled traffic on 80 and 40 meter cw during the late evening, when phone circuits to the U.S. on the higher bands shut down as the bands went dead. In addition, some 900 of the messages originated by YN1SIRA were relayed from the Miami area to points closer to their destinations on cw and RTTY by W4IYT and WB4HIS.

Other Participation

Not all assistance by YNs to the relief effort took place from Nicaragua. Mike, YN1MO, who flies for Lanica Airlines, was instrumental in arranging shipments of generators, equipment, and other supplies to Managua from Florida. Lanica was a great help to the relief effort in other ways, as well; the company provided free transportation for the SIRA group, and shortly after the earthquake, set up an emergency mail system where letters given to any Lanica employee in Nicaragua would be flown to the U.S. for mailing.

Other equipment was brought in by XE1CCP from Mexico and by WØDX/YN1IU from the U.S., the latter shipment consisting of generators, KWM-2 transceivers and two-meter fm gear.

While the earthquake was felt the strongest in the residential part of the city, the devastation was worse in the downtown area as the result of fires and the immediate demolition of unsafe buildings.

Emergency generators were among the most-needed items throughout the disaster area, not only for communications but for hospitals and first aid centers as well.

Dozens of other YNs spent countless hours handling emergency and welfare messages, despite their own losses and grief. YN1FJ of Pan Am used several operators at the airport in handling traffic related to incoming flights; ordinary radio communications from the airport had been knocked out. Others whose calls were mentioned in reports included YN1s AL AMB BCD BE BUD CL CT FHC FMG HJ HL HM HO IMO JFP JSN LEY ND NMP RM RV SL WK, YN2s DX JM, YN3IA, YN8s EP IR JN MB, and YN9s NQ and YN.

The following series of items is representative of the kind of assistance rendered by hams outside the disaster area. Considering the tens of thousands of messages handled during the weeks following the disaster, one can appreciate the futility of trying to report them all. It is gratifying to note that so many were picked up by the press and electronic media, and that many participants were in this way given the recognition they deserved.

On the morning after the 'quake, HK3BQP, XE1CW, and KZ5USA were instrumental in coordinating several flights of relief supplies, including a 100-bed portable hospital and communications team from the Canal Zone; another hospital and 400 quarts of blood from Colombia; and firefighting equipment from Mexico.

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As the result of a request made by the Nicaraguan Consul in Houston to the local Civil Defense organization, Houston hams set up a station at the consular office complete with kilowatt and triband beam. The call YN1ARG/W5 was used to provide direct communication with the government station in Managua.

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All over the U.S., the Nicaraguan consular offices were deeply involved in relief work. Communications with their government (through YN1NIC) was provided by local amateurs such as K3JH, Philadelphia; WA5YAS, Dallas; W5KSI, New Orleans; and W6HVN, San Francisco.

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The U.S. and Nicaraguan governments were not the only ones to use amateur circuits for official traffic. The Ministry of Foreign Affairs of Argentina relied on hams to contact its diplomats in Managua.

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WA2LEY and XYL were driving their amateur-radio-equipped camper through Central America when the earthquake struck. They immediately headed for Managua to provide assistance, arriving on Christmas day. Using the call sign YN1LEY, they established contact with W1PUO at the University of Massachusetts in Amherst, where K1FNA and Managua resident John Mason, YN1JSM, were operating. From this distance, and with relays provided by W4ESJ, Mason was able to guide YN1LEY through the streets of the city to the U.S. Ambassador's residence.

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Amateurs throughout the world offered to handle health and welfare inquiries into the affected area from concerned relatives. In North Carolina, the Charlotte Amateur Radio Club and Mecklenburg Amateur Radio Society used the club station W4CQ in a joint effort to handle the traffic. The Greater Cleveland area was well represented by WA8FTW, W8OAR, W8AVH and others in a similar organized venture.

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The Boston *Herald - Traveler and Record American*, Burlington (N.J.) County *Times*, and Huntsville (Ala.) *News* were among the newspapers which printed editorials lauding the work of hams during the emergency.

Our thanks to the hundreds of people, amateurs and non-amateurs alike, who sent us newspaper clippings or comments related to the role of amateur radio in the Managua disaster. Several hundred related incidents involving a similar number of amateurs were described in these articles and letters, and it would take an entire issue of *QST* to chronicle them all. We have attempted to tell as complete a story as possible of amateur opetation within Nicaragua during the emergency on the basis of notes taken by W0DX/YN1IU at the scene and using whatever additional information was submitted. Of necessity, only a limited number of items relating to the activities of amateurs outside the disaster area could be included in our account. They are representative of the kinds of assistance rendered by thousands of hams all over the world. Anyone whose call has been mentioned to headquarters in connection with Managua relief work will receive a Public Service Award, whether or not they are listed here. Those whose calls will never be known, but whose cooperation was nonetheless vital to the success of the operation, are the operators who refrained from transmitting on the frequencies being used for emergency traffic and instead participated as observers to the unfolding drama. Their good judgement is gratefully acknowledged.

Our special thanks to VE5BO, W1MD, W3YY, W4IYT, W8AVH, and K8ONA, who supplied a large portion of the information contained in this report. Without their thoughtfulness, this account would have been sketchy indeed. – *K1ZND*

AMATEUR RADIO PUBLIC SERVICE

NTS RACES AREC

In the Public Interest, Convenience, Necessity HRH

CONDUCTED BY GEORGE HART,* W1NJM

EMERGENCY COMMUNICATIONS ADVISORY COMMITTEE

IN ACCORDANCE WITH the Rules and Regulations Concerning Advisory Committees, the ARRL Board of Directors at its annual meeting in January formally established its fourth Advisory Committee. The first was Contests, the second VHF Repeaters, the third DX, and now Emergency Communications. At this writing, the Membership Affairs Committee, a standing committee of the Board, is performing the groundwork as required by Rule 2. The call for nominating petitions appeared in the March issue of *QST* page 81. Please consult the rules for further details of procedure. They are contained in the "Articles of Association and By-Laws" leaflet, free of charge to any ARRL member. All members should have a copy.

A few comments are perhaps in order to set the theme of this new AC. The subject was introduced to *QST* readers in a lead to this same column, appearing in the Nov. '72 issue. Rather than repeat anything said therein, we refer you to that item (p. 83). Please understand that there is no magic to the AC concept. It is simply another vehicle for channelizing membership sentiment to the Board or to Headquarters, and a way to tap the field expertise in the form of appointed advisory committee members.

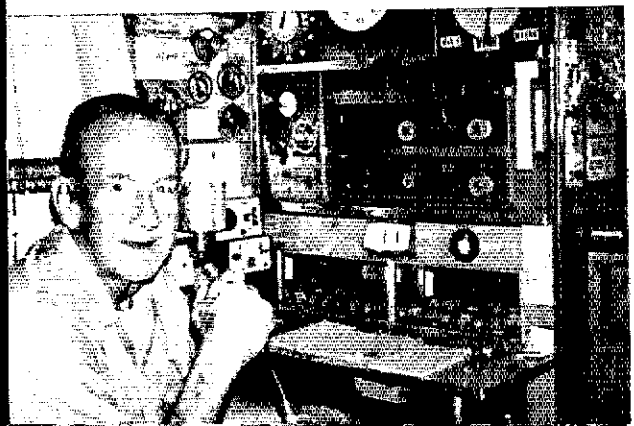
Most of those who commented asserted that this is something that should have been done long ago. Maybe so. In any case, it is being done now, so let's get behind it. Nominating petition forms are available from headquarters. A nomination requires only three ARRL full members as sponsors, so it's not at all difficult to put somebody up – provided he is also a full member of at least two years standing, technician license or higher for at least three, and is currently active in the emergency preparedness field. We hope that by some time this spring or early summer the committee will be in a position to get organized and start functioning.

What will it do? Well, this is not specifically determined at this writing, but in general we assume it will function in any area having to do with amateur radio emergency communications. This covers a lot of territory – AREC, RACES, monitoring services, independent emergency facilities, emergency use of existing repeaters, establishment of repeaters specifically for emergency purposes, emergency activating procedures – the list of possibilities is almost endless. The committee can keep itself quite busy. And, as we said in the November issue, qualified personnel are no problem.

Two points of philosophy are worth mentioning. The first one is that the committee is *advisory*. It doesn't "run" anything (except itself), it doesn't issue directives, edicts, or give orders to anyone. It merely recommends. It can generate its own recommendations, through the experience and general versatility of its own membership, or it can pass along a suggestion from the field – or study it, modify it, *then* pass it along. But none of its actions is necessarily final insofar as ARRL policy or administrative procedure is concerned.

On the other hand (and this is the second point), the recommendations of the committee are not to be and will not be taken lightly, either by the Board or by headquarters. There just is no use to having a committee that you don't intend to support by acting on its recommendations. This has been the pattern with presently-existing Advisory Committees and is intended to be the pattern with the ECAC. Oh, there will be times when an ECAC recommendation will have to be turned down because it is not administratively feasible or practical, but seldom if ever will any be

*Communications Manager, ARRL.



The Mono Co., CA, EC is pictured here. W6AJH is active on most hf bands and has been involved in many public service activities in his 51 years of hamming.

turned down simply because we disagree. While nominally the responsibility for acting on a recommendation lies with the one who acts rather than with the one who recommends, this by no means absolves the committee from at least moral responsibility. So *consider carefully* before you nominate, and don't nominate someone who will take a "why not?" attitude. Don't nominate someone who will say "if they don't like it, they can always turn it down." Nominate members who will assume that every recommendation the committee makes will be adopted, and who will consider each recommendation thus carefully before it is officially made. Remember, this committee will not be dealing with trivia. It will deal directly with the No. 1 "basis and purpose" of amateur radio.

We said above that the specific functions of the committee have not yet been determined. This is true to an extent, but the Board of Directors has already given it two specific assignments, and still another informally in a committee report. Anyone wishing to put his comments on file regarding these matters is invited to do so. We'll retain them at headquarters to be referred to the committee as soon as it is formed.

1) Minute 37 of the January Board Meeting had to do with appointment of a headquarters man to proceed to disaster areas to make contact there with amateur and public officials – purpose, to help coordinate them. In other words, a new National Emergency Coordinator, with a PR sideline.

2) Minute 39 of the same meeting comprised a motion that the ECAC study and make recommendations concerning national and/or international emergency frequencies. In other words, a new set of NCEFs (or ICEFs).

3) This matter was not the subject of a Board motion, but the Planning Committee of the Board in its report suggested that the matter of portable repeaters to be made available in times of emergency also be referred to the ECAC for study, when or if that committee was authorized (which it subsequently has been).

Still some organizational procedures to go through, so the above won't come before the committee the day after tomorrow, but when it does get rolling, these matters will probably be the first order of business. After that, it's on its own.

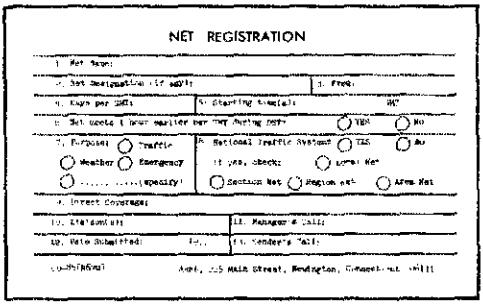
– *W1NJM*

Repeater Registration

Last call for registration for the next Repeater Directory. If you haven't filled out the registration card (CD-85A), and returned to ARRL Hq., NOW is the time. If you haven't sent in for the registration card yet, NOW is the time (with s.a.s.e., please). For more information see page 44 in March *QST*. Let's have your group's repeater listed in the next Repeater Directory. May 1 is the deadline; NOW is the time for action.

Net Registration

It's also time for another registration, that of public service nets for the annual Net Directory. There are three simple requirements for Directory listing: (1) the primary function of each net registered must be a public service activity; (2) the net frequency must be within the amateur bands; and (3) the net must be registered for each revision of the Directory, i.e. nets listed in the last Net Directory will NOT be carried over unless they are re-registered.


NET REGISTRATION

Net managers: have you registered your public service net yet for the next Net Directory? CD-125, available on request from ARRL Hq., should be used to forward net data by the June 1 deadline (see text).

All public service nets which have been registered since July 1, 1972 will be listed in the next Directory. If you have not registered your net, or if you are not sure whether or not the net has been registered, obtain a registration card (from ARRL), complete it and return to ARRL Hq. by June 1, 1973. If you have registered the net since last July, but there have been changes in net data, please advise us.

We prefer use of CD-85 for registering nets. However, net registrations will be accepted in almost any form as long as the necessary information is provided. (See illustration of CD-85 elsewhere in this column.)

Remember, the deadline is June 1, 1973, a little earlier than in previous years. Please help to make the next Net Directory a more complete and useful directory to network operation! Know a net manager? Pass the word. – *WA1FCM*

National Traffic System. WAØMLE reports conditions have been really punk with aurora messing up many nights on CAN. During the Miami Hamfest, the QFN bunch (in newly-re-sectioned Florida) voted to continue representation in RN5. Out west, liaison between RN7 and Alaska has been greatly improved through the efforts of KL7HMU and W7PI in lining-up liaison stations. Jan. was not a bad month on 9RN despite occasional long skip; representation is going along fairly good. W9HRY issued initial certificates to K9HDP and WB9UHL. TEN may be getting some relief from the broadcast station that camped on their net frequency. WØCLS and WBØFMR received new TEN certificates. W3NEM has issued annual 3RN certificates to: W3s EEB EML FA KUN LOS MJ NNL QU TN YA, K3s BA BR EXE KAJ KTH MVO OIO PIE, WA3s GSM KWU LAK MQP MSW OGM PJG QOZ QQR. K7NHL submits his last report as TWN manager. WØLRN has taken over the reins.

BRASS POUNDERS LEAGUE

Winners of BPL Certificates for January Traffic

Call	Orig.	Recd.	Rel.	Del.	Total
W3CUL/4	355	1110	1021	21	2507
K3NSN	40	630	630	30	1330
KØONK	55	546	517	12	1129
W1PEX	119	446	383	39	987
W6RSY	28	453	388	40	906
K1BCS	434	186	59	33	712
WB4WCM	64	344	234	63	705
WB4AIW	24	338	317	21	700
W3VR/4	185	267	231	9	692
WA1NNL	55	358	275	3	691
WA3QOZ	105	290	203	63	661
W6BGF	22	309	255	29	615
WA1MSK	119	244	194	20	577
K4FAC	31	272	239	35	577
W3EML	11	343	204	4	562
k4SCL	105	268	152	28	553
K3BHU	11	274	210	31	526
WØWYX	56	229	126	107	518
WA4SCK	26	251	231	7	515
WBØAXW	39	237	224	13	513

BPL for 100 or more originations-plus-deliveries

WA6BYZ	325	K7VWA	142	W6JIA	120
W8MRM	238	WA3RCI	141	WA4JQS	119
W6INH	204	W4IYI	141	K4TXJ	117
W4PAY	198	WB2WFJ	139	K3CR	115
WA1ECM	193	W3TN	130	W6CPB	110
WNØGQL	178	WAØHTR	129	WA3OGM	109
WA6KUR	175	WB5LIN	128	K8NQW	109
WAØAUX	174	W8IBX	128	WB4FDT	108
WB2CST	173	WB9AHJ	128	W5TI	108
WA1PHJ	171	WB4ZSA	123	WB4HKP	104
WB6VLK	171	WA2RYD	122	VE3EQZ	104
WNØFSL	153	W2URP	122	W4BDZ	103
WA4WOU	146	WNØGVR	122	WA6HAD	103
WB4HML	143	KØPSD	122	WB2ADW	102
WA8LIX	143	WB4QHD	120	WB8HUP	102

More-Than-One Operator Station

KØBIX 111

BPL Medallions (see July, 1968 *QST*, p. 99) have been awarded to the following amateurs since last month's listings: WA1ECM, WB2CST, WA8IQO.

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.

January Reports

Net	Sessions	Traffic	Rate	Avg.	% Rep.
EAN	33	2159	1.418	65.4	98.9
CAN	33	1515	1.050	45.9	100.0
PAN	33	1463	1.001	44.3	100.0
1RN	66	814	.451	12.3	93.9
2RN	66	774	.753	11.7	99.7
3RN	64	655	.485	10.2	98.9
4RN	62	888	.517	14.2	90.2
RN5	66	974	.499	14.7	95.5
RN6*	62	970	.537	15.7	100.0
RN7*	58	232	.244	4.0	56.4
8RN(E)*	57	453	.357	7.9	77.9
8RN(D)*	30	146	.186	4.9	89.0
9RN	68	650	.428	9.6	95.6
TEN*	62	633	.506	10.2	87.3
ECN	68	306	.281	4.5	95.0
TWN*	56	399	.240	7.1	66.5
TCC Eastern*	121[1]	875			
TCC Central	111[1]	768			
TCC Pacific*	124[1]	1055			
Sections[2]	3111	19253		6.2	
Summary	*3995*	*34982*	*RAN*	*8.8*	
Record	*3665*	*38538*	*1.590*	*19.1*	

*Data does not include extra SET sessions.

[1]TCC functions not counted as net sessions.

[2]Section and local nets reporting (78): AEND AENM AENO AENR (AL); ATEN (AZ); QZK (AR); NCN SCN (CA); CCN (CO); CN CPN Nutmeg VHF (CT); EAST EMTN EPTN GN QEN QFTN TPTN VEN (FL); GSN (GA); ILN (IL); KPN KSPN QKS QKS-SS (KS); KNTN KTN KYN (KY); SGN (ME); MDCTN MEPN (MD); EMN EMPN WMN (MA); MNN QMN (MI); PAW (MN); JC2AN MSN WEN (MO); MTN (MT); NHVTN (NH,VT); NJN NJSN (NJ); NLI NLS NYS (NY); BNR OSSBN SSEN (OH); OLZ (OK); BSN OSN (OR); EPA GCRN PTTN WPA (PA); TN TNN (TN); TEX TTN (TX); BUN UCN (UT); VN VSBN VSN (VA); NSN WSN (WA); WVPN (WV); BEN (WI); APSN (AB); MTN (MB); GBN OPN OQN (ON); WQV/UHF (PQ); SATN (SK).

Transcontinental Corps.

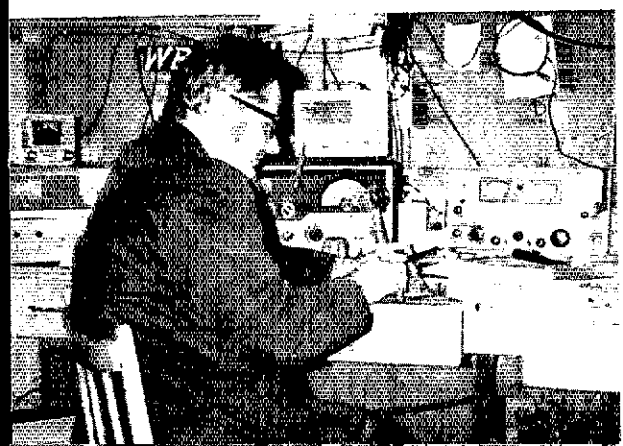
W2IFR handled Eastern TCC organization during the SET while W3EML sojourned in the hospital. Bill is making a return visit, so Howie is at the helm for the month of February. W5TNT is acting as Assistant TCC Director-Central and will take care of things in the event of temporary absence of KØAEM. KØOTH earned a TCC-P certificate.

Area	Functions	% Successful	Traffic	Out-of-Net Traffic
Eastern	121	92.0	2431	875
Central	93	96.7	1360	668
Pacific	124	96.8	2108	1055
Summary	*338*	*95.9*	*5899*	*2598*

The TCC roster (Jan.): Eastern Area (W3EML, Dir.) - W1s BJG FJI NJM QYY YNE, W2s FR GKZ, WA2s ELD ICU UWA, W3s CB EML, K3MVO, WA3OGM, W4s SQQ UQ, K4s FAC KNP, WB4s OMG SGV, W8s IBX PMJ VDA/4, K8KMQ, WA8PIM. Central Area (KØAEM, Dir.) - W4OGG, WB4s KPE YCV, W5s MI OU SBM TNT, WB5FDP, W9s CXY DND YB, WØs HI INH LCX ZHN, KØDDA, WAØIAW. Pacific Area (K5MAT, Dir.) - K1TMK/7, W5RE, K5MAT, W6s BGF FOI IPW MLF VNQ VZT, WA6DFI, WB6VKV, W7s BQ DZX EKB EM GHT KZ PI, K7NHL, WØLQ, KØOTH, WBØAXW.

Independent Net Reports (January)

Net	Sessions	Traffic	Check-ins
20 Meter Interstate Tfc.	24	852	368
North American Traffic	27	246	565
Micfarad	28	115	322
IMRA	34	895	1443
75 Meter Interstate SSB	31	304	1695
7290	48	589	2522
Clearing House	27	197	404



WB4NJI has recently been appointed EC for Volusia Co., FL. He's an active member of the Daytona Beach ARA and operates on several Florida section nets, both phone and cw.

Public Service Diary

More South Dakota flood activity is reported, this time by W9MMP. He was active from Neenah, WI, beginning 1000 local time on June 11 and handled over 150 health and welfare messages for the next six days. W9MMP received good support from radio, television and telephone services. - (W9MMP, EC Outagamie Co., WI)

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On Nov. 13, winds caused serious flooding along Monroe County's (MI) Lake Erie shore. The AREC was activated to assist Red Cross and c.d. communications during the early hours. Two fixed stations reported water levels and two mobiles made spot checks. The group then assisted in evacuating homes, with base stations in three shelters to help in locating families. Assistance was also provided to local fire departments particularly in connection with a propane gas explosion which destroyed three homes. Twenty amateurs participated. - (WA8EFK, EC Monroe Co., MI)

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On Nov. 17, K7UIV reported into the Eye Emergency Network with a request for an eye needed for an emergency operation in Phoenix, AZ. Earlier, WØRRW had requested an eye for Fargo, ND, on an emergency basis and Ft. Worth, TX, had made a similar request, but was later cancelled. WA4TTY advised that Nashville, TN, could supply two eyes. W5JA helped coordinate the shipment, one eye being shipped to Phoenix and one to Fargo. WØONO effected the transfer of the eye to Fargo at the airlines terminal in Minneapolis, MN. These transactions saved the sight of two people. - (W5JA)

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KP4ZC/mobile assisted the Coast Guard and Red Cross on Jan. 1, in relaying information concerning the plane crash which took the life of Roberto Clemente. Travel to the area was restricted but KP4QM made the necessary arrangements as to permit the mobile to move as close as possible to the accident site. The information given by KP4ZC was good enough to finally determine the disaster site. - (KP4QM)

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At 1645 local time on Jan. 9, WA5QJH/5 reported an automobile accident in San Antonio, TX, via the WA5VKZ autopatch repeater. - (WB5CIT)

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WAØPXF, EC South Metro (Littleton, CO) AREC, received a request to mobilize the Arapahoe ARC 2-meter mobile team on January 11. A local laboratory had experienced a broken pipe and great volumes of noxious gases were being wafted into adjacent residential areas. Mobile operators were available within minutes and were quickly assigned to the effected area on a street-by-street and house-by-house basis to advise the residents of the desirability of leaving the area until the gases cleared away. Progress and wind direction reports were relayed to the Emergency Operations Center. Nine club members participated. - (WAØYGU)

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On January 19, WA5FMF came upon a two car collision near Pascagoula, MS. Police were notified through the WA5RMS repeater's autopatch. WA5BNH made the call via autopatch since WA5FMF was not equipped to access the autopatch.

The following day (Jan. 20), WA5BNH discovered a car afire on I-10 near Grand Bay, AL. After unsuccessfully attempting to contact an amateur in Mobile, AL, a toll call was made to the State Police via the WA5RMS autopatch. While awaiting assistance a rear-end collision occurred at the same location. The police were again notified; this time using the WB4QEV repeater autopatch. One health and welfare message was handled for the occupants of the damaged car. WB5FXA assisted with the second call into Mobile. (WA5FII, SEC MS)

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At 1815 local time on Jan. 20, K8AIT/mobile reported a fire via the WA5VKZ repeater. The fire was located on Highway 90 in San Antonio, TX. (WB5CIT)

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On Jan. 21, members of the Great Plains ARC, Woodward, OK, were alerted by local c.d. officials to assist in rescuing motorists stranded by an unexpected blizzard. Using 4-wheel-drive vehicles they assisted in the rescue of occupants of approximately 200 stranded vehicles. WA5YQR acted as control and liaison to c.d. WA5YQQ and WA5BUG were mobile. WB5DGT assisted in relaying information as needed. Operation was 146.94 direct and lasted nearly 12 hours. - (WA5FSN, SEC OK)

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WB4IAG/5 reported a fire in a vacant lot in San Antonio, TX, on Jan. 21, via the WA5VKZ repeater and landline assistance by WB5CIT. Shortly thereafter WB4IAG/5 reported that a car had exploded at the same location. - (WB5CIT)

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It became necessary to notify a man from Gilbertsville, KY, who was on a hunting and fishing trip to the La Paz section of Baja (Lower) California, Mex., that his father had suffered a heart attack and his family wanted him to call home. The request was originated by K4YGE and received, through relays, by K6MVF on Jan. 27. The information was relayed to three Mexican stations who contacted Mexican officials. One of the amateurs involved spotted the hunter later in the week and learned that he had received the message and had called home. - (K6MVF)

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While traveling along Highway 20 in Liberty Co., FL, on Jan. 28, a passenger with W4WEB injured his foot when attempting to exchange seats with another passenger before the car had come to a complete stop. W4WEB called WB4UQH, using 2-meter fm, and described the accident. WB4UQH advised the local hospital and directed W4WEB to the hospital where emergency personnel were standing by. - (WB4UQH, EC Calhoun Co. FL)

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On Jan. 31, WA4UZA/mobile observed a wreck 10 miles south of Fayetteville, NC, in which two men were severly injured. He contacted WA4GTB/4 on 75 meters who relayed to police. Assisting were WA4UWK and W4LEZ. - (WB4CBJ, SCM SC)

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An explosion in Eagle Grove, IA, destroyed two business buildings and took 13 lives on Feb. 2.

Public Service Honor Roll January 1973

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, as reported to their SCM. 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*
WA3QOZ	10	10	12	12	12	6	3		5	70
WA8ETX	10	10	12	12	12	6	3		5	70
WA2RYD	10	10	12	12	12	4	3		5	68
WB4SVH	10	10	12	12	12	7			5	68
WB8HUP	10	10	12	12	12	5	3			64
WA3OGM	10	10	12	12	12	4	3			63
WB5AMN	7	10		9	12	20			5	63
W4OGG	10	10		12	12	18				62
WA2CLB	10	10	12	12	12				5	61
WB4WCM	10	10	12	12	12	2	3			61
W7OCX	10	10	12	12	12				5	61
WB8BMV	10	10	12	12	12				5	61
KØBAD/4	10	10	12	12	12				5	61
KØPIV/4	10	10	12	12	12				5	61
WA2ICU	10	10	12	12	12	3				59
WB5FIN	10	10	12	12	12		3			59
KØBIX	10	10	12	6	12		3		5	58
W5SBM	10	10	12	12	12	1				57
WB2AEH	10	10	12	12	12					56
WB2CHY	10	10	12	12	12					56
WA2EUO	10	10	12	12	12					56
WB2OYV	10	10	12	12	12					56
K3CR	10	10	12	3	9	4	3		5	56
WA3GSM	10	10	12	12	12					56
K3KAJ	10	10	12	12	12					56
WB9AHI	10	10	12	12	12					56
WAØSIG	10	10	12	12	12					56
WB4RUA	10	10	12	3	12	2		1	5	55
WA7JOS		10		12	12	16			5	55
W3ABT	10	10	9	3	12	10				54
WA1FCM	10	10	6	12	12		3			53
WB4EDI	10	10	6	12	12		3			53
WA6DEI	10	10	12	9	12					53
WA3QOR	10	10	12	6	12	2				52
W7BQ	10	10	12	9	6				5	52
WAØMLE	10	10	12	3	12				5	52
WB8JAD	10	5	12	12	12					51
WB4AJL	10	10	12	3	12		3			50
W2MTA	10	10	12		12				5	49
W2RQF	10	10	12		12				5	49
W2TPV/Ø	10	10	12		12				5	49
WA3QLG	10	10	12	9	6	2				49
W5ABQ	10	10	12		12				5	49
WA9EED	10	10	12		12				5	49
WB9KVN	10	10	12		12				5	49
KØMRI	10	10	12		12				5	49
WA3PJG	10	10	12	3	12	1				48
WA2CNE	10		10	12	3	12				47
WB2CST	10	10	12	12			3			47
WB2IKL	10	10	12	3	12					47
WB4ZSA	10	10	12		12		3			47
W6BGF	10	10	12		12		3			47
WB6KJI	10	10	12	3	12					47
W6LRU	10	8	12		12				5	47
K7HLR	10	5	12	3	12				5	47
K8MLO	10	10	6	9	12					47
WB2UFG	10	4	12	3	12				5	46
WB4VZQ	10	10	9	9	3			5		46
WA6IVA	10	10		12	9				5	46
WA8UPI	6	10		12	12				5	45
WBØEAF	10	10	12		12	1				45

WA1MYK	44	W3LOS	39	K4KNP	34			
W4ZJY	44	W3NEM	39	WB5FML	34			
W5AMZ	44	WB8KZD	39	WB6VKV	34			
K5MAT	44	KØAEM	39	W6YBV	34			
WA5YLA	44	*WØHI*	*39*	*W7WAH/5*	*34*			
K5YTA	44	VE3AWE	39	WA8ETW	34			
W7GHT	44	VE3DPO	39	WB8KXV	34			
K7OUF	44	VE3EWD	39	WA8PIM	34			
W8GLC	44	W2CU	38	W9EI	34			
WB9FST	44	WA2UOO	38	W9QLW	34			
WØBV	44	W6INH	38	WBØHCK	34			
VE3GIG	44	WB8KKI	37	VE3EHF	34			
WA8BCX	43	WA3QDH	36	W6DEF	33			
K4UNW	42	W3YA	36	W6RFF	33			
WB8CSH	42	K9KTB	36	WA2AOG	32			
W8IBX	42	WA1NLD	35	WA2LCC	32			
W3FCS	41	WA2AYC	35	W2ZQ	32			
WB4EKJ	41	WA2ELD	35	WB6AKR	32			
WB5DLW	41	K4TXJ	35	W6JVC	32			
K3MVQ	40	WB4VSA	35	W7PI	32			
W9HRY	40	K5ROZ	35	W3TN	31			
K1SXF	39	WB8CWD	35	W4CID	31			
W1UBG	39	K9HDP	35	WB4WXX	31			
W2FR	39	*VE3FQZ*	35	*WNØGQL*	*30*			
W2RUF	39	W3OKN	34	WNØGVR	30			
		W3QU	34					

*Denotes multioperator station.

Category Key. (1) Checking into cw nets, 1 point each; (2) Checking into phone/RTTY nets, 1 point each; (3) NCS cw nets, 3 points each; (4) NCS phone/RTTY nets, 3 points each; (5) Performing assigned liaison, 3 points each; (6) Legal phone patches, 1 point each; (7) Making 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.

WAØRCU and WØESB surveyed the damage and returned to their homes and relayed health and welfare information to concerned parties. They also assisted the Red Cross in sending and receiving messages when telephone lines were not available. - (WØFDM)

— • • • —

While mobile near Flint, MI, on Feb. 3, W8OBA observed a car sideswipe a truck forcing the truck into the median. W8OBA's call through the Clarkston repeater was answered by WB8DMD who called the State Police. - (WB8DMD/W4WNH)

— • • • —

At the beginning of the Simulated Emergency Test period (Jan. 27), the W6IN Society were alerted to earthquake activity near Newhall, CA. The operators were familiar with earthquake disaster conditions, having been in the center of activity during the disaster of two years earlier. Since reports indicated that the quake intensity was not sufficient to cause property damage, the group completed SET activities. - (K6VGL)

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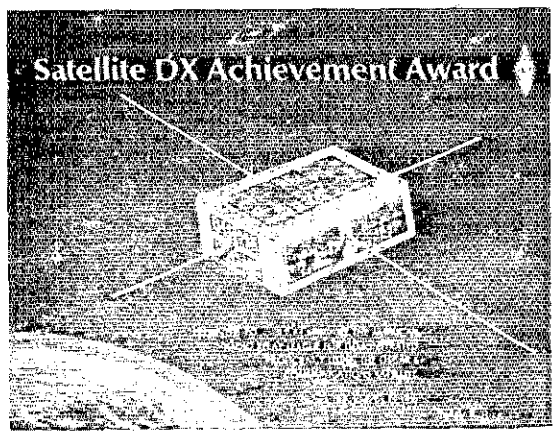
Thirty-five SEC reports were received by the deadline for Jan. reports. (Reminder: SEC reports should be received at Hq. by the 15th of the month following the month being reported.) Only 9679 AREC members were represented by the Jan. reports; the lowest total in years. Jan. 1972 saw 34 reports mentioning 10,973 members. Why is Jan. a low total month? Check March *QST*, page 72 to see how your section rates. The following sections were reported: Alta, Ariz, Conn, Del, EBay, ENY, Iowa, Kans, Ky, LA, Mar, Mich, Miss, Nebr, Nev, NFla, NNJ, NTex, Ohio, Okla, Org, Oreg, SV, SDgo, SJV, Sask, SDak, SFla, Utah, Va, Wash, WVa, WMass, WNY, WPa. QST

OSCAR NEWS



Satellite DX Achievement Award winners: LA1K, K2LGJ, K7BBO, W3TMZ, VE3CUA, K4CYU, VE2BYG, WB2VKZ, VE3HD, WB2UZU, K1ZND, K1HTV, K4TI, W4WNH/8, WA8YFW, WA4YVQ, WA7GCS, VE6AK, W9ZTD, W2WD, WØRLI, VE7ANP, W4CKB, KL7MF, JA1JRK, JA8PL, WA2HKS, VE6SF, JA8ARS, WØTJF.

With reliable amateur satellite communication now a well-established fact for more than hundreds of stations, the emphasis for many operators has shifted from running up contact totals to seeking extended DX contacts. Over-the-horizon reception of Oscar signals has been noted almost from the moment of launch; propagation at 10 meters has been aided by the ionosphere for a significant part of the daylight hours during past months. Nearly everyone using the satellite has noted reception of the ten-meter downlink well before their own return signal was audible. It takes a great deal of patient listening, at times when the satellite is theoretically out of range, to log signals from beyond its calculated 4900-mile working diameter. It *is* possible, though; KØDDA has heard Japan, over 5500 miles distant, while using a two-element quad for a receiving antenna. K7BBO has copied orbits as long as 21 minutes past theoretical LOS (loss-of-signal) and has heard many JA signals.

Two-way communication while the satellite is beyond line-of-sight range is somewhat more difficult, owing to the poorer propagation of two-meter signals and the tendency for stations within range to overload the translator. The longest-range QSO reported to date is K7BBO–SP2DX, about 5050 miles. No doubt some of the other extreme-distance contacts made have been over-the-horizon in nature. Reports of such contacts are especially appreciated by Amsat.

The Satellite DX Achievement Award has had a total of 30 qualified applicants. Three especially interesting applications were received – KL7MF, JA1JRK, and JA8PL; all have confirmed 4 continents, and JA1JRK's application included cards from 19 other JA stations. Also notable is the fact that, of the first group of qualifiers, no less than six were Canadians! Rules for the award appear on page 58 of December *QST*, and a combination rules sheet/application form is available from ARRL headquarters for a stamped, self-addressed envelope.

Continent hunters will be interested in the appearance of Asiatic Russian stations. UAØSBI (Irkutsk) and UA9HG (Tomsk) were reportedly contacted by OH9NV and JA1ATL. There are now over one dozen USSR stations communicating via Oscar 6. G8CUO claims the first RTTY QSO via Oscar, with G3TWX on October 21, 1972. Dave also reports working PAØVLZ and G8EGU on teletype, and G8BNW crossmode with the latter on ssb.

DJ6RD/W9 has been quite active through Oscar, but has experienced some problems receiving QSLs because his address is not in the Callbook: Jurgen Nittner, RR 5, Box 247, Valparaiso, IN 46383.

Do you need high power to work through Oscar? You sure don't! To illustrate the point, here are a few examples of gear used by successful Oscar participants: Homemade transmitter, 15 watts input, 5-element beam. (K4JYM) . . . 20 watts into a turnstile. (JA1NEZ) . . . TV2B into a dipole. (WB4RUA) . . . 30 watts into delta loop beam. (W9AI) . . . 30-watts output, Motorola, into 8-element beam. (K4DVJ) . . . 50 watts to 8-element beam. (WA2HKS, recent Satellite "1000" Award qualifier) . . . ML-2 fm transceiver used on cw with microphone button as key, into 8-element crossed yagi. (KH6IJ) 'Nuff said? Remember, the maximum permissible effective radiated power (erp) is 100 watts.

An additional operating day, Monday (GMT) was added to Oscar's operating schedule. Thus, provided satisfactory battery performance continues, the satellite will be available for communication Friday through Monday (GMT). W1AW bulletins will carry news of any change in this schedule. *K1ZND and WA2INB*

OSCAR 6 TWO-WAYS

	Stations worked	*States*	*Countries*
DJ2RE	168	3	29
EA4AO	93	3	24
KL7MF	32	–	5
KX6HK	11	–	3
SP2DX	470**	–	34
VE3QB	180	–	15
W2GN	82	–	5
K2KNV	120	–	17
WB2VKZ	137	33	13
W2WD	–	32	19
WA3FAL	11	7	2
K3RYL	–	36	14
W3TMZ	–	37	16
WA4JID	205	38	11
K7BBO	1680**	36	15
DJ6RD/W9	81	27	7
W9OII	–	24	4
W9QQG	140	37	9
W9ZTD	50	23	7

**total contacts.

Hamfest Calendar

California – The Antelope Valley Amateur Radio Club's annual banquet is Saturday, April 7. For details write the club, Box 1221, Lancaster CA 93534.

California – The Fresno Amateur Radio Club's 31st Annual Regional Amateur Hamfest is May 4-6 at the new Sheraton Inn in Fresno. For details write Don Burr, W6WME, Hamfest Reservations, 1503 W. Cornell, Fresno CA 93705. For motel reservations: the Sheraton Inn, 2515 N. Parkway Dr., Fresno CA 93705.

California – The West Coast VHF/UHF Conference is May 5, 6 at the Pen and Quill Hotel, 3501 North Sepulveda Blvd., Manhattan Beach. Registration fee is $3. For info contact WA6HXM, Conference Chairman, Box 2473, Palos Verdes Peninsula CA 90274.

Florida – The St. Petersburg Amateur Radio Club's Annual Hamfest is Sunday, May 6, 9 AM to 3 PM at Lake Maggiore, 9th St. S. at 38th Ave., St. Petersburg. Plenty of parking space, as well as good shelters. Registration $1 per family. Bring lunch, family and friends. Address inquiries to Lee L. Kanarian, K4WXS, 461 Pinellas Way, S., St. Petersburg FL 33707.

Illinois – The Kishwaukee Amateur Radio Club Hamfest is May 6, 8 AM to 3 PM. The location is Notre Dame Center, 3 miles south of Dekalb off Rt. 23 (signs will be posted). Talk-in 146.94 and .52 direct; 146.13-73 RPT; 7258 kHz. Tickets are $1.50 advance; $2 at the door. Write the club, Box 473, Dekalb IL 60115.

Indiana – The TARS Hamfest is Sunday, May 6 at Evansville, 4-H grounds, Hwy 41, north 3 miles. Auction, overnight camping, ladies bingo, reserved flea market booths, air-conditioned. For advance reservations and flyer contact Robby, W9MKZ, 502 S. Lincoln Park Dr., Evansville IN 47714.

Massachusetts – The Sharon Amateur Radio Assn. is holding an auction at 1 PM on April 29th at the home of David Fisher, WA1LXE, 30 Ames Ct., Sharon. Free coffee and donuts. For info write Robert Linsky, WN1OWI, 21 Harold St., Sharon MA 02067.

Maryland – The Greater Baltimore Hamboree is April 8 at 10 AM at Calvert Hall College, Putty Hill and Goucher Blvd., Towson (1 mile south of Exit 28, Beltway I-695). Food service, flea market, no table charge or percentages. Registration $2. For info write Joe Lochte, 5400 Roland Ave., Baltimore MD 21210.

Maryland – Potomac area Hamfest is Sunday, April 29 from 9 AM to 5 PM at Westminster. Registration including flea market or tail-gate sales is $2. Professional food and beverage catering, parking for 400 cars, talk-in on 146.94.

Missouri – The 4th Annual Northwest Missouri Hamfest is May 6, 10 AM to 4 PM at Kansas City North Community Center, 3930 N. Antioch Rd., Kansas City (1/4 mi. east of I-29 and I-35 intersection). Swap tables, food, programs of interest, talk-in 3.925 and 146.94. For info write PHDARA, P.O. Box 11, Liberty MO 64068.

Mississippi – The Old Natchez ARC's Annual Hamfest is April 8 in Natchez. Write for info to ONARC, P.O. Box 599, Natchez MS 39120.

North Carolina – The Raleigh Amateur Radio Society's 1st Annual Hamfest is April 15 at the North Carolina State Fairgrounds. Flea markets, net and association meetings, YL and XYL activities. Talk-in on 3.923 MHz, 146.94 simplex, 146.28/.88, 146.04/.64. Overnight trailer and camping parking $2. For info write RARS Hamfest, P.O. Box 17124, Raleigh NC 27609.

New Mexico – The Mesilla Valley Radio Club's Annual Ham Picnic, "bean feed" is Sunday, April 29. Location is 40 mi. north of El Paso, Texas. For info write Carl B. Bundschuh, W5OPN, P.O. Box 207, Mesilla Park NM 88047.

New York – The 14th Annual Hamfest sponsored by the Southern Tier Amateur Radio Clubs is 2 PM, April 14, at St. John's Ukranian Hall, Johnson City. Admission to lectures and flea markets is free. Awards and dinner $5. For tickets or info write STARC P.O. Box 11, Endicott NY 13760. Advance tickets only by April 11.

New York – The Rockaway ARC Spring Auction is Friday, April 27 at 8 PM at the Hall of Science Bldg., World's Fair Grounds, Flushing Meadow Park, Queens. Doors will open at 6 PM to accept sale items. Donations at the door $1. For further info write Al Smith, WA2TAQ, P.O. Box 341, Lynbrook NY 11563.

New York – The first Annual Auction of Radio Society of Greater Brooklyn is Sunday, April 29 at 1 PM, at the Rockaway Center for the Performing Arts, 90-01 Beach Channel Dr., (opposite McDonald's) Rockaway Park. Doors open at 11 AM for accepting equipment. Donations $1. Write Gary Gleicher, WA2IYH, 2539 West St., Brooklyn NY 11223.

Ohio – The 19th Annual Dayton Hamvention sponsored by the Dayton Amateur Radio Association is Saturday, April 28, at Dayton Hara Arena and Exhibition Center. Program includes forums, group meetings, hidden transmitter hunt, and YL/XYL activities. Banquet at 7 PM. At noon on Friday the open house begins. QCWA/OOTC/SSB dinner is Friday evening at 6 PM with Sen. Barry Goldwater, K7UGA, QCWA president presiding. For info and map write Dayton Hamvention, P.O. Box 44, Dayton, OH 45401.

Ontario – The 27th Annual Banquet is April 14th at the Guild Inn, 201 Guildwood Pkwy., Scarborough. For info write Scarboro Amateur Radio Club, 27 Flerimac Rd., West Hill ON.

Wisconsin – The Tri-County ARC Mid-Winter Swapfest is March 11, 9 AM to 5 PM at the National Guard Armory, Whitewater. Tickets $1 advance; $1.50 at the door. Display table reserved for $1. Talk-in on .94. Refreshments, free parking, everything indoors. For tickets and details write Dan Servais, WA9AJW, RR4 Box 309AA, Elkhorn WI 53121 (include s.a.s.e.). Tel. (414) 723-2227.

Washington – Lower Columbia Amateur Radio Assn. is having the 25th Anniversary Celebration and Dinner on April 14 at Sandy Bend Grange Hall near Lexington (Longview – Kelso area). Tickets $3.25. Swap shop, contests, talk-in 146.76 and 3960. For details write Mike Powell, 355 Baltimore, Longview WA 98632.

Washington – The Skagit ARC of Washington State will hold its 20th Annual Hamfest and Banquet at Bryant Grange Hall on April 28. 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

April 27-28-29 – West Gulf Division, Euless, Texas.
May 27 – Virginia State, Vinton, Virginia.
June 2-3 – Florida State, Orlando.
June 9-10 – Georgia State, Atlanta, Georgia.
June 30-July 1 – Rocky Mountain Division, Cheyenne, Wyoming.
June 30-July 1 – West Virginia State, Jackson's Mill, West Virginia.
September 14-16 – Roanoke Division, Reston, Virginia.
September 29-30 – New England Division, Hyannis, Massachusetts.
October 13-14 – Pacific Division, Santa Cruz, 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.

WEST GULF DIVISION CONVENTION

Euless, Texas **April 27-28-29, 1973**

The Western Hills Inn in Euless, Texas, will be the site of the 1973 West Gulf Division Convention Friday evening, Saturday and Sunday, April 27, 28 and 29. Early arrivals will enjoy the opportunity to get acquainted at an informal gathering Friday evening. Saturday and Sunday there will be equipment displays, meetings of various amateur social and technical groups and lots of other activities to insure an interesting but relaxing weekend for all. ARRL Communications Manager George Hart, W1NJM, will participate in the various sessions devoted to operating activities and in the ARRL Forum on Saturday with President Harry J. Dannals, W2TUK, Director Roy L. Albright, W5EYB, and other League officials. President Dannals will be the main speaker at the Saturday evening banquet. Information on the banquet may be obtained from the convention committee.

The Western Hills Inn will accept pre-convention reservations at a special single/double rate of $12.65. Regular rate is $15.45 single/double. Reservations should be accompanied with a check for $12.65 per room. Convention pre-registration is $3 per person; after April 1, $3.50. This does not include the Saturday evening banquet. Requests for information and convention registration go to West Gulf Division '73 Convention Committee, P. O. Box 47382, Dallas, TX 75247.

Changes of Address

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

April 1923

. . . The broadcast boom is reaching its peak, and interference from "those damned amateurs" is a problem as much of public relations as design and engineering. The ARRL Board of Directors dramatically calls upon every amateur to observe quiet hours from 7:30 to 10 P.M. local time – "for the good of our game." This month's W8ZZ cartoon cover highlights the theme, with our hero's hand reaching for the key just as the station clock hits 10:01 – "time for action."

. . . Most other magazines have abandoned amateur radio for the lucrative field of catering to BCLs – yet *QST*, even with a firm decision to stick exclusively to *amateur* radio, is found a desirable medium for these famous manufacturing names of the day: Cunningham, Ray-O-Vac, Grebe, Burgess, Crosley, Kennedy, Atwater Kent, Eveready, Magnavox, Westinghouse.

. . . Membership growth in Canada is recognized by the establishment of a new office of the Canadian General Manager, with 9AW appointed to that post.

. . . The lead technical article is a paper by Prof. Hazeltine, presented before the Radio Club of America, describing a neutrodyne circuit which gets rid of annoying self-oscillation in r.f. stages. Increasing interest in better reception is marked also in 9RY's story of a home-built superheterodyne – and how to make it actually work!

April 1948

. . . Single sideband is the hottest subject of the day, and won't be put off by a.m. Diehards who decry the "Donald Duck" invasion. Prof. Villard, W6QYT, brings us more gospel in the form of a balanced frequency converter circuit for our receivers, to replace the conventional second detector. J.L.A. McLaughlin describes a selectable sideband adapter, to be used for better reception of standard a.m. signals by dumping one sideband and eliminating most of the carrier heterodyne QRM.

. . . F.m. on 80 through 10 meters is rapidly gaining converts, largely for its comparative freedom from interference to broadcast reception. W1PDP's contribution is a balanced-modulator exciter providing narrow-band f.m. output. W8OAP provides some hints on adding a limiter-discriminator to a surplus receiver for n.f.m. reception.

. . . "Something for everyone" could easily be the theme of this issue. W2OXD shows us a complete 20-watt rig for 50 Mc. W1JEQ describes a 2-meter mobile converter. A doorknob (703A) triode powers a 1215-Mc. oscillator built by W3HFW and W3MLN, with a ground-plane high-gain antenna built in! – *W1RW*

Happenings of the Month

BILL REQUIRING FILTERS INTRODUCED

The Honorable Charles M. Teague, Congressman from the 13th District of California, has reintroduced his bill giving FCC authority to set standards for radio and television broadcast receivers, so as to filter out all interference from an amateur or citizens radio station "operating on its assigned frequency." The bill, HR 3516, was filed January 31 and has been referred to the Committee on Interstate and Foreign Commerce. Members of the Committee are: Harley O. Staggers, W. Va., Chairman; Torbert H. Macdonald, Mass., Chariman, Subcommittee on Communications; John Jarman, Okla., John E. Moss, Calif., John D. Dingell, Mich., Paul G. Rogers, Fla., Lionel Van Deerlin, Calif., J. J. Pickle, Texas, Fred B. Rooney, Pa., John M. Murphy, NY, David E. Satterfield, 3rd, Va., Brock Adams, Wash., W. S. Stuckey, Ga., Peter N. Kyros, Maine, Bob Eckhardt, Texas, Richardson Preyer, NC, Bertram L. Podell, NY, Henry Helstoski, NJ, James W. Symington, Mo., Charles J. Carney, Ohio, Ralph H. Metcalf, Ill., Goodloe E. Byron, Md., William R. Roy, Kans., John Breckenridge, Ky., Samuel L. Devine, Ohio, Ancher Nelsen, Minn., James T. Broyhill, NC, James Harvey, Mich., Tim Lee Carter, Ky., Clarence J. Brown, Ohio, Dan Kuykendall, Tenn., Joe Skubitz, Kan., James F. Hastings, NY, James M. Collins, Texas, Louis Frey, Jr., Fla., John Ware, Pa., John Y. McCollister, Neb., Richard G. Shoup, Mont., Barry M. Goldwater, Jr., Calif., Norman F. Lent, NY, H. John Heinz III, Pa., William H. Hudnut, III, Ind., Samuel H. Young, Ill. The text of the bill follows:

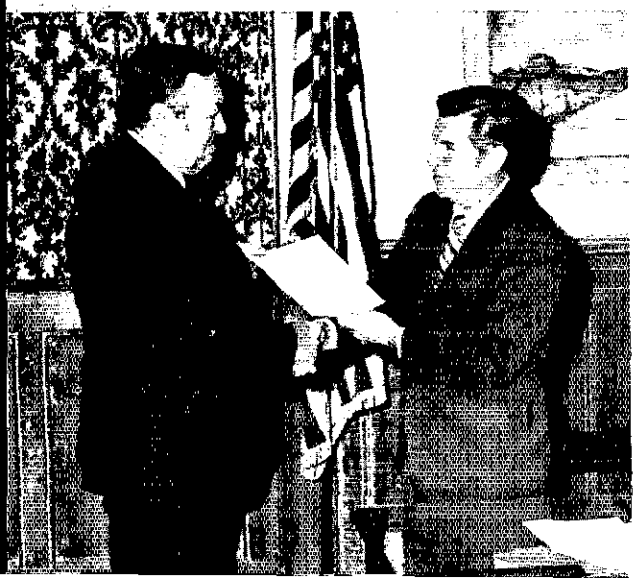
A BILL

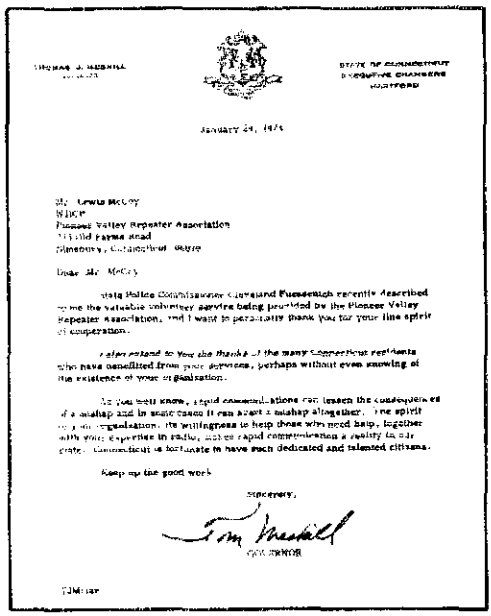
To amend the Communications Act of 1934 to require that radio and television receivers meet certain technical standards for filtering out interference.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 303 (s) of the Communications Act of 1934 is amended by inserting "(1)" after "(s)" and by adding at the end thereof the following:

"(2) Have authority to require that apparatus designed to receive broadcasts comply with standards of the Commission under this paragraph (2), when such apparatus is shipped in interstate commerce, or is imported from any foreign country into the United States, for sale or resale to the public. Standards under this paragraph shall be prescribed by rule for the purpose of requiring the filtering out of interference. Such standards shall include a requirement that all interference from any amateur station, and any citizens radio service station, operating on its assigned frequency, be filtered out."

The Honorable Thomas J. Meskill, Governor of Connecticut, recently sent an individually-typed letter to every member of the Pioneer Valley Repeater Association, which operates five two-meter repeaters across Connecticut, thanking them for their services in reporting highway emergencies and similar events to the police. The governor, right, makes a personal presentation of the letter to Carl Dane, W1FXK, PVRA president. *(Courtesy Dane Photo)*





January 24, 1975

Mr. Lewis McCoy
W1DCF
Pioneer Valley Repeater Association
[illegible] Farms Road
Glastonbury, Connecticut 06033

Dear Mr. McCoy:

State Police Commissioner Cleveland Fuessenich recently described to me the valuable volunteer service being provided by the Pioneer Valley Repeater Association, and I want to personally thank you for your fine spirit of cooperation.

I also extend to you the thanks of the many Connecticut residents who have benefited from your services, perhaps without even knowing of the existence of your organization.

As you well know, rapid communications can lessen the consequences of a mishap and in some cases it can avert a mishap altogether. The spirit of your organization, its willingness to help those who need help, together with your expertise in radio, assure rapid communications a reality in our state. Connecticut is fortunate to have such dedicated and talented citizens.

Keep up the good work.

Sincerely,

Tom Meskill
GOVERNOR

TM:ser

Ted Huddle, W4CID, proudly displays his Kentucky call letter license plates, finally available in 1973 after long fights going back a decade or more. Ted, SCM of Kentucky, worked closely with George S. Wilson, III, W4OYI, and indeed a great many other amateurs, in bringing the struggle to a successful close.

MOUNTED POLICE CENTENNIAL

The Royal Canadian Mounted Police, popularly known as the Mounties ("who always get their man"), will operate a special-events station from Ottawa, commemorating their 100th anniversary. VE3RCMP will operate 23 May to 30 August, 1973, 1200 to 0400 GMT daily, 80 through 2 meters, cw, ssb and fm. A commemorative QSL card will be sent all stations worked; an IRC or stamps will not be required.

The station will be open for visitors, too, as part of the centennial exhibit at the RCMP Training Center, St. Laurent Boulevard, Ottawa.

Further information can be obtained from the Commissioner, RCM Police, 1200 Alta Vista Drive, Ottawa, Canada K1A OR2: Attention Telecommunications Branch.

CRYDER JOINS VRAC; CAIN TO CAC

George R. Cryder, W8LGL, of Delaware, Ohio, has been appointed to the VHF Repeater Advisory Committee by ARRL President Harry J. Dannals, W2TUK. George was co-organizer of the Central Ohio Radio Club Repeater System and is trustee of its stations W8AIC and W8WTB. He helped organize and served as first president of the Ohio Area Repeater Council; currently he's its secretary-treasurer. He's been active in repeater design and operation for the past five years, licensed and a League member for the past twenty.

James D. Cain, WA9AUM, of Indianapolis, Indiana, has been named to the Contest Advisory Committee. He has taken part in Sweepstakes, DX Test, Field Day and Communications Department Parties regularly since 1962. He is a member of the Indy DXers; edits the Mad River Radio Club's publication *Flash*; and holds an ARRL appointment as Official Relay Station.

MODEL-CONTROL RULES

In August 1972 FCC issued a Notice of Proposed Rulemaking, Docket 19572 (See page 98, *QST* for October 1972) looking toward relaxed rules for radio control of models; the idea had come from the Academy of Model Aeronautics in RM-1951. All comments in the Docket, including those filed by ARRL, were in favor of adoption. Accordingly, FCC issued a Report and Order making the following rules effective on January 15, 1973:

Section 97.99 and undesignated headnote "SPECIAL PROVISIONS" are added to read as follows:

SPECIAL PROVISIONS

97.99 Stations used only for radio control of remote model crafts and vehicles.

An amateur transmitter when used for the purpose of transmitting radio signals intended only for the control of a remote model craft or vehicle and having mean output power not exceeding one watt may be operated under the special provisions of this section provided an executed Transmitter Identification Card (FCC Form 452-C) or a plate made of a durable substance indicating the station call sign and licensee's name and address is affixed to the transmitter.

(a) Station identification is not required for transmissions directed only to a remote model craft or vehicle.

QSL DESIGN CONTEST

ARRL is pleased to announce a competition to design an official League QSL card to be used in celebration of the Bi-Centennial of the United States of America in 1976. The competition is open to all U.S. licensed amateurs. The winning entry will be made available to interested printers and amateurs may then purchase QSL cards as they wish from normal commercial outlets.

Entries will be judged on appropriateness to the occasion of our nation's 200th anniversary and amateur radio's role in that celebration. Consideration will also be given to ease and cost of reproduction. Judging will be done by a committee including the ARRL public relations counsel and QSL printers. The winning designer will receive an appropriate plaque, and his design will be publicized in December *QST*. All entries, which become the property of ARRL, must be received by August 31, 1973. Entries should be addressed to Dept. 1776, ARRL, Newington, CT 06111.

Indiana SCM Bill Johnson, W9BUQ, (right) received the fifth annual Indianapolis Radio Club Award of Appreciation from the 1971 winner, William Lueth, W9AI. Bill's long service to the Club, to the Indiana Radio Club Council, as SCM, to Red Cross and YMCA, and as an operator in emergencies were mentioned in the letter of nomination. *(Photo tnx to W9EL – himself an earlier winner of the Award!)*

(b) Transmissions containing only control signals directed only to a remote model craft or vehicle are not considered to be codes or ciphers in the context of the meaning of Section 97.117.

(c) Notice of operation away from authorized location is not required where the portable or mobile operation consists entirely of transmissions directed only to a remote model craft or vehicle.

(d) Station logs need not indicate the times of commencing and terminating each transmission or series of transmissions.

In Section 97.101, the headnote is amended to read as follows:

97.101 Mobile stations aboard ships or aircraft.

The FCC did not, however, honor requests for authority to transmit telemetry from models in flight because of the great ranges possible from even a tiny signal at high altitude. The Commission also reminded amateurs using model control that there was no guarantee of freedom from accidental interference from other stations in the amateur radio service who might happen to use the frequencies; they suggest advance coordination and planning in each locality.

HELENA NEW SEMIANNUAL EXAM POINT

Western Montana, parts of Idaho and Wyoming cease being Conditional Class territory with the establishment of Helena, Montana, as a semi-annual examination point. Applicants whose homes are within 175 miles airline distance of Helena must now appear for an FCC-administered General Class test rather than applying for Conditional.

Amateur and commercial radio operator examinations will be offered at Helena and Billings in April; applications must reach the FCC District Engineer in Charge, 8012 Federal Office Building, Seattle, Washington 98104 by April 13. No applications will be accepted at the time of examination; only those holding FCC Appointment Form 79 will be admitted.

Billings remains an annual exam point; candidates may elect to go to Billings rather than Helena, but the 175-mile circle is centered on the latter. Incidentally, the annual exam point at Great Falls, Montana has been discontinued.

W3 QSL BUREAU NOTE

An error crept into the *QST* article on QSL Bureaus, page 63, February: The W3 QSL Bureau, operated by Jesse Bieberman, W3KT, and his wife, is set up for standard business-letter envelopes, Number 10, measuring about 4-1/8 by 9-3/8 inches, rather than Number 50 manila envelopes as stated in the article.

Please check *your* bureau's preference (the list appears in nearly every issue of *QST* and is indexed on page 3) and follow it; life is difficult enough for these volunteers even when everybody cooperates! And keep a few envelopes on file all the time even if you don't work much DX – cards may come in for you (by error perhaps) and if there is no envelope, the bureau has to keep the card in its dead file for at least a year before discarding it.

AMATEUR RADIO WEEKS

The Commonwealth of Massachusetts will observe Amateur Radio Week June 10-16, 1973, in accordance with the fifth consecutive proclamation

The October *QST* article, "RF Matching Techniques, Design and Example," won the Cover Plaque for its author, Donald K. Belcher, WA4JVE (right). Presenting the award is Roanoke Division Director Victor C. Clark, W4KFC. *(K4ORQ took the pix tnx!)*

Bruce Marcus, WA1NXG (center) received a New England Division Merit Award for his assistance to repeater groups exemplified by the article, "How to Determine Height Above Average Terrain" in January *QST*. New England Director Robert York Chapman, W1QV, makes the presentation while Lewis G. McCoy, W1ICP, hq. liaison to the ARRL VHF Repeater Advisory Committee, looks on. *(Tnx, W1FXK, for the photo)*

of the Governor. The Week begins with the ARRL VHF Contest, and there is a "Worked All Massachusetts Cities and Towns Contest" during the period as well; full details on the latter will appear in the May issue of *QST*, "Operating Events Calendar." The Massachusetts Chapter, National Awards Hunters Club organizes the event.

The **Commonwealth of Puerto Rico** held its Week March 18-24, concluding with the annual hamfest of the Radio Club de Puerto Rico on March 25. Other events included a public display at Plaza Las Americas mall in San Juan, and TV presentations of the ARRL film, "Hams Wide World."

The Honorable Joseph McGreevy, mayor, has declared June 17 through 23 as Amateur Radio Week in **Belleville, New Jersey**. His proclamation mentions specifically amateur communications in emergencies such as hurricanes Camille and Agnes, earthquakes in Alaska and Nicaragua and floods in Pennsylvania. The Belleville Amateur Radio Club will give a certificate to those who work its club station W2FOY during the Week and who send a large stamped envelope with their address on it.

Over half the states have, one time or another, declared Amateur Radio Week. Chases' *Calendar of Annual Events* lists the Week for June 17-23, 1973, though local groups sometimes pick other dates for local reasons. Field Day is our best predictable opportunity for publicity; it's a "natural" for photographers and TV cameramen. Libraries, banks, public-utility offices and sometimes stores will make space available for Amateur Radio Week displays: why not get your club involved now for both the Week and FD?

K1YPE PROMOTED TO SUB-CABINET

Ambassador William J. Porter, K1YPE, who has been representing the U.S. at the Paris meetings on Viet Nam, has returned to the States to become Under Secretary of State for Political Affairs. We amateurs, who know him better as Bill, FA2VX, 7X2VX, K1YPE/XV5, HL9AA and FØADL, offer our hearty congratulations and sincere best wishes!

— . . . —

Two other ambassadors, Armin H. Meyers, W3ACE, who was most recently in Japan, but once gave us DX-otic QSLs under the calls YA1AM, EP3AM, OD5AX, and Leo G. Cyr, ex-9X5AA, have returned to Washington.

COVER PLAQUES FOR 1972

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 last year were:

January: "What You Always Wanted to Know About SSTV," by Eugene H. Hastings, W1VRK

February: "The VE2HN Digital CQer Using NAND Logic," by H.H. Rugg, VE2HN

March: "Broadband Solid-State Power Amplifier for SSB," by Roy C. Hejhall, K7QWR

April: "A Strip-Line KW Amplifier for 432 MHz," by Richard T. Knadle, Jr., K2RIW

(Continued on page 85)

A Pacific Division Merit Award went to Bill Eitel, W6UF, for his 50 years service to amateur radio and the League, which Bill currently serves as an assistant director. Left to right, Jim Maxwell, W6CUF; Bill Walters, W6MKE; W6UF; Pacific Director J.A. Gmelin, W6ZRJ.

IARU 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 II CONFERENCE

IARU member societies in ITU Region II (North and South America) will meet in Santiago, Chile, commencing April 9 for their triennial conference. The five-day meeting is hosted by the *Radio Club de Chile*, and will deal with many amateur radio organizational matters of both regional and worldwide concern. The sessions will be formally opened by Chilean government dignitaries, hopefully headed by President Allende, and including the Minister of Communications. Particular attention will be paid to the possibility of a future world conference on high-frequency allocations, and the establishment of a program for protecting - and perhaps increasing – the present amateur band assignments.

RSGB HONORS SM5ZD

Per-Anders Kinnman, SM5ZD, has served international amateur radio through active participation in the affairs of IARU Region I Division for nearly a quarter of a century, most recently as its chairman. In recognition of his outstanding service, the *Radio Society of Great Britain* has appointed SM5ZD as an Honorary Vice-President.

RSGB occasionally presents an award known as the "Calcutta Key" for notable contributions to international friendship through the medium of amateur radio. At a ceremony recently, SM5ZD became the latest recipient of this unique award.

AUSTRALIAN QSL BUREAU CORRECTIONS

The QSL Bureau addresses for the various VK call areas which appeared in this column for December, 1972, are incorrect. While no cards will be lost if they are sent to those addresses, speedier handling will result if the packages are addressed as follows:

VK1 – QSL Officer, VK1ACA Canberra Radio Society, PO Box 1173, Canberra City, A.C.T. 2601.

VK2 – QSL Officer WIA Hunter Branch, P.O. Box 134, Charlestown, N.S.W. 2290.

VK3 – QSL Bureau, Mr. E. Trebilcock, 340 Gillies St., Thornbury, Vic. 3071.

VK4 – QSL Officer, P.O. Box 638, G.P.O. Brisbane, Qld. 4001.

VK5 – QSL Bureau, Mr. Geo. Luxon, VK5RX, 27 Belair Rd., Torrens Park, S. Aust. 5062.

VK6 – QSL Bureau, Mr. J. Rumble, VK6RU, Box F319, GPO Perth, W. A. 6001.

VK7 – QSL Bureau, P.O. Box 371D, G.P.O., Hobart, Tas. 7001.

VK8, 9, Ø – Federal QSL Bureau, 23 Landale St., Box Hill, Victoria 3128.

NOVICE LICENSE PROPOSED IN NORWAY

In most countries, the regulations specify a minimum age for the holder of an amateur license – usually 16 or 18. This creates frustrations for youthful aspirants to amateur radio, for example those who have been introduced to radio through the scouting movement.

Recognizing this problem, the Norwegian Telecommunications Administration has proposed to establish a Novice license in that country to permit youths below the minimum age of 16 to sample amateur radio from their own stations. The new license would permit the holder to operate cw only, with a maximum power input of 15 watts, for a period not exceeding two years. The applicant will be required to pass examinations in basic radio theory and regulations and a Morse code test at 8 words per minute, and to be at least 14 years of age.

With the adoption of this proposal, Norway will join a small but growing number of countries who issue Novice licenses.

DX OPERATING NOTES

Reciprocal Operating

(Bold face type indicates changes since last list.)

United States reciprocal operating agreements exist only with: Argentina, Australia, Austria,

This gathering of key members of the *Organization Radio Amateurs Republic of Indonesia* (ORARI) took place during the annual contest awards ceremony held recently in Jakarta. (l-r) YB0s ABB, ABD, CJ, BR, JC, BY, and BT. *(Photo by YBØAAV)*

Per-Anders Kinnman, SM5ZD receives his "Calcutta Key." (l-r) SM5ZD; Dr. J. A. Saxton, 1973 President of *RSGB*; and Sir John Eden, British Minister of Posts and Telecommunications.

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 Kingdom*, Uruguay, and Venezuela. Several other foreign countries grant FCC licensees amateur radio operating privileges on a courtesy basis; write *ARRL* headquarters for details.

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

Third-Party Restrictions

Messages and other communications – and then only if not important enough to justify use of the regular international communications facilities – may be handled by U.S. radio amateurs on behalf of third parties *only* with amateurs in the following countries.** Argentina, Barbados (only U.S. stations /8P), Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Greenland (XP calls only), Guyana, 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 8R and 9Y4. Canadian hams may handle these same type third-party messages with amateurs in Bolivia, Chile, Costa Rica, Dominican Republic, El Salvador, Honduras, Israel, Mexico, Peru, Trinidad & Tobago, U.S., and Venezuela. Permissible prefixes are: CE CP HI HR K OA TI W XE YS YV 4X 4Z and 9Y4.

DX Restrictions

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

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

*Agreement includes overseas entities.

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

Happenings of the Month

(Continued from page 83)

May: "Towards a National Plan for 2-Meter FM," by John A. Mason, W5NSQ

June: "The W2FMI 20-Meter Vertical Beam," by Jerry Sevick, W2FMI

July: "The Flashlight Sidebander," by R.P. Burr, W2KQP

August: "A Twelve Foot Stressed Parabolic Dish," by Richard T. Knadle, Jr., K2RIW

September: "A 4000-Channel Two-Meter Synthesizer," by Derwin H. Stevens, W1UYK/WA2DHA

October: "RF Matching Techniques, Design and Example," by Donald K. Belcher, WA4JVE

November: "Antenna Traps of Spiral Delay Line," by William J. Lattin, W4JRW

December: "Simplified Impedance Matching and Mac Chart," by James E. McAlister, WA5EKA

If you missed any of these articles, they're worth turning back to!

TECHNICAL MERIT AWARD

An annual award is made, too, for a major contribution to the technical side of amateur radio – The ARRL Technical Merit Award. The 1972 award, by the Board at its annual meeting in January, 1973, was to the Radio Amateur Satellite Corporation, producers of Amsat-Oscar 6, for its contribution to amateur space communications: see the separate story elsewhere in this issue for the fun amateurs are having with QSOs through the satellite on 2 and 10 meters. (Project Oscar, Inc., won the parallel honor in 1962.) QST

– . . . –

The Post Office Department promises faster mail service with the new Zip codes. Use yours when you write League Headquarters. Use ours, too. It's 06111.

Correspondence From Members-

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

RECENT EQUIPMENT

● Congratulations on the Recent Equipment column in January *QST*. It is the best one in a long long time. It is delightful to see *lab measured parameters* in place of and/or in addition to, the usual description from the manufacturer's instruction manual.

Now you're giving me the information I want and need — hopefully we will see more of this in future issues. — *Donald R. Nesbitt, K4BGF, Athens, GA*

● The story on the HW 7 in January brings to the reader the good points and shortcomings of this transceiver. It appears to be an honest appraisal, and Heath took corrective measures.

On the other hand, the discussion of the Swan 600T is a "white wash" job that *QST* should be ashamed of. I am referring to the spectral analysis which is pictured on page 47, but to which no mention is given in the text.

The *Handbook*, states, "For splatter reduction, an S/D ratio of 25 dB is considered a border-line minimum, and higher figures are desirable." The Swan 600T with its third order distortion product only 16 dB below the two-tone output should certainly not be acceptable. Compare the Spectrum Analyzer picture of the 600T with the *Handbook* rig on page 427 (49th edition). What a difference!

Paul A. White, W6BKX, White Electronics, Mill Valley, CA

● *QST*'s new approach to "Recent Equipment" — including the ARRL lab measurements — is much appreciated; please continue. The more details the better. — *Earl Tonjes, W4NG, Gainesville, FL*

● I am very much in favor of releasing the ARRL lab findings and figures when reviewing new equipment and I feel that it is long overdue.

As a League member, I would ask that you continue to publish all lab data and measurements and compare them to the manufacturers data and thus make *QST* an even stronger consumer advocate for our fine hobby . . . . — *Dexter Young, W6MLA, La Habra, CA*

● I am happy to see that the people we pay through our dues to write technical articles and related projects have also been able to improve commercial equipment just coming out on the market. I am referring to the Heath HW-7. WICER and others should be given praise for helping to correct certain problems in equipment such as the HW-7. I am letting you know this because many hams take the ARRL technical staff for granted and do not realize just how much they really do. — *John C. Schaefer, Jr., WA2FDW, Hollis, NY*

● I like the more revealing format. Three other magazines carry press releases and generally favorable reviews of new equipment. *QST* is in the unique position of being able to offer something different.

The ARRL measurements on new equipment are useful. But, in my opinion, the reviewer's comments are even more helpful. A piece of equipment can meet published specifications but still be poor in actual use. Conversely, it might fail some specification but still be, overall, a great piece of gear. Frank and fair comments make these situations clear.

Another important ingredient, present in the January section, is prior notice to the manufacturer of unfavorable results. Some production units of the best design will have flaws — the manufacturer should not be overly castigated for these. Also, if his design has flaws and he is willing to correct them he should be allowed to do so. This result is helpful to amateur radio and is a valuable service of *QST*. — *Jack Althouse, K6NY, Palomar Engineers, Escondido, CA*

RESTRICTIVE REGULATION

● Why isn't ARRL doing more to fight Docket 19555, the FCC's proposed environmental rules? These rules spell the end of the line for much of amateur radio. The former FCC amateur chief, Bill Grenfell, W4GF, said that the proposed rules were foolish: "For the FCC to require that the sight of your proposed antenna be endorsed as pleasing to the eye by every one of your neighbors *before* you can put it up is just about as impracticable as one can get!" (*Auto Call* December 1972).

You should be telling hams to write in protest to their Senators and Representatives and to the President. You should be giving a lot of attention to this major threat to ham radio. Our antennas don't cause any pollution and yet they are going to be treated as if they were poison. I think that the League has let us down and is not representing ham radio strongly enough. — *Nickolaus E. Leggett, WA1PCM, Chicago, IL*

● I wonder what ARRL is doing about this crazy FCC rule-making. I always thought the ARRL was supposed to be behind the amateur. Up to now, I don't see the ARRL doing a darn thing. I am on the Tech. Committee of the CFAR repeater here in Chicago and we are all waiting for some action. What to do? I think fellers like you ought to get off their fannies and see what the FCC is trying to pull. — *C. W. Peterson, W9SH, Chicago, IL*

[EDITOR'S NOTE: Perhaps reader Leggett missed the League's comments in Docket 19555, beginning on page 78 of *QST* for December; it is worth rereading! And both W9SH and WA1PCM should approve of the resolution appearing on page 11 of the March issue.]

● The Pilot Knob Amateur Radio Club (Kansas) unanimously supports the action of the League's

Board of Directors as contained in the resolution of January 18, 1973 [p. 11, March *QST*]. We, with the League, do not understand the increasingly restrictive regulations imposed on the amateur service. Your lead in this matter is appreciated. — *W. T. Thompson, W0NYG, President*

● The Potomac Valley Radio Club unanimously support the ARRL Board resolution of January 18, 1973. This club appreciates the efforts of the League in behalf of all radio amateurs to assure the continued growth of amateur radio in this country. — *Leland W. Smith, Jr., W4YZC, Secretary*

● The Capitol City Amateur Radio Club (Montana) and its members share the concern of radio amateurs everywhere over the progressively restrictive regulations imposed by the Federal Communications Commission upon the Amateur Radio Service, and enthusiastically endorse the program of resistance and counteraction contemplated by the January 18 Resolution of the ARRL Board of Directors. — *H. J. Luxan, WA7OOG, Vice President*

● The Mt. Vaca Radio Club, Inc, wholeheartedly endorses the resolution. We urge you to do everything in your power to carry out the program charged to you in this resolution. — *Norman Brooks, K6FO, President*

● The Delta DX Association fully supports opposition to the latest FCC interpretations of the rules and regulations concerning amateur radio. We sincerely hope that the ARRL can find the necessary ways and means of getting these interpretations cancelled. — *Cliff Ryan, WA5WEY, President*

● It seems to me ARRL is overreacting to this situation. We have all waited it seems like years for these decisions on rather complex issues, and is also seems to me that the FCC has done rather well in arriving at reasonable compromises.

A lot of the hue and cry seems to be about incentive licensing and net operation. Many of the nets I've heard are rather childish and not worth the spectrum space they use. If they are really handling traffic or accomplishing something, then fine. If many of the hams that holler so loud would get busy and get a better grade of license a lot of problems would be solved. . . .

I'm all for ARRL, but it seems to me that a little more objectivity and less emotion is needed. — *Robert E. Leo, W7LR, Bozeman, MT*

● Some planned and already existing new regulations make me believe I am back somewhere in Europe serving some kind of little tsardom.

To reverse the trend, I support and enthusiastically endorse the resolution of the ARRL Board of Directors at their January meeting, namely, that the ARRL should vigorously undertake a program to seek more reasonable regulation of the amateur radio service. - *Les Radnay, W1PL, ex-HA4SA, Melrose, MA*

● I was very sad to receive word that the FCC has denied all petitions for reconsideration in the matter of the new repeater rules. They could not have possibly seriously studied all of them and then come to the conclusion that they were all without merit. There must have been some very well considered petitions involved and for the FCC to dismiss them without serious study is most distressing . . . .

. . . In this case, there was a notice of proposed rulemaking, but the final rules as adopted bore little resemblance to the proposed rules that the FCC published in its public notice. Since there were so many changes made, I contend that a new notice of *proposed* rulemaking should have been made so that interested and concerned parties could make comments for consideration by the Commission. . . .

This matter is something which will affect fm repeater operation all across the nation for years to come. In my case, I am a trustee of the Detroit Area Repeater Team's repeater system and the new rules will require us to spend several thousand dollars to obtain antenna coverage patterns and other special requirements in the new rules. We do not have that kind of money and if the rules are allowed to stand as they are, our repeater will probably have to suspend operations. The FCC should not be allowed to get away with enacting rules which are more strict for amateurs than for commercial repeater systems! — *Keith B. Petersen, W8SDZ, Technical Director, Detroit Area Repeater Team, Royal Oak, MI*

● The amateur service, which has a very much envied record of compliance with the law and self-policing, is hardly deserving of such harsh interpretations and restrictions. The wording of the Commission's rebuttal to the League's request for reconsideration of the phone band docket raised doubts in my mind of the Commission's opinion on amateur radio. I wonder how many public service-oriented amateurs will stop handling traffic, and other public service-oriented activities, because of possible kickbacks by the new "rules?" Also, I wonder how many amateurs will abandon home-brew projects, especially in the area of repeaters, because of increasingly complex technical regulations? — *Paul W. Reich, WA7QIG/7, Bozeman, MT*

● I share the Board's deep concern over regulatory matters and interpretation of the new rules; however, I remain firm in my conviction that the 75-meter decision was best in the long run for amateur radio. Moreover, the Commission's observations concerning Conditional Class and the statement that they would be doing something about it should help to get some of the Conditional Class hams scurrying to the nearest FCC examining office!

I presume my support of the FCC's action concerning 75 meters will be part of the minority. However, in a recent Southeastern Division questionnaire, the first 1000 returns indicated 84% of the respondents as being "reasonably well satisfied with FCC rulings." — *James A. Gundry, W4JM, Atlanta, GA*

[EDITOR'S NOTE: The aforementioned poll was taken in November; the environmental protection matter was not publicized until the December issue of *QST*; the "Eyebank" decision ditto; and FCC denials of petitions for reconsideration in the matters of phone suballocations and repeaters were not publicized until March.]

● We've been bombarded with large doses of indoctrination that the future of amateur radio lies in moves on the international level; that we must conform to the supposed needs throughout the world. Perhaps so, who can now answer that one? But wouldn't it be ridiculous to win the inter-

national battle and lose enough privileges at home to so severely restrict our activities that we would see the amatuer service wither on the vine?

For some unknown reason all of the recently released new rules and regulations seem to have become more and more regulatory instead of allowing amateurs to go about their business as has been its tradition for so many years. – *Chic Cotterell, W@SIN, Lakewood, CO*

● The filing suggests that dividing the "fun" bands so as to force incentives and higher class licenses on the serious amateurs is desirable, but when incentive licensing starts interfering with emergency communications it's no longer a good thing.

I'm a strong supporter of incentive licensing, but I hope JJ-Walker-and company will adopt the League-requested modifications. Our public-service capabilities must take precedence. – *Dave Heller, K3HNP, Levittown, PA*

● At long last the ARRL blew their finals at the FCC for some of the recent decisions handed down from Washington. Hang in there, Newington. Better late than never! . . . – *Lou Schurrer, WB6OON, Hollywood, CA*

● The action – and more important, the philosophy – of the FCC in the "Eyebank Matter" is one more instance of a growing tendency on the part of the administrative branch of the Government to impose excessive control on activities of the citizen. I would not want this to be construed as a political or partisan point of view, but it becomes more and more apparent that Government agencies in many areas are expanding their responsibilities beyond the intent of the acts which established them. It is indeed unfortunate that the FCC, after decades of regulation in the amateur service based on successful self-policing by the radio amateurs themselves, has decided to outline a rigid interpretation of the rules of traffic handling. However, it seems to me that this is but one example of the gradual erosion of our individual liberties which seems to be the fashion in Washington these days. – *Julian N. Jablin, W9IWT, Skokie, IL*

● In the light of some recent actions eminating from the Commission, we can only offer that it's about time for someone to start screaming. – *Art Gantert, W3OLG, Bernville, PA*

● This rule making imposes regulations in a multitude of areas where I have been unable to find any reason for regulation at all. It seems as if the Commission was trying to regulate against any possible problem that might ever conceivably come up. Most of the problems re repeaters have been solved already by the operators themselves, as we have traditionally held tremendous pride in our own self-regulatory efforts. Certainly there was some need for organization, but not necessarily a need for the FCC to take the entire matter from our hands. – *G. M. (Mike) Judy, W7CCY/WA7LAJ, Wenatchee, WA*

● The Signal Hill Amateur Radio Club (So. Dakota) is unanimously in favor of the action taken by the Board. – *Dorotha C. Adams, WØDVB, Secretary* . . . The UCLA Health Sciences Radio Club unanimously applauds the wisdom and vigor of the Board of Directors of The American Radio Relay League for its resolution regarding a more reasonable regulation of amateur radio. – *Paul Zukin, W6OVW, President* . . . Sunrise Radio Club (N.Y.) is 100% behind the Board action which proposes that overly restrictive regulation of radio amateur activities be curbed. – *Steve Scantzoulis, W2HNB, President* . . . The Board action has the unanimous support of the South Bay Amateur Radio Society (Calif.). We feel that your action is in the best interest of amateurs everywhere. – *Dave May, WA6HLA, Secretary* . . . The Tri-State Amateur Radio Society (Indiana) concur 100% with the ARRL Directors decision to undertake to seek more reasonable regulation of the amateur radio service. – *Jay P. King, WB9ICL, Secretary* . . . The Old Timer's Radio Club members voted unanimously to support the ARRL in this matter. OTRC is a select group of active radio amateurs with more than 725 man years cumulative licensed radio experience. – *Willard P. Summers, K2BOQ, Secretary-Treasurer* . . . The Eglin Amateur Radio Society (Florida) discussed the resolution passed by the Board and went on record as strongly approving this resolution. – *Frank M. Butler, Jr., W4RKH, Secretary* . . . The Harmonic Hill Radio League (N.Y.) is 100 percent behind you in your opposition to the environmental issue. We commend the League for its very thorough rebuttal to the FCC on this matter.

Harry E. Fullam, K2DIJ, President . . . At the most recent meeting of the Central Oregon Radio Amateurs, your resolution was read to all members present. Everyone agreed that your views were excellent and that this club shall try to obtain as many members as possible to join with the ARRL and give their support. – *Robert H. Fox, WA7NVG, Secretary-Treasurer* . . . The Telephone Amateur Radio Club (N.Y.) agrees unanimously that ARRL should seek more reasonable regulations of our Amateur Radio Service. – *Frank Capellupo, President* . . . The Grand Rapids Amateur Radio Association membership discussed the resolution at length, is in favor of it, and will support it. – *Bernice Scott, Secretary* . . . Concerning the restrictions and unrealistic regulations being imposed on amateur radio, the Eufaula Amateur Radio Club hereby unanimously supports your resolution. – *James E. McQueen, WB4LJP, President* . . . The Indian Hills Radio Club voted to endorse and support the action of the ARRL Board. – *Fred C. Cousine, WA8AAV, Secretary* . . . The Oswego County Amateur Radio Association (N.Y.) offers wholehearted support of the resolution. – *David Brown, WA2LOW, Secretary/Treasurer* . . . The Montgomery (Ala.) Amateur Radio Club will join in supporting the ARRL in helping abolish this apparent trend of overly-restrictive regulation from the FCC. – *Craig Kendall, WA3RGH, Secretary* . . . The Clark County (Ind.) Amateur Radio Club Inc., by unanimous vote conveys full support of the Resolution. Comments specifically made included several to the effect that more regulation can not possibly be needed when FCC is completely unable to enforce those now in effect with regard to the Citizens Band Radio Service. – *Robert A. Leonard, W9HRY, Secretary* . . . The membership of the Northrop Radio Club have been alarmed over the recent FCC edicts, particularly the newest one – Docket 19555, the ecology anti-antenna proposal. We are happy to report that our membership in a formal vote completely, except for one abstainer, concurred with the Board's action. You may call on us for any help the League may need to fight this trend to overly restrictive regulation. – *Robert K. Cobb, W6CFM, Secretary.*

How's DX?

CONDUCTED BY ROD NEWKIRK,* W9BRD

How:

Grommethead Schultz turns out a pretty fair homespun anchovy pizza if you watch out for the hot spots. Heatkits, he calls 'em. We were nearing the center dividing line when Grom reached over to activate his transceiver. He mumbled something about a 15-meter repeater.

"No repeaters allowed on 21 MHz, Gromboy," we laughed. "Besides, what's wrong with the good old ionosphere?"

"Yeah, what *is* wrong with the good old ionosphere lately?" grunted Grom. "Here, unbeliever, I'll show you a 15-meter repeater that really works. It's hooked up for Africa today. I'm on the list."

Schultz dialed up a frequency near 21,300 kHz and we heard: 5X5XX IS CALLING STATESIDE THIS IS WA4XYZ. "That's the repeater's call today," explained Grommethead.

We heard some weak scratchings on frequency that could have been 5X5XX or somebody's backscatter. 5X5XX IS CALLING W9XYZ THIS IS WA4XYZ GO AHEAD. We heard some more weak scratches, then: W9XYZ REPORTS 5X5XX 5-7 IN WISCONSIN THIS IS WA4XYZ GO AHEAD. More unreadable noises, then crisp and clear: 5X5XX SAYS W9XYZ is 5-6 IN UGANDA THIS IS WA4XYZ 73 THANK YOU GO AHEAD.

"I should be next," figured Schultz. Sure enough came the repeater's voice, 5X5XX IS CALLING W9— and so forth. Grommethead gave him a conservative 4-6 but we never heard a thing except the repeater which was S9 plussedy-plus. The voice said Schultz was 4-5 in Uganda, by golly, even barefoot off the side of his beam. An international repeater! We marveled at it, especially the speech processing that somehow gave all signals such a pleasant touch of southern accent.

We made our way homeward still mind-boggled. Was Grommethead Schultz putting us on? The more we think about it now, the more we suspect that WA4XYZ is just another fancy ham station, sort of a big black box with a little man inside merely pretending to be a real repeater. Just what was being accomplished completely escaped us, but someday there may be a sensible use for the thing.

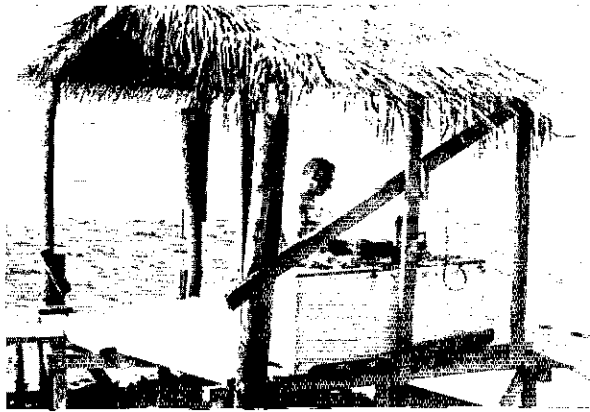
† † †

What:

While on the subject of 21 MHz let's make an in-depth check of dispatches from the Novice DX front. Conditions are a far cry from the good skip of recent years but our WNs are still in there pitchin'. So long as the overseas crowd hangs around to produce activity when those brief and erratic openings do come along, things should remain interesting. Stick in there, DX!

15 CW Novice notes and quotes from near and far: Since WNs have been authorized use of VFOs DX is easier to work, but you still need patience to search for it. VOA and Radio Moscow finally drove me off 40 meters after six months of QRM. Recent shack projects include a homebrew solid-state receiver, an antenna tuner and vhf gear for future General work. (WN2EOO) . . . Worked my last continent on my first anniversary on the air. WN2s, WN3s, WN8s, etc., really chase this 43-year-old Novice around the band for Colorado contacts! (WNØGFL) . . . Worked/confirmed 42/28 from Nebraska on my vertical. HB9AMZ needs only WL7 to complete his WN-style WAS. (WNØGTJ) . . . I like 15 meters best because of its DX surprises and relative lack of QRM. A lot of us can't get antennas up for 80, and 40 is usually jammed. Conditions on 21 MHz take a deep noontime dip in Pittsburgh. As for Elmers, my vote goes to W3VF who showed me many a trick of the trade. (WN3SWP) . . . A faint "BY5AR" answered one of my CQs on 15 last fall, then was smeared by German ssb. I'm still curious about possible activity in mainland China. (WN1QMK) . . . Colorado was my best DX until I hooked DK5SZ and ZS1CZ. Sure hope they QSL! (WN4WLK) . . . Working 21 DX stations in 20 different countries is really spreading my luck. The duplicate was an extra SM. Still need a G contact, of all things. Early mornings can still be great on 15! (WN4WHE) . . . Used four different routes to QSL 9X5VL. Persistence and patience can pay off with good cw-to-ssb DX on 21 MHz. Take it easy, though, since phone DX ops often are rusty on the code. Operators at the DX end who give Novices a break surely deserve our thanks. Quickly con-

*c/o ARRL, 225 Main St., Newington, CT 06111.



ZF1SF sported a breezy QTH of the Month last fall at the end of a Rum Point pier. The operator is WB4SHB, formerly J2ISF, KL7AAY, W4ISF, etc. Gat dispensed hundreds of Caymans contacts with an Argonaut two-watter and dipoles. W4ZMQ, K4SHB and WB4TAF had ZF1VD rockin' at the other end of the dock for 1800 contest contacts on higher power, while colleague W4BRB was making multicountry 160-meter DX hay as ZF1GS from comfortable hotel quarters nearby.

SU1IM favors the code mode with this Cairo set-up. Ibrahim's daughter Moona likes cw, too, and is widely worked as SU1MI (photo last September's "How's"). Watch 0300. *(Photo via W3HNK)*

firmed 35 of my first 50 countries worked with an HT-40, SB-301, S-76, 5-element Gotham, home-made TR switch and Heath keyer. Sure hated cw when I first gave it a try thirty years ago but now that I'm used to it I think I'll stay with it. (WN8IOT) . . . All my fifty-plus DX stations were worked during my second year as a Novice. The old one-year Novices who worked so much DX before us deserve much credit. (ex-WN2MBP) . . . DX in Virginia isn't exactly terrific, and I'll feel better when ten holdout countries finally come through with QSLs. When 21 MHz seems dead just keep calling CQ. ZD8FM answered me under such circumstances. Morning action on 15 is still unbelievable at times. Hooray for ON8VL whose QSL came through in five days. (WN4ZGE) . . . My ninth QSO turned out to be a PJ9 whose suffix was covered by QRM. Sounded like "ADD." Any info? (WN4ZYQ) . . . With a new vertical on 15 I hardly ever go back to the QRM on 40 and 80 meters. Possibly aided by eight radials hooked to a lawn sprinkler system I get consistently good reports on 25 watts. Fifteen peaks well to South America late in the day with especially good signals from DXs and PYs but school sure cuts into my DXing! (WN8LQY) . . . WAS-hunters could use more KH6s and WH6s on 15. (WNØELM) . . . Had JA7OWL's QSL on my wall just six days after QSO. (WN6PZW) . . . I operated commercially years ago at WBSO and WMP. (WN5ERI, ex-W1AIB) . . . ZE3JO really enjoys working the Novice gang on 15. (W8OZA) . . . QSLs from EA F G JA OH OZ PY and TF help ease the frustration of worsening DX conditions. (WN2CTN) . . . I concentrate on Europeans each weekend between 21,110 and 21,135 kHz. (WH6HPP) . . . Glad to offer New Hampshire schedules any time except normal weekday working hours, 21,100-21,125 kHz, with an SB-303/SB-401. (WN1QEV) . . . JH1WIX, who is a collector of WN QSLs on 21 MHz, helped pioneer amateur radio in Japan during the 1920s and '30s as J2GX. He's now an executive with one of Japan's leading electronic firms. (WN4VXG) . . . Received VP2LY's card from QSL manager VE3BMV within two weeks of contact. Passing my General exam means the end of cw-to-ssb crossmode DXing fun. (ex-WN2AMU) . . . VEs may not be DX to kilowatt Generals but they're fun for Novices. I use a 723 and A-2516. My QTH is on Crystal street! (WN9IWY) . . . KP4DLR delights in giving WNs their first Puerto Rico QSOs. I rigged up a 3-element homebuilt beam in November although the old ground-mounted vertical performed well with my HW-16. Tell the gang to keep that Novice DX news comin' in! (WN6OSS) . . . QSLs from ZE3JJ and ZM2GH will complete my WAC. Passed the General exam yesterday and I'm already impatiently awaiting my new ticket. (WN2SXD) . . . A code-to-voice contact with A2CAB finally got me Africa in the old upper 50-kHz portion of the 15-meter Novice subband just before we lost it. I have half-DXCC worked, 31 countries confirmed. (WN7UMU) . . . My DX-40, Mohawk and dipole surprised me with an evening PJ8NLO contact on 3709 kHz. (WN2GOJ) . . . Here's a sampling of 21-MHz goodies captured lately y WN correspondents: A2CAB, CEs 3CF 5FX, COs 2BB 2FL 6AH, CR6AL, CTs 1SX 1WY 2AC 3AS, CXs 2XA 5BT 7AP, DA1LB, DJs 1KQ 2BW 4SN 7AK 7CX, DLs 1DQ 1ET 2ANA 3LR 3ZC 8QU, DKs 1NZ 3UG 3VV 5SZ 5VB, EAs 1KW 5BS, EI5BW, EL2s CB NY, Fs 2DN 3JZ 3MF 5BM 5BK 5IJ/mm 6ALA 6API 6BLP 6BRF 6BVS 6KBD 8TC 9IQ, FG7AA, FM7s AD/FS7 WU, FO8BW, FR7AI/E, Gs 3XW 3XMM 3YMM 3YSK 4BKY, GI3JEX, GMs 3AWF 3AWW 3LLP 3NHQ 3TRI 6MS, GW4OH, HAs 3GA 5KBM 8KCP, HBs 9AMR 9AMZ 9ASL ØARW ØNL, HCs 1FM 2HB 5LJ, HI7RFM, HKØBFX, HR3AC, Is 1AYP 1CGK 1RSQ 2CEX 2LBA 3ZIQ 4FTU 5FOS 6TAD 8MUW, ISØSLE, IT9RAN, JAs 1CIO 1NHM 1TRP 2QVQ 2RGH 4ONZ 5BHL/mm 6AN 7OWL, JE1HUT, JH1s DXM KPC WIX, JR1GWT, KAs 8RO 9DL, KGs 4ER 4NFF 6AKR, KH6HIY, KL7s A1Z DZU GSC, KP4s BBN BPV DLR DPN, KR6BJ, KV4s CF EY HW, KZ5s KHN YY, LAs 2CO 4Y 4ZL 7TW 8CO 8KD 9CE, LUs 2JV 6DJX 9DTO 9FAN, LX1LF, LZ1KPG, OA4QN, OD5LX, OE3WJW, OHs 1JN/OHØ 3ZN 4SL 6NH 8TM, OKs 2BB 2DB 3AS, ON6s CO DX FR, OZs 2TY 6AN 7Z, PAØs BFN DOG HR KZ NLC MBO POC, PJ8NLO, PYs 2BKO 2FQK 4ASJ 4AST 5ASN, SK6AW, SMs 2AGD/CEØ 2CTY 3ABG 3BYJ 3EJV 4EPK 5BNX 5BPP 5CAK, SPs 1PCN 5PSL 5PV 6DL 6FVF, SVØs WO WOO, TG4TE, TI2s KH WX, TU2DD, UAs 3KAO 3SR 9OH, UB5LS, UC2WP, UKs 2BBB 2GAS 5OAB 9HA ØKAS, UR2FQ, UT5HT, UWØIQ, VKs 2ZW 3AIH 3AR 3BZ 7ZD, VO1DZ, VPs 2AX 2LY 2ST 7CQ, VP9R, Ws 5ZIS/YV1 9WDC/HK1, WAs 3SMN/TF 5YSI/HK6 WB5BUQ/KL7, WH6s HPP HRL, WL7s HEI HHX, WP4s DNJ DPI DQG, ZEs 1FFY 1JG 1TI 2RV 2VY, YO6AW, YUs 2HH 2JZ 3TDS 3TSM, YVs 3NQ 3VU 5BUK 5CIT 5DRN, ZD8CW, ZF1s NF SF WB, ZE3JJ, ZLs 2GH 3JC 3JO, ZSs 1CZ 6BMP 6KO, 3D2EK, 5U7AZ 8RIN, 9F3USA, 9J2s JC MA, 9Q5AW and 9X5VL. Just about a DXCC's worth in that rundown so our sophomore WNs might still make the Club. Any Novices for 10 cw yet? It's the wrong part of the solar cycle to expect great things from our new 28-MHz WN subband but we should be hearing from a pioneer or two.

† † †

Where:

NORTH AMERICA — For unusually snappy QSL comebacks "How's" correspondents Ws 1RML 1SWX 1VAH 7HPI, K4s KH SD, WAs

9M2GV sent this QSL of the Month to commemorate his 500th scheduled contact with Ws 5ZD 6BMN and/or K6LAE. Ever try to carve a coconut? *(Photo by K6LAE's jr. op)*

2ONO 5VUC 7RKA, WBs 2AMU 4WLK ØGEX, WNs 2EOO 4WHE 6OSS 7UMU and VE7BAF heartily endorse these QSLers of the Month: CRs 6CA 7FR, DK2OI, DU1JVL, EA9s AQ EJ, ET3USD, F8TC, FO8DF, FP8FU, GD3TIU, GM3s UU XDN, HC1KP, HM5EE, HV3SJ, I6TAD, JA8AA, JH1WIX, KA2AS, KH6s CCL EOQ GEC SP, KL7s GDO GSC, KP4DLR, KS6DY, KV4s GP GW, KX6BB, PAØs KZ VO, PYs 1CKV 4ASJ, SM5CAK, TF3s HS SV, TG9CG, TY6ABK, VK2VA, VP2s A LAW ST, VP9s DC HCS, VU2BX, WØAAD/HR6, WAs 1ARF/HR6 ØQII/KG6, WN4ZYF/KV4, XV5AC, ZE1CU, ZF1WB, ZM2GH, 3B8DA, 4X4UE, 6W8AL, 6Y5AH, 9L1VW, 9Q5MG and 9Y4MH, plus QSL agents Ws 6KNH 7VFO 8CNL 9FIU, WAs 1HAA 2FLA 4WTG, WB4SBK and DJ4PS. Any worthy nominees in your records? . . . Halp! These parenthesized brethren seek leads toward pinning down wallpaper from holdouts mentioned: (W1QPJ) VPs 2HC '54, 4RF '53; (W7IUO) CP6FG, PY7SR, T12s MV PZ; (K1OME) KR6RN; (K9KLR) XF4BA '67, ZD3Z; (WA9FZQ) ZT2AC; (WN2EOO) DK3VV, GM3LLP, OH3ZN, OK2DB, OZ6PI; (WN6OSS) JD1YAA, KA1IW, KZ5MS, LUs 5DON and 8AHW. Any 'alp? . . . K3CHP, WB4UWE and WN3SZQ are ready and willing to assume QSL managerial duties for overseas DX ops in a bind. . . . In almost every instance arrangements between DX stations and Stateside managers are made directly as a result of on-the-air contact. If you wish to handle cards for someone your best bet is to query DX stations you work as to whether or not they would like to have you handle their QSLing chores. Once you find someone interested in your assuming QSL responsibilities for them it is usually a simple matter to agree on details. (W4WFE/1) . . . About a third of all QSLs received here do not indicate my station as a portable although I never give my call without the designator and inscribe it clearly on all my cards. This is quite a handicap to those of us striving for strictly-portable DX awards which, incidentally, should be more numerous and worthwhile. (W9LHG/Ø) . . . I've been able to confirm sixty percent of my DX contacts without resort to International Reply Coupons. (WB2AMU) . . . My QSL response runs about 90 percent using self-addressed stamped envelopes, IRCs or mint postage as appropriate. Bureau returns seem to be about 65 percent going back to 1969. My most reluctant group of QSLers appears to be South American. An Idaho QTH doubtless helps my average. (W7IUO) . . . Effective January 7, 1973, I am QSL manager for VP5LD. (WA1HAA) . . . I've been receiving QSLs for 14-MHz phone contacts I haven't made. What gives? The cards whetted my DX appetite, however, and I'm back on hf bands now after staying with vhf since 1965. (WA2ONO) . . . Finally figured out that about 250 DX QSLs received here really were meant for W2LXK. Radio telegraph DXers, especially those with "K" at the ends of their call signs, should be very careful with procedural indicators. (W2LX) . . . Collectors! My WB8IJN/mm QSLs are signed by His Royal Highness (and/or Deepness), King Neptune, Ruler of the Seas, etc., himself. (WB8IJN) . . . Regarding WØTUT's comment on current lack of originality and pride in QSL designs, I enclose a sample of my latest. They may be the first to bear an important ecological declaration: Printed on recycled paper. (W4UMF) . . . My ZF1PL card is too large for the usual envelope so I'll accept unaffixed stamps in lieu of s.a.s.e. (W1RFW) . . . Panama's amateurs used their 3E label in February and March, suffixes the same. 3E1GC was really HP1GC. (DXNS) . . . Note the address change for Fiveland's ARRL QSL Bureau branch. (NTDXN) . . . Prince Edward Island amateurs inaugurated their CI prefix this winter, suffixes unchanged. VE1GV signed CI1GV. (DXNS) . . . WA2HSU disclaims FK8 and FY7 QSL managerial connections. (K2HYM) . . . The current *Callbook* still lists my old address for ARRL's VE6 Bureau branch but VE6TK now has the mob. (VE7ATH, ex-VE6AAV)

ASIA — Pirating of YA calls evidently continues. Cards are still received for recent YA1DLC QSLs although that station has long been QRT. Some confusion with the YU prefix on radiotelephony also may be producing QSLs for unknown YAs. United Nations personnel here can be addressed UNDP Kabul, Afghanistan, Box 20, Grand Central Station P.O., New York, NY 10017, as well as UNDP, P.O. Box 5, Kabul. (YA1AB, CDRC) . . . Anyone still needing QSLs from KA6DO-KR6DO should apply via my home address. (WA3IUH) . . . A4FE (ex-ZC4MO) is QSL manager for Oman stations at P.O. Box 981, Muscat. G3LQP holds no A4FA logs, only Jim's MP4MBB records. (DXNS) . . . EP2s still sometimes sign 9C9 prefixes with their usual suffixes. (LIDXA) . . . Former operator Tony Kathro of XU1ZZ may be able to supply Cambodia QSLs from 10 Erw Wen, Rhiwbina, Cardiff, Wales. (DXNS) . . . JY9VO contacts after 1972 can be confirmed through W7AZG or myself on the customary s.a.s.e., or s.a.e. plus IRCs, basis. (W7JHO) . . . With the help of my new manager, WB6ZUC, I plan to QSL 100 percent. (VS6AW) . . . I have VS6AW's logs dating from October 22,

ELØP/mm is operated by HM5AP aboard M/V *Midas Apollo*, a 16-kiloton freighter on global runs out of Tokyo. Off-duty hamming on DX bands is done mostly on 40-, 20- and 15-meter cw with a homebrew 30-watter and long-wire. Formerly HM1AP, Cho also holds such calls as HM5AP/DL and PA9SR.

HA3MB is consistently heard on cw and ssb with his HT-44, home-spun inhaler, ZL Special beam, dipoles and vertical. Zoli formerly signed HA6N and is a long-ago Hungary schoolmate of K4UQ who contributes this picture.

1972. (WB6ZUC) . . . Still clearing up my HL9WU QSLing. Just mailed 437 cards to Japan alone. (WA9QVT/4)

AFRICA – Difficulties with his printer put 9L1GC far behind in QSLing. He apologizes for months of delay but promises to catch up eventually. (W9ADN) . . . QSOs with XT2AA operator Art can be confirmed through W1AM, and the latest Uganda call sign variation has 5Z4LW temporarily signing 5Y4XLW. Zaire's QSL bureau address is given as P.O. Box 1459, Kinshasa, but 9Q5 tickets have been invalid since July according to UZRA. (DXNS) . . . I'm receiving cards for fairly recent 9Q5PA QSOs but my own contacts using that call occurred only from 1964 through '66. Apparently it has been reissued. (K5LZT) . . . As QSL agent for ET3USC my logs go back to March 20, 1972. (WA1HAA) . . . Never received logs from 9Q5KP so I must withdraw as his QSL aide. I'll forward cards on hand for him to the last 9Q5KP address on file here. (K2QHT) . . . WA1HAA's logs for VP9HCS date from October 19, 1972. (LIDXA) . . . My QSLing for EA8GZ started as of this February. Cards for earlier contacts should go via VE7BWG. EL2CB's October '72 contest logs disappeared in the mails; patience, please, until another copy is available. Also note that I do not handle SU1IM's QSLs, only those for his daughter, SU1MI, but I do forward cards to Ibrahim when received. (W3HNK)

EUROPE – Hereafter only former IP1s will sign the II prefix. Other Italian stations will use their proper call area numerals. (WCDXB) . . . Russian Antarctic ham stations now sign 4K1A at Molodyzhnaya base, 4K1B at Mirny, 4K1C Vostok, 4K1D Novolazarevskaya, 4K1F Bellingshausen, 4K1G Leningradskaya, and 4K1H at Russkaya station. (DXNS) . . . I have about two hundred cards overdue from Moscow's Box 88. No returns for eighteen months with one exception, a Sakhalin QSL that came through the bureaus in four months. (K6SF) . . . My definition of frustration is reading in January's "How's" about the incineration of unclaimed Russian QSLs while I hunger for a DXCC-clinching handful. (K4BZH) . . . My QSL managership for GM6RV commenced with '73 QSOs. (K9KLR) . . . SV0WII closed down in Athens and I'd like to wind up his QSLing as soon as possible for contacts from June, 1971, through November 24, 1972, including Crete operation November 24-28, 1971. (WA1HAA) . . . LX1BW's logs arrive here twice monthly. (W3HNK)

SOUTH AMERICA – I'm interested in securing the services of a W/K-land QSL manager. (HK4AJF) . . . HK4BDA also is looking for a Stateside QSL representative. My own cards are handled by W7VRO and WA9ZAK. (HK7UL) . . . 4M4AGP ARRL DX Contest QSLs, voice only, can be QSLd to my address, also all YV4AGP contacts since January of this year. (W0YVA/4) . . . 4M4AGP radiotelegraph contacts may be confirmed through W6OAT. (WA2TUJ) . . . Anybody had any luck tracing the old (1970) USAF Det. 517, APO, New York, NY 09877, address of CE0AE military operators? (W9BRD) . . . My pile of HD8IG, W3ABC/HC1 and ZD8HT outbound QSLs is gradually diminishing. (W3ABC) . . . My QSLing in behalf of 9Y4VV began February 1, 1973. (K9KXA)

OCEANIA – I manage QSLs for VR1PA, WB4LDK/VR1, OX8BA and any other calls Bert may sign. 9M8s OEA and SPD write to say that shipping delays at their new Philippines QTH caused a QSLing backlog that will be attended to as soon as possible. (WA6AHF) . . . I hold the logs of 3D2AN dating from September 3, 1972. KG6SY's from July of '71, and 9M6HM records from May 1, 1969. (K6ZIF) . . . I'm handling QSL matters for 3D2GK including QSOs made by Gerry under his former CP1HW, HC1GK, OA4YM and YB0AAN calls. SWL reports from the U.S.A. must be accompanied by s.a.s.e. (K7DVK) . . . A January letter from the French Polynesia P&T affirms that Clipperton is inactive amateurwise, will probably remain inactive, and hasn't been active for years. (W2AXZ) . . . Here are QTH specifics gleaned from this month's "How's" mailsack but keep in mind that each suggested item is necessarily neither "official," complete nor accurate:

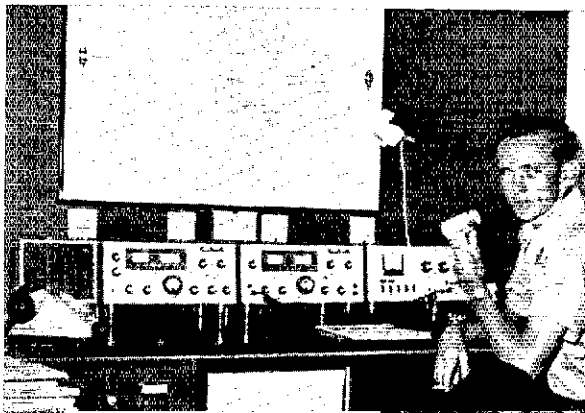
A4FD, D. Beale, 20 Lavender Rd., Cambridge, CB4-2PU, England (or via G3XEC)
A4s FE FF, P.O. Box 981, Muscat
A51PN, H. Pradhan, Wireless Communications, Dechentshi, Thimpu, Bhutan
CR3RB, C. P. 205, Bissau, Portuguese Guinea
DU1PT, P.O. Box 2071, Manila, P. I.
EA8IQ, Box 547, Las Palmas, Canary Islands
EI1CJ, 110 Avondale Rd., Killiney, Ireland
FB8s XA XB XC XX (via F2MO)
FG0GE, P.O. Box 211, Philipsburg, St. Martin, F. W. I.
HP1RV, Box 869, Panama, R. P.
HP4RC, Box 333, Changuinola, R. P.
JA4SOL/mm, 456 Kusa Maniwa, Okayama, Japan

EA8GK practices his English on 20 with this Las Palmas layout. Antonio and friends intend a Spanish Sahara DXcursion this month. *(Photo via VE3AGC)*

JY6AMH, P.O. Box 117, Zarka, Jordan
JY8DX, P.O. Box 1055, Amman, Jordan
KF6DG, Box 1037, 2194th Comm. Sqdn., APO, San Francisco, CA 96305
KV4s CF FA, via P. Friedel, W4AHN, Rt. 3, Box 803, Erwin, TN 37650
KX6JX, Box 58, APO, San Francisco, CA 96555 (or via K2KGB)
OHØMA, K. Eriksson, SF-22430, Saltvik, Finland
OX3CM, Box 906, Sonderstrom Air Base 3910, Greenland
PJ8NLO, B. Stanfield, P.O. Box 288, St. Maarten, N. A.
PY2ZBA, R. Hickey, Box 11, Sao Paulo, Brazil
PZ5RK, P.O. Box 1334, Paramaribo, Surinam
TU2DR, F. Bibeau, B. P. 4058, Abidjan, Ivory Coast
VK3MK, B. Bailey, Box 708F, Melbourne, Victoria, 3001, Australia
VP2s GNA GNE GRN (via W4YHB)
ex-VS9AWR, W. Reid, Communications & Electronics Div., Hq. AFCENT, BFPO 29, London, England
W1RED/KV4 (to W1RED)
WA3GHC/TF (via WB9DLO)
WA9VYR/TF (via W9MK2)
WB6WUH/TF, J. Campbell, Box 44, FPO, New York, NY 09571
YA1DT, D. Tokura, P.O. Box 5, Kabul, Afghanistan
ZB2s CF CO, P.O. Box 292, Gibraltar
ZF1FOC, P.O. Box 845, Miami, FL
ZF1JA, C&W (WI) Ltd., P.O. Box 293, Georgetown, Grand Caymans
ZS3AUF/3D6 (to DK2SU)
5A3TB, Mohammed Ariffi, P.O. Box 2325, Tripoli, Libya
ex-5H3LV, G. Hamilton, VE3EUP, 123 Glencairn Av., Toronto 310, Ontario, Canada
5V7GE, P.O. Box 2, Bassari, Togo
6Y5ED, 28 Elizabeth Av., Kingston, Jamaica
9G1HO, c/o Dept. of State Ghana, Washington, DC 20521
9HSC, Box 302, Valletta, Malta
9J2LL (via I4KJW or WB2ZHM)
9J2TC, Box 1167, Lusaka, Zambia
9K2DG, Box 2301, Kuwait
9M2PU, Box WD-100, Tapah, Malaysia
ex-9M8s OEA SPD, Mr. & Mrs. C. Schaub, Regional Relay Facility, PSC No. 2, Box 19047, APO, San Francisco, CA 96274
9X5JC, P.O. Box 198, Kigali, Rwanda
CI1ATJ (see text)
ex-CP1HW (via K7DVK)
EA8GZ (see text)
EL2DK (via W5PAW)
ELØP/mm (via JA1VE)
ET3USC (via WA1HAA)
FS1J/mm (via F5XA)
FØALN (to K4II)
EL8AG (via CN8CG)
EL8OM (via DJ1TC)
EL8WS (via F6AVB)
FP8DH (via VE6AYU)
GM6RV (via K9KLR)
HB9XMW (to WB2FSC)
HBØAVB (via DK3ST)
ex-HC1GK (via K7DVK)
ex-HL9WU (to WA9QVT)
JW4EJ (via SM3BCS)
JY9PP (via DJ2GW)
KA6DO (to WA3IUH)
KV4HW (via KV4CE)
ex-OA4YM (via K7DVK)
OHØNA (to OHØMA)
PJ7ARI (to PJ2ARI)
PJ8GQ (via W2GHK)
PY2WH (via W3DJZ)
SQ5Z (via SP5PMT)
SVØWJJ (see text)
SZØBV (to SV1BV)
TI2DX (via K7NHV)
TR8PB (via REF)
VKØWW (via VK3FF)
VK9ZK (to VK3MK)
VP1KD (via K4ELK)
VP2AAK (via K4RHL)
VP2MH (to VE3GBI)
VP5GR (to W6MAR)
VP5LD (via WA1HAA)
VP7BA (via G3AMR)
VP9HI (via RSB)
VS6AW (via WB6ZUC)
XE1OJ (via W4QV)
XG1J (to XE1J)
YA1VKJ (via W3HNK)
ex-YBØAAN (via K7DVK)
YJ8KS (via JA2KLT)
YK1AA (via JA2KSO)
YV4AGP (see text)
ex-ZC4MO (to A4FE)
ZD8HT (to W3ABC)
ZD9GC (via ZS6XO)
ZS1ANT (via ZX6GE)
3D2AN (via K6ZIF)
3D2GK (via K7DVK)
5Y4XKL (to 5Z4KL)
8P6EZ (to W1RED)
9C9DO (via KL7BJW)
9C9ES (to EP2ES)
9J2AR (via VE4ZX)
9J2BL (via SM6CKU)
9Q5PA (see text)
9Y4VV (via K9KXA)

Your thanks for the preceding glossary should go to Ws ICW IRML ISWX IYL 4WFL 4WX2 6AM 6GSV 9LNQ ØYVA, Ks 1OME 2QHF 3CL 4SD 6EVY 9UCR, WAs 2FHV 2ONO 2TUJ 5VUC 7RKA 9FZQ, WBØGEX, WNs 2EOO 2GOI 6OSS 7UMU, KA2PJ, VE7BAE, K. Muller, Columbia Amateur Radio Association *CARAscope* (W8ZCQ), *DX News-Sheet* (G. Watts, 62 Bellmore Rd., Norwich, N. 72T, England), Far East Auxiliary Radio League (M) *News* (KA2LL), Florida DX Club *DX Report* (K4KQ), International Short-Wave League *Monitor* (E. Chilvers, 1 Grove Rd., Lydney, Glos., GL15 5JE, England), Japan DX Radio Club *Bulletin* (JA3GZN), Long Island DX Association *DX Bulletin* (K2KGB), Newark News Radio Club *Bulletin* (M.Witkowski, Rt. 5, Box 167, Stevens Point, WI 54481), Nigeria Amateur Radio Society *News* (5N2ABG), North Texas *DX News* (W5SZ), Northern California DX Club *DXer* (Box 608, Menlo Park, CA 94025), Southern California DX Club *Bulletin* (W6EJJ), VERON's *DXpress* (PAØs INA TO), West Coast *DX Bulletin* (WA6AUD) and Western Washington DX Club *Totem Tabloid* (WA7JCB). Got an item for the gang we missed? K!

† † †



VP2SG is among St. Vincent's more active DXers. Alwyn indicates that VP2S-stations should soon be more numerous due to an influx of single-sideband gear on the island. *(Photo via K8ESX)*

FM REPEATER NEWS

IN CASE THE WORD hasn't reached you, at press time the FCC has issued two repeater calls, WR9AAA and WR2AAA. Others appear imminent.

This writer has spent considerable time both in Washington and in phone conversations with FCC personnel to examine a number of the practical aspects of the rules and how they are being interpreted. The following is a summary of the major points discussed.

1) Section 97.108 (4) says, "Provisions must be incorporated to automatically limit transmission to a period of no more than three minutes in the event of malfunction of the control link."

FCC now interprets this to mean that one can use a timer on the transmitter to provide positive shut down of the repeater transmitter. In other words, most repeaters operate with a 3-minute timer IDer which will recycle when someone times out the repeater. This particular timer could be changed to a two-minute, thirty-second timer and still perform in the fashion already described. A second timer, 3 minutes duration, operates from the transmitter's output, not the COR. If for some reason the repeater locked on, then the second three-minute timer would shut down the repeater and the timer would have to be recycled manually (by radio remote or telephone line). This is somewhat easier than having the control station send a repetitive pulse or some other signal via the control link up to the repeater.

2) On the problem of monitoring both the input and output frequency of a repeater before transmitting there are several answers. In the case of a manned repeater (not remotely controlled) the operator can of course monitor both frequencies on site before turning the transmitter on.

In the case of a remotely controlled repeater, if the control station is in a location that is capable of receiving signals of the same level as those coming into the repeater site, he can monitor at the control point before activating the repeater.

In the situation where the control station cannot meet the above requirements, there is still another alternative *not* requiring down-links for the purpose of monitoring.

FCC will accept a receiver on the output frequency with a COR (carrier operated relay) *on the receiver*, so if there is activity on the output frequency, the receiver would keep the transmitter from coming on. This method would mean that a down-link transmitter would not be required. How "tight" the COR would be set would depend on each installation, how near other repeaters on the same frequency happen to be, ambient noise, and so forth.

In areas where the majority of amateurs who are on the input frequency of a repeater, and are there for the express purpose of being repeated, the control operator may first check the output frequency (as described above) and then activate the transmitter to check the input frequency briefly to make sure the frequency is clear for repeat operation.

FCC has asked us to point out that *every* control operator, and for that matter, every amateur, should be thoroughly familiar with Subpart E – Prohibited Practices and Administrative Sanctions. Control operators should study this section of the regulations so they have a clear understanding of what may or may not be repeated or transmitted.

FCC will also accept down-link monitoring, and monitoring via telephone, assuming one had wire control (telephone line, unlisted number). Actually, there are several possibilities here.

3) Some of you may recall that FCC said that use of standard dial tones used to control a repeater was not good amateur practice. The question was asked, "While FCC says this, would they accept an application that used this method?" The answer was a positive *yes*.

4) *Antenna patterns.* On the vertical pattern problem, there are several possible answers. The WR9AAA group took their antenna from its mount, turned it over so that it was horizontal, about three wavelengths above the ground, and fed it with a signal generator. They mounted a field-strength meter, calibrated in decibels, about 600 feet away and then rotated the antenna five degrees at a step. The field strength readings were recorded and this information was converted to a polar plot showing the vertical pattern. This method was accepted by FCC.

Additionally, FCC will accept the mathematical derivation of the vertical pattern. For that purpose, this issue carries an article by W1YNC on how to do this. The article simplifies the formulas for pattern derivations used by Dr. Kraus, W8JK, in his widely-accepted text book, *Antennas*.

Several repeater applicants are showing only a simple half-wave vertical dipole. The vertical and horizontal patterns are the standard "text book" type, a "figure eight" for the vertical pattern and a "circle" for the horizontal. Because the standard reference antenna used by the amateur division of FCC is a half-wave dipole (zero dB gain reference) there is no valid reason for FCC not to accept such patterns.

Prose Walker has written several antenna manufacturers spelling out what is required for filing with the Commission of various parameters of their products, so that in the future applicants for repeater licenses can make reference to such material (assuming approval). Meanwhile, many applicants are installing the simple half-wave dipoles in order not to be delayed by this approval process.

5) *HAAT maps.* FCC will now accept that portion of the map which covers the 10-mile required area around the repeater site. In other words, one doesn't have to send in the entire map -- only that portion showing the required eight radials and 40 check points used to determine HAAT. The border containing the legend should also be included.

6) As indicated in a March *QST* news item, FCC will accept a system of private line telephone control. The system shown there is a *basic* method. Telephone companies in the Bell system have different requirements as to exactly what can be attached to their lines. It is important that the line is not unbalanced by any device that is used. There are many methods of using the lines without any danger of unbalance – acoustic coupling, LED coupling, and so forth. The important point is that FCC will accept such systems.

7) FCC emphasized time and again that the applicant should keep his application simple and should not "overfile." In other words, liberal rather than literal interpretations of the rules have eased the burden. Incidentally, one of the difficulties FCC is having is that there is no standard terminology in the repeater field. (One application actually used a "kerchunk" circuit – whatever that is!) If one has any doubts about terminology, he should explain in simple language what the term means.

While there is no official statement to that effect, we understand that as long as applications for repeater licenses are filed by April 30th, if the workload is such that processing is not completed by the June 30 deadline, there no doubt will be some provision for taking care of the problem.

Reproduced below is the copy of the letter from Prose Walker to the antenna manufacturers. Keep in mind that it is up to you as a purchaser of a particular antenna to make the antenna manufacturer aware of the fact that he must file this information.

(To Antenna Manufacturers)
Dear Sir:

It is assumed that you are in possession of a copy of the Report and Order, and Memorandum Opinion and Order in Docket 18803. That explains the requirement for antenna pattern and gain characteristics by amateur applicants for a repeater station license.

In submission of data for approval by the Commission, the following information is normally provided:

a) Block diagram and description of test set-up.

b) Description of test equipment, calibration information, etc.

c) Name of engineer making measurements and his qualifications.

d) Horizontal and vertical pattern measurements, computations, or a combination of both to justify the patterns; gain figure(s) in the main lobe(s) of the horizontal plane, and a description of the measurement procedures including physical dimensions, etc.

e) Manufacturer's type number for each antenna associated with the pattern and gain figures, and descriptive information on each antenna.

Upon submission of appropriate data, the Commission will inform you if the antenna characteristics are accepted. If affirmative, then amateur applicants using such antennas need only specify the manufacturer's type number and specifications for the horizontal and vertical patterns and gain figure(s) and a statement that the antenna characteristics have been approved by the Commission. The burden of proof is upon you as the manufacturer to provide the information.

I trust this is the information you desire to enable you to submit antenna data for approval.

Cordially yours,
A. Prose Walker, Chief,
Amateur and Citizens Division

In conclusion, don't forget to send us your repeater registration card for the next edition of the repeater directory. If you have a repeater, or propose to put one on the air and you know the frequencies to be used, you can get a registration card by making a request to the Communications Department of ARRL. Also, don't hold up your registration card waiting for a new repeater call. – *W1ICP*

ARRL QSL Bureau

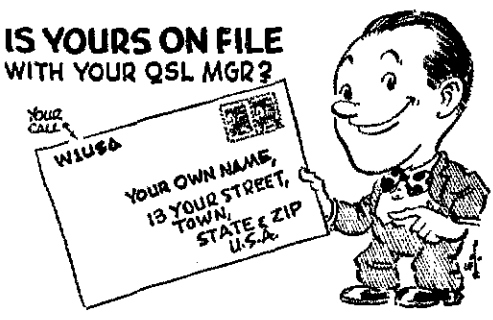
The function of the ARRL QSL Bureau is to facilitate delivery to amateurs in the United States, its possessions and Canada, of those QSL cards which arrive from amateur stations in other parts of the world. All you have to do is send your QSL manager (see list below) a stamped, self-addressed envelope,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

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

W1,K1,WA1,WN1 – Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.
W2,K2,WA2,WB2,WN2[1] – North Jersey DX Assn. P.O. Box 505, Ridgewood, NJ 07451.
W3,K3,WA3,WN3[1] – 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 – J. R. Baker, W4LR, P.O. Box 1989, Melbourne, FL 32901.
W5,K5,WA5,WB5,WN5[1] – **ARRL W5 QSL Bureau, Box 1690, Sherman TX 75090.**
W6,K6,WA6,WB6,WN6 – No. California DX Club, Box 11, Los Altos, CA 94022.
W7,K7,WA7,WN7 – Willamette Valley DX Club, Inc., P.O. Box 555, Portland, OR 97207.
W8,K8,WA8,WB8,WN8 – Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, OH 43215.
W9,K9,WA9,WB9,WN9 – Northern Illinois DX Assn., Box 519, Elmhurst, IL 60126.
W∅ – Reggie Hoare, W∅OYP, P.O. Box 115, Mitchellville, IA 50169.
K∅,WA∅,WB∅,WN∅ – Dr. Phillip D. Rowley, K∅ZFL, Route 1, Box 455, Alamosa, CO 81101.
KP4,WP4[1] – Alicia Rodriguez, KP4CL, P.O. Box 1061, San Juan, PR 00902.
KV4 – Graciano Belardo, KV4CF, P. O. Box 572, Christiansted, St. Croix, VI 00820.
KZ5 – Lee DuPre, KZ5OD, Box 407, Balboa, CZ. Box 407, Balboa, CZ.
KH6,WH6[1] – John H. Oka, KH6DQ, P.O. Box 101, Aiea, 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, VE3HW, 20 Almont Road, Downsview, ON.
VE4 – D. E. McVittie, VE4OX, 647 Academy Road, Winnipeg R3N OE8, MB.
VE5 – A. Lloyd Jones, VE5JI, 2328 Grant Road, Regina, SK. S4S 5E5.
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[1] – 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 4 1/4 by 9 1/2 inch or No. 10 business envelopes.

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



The World Above 50 Mc.

CONDUCTED BY BILL SMITH,* W7JNK

Space Diversity Reception

THE USE OF diversity reception techniques, particularly in the ht range, is not new. The first papers on the subject date back some 40 years. But diversity reception, the combining of one or more antennas and receivers to negate received-signal phase distortion, has seen little application on the amateur bands.

Though the technique is widely used on commercial frequencies, where sufficient real estate is available to place antenna arrays five or more wavelengths apart, few amateurs have the ground area at their disposal. The situation changes at vhf, where a free-space wavelength at 50 MHz is approximately 20 feet, 7 feet at 144, slightly over 4 feet at 220 and 2 feet at 432. On many house lots it is not difficult to achieve a 5-wavelength spacing at six meters, and 10 wavelengths at two meters is even easier. Now what can be accomplished with two arrays of similar antennas spaced several wavelengths apart?

It is generally accepted that over-the-horizon vhf signals are scattered, with the possible exception of most ionospherically-propagated signals. How scattered signals arrive at the receiving site is a "guesstimate" at best. If they arrive in phase, the signal level will be steady. If not, there will be fading, usually about the time we're seeking an important bit of information. This is where space diversity (and polarization diversity mentioned later) can help eliminate fading signals.

A signal arriving at array 'A' may be out-of-phase but a few wavelengths away the scattered signal may be arriving in phase. Experiments by the late W6NLZ and others have shown surprising differences in signal amplitude on similar arrays mounted at the same elevation, but only a dozen or more feet apart. Over a decade ago W6NLZ conducted numerous tests on 144 MHz, using like antennas mounted side-by-side and separated 12 feet. John found that when the received signal faded on one array, often it was many dB stronger on the other. The tests were performed over tropo-scatter paths exceeding 200 miles. Similar results with both space and polarization diversity were obtained at W1HDQ in 1949.[1]

Establishing a working system for this elementary but effective type of diversity reception is not difficult. Inexpensive slip-up masts used to elevate 10-element Yagis, fed with individual coax feedlines run through a switching relay ahead of a converter, would allow selecting signals from either of the two antennas. Tandem-operated rotators could be used for azimuth control. Television station video carrier frequencies (see page 76, *QST*, February 1972) can provide test signals over selected distances, and such a simple system may convince the user to try similar techniques on his favorite vhf band.

Other space diversity experiments may be done with individually fed antennas mounted at different heights on the same support. Highest is not always best! Still another aspect worth investigating is polarization diversity on ionospherically-propagated signals, such as *Es*. Anyone who has observed *Es* can testify that it may be difficult to determine the direction from which a given signal peaks. How and from where are the signals arriving? W6ABN has used selectable horizontal and vertical Yagis for years on six-meter *F* and *E* paths. His signal speaks for itself.

In the December, 1971, issue of *Ham Radio*, W2EEY discussed more sophisticated diversity reception techniques, where signals are electronically selected from the antenna receiving the strongest signal. W2EEY's method eliminates the need for manual antenna switching, but for those interested in diversity reception experiments, the thoughts presented here will provide rewarding results with simplicity and minimum investment.

Editor's Note

With this issue your column editor begins his seventh year as writer of "The World Above 50 Mc." It has been a personally rewarding experience to be associated with ARRL and to have made so many friends around the world through the medium of these pages. Thank you for your continued support. At the head of this column you likely noted I'm now signing a new call, W7JNK. My address is 1935 East Michigan Avenue, Phoenix, Arizona 85022, for those who wish to write direct. If you want to call, dial 602-971-2566.

OVS and Operating News

50-MHz DXers found the usual let-down, beginning around the middle of January, judging by the small number of reports received, but those who did report seem to feel that January and February provided at least the customary number of scattered openings of various kinds.

WA1PFA, Dartmouth, Mass., who is looking for double-hop skeds for early summer, caught several January *Es* openings to 4s, 8s, and 9s, and worked W5ZZK in Arkansas. Chuck says that the warming

*Send reports and correspondence to Bill Smith, W7JNK, ARRL, 225 Main St., Newington CT 06111.

[1] Tilton, "Antenna Polarization at 144 Mc.," January, 1950, *QST*, p. 15.

trend in January brought improved tropospheric propagation to New England. During an aurora Feb. 21, he worked WA1EXN in Maine, WA1JEX in Vermont, WA3SKE/4 (?) in Kentucky, WA3PNQ in Maryland, and WB8IWI, Cleveland, Ohio, via the buzz, between 2305 and 2355 GMT. WA1EXN reported that he had been hearing aurora signals as early as 2000 GMT. There was a little aurora around 0320 GMT, Feb. 23, also.

WA1QEY called the January 14 E_s "fantastic." Jon worked 4, 5, 8, 9 and ϕ, with 5 watts, a-m, in a 4-hour session. WA3PCS reports contacts with Georgia, Alabama, Wisconsin, and Illinois during this one, 2100 to 2320 GMT. W6YKS caught WB5EKT, New Mexico, at 1730 on the 13th.

K5ZMS, San Antonio, reporting to W1HDQ on 10 meters, found the band quite lively during February. Ray's observations track well with those of WA5IYX, detailed below. He feels that there was an exceptional amount of propagation to West Texas, New Mexico, Arizona and California during February. On Feb. 7, Spanish-language TV was heard, Utah was worked, and Houston-area and Oklahoma stations were worked on back-scatter, on a 285-degree heading. The second harmonic of the 25-MHz WWV (need a good band-edge marker for 50?) was heard the evenings of the 8th and 10th, along with Utah, New Mexico and Arizona stations. An unidentified signal on 49.99 MHz has been heard from the southwest several evenings.

WA7FPO, near Phoenix, says he noted several minor *E* openings in January, some lasting for only a few minutes, and mostly to central Texas and W6. At Las Vegas, K7ICW says *E* activity increased considerably during January. Al found three openings, and compared to December at this location, that *was* a big improvement. Says Al, "This report represents a typical winter doldrum during very quiet sunspot activity for above 30° latitude in sparsely populated areas."

In California, WB6RUN, in the Los Angeles area, says he, K6AKC, and WB6RFB caught a February 10 *E* opening to El Paso for over one hour.

WA5IYX, San Antonio, observed no less than 24 openings on 13 January days, but Pat says most were short-lived. Seventeen states, mostly 4s, 6s, 7s, 9s and ϕs, were included in the sessions, which covered a total of 865 observed minutes. He calls January '73 "above average" for *E*. Pat keeps sunspot count measurements also and says, as of late February, the average daily count was the lowest since March, 1966, and undergoing a very rapid rate of decrease. Will April still provide a last gasp of *F*-layer DX on 50 MHz, from at least the southern U.S.?

Moving into February, WA5IYX reports an excellent *E* opening on the 3rd, beginning in the late afternoon and lasting some six hours. Pat logged states from Virginia to California, but says apparently conditions were even better from the 4s and 8s, with K8LEE mentioning KP4s. But then came the 7th through the 10th. The first of the above-50 MHz *E* began in San Antonio in the late afternoon of the 7th, to the Minneapolis area. It lasted until after 2300 local time, with the muf peaking to at least 98.5 MHz, to Las Vegas and Radio Mundial in Guatemala City! The higher-muf DX was observed between 1900 and 2130 San Antonio time, with Pat spending most of his time logging fm broadcasters.

An ice and snow storm the following day forced Pat to battery-powered operation. Mexican and Central American TV came through on channel 2, and there was a helping of 7s and ϕs on 50 MHz. February 9th was a near-repeat of the 7th and the following day approximated the 8th. Thanks again, Pat, for your usually detailed report.

In El Paso, WA5ZLJ caught some of the January *E* working stations from South Dakota to California. In New Mexico, WB5AOX worked 9 Texas stations on the 7th and logged TV stations up through channel 6.

WØMOQ, Iowa, writes that during the past year, a weak, watery type of *E* propagation has been observed frequently at his location, characterized by signals from the normal single-hop zone for periods of one to two minutes. WØMOQ says that while the mode is loosely called "scatter" it has none of the characteristics typical of tropo, ionospheric, or meteor scatter and suggests a sporadic sporadic E (E_{ss}). He says observance of these signals is sometimes followed by a normal *E* opening. Regular *E* openings were caught January 8 and 14, to 2s, 3s and 4s.

144 MHz activity continues to be centered around the uplink to Oscar, but elsewhere, K4GGI/1, Mass., says many operators miss good winter tropo opportunity by not watching periods of high barometric pressure. Lewis reports that channelized non-repeater fm activity is becoming more popular in eastern New England, with operators discovering the potential of simplex work. He says 146.52 and .94 are the most popular simplex channels.

January 22 was an unusual day. Be it known that W2AZL took pen in hand and brought us

Well known vhfer SM5LE shown at his operating position has been very active in Oscar 6 work.

up-to-date with his first letter to this column in more than six years! Good reason, too, because Carl now leads the second call area in states worked on 144 MHz. State 37 was KØAWU, N.D., worked last August during the Perseids, but the clincher was W6PO, worked January 14 on moonbounce. That was following two previous schedules when contacts were nearly completed. W2AZL runs a kilowatt input, and four 11-element Yagis. He says W6PO's moon-reflected signals could be heard all over the house. The contact was made with the moon nearly on the western horizon from New Jersey. W2AZL has been scheduling VE7BQH, but local power-line leakage has prevented their completing a QSO. W2AZL is interested in other moonbounce schedules, with stations having tiltable arrays so that Carl can hit the moon on the horizon. His tiltable array will be completed when the weather warms. Carl has yet to hear his own signal off the moon, which he hopes will encourage others to try the EME route. Says Carl, "they won't make a contact everytime, but one a year puts you ahead of the game." Congratulations, Carl, on being top-dog from W2. I know of few who have worked harder, or kept their enthusiasm for so many years.

WA2UDT, N.J., says "nothing unusual" to report. Bill thought the January Quadrantids were quite poor. Pings and bursts heard were weak and of short duration.

K3RYL, Pa., has spent much time working through Oscar contacting 36 states and 14 countries through mid-February. All of his contacts have been made running 40 watts PEP ssb to a 5-element close-spaced Yagi, tilted 30° above the horizon. He says the close spacing of the Yagi gives a number of minor lobes useful for satellite tracking. K3RYL mentions that he, too, has noted the up-Doppler shift reported in the February column. WØLER is searching for more such documented reports of the up-Doppler, and he thinks an interesting discovery may be near; one that could greatly benefit amateur radio. If you have made similar observations, WØLER would like to hear about them. W3LNA, Pa., has also been following Oscar, but laments the use of high power through the satellite.

A major project completed recently by K3QCQ is a version of the single-ended 4CX250B amplifier (ARRL *VHF Manual*) for 144 MHz. Bill revised the tuning arrangement to use a vane, in place of the screw-driven disk of the original. This results in smooth tuning and improved overall performance. He will send details to anyone really interested in building the amplifier. Write William J. Lakatosh, 208 Poplar St., Lebanon, Pa. 19042, and enclose SASE.

Bill made his first Michigan contact Jan. 11, with W8YIO, 400 miles, and also worked W8DGF and K8III, 300 miles. They have been worked regularly on schedule since that time. The two nearer ones are always readable. W8YIO is heard, but not always solidly readable. W3QCQ worked New Hampshire, Illinois, Connecticut and Ohio during the Jan. 20 aurora.

WA4BZP passes along some striking evidence of need for better voice-operating techniques. When Tom flew from St. Paul to Atlanta recently, he listened on various 2-meter fm channels much of the way, at 37,000 feet. Needless to say, he heard plenty of stations. He identified 18 stations (4, 8, 9, 9). Many others were heard, but signing too fast or with unclear enunciation prevented more than a wild guess at most of the calls.

For those needing Tennessee, WB4ZDA offers his ssb services from near Memphis. Skip runs about 100 watts and a 40-element collinear 55 feet high. WB4ZDA's address is 7747 Kiowa Avenue, Millington, Tennessee 38053. In Tulsa, WB5BKY seeks meteor scatter schedules for his kilowatt and 20-element collinear. Write Will at 10114 East 4th Street, Tulsa, OK 74128. Shelby Ennis, WB8DMD, at Clio, Michigan, has qualified for the Oscar 1000 certificate, having worked over 30 states and 10 countries.

Here is a bit of winter-time tropo DX, worked on 2-meter fm, as reported by K6YLQ. Larry says that WA6ZRH, remote, Santa Barbara, worked WA6DGJ, remote, in Eureka, at 8 pm Jan. 31. This is a hop of more than 450 miles.

From near Chicago, K9HMB is among the growing number to have worked the excellent moonbounce signal from W6PO. Frank made his contact February, 12, with solid signals. He had his EME array on a small temporary mount. Seems as though his wife thinks *seven* towers in the yard are enough and says "no more!" Frank was planning late-February 220 EME schedules with WB6NMT, the results of which were not known at this writing. K9KQR, also near Chicago, says 50° January 13 weather provided tropo into the Cleveland area, and aurora was worked January 20 and 21, from South Dakota to Michigan. Another weak aurora was worked by Dick January 28. WØMOQ, Iowa, worked the January 20 buzz, having contacts in Michigan and New York.

In the Southwest, WA7FPO, Phoenix, after a series of rig failures, was getting his signal through Oscar in late February, having good success with 100 watts of ssb and a groundplane 40 feet high.

432 MHz is our next band up for reports this month, there having been no 220 reports. W2AZL, N.J., enters the states worked box with 21, running a kilowatt and four 13-element Yagis. Carl, you'll remember, was on one end of the first 432 meteor scatter contact, working WØLER over a 1000-mile path, last August. K2OVS, N.Y., updates his 432 standings this month and says he is still working on a 1296 solid-state amplifier design. WA6EXV, Ridgecrest, is preparing for a serious moonbounce assault. Chuck, who is always building new equipment, is constructing a separate ham shack for his EME installation. "Have the roof, walls and doorway finished . . . looking better all the time," reports Chuck. Between pounding nails, Chuck drilled tropo signals over the mountain path to W6FZJ at San Jose, three days in January, including ssb contacts on the 16th and 23rd. These were the first ssb contacts after more than 18 months of schedules, often successful on cw.

W9YYF, Ill., is on 432 and reports making several contacts, but is preparing to make 'big noises' this summer. And near Kansas City, WBØBHE writes that WØYZS is moving to a rural location with a kilowatt, 200 feet of tower and about 100 elements. Do you think Mike has plans for something big?

West Coast VHF-UHF Conference

This popular yearly event will be held May 5-6, at the Pen and Quill Hotel, 3501 North Sepulveda Blvd., Manhattan Beach, CA. This is a change of site from earlier announcements. Peter Von Hagen, WA6HXM, is the conference chairman, Box 2473, Palos Verdes Peninsula, CA 90274. Registration $3.00. Motel and Hotel information on request.

YL news and views

CONDUCTED BY LOUISE RAMSEY MOREAU,* W3WRE

The YL Story — South America

FOR THOSE OF US who say with Kipling "I've never sailed the Amazon, I've never reached Brazil," the act of turning on our equipment can bring us into these countries in the time it takes to answer a call from any of them. And it is very easy to work a YL operator in South America, for about 2400 women hold amateur radio licenses in that continent.

The past forty-seven years have seen a tremendous YL interest in amateur radio since Brazil opened the door when Odette Chavez, SB7AB, became the fifth DX YL in radio, and added a third continent to the YL map. Argentina now leads with over 900 women operating in all call areas. The 448 in Brazil, 287 in Venezuela, and 174 in Uruguay, also represent all the call areas in these countries, and there are 197 in Chile who hold a CE prefix.

When Katherine La Pierre received OA4CM in 1927, she was not only the second YL in South America, she was the first to hold one of the new ITU assigned prefixes, and now Peru has 125 YLs on the air.

Colombia has 79 with the HK prefix; and there are 43 in Bolivia representing all call areas. Ecuador, where in 1935 HC1AY was granted to the "first lady" in that country, now has 41 women operators.

The "baker's dozen" women representing Paraguay are: ZP2EE, ZP3DE, ZP5CI, ZP5DR, ZP5FK, ZP5FK, ZP5JE, ZP5JJ, ZP5JP, ZP5KG, ZP5NY, ZP5PJ, and ZP5RH.

Of the 39 licensed amateurs in the Falkland Islands one fifth are YLs: VP8DQ, VP8DR, VP8GM, VP8IA, VP8KM, VP8LC, VP8LX, VP8MF.

Only one woman represents what has been called the distaff side of amateur radio in four countries of South America: CEØAD in Easter Island; HC8MP in Galapagos; PJ2JC in the Netherlands Antilles, and PZ1BR in Surinam.

It is not yet possible to create a Worked All South America award for YL contacts alone, for there are no women operators listed under many of the prefixes. The feminine touch is still lacking in three of the areas that make up CP9; FY7; PJ3; those under PJØ; and the many islands that have VP8 as a call, as well as VP9; 8R; 9Y4; and 8J.

Antarctica probably will be without YL representation no matter what call is assigned to it for, so far, only one woman was able to operate officially from that area when Evelyn Scott, W6NZP, operated from KC4USP during a visit to that station on one of her many trips to the DX countries.

The YL story in South America is one of a steady increase in interest in amateur radio since 1926. Katherine C. T. La Pierre is the only one of the pioneer women of that continent who remains active with her original call. The picture is, as with all continents, incomplete for in many countries both husband and wife operate with the same call. Also, there is always the "bug bear" of the language barrier that can possibly obscure the identity of a name as being feminine. The changes in the lists are constant because more and more calls are being assigned as the YL interest in amateur radio increases.

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

No communications gap in the family when Amy WA3CAP married Bob Young, WA2JAN, for both are members of Army MARS and are very active in amateur as well as MARS operation. *(Photo courtesy of WA3NGV)*

Marilyn Duncan, VP9HD has been active from Bermuda since June 1972. The XYL of VP9AF, she can usually be found on the low end of 20 meter cw, for in VP9 land one must first work 200 cw contacts before receiving phone privileges. *(Photo courtesy W1NU)*

At present South America ranks second among the continents in the number of YL operators.

As always, in the interest of accuracy in presenting as clear a picture as possible of the story of the YL, world-wide, "YL News and Views" will welcome any omissions, or corrections to this report on the ladies in South America.

1973 Buckeye Belle Week

Ohio's statewide YL club the Buckeye Belles have scheduled Buckeye Belle Week – the annual QSO activity begins at 2400 GMT April 8, and ends 2400 GMT on April 15. Members of the club will be looking for contacts during that time using all modes of emission on all the amateur frequencies.

A special certificate will be awarded by the club to the person who sends in log information for working the largest number of members of the Buckeye Belles. This is also an excellent time to acquire those missing contacts for the Buckeye Belle certificate. Send log information to the custodian Marge Farnet, K8ITF.

Ontario "Trillium Weekend" Results

Irene Williams, VE3BFI has announced the results of the Annual "Trillium Weekend" held in November 1972: Highest score, VE3CQY; second, VE3BND; third, VE3AGS. The Ontario Trillium plaque will be awarded to the top score holder VE3CQY, and certificates to be presented to the second and third place holders.

The TOT member with the largest number of contacts during the contest was Doris Cody, VE3BBO. Winners of the "Lucky Draw" were VE3FQK, VE3DOR, VE3CHZ. This annual contest is open to all amateur radio operators. The dates for the 1973 contest will be November 2, 3, 1973.

XYL – YL

Again there have been a series of complaints from wives of amateurs, as well as requests from OMs for clarification of the designations XYL, and YL. The definitions are simple. We are all YLs, on the air whether we are 6 or 600 years old, just as all men are OMs regardless of age. The XYL indicates marital status whether the lady be a licensed amateur radio operator or not. All of us are proud to be able to add that "Mrs." to our name; XYL is just the way of indicating it in the "language" of amateur radio.

JA YLs

Interested in contacting the gals from Japan and baffled by those initials in the Call Book that do not designate the name? The following calls are all members of the Japanese Ladies Radio Society, and represent the 10 districts on Japan.

JA1: FM, YL, ZA, AEQ, CFS, CLI, CUO, DAR, DAV, DIM, EYL, FPB, SLU, TQG, VFZ. *JH1:* ANX, CCQ, GMZ, GWK, HDU, OFY, SKK, TCZ, WBH, WKS, WQC. *JR1:* AJT, DYR, GWS, HRI, MUZ, PQP, UNE, VTY, XCC. *JE1:* BIX, IVL, IVM, IWT, IWR, JOA, NXO, OSG, RXM, SZV, TEQ, TES, JF1ACF.

JA2: AWB, BAA, BBG, BBH, BFO, CHT, DYL, KGM, LSM, NFJ, PQJ, RPO, SFY, TBJ. *JH2:* BVZ, GGS, HEZ, KPW, NIP, ORM, RHO.

JA3: JZN, UPR, UTL, VMT. *JG3:* DTT, IPM, QIU, ROF, RRR, SVS. *JR3:* AQE, (JA4RWA/JA3).

JA4: ETS, EYL, FRV (RWA).

JA5: YL, AEV, FJC.

JA6: BVA, CNX, DGI, FCI, GSE, HBS, ILU, KZI, NMT, RHA, TQL, (PR). *JA6*BON.

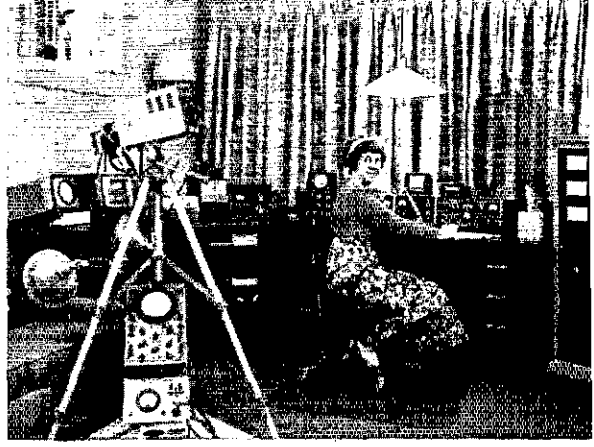
JA7: GXX, MFM, (BYL), (JSL).

JA8: YL, AQY, CDO, CVE, DHL, DYM, EAA, EDC, EIZ, DJC, EJH, GJO, IKL, IQO, JIE, LVB, MCL, MXB, MWW.

JA9: NB, CHE, CZY, EKM, FNW.

JA0: EC, IW, ADZ, JA6PR/JA0.

Bea Austin, W7HHH, has been DC of the 7th YLRL District for three terms, and is a past president of the Portland Roses. She is not the only licensed amateur in the family, a nephew is K7OZT.



Mabel Banks, W4LAX.

Meet the Club, JLRS.

The Japanese Ladies' Radio Society was organized in 1956 by a group of YLs in the First District in Japan. From a small group in just one district, the club had grown to 134 members in all 10 districts when they celebrated their 15th anniversary in 1972.

Officers are selected by members in each district every three years. The 1972-73 officers are: President Mrs. Fumi Abe, JA1AEQ; Vice-presidents are JA1YL, and JA1CFS; Secretary JH1ANX; Editors of the club bulletin *The JLRS*, are JA1CUO, JA1DAR, and JA1DYL.

The "YL-10" certificate sponsored by the club is offered to all amateurs who qualify. The rules are 2-way communication with 10 different licensed YL amateurs. Contacts with YLs anywhere in the world are recognized for Japanese YLs, and for DX operators the contacts must be with YLs in Japan only (definition of DX in this case is any country outside Japan.) At least one of the 10 YLs must be a member of JLRS. 10 QSL cards, or other written communications confirming 2-way contacts, accompanied by a list of claimed contacts must be submitted by the applicant to the JLRS Award Manager: Sachiko Tamura, JH1ANX, 4-38-6, Midori-machi, Tokorozawa, Saitama, Japan 359. Sufficient postage must be sent with the confirmations to finance their return by registered mail. Endorsement stickers will be made to the original certificates for each 10 additional contacts.

"YL News and Views" in indebted to "Sam" Masami Saito, JH3PJE/JA4RGO for this information as well as the list of Japanese YLs.

Mabel Banks, W4LAX

Mabel was a very quiet key after she passed the test thanks to World War II and the enforced silence on the part of all of us, but she had the satisfaction of knowing that she had obtained not only her Class B Amateur Radio Operator's license, but the Commercial Telephone, and Telegraph licenses as well. After the war she received the call W4LAX, and in 1947 qualified for the Class A amateur license.

When Mabel tells of her equipment layout she talks about a GMXV monitor, a Robot monitor, and Robot camera with a homebrew fast-scan monitor mounted in TRIPOD for focusing pictures from the camera in addition to the standard station equipment. She is very active with slow-scan TV, and her DX contacts make the enviable list of VU2KV, VK5MF, CR6CA, VK3TE, OD5HC, DL9MO, F8BDJ, XE1JM, DL2RZ, CP1FW, 9Y4VU, HK1BAR, VP2ME, OD5BV, ZL1AOY, VK6ES, G5ZT, KP4GN, SZØOG, FG7XT, KL7DRZ, PZ1DA, SK4XA, OH1LA, GW3DZJ, and PAØLAM with good quality pictures to her credit.

DX is not her only SSTV accomplishment, for she participated in the Apollo 9, 11, and 16 missions and was able to relay fair quality pictures of the lift-off of Apollo 16 to the prime recovery ship. QST

Sweaty Palms

(Continued from page 66)

"I will call off the names of those who have *flunked*, repeat, *failed to pass* the code receiving examination. If your name is called, please leave the room immediately." I am halfway out of my chair, aiming for the door, and a life of CB. "Hello, Green Giant, this is the Phantom calling. How do you copy? Boy, my new linear is great; twenty thousand watts."

The reading of the names of the condemned is beginning. I am prepared to die.

"Evans, Balowski, Crider, Everhardt . . . ." He is getting up. "Tung-Sol" is getting up, and leaving the room. He is not whistling anymore. His Pickett slide rule is in its case, slapping his leg as he walks. "Tung-Sol" is out. He has flunked the code receiving. He has blown it. Hi, hi . . . .

The examiner has concluded his reading. My name is not on the list. I have copied thirteen words a minute. I have done it. Somewhere on that paper is sixty seconds of solid copy. I have done it. I have done it.

Now, it's like a symphony. I am going to live. The pages of theory fly by. Ohm's law returns to my head. Not a single phase angle crosses my view. From here, it's all a downhill run . . . . I'm a ham, a real ham. WOW! QST

Digipet

(Continued from page 54)

Digipet-60 Frequency Counter

Frequency range: 1 kHz to 60 MHz.
Resolution: 1 kHz or 1 Hz (at 1 ms or 1 s gating times).
Dimensions (HWD) and Weight: 2-3/4 × 7 × 7-1/2 inches, 3-3/4 pounds.
Power requirements: 117 V ac, 11 watts (50 to 400 Hz) or 10 to 14 V dc (negative side ground).
Price class: $300.

Digipet-160 Frequency Converter

Frequency range: 130 to 160 MHz.
Maximum input sensitivity: 50 mV (rms).
Dimensions (HWD) and Weight: 1 × 6-1/4 × 5-1/2 inches, 3/4 pound.
Price class: $50.
Manufacturer: Miida Electronics, a division of Marubeni America Corp., 2 Hammarskjold Plaza, New York, NY 10017.

Operating News

GEORGE HART, W1NJM
Communications Manager
ELLEN WHITE, W1YL
Deputy Communications Mgr.

ASST. COMMS. MGRS.: *DXCC*, R. L. WHITE, W1CW; *Hq. Station*, C. R. BENDER, W1WPR; *Contests*, F. D. NISWANDER, WA1PID; *Public Service*, W. C. MANN, WA1FCM.

New SCM Functions. Your hard-working SCMs have been granted some new functions, pretty much at their own request, by the Board of Directors of ARRL at their annual meeting in January. The action followed a questionnaire sent out by the Communications Department asking SCMs how they felt about it and, while we were at it, requesting some additional data on SCM activities. All SCMs have been apprised of their new duties by special bulletin.

Perhaps "duties" isn't quite the right word. They are more in the nature of privileges than duties, since the Board's action was an enabling one, not intended necessarily to add to the SCM's already-heavy burden of supervising and administering operating activities. But down through the years, the membership has come to regard SCMs as ARRL spokesmen on *all* amateur affairs, not just those having an on-the-air connotation. With authorization for reimbursed travel, this view has become ever more prevalent, and SCMs have frequently asked headquarters for assistance. Usually it was provided; occasionally, when the "assistance" involved reimbursement funds for travel on a matter not directly connected with an SCM's prescribed functions, it was necessary to demur.

Consequently, the Rules and Regulations of the Communications Department are being changed to permit SCMs to participate, officially, in such activities as public relations promotions; publicity; convention and hamfest planning, organization and promotion; recruitment and training of new amateurs and ARRL members; and dissemination of information to clubs, appointees and members. These new functions were effective with the publication of the Board Meeting minutes in March *QST*.

Many members will of course say that they thought these were SCM functions already, just as many SCMs told us in their questionnaire responses that they were already performing most of these functions, so what else was new?

The question of a change in name now comes up. Shall we retain SCM, or change it to SAM (Section Activities Manager) or simply SM (Section Manager)? Any other suggestions? We may poll a sampling of the membership on this minor matter; meanwhile, the SCM remains the SCM and his former "required" duties have not changes. The new functions are just frosting on the cake.

Just a short paragraph on statistics. Did you know that the average (yes, that's what we said, not unusual) SCM already spends 37.9 hours per month at his job? That's a full workweek in most occupations. The biggest, most time-consuming job most SCMs have now is generating their monthly reports. This takes about 7 hours.

Most SCMs serve more than one term; the average is 4.2 years. Some go 'way back. Look on p. 6, this issue, then compare with p. 6 for Apr. '63 *QST*. Yep, seven SCMs are the same: W9PRN,

"I CANNOT TELL A LIE"

The other night I was visiting a friend in his radio shack who was having a pleasant QSO with a 4. "You're a good 9-plus," said my friend, "readability 5 all the way through, beautiful copy." After they had signed, I asked why he had given the 4 a 9-plus reading when the S-meter clearly registered only 5.

"Aw, what difference does it make?" said my buddy. "I gave the guy pleasure with just a small white lie. Besides, the S-meter doesn't really mean anything. It's the readability that counts, and he was readability 5 all through the QSO."

The incident started me thinking. Most of us are basically nice guys and want to have pleasant QSOs. It is rather embarrassing to get a 5-9 plus report and then have to tell your contact he's only a 5 & 5. So, what do many of us do, as a rule? Give our fellow ham an exaggerated report, that's what. You may well feel that there is nothing lost in the long run when you tell your contact "you're booming in here." or "you're real arm-chair copy." No one is actually hurt, and you may have made a guy feel good.

I doubt that any two S-meters are calibrated exactly alike anyway. Some are scotch, some are liberal, so what is a true S-meter reading for any signal?

So, you ask, what's the answer? Well, I doubt there is one to satisfy everyone. Perhaps we should do away with S-meters. It would save money and would make honest hams out of many of us because we wouldn't feel obliged to give out S-meter readings. As my friend said, all that is really important is the readability anyway.

– *K3FDL.*

W1AW FALL-WINTER SCHEDULE
(Oct. 29, 1972-April 29, 1973)

The Maxim Memorial Station welcomes visitors. Operating-visiting hours are Monday through Friday 1 P.M.-1 A.M. EST, Saturday 7 P.M.-1:00 A.M. EST and Sunday 3 P.M.-11:00 P.M. EST. 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 on Nov. 23, Dec. 25, 1972; Jan. 1, Feb. 19, Apr. 20, 1973. Please note that all times-days are in GMT. Specific operating frequencies are approximate and indicate general operating periods.

GMT	*Sunday*	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*	*Saturday*
0000	.....	.....	.....	.....	RTTY Bulletin[3]	.....	.....
0030	← CODE PRACTICE DAILY[1] 10-13-15 wpm →						
0100	.....	← CW BULLETIN[1] →					
0120-0200[4]	.....	.....	3.7 Novice[5]	14.080	7.080	7.15 Novice[5]	3.580
0200	.....	← PHONE BULLETIN[2] →					
0205-0230[4]	.....	.....	3.990	50.120	145.588	1.820	21.390
0230	← CODE PRACTICE DAILY[1] (35-15 wpm TThSat, 5-25 wpm MWFSn) →						
0330-0400[4]	.....	.....	3.580	.....	1.805	.....	3.580
0400	RTTY Bulletin[3]	.....	← RTTY BULLETIN[3] →				
0430	Phone Bulletin[2]	.....	← PHONE BULLETIN[2] →				
0435-0500[4]	.....	.....	7.290	3.990	7.290	3.990	7.290
0500	CW Bulletin[1]	.....	← CW BULLETIN[1] →				
0520-0600[4]	.....	.....	3.7 Novice[5]	7.080	3.990	7.15 Novice[5]	3.580
1400	.....	← CODE PRACTICE[1] (5-25 wpm MWF, 35-15 TTh) →					.....
1800-1900	.....	21/28 CW[7]	21/28 SSB[8]	21/28 CW[7]	21/28 SSB[8]	21/28 CW[7]	.....
1900-2000	.....	14.290	14.080	14.290	14.080	14.290	.....
2000-2100	.....	7.080	7.290	14.095 RTTY	7.290	7.080	.....
2100-2130	.....	21/28 SSB[8]	21/28 CW[7]	21/28 SSB[8]	21/28 CW[7]	21/28 SSB[8]	.....
2130	.....	.....	CW Bulletin[1]	.....	CW Bulletin[1]	.....	.....
2200-2230	.....	7.150 Novice	21.125 Novice[6]	7.150 Novice	21.125 Novice[6]	7.150 Novice	.....
2230	.....	.....	RTTY Bulletin[3]	.....	RTTY Bulletin[3]	.....	.....
2300	.....	CPN[6]	7.095 RTTY[4]	3.625 RTTY	14.095 RTTY[4]	CPN[6]	.....
2345	.....	.....	CN[6]	.....	CN[6]	.....	.....

[1] CW Bulletins (18 wpm) and code practice on 1.805, 3.580, 7.080, 14.080, 21.080, 28.080, 50.080 and 145.588 MHz.
[2] Phone Bulletins on 1.82, 3.990, 7.290, 14.290, 21.390, 28.590, 50.190 and 145.588 MHz.
[3] RTTY Bulletins sent at 850-Hertz shift, repeated with 170-Hertz shift; frequencies 3.625 7.095 14.095 21.095 and 28.095 MHz.
[4] Starting time approximate. Operating period follows conclusion of bulletin or code practice.
[5] 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.

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 improve your fist by sending in step with W1AW (but not over the air!), and to allow checking the accuracy of your copy on certain tapes, note the GMT dates and *QST* practice text (from the issue 2 months previous) to be sent in the 0230 GMT practice on the following April dates and 0130 GMT in May.

Apr. 6:	It Seems to Us
Apr. 12:	Correspondence
Apr. 16:	League Lines
Apr. 24:	ARPS
May 2:	World Above
May 7:	YL News

W1ALP, K1AAV, W6JPU, W8JM, W4RKH, VE7FB. Go back ten more years and W1ALP was still there. Frank goes back to 1940, believe it or not! Thirty-three years an SCM. This sort of boosts the average, but it also emphasizes that members don't take on SCM jobs for the fleeting glory of it, as a general rule. They take it to do a job.

So support your SCM while he is in office, and help him all you can to do the many things he is supposed to do and the many other things he is authorized to and wants to do. He is your elected administrator of section activities. If he doesn't do it the way you think it should be done, you have two alternatives: support the candidacy and election of someone you believe can do it better, or run for the office yourself.

New A-1 Operators, December-February

WB2ERG W2GS WA3CXY W4DQZ W3GL K3JH W4AZJ W4CXH W5FLD W6JTA WØRLI DK3EQ DJØVZ HA1VE LX1BW OK3EE SM3CWE SM6EDH WM7QY.

W1AW operators, past and present! At an informal gathering of the CD staff on the occasion of the retirement of Murray Powell, W1QIS, someone noticed that there were six present who were or had been on the W1AW staff. Here they are, left to right: W1YNC, W1SL, W1QIS, W1NJM, W1GRE, W1WPR. Also at League Headquarters, but not present, W1NPG, WA3JSU.

W1AW "Operators." The two pictures of present and former members of the W1AW/W1MK staff, and the occasions they represent, brought about some reminiscing, and this in turn brought about some research, results of which may be of interest. Bob Parmenter (W9WT) was the first full-time paid operator, from 1928-33 and Hal Bubb, W1JTD, took his place in 1934 until W1MK was flooded out in '36. W1INF was the call used, from ARRL headquarters on La Salle Road, from the flood until Feb. '37, when FCC authorized W1AW, the Old Man's personal call. From then until today, would you believe it, 26 operators or regular maintenance staff have worked at W1AW, not to mention a number of temporary (summer) fill-ins. Here is a list, with the dates, and we hope (but doubt) that we have all names, calls and dates correct:

Hal Bubb, W1JTD, 2/37-12/41 and 9/45-1/46
George Hart, W3AMR/W1NJM, 8/38-1/42
Bob Morwood, WØQMD, 12/41-1/42
Dave Parmelee, W1LFK, 1/46-3/46
Tom York, W1JBJ, 2/46-11/46
John Rameika, W1JJR, 4/46-9/47
Bill Matchett, W1KKS, 8/46-10/47
Jim White, W1PHW, 11/46-9/47
Rod Newkirk, W9BRD/W1VMW, 9/47-5/48
Tom McMullen, W8YCK/W1QVF (now W1SL), 11/47-11/50

Speaking of Hq. station operators, here's the first one: Bob Parmenter, now W9WT, at the ARRL booth during the Starved Rock (Ill.) Hamfest last June. Bob was the silver-fisted operator at W1MK from 1928 to 1933.

Dick Fidel, W2MHW/W1RUP, 3/48-7/50
Ned Cone, W1WCM, 5/48-7/48
Bob Morrison, W3LRK/W1RXL, 8/48-9/50
Murray Powell, W1QIS, 6/50-12/72
Jim Barrett, W4KVM, 12/50-6/51
Lin Morgan, W2ZGG, 6/51-8/51
Charlie Wood, W2VMX, 8/51-9/52
Chuck Bender, W3QDU/W1WPR, 9/52-
Bill Parkinson, K6OSO, 3/69-10/69
John Kaufmann, WA1CQW, 6/70-8/70
Chuck Utz, K1QNF, 7/64-1/66
Gus Wilson, W1NPG, 1/66-1/68
Gary Awsiukiewicz, WA1DEM, 7/66-2/67
Chuck Watts, WA6GVC, 11/70-8/71
Tony Dorbuck, W1YNC, 8/71-9/72
Alan Bloom, WA3JSU, 9/72-
Al LaPlaca, K2DDK/W1GRE, 10/72-

Summer operators: Tony Dorbuck, W1YNC (57,58); Bob Eaton, W1FYF (59); Lance Johnson, K1MET (60, 61, 62); Jeff Jenks, WA1GFW (67, 68). Longest tenure (so far), Murray, W1QIS, 22.5 years. Murray Powell and Chuck Bender worked together at W1AW for over 20 years, from Sept. '52 through Dec. '72, when Murray retired. During most of that period, W1AW was alone on the 7-acre farm in Newington, and required a minimum of supervision from headquarters.

Excuse the reminiscing, but the above has a place in ARRL history. — *W1NJM*

IN A COMMUNICATIONS EMERGENCY, MONITOR W1AW FOR SPECIAL BULLETINS AS FOLLOWS:

Phone: On the hour GMT
RTTY: at 15 minutes past the hour GMT
CW: on the half hour GMT

January CD Party

High-Claimed Scores

That sneaky Pete of the West – the one that contests under so many different aliases the FBI has trouble keeping track – has struck again, this time under the guise of W6PAA. This is obviously another blatant attempt to confuse the erudite scholars of CD Party lore. Well, it's not going to work Ken – W6PAA is really WA6DKF who is really (but not any more) K2EIU. Thought you snuck another one by us, eh?

CW conditions were great – phone conditions? Ugh! W6PAA came through with the second

DX CENTURY CLUB AWARDS

Radiotelephone listings follow the general-type "New Member" and "Endorsement" listings – *January 1-31, 1973*

New Members

LA6GF	261	WB9BPN	119	OZ9FW	109	G3VMY	104	K2JOC	101	WB2DXW	100
K1LPL/3	250	EA9EJ	117	W4TZX	109	OK1ATZ	104	K4WSB	101	W3OHS	100
OH2BGD	240	OE2MCL	116	OH2BMG	108	OZ7XG	103	K7BEY	101	W3YXM	100
JA1OTX	225	W7WN	116	HB9AJD	107	W2EUO	103	OK3CEK	101	W4HDX	100
JA8AIP	215	W7YTF	115	KØEOU	106	WA8SWM	103	OZ1HX	101	WB4DBO	100
WB4MFIK	204	KG6SW	114	WA4SDK	106	WØBKS	103	SP6PZB	100	WB4TPI	100
YA1OS	134	SM7RS	113	W6HJP	106	ZD8CS	103	SP7DTP	100	W5RMC	100
W7GUR	131	WB9BUV	113	JR1NRP	105	ON8UL	102	VU2REG	100	WB5DRU	100
OK1ND	128	DL2TJ	112	K6SE	105	VE6AZB	102	W1LMO	100	WA8SNF	100
JA1KTM	126	K3NYI	112	VE6AIW/WI	105	WA3SRY	102	WA1MWW	100	XV5AC	100
WA3LHG	120	JE1GMM	110	W3FTG	105	JA3XYC	101	W2KZ	100	5R8AB	100
W7NJ	120			WA9HLU	105			WA2EUO	100		

W6HJA	257	W8GIO	137	JY6HC	115	K4MEZ	110	PY3AFO	105	WA5SDT	102
LA6GF	249	WØHBH	130	W3GHA	115	WA5ZNY	110	W6JNO	105	WAØWFE	102
KH6GKD	220	DL6HM	127	1R1RDE	114	SM7RS	108	WB9BPN	104	K17HFQ	101
OH2BGD	185	K3BCG	120	KG6SW	114	VE3CVZ	107	1B1FL	103	PZ5CW	100
JA8AIP	184	W7GUR	118	JA1KIM	112	W4TZX	107	K7CUZ	103	WA9LQI	100
DJ2QZ	167	K6BAZ	117	OZ5JR	112	DK4HK	106	W2NHV	103	WAØQLH	100
K8VRZ	147	EA9EJ	115	W7LVH	112	K3NYI	106	WA3QFF	103	9X5VA	100

Endorsements

In the endorsement listings shown, totals from 120 through the 240 level are given in increments of 20, from 250 through 300 in increments of 10 and above 300 in increments of 5. The totals shown do not necessarily represent the exact credits given but only that the participant has reached the endorsement group indicated.

W2QHH	345	K6UFT	280	OK3HM	250	HB9AMO	200	K5LMG	180	K6RK	140
W5GR	340	VE7IG/VE8	280	W2BBK	250	K4UEE/6	200	K6RIP	180	K9QVB	140
K6KII	330	W7VRO	280	W3HTW	250	KH6GKD	200	K8VRZ	180	OZ6HS	140
OK3MM	330	WB8EUN	280	WB4DOY	250	KH6HIF	200	PAØDN	180	VE3FLE	140
K6RN	325	F2NB	270	WB8ABN	250	KP4DLW	200	W2BZL	180	WA1HAA	140
W5NW	325	W3BRB	270	W9DDL	250	OZ4PM	200	W4UPJ	180	WØBWI	140
W9EB	320	W3KEQ	270	DL1ED	240	PY2DBU	200	WA4VAI	180	WBØBOG	140
VE7CE	315	W4BKP	270	K4SXD	240	VE3CVZ	200	WB4QFH	180	ZL1BFM	140
W9WNB	315	W4WWG	270	K9KXA	240	VE3WB	200	WA6HTT	180	5W1AU	140
F2IU	310	W5HCJ	270	W7BE	240	W1DAL	200	1B1HDB	160	K4FJQ	120
W4RJL	310	W6HJA	270	HB9RK	220	W1OOP	200	JA1WSA	160	K4FAC	120
WA5JSI	310	WAØNFC	270	JA1ILN	220	W2HHU	200	K3NEZ	160	K9DDA	120
WA9IVL	310	OZ8KV	260	K6SSN	220	WA2LYA	200	K7NHV/8	160	W2ABE	120
ON4PA	305	W1QV	260	KH6GKD	220	WB2VIT	200	W1SPK	160	WA2MBP	120
W5MOG	305	WA2CHI	260	PAØLRK	220	WA3MBQ	200	WA1NRV	160	WB2FWW	120
K3SGE	300	WB2AMO	260	VE6VM	220	WA3NNA	200	WB2FSC	160	WB2ZOW	120
K4CEE	300	W3LB	260	W5ECX	220	W5PD	200	W4PGK	160	W4HNK	120
K6OZL	300	W5WJQ	260	W5KFN	220	W5RFX	200	WB5DLX	160	WB4RUA	120
SM5WJ	300	WA9SLD	260	WA5SDT	220	W5CWQ/6	200	WB9DVV	160	W5RKT	120
W2AWK	300	K1INO	250	W5UNF/6	220	W8YMB	200	HB9ANZ	140	WA5OKC	120
W2LWI	300	K2AAC	250	W9GHO	220	W9OFQ	200	HB9DI	140	WA5ZWC	120
W6GMY	300	K2QII	250	WØIBZ	220	WAØTLT	200	JH1AGU	140	W7VCB	120
ZS6IW	300	K4FKJ	250	KØIEA	220	K1LBB	180	K3BHJ	140	W8PV	120
F8SK	290	K4KJN	250	WØNAR	220	K1OMF	180	K6UTW/5	140	W9MLG	120
K2BT	290	KØDQI	250	DJ6ZM	200	K2GBC	180	K6BAZ	140	WA9IAA	120
PY4LW	290	OH2BCV	250	PA7WN	200	K4IBN	180			WØLJF	120

W6RKP	330	K6AOV	290	K6RN	250	WA9NFI	220	K2OO	180	K6RK	140
YV5BPJ	320	W9CPD	280	K7PXI	250	CT1ZW	200	W5PD	180	KØDBN	140
W6KNH	310	9M2DQ	280	W9DOL	250	PA7WN	200	WB5DJA	180	OZ7KV	140
K8LSG	305	W2AWK	270	WA9SLD	250	K9DXO	200	WØAUB	180	WØBWJ	140
W5OKZ	305	W4BKP	270	DK1YG	240	KH6GKD	200	W2FWI	160	5W1AU	140
W6ISQ	305	W8WT	270	I2AHG	240	VP9GL	200	W3BLC	160	G3WQA	120
K4BBF	300	I1BGJ	260	I1ZGI	240	W2CCS	200	WB4NVH	160	K2GBC	120
W2GBC	300	OE3WWB	260	W2OVC	240	WA2LYA	200	W6OHS	160	K4BKF/6	120
W2QT	300	VE3AGC	260	W4ORT	240	WA3MBQ	200	W8FXD	160	W4HNK	120
W3MP	300	W2ONK	260	W5MUG	240	WA5ZGI	200	WA8GPX	160	WA4OQO	120
W4BBL	300	W6LQC	260	K6SSN	220	W7ELU	200	W9OFQ	160	WB4TOB	120
WA8ZDF	300	W6TTS	260	WA4NRE	220	W9GBI	200	WB9BXQ	160	WA8DXG	120
F8SK	290	W7VRO	260	W5QHB	220	W9RKP	200	KØIUC	160	WA8VXF	120
G5AFA	290	WB8EUN	260	W8AQE	220	I1ILR	180	JA1ILN	140	W9MLG	120

highest score ever produced in a January Party to take number one on the keyed mode while W9DOB placed his call in the top spot on phone for the first time.

Starting with the April Parties the received deadline for logs will be moved up to the 10th of the month following the Parties. See the April CD Bulletin for additional information. *–WA1PID*

CW

W6PAA	317,450-	900-70-20	
K4PUZ	303,100-	859-70-20	
W2UZK	276,710-	819-67-19	
WA2UOO	266,350-	754-70-19	
WB9AWY	255,245-	719-71-20	
K4BAI	253,260-	709-67-20	
W8KAW/4	243,545-	721-67-18	
WA2SRQ	240,040-	700-68-20	
W9DOB	238,185-	705-67-20	
WA9AUM	238,050-	684-69-17	
WA2EUO	220,110-	662-66-17	
W4UQ	200,900-	567-70-16	
KH6RS (K2SIL, opr.)			
	196,020-	587-66-14	
W6DGH	194,700-	583-66-11	
WA1LKX	194,675-	593-65-15	
KV4HW (W6NUT, opr.)			
	191,425-	582-65-18	
WA8VRB/1	190,125-	582-65-15	
WA6JVD	189,380-	553-68-18	
WB2RJJ	183,580-	548-67-20	
VE7TT	179,900-	508-70-17	
K3OIO	168,170-	497-67-13	
WA9BWY/9	169,975-	519-65-12	
WB4SGV	162,175-	493-65-15	
WA2DHS	160,050-	480-66-15	
WB8AKW	159,040-	493-64-16	
W7GHT	155,380-	451-68-16	
W3IN	151,360-	467-64- 8	
W5YNT	151,240-	436-68-20	
W7TML/1	146,790-	486-63-13	
K4IAF	145,275-	442-65-14	
WA1QHU	142,025-	430-65-18	
WA3PXA	136,500-	416-65-14	
K4SXD	134,310-	401-66- 9	
K4FAC	131,840-	405-64-13	
W9PIT	131,130-	418-62-13	
W1AX	130,000-	393-65- 8	
W3GRM	121,210-	386-62-13	
WA2RYD	*121,085-*	*392-61-13*	
WAØMLE	118,720-	365-64- 7	
W3IZJ/8	116,160-	358-64-17	
WB5EEE	114,700-	370-62- 7	
W4HIR	113,600-	355-64-13	
WA2MPC	112,450-	341-65- 7	
W3ADE	112,125-	338-65-15	
W5QGZ	105,400-	333-62- 7	
K1ZND	103,635-	322-63- 4	
W5QNY/VE3			
	103,230-	329-62- 9	
WA7GWL	102,375-	325-63- 8	

PHONE

W9DOB	126,720-	390-64-17	
WA3RDU	125,685-	395-63-17	
W5QGZ	122,100-	400-60-10	
KØRPH	111,825-	349-63-13	
W3EZT	109,495-	354-61- 9	
W6DGH	100,890-	347-57- 8	
K4VFY	90,440-	260-68-10	
WB4SON	88,200-	290-60-12	
WA2UOO	84,700-	301-55-12	
K3HXS	82,895-	277-59-13	
K6QPH	73,700-	263-55-	
WA2EUO	69,390-	252-54- 6	
WB9HAD	64,625-	231-55-16	
WA7TZO	56,500-	221-50- 8	
WB8AYC	56,160-	204-54- 6	
W2PZK	55,845-	212-51- 8	
W2AZO	52,275-	200-51- 8	
W9PJT	51,250-	200-50- 8	
W7GHT	48,960-	186-51- 8	
W4OZF	43,000-	167-50- 4	
K4KZP	42,500-	165-50-12	
K4BSS/4	40,040-	147-52- 5	
WA3LMY	40,020-	171-46-12	
W5LL	39,690-	162-49- 9	
W1FJJ	39,160-	172-44- 4	
K4PUZ	38,720-	169-44- 5	
W5QNY/VE3			
	38,160-	155-48- 6	
WA5CAC	36,750-	150-49- 7	
WA1NLD	36,425-	150-47- 7	
W5NCB	35,650-	150-46- 6	
WAØLRQ	34,080-	142-48-10	
WA6CPP	33,120-	140-46- 5	
WA9AUM	31,725-	129-47-	
W1AX	31,680-	125-48- 4	
WB4SGV	31,600-	152-40- 5	
WA3AFQ	*29,920-*	*131-44- 7*	
W8NOH	29,375-	120-47- 3	
WA9BWY/9	27,900-	120-45- 4	
W3GN	27,300-	123-42- 4	
WA4FFW	27,270-	126-44- 4	
WØPAN	26,250-	120-42- 5	
WA8VRB/1	26,230-	119-43- 5	
W6MAR	26,015-	114-43- 2	
WAØLOY	25,000-	123-40-	

SCM ELECTION NOTICE

To all ARRL members in the Sections listed below.

You are hereby notified that an election for Section Communications Manager is about to be held in your respective sections. This notice supersedes previous notices.

Nominating petitions are solicited. The signatures of five or more *ARRL full members of the Section concerned* are required on each petition. No member shall sign more than one petition.

Each candidate for Section Communications Manager must have been both the holder of amateur Conditional Class license or higher (Canadian Advanced Amateur Certificate) and an ARRL full member for at least two years immediately prior to receipt of petition at headquarters. Petitions must be received on or before 4:30 PM Eastern local time on the closing dates specified. In cases where no valid nominating petitions were received in response to previous notices, the closing dates are set ahead to the dates given herewith. The complete name, address, Zip code of the candidate and signers should be included with the petition. It is advisable that a few extra full-member signatures be obtained, to insure that it will be valid.

Elections will take place as soon after the closing dates specified as full information on the candidates can be obtained. Candidates' names will be listed on the ballot in alphabetical order.

The following nominating form is suggested. (Signers should be sure to give city, street address and Zip code.)

Communications Manager, ARRL (Place and date)
225 Main St., Newington, Conn. 06111

We, the undersigned full members of the . . . . . ARRL Section of the . . . . division, hereby nominate. . . as candidate for Section Communications Manager for this Section for the next two-year term of office.

You are urged to take the initiative and file nominating petitions immediately.

George Hart, W1NJM, Communications Manager

Section	*Closing Date*	*Current SCM*	*Present Term Ends*
Idaho	5/10/73	D.A. Crisp, W7ZNN	12/10/72
N.Dak.	5/10/73	H.L. Sheets, WØDM	3/18/73
Maine	5/10/73	P. Sterling, K1TEV	6/9/73
Tenn.	5/10/73	O.D. Keaton, WA4GLS	7/1/73
S.Diego	5/10/73	P.C. Thompson, W6SRS	7/11/73

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.

S.C.	J. Rubin, WB4CBJ	2/1/73
Mo.	E.S. Phillips, KØVVH	3/19/73

FEBRUARY 11 FMT RESULTS

The February 11 ARRL Frequency Measuring Test brought in a total of 142 entries representing 1966 individual measurements. Entries received after the announced date of February 22 are not listed (that's the date W1AW started carrying the results of the test). The umpire measured frequencies for the early run at 3513.067, 7070.455 and 14117.286 kHz. The late run checked out at 3531.201, 7077.786 and 14080.202 kHz. Interested in an appointment as an ARRL Official Observer? If so, check with your SCM (p. 6, this issue). Plan now to participate in the May 12 FMT, full rules Operating Events this issue. *—W1YL*

HONOR ROLL

This top listing is the standing of the frequency measuring leaders. In consideration of the minimum possible error due to doppler and other unavoidable factors, we 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 quality for this listing.

W1BGW W1PLJ K1VHO W2AIQ K2BZT WA2KSB W2SAS W3BFF W3CPR W3PT W4AAD/K3WIK K4BE W4NTO W4VWS WA4YVQ K5AXH W5QS W5QLO WA6CKD WB6MZP W6NBS W6RQ K7JNK/Ø WØMDL WA8MSC W8IPW W9MNY KØBRS WNØBWL WØHH WØMDL WØMVE WØPHY KØQVF KØRJS KØRPH VE5DP 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 parts per million. Class II OOs must show at least 357.2 ppm.

(.5) W5UJW (.6) W6CBX KØMZN W9VOX KØTTV (.7) WA1LNF WB4SXG K9WMP, (.8) W1VH W6FB, (.9) W1IA K4KA, (1.1) WA9VDJ, (1.3) WA3KEG, (1.5) W1ØEFN, (1.7) W7AXT, (1.9) K4SIR, (2.1) W8DPW W9FKJ, (2.2) WB6OFX, (2.3) W6KJ, (2.4) WA1IUR, (2.7) WØRAY, (3.0) W9REC, (3.7) W3CPU, (3.8) W5KYD, (4.3) WA3CAG, (4.7) W1DDO, (5.1) WA2YPW, (5.2) W9UC, (5.7) W9KO, (5.8) W1AQ WA1QJE, (6.3) WB4BAP, (6.6) W1IG, (7.0) W4HU, (7.2) W2JDC, (8.1) W8IBX, (8.6) W3MFY, (8.9) W4UCL, (9.3) VE3EVW, (9.4) WA3JSZ, (9.5) K3NEZ W9AG, (9.9) WA5ROU VE3CYR, (10.0) W2BHJ, (11.4) W1DBH, (11.6) W1AYG WA2BUC, (12.2) W4QN, (12.6) WB4FJT, (12.8) W8BU, (13.2) WA8NPY, (13.4) K6EC, (14.0) W6CLM, (15.1) W3KEK/K3TXG, (15.3) W5PDG WAØTAS, (15.6) W3GN, (16.4) W5MPE, (17.7) W3ADE, (17.8) WA2MID, (18.0) WA7HGB, (19.9) WA2AIV, (20.6) W3KCM, (21.3) K4IKP, (21.4) VE6MJ, (21.5) WA1PHF, (24.0) KØAYO, (24.6) K6GG, (26.6) K4VT, (27.0) W8TZZ, (29.0) KØBIX, (31.0) K8TMK, (33.1) WA4NWM, (36.0) WB9AHJ, (36.1) WAØOTE/WA7TZO, (38.3) K7NHV/7, (38.6) W6AUC, (43.6) K6QPH, (48.1) WAØRIQ, (55.6) K8HUT, (58.1) W9TGN, (58.5) W9MTT, (70.5) W7FIS, (78.5) W5EMO, (81.7) K4JK, (85.9) VE3GEO, (89.2) W4PKD, (97.7) W8ZCQ, (117.6) KØLMU, (122.2) K8RAY, (133.4) WAØPRS, (141.7) WA1FBE, (142.85) WB4RNT, (159.6) W1ILNQ, (197.1) WØLQK, (257.7) W6AEE, (284.6) WB2TFH, (322.9) WB2LPQ & WN2KDJ, (340.1) W8OMY, (360.0) WA1MKP, (700.6) K6CL. QST

Operating Events ..... *de W1VI.*

APRIL

4 ***W6OWP Qualifying Run*** (W6ZRJ, alternate) 10-35 wpm at 0500 GMT on 3590/7090 kHz. This is 2100 PST the night of April 3. Please note that dates are always shown at least two months in advance and times are always the same local "clock time," i.e. 9 PM local Pacific time. Underline one minute of highest speed copied, certify copy made without aid and send to ARRL for grading.

7-8 ***CD Party, cw.*** This is a quarterly event for League appointees and officials notified separately by bulletin. The event starts at 2300Z April 7 and ends at 0500Z April 9. Check with your SCM (p. 6) to see if you can qualify for an appointment. The July Parties are open to all ARRL members. ***Florida QSO Party, SP Contest,*** p. 108 March.

10 ***W1AW 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 9. Underline one minute of top speed copied, state no aids used (typewriters OK), sign and mail to ARRL with your full name, call (if any) and complete mailing address.

13-16 ***County Hunters SSB Contest,*** p. 108 March.

14-15 ***CD Party, phone. VHF Space Net Contest,*** commemorating the Apollo 13 and 16 missions, from 6:00 PM to 6:00 PM your local time. Single or multioperator, power classes 1-25, 25-100, 100 watts to 1 KW input. Trophies for first and second place in each power class. A special trophy to Novice class. Club aggregate scores welcomed. Dual silver medals on each plaque. Each complete QSO counts 2 points, each different zip code worked is a new multiplier. Each contact on a different band counts 2 points (zip codes count just once). All modes of operation, except repeaters. All stations submitting logs will receive a participation certificate. Logs must be postmarked no later than April 30. Send to: Tony Slapkowski, WB2MTU, Box 909, Sicklerville, NJ 08081. ***Zero District QSO Party,*** sponsored by the TRA ARC of Iowa State University at Ames. Stations outside the zero district will exchange reports with zero stations only. Zero stations may work other zeros and any other station. Be sure to watch for mobiles changing counties. The contest will run from 0000-0400Z April 14, 1400Z April 24 until 1259Z April 15. All frequencies valid, concentrated activity around: 3570 7070 14070 21070 28070, 3900 7270 14300 21370 28570. Novices try 3725 7125 21125. All send RST, QSO number and county/state (for Iowa stations) or ARRL section/country for others. Each station may be worked just once per band. (Phone and cw count as separate bands.) If a zero station changes counties he may be worked again. To score: zero stations multiply the number of QSOs by the total number of ARRL sections plus zero-district counties plus foreign countries. Non-zero stations multiply the no. of QSOs by the no. of zero sections worked plus the no. of zero counties worked. Appropriate certificates. To be in competition, please send logs, claimed score and s.a.s.e. by May 7 to the TRA ARC, WAØTKK, Wilson Hall, Ames, Iowa 50010.

22-24 ***QRP QSO Party,*** p. 108 March.

28-29 ***RTTY WAEDC, PACC Contest,*** p. 108 March.

30 ***W1AW Special Evening Qualifying Run,*** 0230 GMT (this is 2130 EST the night of April 29). All other details as under the April 10 listing.

MAY

3 ***W6OWP Qualifying Run.***

5-6 ***H-22 Contest,*** sponsored by the USKA, from 1500Z May 5 through 1700Z May 6, all bands 160-10, no cross mode. Send RS(T) plus serial number starting with 001. In addition, Swiss stations will transmit a two-letter designation of their canton. Each contact with an HB station counts 3 points. The multiplier is the sum of Swiss cantons worked on each band (possible multipliers of 22 PER BAND). Abbreviations of the 22 cantons are: AG AR BE BS FR GE GL GR LU NE NW SG SH SO SZ TG TI UR VD VS ZG ZH. Final score equals QSO points multiplied by the sum of cantons worked on each band. Appropriate certificates. Logs must be postmarked no later than 30 days after the contest. Send to: TM USKA, HB9AHA, im Moos, 5707 Seengen, Switzerland. For the H-22 Award, send QSLs for each of the 22 cantons to HB9ALF, Walter Blattner, Box 450, CH 6601 Locarno, Switzerland.

5-7 ***Georgia QSO Party,*** sponsored by the Columbus Amateur Radio Club, starts 2000Z May 5 and ends 0200Z May 7, no time or power restrictions. Contacts may be made once on phone and once on cw on each band with the same station. Ga.-to-Ga. contacts permitted. Exchange QSO no., report and QTH (county for Ga. stations, state/province/country for others). Score 2 points per contact. Ga. stations multiply QSO points by the total no. of different states/VE provinces worked. DX stations may be worked for QSO points but do not count as multipliers. Out-of-state stations use the no. of Georgia counties worked for multiplier (possible total of 159). Appropriate certificates/plaques. Suggested freqs.: cw, 1810 3590 7060 14060 21060 28060; ssb, 3975 7260 14290 21410 28600; novice, 3718 7125 21110 28110. Try 160 at 0300Z, 10 on the hour and 15 on the half hour during daylight periods. Logs must show date/time in GMT, stations, exchanges, bands, emissions, multipliers. Check lists would be appreciated. Include the usual declaration and mail by June 11 to the Columbus ARC, attention John T. Laney, K4BAI, Box 421, Columbus, Georgia 31902. Enclose an s.a.s.e. for a copy of the results.

12 ***Frequency Measuring Test,*** open to all, begins with a callup at 0130 and 0430 GMT May 12. (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 AVERAGES for each 5-minute period which will be compared with the umpire's averages during the same period. (The umpire is a professional measuring laboratory.) Tell how many readings you took to form your averages. Approximate frequencies for the early run are 3538, 7035 and 14,052 kHz. Late-run frequencies are 3541, 7010 and 14,063 kHz. Your entry must be RECEIVED by May 23 to qualify for the *QST* report of the competition. W1AW will start transmitting the official readings May 24. ***World Telecommunications Day Contest,*** cw, sponsored by the Brazilian Ministry of Communications, the full 24-hour GMT period, 160-10 meters. Each participant will attempt to make the highest possible number of contacts with the different ITU zones of the world, in order to enable his country to win the ITU Trophy. Send report plus ITU zone (see page 87, April 1972 *QST*). Contacts with stations in the same country = zero points; in another country in the same ITU zone 80/160 = 2 points, 10-40 meters = 1 point; on the same continent and in another zone, 10/15/20 = 2 points, 40 = 3 points, 80/160 = 4 points; on another continent, 10/15/20 = 3 points, 40 = 5 points, 80/160 = 6 points. Final score the sum of QSO points times the number of different ITU zones worked. Medals to the 3 highest world scorers per mode. Logs must be postmarked by June 30 and sent to: Minister of Communications, DENTEL, 7000, Brasilia, DF, Brazil.

12-13 ***Russian Contest*** all (cw) from 2100Z May 12 to 2100Z May 13, 80-10 meters, sponsored by the Radio Sports Federation of the USSR. Contest call is CQ-M (CQ Peace to the World). Send RST plus (for USSR stations their oblast number, for non-USSR stations a serial no. starting with 001). Competition classes are single operator single band, single operator multiband, multioperator all band (single transmitter) and SWL. Contacts between stations in the same country are not permitted. Multipliers are the countries/territories on the R-150-S list (similar to the ARRL Countries List). Multipliers count once only. Each QSO between stations on the same continent are worth 1 point, contacts between stations on different continents are worth 3 points. Final score equals total QSO points times the sum of different countries worked (countries count just once during the contest). To be eligible for an award, a country winner must show a minimum of 6 hours of operation; a continental winner must operate a minimum of 12 hours. All entries must be postmarked no later than July 1, 1973 and mailed to the Krenkel Central Radio Club of the USSR, Box 88, Moscow, USSR.

12-14 ***Connecticut QSO Party,*** sponsored by the Candlewood Amateur Radio Assn., open to all. It starts 2300Z May 12 and ends 0400Z May 14. 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 one point per QSO. Conn. stations use the sum of sections and countries for multiplier. All others use Conn. counties (maximum of 8). Suggested frequencies: 3540 7040 14040 21040 28040, 3925 7250 14300 21375 28540, novice 3725 7125 21125 28125. Appropriate certificates. Logs must show date/time in GMT, band, mode, numbers, RS(T) and QTH. All logs must be postmarked before June 17 and sent to the Connecticut QSO Party, c/o Fred Porter, W1VH, Carmen Hill Road †2-RR4, New Milford, CT 06776. Include an s.a.s.e. for results.

13 *VT ISSB QSO Party*, cw, the full 24-hour GMT period, one 6-hour rest period. Non-members invited. For full details and application forms write Lyle W. Coleman W7EOI, 412 Nineteenth St SW, Great Falls, MT 59404.

16 *W1AW Qualifying Run.*

19 *Armed Forces Day, World Telecommunications Day Contest*, phone (see May 12 listing for details).

19-20 *Tennessee QSO Party*, sponsored by the Tennessee Council of ARCs, open to all, from 2200Z May 19 through 2200Z May 20, no time or power restrictions; all bands. Outside stations work only Tennessee, Tenn. stations work each other as well as non-Tenn. stations. Exchange RS(T) and QTH (non-Tenn. send state/country, Tenn. send county). Log date/time in GMT, stations, exchanges, bands, modes and multipliers. Stations may be worked on each band/mode. Portables and mobiles may be reworked if they change counties. Only those portions of the bands licensed to generals may be used. Following are suggested areas: 3550 7050 14050 21050 28050, 3980 7280 14280 21380 28580, novice 3775 7125 21125 28125. Outside stations multiply no. of Tenn. QSOs by the no. of different Tenn. counties worked (maximum of 95). Tenn. stations multiply QSO points times the sum of states, VE districts, Tenn. counties, and bonus. The special Tenn. bonuses as follows: cw to cw contacts count one and a half points (phone 1 point); all home stations are to be single op. If operation is from a county other than the regular QTH (just for the contest), take a 10% score bonus. All club stations are to be multioperator, operating in the field on emergency power and will receive a 10% bonus plus an additional 10% if operation is from a county other than the club's QTH. All mobiles are considered multiop, and must be on the air a minimum of 1 hour from each county (in motion or parked). Stations may be reworked from each county. These mobiles receive a 500 point bonus added to their score for each county. Appropriate awards. Any station disrupting a Tenn. traffic net or whose log exhibits obvious irregularities will be disqualified from award consideration. *Logs must be postmarked by June 22 and send to Mel Wardell*, K4PJ, Box 489, Oak Ridge, Tenn. 37830. *Five Flags ARC VHF Contest*, open to all, the full 48-hour period, no time limit. Contacts must be made and confirmed by exchanging RST, QSO no. and section. Repeater contacts count only once. Equipment used under one call may not be used under any other call unless station addresses are the same. Each contact will count as follows: 50 MHz 1 point per QSO, 144 MHz 2 points, 220 MHz 3 points, 420 MHz 4 points. All other bands above 420 MHz 5 points. Crossband not permitted. Power mults.: 5 watts or less X 4, 30 watts or less X 3, 300 watts or less X 2, 1000 watts or less X 1. Mode mult.: cw and ssb X 1, all other modes X 2. Section mult.: all ARRL sections and all new countries count 1 per band for mult. Total of sections times total points for final score. All points and multipliers will be nullified on duplicate contacts. Log date/time in GMT, bands, RST, exchanges, bands, points, multipliers, QSO points, new sections. Single operator awards. Report no later than June 1 to WA3ODA/4, 1801 Border St., Lot 37, Pensacola, Florida 32505. Send an s.a.s.e. for rules, logs, summary sheets.

27-June 2 *Ascension Day Commemoration*, sponsored by the amateur radio operators on Ascension Island. Special calls ZD8 followed by a single letter will be used. Any station making two contacts with the island during the noted period will be awarded a special QSL card.

JUNE

3 *Minnesota QSO Party.*

6 *W6QMP Qualifying Run.*

9-10 *VHF QSO Party.*

10-14 *Worked All Mass. Cities and Towns Contest.*

14 *W1AW Qualifying Run.*

23-24 *Field Day.*

23-July 15 *NRL's 50th Anniversary celebration.*

27 *W1AW Morning Qualifying Run.*

July 14-15, "Open" CD Party, cw.

July 21-22, "Open" CD Party, phone; HK Contest.

July 28-29, Kentucky QSO Party, CW County Hunters Contest.

Sep. 8-9, VHF QSO Party.

Nov. 10-11, SS, phone.

Nov. 17-18, SS, cw.

Dec. 8-9, 160-Meter Contest. QST

RTTY Contest

(Continued from page 62)

G3ROY	84,280	HB9APL	990
EA7PZ*	83,640	VE6ANE	795
HC1DI*	79,564	W6CP	424
W7UX	66,860	WB6SFP	120
K4JAF	61,068		
VE2LO/W6	60,740	**Multioperator**	
VK4MJ	58,976	HA5KBF	170,192
W7CBY	58,512	HV3SJ*	164,616
VE5LG	58,512		
VE6AWW*	58,380	**SWL Printer**	
VE2AXO*	51,325	P. Boer	901,138
9Y4VU*	46,408	P. Menedier	718,350
K2RYI	46,270	W. Meier	526,008
K8KAG*	45,350	P. King	464,222
VE5DO	40,700	L. Reynolds	340,200
JA1EUL	34,430	G. Kiss	1020
PAØWDW*	26,860	A. Marchesini	473
DL8CX	21,456		
OK2OP	15,840	**Check Logs**	
WA9UGE*	15,291	G6JF	
I8AMP	14,456	W8TCO	
K6TV	10,120	WA3HXR/5	
K1SGU	7576	SM4WQ	
VE4SC*	6834	HP1FB	
4X4MR*	6300	JA1ACB	
OZ8O	5586	VE7UL	
HA5FA	4326	VE3CWO	
VE5SC	2557	VE3RTT. QST	
OK1AMS	1632		

A Primer for Novices

(Continued from page 65)

disease, although he may struggle, refuse to face reality, and even deny that he has it or that it has him. He will fight it, if he sees it affecting his work, his family relationships, his pay check, his friendships (except those which are radio-based) and what he knows should be his good, general all-round development. He may take care of the symptoms as they appear, one by one, in the same meticulous way that he would replace a burned-out resistor or track down a wire that has become unsoldered, but new, unexpected symptoms will appear and he will discover that he has not eliminated the source of the problem.

The disease can be acute, intermittent, chronic, *or latent, but it almost never – once it has really* taken over – becomes completely cured. Even surgical amputation, complete severance from all radio activity, still leaves nerve endings which, under certain stimuli, continue to be felt throughout the amateur's lifetime.

In other words, if you get the real disease – and not some pseudo something-or-other which simulates true interest but isn't – if you really get it, you've got it. And whether they like it or not, your family and friends are going to be exposed and some of them will get it, too. If that is the situation in your household, good luck to all of you! As for wives – particularly those who are not hams themselves - here is a message in slow scan: Remember that it is better to have your husband on-the-air, where you can find him, than on the town, where you can't. [NOTE: Stories in the old primers usually contained a moral lesson, thinly disguised. That was mine.]

Now, let's get to work. QST

Silent Keys

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

W1ASJ, Nathan G. Harris, West Hartford, CT
WA1BLZ, Guy B. Simeone, Milton, MA
W1CVM, Herman T. Kennedy, Danvers, MA
WA1HOO, John F. Palma, Holbrook, MA
W1IBY, Herbert W. Gordon, Harvard, MA
W1LSS, Joseph D. Ogle, Simsbury, CT
W1OH, Winthrop "Don" Hodges, Nantucket, MA
K1PHF, Robert C. Stone, Jr., Wolcott, CT
K1TFN, Gordon C. Hurley, E. Braintree, MA
W1TQQ, Allie V. Lindquist, E. Weymouth, MA
W1YOE, Carl E. Ahlin, Terryville, CT
W2CFT, Alfred Waring, Lake Ronkonkoma, NY
K2CL, John C. Wagner, Paramus, NJ
WA2DRT, Floyd S. Snyder, Burlington, NJ
W2DUA, Robert H. Weinmann, Roslyn Heights, NY
W2EMI, Frederick S. T. Olsen, Greenwood Lake, NY
K2GCP, Leslie Mende, Lawrence, NY
W2GIE/EI2VFG, Vincent J. Tierney, NY, NY
W2GIW, Walter D. Walker, Jr., Vineland, NJ
W2KVT, Harry L. Samuelson, Jersey City, NJ
W2VL, Maurice R. Gutman, Oceanside, NY
W2WFY/WB4PUN, George P. Schmitt, Dunedin, FL
W3APP, Louis F. Paulick, Arnold, PA
W3BI, Robert Y. Edwards, Langhorne, PA
K3CHS, Edwin J. Bush, Newtown Square, PA
W3CX, William R. Stewart, Philadelphia, PA
K3EMA, Peter J. DeConter, Ardsley, PA
W3JH, Howard B. Hayes, Derwood, MD
W3KDL, Edgar L. Kelly, Pittsburgh, PA
W3LIH, Ulsh G. Herbster, McClure, PA
WA3MUE, Albert W. Friend, Bethesda, MD
WA3OYE, Leon Godbey, Sr., Oxon Hill, MD
W3QFI, John V. Schearrer, Pittsburgh, PA
K3RUA, Kelso J. Kuhns, Levittown, PA
WN3SEL, Carl E. King, Earleville, MD
W3SG, Frank J. Andrews, McKeesport, PA
K3TDB, Hulbert K. Peters, Jeannette, PA
W4BVT, Willard T. Mitchell, Louisville, KY
W4CIU, William H. Britton, Jasper, AL
W4CJD, *Vernon J. Smith, Alexis, NC
K4DS, Robert Pierce, Jacksonville, FL
W4IFA, Benjamin M. Dove, Sandston, VA
WA4IHV, Robert E. Ledford, Port Orange, FL
WA4JES, Gordon Donahue, Midland, GA
K4JJJ, Homer C. Odell, Gadsden, AL
W4KJL, Robert C. Mathewson, Jacksonville, FL
W4KUK, Prescott H. Wellman, Jr., Indian Harbour Beach, FL
W4RBK, Albert E. Bathiany, Jr., Ft. Thomas, KY
W4SJT, Morris Tepper, Miami, FL
W4WVF, Edison A. Fairey, Jr., Orangeburg, SC
WA4YPB, Joe C. Pickering, East Point, GA
W4ZGT, Edgar A. DeWalt, Rex, CA
W5ACH, Cecil E. Pearce, Baton Rouge, LA
W5CBY, Arthur P. Steed, Enid, OK
W5DBQ, John C. Hunborg, Eureka Springs, AR
W5FDI, John G. Claiborne, Dallas, TX
W5GRY, Arthur W. Pryor, Jasper, TX
W5HZL, Harry L. Reid, San Antonio, TX
W5QQY, John W. Stack, Mesquite, TX
W6ARP, Harry L. Heibeck, El Cajon, CA
W6AUZ, William D. Shattuck, Oakland, CA
WA6FDR, James A. Dunlap, Carson, CA
WB6FLY, George Stewart, Fontana, CA
WA6HCB, James F. Glover, Sr., Lompoc, CA
W6HZ, Al E. Harris, Tujunga, CA
WB6KZF, Carl Isham, Los Angeles, CA
W6LAE, Ralph J. Abramson, Seal Beach, CA
K6MAG, Walter A. May, Jr., Los Angeles, CA
W6MYJ, Albert W. Bellamy, No. Hollywood, CA
W6NMS, Chester A. Wallack, Newhall, CA
WA6OVM, Thomas F. Dempsey, San Bernardino, CA
W6QVD, Waino A. Lauri, Canoga Park, CA
W6RPH, Leland A. Borden, Rialto, CA
W6SUW, Edward O. Meador, Yorba Linda, CA
W6TDS, Clyde Solie, San Pedro, CA
WA6TXK, Edmund D. Stibbles, Sun Valley, CA
K6UBK, Albert M. McGuirk, San Francisco, CA
W7DHW, Robert M. Geddes, Portland, OR
W7EVT/WBØDAE, G. William Svetich, Grand Forks, ND
W7HXA, James V. Rollins, Seattle, WA
WA7LSV, Fred H. Carver, Page, AZ
W7WTK, Lucile E. Krepela, Salem, OR
W7ZJF, Vernon E. Moore, Anacortes, WA
W8BON, Willson W. Brigham, Westlake, OH
WB8KTB, Harold H. Boyers, Morgantown, WV
WN8KVN, Richard J. Wilson, St. Johns, MI
W8LH, Harry R. Maule, Dearborn Heights, MI
K8LHL, James C. Burt, Pontiac, MI
W8OSX, Philip R. DeMarco, Richmond, OH
W8QJS, Raymond E. Rockefeller, Troy, OH
K8UMA, Eugene W. Melter, Sr., South Euclid, OH
K9ASH, Charles D. Blair, III, Madison, WI
W9ATE, Charles G. Reynolds, Indianapolis, IN
Ex-9BZY, J. Uridil, Berwyn, IL
W9CFT, John F. Schneider, Wausau, WI
K9HAJ, Harry K. Bates, Pryor, OK
W9JYU, Donald W. Schoenefeld, Sr., Ft. Wayne, IN
W9RWL, William W. Beacham, Du Quoin, IL
W9VZM, Fred C. Neudecker, Du Quoin, IL
W9ZBH, John D. Johnson, Burnham, IL
WØBZZ, Robert K. McFall, Minot, ND
WØCH, Benjamin F. Riggin, Sr., Kansas City, MO
WBØCIQ, Carl "Ed" Specht, Seneca, KS
KØCZO, Edward J. Land, Bennet, NE
WØENZ, Jack A. Furtney, Fairmont, MN
WØEOU, William R. Parker, Hot Springs, SD
WØFGZ, William K. Gardner, St. Louis, MO
WØFHV, Bernard B. Vest, Kansas City, MO
WØFZT, Charles J. Schwarz, St. Louis, MO
WØGDA, William C. Castle, Shenandoah, IA
KØLIQ, Benjamin A. Everett, Kansas City, MO
KØOUG, Jarold E. Figgins, Boone, IA
WØPLC, John C. Mayabb, Kansas City, MO
KØQKD, Warren W. Kinney, Jamaica, IA
KØUAG, Orville C. Martin, Shenandoah, IA
WAØWYJ, Joseph L. Murphy, Hawley, MN
KH6DJU, Francis B. Martin, Jr., Kailua, HI
KH6EK, Masao Sone, Wailuku, HI
VE3HZ, Murray Caston, Toronto, ON
HI3JR, Jose Riggio, Santiago, Dominican Republic
HI8MMN, Maximo Miguel Nanita, Mayaguez, PR
HK7XI, Hernando Vargas M., Bucaramanga, Colombia
YN1BUD, Charles A. Kennedy, Managua, Nicaragua
Ex-ZL1NL, L. B. Dickson, Henderson, New Zealand

*Life Members

All operating amateurs are invited to report to the SCM on the first of each month, covering station activities for the preceding month. Radio Club news is also desired by SCMs for inclusion in these columns. The addresses of all SCMs will be found on page 6.

ATLANTIC DIVISION

DELAWARE – SCM, Roger E. Cole, W3DKX – SEC: WA3DUM. PAM: WA3GSM. RM: W3EEB. Nets: DTN M-F 6:30 EST; DEPN Sat. 6:00 EST; DEPON Sat. 5:15 EST; D 2-Meter Net 145.26 am Mon. 7:30 EST. W3YAH recently became a Grandfather. 2-Meter am continues to thrive in Northern Del. with the D2MN and Army MARS 2-meter am nets showing QNIs in double figures. The MARS group however, expects to set a target date to go fm in the near future. W3BHG and WA3QND are operating through Oscar 6. Contact First State ARC members for dates of free technical lectures by club members at Brandywine H.S. Thur. evenings. CQ Campers for a week end gathering May 19-20 for hams, families and friends. Details next month. The Maverick ARC transmitter hunt Jan. 20th was won by WA3IIX. K3FPB and WA3JJL with W3ZNF and WA3KGV second. Congratulations to Del. hams for a good turnout for the SFT. Traffic: WA3GSM 121, K3KAJ 101, WA3DUM 66, W3DKX 65, W3EEB 22, WA3SYT 8. W3HKS 33. (Dec.) WA3QJU 708.

EASTERN PENNSYLVANIA – SCM, George S. Van Dyke, Jr., W3HK – SEC: W3FBF. RMs: W3EML, K3BR, K3MVO, K3PIE, W3CDB, WA3AFI. PAMs: K3BHU, WA3PLP. OBS reports received from W3ID, W3CL, WA3AFI, WA3KFT, W3ZMN, WA3EUG, W3CBH. OO reports from K3NSN, W3CL, W3KFK, W3NNC, W3BFF, K3RDT. OVS reports from WA3HIT, W3CL, K3VAX, WA3KFT, K3QCQ/3, WA3PCG, W3ZRR. BPLs: K3NSN, WA3QOZ, W3EML, WA3OGM, K3BHU. PSHR: W3ABT, WA3OGM, WA3QLG, WA3QOZ, K3MVO. SET messages received by SCM from: WA3FOF, W3CL, WA3RCA, WA3HIT, W3ZAT, W3EBF, K3PIE, K3BR, WA3QOZ, K3BHU, WA3AJT, K3WEB, K3KTH, W3IVS, WA3QLG, WA3LWR, WA3QNP, WA3OGM, W3MTA, WB5FDP, WA4NQU, WB2CST, WB2WFS. Welcome to EPA WA3TQP formerly WB2AMW. Anyone interested in DNTS contact WA3QOZ. Our TCC anchor man W3EML has been ill, send him a message to perk him up! Would you believe K3BR our EPA RM is also pres. of Bucks Co. Folk Song Society. W3BNR has joined the 2-meter fm gang, Phila Co. AREC net on 50.7 MHz is accepting 220 MHz check-ins. WA3AFI less active on nets.

Net	*kHz*	*Operates*	*QNI*	*QTC*	*RM/PAM*
EPA	3610	7:00 P Dy	425	328	K3BR
PTTN	3610	6:30 P Dy	95	35	WA3AFI
PEN	3960	5:30 P M-F	678	579	K3BHU
EPAEP&TN	3917	6:00 P Dy	552	235	WA3PLP

WA3BSV got his WAC. K3VAX says keeping Lancaster repeater on air is full time job. W3GMK QRT let his license expire, maybe you better look at yours to be sure. WN3SZD active in traffic. WA3RKH has antenna so he can be heard now. The PENNARC invites you to join their 15-meter cw net 0200Z Wed. eve (21,130 kHz). All RMs and PAMs report the SET went very well. New officers: Cumberland ARC W3AJT, pres.; K3EYL, vice-pres.; WA3BKK, secy.-treas.; W3FYD, pro.; WA3NVQ, PIO; W3ATJ, property; K3VKY, tech.adv.; W3WEB, EC. York ARC K3NVI, pres.; K3BWB, vice-pres.; W3IXG, secy.; K3FOB, asst. secy.; W3NGN, trustee. Lafayette College ARC WA3FPM, pres. & trustee; WA2IUR, vice-pres.; WA2HPM, secy.-treas. K3FOB reports a 60-watt repeater will soon be operating in York Co. WA3ATQ our EPA anchor station with SS Hope still going strong. WA3ATQ appointed PIO for National Women Marines. She now has about 1500 members to send birthday greetings to via ham radio! Spring is here so lets get the antennas repaired before the grass starts to grow. Traffic: (Jan.) K3NSN 1330, WA3QOZ 661, W3EML 562, K3BHU 526, WA3OGM 440, K3BR 254, WA3MQP 201, K3MVO 182, WA3ATQ 94, W3ABT 71, W3EBF 59, WA3KWU 57, WA3LWR 53, WA3QLG 49, W3WRE 45, W3HK 42, WN3SZD 37, W3ADF 25, WA3PLC 25, W3BNR 24, WA3TQB 23, W3VAP 22, WA3HIT 18, K3KTH 15, W3BUR 12, WA3LYC 12, W3OY 12, W3ID 11, WA3PHQ 11, W3CL 9, W3CBH 8, WA3CKA 8, W3OMT 8, WA3PQA 8, K3PSO 8, WA3AFI 7, K3KNL 6, WA3RKH 6, WA3BSV 4, W3LC 4, K3MNT 4, K3HXS 2, W3KEK 2, W3EU 1, W3GMK 1, K3VAX 1, WA3BJO 2. (Dec.) WA3RCA 156, WA3TQB 43, WN3SZD 6, W3ID 1, W3KEK 1, W3LC 1.

MARYLAND-DISTRICT OF COLUMBIA – SCM, Karl R. Medrow, W3FA – SEC: K3LFD. RM: W3EZT. PAM: K3TNM. NCM: W3LDD. Photo credit for Feb. OST goes to WA3CUC. WA3RCI and W3IN made BPL for Jan. The Nets/sessions/traffic/QNI average are. MDD/67/341/9.5 MHFN/23/166/11.6. MEPN/22/54/20.5. MDCTN/15/62/18.2. FCRN/22/30/4.1. East Coast RTTY Net meets daily at 2100 EST on 3609 kHz with WA3KBI at the control is a brand new one. WA3ADQ was the MEPN topper. W3QU looking for new ways to credit net member performance with WA3QIA, K3KAJ and W3IN as the Jan. MDD leaders. Bigger and better antenna department has WA3QDH, WA3DIQ, WA3QPM and WA3RJS all in there. Veep W3EKZ edits the Md. Chapter Telephone Pioneers ARC bulletin with WN3PIM pres. and W3BPX the training instructor. WA3EOP takes on the edit job for QRN the Antietam Radio Assn., pub. WN3RIY a busy Novice with 4 different skeds. W3OKN finds those 0000Z skeds hard to meet. K3LFD has the big ones alerted, and sayt it's up to you guys to alert your local outlets for Public Service. W3ZNW does it for Calvert Co. W3FCI makes the scene on MEPN. W3JZY fights the ice storms trying to keep his wires up. W3ABC was exotic as ZD8HT. W3HXF was the man behind WA3NAN with an assist from WA3TJM and WA3UDM. WA3RDU new prexy of St. Mary's ARA. W3FOR got some traffic into YN1 for real satisfaction. W3EOV finding early AM nets are fun. W3CDQ a new woman with her renovated 1R-4. WA3AGP ran smack into SET for a new experience. W3EZV set back by the flu bug. K3GZK shows up on all the NTS nets. WA3EHK can find no idle time. WA3PYZ keeps Hagerstown on the map. W3ECS moving up the corporate ladder. WA3PIG pleased with his 3RN certificate. WA3QIA loves his 35 wpm sticker. WA3SWS doing his thing on 40 meters. K3TNM has MDCTN all down to a routine. WA3AFQ finds new ways to be emergency powered. K3LFD along with W3LDD, K3TNM and W3EZT had the SET all tuned up for a smooth operation. Well done gang! Traffic: (Jan.) WA3RCI 307, W3TN 258, WA3QIA 183, W3QU 161, WA3PIG 151, WA3AFQ 116, W3FA 116, WN3RIY 102, W3OKN 85, K3TNM 74, K3LFD 68, K3GZK 59, WA3QDH 59, WA3SWS 56, WA3NAN 45, WA3RBI 44, W3FZV 36, W3EOV 35, WA3EOP 34, WA3RDU 31, W3ECS 30, W3FCI 27, K3ORS 23, W3ABC 21, WA3EHK 14, W3ADQ 7, W3ZNW 6, WA3PYZ 3, W3HXF 2. (Dec.) WA3RDU 3.

SOUTHERN NEW JERSEY – SCM, Charles E. Travers, W2YPZ – Acting SEC: W2YPZ. PAMs: WB2FJE, WA2RYD. RM: W2JI. The annual SET is history. Do you have any suggestions for improving the SET – if so send them to your SEC. Time and effort are the ingredients for a good program. While we think we have done our best there is always room for improvement. WA2ALN having equipment problems and finds it impossible to be on the frequency. Hope to see you soon. W2FBF is county hunting but finds little cause for OO reports. WA2NZJ is developing quite an RTTY station. He hopes to be back with two of his friends WA2IXP and WA2QZP on RTTY as OBS. The health of W2ORS showing improvement. The West Jersey Radio Club reports the following officers for 1973: WB2LXA, pres.; K2OPN, vice-pres.; K2OIJ, secy.-treas.; WA3NLD, trustee. Stations wishing AREC affiliation should contact the SEC or EC for your county as soon as possible. There are vacancies for appointment. If you feel that you would like to have a part in shaping the program for the emergency program this is the time to become involved so that plans can be made for the coming year. Traffic: WB2VEJ 284, WA2CZA 126, W2ZQ 104, W2YPZ 43, WB2FJE 13, W2ORS 8, WB2SEX 7, WA2NZJ 6, W2ZI 5, WA2KWB 1.

WESTERN NEW YORK – SCM, Richard M. Pitzeruse, K2KTK Asst. SCM: Rudy M. Ehrhardt, W2PVI. SEC: W2CFP. The SET

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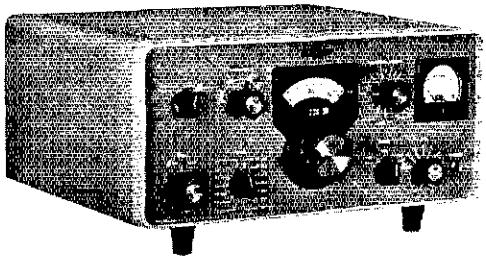

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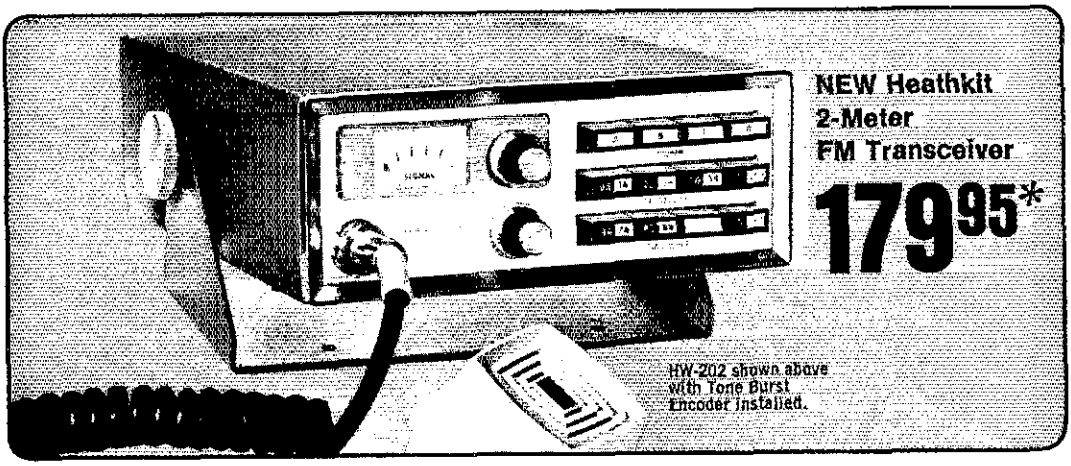


NEW Heathkit 2-Meter FM Transceiver

179.95*

HW-202 shown above with Tone Burst Encoder installed.

• All solid-state design • Can be completely aligned without instruments • 36-channel capability *— independent push-button selection of 6 transmit and 6 receive crystals* ***• 10-Watts Minimum Output*** *— designed to operate into even an infinite VSWR without failure* ***• Optional Tone Burst Encoder*** *— mounts inside, gives front-panel selection of four presettable tones*

The Heathkit HW-202 compares with the best wired amateur 2M/FM rigs. Plus it has: 36-channel capability via independent selection of 6 transmit and 6 receive crystals. Solid-state circuitry with complete built-in alignment procedures using only the manual and the front-panel meter allow operation over a 1 MHz segment from 143.9 to 148.3 MHz. Removable front-panel bezel permits installation of the new Heathkit HWA-202-2 Tone Burst Encoder.

10-15 watts transmission into an infinite VSWR — indefinitely, with no failure! The HW-202 needs no automatic shut-down — it continues to generate a signal regardless of antenna condition. Transmitter deviation is fully adjustable from 0 to 7.5 kHz, with instantaneous deviation limiting. Harmonic output is greater than −45 dB from carrier. The push-to-talk ceramic microphone supplied has an audio response tailored to the HW-202.

Excellent reception — 0.5 uV or less produces 12 dB Sinad, or 15 dB quieting. Output at the built-in speaker is typically 2 watts at less than 3% total harmonic distortion. The receiver circuitry utilizes diode-protected dual-gate MOSFETS in the front end; an IC IF that completely limits with less than a 10 uV signal; dual conversion, 10.7 MHz and 455 kHz via a 4-pole monolithic 10.7 MHz crystal filter. Image response is −55 dB or better. Spurious response is −75 dB or better.

The Heathkit HW-202 comes with two crystals used in initial set-up and alignment, give you simplex operation on 146.94. Kit includes microphone, quick-connecting cable for 12-volt hook-up, heavy duty alligator clips for use with a temporary battery, antenna coax jack, gimbal bracket, and mobile mount that lets you remove the radio from the car by unscrewing two thumbscrews. The HWA-202-2 Tone Burst Encoder provides four presettable pushbuttons for instant repeater access. Fixed station operation is as easy as adding the HWA-202-1 AC Power Supply. The HA-202 2-Meter Amplifier puts out 40 watts for 10 watts in, and externally it's a perfect mate for your HW-202.

Kit HW-202, 11 lbs., mailable **179.95***

Kit HWA-202-2, Tone Burst Encoder, 1 lb. . . **24.95***

Kit HWA-202-1, AC Power Supply, 7 lbs. . . **29.95***

Kit HWA-202-3, Mobile 2-Meter Antenna, 2 lbs. **17.95***

Kit HWA-202-4, Fixed Station 2-Meter Antenna, 4 lbs. **15.95***

HW-202 SPECIFICATIONS — RECEIVER — Sensitivity: 12 dB SINAD* (or 15 dB of quieting) at .5μv or less. **Squelch threshold:** 3 μv or less. **Audio output:** 2 W at less than 10% total harmonic distortion (THD). **Operating frequency stability:** Better than ±.0015%. **Image rejection:** Greater than 55 dB. **Spurious rejection:** Greater than 60 dB. **IF rejection:** Greater than 75 dB. **First IF frequency:** 10.7 MHz ±2 kHz. **Second IF frequency:** 455 kHz (adjustable). **Receiver bandwidth:** 22 kHz nominal. **De-emphasis:** −6 dB per octave from 300 to 3000 Hz nominal. **Modulation acceptance:** 7.5 kHz minimum. **TRANSMITTER — Power output:** 10 watts minimum. **Spurious output:** Below −45 dB from carrier. **Stability:** Better than ±.0015%. **Oscillator frequency:** 6 MHz, approximately. **Multiplier factor:** X 24. **Modulation:** Phase, adjustable 0-7.5 kHz, with instantaneous limiting. **Duty cycle:** 100% with ∞ VSWR. **High VSWR shutdown:** None. **GENERAL — Speaker impedance:** 4 ohms. **Operating frequency range:** 143.9 to 148.3 MHz. **Current consumption: Receiver** (squelched): Less than 200 mA. Transmitter: Less than 2.2 amperes. **Operating temperature range:** −10° to 122° F (−30° to + 50° C). **Operating voltage range:** 12.6 to 16.0 VDC (13.8 VDC nominal). **Dimensions:** 2¾" H x 8¼" W x 9⅞" D.

*SINAD = $\frac{\text{Signal + noise + distortion}}{\text{Noise + distortion}}$

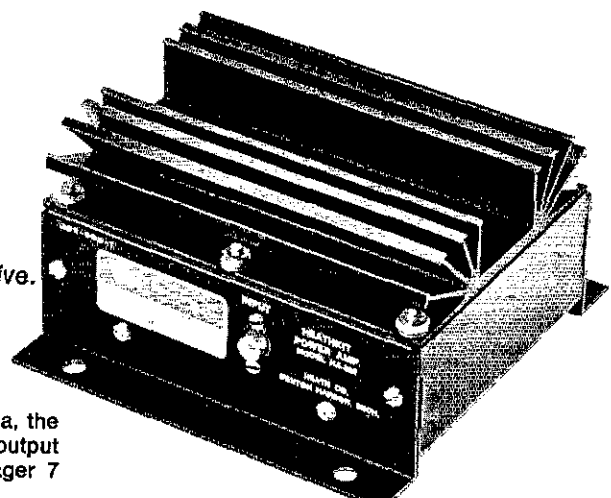
...and here!

NEW Heathkit
2-Meter Amplifier for cleaner
FM copy on the fringe... 69.95*

40 watts nominal out for 10 watts in — *requires only 12 VDC supply.*

Fully automatic operation — *with any 2-meter exciter delivering 5-15 watts drive.*

Solid-state design — *all components mount on single board for fast, easy assembly.*



If you're regularly working from a fringe area, the new Heathkit HA-202 can boost your mobile output to 40 watts (nominal), while pulling a meager 7 amps from your car's 12-volt battery.

Install it anywhere...in the trunk, under the hood or dashboard. Use it with any 2-meter exciter delivering 5-15 watts drive. Features fully automatic operation. An internal relay automatically switches the antenna from transmit to receiver mode when you release the mike button.

All solid-state design features rugged, emitter-ballasted transistors, combined with a highly efficient heat sink, permitting high VSWR loads. Tuned input-output circuits offer low spurious output to cover the 1.5 MHz segment of the 2-meter band without periodic readjustment. All components mount on a single printed circuit board for easy, 4-hour assembly. Manual shows exact alignment procedures using either a VOM or VTVM. And installation is just as simple.

Kit includes transceiver connecting cable, antenna connector. Operates from any 12 VDC system — additional power supplies are not required. Add HA-202 power to your mobile 2-meter rig, and boom out of the fringe. **Kit HA-202,** 4 lbs.

HA-202 SPECIFICATIONS — Frequency range: 143-149 MHz. **Power output:** 20W @ 5 W in, 30W @ 7.5W in, 40W @ 10 W in, 50W @ 15 W in. **Power input (rf drive):** 5 to 15W. **Input/output impedance:** 50 ohms, nominal. **Input VSWR:** 1.5:1 max. **Load VSWR:** 3:1 max. **Power supply requirements:** 12 to 16 VDC, 7 amps max. **Operating temperature range:** −30° F. to +140° F. **Dimensions:** 3" H x 4¼" W x 5½" D.

...and here!

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VHF Wattmeter/SWR Bridge... 29.95*

Perfect tune-up tool for your 2-meter gear. Tests transmitter output in power ranges of 1 to 25 watts and 10 to 250 watts ±10% of full scale. 50 ohm nominal impedance permits placement in transmission line permanently with little or no loss. Built-in SWR bridge for tuning 2-meter antenna for proper match, has less than 10-watt sensitivity. **Kit HM-2102,** 4 lbs.

HM-2102 SPECIFICATIONS — Frequency range: 50 MHz to 160 MHz. **Wattmeter accuracy:** ±10% of full-scale reading.* **Power capability:** To 250 W. **SWR sensitivity:** less than 10 W. **Impedance:** 50 ohms nominal. **SWR bridge:** Continuous to 250 W. **Connectors:** UHF type SO-239. **Dimensions:** 5¼" W, 5¼" H and 6½" D, assembled as one unit.
*Using a 50 Ω noninductive load.

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has again come and gone, and again the participation in WNY was superb. Both W2CFP and I received many messages indicating widespread activity in the test. WB2VAR has designed and printed a message form for members of the Auburn Amateur Radio Assn. Good idea for your club. W2EMW has returned to the frozen north after a year or so in the sunny south. WA2ELD did an excellent job as acting mgr. of NYS during the SET. New officers of the Rochester VHF group are K2CEH, chmn.; K2VCI, vice-chmn.; WB2ZJY, secy. Congrats to new Advanced WA2PPC and WB2AQP and new Extra WB2VVZ. W2MPM, chmn. of the Rochester Radio Repeater Assn. reports that RRRA has participated in many public service ventures including the SET. W2AET participated in SET from Radio Station WOSC where Bob is general mgr. WN2JRX got one new state, 8 new countries, and WC1MAR during Jan. 8 countries is 6 more than your SCM managed during his 10 months as a Novice back in 1955. NYS handled 566 messages in Jan. using 73 sessions and 1104 check-ins. K2FJ enjoyed another DXcursion as PJ8DX and VP2VAN – 2052 total contacts and besides that he even climbed into a volcanic mountain crater. WB2YEM does a good job as Editor/Publisher of ARATS Coherer. The Rome Radio Club is interested in forming an Area Repeater Council. If interested please contact WA2CZR. Those who look at 2-meter fm as "glorified CB" would do well to consider the modes possibility in emergency communications as witnessed during the Southern Tier floods. W2PZL lost his tower in a zero degree storm but remains active. WB2HCT is using his underground studio but when his mobile tried to go underground at 30 mph it didn't make it. Nine Buffalo area clubs are planning a joint meeting for May 8 and are trying to get WIHDQ for the program. W2EQH in Dansville is one and the same as W2AYM in Buffalo, both stations with 100% homebrew gear. W2VTU is working better DX after lowering that old radiation angle. WA2LCC will be portable eight attending the Ohio Institute of Technology. WB2QGD has stopped looking at the transceiver dial since adding a digital counter. BPL: WB2ADW. Traffic with * indicating PSHR: WA2ICU* 398, WA2ELD* 323, W2FR* 291, W2MTA* 274, WA2AYC* 241, W2OE 216, W2RUF* 202, WB2ADW 198, K2KQC 151, WA2MPC 114, W2FEB 94, W2HYM 93, WA2PUU 93, W2RUT 88, W2ROF* 68, W2FZK 65, WA2HSB 65, WN2FHX 59, WA2LCC* 56, WA2AOG* 52, WB2NRK 50, W2MSM 41, WN2CTB 26, W2GLB 26, W2EAF 22, WA2SMO 20, WB2VND 20, WA2AIV 19, K2IMJ 18, W2PVI 18, WA2ABL 14, WN2JRX 10, K2OFV 10, W2PZL 10, K2KTK 8, W2AET 2.

WESTERN PENNSYLVANIA SCM, Robert E. Gawryla, W3NEM – SEC: W3KPJ. PAM: K3ZNP. RMs: W3LOS, W3KUN, WA3IPU. WPA CW Net meets daily on 3585 kHz at 7:00 P.M. KSSN meets Mon. through Fri. at 6:30 P.M. on 3585 kHz. It is with deep regret that we record the Silent Key of W3BOZ. Congrats to W3ZUH who received his last confirming QSL card for 5BWAS who already holds the plaque for 5BDXCC. K3TNH has upgraded to Advanced Class. WN3RCI advanced from Novice to General Class. WN3TXR is a new Novice handling traffic for the Dubois area. WN3UBK is a new Novice in the State College area. The Penn State Univ. ARC has a new Heath SB-301 and 401 line for their station. The Nittany ARC also has the new same line plus the KW linear to go with it. The Foothills ARC of Greensburg is conducting a facsimile net and have an average of four stations QNI regularly. The South Hills Brass Pounders & Modulators (W3PIQ) announce the following new officers for 1973: W3MML, pres.; WA3LVB, vice-pres.; WA3LVA, secy.; K3WNZ, treas.; W3BWU, W3LDB, W3LYC, dir.; W3ADB, K3HIW, K3VXV, trustee. It might be noted that they have been chartered since 1931. Some record. W3BMD, the Indiana Co. ARC announces their new officers as WA3MZH, pres.; WA3RTD, vice-pres.; WA3RYL, secy.-treas.; K3TOM, trustee. Check your license expiration date. Upgrade if possible, it's better. PSHR for Jan.: K3CR 57, WA3QQR 54, W3LOS 39, W3NEM 39, W3YA 36. WPA NTS Net had 37 sessions, 371 messages and 529 stations QNI for Jan. W3MJ had a perfect month of WPA QNI for Jan. Traffic: (Jan.) K3CR 198, W3YA 195, WA3QQR 173, W3GV 162, W3LOS 160, W3NEM 148, W3KUN 137, WA3PXA 111, W3MJ 96, K3HCT 62, W3SN 42, WA3MDY 40, WA3IYA 38, K3SJN 33, WA3QQQ 32, WA3GJU 30, WA3LDA 23, W3ATO 21, W3ZUH 21, WA3HSR 17, WA3EJO 16, W3IDO 15, K3VQV 15, K3ZNP 15, K3SMB 14, WA3LJW 9, K3HWL 5, W3FLZ 4, K3TNH 4, K3LVO 3, WA3PMI 2. (Dec.) W3MJ 124, K3ZNP 8.

CENTRAL DIVISION

ILLINOIS – SCM, Edmond A. Metzger, W9PRN – SEC: W9RYU. PAMs: WA9CCP and WA9PDI (vhf). RM: W9MUC. Cook County EC: W9HPG.

It's fun to build quality.

Two new Heathkit Calculators.

At left is the totally new Heathkit IC-2009. It's first a self-contained portable, weighing in at 11 oz. and small enough to fit in your coat pocket. But it's a desk-top calculator, too. The internal Nickle-Cadmium battery gives five to eight hours use between charges. Or, the IC-2009 can be left connected to its charger for indefinite operation. And unlike other pocket calculators, the Heathkit IC-2009 is designed to be maintained by you. Plug-in keyboard and display boards, plus a complete troubleshooting section in the manual make it easy — and economical. Add up the features for yourself: 8-digit capacity. Four arithmetic functions. Full floating decimal. Constant key. Chain calculation capability. Clear entry key. Entry and total overflow indicators. Negative answer indicator. Battery-saver circuitry. Low battery indicator. Tactile-feedback keyboard for positive entry indication. Order your IC-2009 now. You'll have it built in two or three evenings. Mailing weight, 3 lbs.

The Heathkit IC-2108 on the right features a sleek, low-profile case with bright ½" read-out tubes in an 8-digit display — one of the largest, most legible in the industry. The color-coded keyboard is human engineered to slope down to the desk so you can rest your arm while using. And the IC-2108 is loaded with features: Four arithmetic functions. Floating and fixed decimal. Constant key. Chain calculation capability. Clear display key. Entry and result overflow indicators. Negative number indicator. 120/240 VAC operation. In addition, the IC-2108 is amazingly simple to build. Two spare evenings will do it. 4 lbs. mailing weight.

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6-2 VFO 34
VX-1 VOX unit 15
Galaxy III Xcvr 169
Galaxy V Xcvr 339
Galaxy V Mk II 259
Galaxy V Mk III 279
AC-35 AC supply 65
G-35 DC supply 69
RV-1 Remote VFO 49
VX-3 VOX 9
SC-35 Speaker 15
DAC-35 Dlx. console 75
G-500 DC supply 75
AC-400 AC supply 75
F-3 300cy. filter 24
2000 Linear/supply 259
Duo-power 300 AC/DC supply 75
GT-550 Xcvr 329
GT-550A Xcvr 389
SC-530 spkr. console 19
AC-210 AC/DC supply-booster 25
FM-210 2m FM Xcvr 99
PR-550 ph. patch 39
AC supply for relector 4
G-1000 DC supply 95

GONSET
Comm II 6m $ 69
Comm IIB 6m 79
Comm IV 2m 149
Comm IV 6m 125
Comm IV 220Mc 249
GC-105 2m Xcvr 119
G-28 Transceiver 149
G-50 Transceiver 139
900A 2m Xcvr 199
900B 2m Xcvr 199
901A AC supply 39
910A 6m Xcvr 199
911A AC supply 39
G-76 DC supply 49
972-A Comtron 2m mobile amp. 149

HALLICRAFTERS
S-38A Receiver $ 39
SX-62 Receiver 129
SX-62A Receiver 159
SX-100 Receiver 139
SX-101A Receiver 189
SX-110 Receiver 99
SX-111 Receiver 129
S-120 Receiver 29
S-125 Rec(demo) 49
SX-130 Receiver 139
SX-133 Receiver 195
HR-600 Receiver 39
R-46B Speaker 9
HT-32A Xmtr 225
HT-44 Transmitter 189
HT-46 Transmitter 219
SR-150 Xcvr 275
SR-160 Xcvr 169
PS-150-120 AC sup. 75
PS-150-12 DC sup. 75
P-500DC DC sup. 95
SR-34 (AC) Xcvr 174
SR-34 (AC/DC) 199
SR-42A 2m Xcvr 99
SR-46 6m Xcvr 79
SR-46A 6m Xcvr 89
HA-17 cal'ib (SX-122) 15
HA-19 cal'ib (SX-130) 19

HAMMARLUND
HQ-100 Receiver $ 99
HQ-100C Receiver 109
HQ-100AC Receiver 149
HQ-110 Receiver 109
HQ-110C Receiver 119
HQ-110A Receiver 149
HQ-110AC Rec. 159
HQ-129X Receiver 75
HQ-140X Receiver 119
HQ-170 Receiver 149
HQ-170C Receiver 159
HQ-170A Receiver 199
HQ-170AC Rec. 209
HQ-170A/VHF 259
HQ-215 Receiver 225
S-100 Speaker 9

HEATHKIT
GR-64 Receiver $ 39
GR-78 Receiver 99
HR-10 Receiver 49
HR-10B Receiver 59
RX-1 Receiver 139
SB-300 Receiver 209
SB-301 Receiver 229
XC-2 2m converter 25
XC-6 6m converter 25
SB-600 Speaker 15
HS-24 Speaker 9
HD-11 Q-multiplier 12
GD-125 Q-multiplier 15
HW-7 QRP Xcvr 59
DX-60 Transmitter 59
DX-60B Transmitter 69
TX-1 Transmitter 99
HX-20 Transmitter 125
HX-30 6m Xmtr 149
HA-20 6m Linear 75
HW-12 75m Xcvr 75
HW-22A 40m Xcvr 85
HW-32 20m Xcvr 75
HW-32A 20m Xcvr 85
HW-18 (for 80m CAP) 99
HW-16 Transceiver 99
HW-101 Transceiver 269
SB-101 Transceiver 349
HW-10 6m Xcvr 119
SB-110A 6m Xcvr 295
SB-310 Gen. Conv. 229
HW-30 (Two'er) 39
VHF-1 (Seneca) 119
HP-13 DC supply 49
HP-23 AC supply 49
HP-23A AC supply 54
HRA-10-1 calibrator 8
HO-10 Monitor 59
HO-13 Hamscan 69
HW-17A 2m Xcvr 119
HW-17-1 DC supply 19

JOHNSON
Adventurer $ 29
Challenger 54
Valiant I 139
Valiant II 189
Pacemaker 129
Invader 200 225
Courier Linear 139
6N2 VHF Xmtr 89
TR switch 19

K-W ELECTRONICS
KW-2000B Xcvr w/AC supply $495

KNIGHT
R-100 Receiver $ 59
T-50 Transmitter 24
T-60 Transmitter 34
TR-106 6m Xmtr 69
v-107 VHF VFO 19
TR-108 2m Xcvr 89
G-30 GDO 12

LAFAYETTE
HA-750 6m Xcvr $ 49
HB-502 AC supply 19
HA-225 Receiver 79
HA-600 Receiver 89

LAKESHORE
Signal Splitter (as-is) $15

MOSLEY
CM-1 Receiver $ 99

NATIONAL
NC-98 Receiver $ 89
NC-125 Receiver 75
NC-155 Receiver 119
NC-270 Receiver 125
NC-300 Receiver 125
NC-303 Receiver 199
HRO-50T1 Receiver 125
HRO-60 Receiver 199
NCX-3 Transceiver 169
NCX-5 Transceiver 329
NCX-5 Mk II Xcvr 369
NCXA AC supply 75
200 Transceiver 239
NCX-500 Xcvr 269
NCL-2000 Linear 375
AC-500 AC supply 75

P&H
2-150 SSB conv $139

POLYTRONICS
PC-628 6&2m $139

RME
4300 Receiver $ 89
4350A Receiver 109

RAYTRACK
DX-2000-L Linear $395

REALISTIC
DX-150A Receiver $ 89

REGENCY
HR-2 2m FM Xcvr $149
HR-2A 2m FM Xcvr 169

ROBYN
500 Transceiver $595

S B E
SB-33 Transceiver $189
SBE-LA Linear 175
SB-34 Transceiver 279
SB2-VOX 19
SB2-MIC Mike 9

SWAN
SW-140 Xcvr $ 75
14-117 DC supply 99
SW-12 DC supply 59
TCU Control unit 89
117AC AC supply 59
117B AC supply 59
508 VFO 95
260 Transceiver 299
270 Transceiver 329
250C 6m Xcvr 329
350 Xcvr (late) 389
SW-117C AC supply 65
350C Transceiver 325
500 Transceiver 349
500C Transceiver 369
117XC AC supply 85
14-A DC supply 29
TV-2B 2m Xverter 225
22 VFO adaptor 22
22B VFO adaptor 25
250 6m Xcvr 229
210 6m VFO 89
500kc Calibrator 15
NS-1 noise silencer 24
TV-2 2m Xverter 189

TEMPO
FMA 25w 2m FM $249
ACA AC supply 25
Tempo One AC sup. 75

TEN-TEC
PM-2 Transceiver $ 34
PM-2A Transceiver 39
PM-3A Transceiver 54
PM-3C Xcvr 69
TX-100 Transmitter 79
AC-4 SWR bridge 9

TOP BAND SYSTEMS
TBS-2000 Linear $175

UTICA
650 6m Xcvr/VFO $ 59
650A 6m Xcvr/VFO 79

VARITRONICS
FDFM-2A 2m FM $ 89
FDFM-2SA 2m FM 99
IC-2F 2m FM Xcvr 169
PA-50A 2m FM Amp. 69
HT-2 hand-held 139
HT-2 Mk II 159
FM-208M amp & sup 69

WATERS
361 Codax keyer $ 39
359 Compreamp 19

February 1973

NEW EQUIPMENT SPECIALS & CLOSEOUTS

Due to the low prices and limited quantities of the merchandise listed below all prices are for "Payment In Full With Order—No Trade".

	reg.	NOW
BTI		
2000 Wattmeter	$ 49	$ 39
CLEGG	reg.	NOW
22'er FM series 25	$384	$269
22'er FM series 24	384	269
FM-27A 2m FM Xcvr	479	329
Thor DC supply/modulator	159	80
22'er Mk II AM	389	289
COLLINS	reg.	NOW
75S-3B Rec. - New Display	$1100	$880
32S-3 Xmtr - New Display	1330	1064
351D-2 mob. mt. - New Disp.	337	187
CUSH CRAFT	reg.	NOW
AM-22 2m stacked halo/mast	$17	$12
AM-26 2 & 6m Halo/mast	19	14
R. L. DRAKE	reg.	NOW
TR-4 Transceiver	$599	$499
L-4B Linear - New Display	825	660
TC-6 6m xmt. converter	278	248
ML-2 2m FM - New Display	299	239
R-4B Receiver	475	395
T-4XB Transmitter	495	395
TC-2 2m xmt. converter	378	278
SC-6 6m Rec. converter	71	71
CC-1 Converter console	49	49
CPS-1 Power supply	20	19
SCC-1 VHF calibrator	27	26
RV-6 VFO for TR-6	110	95
RV-4 VFO for TR-4	110	95
ETO	reg.	NOW
PA-70V Linear w/160m	*$1875*	*$1475*
EICO	reg.	NOW
751 AC supply - kit	$ 79	$ 49
751 AC supply - wired	109	79
752 DC supply - kit	79	49
752 DC supply - wired	109	69
GALAXY	reg.	NOW
AC-210 AC supply/booster	$ 49	$ 29
GT-550 80-10m Transceiver	550	350
GT-550A New Display	595	450
GAVIN	reg.	NOW
Maverick II 6m Filter	$ 34	$ 15
GONSET	reg.	NOW
902A DC supply	$ 79	$ 39
GSB-201 Mk IV Linear	660	389
HY-GAIN	reg.	NOW
203BA 3 el. 20m Beam (shipped in error to a customer)	$139	$ 79
HB2S2 stacked 2m Halos	26	12
SD-150B 159-174 Mc J-pole	125	49
HB2S4 4 stacked 2m Halos	54	27
400 Rotor - New Display	229	199
KENWOOD	reg.	NOW
TS-511S 80-10m Xcvr and AC supply - New Display	$520	$450
LINEAR SYSTEMS (ADCOM)	reg.	NOW
350-6 6v DC supply	$125	$ 20
12-150 12-110v 150w inverter	60	20
PEARCE SIMPSON	reg.	NOW
GLADDING 25 2m FM Xcvr WITH matching AC supply	299	$229
RAYTRACK	reg.	NOW
CB Autolevel	$ 69	$ 19
S&E	reg.	NOW
SB-36 Xcvr. - New Display	$969	$769
SB-SV Scanvision Monitor and Camera - New Display	999	780
SB-144 2m FM - New Display	259	229
SB-2MIC Mike (dynamic)	16	12
SONAR	reg.	NOW
FM-3601 2m FM 8 ch, 10w	$299	$175
PS-2923 AC supply for above	39	25
FR-2514 *Low-band Scanner*	189	99
2902 Porta-Pak for FR-104	59	25
STANDARD	reg.	NOW
SR-C146 Hand-held 2m FM	$279	$199
SR-C826M 10w, 12 ch, 2m FM	359	259
SR-C140 Base - New Disp.	$95	476
SWAN	reg.	NOW
410C VFO for 500C	$120	$ 85
500CX/SS16B - New Disp.	589	549
600R Custom - Demo	545	495
600T Xmtr - New Display	589	535
1200W Linear (110v)		225
1200W Linear (230v)		225
TEMPO	reg.	NOW
FMV 10w, 2m FM	$249	$149
2000 Linear	395	350
VARITRONICS	reg.	NOW
FDFM-2 and BP-1	$262	$149*
FM-20M Mobile Amp	150	99*
FM-208M Base Amp/supply	235	75*
PA-50A 2m FM Amp, 12v	129	85*
FDFM-25 (mod. for MARS)	310	160*

* with 90-day AES warranty

	reg.	NOW
WATERS		
346 Neuverter, 6—2 conv.	$175	$ 75
REGENCY CB	reg.	NOW
Imperial 23 ch, 110& 12v	$299	$199
KAAR CB		
Skyhawk II, 23 ch, 12v	$229	$129
SQUIRES-SANDERS		
Skipper 23 ch, 12v	$159	$ 79

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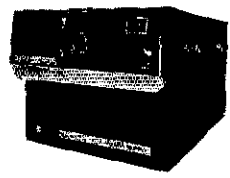
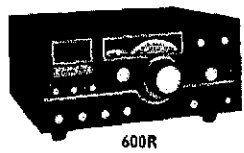
160X with SS-16B filter installed	529.95
160VFO VFO for 160X	119.95
270B 80-10m 110vac Transceiver	469.95
270B with SS-16B filter installed	529.95
14A 12vdc Converter for 270B	44.95
500CX 80-10m Transceiver	529.95
500CX with SS-16B filter installed	589.95
250C 6m Transceiver	469.95
NS-1 6m Noise Silencer	39.95
210 6 Meter VFO for 250C	109.95
TV-2C (specify 14 or 50Mc i.f.)	359.95
CYGNET 1200X Linear	259.95
Mark II 80-10m Linear	679.95
Mark 6B 6m Linear	679.95
117XC AC Supply w/spkr. in cabinet	109.95
230XC 230v AC Supply, spkr., cabinet	115.95
14-117 12v DC Supply w/cable	139.95
14C 12v DC Module/cable ONLY	69.95
510X MARS Oscillator - less crystals	53.95
508 Full Coverage VFO	159.95
VX-2 Plug-in VOX	35.95
FP-1 Phone Patch	48.95
MTK Mobile Mounting Kit	9.95
GMTK "Gimbel type" mobile mtg. kit	5.20
SS-16B Custom Crystal Lattice Filter	79.95
600T Transmitter 80-10m, 600w	589.95
600R Receiver 80-10m	439.95
600R CUSTOM Receiver (with I.F., Noise Blanker and I.C. Audio filter)	545.95
600R CUSTOM Receiver/SS-16B	599.95
600S Speaker for 600R	21.95
600SP Deluxe Speaker (w/ph.patch)	64.50
600 Hz CW Filter for 600R	29.50
AM Filter for 600R	39.95
NB-500 I.F. Noise Blanker Kit	89.00
ICAF I.C. Audio Notcher-Peaker Kit	59.00
SWAN 444 Desk Mike	28.50
SWAN 404 Hand Mike	21.95
WM-1500 Wattmeter	49.95
FM-2X 2m FM Transceiver	299.95
FM-1210A 2m FM Transceiver	359.95
VHF-150 150w 2m Amplifier	299.95
Crystals for FM-2X and 1210A	each 5.00
–SWAN TRIBAND BEAMS (10-15-20m)–	
TB-2 2 el., 6½' boom	89.95
TB-3 3 el., 14' boom	108.00
TB-3H 3 el., 16' boom	125.00
TB-4H 4 el., 24' boom	148.00
MB-40H 2 el., 40m Beam	145.00
80-40m Trap Dipole	29.95
1040v 10-40m Vertical Antenna	69.95
75m Add-on Kit	36.95
–SWAN MOBILE ANTENNAS–	
Model 45 80-10m (manual switching)	$ 79.95
Model 55 80-10m (remote control)	129.00
Kwik-on connector	6.95
BMT Bumper Mount	24.00
–MODEL 35 (SINGLE BAND)–	
Top Section, 6 ft. whip	$ 12.00
15m Coil ... 22.00 40m Coil ...	26.00
20m Coil ... 24.00 75m Coil ...	28.00
18 inch Base Section	8.50
36 inch Base Section	9.00
48 inch Base Section	9.50



FM-1210A



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Signature

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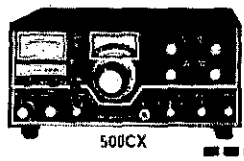

500CX

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Expiration DATE _____ *Master Charge Interbank number _____ (4 digits)

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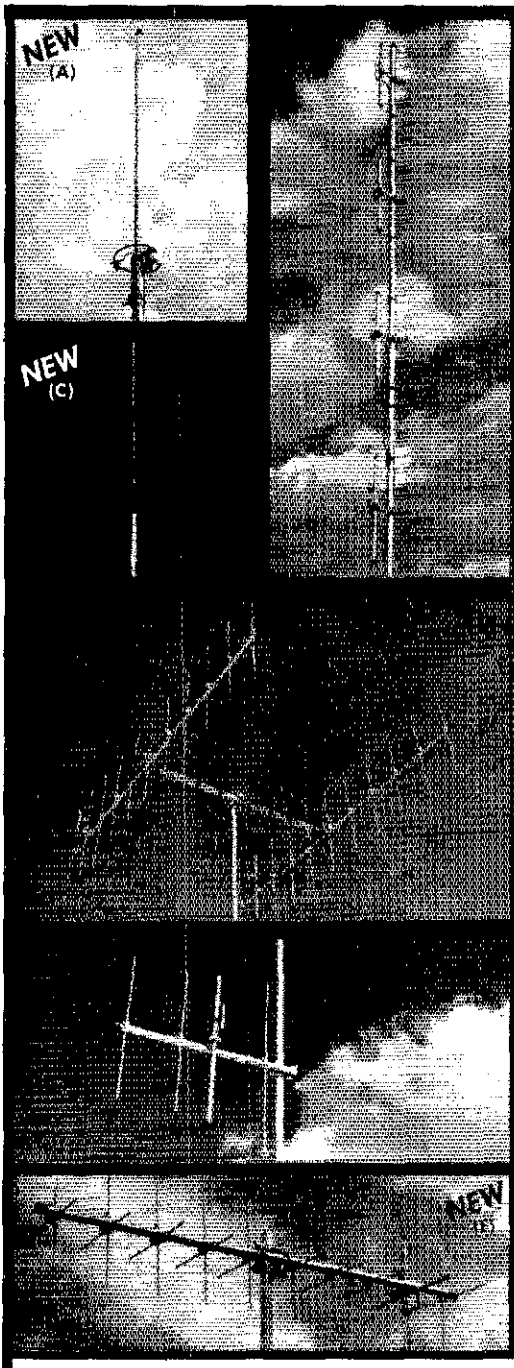
Net	Freq.	GMT/Days	Tfc.
IEN	3940	1400 Su	14
ILN	3690	0300/2300 Dy	173
Ill PON	3915	2245/1430 M-F	597
Ill PON	145.5	0200 MWF	20
Ill PON	50.28	0200 M	0
NCPN	3915	1300/1800 M-S	99
Ill Novice	3720	0100 Dy	79

W9PRN spoke at the Feb. meeting of the Cenois Amateur Radio Club. W9LNQ won national honors in the recent IPON CCPX contest. The second meeting of the QCWA in Chicago was very good in attendance and the organization is studying a constitution. W9NPB has several good conversions for FAX operation. WA9SRE is recuperating at home after a serious hospital seige. The Wheaton Community Radio Amateurs annual hamfest this year surpassed all others to make it their largest in attendance. The annual Hamfesters (Chicago) Picnic will be held Aug. 12 at the usual site, Santa Fe Park on the south side. Contact K9DRS for details. WA9RHU is stationed in Louisiana army base. WB9AZQ/9 is a new ham in the Robinson area. From all reports received to date, the SET was good. Many clubs failed however to report results. W9HRY reports the 9RN traffic total for the month is 766. New officers of the Chicago FM Club are WA9LRI, WB9GSH, W9JXT, WA9TKA, WA9ERC, WA9DZS, WB9BDS, WA9KOD, K9MDM and WB9IEN. W9KRH of Clinton has been assigned to the IC railroad in Decatur. WA9CAR has retired from the IC. WA9WOB, WB9HZG, K9KXP and W9YZE are the new officers of the Egyptian Radio Club. The League's executive committee has approved the application of Fremd (HS) Amateur Radio Club and has declared it a duly affiliated society. W9FBB has erected a new tower and bander. The 1973 officers of the Rockford Amateur Radio Assn. are WB9IOG, WB9IED, WB9KOS and WB9KOT. The Ill. Weather Net meets every evening of the year on 3940 at 0000 GMT (or 6:00 CST). Please check in or contact K9DCG for particulars. The Six Meter Club Hamfest will be on Sun. Aug. 5 at Frankfort, Ill. The elected officers for the 1973 season of the Twin City Amateur Radio Club are WB9BLL, WA9YLE, WA9KGU, W9DCZ and K9QZI. Traffic: (Jan.) W9NXG 212, W9OYL 146, WB9FHI 119, W9AES 101, WB9JTK 98, WA9ZLN 98, W9JXV 82, WB9HEG 81, W9LNQ 78, W9MUC 75, K9KHI 72, WA9OBR 63, W9KRR 62, WA9LDC 54, W9ZAV 44, W9HPG 35, WB9FVG 31, W9KV 24, K9DQU/WB9AIE 18, WB9ELP 18, W9PRN 18, W9KR 13, WA9LHU 7, WB9AWY 2. (Dec.) WB9AWY 2.

INDIANA – SCM, William C. Johnson, W9BUQ – SEC: WA9YXA. RMs: WA9EED, WB9EAY, W9HRY, WB9KVN. PAMs: K9KTB (vhf), W9HWR, W9PMT.

Net	Freq.	Time(Z)/Days	Tfc.	Mgr.
ITfc	3910	1330-2300 Dy 2130 M-S	518	K9KTB
QIN	3656	0000-0400 Dy	453	WA9EED
IPON	3910	1300-2130 Su	25	WB9AHJ
IPONCW	3740	0000 Dy	110	WB9KVN
IPONVHF	50.7	0100 M-W-Th	26	WA9ULH
IPONVHF	50.2	0200 Dy	70	W9MHZ
Hoosier VHF			16	W9PMT

With deep regret, I report the passing of WB9EFY, Gibson County AREC net reports 5 sessions, traffic 8, 134 minutes. At the recent Red Cross Novice class instruction, disaster dir. Clarence Green passed his Novice exam and now is WN9LHW. Indianapolis Radio Club officers for 1973 are W9CKB, pres.; W9BR, vice-pres.; WN9JIM, secy.; W9AI, treas.; WA9YCA, chief op.; W9DNQ, W9JGZ, dir. The SET was a great success with over 75% of the clubs listed participating. Your new SEC for Ind. WA9YXA was a busy ham. W9NTP EC for Rush Co. spoke at the Ind. Amateur TV and UHF Club meeting Jan. 13. They also had a discussion on the frequency in the 420 to 450 MHz range. Currently we have been using 432. Decision was to try 436. 1973 officers for Tippecanoe ARC are K9LYA, pres.; WA9ZIY, vice-pres.; W9VIP, secy.; WB9FOT, treas. Indianapolis Red Cross elected WA9BVS, pres.; K9OXA, vice-pres.; Richard Smith, secy.; WA9FSZ, trustee; WB9CCO, chief op. QIN Honor Roll: WA9EED, WB9KVN, W9QLW. BPL: WB9AHJ. Amateur radio exists because of the service it renders. Traffic: WB9KVN 369, WA9EED 300, K9HDP 283, WB9AHJ 240, WB9EAY 203, W9HWR 180, K9KTB 134, W9QLW 117, W9FWH 106, W9JBQ 90, W9BUQ 77, W9EI 73, WA9TJS 67, K9CBY 56, WA9TQD 56, WB9FOT 42, K9FZX 42, WA9OHX 41, W9ZSC 35, W9KWB 34, K9ILK 30, K9YBM 27, W9DZC 22, K9RPZ 20, WB9FST 18, W9RTH 17, K9JQY 16, W9PMT 16, WA9NQA 15, WA9AXF 13, WB9BAP 12, WA9OKK 12, K9FHQ 11, K9RWQ 10, W9VMW 10, W9BDP 9, WA9OAD 9, WA9QEQ 9, W9ENU 8, K9FUJ 8, K9PNP 8, W9UOZ 7, K9DIY 6, WA9VBG 5, W9EQT 2.



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AR-2	100 watts	135-175 MHz		**$12.50**
AR-25	500 watts	135-175 MHz		**17.50**
AR-220	100 watts	220-225 MHz		**12.50**
AR-450	100 watts	420-470 MHz		**12.50**
AR-6	100 watts	50-54	MHz	**18.50**

(B) 4 POLE: A four dipole gain array with mounting booms and coax harness 52 ohm feed, 360° or 180° pattern.

AFM-4D	1000 watts	146-148 MHz	**$42.50**
AFM-24D	1000 watts	220-225 MHz	**40.50**
AFM-44D	1000 watts	435-450 MHz	**38.50**

(C) FM MOBILE: Fiberglass ⅝ wave professional mobile antenna for roof or trunk mount. Superior strength, power handling and performance.

AM-147	146-175 MHz mobile	**$26.95**

(D) POWER PACK: A 22 element, high performance, vertically polarized FM array, complete with all hardware, mounting boom, harness and 2 antennas.

A147-22	1000 watts	146-148 MHz	**$49.50**

(E) 4-6-11 ELEMENT YAGIS: The standard of comparison in VHF/UHF communications, now cut for 2 meter FM and vertical polarization. 4 & 6 Element models can be tower side mounted.

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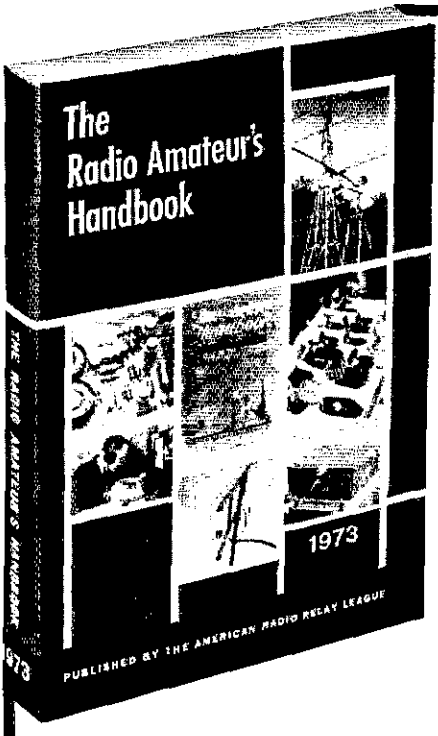

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The **AMERICAN RADIO RELAY LEAGUE, INC.**

NEWINGTON, CONN., U.S.A. 06111

WISCONSIN – SCM, Joseph A. Taylor, W9OMT – SEC: W9NGT. PAMs: K9FHI, WA9OAY, WA9QKP. RMs: W9UCR, K9KSA.

Net	*kHz*	*Time(Z)/Days*	*QNI*	*QTC*	*Mgr.*
WSBN	3985	2300 Dy	1440	176	K9FHI
WIN (E)	3662	0000 Dy	356	95	W9UCR
WIN (L)	3662	0400 Dy	111	51	WB9HLM
BEN	3985	1700 Dy	108	43	WA9QKP
BWN	3985	1145 M-S	442	277	WA9OAY
WSSN	3662	2330 MWF	70	14	K9KSA
WI-PON	3925	1701 M-F	436	85	WA9NIX
WI-PON	3697	2330 W	15	4	W9EMC

The two big activities of the month were the SET and the Wisc. QSO party. From the messages your SCM received there appeared to *be plenty of activity during both of these events. Things are picking* up very nicely on the Wisc. Slow Speed Net – with 70 QNI it looks as though we have set a record for this net. K9KSA reports many new faces as well as old ones – even W9CUA and W9ESJ. Your SCM just finished a six week theatre engagement doing lead in the "Tender Trap." Congrats to two new asst. ECs WA9ZAZ and WA9HCZ in La Crosse; also to W9PJT in Winnabago Co. The WVRA got involved in an activity not too common these days. They had two hidden transmitter hunts this month. The Wisc. Assn. of Repeaters elected officers at their Jan. 28 meeting – K9YZS, chmn.; WA9SXN, vice-chmn.; W9ATK, secy.; K9KSA, treas. Congrats to the new officers. Rib Mountains repeater is now in operation on 22/82. Traffic: W9DND 228, K9FHI 90, W9UCR 79, W9MMP 63, K9KSA 34, WA9OAY 28, WA9BZW 22, WA9LYY 12, W9KRO 9, W9DXV 4, K9UTQ 4.

DAKOTA DIVISION

NORTH DAKOTA – SCM, Harold L. Sheets, WØDM – SEC: WAØAYL. OBS: KØPVG. RM: WAØMLE. OO: WØBF. WAØJPT went south for part of the winter. WAØUNA now Advanced and WBØFDT General Class licensees. WAØCSK able to retain his old call and is working on 2 meters fm. WBØBMG finally hooked Hawaii for *WAS. WBØBHJ has his rig back but too QRL with work. WAØSJB* reports renewed Novice activity. WAØOVW teaching code to the CAP unit at UND as well as operating the UND station WBØBCZ in contests. WAØTOF reports renewed activity on 2-meter fm. WAØUNA is warming up to slow-scan. It's nice to hear KØPVG back on the air. WØFNZ retired from BN. WAØREW spoke to the Biology Class at the High School. The Forx Amateur Club won the membership drive for clubs in the ND section and received a set of ARRL publications from the Dak. Division. Some of our OTs came back. Bad band conditions during SET was rather poor but the turn out and operation was tremendous when the skip was favorable. Nice job of the PON and RACES Nets and individuals. SEC WAØAYL was unable to do much in the SET. WAØMLE reports bad conditions on the cw nets. He has been appointed as Asst. Dir. for the Dak. Division, also to the PSAA. He and WAØELO take *traffic* on cw while WAØSUF helps on ssb nets. WAØMLE and WAØOVW made good scores in the CD contest for Jan. WØBHT held a meeting with those in the Peace Garden area to start planning for the Peace Garden Hamfest July 7, 8. K7DGV/Ø is back to the home state and *stationed at Sherwood.*

Net	*kHz*	*CDT/Days*	*Sess.*	*QNI*	*QTC*	*Mgr.*
Goose River	1990	0900 S	4	64	3	WØCDO
PON	3996.5	0900 S				
		1830 S-S	12	340	102	WAØSJB
YL WX	3994.0	0730 M-F	23	358	347	WAØGRX
RACES	3996.5	1730 M-F	46	937	47	WBØATJ
		1830				
NDN	3642.0	2150 M-F	18	20	46	WAØMLE

Traffic: WAØMLE 254, WAØRWM 232, WØDM 75, WAØSUF 72, *WØWWL 59, WØMXF 46, WAØCSL/Ø 42,* KØPVG 26, WØCDO 17, WBØFDT 5, WAØSJB 42.

SOUTH DAKOTA – SCM, Ed Gray, WAØCPX – The Signal Hill Amateur Radio Club at Deadwood have helped WNØJEJ, WNØJEK and WNØJEL. WAØDEM and WØNWK have been instrumental in creating a good deal of activity in the club. WØURQ and WØKJZ formerly of St. Paul, Minn. now living in S.D. The Signal Hill Amateur Radio Club and the Black Hills Reapter Assn. have been cooperating to get a repeater established in the Northern Hills. It is expected to have the Northern Hills Repeater on this summer. The Lawrence Co. AREC reported 10 QNI and 20 QTC in the SET. Net reports: NJQ 637 check-ins and 12 formals; Early Evening 826 QNI and 21 QTC; Late Evening 1989 QNI and 28 QTC; SDN CW 268 *QNI and 90 QTC. Traffic: WØZWL 377, WØMZI 224, WØHOJ 169,* WAØTNM 93, WAØROK 117, WØKJZ 69, WAØUEN 69, WØIG 54, WØDVB 35, KØAIE 26, WAØBZD 26, K4GXV/Ø 15.

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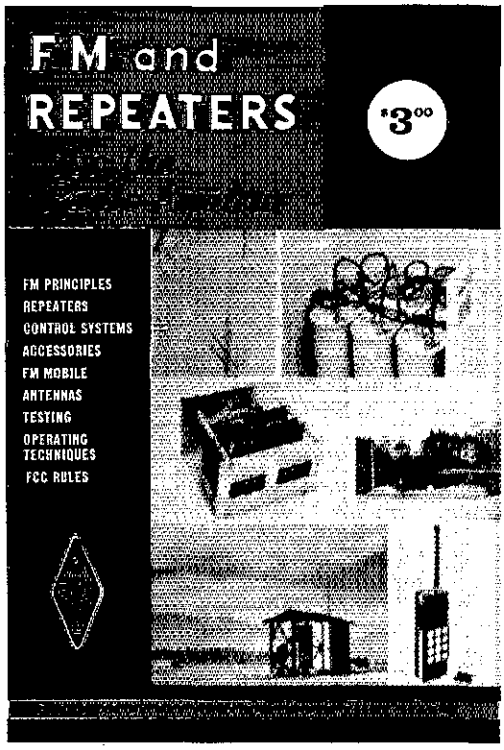

This book is a *must* for the fm buff as well as the operator just breaking into fm and repeaters. Everything is covered! Fourteen chapters include: mobile installation, transmitters, receivers and antennas for mobile and base, and fm test equipment. Special sections treat alignment and troubleshooting gear as well as repeater technical problems and cures. Club organization, repeater location planning, and operating under the new regulations are all covered. If you operate fm or are just becoming interested, you cannot afford to be without this book.

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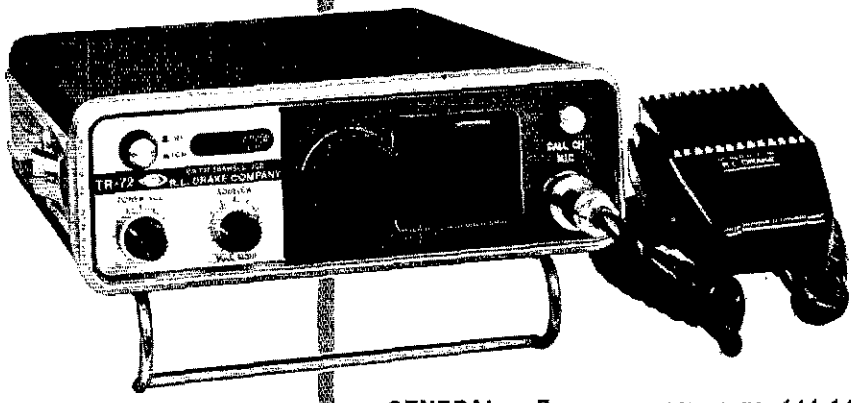

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DELTA DIVISION

LOUISIANA – SCM, John R. Rivoire, K5AGI – Asst. SCM: Louis A. Muhleisen, Jr., WB5AEH. SEC: K5SVD. RM: W5GHP. VHF PAM: WA5KND. This month's column being written by WA5TTH, XYL of K5AGI. I am happy to announce the appointments of K5SVD as the new SEC and WA5KND as VHF PAM. Make your plans now to attend BRARC's Hamfest 1973 on May 5 and 6. For information and advanced reservations contact WB5COO, Chmn.P.O. Box 53194, Baton Rouge, La. 70808. See you there in May! Congrats to newly elected officers of JARC: WB5CXJ, pres.; WA5WHS, vice-pres.; K5PKS, secy.; K5HEK, treas.; W5FMO, K5AFR and W5WZE, board. WA5WPO and XYL are proud parents of a new baby girl. K5DPG is again back on the air thanks to all who helped erect the tower at his new QTH. NOVHF Club 16/76 Repeater should be operational at this time. Anyone interested in an EC appointment please contact the new SEC, K5SVD. WB5CZV now is WB5INZ and sports new General Class license. WA5YFQ is the new GNOARC secy. WA5VCF has put up a new 80-ft. tower. Reports still are coming in on the many La. hams who helped out during the recent Managua disaster. Thanks to all who participated in the SET held in Jan. It is reported that WB5ADU and WN5MFG have both passed the General Class exam. W5CEW reports a six way QSO with hams whose total time on the air was a whopping 257 years! Traffic: W5MI 243, W5GHP 162, W5CEZ 72, W5FA 6.

MISSISSIPPI – SCM, Walker J. Coffey, W5NCB – SET exercises was outstanding thanks to WA5FII and all who participated. WA0GVO/5 appointed PAM for PO Net. QNIs in this net are over 400 monthly. WB5BUE new mgr. of MSBN. WA5UIH resigned as mgr. to resume studies in MSU. WA5VVV is new mgr. of CGCHN. The work of WB5EIN with the Novice Net is outstanding. Miss. section really turned out for the Jan. CD Party. See you again in Apr. CD Party. ECHO (Emergency Communication by Ham Operators) group in Jackson hope to activate 2-meter fm repeater shortly. W5LL has new sticker for his CP Certificate – 30 wpm. PSHR: WB5EIN, W5SBM, W5AMZ, K5YTA, WB5DLW and WB5FML. WB5EIN also made BPL. See you at the Natchez Super Hamfest Apr. 8.

Net	*Freq.*	*Time(Z)/Days*	*QNI*	*QTC*	*Mgr.*
MTN	3665	0045 Dy	241	187	WA5YZW
MNN	3733	0100 TTS	–	–	WB5DEK
GCSBN	3925	0030 Dy	–	–	W5JHS
CGCHN	3935	0100 Dy	1443	121	WA5VVV
MSPON	3970	2345 MS	407	90	WA0GVO/5
MSBN	*3987.5*	*0015 Dy*	*1034*	*140*	*WB5BUE*

Traffic: (Jan.) W5SBM 354, WB5EIN 190, W5EDT 162, WB5FML 121, W5NCB 119, WB5DLW 116, WA5FII 107, W5AMZ 95, WA5YZW 95, K5YTA 63, W5WZ 53, WB5BUE 49, K8YUW/5 45, W5BW 13, WB5DCY 13, WB5BKM 12, WB5AHY 3, WA0GVO/5 37. (Dec.) WA5FII 20.

TENNESSEE – SCM, O.D. Keaton, WA4GLS – SEC: WB4ANX. PAMs: W4PFP, K4MQI, WA4EWW, WA4NEC. RM: W4ZJY.

Net	*Freq.*	*Time(Z)/Days*	*Sess.*	*QNI*	*QTC*	*Mgr.*
TPN	3980	1245 M-F	31	1503	147	W4PFP
		1400 SSuH				
TSSBN	3980	0030 TSu	26	1015	67	K4MQI
ETPN	3980	1140 M-F	21	476	27	WA4EWW
TCN	3980	0200 Th	4	32	0	W4CYL
TPON	3980	0030 M				WB4BHZ
TN	3635	0000 Dy	31	243	196	WB4YCV
TNN	3720	0000 Dy	24	107	22	WB4USG
ETVHFN	50.4	0000 TThS	13	129	0	WB4IOB
ETVHFN	145.2	0000 WF	8	31	0	WB4DZC
ETTMN	28.7	0200 WF	8	49	0	WB4NFI
MTTMN	28.8	0200 TF	6	50	0	W4PSN
KVHFN	50.7	0100 T	3	15	0	WB4MPJ
KVHFN	146.22	0100 T	2	8	0	WB4MPJ
	146.82					
ACARECN	146.28	0100 M	4	46	0	WB4DYJ
	146.88					

TN Honor Roll for Dec. 1972 were: K4CNY, WB4YCV, W4ZJY, WB4DJU and WB4USG. Congratulations to three Knoxville YL's who upgraded to Advanced Class. WB4MRA, WB4NDX and WB4NKO. On Jan. 3, 1973 WA4GLS/mobile summoned ambulance and state trooper to aid victims of auto accident at I-40 and exit 3 through stations WA4OHF and WA4BCS during the TPN session. These stations were awarded the Certificate of Merit. Summary of net activity for 1972 is 1790 sessions held, 41,698 check-ins and 3580 formal messages passed. Let's make 1973 a greater year. Traffic: W4OGG 206, WB4ANX 203, K4CNY 189, WB4NIR 131, WB4DYJ 109, W4ZJY 78, WB4VZQ 72, WB4DJU 69, WB4USG 68

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GREAT LAKES DIVISION

KENTUCKY – SCM, Ted H. Huddle, W4CID – SEC: WA4GHQ. *Appointments: WB4HRK as EC; WB4UAN and W4ELG as OOs;* WA4OMH as OVS. Endorsed: WA4WWA, WA4AGH, WB4HTN and WB4FDK as ECs; K4TXJ as ORS; WA4EAF and WB4HTN as OPSs; WA4GHQ as OVS. BPLs: W4BAZ, WA4JOS, WB4WCM, WB4ZSA and K4TXJ.

Net	*QNI*	*QTC*	*Net*	*QNI*	*QTC*
KRN	355	24	KYN	460	405
MKPN	740	43	KNTN	200	138
KTN	1466	217	KPON	102	78

The Jan. pre-SET planning meeting was a big success with 38 attendees. W4CDA has been doing an FB publicity job for amateur radio in his newspaper. WA4BZS conducting code classes in the Danville area. New Kentuckiana RC officers are K4KZH, pres.; WB4VVQ, vice-pres.; K4TXJ, secy.; WN4ZSV, treas. WN4AQJ has a new 15 wpm code proficiency certificate. WN4COM a new Novice in Louisville. WA4WWA, WA4WQZ, K4GEI and K4VAI were guests at the Jan. meeting of the Morehead ARC. Traffic: WB4WCM 705, WB4ZSA 394, WA4GHQ 354, WA4BAZ 325, WA4JQS 269, W4CID 236, K4TXJ 223, WB4FDK 164, K4HY 161, K4MAN 112, K4UNW 107, WB4FOR 76, WA4VZZ 69, WN4ZMK 66, WA4AGH 64, WB4AUN 55, WB4NHO 54, WN4YQS 48, K4AVX 38, WA4AVV 36, W4OYI 32, W4CDA 27, K4HOE 22, K4QHZ 22, W4BTA 21, WB4REN 20, WA4ENH 19, WA4EAF 19, WB4FOT/4 19, WB4ILF 17, WN4ZFO 16, WN4AQG 12, WB4IBQ 12, WB4TNZ 12, WB4PVC 11, WA6KTN/4 9, WB4YAF 8, WB4GCV 6, W4OXM 3.

MICHIGAN – SCM, Jerry L. Olinghouse, *W8ZBT* – SEC: W8MPD. RMs: W8IYA, W8WVL, W8RTN, K8KMQ, W8GLC. PAMs: K8PVC, WA8KHB, WB8HQS. VHF PAMs: K8AEM, *WA8WVV*.

Net	*Freq.*	*Time/Days*	*QNI*	*QTC*	*Sess.*	*Mgr.*
QMN	3663	2300 Dy	1263	863	93	W8IYA
WSSB	*3935*	*0000 Dy*	*873*	*210*	*31*	*K8PVC*
BRMEN	3930	2230 S/F	781	73	27	WA8KHB
UPEN	3920	2230 Dy	639	87	31	WB8HQS
GLETN	3920	0230 Dy	648	55	29	WB8AXI
PON	3955	1600 Dy	1069	389	31	K8LNE
PON/CW	3645	2400 M/S	159	22	27	VE3DPO
MI-6M	50.7	0000 M/S	213	52	21	WA8VXE
MI-Nov.	3720	2230 Dy	183	45	31	WB8JAD

The SW Mi. 2-Meter Net reports 76 QNI, 3 QTC, 5 sessions. 6-Meter WX Net in 4 sessions QNI 58. W8IYP and WA8ZQU have joined Silent Keys. CMARC again furnished transportation and communication for the March of Dimes in Ingham Co. and Lansing with 15 mobiles and 3 base stations. W8THZ is asst. EC for Ingham Co. SCARC W8QQO was base station for 34 mobiles on 146.94 in hunt for missing woman, mobiles from Owosso, Midland, Flint and Lansing area assisted in furnishing communication for over 2000 searchers. GRARA W8DC and 11 stations operated SET and all were operated on emergency power. Officers for Lansing Repeater Assn. are W8RQD, pres., W8FSZ, vice-pres.; WA8ILY, secy.; K8ZLP, treas. WB8IFX worked the east coast and Fla. on 6-meter am with 8 watts. *W8SH has a new 20-meter beam.* WB8LWW has a new Advanced Class ticket. WB8IJI also got the A ticket. W8DSW has completed 51 years of ham radio. W8MQT now is W8QB. PON Amateur of the Month and Special Award go to W8DCN. A Brass Plate was installed in Dossins Museum in Detroit in honor of W8EX for his contribution to the Museum. Traffic: (Jan.) WA8PIM 308, WB8IAD 288, W8IBX 269, W8MRM 259, K8KMQ 246, WA8WZF 231, W8GLC 228, K8CKD 143, K8LNE 118, K8DYI 112, WB8FBG 82, WA8ENW 80, K8ACO 79, *W8IZ* 77, WB8KWI 75, W8RTN 73, K8PVC 68, WB8IMI 66, W8OW 54, W8DC 51, W8WVL 50, K8MXC 48, WB8FOO 44, WB8HPZ 42, WB8HQS 41, W8BEZ 40, W8TZZ 40, *W8UFS* 40, *K8ZVO* 37, *WA8EXR* 36, W8LXY 36, *K8JED* 34 WA8KHB 32, W8IYA 30, W8MO 30, W8ZBT 28, W8EU 26 WB8DKQ 23, K8SDA 21, WB8DJS 20, K8WRJ 20, W8DCN 19 W8IUC 18, W8ECU 15, WA8OJE 15, W8TBP 15, W8VIZ 15 W8NOH 14, W8ACW 12, WB8DTJ 12, W8NDI 12, K8JHA 11 K8GOU 10, WB8GWK 10, WB8EHJ 9, WA8MDK 9, WA8WVV 9 W8NDI 8, W8SCW 8, W8VXM 8, K8GXV 7, W8IKL 7, W8QBE 7 WB8ICN 6, WB8ICU 6, K8KCF 6, W8SH 6, K8QOJ 4, WB8DRT 2 (Dec.) WA8VXE 45, WB8IJI 8.

OHIO – SCM, William E. Clausen, W8IMI – Asst. SCM: Kennett L. Simpson, WA8EPX. SEC: W8QUU. RM: WA8WAK. PAM

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Net	QNI	QTC	Sess.	Freq.	Time(Z)	Mgr.
OSSBTN	3284	1697	96	3972.5	1530/2100/2315	K8UBK
BN	727	520	66	3577	0000/0300	WA8WAK
O6MtrN	526	122	37	50.16	0200	WA8ADU
OSN	265	85	31	3577	2325	WA8WAK
BN RTTY	213	218	32	3605	2300	W8SZU

New appointee: WB8GZL OVS. Renewals: K8QYR OPS; WB8CLF, WA8GRR, W8SZU, W8QCU, W8ELU, ORSs. The 1973 Simulated Emergency Test is history but there is still an important job to be done – *to evaluate our performance and correct the mistakes and* weaknesses the test uncovered. Plan to attend the ARPSC forum at the Dayton Hamvention and participate in a critical review of the SET. WA8MCR has been appointed asst. mgr. of the Continental Traffic Net, the long haul net in Daytime NTS. New officers of the Champaign-Logan ARC are K8WDA, pres.; WB8BYZ, vice-pres.; W8HFK, W8JXM, W8GKI, dir. Central Ohio AREC was active in Kidney and MD fund drives. K8ONA gave a speech on ham radio at Cleveland State Univ. Correction: WB8GVE was at W8UMD winning the Ohio QSO Party last year. SEC W8OUU reports that we ended 1972 with 718 AREC members and 24 active local emergency nets. OVS WB8GZL worked his 36th state on six meters. WB8JRS and K8CMO, representing Milford High School ARC, promoted ham *radio on a WLYK talk show. Daytime 8RN now meets at 2100Z on* 3940. OO K8RMK reports the arrival of the first harmonic, a girl. EC W8ARW reports the AREC Net in the Greenville area meets Mon. at 1930 local *time on 145.44.* The Toledo area's *Hamshack* Gossip reports that WA8IJI worked JA7AO on 160 meters, the Critical Bias RC sponsors a monthly two meter FM hidden transmitter hunt, and WA8FWW invites weather net check-ins Tue. *at 2100 EST on 50.168. New officers of the Ohio Valley ARA are* K8TVO, pres.; WB8AEO, secy.; K8WWU, vice-pres.; W8MAL, treas.; K4RZK, trustee. Wanted: an active League-affiliated radio club to sponsor the next Ohio QSO Party – contact W8IMI if interested. Traffic: K8NQW 361, WA8MCR 347, W8PMJ 300, WB8HUP 259, WA8ETX 257, WA8HGH 235, WA8YLW 235, WA2ASM/8 198, WA8WAK 196, W8CHT 173, K8UBK 169, K8MLO 167, WB8KKI 146, W8CUT 142, W8MGA 140, WB8MKZ 102, WA8ITW 100, W8VIT 97, W8ENI 93, WA8VWH 91, W8JD 90, WB8KZD 90, W8OUU 85, W8IGD 83, WA8UPI 80, W8DDG 76, W8VND 72, WB8JEL 67, WA8DWL 65, W8GVX 65, WB8CSH 64, WA8ADU 63, WB8ALU 61, WB8IBZ 61, W8MOK 61, WB8CWD 60, W8OE 59, K8BPX 57, WA8MIH 57, W8WEG 57, WB8IXD 55, WA8SED 54, WB8KXV 52, WB8ECT 51, WB8JGW 51, WA8ESX 46, W8SUS 46, WA8YIB 46, WB8AYC 44, WA8YXB 42, WA8MHO 40, K8JDI 34, WB8GGR 29, K8CKY 26, WA8ETW 26, W8GOE 25, WB8AJC 24, *K8BNL* 23, *WB8FWF* 23, *W8LZE* 23, *WA8BCX* 19, *WA8GRR* 15, W8ARW 14, WA8LAM 14, WB8FAI 13, WA8KPN 12, WA8SSI 11, K8DHJ 10, WB8CLF 9, WA8ECQ 9, W8MGC 8, WA8MAZ 7, K8QYR 7, WB8GZL 4, W8PBS 4, K8RXD 4, W8ETU 3, WB8MXU 2, W8DYF 1, W8BHL 24.

HUDSON DIVISION

EASTERN NEW YORK – SCM, Graham G. Berry, K2SJN – Asst. SCM/PAM: Kenneth Kroth, WB2VIB. SEC: W2URP. RMs: WA2VYS and WA2FBL. RTTY RM: K2DN. Nets: NYS daily at 0001Z and 0300Z on 3.675 MHz; Empire Slow Speed (ESS) daily at 2300Z on 3.613 MHz (10 wpm); Novice Training Net Mon. 3.677 MHz at 7:45 P.M. local time, 0045Z Tue.; RTTY Net daily 3.615 MHz at 2330Z; NYSPT&EN daily on 3.925 at 2300Z. Appointments: K2YJL, EC for Orange County, WB2HZY as ORS. Communications Club of New Rochelle installed 1973 officers and directors, heard Hudson Division Dir. K2SJO at Jan. session. Harmonic Hills RL heard NY Telephone Co. on "Most Complex Machine in the World." Westchester ARA heard Ray McNabb, of U.L., on "Basic Safety Practices." Albany ARA heard talk on CATV Systems from Frank Noessle. Schenectady speaker WB2EAF on *"Shack Measurements." Officers at RPI (W2SZ) Club are WA2FBI*, pres.; WB2BXP, vice-pres.; WA2HBP, secy.; WA2YGA, equip. super.; W2GH, faculty advisor. Regret to report W2GWY Silent Key *on Jan. 20.* SEC W2URP *"went commercial"* via *WTRY am and fm* tapes during SET to explain AREC function to general public. NCS stations for RTTY Net include W1QRZ, W2IGL, W2NQW, W2SAS WB2EEX and K2DN as backup. Seven states checking in regularly! WA2MID worked first W7 via RTTY. Please note WA2SVH helper K2BK in his recent win – not UH as printed. WB2JAM, WA2BWF WN2EEO, WN2KJT running W2NVB operations. WA2FBI has 2-meter fm in car. WB2FBF working on Division PR setup; runs net on 3.925 Sun. 2200 GMT for mutual help. WA2RAU to So. Pacific

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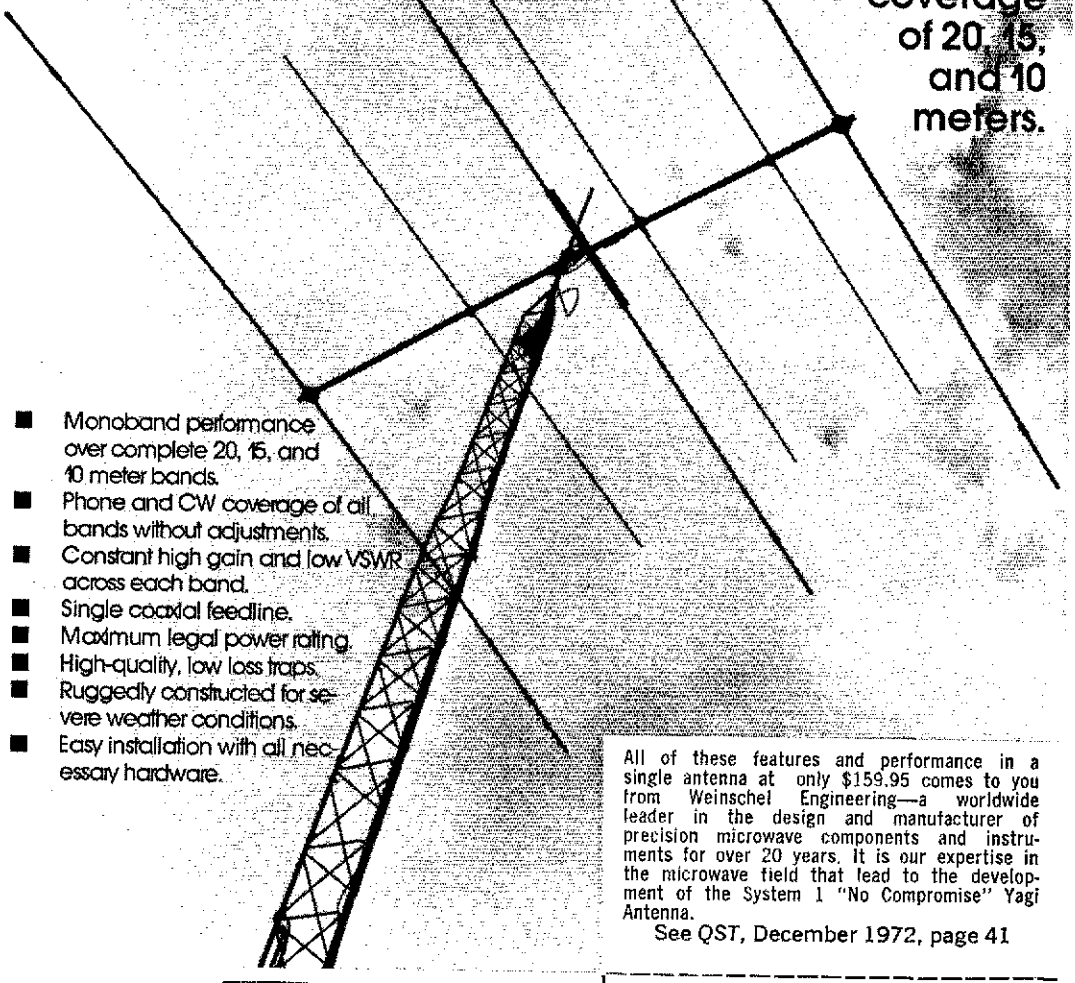

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See QST, December 1972, page 41

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on brief trip at month-end. Thanks to many stations heard active in SET. But why – why – no EC volunteer after 5 years asking for Putnam and Dutchess Counties? You can have emergencies, too – and need AREC. Aw, go ahead – contact W2URP or your SCM and get going! And section Novices – keep your ears open for Novice AREC net now trying to get off ground. Details later. Traffic: (Jan.) WA2CNE 315, W2URP 296, W2SZ 227, WA2LIK 135, W2GPH 72, K2SJN 62, K2UYK 51, WA2WGS 42, WB2CUH 41, WB2LZZ 41, WA2SVH 37, WB2IXW 26, WA2FBI 24, WN2EEO 21, WA2EAH 12, K2HNW 11, WB2AEQ 10, WB2HZY 10, WA2REP 9, WB2LXC 7, WB2NME 7, WB2PBP 6, WB2JLR 6, WB2KLY 2. (Dec.) K2DN 81.

NEW YORK CITY AND LONG ISLAND – SCM, Fred J. Brunjes, K2DGI – SEC: K2HTX. RM: WB2LZN. PAM: WA2UWA. VHF PAM: WB2RQE.

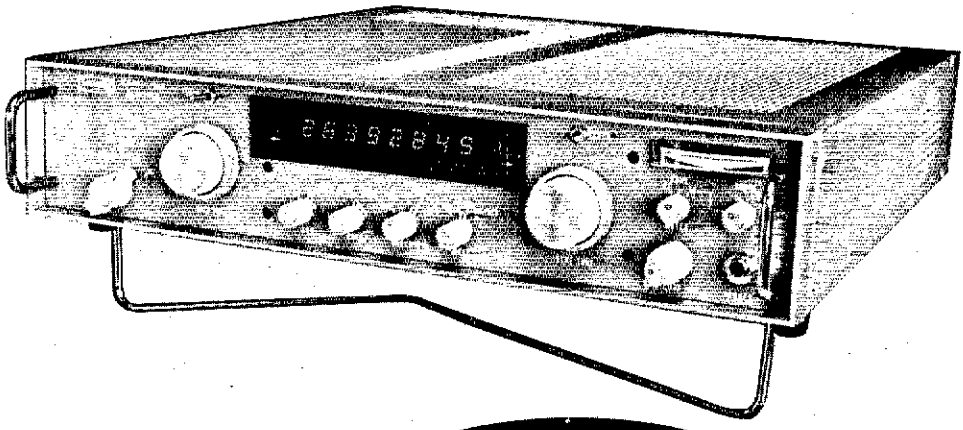
NLI*	3630 kHz	1900/2200 Dy	WB2LZN RM
NLS*	3730 kHz	0830 Dy	WA2CLB Mgr.
VHF*	148.8 MHz	1930 MTWTF	WB2RQE PAM
NLI Phone*	3932 kHz	1600 Dy	WA2CXY Mgr.
Clear House	3925 kHz	1900 Dy	WA2VYT Mgr.
All Svc.	3925 kHz	1400 Dy	W2OF Mgr.
Mic Farad	3925 kHz	1100 Dy	W2OE Mgr.
NYSTPEN	3925 kHz	1800 Dy	WB2QAP Mgr.

*Denotes section nets; all times are local! While attending the Southeastern Division Convention in Miami, I had the pleasure of meeting many former members of our section along with others who had been enjoying the sunny weather while on vacation in the area. Some of those met at the Convention were: K4GFK (W2IFR), W4LEP (W2OBU), K4NI (K2ND), K2DEL, W2AEV, WA2GPT, K4EGN (W2FOZ), W4CAZ (W2DID), WB2CDV/4, and W2TUK, *W1NJM, WA2INB of the Hq. staff.* Glad to report that 'ol *W2BCB* is coming along nicely, and is able to put some time in on amateur radio again! Other happenings around the section come in from WB2UZU, who is among the first 12 to qualify for ARRLs' new certificate for 1000 points via Oscar VI. Congratulations! This was accomplished without special antenna structures and power; so if you have 2- and 10-meter capability and some patience, you might *give it a go for a change of pace! Hope I can report you as the* second station from NLI to achieve this award? WN2COW has completed building an HD-10 keyer, and hopes you won't mind him sounding a bit QLF until he gets in some practice! W2AWK is showing off his new DXCC-300 sticker to all who are willing to be a little frustrated DXers. WN2UDS is no longer; upon passing his General Class exam he now is WA2UDS. Congratulations to all! K2HK has up and went to Fla. for a mid-winter vacation, and W2PF cruised on the QE II to the Carribean and YV-Land (the shame of it – hope they got a sunburn)! WN2LIG reports receipt of 25 wpm sticker certificate and is shooting for 30 wpm! And W2BOP's new *10 through 75 vertical is working nicely for him. W2ORM has been* appointed EC for the Township of Islip; and K2VGD has been appointed ORS. The Staten Island Amateur Radio Assn. has a new slate of officers: K2KQZ, pres.; WA2IAF, secy.; W2EUY, treas. SIARA also has a club activity on 145.62 MHz each Mon. at 2100. The Huntington VHF Society, operators of the 16-76 repeater, WA2UZE have moved the repeater's frequency to a "club" *frequency to relieve the heavy service on the equipment* by non-member users. This leaves the 16-76 repeater pair relatively clear in the Conn.-L.I. area. I would suggest coordination with the Northeast Repeater Assn. before planning on using the pair. Area NERA representative is K2AHP of NYCRA. K2OVS has recently received an OVS appointment after many years experimenting on the vhf-uhf frequencies. BPL: WB2WFJ. Traffic: (Jan.) WB2WFJ 419, W2GKZ 373, WB2LZN 301, WB2OYV 191, W2EC 175, WA2CLB 171, WB2CHY 103, WB2LGA 86, WB2ROE 63, WN2COW 40, WA2PLI 38, K2JFF 34, WB2BYY 27, K2VGD 17, W2BCB 10, W2EW 8, K2HK 6, W2PF 6, W2DBQ 5, WA2MDX 3. (Dec.) WA2CLB 193, WB2UFG 137.

NORTHERN NEW JERSEY – SCM, John M. Crovelli, WA2UOO – SEC: K2KDQ. RM: W2ZEP. PAMs: K2KDQ and WA2FVH.

Net	*kHz/Time(PM)/Days*	*Sess.*	*QNI*	*Tfc.*	*Mgr*
NJN	3695 7:00 Dy	38	576	426	W2ZEP
NJN	3695 10:00 Dy	31	276	186	W2ZLP
NJSN	3730 8:15 Dy	21	28	12	WB2RYD
NJPN	3950 6:00 M-S	17	730	361	WA2FVH
NJPON	3940 6:00 Su	4	87	43	WB2FJF
PVTEN	145710 7:00 Dy				K2KDQ

New appointments: WB2IEC as OO; WA2OKX EC for Rahway and vicinity; WA2JUI OVS; WA2ATO and WA2GAX OBSs. Endorsements: K2BMI, WA2CCF, W2FJK and W2TPJ as OOs. *K2DQT, K2KDO and WA2SOQ ECs; WA2JNQ, WB2NSV*



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WB2RKK and K2RXQ ORSs; K2KDO OBS; WB2JYM OVS; K2KDQ PAM (vhf). OO reports received from K2BMI, WB2IBC, WB2TFH, W2TPJ and WA2APG. The N.J. DX Assn. elected W2RGV, pres.; WB2UKP, vice-pres.; W2ZTV, secy.; W2JLH, treas. for 1973. The Morris Radio Club likewise elected WA2ZVX, pres.; K2BHK, vice-pres.; WA2QCE, secy.; W2COL, treas. WN2TMA has been elected pres. for the Fair Lawn Radio Club. The Scotch Plains RACES group handled radio communications for a Boy Scout event at Watchung. Active were W2KOG, WA2BMR, K2QAU, WB2ZCU, W2CZM, WB2HMR, W2NVA, K2OTX, W2ZDP, WA2FXB and FC W2NKD. W2CVW now on 6-meter ssb with a new Yaesu FT-650. WA2SRQ built two more IC keyers this month. WB2AEH acquired an SB-200. K2SLO active on 2 fm fixed/mobile with a new TR-22. WA2MAP using his Comm. IV on 2 fm/am. WA2QPW now portable four near Orlando. All NJ Traffic nets were active during the 1973 SET. The exercise pointed out the need for more emergency power readiness. K2BMI has a new 75-S3 for OO chores. K2KDQ was appointed First District Coordinator for Navy MARS. K2IEL on the air with the Kenwood Twins. Congratulations to WB2HGV on passing Advanced and WA2EXX on General Class exams. WA2RYD still needs Colo. and Mont. confirmed for WAS. The Fair Lawn Kiwanis Club enjoyed a talk on Amateur Radio given by WA2OZF and W2NQT. WA2CAK trying hard for BPL. WB2BMR has a new QTH and his XYL studying for her General. W2FJK and his XYL put up a new 75-meter inverted "V." W2JVU is active on 2 fm with a Drake rig. WA2RYD reports NJSN looking for stations of all classes to participate in traffic handling at slower speeds. NJPN liaison with NJN functioning very well. WB2CST received a 2RN certificate. WA2EXX is the new pres. of the Don Bosco HS ARC. BPLs for Jan. go to WB2CST and WA2RYD. Traffic: (Jan.) WA2RYD 441, WB2CST 358, WB2DDQ 308, WA2EUO 238, WB2RJJ 179, WB2AEH 167, W2ZEP 116, WA2CAK 108, WA2SRQ 77, WA2UOO 74, W2CU 69, WA2MJG 55, K2ZFI 19, WB2NOM 16, WB2COV 13, W2CVW 12, WA2CCF 9, WB2CFT 9, WB2HGV 6, WA2QJU 3, WB2WNZ 2. (Dec.) WA2SRO 106, K2OOJ 48, K2KDQ 28, K2DEL 4.

MIDWEST DIVISION

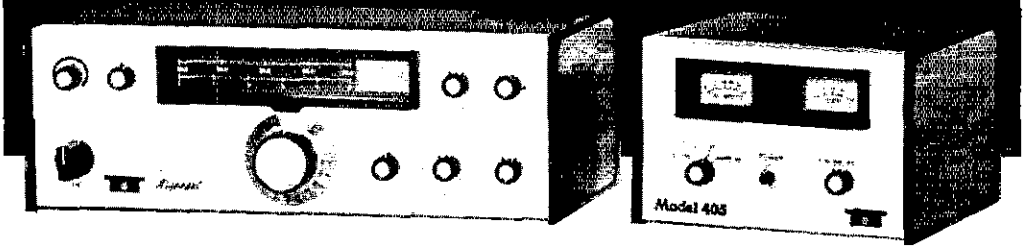
IOWA – SCM, Al Culbert, KØYVU – It is with mixed emotions that I announce the resignation of KØLVB as SEC, who has done a remarkable job of restructuring our AREC/RACES organization in Iowa. Gregg will be succeeded as SEC by KØCLI who is no stranger to many of us who have been active on 75 for many years and is a former EC. Congratulations to the O'Brien County Amateur Radio Assn. upon becoming an ARRL affiliate. WØIZO reports the 3900 Club membership now has reached 150, but adds there is always room for more, give a check at 3900 kHz at 1500Z and Sun. for more details. I wish to remind groups within the section who are planning sponsorship of an activity which is deserving of publicity in this column, to allow 3 months lead time for publication. WBØDTD got a rush on spring fever and has been readying his TR-4 for mobiling. WØMOO has moved from Lisbon to Mt. Vernon. WAØAUX has been appointed trustee of the Camp Sunnyside station by the Iowa Hand-Ham System, which will play an important part in the Pony Express Fund drive in late Mar. WAØDYZ has a new job. Early reports on SET not too exciting for Iowa.

75 meter net (noon)	ONI 1646	QTC 98
75 meter net (eve)	ONI 1168	QTC 63
Tailcorn (cw)	ONI 182	QTC 96
Interstate (cw)	ONI 76	QTC 3

Traffic: KØDDA 368, WAØAUX 203, KØAZJ 139, WAØTAQ 56, WBØDBG 24, WØMOQ 22, WØWSV 16, WBØBPH 14, WBØAVW 12, KØYVU 12, WAØZVF 12, KØCNM 9, WØBW 8, WAØOTQ 6, WBØDTD 3, WAØEFN 1.

KANSAS – SCM, Robert M. Summers, KØBXE – SEC: KØIMI. PAMs: WØGCJ, WBØBCL. RM: KØMRI. VHF PAM: WAØTRO. It appears that while BPL is fresh in the minds of our newer traffic handlers, traffic totals will be high for a few more months. Congratulations to WNØGQL, WNØFSL, WNØITR, WNØGVR and KØPSD, on their efforts towards BPL. Many thanks to WBØLA with a count of 401 but no BPL and to the other top traffic *handlers of Kans. for a job well done. The grapevine tells me that* WA2HSP will be operating a KL7 slant instead of /Ø come summer. The Lawrence Repeater has now changed frequency to 146.16-146.76 MHz; Winfield Repeater on same frequency. WAØTKJ received last OSL for 5BWAS. OKS SS looking for more Novices to join the net. Kans. City appears to be the only main area now covered. Join the gang on 3735 kHz daily 0200Z. WNØGQL has started a YL net on 7123 kHz 1400Z Thur. The SET has settle

The Argonaut has a stalwart new companion—a Solid State Linear!



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and results have begun to appear. It looks like a good exercise for some zones. Mid States Mobile Monitor Service has another fine month QNI 1580 including 57 mobiles, 60 QTC and 59 calls or phone patches in 93 hours of operation. HBN will be reporting via Kans. activities for 6 months with Jan. QNI 538 and 68 QTC. HBN still meeting 1830 CST M-F on 7280. Kans. reports for Jan. KWN QNI 142, QTC 162. QKS QNI 621, QTC 323; QKS SS QNI 278, QTC 514; KPN QNI 222, QTC 14 and KSBN QNI 1025, QTC 89. Traffic: WBØEAF 401, WNØGQL 299, WNØFSL 298, KØMRI 281, WØHI 238, WAØHTR 218, WNØGVR 211, KØPSD 189, WBØHBM 163, WØINH 154, WØCHJ 128, WØNEE 91, WAØLLC 90, WØPB 81, WBØCZR 80, WØMA 78, KØFPC 53, KØJMF 48, KØBXF 46, WAØSRQ 35, WAØUXI 32, WNØHTH 28, WØRBO 27, WØCCJ 26, KØZHO 26, WAØYXK 23, WAØZTW 21, WAØSXR 20, WAØUMZ 19, WAØTAS 14, WWBØCUY 13, WAØYMK 12, WAØWJX 11, WBØEEJ 10, WØFDJ 10, KØLPE 10, WØNYG 10, WAØTKJ 6, WØBLI 5, WAØOWH 5, WAØTRO 1.

MISSOURI – SCM, Robert J. Peavler, WØBV – SEC: WØENW. Appointments renewed: KØAEM as EC, WAØNVZ as OO. New appointments: WAØITU as OO III and IV, WAØWOC as ORS.

Net	*Freq.*	*Time(Z)/Days*	*Sess.*	*QNI*	*QTC*	*Mgr.*
MNN	7040	1900 Dy	31	77	36	WØGBJ
MoPON	3963	2300 M-S	28	813	66	WAØTAA
MoSSB	3963	2400 M-S	28	2171	102	KØHNE
MON2	3585	0345 Dy	31	151	78	KØAEM
MON	3585	0100 Dy	32	192	213	KØAEM
MSN	3703	0130 T-S	34	139	57	KØBIX
		2200 Su				
WEN	28.6	0130 M	7	35	49	WA5KBH/Ø
PHD	50.45	0130 T	5	83	11	WAØKUH
JCAREC	146.94	0330 1	5	30	1	WAØRVT

Operation of MNN was suspended as of Jan. 31; my sincere thanks go to WØGBJ for his devoted service. The Missouri College and Univ. Net started Feb. 5 on 3963 kHz, with sessions at 1830Z Mon. through Fri. My thanks to all who participated in the 1973 SET; it was a great success. KØONK handled about 100 messages during the Nicaraguan earthquake disaster. KØTOV is being transferred to Ohio. WØGBJ, WØOUD, WØRTO and WØRTW were listed in QST 18 years ago and are still very active; there must be more such amateurs in Mo. and I am grateful to them all for their service to amateur radio. KØRPH, WØNL, WBØBBD and WBØHOE, representing the Jefferson City Club, presented a Field Day trophy to WAØKDE, pres. of the Warrensburg Club. Traffic: (Jan.)KØONK 1129, KØAEM 327, KØBIX 248, WØBV 206, WØOUD 115, WBØCXN 100, WØGBJ 62, WAØVBG 60, WBØFQM 57, KØPCK 34, WAØWOC 22, KØENH 18, KØSGJ 15, WNØGAQ 11, WAØKUH 10, WNØGQP 9, WØNUB 8, WAØJOG 5. (Dec.) WBØCXN 73.

NEBRASKA – SCM, V.A. Cashon, KØOAL – Asst. SCM: Velma Sayer, WAØGHZ. SEC: KØODF. Appointment: WØDJO as PAM. Endorsements: WAØJUF, WØNIK, WAØGHZ, WAØLOY as PAMs; WØCXH, WAØEEI, WAØIBL, WØIRZ, WAØLLQ, WØVQR, WØWKP ECs.

Net	*Freq.*	*GMT/Days*	*QNI*	*QTC*	*Mgr.*
NSN I	3982	0030 Dy	1423	39	WAØLOY
NSN II	3982	0130 Dy	826	37	WAØLOY
Neb. 160	1995	0130 Dy	576	344	WAØCBJ
NMN	3982	3982 Dy	1283	28	WAØJUF
WNN	3950	1400 M-S	564	44	WØNIK
AREC	3982	1430 Su	196	5	WØIRZ
CHN	3980	1830 Dy	1085	65	WAØGHZ
SHN	3950	1930 Dy	200	13	WØDJO
DEN	3980	2100 M-F	563	11	WAØAUX

Congrats to KØYRL and XYL on new harmonic. Welcome back to WØTAS and KØYTY. Officers of Lincoln RC: WØASM, pres.; G3UGH/WØ vice-pres.; WØJCP, secy. AK-SAR-BEN RC: WAØVEE, pres.; KØJIU, vice-pres.; KØUIV, secy. Novice classes being held by Ogallala hams. WØABI retiring to Ark. AK-SAR-BEN RC presented 30 year membership certificates to WØABI, WØYMU and WØFQB. Scoutmaster KØPTK with the help of KØUOK showed members of his troop how amateur radio worked. WØZYJ operating new HW7 ew QRP and having a ball on 15 meters. WAØOWU operating new HW-101. WAØJIH on 2 meters. WØHOZ and KØODF plan to erect 2-meter beams. Box Butte Co. 2-meter AREC Net QNI 10, QTC 1. Traffic: WAØCBJ 65, WAØQEX 54, KØODF 47, WAØIXD 44, WØNIK 34, WØAIY 29, WBØCAU 28, WØZJF 28, KØOAL 25, WØCSW 20, WØVYX 20, WØNHS 19, WØVEA 18, WØGEQ 16, WØMW 16, WØDMY 15, WØFQB 15, WAØGAT 14, WAØGHZ 14, WØEFV 13, WØELO 12, WØZOU 12, WØHTA 10, WAØJKN 10, WØLWS 10, KØFJT 9, WØWKP 9, WAØBOK 8, WAØDXY 8, WØYFR 8, KØDGW 7, WAØHAL 7, WØPQP 7, WAØEEI 6, KØHNT 6, WØLJO 6, WAØOQX 6, WØDJO 5, WØHOP 5, WØFOW 4, KØIXY 4, WAØJIH 4, WAØVIT 4, WØWZR 4, WØHQZ 3, WAØLOY 3, WAØYGZ 3,

Test Equipment Sale

The following used and recalibrated equipment is offered subject to prior sale, F.O.B. our plant in Mamaroneck, New York. All units are guaranteed in good operating condition.

Hewlett Packard

175A Scope	$ 775.00
712B Power Supply	135.00
526B Time Interval Unit	85.00
200 AB Oscillator	125.00
210 B Audio Oscillator	75.00
524C Counter	900.00
525A Frequency Converter	140.00
200C Audio Oscillator	80.00
200 CDR Audio Oscillator	135.00
560A Digital Recorder	575.00
561B Digital Recorder	685.00
580A Digital Analog Converter	170.00
5261A Video Amplifier	300.00
410BR VTVM	115.00
410B VTVM	115.00
41A VTVM	225.00
187C Probe Kit	515.00

General Radio

1750-A Sweep Drive	365.00
908-R96 Dial Drive Unit	50.00
1001A Signal Generator	595.00
1419B Decade Box	50.00
1555A Sound Meter	415.00
W10MT3W Variac	75.00
667 A Inductance Bridge	195.00

Measurements Corp.

71 Square Wave Generator	75.00
111B Crystal Calibrator	50.00
65B Signal Generator	375.00
82 Signal Generator	375.00

Transistor Specialty

673 Transistor Tester	585.00

Electro Instruments

3400 Digital Voltmeter	225.00
3010 AC Converter	375.00
3000A Power Unit	375.00

Textronix

565 Dual Beam Scope	$ 1,875.00
2A60 Plug-in Amplifier	75.00
3A3 Plug-in Amplifier	300.00
545A Scope	875.00
Type L Plug-in Amplifier	125.00
541A Scope	585.00
541A Duplicate Scope	585.00
53/54K Pre-amplifier	50.00
80 Vertical plug-in unit	20.00
3A72 Plug-in Unit	310.00

Berkeley

Series 5000/7000 Counter	225.00

Marconi

TF-1245 Q Meter	300.00
TF-144H Signal Generator	425.00

Boonton

250A RX Meter	1,050.00
260A Q Meter	575.00

Lambda

No. 25 Power Supply	20.00
1510M Power Supply	150.00
1500M Power Supply	120.00
29MPower Supply	30.00

Ballantine

305A AC VTVM	125.00
314 AC VTVM	150.00
314AC VTVM	150.00
300D S/2 Voltmeter	60.00
310A Voltmeter	65.00
317 AC VTVM	150.00

Wandel Gottermann

LDS-2 Transmitter	4,500.00
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NEW ENGLAND DIVISION

CONNECTICUT – SCM, John McNassor, W1GVT – SEC: W1HHR. RM: K1EIR. PAM: K1YGS. VHF PAM: K1SXF.

Net	*Freq.*	*Time/Days*	*Sess.*	*QNI*	*QTC*
CN	3640	1900 Dy 2200	66	753	661
CPN	3965	1800 M-S 1000 Su	36	763	443
VHF 2	145.98	2200 M-S	26	81	29
VHF 6	50.6	2100 M-S	23	96	10

High QNI: CN – W1BYW, W1EJI, WA1FCM, WA1GFH, W1KV and W1MPW. CPN – W1BFY, W1GVT, W1MPW, WA1NLD and K1SXF. SEC W1HHR extends thanks for the many SET messages and would appreciate ARFC reports covering your activity. Dir. W1QV will consider your comments and suggestions if you send a letter with details. The activity of the month was the SET – another Winter Field Day! All nets overly active with special Newsletters from RM K1EIR and PAM K1YGS and the suggestion from VHF PAM K1SXF to make better use of the Nutmeg VHF Traffic Nets. 6-Meter outlets will cover the state with ease and 2 meters can be used much more. Be ready for next year! Tri-City 10-Meter Net Sun. 9 P.M. on 28.550, everybody welcome! Congratulations to: K1EPW for Extra Class; WA1QMI Advanced Class; W1EJI for 35 wpm; WA1FCM and WA1PHJ for Jan. BPL and to ARRL Affiliated Clubs: Greater Norwalk ARC, Glastonbury ARC, Jared Eliot School ARC and Newington High School RC! Appointees received special Newsletters from ARRL – please request renewal to continue on the list. For the sake of change, at least one day each year, all AMers should operate on ssb, FMers on RTTY, and phone operators on cw – the time is NOW – BCNU?! Traffic: WA1FCM 456, W1EFW 379, W1EJI 369, WA1GFH 280, W1MPW 232, WA1PIJ 214, W1CTI 201, WA1NLD 200, W1AW 125, W1DGL 110, W1KV 104, W1GVT 78, K1EPW 77, WA1OPG 73, W1YL 67, K1SXF 65, W1DQJ 51, WA1NYU 51, WA1GGN 46, WA1JCN 44, K1DGK 40, WA1HYN 33, W1BDI 31, W1QV 19, W1RML 11, WA1OPB 9, W1CUH 6, K1ZND 4, W1CWA/1 1.

EASTERN MASSACHUSETTS – SCM, Frank L. Baker, W1ALP – SEC W1AOG in Fla. I received many SET messages. W1CVM, K1TFN, W1IBY, W1UE, W1TQQ are Silent Keys. W1ELW is W1TQQ's son. K1BUF teaching and at grad school. W1VN got married. On Apr. 1, W1NF celebrates 70 years of hamming! WA1QQQ is the son of W1RRR. EMPN is on 3898 at 6 P.M. 5 days a week. 19 Club met at W1MNK's. W1YCV retired. WA1KDL now in Westwood. WA1CTR still active in Navy MARS, also K1AAO and W1LF. DK3YJ here for training. WA1QPD active at W1SW. South Shore Club will have an auction on Apr. 19 and Ladies night on May 17. OA1CP/OA4, HC2OK, 112WTC visited W1MD. W1BHD is on SSTV, FAX, RTTY. BPLs: W1PEX, WA1NNL, WA1MSK. K1EPL has SSTV capabilities. The PI-Net of the Middlesex ARC meets Wed. 8 P.M. on 28680. New officers of Massasoit ARA W1WLZ, pres.; W1ECK, vice-pres.; WA1NHI, secy.; W1LJH, treas. W1KVO is retired. The Fall River and New Bedford boys have an informal net daily on 51 MHz at 7 P.M. WA1IFE has an SR-42A on 2. WA1PCH visited Guyana and met 8R1D, also wrote article on Ham Radio for Highland Park Free School paper. WN1RGS, WN2FBW, WN2DBC, WA1NKE active in Phillips Academy RC. K1SLZ working in Ohio. WA1MQP working DX. WA1JGG active on several bands. K1MVT on 5 bands with SB-200. W1DFS home from the hospital. W1LAV buying an SB-102. W1EHS in the hospital. W1KSB/4 in GA. WA7NLF is ex-W1FOG. Quannapowitt RA held a meeting with a film and talk by W1DAL. W1BHD is dir. of club. K1CCW is an Asst. Dir. for W1QV. WC1MAR on the air and worked quite a few from Wellfleet. WA1NKE is a new OPS. Endorsements: WA1IRY, WA1NNL, W1AX, WA1MJD, W1ABC as ORSs; W1BHD, W1YYZ, K1WVW, K1NFW, W1BAB ECs; WA1NNL, WA1LXE, WA1NDM, W1AX OPSs; WA1MJD, W1BHD OVSs; W1BHD, WA1LXE OBSs. WN1QAA, pres. of Chelmsford ARA says their club wants to exchange newsletters with other clubs. W1QPU is on 2. Murphy's Marauders held a meeting at W1MX. Capeway RC met at W1UOH's QTH. K1KNM got married.

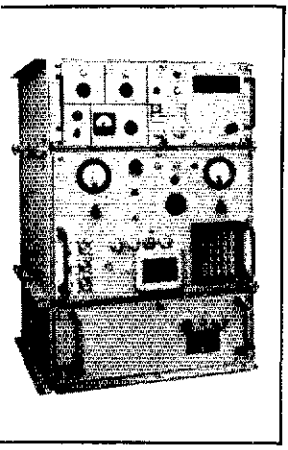
Net	*Freq.*	*Time/Days*	*QNI*	*QTC*	*Mgr.*
EM2MN	145.8	2000 M-F	147	148	WA1OWQ
NEEPN	3945	0830 Su	91	13	K1EPL
EMPN	3898	1800 M-F	129	73	WA1MYA
EMN	3660	1900/2200 Dy	448	402	WA1MSK

WA1RNS/WA2RIN new in Boxboro. K1OQX has made 150 DX mobile contacts, 141 confirmed. WN1RIM has 160 and on 40 and

Give yourself a tactical advantage!

HARRIS

The RF-130 1 KW HF/ISB Transmitter With Plus... And More Plus



When you get right down to
in tactical communications . . .
he need to know and the need
o tell . . . what do you
eally need?

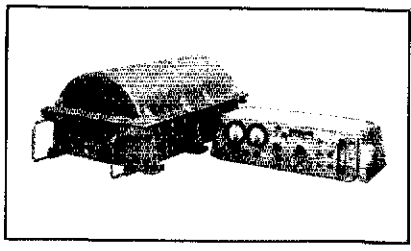
You need narrow-band
ecure voice and high speed data
apabilities. You need rapid
utomatic tuning, power source
exibility, full remote control
apability, and *dependability.*
n short, you need the best the
late-of-the-art has to offer: the
ersatility of the RF-130 1 KW
F/ISB Transmitter.

The RF-130 has exactly what
ou need . . . and more! Modes of
peration include USB, LSB,
ME (compatible AM), CW, and
or 4 channel ISB (DCA or CCIR
ompatible). Plus solid-state
esign, modular construction
ffering ease of maintenance,
nd much more. *Give yourself*
e tactical advantage
ansmitter.

Plus

RF-601A AUTOMATIC ANTENNA COUPLER

If you don't have a broadband antenna available, the advantage you gain from an auto-tune transmitter can easily be lost. The RF-601A Automatic Antenna Coupler was designed to tune whip and long-wire antennas up to 500 feet away. Its accurate and reliable tuning assures frequency changes in less than ten seconds anywhere in the HF band.



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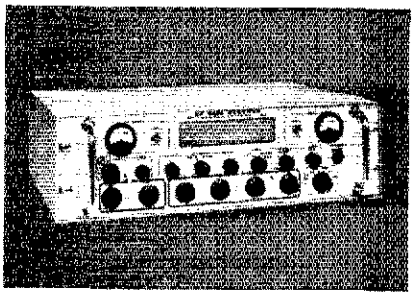
RF-505A HF SSB/ISB GENERAL PURPOSE RECEIVER

The RF-505A, the first really new HF synthesized receiver in over a decade, is the perfect companion to the RF-130 Transmitter. Full coverage from VLF to HF (up to 30 MHz) . . . all solid state . . . LSB, USB, AM, CW, ISB, for reception of voice, telegraph, teletype, facsimile and high speed data signals. Two words describe it: *versatile* and *dependable. Stack it with the RF-130 Transmitter for your tactical advantage.*

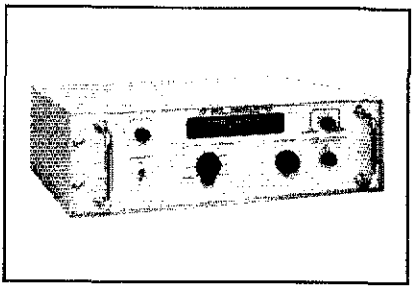


Plus

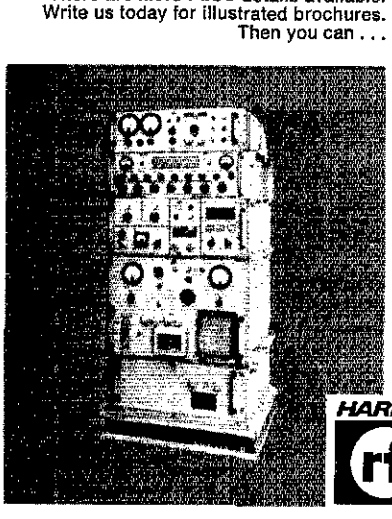
RF-507 PRESELECTOR and PROTECTION UNIT

Critical communications often require transmitting and receiving at the same time, often at relatively close frequencies. This leads to a drop in receiver performance from blocking, intermodulation and cross-modulation, and can even lead to permanent receiver damage. The RF-507 Preselector and Protection Unit is designed to eliminate these problems and increase overall receiver sensitivity and selectivity.

The RF-507 is completely self-contained, including power supply, and is a perfect companion to the RF-505A Receiver/RF-130 *Transmitter, permitting full duplex operation.*



There are more PLUS details available. Write us today for illustrated brochures. Then you can . . .



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80. W1AUQ was on at WC1MAR, also WA1KRI, WA1OTE, WA1OTF, WA1OLK, W1ILP. WA1DYU is trustee for Whitman RC station. WA1ONI talked on filters for power supplies at the Framingham RC. WA1MJD has a new daughter. Ex-W1EEE is now W7ZJ. Traffic: (Jan.) W1PEX 987, WA1NNL 691, WA1MSK 577, W1CE 201, WA1OWQ 164, WA1OML 121, K1PRB 120, WA1IFE 103, W1EMG 100, WA1MYA 71, WA1MYK 70, WA1MXV 43, WA1DJC 30, W1AEC 22, WA1NRT 18, WA1OAM 17, W1LE 14, WA1NKE 13, WA1OZI 13, W1DOM 11, W1ARC 10, K1EPT 8, W1PL 8, WA1PDM 7, WN1RIM 6, WN1RFD 4, K1LCQ 3, K1WVW 2. (Dec.) W1OJM 399, WA1DJC 40, WA1NKE 9, WA1PAZ 1. (Oct.) WA1OMM 145.

MAINE – SCM, Peter E. Sterling, K1TEV – SEC: K1CLF. PAM: WA1PEN. RM: W1BJG. W1AE got off to Fla. the last day of Jan. K1DAP burned the traps out of TA-33 and is now happily working 20 meters with a homebrew ground plane. *W1NND is on* with his new amplifier and doing very well. WA1GTT and XYL WA1ODM are in Ariz. and operating portable 7. The Caribbean Cruise of W1EM in Jan. was cut short – engine trouble on the ship completed trip in Feb., compensation by the company. The Northeast Area Barnyard Net reports 27 sessions, 840 check-ins, 4 traffic for Jan. New hams in Maine are WN1RJU, WN1RDB, *WN1RKM. Congratulations, fellows. W8AQ and W1BXH made their* 50th anniversary with a QSO Feb. 4, 1973 on 7 MHz; each is a golden certificate holder in the QCWA. Interested in an appointment? Get in touch with your SCM. W1BHA, W1SFS, W1CTR visited W1DFS at the V.A. hospital who now is at home. They also visited W1ARR, W1AYI and also QTH of W1KJ. The Portland Amateur Wireless Assn. have moved to their new QTH, 58 Pine St., Portland. We are looking for NCSs for the PTN and the SGN; for details write your RM and PAM. Traffic: WA1QHU 157, WA1JHT 45, WA1NMW 43, K1TEV 30, WA1REM 24, K1GUP 15, W1OTQ 10, WA1PEN 10.

NEW HAMPSHIRE – SCM, Robert C. Mitchell, W1SWX. SEC: K1RSC. RM: W1UBG. New EC for Rockingham Co. is WA1KTD. Endorsements: W1JSM and W1QKA as OVSs; WA1GCE as OO and ORS; K1BCS as EC. Greetings to new hams WA1RJZ, WN1RKH and WA1RKN. W1ISM is the only NH station reporting Oscar 6 activity. He has worked GW3FSP, F9FT, FP8AP, SE1PY, VE1s, 2 and 3 for 71 stations since Oct. WN1QNK will schedule anyone needing NH. *W1GFT was heard working DX on 80 meters.* W1DXB's DXCC now totals over 270. W1UBG reports 151 check-ins and 165 traffic. K1ACL is on 2-meter fm. Fred also looking for RTTY activity on 6 meters. Top check-ins for the CW Net were K1POV, W1UBG and third place tie to WA1MXT and K1BCS. Happy Easter to all. Traffic: K1BCS 712, K1YMH 214, W1UBG 116, K1POV 78, WA1GCE 37, K1EEH/1 21, WA1KOW/1 *21, K1WQV/1 20, K1VXX/1 19, WA1JSD 17, WA2KVU/1 11,* W1SWX 7, K1ACL 3, W1YWC 2.

RHODE ISLAND – SCM, John E. Johnson, K1AAV – SEC: W1YNE. PAM: W1TXL. W1JFF has been appointed Network Coordinator for Southeastern Mass. Territory for The American Red Cross and was very active in the recent SET. Also participating were W1s TXL, JAG, BLS, AGB/1; K1s VPK, AUN, AUO, YMC. SSI, UER; WAIs DRB, CSO, KUU, HXJ, BQO and WA5EXE/1. Mobiles were WA1OSL, WA1AUL and K2GIG. Operating Net Control station was W1JFF with WN1QOT as log keeper for station WA1EXU. K7ICW is interested in contacting any R.I. station on 160 meters. He needs R.I. for his 160-meter WAS. WA1RKQ now has his General Class ticket; WA1RJY and WA1RKR are new Techs and WN1RKL is a new Novice. If your club has any information about future events send them to the SCM for publication. Traffic: (Jan.) K1QFD 21, WN1QAW 14. (Dec.) K1QFD 20.

VERMONT – SCM, James H. Viele, W1BRG – SEC: W1VSA.

Net	*Freq.*	*Time(Z)/Days*	*QNI*	*QTC*	*Mgr.*
VTSB	3909	2300 M-S 1230 Su	552	197	W1ZCJ
VTPO	3909	2200 Su	92	34	K1BQB
Carrier	3932	1400 M-S	618	30	W2QWP
Gr. Mt.	3932	2200 M-S	450	32	W1JLZ
VT Phone	3932	1430 Su	85	11	W1JLZ

Welcome new amateurs WN1RKG, WN1RMD and WN1RME, father and son. WA1PYA received General ticket and moved to Mass., but operates week ends from Vt. He is looking for skeds 80-10 with stations needing Vt. WA1HSG appointed PAM for Vt. W1KOO has 450 MHz repeater on the air. 444.4 in and 449.4 out. Carrier Net had all time record check-ins in Dec. Most stations on am. Traffic: K1BQB 266, WA2DZG/1 20, W1KVK 4.

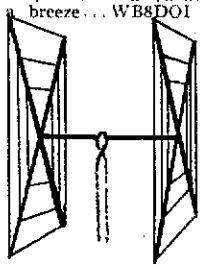
WHICH ANTENNA WINS THE CONTEST ?

In open competition against thousands of commercial and home-brew antennas, WA1JFG won the New England championship with a Gotham beam, by a margin of 5,982 points! WB2JAM won the sectional award for the Sweepstake contest in 1969 and 1970 with a Gotham 4-element 15-meter beam! Hundreds of unsolicited testimonials from grateful hams are our proof that Gotham antennas give you the best design, and the best materials. Forget our low prices — rely on the results op open, competitive contest. Ask yourself: Why do Gotham antennas win?

In QST since '53 without missing an issue!

QUADS

Totally satisfied with quad. Worked DK4VJP, SM7DLH, XE1AB, DM4SEE, FL8SK, FO8AUM, HK7YB 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.

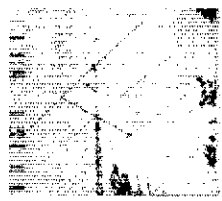
Now check these startling prices — note that they are much lower than even the bamboo-type:

10-15-20 CUBICAL QUAD	$41.00
10-15 CUBICAL QUAD	36.00
15-20 CUBICAL QUAD	38.00
TWENTY METER CUBICAL QUAD	31.00
FIFTEEN METER CUBICAL QUAD	30.00
TEN METER CUBICAL QUAD	29.00

(all use single coax feedline)

BEAMS

"Just a note to let you know that as a Novice, your 3-El. 15 Beam got me RI Section Winner and New England Division Leader in Novice Round-up. See June QST, p. 57 for picture of ant. (below). Tnx for a fine working piece of gear. 73s, Jay, WA1JFG"



Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history! Each beam is brand new! full size (36′ of tubing for each 20 meter element for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅞″ 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	$25	4 El 10	$24
3 El 20	31*	7 El 10	38*
4 El 20	38*	4 El 6	24
2 El 15	21	8 El 6	34*
3 El 15	25	12 El 2	31*
4 El 15	31*	*20-ft. boom	
5 El 15	34*		

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, WB2FGB, W2YHH, VE3FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3KT. Moral: It's the antenna that counts!

***FLASH!* Switched to 15 c.w. and worked KZ5IKN, KZ5OWN, HC1LC, PY5ASN,FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5CLK, OZ4H, and over a thousand other stations!**

V40 vertical for 40, 20, 15, 10, 6 meters $18.95

V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters $20.95

V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters . . $22.95

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WESTERN MASSACHUSETTS – SCM, Percy C. Noble, W1BVR – SEC: WA1DNB. CW RM: W1DVW. PAM: WA1ITL. UHF VHF PAM: W1KZS. All nets were very active during SET (best ever). WMEN held 4 Sun. sessions with QNI of 44. WMN held 31 sessions with QNI of 187 and traffic 189. During SET reported traffic on WMN totaled 61. WMPN held 21 sessions with QNI of 128 and traffic 7. Three SET sessions were held with QNI of 21 and traffic 23. All W.Mass. 2-meter repeaters also very active during SET. Section net certificates have been issued to the following WMPN members: WA1ITL, K1RGQ, W1ESG, K1MAL, W1GQP, W1BVG, W1KZS, WA1MBX, W1NLE, WA1LNF, K1PKZ, W1OBA. New OPSs: K1RGQ, W1BBI. New ORS: WA1OUZ. W1ZPB made BPL in Dec. New OO K1VHO is doing one whale of a job. HCRA reports speaker of the month was W1YNC of ARRL. MARC says speaker of the month was WA1KRJ. Mt. Tom RA new members are K1FKX, WA1RHE, W1RRW, K3RFF, K1VKP, K1ZGB. Somebody there sure did a job getting 5 pages of calls and handles of 2-meter fm operators. Congrats! Notice: Mt. Tom ARA will hold an auction of radio equipment on Apr. 23. Details from WA1BWF. NOBARC says that on Jan. 6 the old repeater on Mt. Greylock was removed and a new one installed. Those involved were W1VMK, WA1KJI, WA1PJR, WA2FQL and WA2CSQ. Pelham Repeater reports an emergency call-up program is working out well. SCM reports Mass. Amateur Radio Week is June 10 to 17. Details in 1973 May QST under the Operating Events column. Traffic: W1BVR 175, W1DVW 135, WA1LNF 93, W1TM 85, WA1DNB 71, WA1LPJ 47, W1ZPB 31, W1STR 23, W1KZS 21, WA1FBE 13, WA1OSK 6, WN1QHR 6, WA1OUZ 3.

NORTHWESTERN DIVISION

ALASKA – SCM, Kenneth R. Klopf, KL7EVO – AKS (Alaska Section Net 3735 kHz 0330Z daily) now has liaison with RN7 through W7PI facilitating outside traffic. Jan. QTC 13. Net mgr. is KL7HMU. Contact him for details. Northern Lights Net Traffic 19 Net mgr. WL7HJR. WL7HNP, Stevens Village contacted KL7EVO with less than 2 watts on 3735 concerning a medical emergency, time 2300 AST. An air evacuation was needed. KL7AG relayed medical and weather info from EVO to State Police and then to Rescue Coordination Center at Elmendorf AFB who dispatched a helicopter from Ft. Wainright to Stevens Village. Helicopter picked up patient at 0900 AST and transported him to Anchorage hospital. There was minor unwitting QRM from Alaskan stations not hearing the emergency. KL7HMU and WL7HJH silently stood by in case they should be needed. Listen for emergencies; listen before you transmit; standby if not needed!

IDAHO – SCM, Donald A. Crisp, W7ZNN – SEC: WA7EWV. The new Idaho-Mont. CW Net is off to a good start with good participation. Check-ins are needed from several areas in both Idaho and Mont. The net meets on 3575 kHz week nights at 8 P.M. MST. W7GHT is the NCS. Congratulations to W7GHT for working 5BWAS, the 139th to do so. K7NHV has received an OO appointment. WA7EWV built an SB-200 Heathkit linear. W7OWA is in the veterans hospital at Walla Walla. Participation was good in the SET. Several ECs held simulated emergency sessions in their areas. The Idaho RACES Net scheduled 4 special net sessions to handle the traffic. A good portion of the traffic was handled on the FARM Net. FARM Net reports 28 sessions, 882 check-ins, 88 traffic handled. Idaho P.O. Net reports 13 sessions, 127 check-ins, 16 traffic handled. Traffic: W7GHT 308, WA7BDD 71, W7AXL 69, W7ZNN 39, W7IY 10, W7FIS 7.

MONTANA – SCM, Harry A. Roylance, W7RZY – Asst. SCM: Bertha A. Roylance, K7CHA. SEC: W7TYN. PAM: WA7IZR. Thanks to all who participated in the SET. Officers for Hellgate Radio Club are K7IOA, pres.; WA7TZB, vice-pres.; WA7IIQ, secy.-treas. The Great Falls Club is busy making a supplement to the Mont. Call book. K7RRS is teaching code and theory class. WA7PDC will be operating from Bluenose lookout in the June VHF QSO Party. The Mont. VHF Repeater Advisory Group met in Helena and decided to adopt the Tex. plan for two meter repeater operations. W7DXQ, WA7HAG and W7QYA attended the Southeastern ARRL Convention in Miami. W7IBG is back on the air. Good to hear you, Don. WA7KMP has a new 1200X linear. Montana Traffic Net had 1143 check-ins, 58 traffic and 22 sessions. K7VCA was endorsed as EC and W7FKB as ORS. Montana PON had 353 check-ins and handled 18 pieces of traffic. Traffic: WA7JQS 82, WA7KMP 19, WA7OBH 15, WA7IZR 8, W7RZY 7.

OREGON – SCM, Dale F. Justice, K7WWR – SEC: W7HLF. RM: K7GGQ. PAM: K7RQZ. Net reports: WA7NWV reports for

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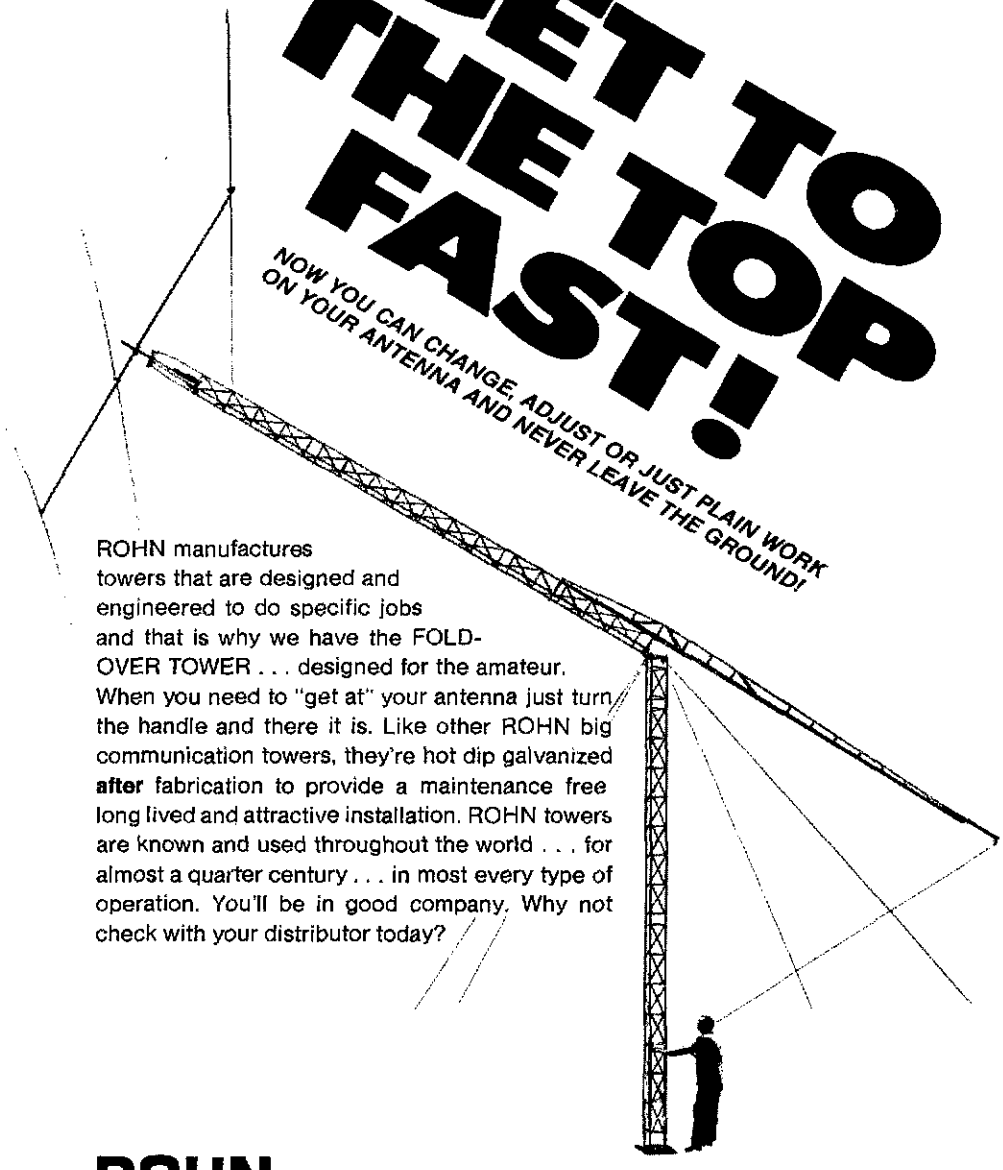

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BSN sessions 62, check-ins 1205, traffic 125, contacts 130. K7OUF, newly appointed mgr. reports for OSN for Jan. sessions 31, check-ins 77, traffic 34. The Feb. 1 meeting of the Rogue Valley RC was held as a dinner in Medford. Guest speakers were W7PGY, NW Director and K7WWR, NW Vice Director/SCM. SEC W7HLF and EC WA7ADW, and Asst. Dir. K7YQM were present. The SET was a success with activity in several parts of the state. Traffic: K7NTS 134, K7OUF 134, K7QFG 76, WA7NWV 62, W7ZB 56, W7HLF 30, WA7TXV 28, K7WWR 22, WA7MOK 11, W7DAN 8, W7MLJ 7, W7LT 3.

WASHINGTON – SCM, Arthur Henning, W7PI – SEC: W7UWT. RM: K7OZA. PAMs: W7GVC, W7MCW. VHF PAMs: K7BBO, K7LRD. New appointment: K7SUX as EC for Clark, Cowlitz, Wahkiakum, Skamania and Klickitat Counties. Regret to report that W7ZJF, W7HXA and W7AMC became Silent Keys.

Net	*Freq.*	*Time(Z)*	*QNI*	*QTC*	*Sess.*	*Mgr.*
WSN	3590	0245	579	265	62	K7OZA
NSN	3700	0300	341	117	31	WA7OCV
AREC	3930	1800 Su	91	136	5	W7UWT
NTN	3970	1930	1557	93	31	W7PWP
NWSSB	3945	0230	682	31	31	W7SVV

Skagit Hamfest will be at Bryant Grange Hall, Apr. 28. The Lower Columbia Basin ARC having 25th Anniversary celebration and hamfest in Longview Apr. 14. Contact WA7NRQ for details. OO K7GGD has new frequency counter. W7RXH spent month in Panama. Congratulations to the SET participants for a great job – SET exercise goes more smoothly each year and coordination between AREC, RACES, section nets, both ssb and cw to handle traffic efficiently went very fine. W7LG is conducting phone patches with USCG Cutter WINONA. WA7ELI is NCS on 2-meter AREC Net. Active stations working Oscar 6 are K7VNU, WA7NAN, K7MWC and W7MCT. Very QRL with college is WA7LMO. WA7LQV using his 2-meter gear for motorcycle mobile. For the Wenatchee Hamfest coming up, reserve the dates June 9 and 10. K7IEY, Chehalis is interested in starting 2-meter fm net, say 146.76 simplex. Contact him. Traffic: (Jan.) W7PI 433, W7KZ 279, W7GYF 151, W7UWT 140, WA7OCV 131, W7GVC 116, W7IEY 113, WA7KNW 108, K7OZA 107, W7AXT 101, W7DZX 95, WA7HKR 93, W7LG 67, K7VNI 55, WA7EDQ 49, W7BQ 46, W7MCW 42, K7OXL 42, W7APS 41, WA7RCR 39, W7PWP 36, W7IEU 28, W7RUN 25, W7AIB 10, W7RXH 9, K7BBO 5, WA7ELI 5, K7VAS 5, WA7GVB 3, WA7IOF 2. (Dec.) WA7LMO 6.

PACIFIC DIVISION

EAST BAY – SCM, Paul J. Parker, WB6DHH – Many clubs participated in this year's SET with local ones showing the most action. GPVHF Club, WB6AAE, got into the picture recently for the Walk-a-Thon with March of Dimes; participated in recent SET and then for almost two days provided continuous communications for the airplane crash in Alameda. Hats off particularly to WA6CGS who gave almost 30 hours of continuous service during Alameda Disaster, as well as 57 hours and 77 pieces of traffic during recent Managua Earthquake. W6CX, Mt. Diablo ARC participated in SET from local Red Cross Building in Walnut Creek. There seems to be an upsurge of community minded projects which local clubs participate in and never tell anyone about. Why? Traffic: W6IPW 418, WB6VEW 8, WA6CXK 6, WB6DHH 2.

HAWAII – SCM, Lee R. Wical, KH6BZF – SEC: KH6BZF. RM: KH6AD. PAM: KH6GJN. VHF PAM: KH6GRU. SRC: KH6FOX. QSL Mgr.: KH6DQ.

Net	*MHz*	*Time(Z)/Days*
Friendly	7.290	2030 M-F
Confusion (Patches)	21.400	0030 All
Pacific Interisland & Micronesia	14.305	0800 All
S.E. Asia	14.320	1230 All
Marine Corps	21.430	1900 All

I regret to report the death of retired USAF LtCol E. Joe Kaidy, an ex-KH6. It is with deep regret that we record his passing to Silent Keys. KH6OT wants to trade his TR-2200 (6-channel) rig for something more powerful. The annual SET message, a cw transmission, from Pac Dir. W6ZRJ was poor copy here in the Islands. What copy you did receive forward to W6ZRJ with comments. WØBWJ/KH6 was active last CD party. The 4th Annual Confusion Net get together is announced for July 7, '73 in San Diego. Contact W6MHA for more details. KC6RS has moved to Guam. In town for surf and sand were WØBWJ, WØHP and K6SDB and their XYLs. W1BLH/KH6 is assigned to Hq. 14th Coast Guard

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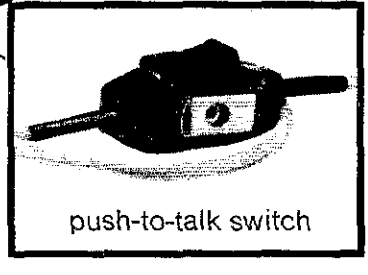

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in Honolulu. WH6HSS and WH6IBF active on 40 meters. WA7SQL/KH6 has applied for his KH6 call. For those on the West Coast who watch VHF the Kaneohe MCAS aerobeacon on 281.0 MHz operates with a power output of 100 watts. W6RSY writes he'll meet any KH6 on any frequency at any time to pass traffic to and from the Islands. Contact W6RSY direct. W7BVP and family rotated to Calif. Send those station reports to reach me NLT the 1st each month. Traffic: KH6BZF 15, KH6BWT 3.

NEVADA – Acting SCM, Harold P. Leary, K7ZOK – Congratulations to WA7BAV on winning one of the big prizes at the SAROC. WA7RPZ has the VKs calling him. W7TVF represented Nev. in the CD party. W7BIF keeps active on RTTY with W1AW bulletins. K7ICW very active on 2 Sun. mornings looking for contacts on ssb. The Las Vegas Amateur Radio Club is looking for diversified hams as members. W7AKE repeater changed to cd frequency of 147.18 - 147.84. W7GAM moved to new QTH. WA7MVY moved printing shop downtown. W7OK set new time record for worked all U.S.A. (3079) counties - 14 months. Congrats! K7ZGV passed General Class exam. K7YUJ back in town after 2 years in Japan. W7ILX most active on several P.O. Nets. W7DNX reports the code and theory course at Reno High, great guns. WA7MKI has new beam and tower. W7BES has Advanced Class. Traffic: W7ILX 37.

SACRAMENTO VALLEY – SCM, John F. Minke, III, W6KYA – SEC: W6SMU. Sacramento County EC WB6KZN reports that Sacramento Co. had an excellent turnout for the Jan. SET. Let's have some activity up north for the 1974 SET; I know you guys are up there because of the large SV participation in Field Day. W6BIL in Redding has retired and is applying for an OO appointment in addition to working toward 5BDXCC. WB6MDP is busy in the Intruder Watch program. I was unaware that the section had participation in the program since the appointments are not made by the SCM, but Hq. Many of you read this column and the operating news and probably noted that my term as SCM will expire in May. I have been SCM for 8 years now and have decided to step down. There may be some who will want to run for the office and if there is more than one nomination there will be an election. Therefore, if there is an election, please vote. You owe it to yourselves and the candidates to vote. Study the candidates carefully and vote accordingly. WA6JVD says NCN (Northern California Net) is looking for check-ins from Sacramento. NCN meets daily in the evenings at 7 and 8:30 local time on 3630. How are your Field Day plans coming? Traffic: WA6JVD 31, W6KYA 8.

SAN FRANCISCO – SCM, Tom Gallagher, W6NUT – The Valley of the Moon ARC has a new board of dir.: WA6NQZ, pres.; K6SRM, vice-pres.; WA6CBR, WB6KMI, W6WXU, dir. WB6JQP handled 114 fone patches for Pacific stations in Jan. Many of the gang were down with the flu in Jan. W6HM, WA6NQZ and W6WLV. W6NUT made a brief detour on a business trip back East to operate from KV4HW in the CW CD Party and worked W6BIP on five bands. WB6NMT/6 is QRV for 50 and 222 MHz FME skeds. Write your SCM for details or look for Lou on the West Coast VHF Net (3815 at 0430Z Mon.) where he operates W6KMW. We still need volunteers for leadership appointments in this section. Also, those interested in OO, ORS, OPS or OVS appointments should drop me a line. Traffic: WA6BYZ 466, W6RNL 116, W6BIP 45, WB6JQP 15, W6WLV 12, W6BWV 8.

SAN JOAQUIN VALLEY – SCM, Ralph Saroyan, W6JPU – The new officers of the Delta Amateur Radio Club are WA6UAA, pres.; K6OZI, vice-pres.; WN6SSE, secy.; WB6ZOQ, treas. They were installed Jan. 20, 1973, at the Sampam Restaurant, with 36 in attendance. WA6HJP vacationing in Mexico. WB6OPO active in MARS. K6RGZ gave a talk on transistors at the Tulare Co. Amateur Radio Club. WB6TTP is editor of TARC Gridleak. WB4DHA/6 now active on the USS Ranger. W6OHT recuperating from an operation. WB6OHB has a TPL 2-meter amplifier. WA6EDO has an SRC-14U and a frequency counter. WB6QMD has Standard 146. WB6GIT has a Marker Luxury on 2 meters fm. WB6ZTE heard on 2 meters fm. WN6RXI building a new ham shack and active on 80 handling traffic. WA7BCS is located at NAS Lemoore and active on all bands. K6KUO putting up a self supporting tower. WB6RLX building a ham shack. W6OBJ heard on 2 meters fm. K6BGK heard on 2 meters fm. K6RAU was active in local SET. WA6SCE lost his antenna in a windstorm. New officers of the Calaveras Amateur Radio Club are W6GSQ, pres.; W6IRJ, vice-pres. WA6BUH has a Regency frequency counter. Traffic: WA6SCE 59, WA6JDB 19, WB6RZI 6.

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SANTA CLARA VALLEY – SCM, James A. Hauser, WA6LFA – SEC: WA6RXB. RMs: W6BVB, W6RFF. W6MMG reports W6GWQ has been elected pres. of the San Carlos Radio Club. He also reports K6QZX has a new beam on the air. WA6NHD reports WA6RXB has been elected pres.; WB6PZX, vice-pres.; WA6NHD, secy.; WB6ZUZ, treas., of the West Valley Amateur Radio Assn. The first traffic report that I have received from a Novice came this month. Hope to have many more. W6NLG is putting up a new tower. W6AUC reports working skeds portable from the mountains and handling KH6 and KL7 traffic from home. W6DEF reports being busy in the SET, more work about the same traffic as last year. W6KZJ is busy with NTS nets. WA6NHD was busy with the traffic nets. W6BVB reports NCN had 62 sessions in Dec. with 636 check-ins, 573 pieces of traffic; says also NCN had more representation than traffic this year. W6YBV reports W6IQU is hospitalized. W6RSY reports he still is handling Nicaraguan traffic. W6DEF, W6RFF and W6YBV made the Honor Roll this month. Traffic: (Jan.) W6RSY 906, W6YBV 249, W6BVB 207, W6RFF 125, WA6HAD 111, W6KZJ 103, W6DEF 94, W6AUC 31, WA6NHD 17, W6NLG 10, WN6OSS 6. (Dec.) WA6NHD 2.

ROANOKE DIVISION

NORTH CAROLINA – SCM, Chuck Brydges, W4WXZ – SEC: W4EVN. PAM: WB4JMG. RMs: WB4VBM, WB4ETF. The SET really ran hot with a record number of stations on emergency power. Thanks to all for helping out. Check QST for listings of local EC reports on SET action. WB4MLI and WB4OQM had a DX contest on 75. New Novice is WN4ANI who is running inverted vees and quad and was assisted by WB4HDS in becoming a ham. WB4UOU is asst. EC to Dad W4OFO. WAØYDJ/4 led the traffic this month, congrats Jim. WA4BNO loading up his rain gutters on 40 and suggests this as antenna possibility to apartment dwellers. The Morehead High School ARC, WB4TLD has new Novices WN4CKR, WN4CKS, WN4CKU and WN4CON as reported by W4NAP. Congrats! New officers for the Mecklenburg ARS are WB4CES, pres.; WB4NDB, vice-pres.; WB4SJO, secy.; WB4WAW, treas. New Novices in Buncombe Co. ARC are WN4CUN, WN4CUK and WN4CUP. W4WXZ attended the club meeting at Asheville. W4NQA has returned to NC. The Guilford Co. 2-Meter Emergency Net now on 16/76 and operates Mon., Fri. at 9 P.M. W4AJT is back as EC for Greensboro. W4USS rebuilding at new QTH. K4RJ had nice writeup in Franklin paper about his moon-bounce exploits. W4SDF and WA4UQC are on 2. New Novices in Wilson are WN4ZAK, WN4AZL, WN4AZM, WN4BEI and WN4BEH. The Western NC Traffic Net continues active through WA4BVW on 16/76 at 8 P.M. Sincere sympathy to the families of W4PZH and WB4PNR who joined Silent Keys. Traffic: (Jan.) WAØYDJ/4 335, WB4OZL/4 300, W4WXZ 140, K4MC 57, WN4YMV 47, WB4TNC 38, W4OFO 37, WB4JMG 36, K4VBG 29, K4EZH 25, WB4MLI/4 25, WA4KWC 24, WB4UOU 18, K4FBG 16, W4ACY 14, WB4BHJ 3, K4TTN 2, K4KH 1, WB4VSA 1. (Dec.) WB4CES 12, K4TTN 2.

SOUTH CAROLINA – SCM, Joseph Rubin, WB4CBJ – SEC: WA4ECJ. PAM: WB4KNB. RM: K4LND.

Net	*Freq.*	*Time(Z)/Days*	*Mgr.*
SCSSB	3915	0000 Dy	WB4KNB
CN	3573	0000 Dy	WB4VBM
CN	3573	0300 Dy	WB4ETF

Repeaters: WB4PLN Columbia 146.34/146.94 B1800. Carolina Repeater Society now has solid state repeater. Attending Feb. 2 meeting were K4AVU, K4DSK, K4FRX, K4KAX, W4DQY, W4EGV, W4WQL, WA4EAU, WA4NJT, WA4MPC, WA4SQS, WA4SQT, WA4WND, WB4CBJ, WB4DQJ, WB4SNY and WB4SQP. New members: WA4CPA and WA4UAO. Tone burst decoder being installed for 1800 Hz. Blue Ridge Radio Society is working on a repeater for Ceaser's Head (Mountain). Frequencies: 146.01/146.61. Tests are being conducted. More data available later. K4LNJ addressed local Lions Club on amateur radio, it's operation and purpose. W4NTO contacted K1HTV via Amsat-Oscar using SCR 522 (18 watts) barefoot receiver and two ground planes. If you have items you would like to see in this column, please forward them to me. Traffic: (Jan.) W4NTO 64, WB4PDQ 11, K4JIF 10, K4NJS 8. (Dec.) W4NTO 62, K4JIF 6. (Nov.) W4NTO 92. (Oct.) W4NTO 43.

VIRGINIA – SCM, Robert J. Slagle, K4GR – Asst. SCM: A.E. Martin, Jr., W4THV. SEC: WA4PBG. Asst. SEC: WA4JJF. RMs: W4HIR, W4SQQ, W4SHJ, KØPIV/4. PAM: WB4RZW. Best year yet for SET; not only the highest traffic count, but no big back up as in previous years. VSBN Jan. QNI 1021, QTC 620; two SET sessions 18.5 hours. Congrats to WA4VOQ as new VP of ECARS. Dir

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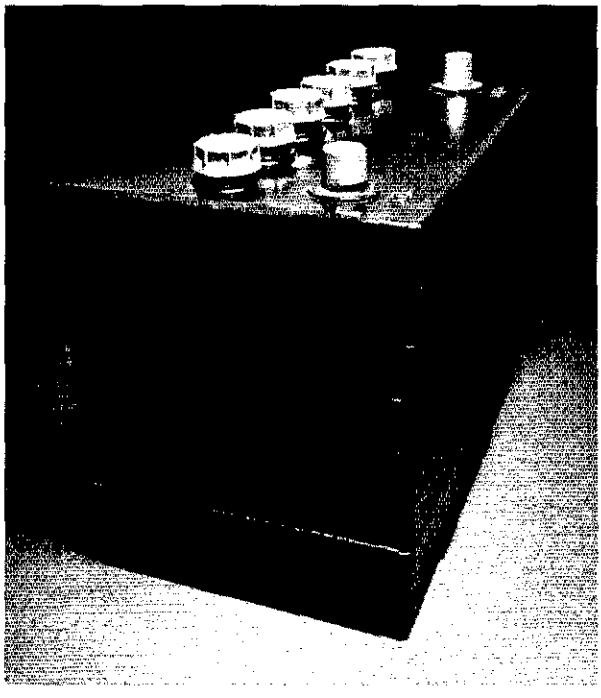

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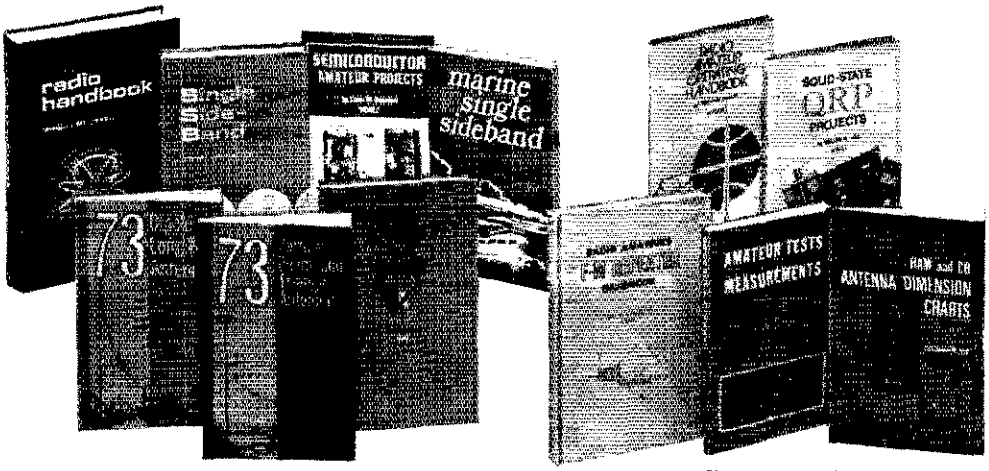
W4KHC attended SAROC and Board meeting, participated in everything. WB4FDT again discovered and got squelched another bill to increase our license plate fee to ten dollars. W4DM reports basement shack too cold this time of year. W4THV participated in SET with the flu – real devotion! K4IKP new call of OO K2HBA/2. W4MK enjoyed a few hours in Jan. CD Party. VU2IRA/W4IDG new in Fairfax. K4OD now PY1ZAL. W4JUJ winner in Va. for 1972 Delta QSO party. W4KX reports alive but inactive. W4TJN frowning after building double Bazooka antenna. WB4RNT entered Navy boot camp Feb. 13, will be going to electronics school. WA4UNS getting station set up in Blacksburg. WB4PWP should have a pair of 813s working by now. WB4RDV reports 5BWAS with 170 worked and QSL 144. K4KA has new frequency counter. K4JM reports nothing new. W4HIR, at their invitation, addressed two local Rotary Clubs on NTS and Public Service communications. Counties: *WA4WQG 3039, W4JUJ 2800, WA4UNS 1518, WA4EPH 700.* Nets: VSMN 3947 kHz at 0715/1630; VSBN 3935 kHz at 1800/2200; VSN 3680 kHz 1830; VN 3680 kHz at 1900; VPN 3947 kHz at 1900; VRN 3625 at 2000, and VPON 3905 at 2215Z Tue. WB4WLK rag chewing on 20. BPLs: W4PAY, WB4FDT. I have received license from WB4FDT as Teenager in Va. (honorary). Traffic: K4KNP 432, W4PAY 313, KØPIV/4 271, WB4FDT 258, W4QQ 224, WB4PNY 215, W8VDA/4 212, W4YZC 210, K4IAF 209, W4HIR 208, W4SOQ 202, K4PQL 195, WA4PBG 166, WR4KIT 163, K4GR 149, WB4KSG 146, WB4RZW 122, WA4JJF 121, WB4RDV 119, W4TJN 91, W4TF 82, W5VZO/4 58, K4KA 51, W4KFC 42, K4VIG 42, W4FQV 29, WA4EUL 26, K4JM 20, K4FGV 15, WA4WOG 11, WA4OLN 10, WA4FGC 7, WA4EPH 6, W4MK 6, WB4PWP 6, W4JUJ 4.

WEST VIRGINIA – SCM, Donald B. Morris, W8JM – SEC: WA8NDY. RM: WB8BBG. PAMs: W8DUW, K8CHW, W8IYD. CW Net Mgr.: WB8CYB. Phone Net Mgr.: WB8BMV. Morgantown area repeater, now operating on 19-79. New amateurs, WN8ROMC, Princeton and WN8OHR at Burnsville. K8IUD printing excellent weather map information. K8LSN, K8BCF, WA8WCK, WB8IJW and WB8LAI report new 2 meter tm transceivers. Tri-State and Kanawha radio clubs held joint dinner meeting in Huntington. WVN CW Net *with 25 sessions and 87 stations passed 69 messages and the phone* net in 30 sessions with 442 stations handled 150 messages. W8HZA, K8QYG and W8MIS active on 160. WB8BMV consistent in the PSHR report. W8DUV and W8DUW were co-recipients of the First Army MARS Commander's Trophy. Be sure and mark your calendar for the following: Division EC Meeting on May 12 and the Division Convention in Reston, Va. on Sept. 14 week end and our own State ARRL Convention at Jackson's Mill, June 30, July 1 with W8DUV as General Chmn. Traffic: WB8DXF 156, WA8WCK 130, WA8NDY 127, WN8IJW 47, WB8BMV 45, W8AEC 43, WN8MKL 41, K8QEW 39, WA8YCD 26, W8JWX 25, WB8EKG 23, W8JM 23, WA8LFW 19, WA8UIH 15, WB8BMW 11, WB8CYB 7, W8DUV 5, K8ZDY 3, WA8OKG 2, WA8YTP 2, WB8CJG 1, W8CKX 1, W8FZP 1, WB8IHA 1, W8KGW 1, K8QNG 1, WA8THX 1, WA8YHH 1, WA8ZNH 1.

ROCKY MOUNTAIN DIVISION

COLORADO – SCM, Clyde O. Penney, WAØHLQ – SEC: KØFLQ. RM: WØLRN. PAMs: KØCNV, WØLRW, WAØWYP. WBØBSS received his Extra Class license in Jan., as did WAØWYP, while WBØGXY received his Technician ticket. Congratulations to all three of these fine amateurs. Congratulations are also in order for WAØSIG who was appointed mgr. of the Daylight TWN, and for WØLRN who was appointed mgr. of the regular night time TWN. WAØSIG has also been appointed asst. EC for South Metro AREC. WØNQQ reports making 54 contacts in Jan. via Oscar. Newly elected officers of the Colorado YLs are WAØPYZ, pres.; WAØSLX, vice-pres.; WAØMNM, secy.; WØHEM, treas. Congratulations to all amateurs in the Colo. section who participated in the recent SET. It was an excellent exercise, and the results were most encouraging. Net traffic Jan.: Columbine *QNI 1088, QTC 48, informals 174,* 27 sessions. CCN QNI 411, QTC 307, 35 sessions. Traffic: (Jan.) WØWYX 518, WBØAXW 513, W2TPV/Ø 225, WBØHCK 221, WØNGA 162, KØOTH 138, WØLQ 123, WØLW 120, WØLRN 113, KØCNV 108, KØFLQ 106, KØJSP 97, WBØCCB 74, WAØSIG 74, WRØHSZ 50, WBØHBT 46, WØNQQ 33, WAØTMA 33, WAØZPP 28, KØTIV 27, WØNZL 26, WØGV 24, KØPHF 19, WBØBSS 18, WØGAQ 17, WØSIN 17, WØLAE 15, WAØWYP 10, WØJRW 7, WAØNFO 7, WØBY 6, WØLLA 3, WØOPN 3, WAØHLQ 1, WØNK 22. (Dec.) WØOOY 47, KØCNV 37, WAØYHH 24, KØTIV 20, WØKFH 11, KØPHF 2.



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UTAH – SCM, John H. Sampson, Jr., W7OCX – SEC: W7GPN. RM: K7HLR. The Beehive Utah Net meets daily at 1930 GMT on 7272 kHz. The Utah Code Net meets daily at 0230 GMT on 3575 kHz. Both nets are part of the NTS. A new Novice net started Mar. 2 on 7130 kHz, 3 days a week under the guidance of WA7QAR. The 7 operators at WA7SLG, the Univ. of Utah ham station, have been active in the Intruder Watch directed by WA7BSG. W7KSB reports he is doing well in EE at the Univ. of Utah. 1973 officers of the Cache Radio Club: W7HJK, pres.; WA7MXZ, vice-pres.; WA7MBL, secy. Sporting a new homebrew linear is W7IEQ. He gave his old one to his son-in-law WN7SQA who is waiting to drop the N. Activity and participation in the SET was up this year. W7LLH, W7FYR and others in the Ogden area are combining talents in building what they hope to be the ultimate QRP rig. Not much interest has been expressed to date in the NTS daylight traffic net. Representatives from BUN and UCN to the daylight net are sorely needed. If you are interested, contact your net mgr. Traffic: W7EM 204, K7HLR 187, W7OCX 145, K1TMK/7 101, W7UTM 40, K7ZVT 35, WA7MEL 30, W7FYR 29, W7IQU 23, W7DKB 21, W7GPN 19, K7BNZ 12, WA7MXZ 12, K7CLO 11, WA7KZP 8, WA7OAU 8, WA7BSG 4, WA7OAR 4, WA7HCO 2, WA7SLG 1.

NEW MEXICO – SCM, James R. Prine, W5NUI – WA5OHI and WA5WBN have been actively working with the Fort Wingate Indian School to organize an amateur radio club. W5TLK reports 54 sections in the CD party for 47,520 points. The RACES program received a big boost with many of Mesilla Valley ARC holding certificates. W5SHJ has new QTH in Silver City with a good 40-meter site. W5REJ joined the Silent Keys Feb. 10 as a result of an aircraft accident. W5MVP seeks other interested Northern New Mexico VHF enthusiasts to build a VHF-CW station atop a local mountain for serious DX and antenna experiments. Traffic: K5MAT 282, WB5BHN 274, W5UH 126, W5MYM 47, W5TLK 44, W5PDT 42, W5DAD 32, WA5OHI 24, WA5MTY 10.

WYOMING – SCM, Wayne M. Moore, W7COL – SEC: K7NQX. PAMs: W7TZK, K7YUG. OBSs: K7NQX, W7SDA, WA7FHA, K7YUG. Nets: Pony Express Sun. at 0800 on 3920; YO daily at 1830 on 3608; Jackalope Mon. through Sat. at 1215 on 7260 (alt. 3.920); Wx Net Mon. through Sat. at 0630 on 3920; PO Net 1900 Mon. through Fri. on 3950. W7IDO passed away on Feb. 9. Betty will always be remembered as the cheerful voice from Casper and made many friends via ham radio. W7GS back on the air after a few years absence with a new rig. K7WRS also has a new rig, a transceiver with a linear. W7HEB does get to use it at times. The SET went off fairly well here in the state. Field Day is coming up and a very nice trophy is being offered to the winner so, start your planning now. Traffic: K7VWA 142, W7SDA 101, W7HNI 51, W7TZK 39, W7BHH 37, W7YWW 30, W7GSQ 13, K7SLM 6, K7ITH 5, WA7NHP 5.

SOUTHEASTERN DIVISION

ALABAMA – SCM, James A. Brashear, Jr., WB4EKJ – SEC: W4DGH. PAM: WB4WAI. RM: W4HFU. K4ZZE, NM of AENR reports starting time for the AENR net has been changed to 8 P.M. CST. WB4SVH, EC Tuscaloosa Co. and NM of AEND reports SET went smooth with 459 points for AEND and 130 for Tuscaloosa Co. My apology (again) to WB4ADT and to K4MG. In Jan. '73 Station Activities, I erroneously listed K4MG as having the high section scores for phone and cw of the 38th ARRL International DX Competition. I failed to notice the stations listed under "addenda", page 94 Oct. '72 QST which shows WB4ADT as the section CW winner. Congratulations to Huntsville High School ARC who received their new license – WB4DDF. New officers of the Wiregrass ARC are WB4MAL, pres.; W4KGB, vice-pres.; WB4SLW, secy.; WB4SVX, act. mgr.; WA4IHL, treas. K4JK has an HR2A in his car. WB4JMH reported rig trouble but heard him QNI the nets. Through the efforts of K4HJM and Mr. Harry Mabry, mgr. WHMA-TV, the general public recently received much favorable publicity about amateur radio. The Breakfast Club (3.973) presented Mr. Mabry certificate No. 946 for his interest and assistance to amateur radio. K4HJM also made arrangements to "Hams Wide World" on WHMA-TV at some later date. WA4ZDW reports not missing QNI a session on AEND in Jan., also their 2-meter group assisted with the March of Dimes Walkathon. K4MG reports condition great for the CQ 160 contest; he worked all districts and 3 foreign countries. The Old Old Timers QSO party (phone and cw) were great get togethers. WB4WUS NM AENO reports SET was quite a workout for some operators. WB4ZOG received new General Class license, has a VFO and has been QNI on AENB. WA4ZDW has injected an idea for the North Ala. area; an RTTY net operating as an auto-start through a

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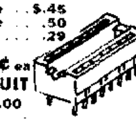

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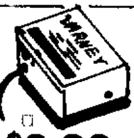

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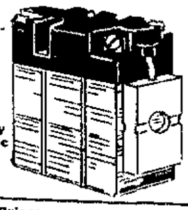

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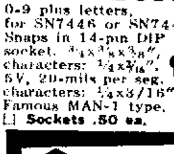

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2-meter repeater; why not get busy and lets get something started? Officers of the Mobile ARC are WB4MNU, pres.; WB4TIC, vice-pres.; WB4OCU, treas.; James Knight, secy. Our SEC wants more ECs to submit monthly reports. Don't forget the Birminghamfest (May) and the Mobile Hamfest (June). Endorsed W4UGH as *SEC* and *OPS*; appointed WB4WUS as *OBS*. Traffic: (Jan.) WB4EKJ 217, WB4SVH 183, W4DGH 88, K4AOZ 69, WB4JMH 66, W4MOO 42, WA4ZDW 31, WN4ZOF 23, K4HJM 7, WB4WUS 7, WN4ZOG 6, K4MG 1. (Dec.) WB4SVX 38, WN4ZOG 12.

GEORGIA – SCM, A.J. Garrison, WA4WQU – Asst. SCM: John T. Laney, III, K4BAI. SEC: WA4VWV. RMs: WB4RUA, WB4SPB. PAMs: K4HQI, W4LRR.

Net	*Freq.*	*Times(Z)*	*QNI*	*QTC*	*Mgr.*
GSN	3595	0000/0300/1150	986	526	WB4RUA
Ga.SSB	3975	0000	1024	293	K4VNV

The Lanierland ARC has obtained the call of the late Emory M. Ayers, W4IKR for their club station. New officers for the Lanierland Club are WB4IMU, pres.; WB4OYV, vice-pres.; K4NSO, secy.-treas. W4RNL reports that the Northeast Georgia 2-Meter FM net was in session 8 hours each day of the SET with a total QNI 23 and QTC 31. The Ga. SSB net was in session 14 hours 7 minutes. The GSN 8 hours. Participation in this year's SET exceeded all expectations. At this writing, all of Central Georgia is busy digging out from a record breaking snow fall, ranging from 8 to 18 inches. Stranded motorists have been the source of considerable traffic during the snow storm. Traffic: WA4WQU 301, W4AMB 255, K4BAI 206, WB4RUA 167, W4RNL 154, W4PIM 138, W4EEP 120, WB4UIH 102, WB4WXX 76, W4NSO 72, W4CZN 71, WA4NMU 70, WB4WOL 60, WA4RAV 53, K4NM 51, K4KZP 27, WB4NTW 20, WA4LLI 15, W4JM 14, WA4BAA 12, W4FDN 11, K4VGI 11.

NORTHERN FLORIDA – SCM, Frank M. Butler, Jr., W4RKH. SEC: W4IKB. RM: WA4BGW. RTTY: W4WEB/WA4WIW. PAM 75: WA4IZM. PAM 40: W4SDR. VHF PAM: WB4KGW. New appointments: WA4BGW as RM; WB4GMB as EC for Marion Co. WB4SKJ renewed ORS. The 1973 SET appeared to be a big success, judging from the messages received by the SEC and myself. The NFPN had two emergency power sessions, with several QNI. Jacksonville: OVS W4VLK is stirring up some 1296 MHz activity. The CW training net may be moved from 15 meters to 10 meters; *check with EC WA4VZF. Daytona Beach: The DBARA newsletter* contains lots of good tidbits. WB4RGO worked the state from Miami to Pensacola on 2 meters during recent band opening. He is building a helix antenna. New hams are WN4CPC, WB4CPT and WN4CQR. A novice class is being formed; contact W4SDR for details. *WB4NGI* moved to Gainesville, Orlando: *W4YSO* helped set up a ham station and message center at a convention; "Ham's Wide World" was shown. The Orlando SET was interrupted by the real thing – a tornado! Winter visitor W2JI/4 is active on cw nets with SB-300 and SB-401. WN4BXT is active on QFTN. Lake County: LARA has about a dozen in its Novice class under direction of K4LV and WB4SKJ. Sanford: WB4WIQ can be found on 10 meters. Gainesville: The Suwannee Chapter, QCWA, has rotated its meetings from here to Jacksonville to Tallahassee. TARC now puts out a newsletter bi-monthly. The club also has a Novice class going, taught by WA4DCN and WB4GTY. WN4BSP, WB4NCH/4, WB4UGU, WN4UPJ/4, WN4VPL and WB4ZOC are active on the cw nets. W4MLE was heard after a long absence. K4QDN in Quincy keeps 75 meter skeds with W4BGO in Sarasota; also working SSTV. WN4CCZ works 80- and 40-meter cw from this rare county. Ft. Walton Beach: W4CSS won section award for Sept. VHF QSO Party. Traffic man WA9QVT/4 had his rig go out during SET! W4ROM/mm works all the Gulf coast repeaters during his runs from Galveston to Tampa. At a recent meeting PARC had an interesting talk by the Fla. *Marine Patrol. Pensacola: WB4KGW, WA4JNA, WB4ZPC,* K4SVX, WA4BMW and WA4BMU met to form a 440 MHz ATV group. WB4ZPC is converting a T-44 for TV. WA4JNA built a video synthesizer from scratch. WB4MUS put an HT-220 together for 2-meter fm. WN4WEQ passed his General Class exam. WN4COZ is a new YL ham. Traffic: *KØBAD/4 394, WB4OMG 293, W4IKB 265,* WA9QVT/4 194, WB4NCH/4 144, W4SDR 125, WA4BGW 116, WA4EYU 81, WN4BSP 76, WN4UPJ/4 75, W4RKH 67, WA4VZF 65, K4BSS 64, WA4WBM 64, WB4WHK 61, W4LSR 58, WB4NJI 57, WB4OAA 50, WB4WTL 36, W4DFP 33, W4GUJ 31, W4LDM 31, WB4ADL 24, WB4RCI 24, WB4ZOC 24, WA8GCW/4 23, W4NGR 21, WB4QNW 21, WA4FJA 20, W4DTV 19, K4EZE 16, WN4BXT 12, WB4HJY 12, W2JI/4 12, WB4SKJ 11, W4OOH 10, WB4HPR 9, WB4VAP 9, WB4PNJ 7, WB4NHH 2.

SOUTHERN FLORIDA – SCM, John F. Porter, W4KGJ – SEC: W4IYT. Asst. SEC: W4SMK. RMs: K4FAC CW, K4EBE RTTY.

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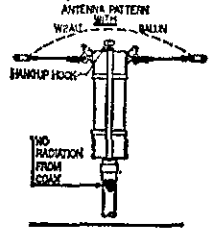

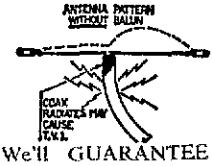

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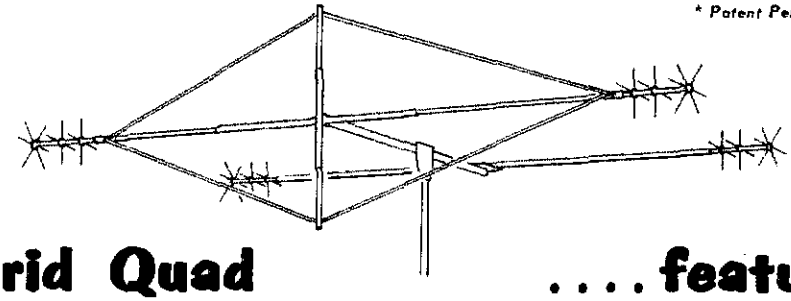

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PAM: W4OGX. The '73 SET appears to be at this time running a little behind last year. All records are not in as yet. Some SET Net statistics follows: FAST QNI 224, QTC 141, QFN QNI 189, QTC 311, QFTN QNI 42, QTC 30. The FAST Net operated one session on emergency power. Key stations in Miami area were K4IWT Red Cross, K4JVA Hurricane Center, WB4HKP CW and WB4HIS RTTY. Officers of Gator Chapter of QCWA are K4MFF, pres.; W4FOM, vice-pres.; W4GQ, secy.; K4QG, treas. K4FAC received 5BWAS No. 138. His score in Jan. CD party was 131,000 cw. W4OZF worked 10 countries in 160-meter contest. W4DO worked 188 stations in ARRL VHF SS. Hollywood ARC is planning trip to Dry Tortugas in June. You FD stations be on look out for them. We welcome WN4CTM, new Novice in St. Pete. WA4IHV became a Silent Key in Jan. His many friends will miss him. WB4GHD, W4SMK, WB4URG and K4WKY qualified for FAST Net certificates. OO reports were received from WB4HKP, W4OZF and WB4INC. WB4AJL made PSHR. Following received BPL for Jan.: W3CUL/4, WB4AIW, W3VR/4, K4FAC, K4SCL, WA4SCK, WB4GHD, WB4HKP, WB4HML and W4IYT. Had a nice meeting with the Dade County ARPSC Feb. 8 and the Everglades ARC on the 9th. Plan to meet with as many clubs as possible this year so please have your secy. advise me of your meeting dates. The close-out date for all your reports will be the 7th of the month. Any after this will be held *until the next month. Traffic: (Jan.) W3CUL/4 2507, WB4AIW 700,* W3VR/4 692, K4FAC 527, K4SCL 553, WA4SCK 515, WB4GHD 437, WB4HKP 333, WA4IJH 285, WR4AID 185, WB4HML 183, W8BZY/4 183, WB4FLW 180, WB4PNG 177, WA4NBT 166, W4IYT 162, W4EH 117, WB4IJW 101, K4EBE 87, K4BLM 80, W4DVO 78, WA4HDH 74, WB4WYX 70, W4BM 66, WB4JSK 61, K4JVA/4 58, WB4AIK 53, W4TJM 47, K4HGG 33, W4IAD 28, W4KRC 28, W4KUM 27, WB4TUP 27, W4KGJ 26, K4SJH 24, W4FFF 23, WB4BBH 21, K4MV 19, W4MML 17, W4BCZ 16, W4NTE 16, W4SMK 15, W4OGX 13, WA4CLE 12, W4DDW 10, WB4NSQ 10, W4ZAK 7, WA4ALF 5, WN4ZZB 5, WB4SQB 4, WB4DUP 2, K4HEW 1. (Dec.) K4EVY 94, KØECG 55, K4KQ 30, K4OER 29, WB4NCH 19, W4MML 9. (Nov.) W4MML 8.

WEST INDIES – SCM, Pedro J. Piza, Jr., KP4AST – 2-meter activity keeps growing very fast. KP4ANG, KP4BBU, KP4BNY and KP4DQN are among the latest stations to join the group. KV4BV, KV4DO, KV4HI, KV4EY are working on reforming RACES in Virgin Islands. KV4EY finally back on the air. KP4DLW and KP4AST are active on 160 meters. Congratulations to KP4JM on getting Extra Class license. KP4UW is quite active on 7.0 MHz. KP4DPN and KP4BOL are active on ten meters with the Ten Ten Club. KV4FZ is OBS for V.I. Traffic: KP4WT 105, KV4EY 6.

SOUTHWESTERN DIVISION

ARIZONA – SCM, Gary M. Hamman, W7CAF – RM: K7NHL. PAM: WA7JCK. The annual Winter Hamfest in Phoenix was attended by 300 people. The next hamfest is the Ft. Tuthill Hamfest in Flagstaff on July 27-29. The Amateur Radio Council of Arizona (ARCA), as one of its functions, coordinates its member *clubs to sponsor these hamfests. Newly elected officers of* ARCA are K7YFR, chmn.; WA7JCK, vice-chmn.; WA7DTW, secy.; WA7JDR, treas. Two local tests were held as part of the SET, one in Pima Co. under the direction of EC K7NTG and the other in Maricopa Co. under EC K7JWB. About 75 participants from around the state handled over 2100 messages during the exercises. WA7CEM repeaters were voluntarily closed down, temporarily, after possible rule infractions were noted by FCC inspectors at one of the transmitters housed at a commercial TV site. No citations of violation were issued, however. The Ariz. Repeater Assn. is in the process of moving its transmitter site and WA7CEM will then be back on the air. Long time traffic handler WA7NAR became a Silent Key. Section awards were earned by K7GLA, WA7HIT, WA7IXC, WA7JCK, WA7KQE, WA7NBQ, K7NTG and K7RLT. ATEN: 760 QNI, 72 QTC, 382 minutes. Traffic: K7NHL 436, W7IQ 239, K7NTG 190, K7MTZ 128, K7RLT 104, W7CAF 63, K7WUG 61, K7UYW 51, W7PG 34, WA7JCK 28, WA7KQE 23, WA7IXC 13, K7GLA 9, WA7TZO 6, K7ZMA 5, WA7UEO 4, W7LLO 3, WA7NBQ 1.

LOS ANGELES – SCM, Eugene H. Violino, W6INH – SEC: WA6OZY. RM: W6LYY. The QCWA group will have their spring banquet on the Queen Mary Apr. 29 starting at 3 P.M. This will include a tour of the famous vessel, dinner and raffles. Members and guests should contact W6MDQ or W6YYV. W6FOW has been band jumping and very active on WESCARS. WN6SWY passed his General Class exam and hopes to have the Advanced ticket by Field Day, his

16th birthday. The Antelope Valley Club still issuing their "Jackalope" award; those interested contact WB6PRT. They also report that many antennas were lost in the Jan. big winds. W6VZA was guest speaker at the San Gabriel Club with many slides being shown. The SCVC also has a Wed. meeting on 21165 kHz at 1930 local time. Congrats to Mission Trail and other nets on their handling of the Nicaraguan disaster traffic. We have a pipe line that way and anyone wanting to send messages will have no trouble. Our new Vice Director W6NJU attended ARRL board meeting in Hartford; also attended SAROC. W6AM now has mobile kw on hf bands and 120 watts mobile on 2 meters. WA6AAW has been looking for new DXpeditions. W6MLZ reports the Mexican Govt. has suspended all Ham Licenses because of alleged illicit licensing practices. All Mexican amateurs will have to be re-examined. New officers of the Los Angeles Council of Radio Clubs are G. Riggins, chmn.; Vern MacIntyre, vice-chmn.; Rosemay Willis, secy.-treas. WB6CMR reports he passed his Extra Class exam. W6USY is teaching two deaf boys the code. They keep their fingers on the speaker cone and it works. FB Les. K6ASK suggests that we set aside a few frequencies on two meters for National VHF traffic nets. The yearly SET was a success in our area. 306 messages were handled by 29 participating stations on SCN. The AREC group did a bang-up job. WA6KUR has been handling large amounts of traffic for Antartica and was very active with the Nicaraguan earthquake nets. Now that we have a Daytime National Traffic System going I hope to hear from you retired hams who like to handle traffic either phone or cw, this is something new and I would like to see a good turn out if we are going to keep this net going. Traffic: W6INH 391, WA6KUR 344, WB6KJI 104, W6LYY 97, K6EA 66, W6OEO 60, WB6KGK 44, WB6PKA 39, W6USY 36, W6QAE 34, WA6ZKI 22, W6IVC 20, WB6YIZ 16, WA6AAW 14, W6DGH 13, W6FD 10, K6UYK 10, W6HUJ 9, WA6IDN 9, K6ASK 6, WB6TPO 5, W6AM 2, K6CL 2, WB6KXC 2.

ORANGE – SCM, William L. Weise, W6CPB – Asst. SCM: Richard W. Birbeck, K6CID. SEC: WA6TVA. PAM: K6YCI. RMs: WB6AKR, W6BNX. New OOs WA6FIT and W6OKX. Congrats to all who participated in '73 SET. Excellent results from your pre-planning. WA6ALV repeater has emergency power in case of commercial power failure. WB6IAO is a Silent Key. Our condolence to the family. Anyone who copies WA6DBX bulletins should inform Greg. Give time and frequency. Greg also has a New Year's resolution – don't drop vacuum tubes on a concrete floor. Hi. WB6JOT reports plans to move to Kans. with call WØTTG. He was WNØTTG way back in 1954. Sorry to CU go Verle. WB6VTK reports he may be QNI on SCN if his boss changes his work to nights. W6DTR was elected chmn. and WA6FIT, secy. of the Orange County Council of Amateur Radio Organizations. Many thanks to the out going pres. and secy. WB6CQR and W6NT for their excellent leadership during the past year. After an absence of 15 years WØHAW/6 is back on the air. Welcome! WN6VES is new Novice in Garden Grove. Congrats. Traffic: W6CPB 233, WB6VTK 218, WB6AKR 85, K6GMI 85, WA6TVA 66, WA6YWS 27, W6WRJ 17, W6QBD 11, WB6QNU 10, WB6JOT 2.

SAN DIEGO – SCM, Paul C. Thompson, W6SRS – Asst. SCM: Art Smith, W6INI. SEC: W6GBF. RMs: W6LRU, WB6BGF. This year is off to a good start with AREC members numbering over 400. If you enjoy the "Pancake Breakfasts" we will be making them one of the regular activities with programs which develop our amateur activities here in the section. AREC participated with the Amigos de Americas walk and will be providing the communications again for the Torry Pines Glider Meet in Apr. A new adventure for the section will be re-establishment of the Transmitter hunts on 10 meters. How many of you remember the old 29.5 am hunts. Get those DF kits going gang. Clubs – Imperial Valley ARA had W6KW SW Div. Director as a guest at the Feb. meeting. North Shores held a recap of the SET. Palomar ARC has changed their meeting to the Oceanside Savings and Loan Bldg. in Vista on the first Wed. of the month. New club in the section is the ARS of Central High School in El Centro. Station activities – Ex-W6YKF now is W7JER in Olympia, Wash. WA6HBQ now is in AREC activity. RATT now for WA6BDW WA6AMK has been working 40-meter DX. WB6LEC Asst. EC in Southern Dist. New in the section is WB6SIP. WB6PVH has been a mainstay on SCN. Homebrew RC tester for W6DEY. PSHR: W6LRU 47, W6BGF 47, WB6VKV 34. BPL: W6BGF. Traffic: W6BGF 615, W6VNQ 309, WB6VKV 224, WA6AMK 184, W6LRU 184, W6DEY 39, WA6BDW 17, K6CXR 4, W6SRS 3, WA6DMB 2, W6MAR 1.

SANTA BARBARA – SCM, D. Paul Gagnon, WA6DEI – SEC: W6JTA. RM: W6UJ. PAM: K6EVQ. W6JTA has qualified for his third BPL to earn the BPL Medallion. WB6UAX has a new Tempo One and WB6LBO has a new four-element tribander and SB-220 or

from Lompoc. We regret to report WA6HCB a Silent Key. The TRI Counties Radio Council is sponsoring a Field Day Award. Contact *your club delegates for information. 146.52 simplex has been* adopted as club frequency for MAKRAC/Satellite/and Santa Barbara RCs. Antique collectors W6HUT, WB6ITZ and WA6PFF won first place and Sweepstakes awards in the Santa Barbara Hobby *Show. OO W6MUL has new Monitor Scope. Remote base WA6SIN* has kept WA6OBT and K6YLQ busy installing 450 MHz functions. K6ITY uses WA6SIN on 144 and 450 from San Nicholas Island. WB6BWZ has been to FAA flight instructors school. W6QAL has 15 states and 3 countries through the satellite. WA6DDQ joined Army MARS. I received many messages during the SET and was encouraged to see many more of you are getting involved in preparing for emergencies. Keep up the good work! W6MHK has a unique WAC; one continent on each band 160 through 10 using an indoor loop antenna. K6OU presented slides from his San Marino DXpedition to a group at the SBARC. New Conejo Valley club officers are WB6IWF, pres.; K6LHA, vice-pres.; WB6NYH, treas. WA6LLI now on 450 MHz. PSHR: WA6DEI. Traffic: (Jan.) W6JTA 313, WA6DEI 309, WB6PGK 286, K6QPH 70, WA6MBZ 64, W6IDU 40, K6PYE 38, WA6WYD 30, W6CDN 26, WA6PFF 11, WA6SSN 6, W6IJJ 5, W6MJU 2, K6YLQ 1. (Dec.) WB6MXM 16.

WEST GULF DIVISION

NORTHERN TEXAS – SCM, L.E. Gene Harrison, W5LR – Asst. SCM: Frank A. Sewell, W5IZU. SEC: K5QKM. Asst. SEC: WA5KHE. RM: W5QU. SET now history. Fort Worth, Arlington, Eastexas all made good showing. Congrats folks. Frequencies 7070, 3770, 3961, etc. plus W5JVR, WA5YEA, W5ZBJ, WB5EEE and K5QKM NTex SEC. Tex CW Traffic Bulletin presented FB report. Arlington ARC pres. K5FOG has plans for all during 1973. WA5SRK reports General and Advanced classes started in Mar. W5TBW Arlington ARC new OO made nine observations. FB. W5TI Dec. report late and W5KYD finished Navy duty and now with Collins. WA5SUY TTN reports 31 sessions, 621 QTC, 1674 check-ins. Tarrant Co. CD office advises "Skywarn" school on now. W5ARV and K5PCW submitted OO forms for endorsement. WA5VGP recovering from heart attack. WA5UOC needs help with mailing 5500 convention letters. Jess Hayes moved, new no. 277-0109. WB5GPS passed his Advanced Class exam. Garland ARC dues now payable and Jim Hester now back from "down under." *Dallas ARC held special meeting covering election of officers Feb. 6.* Lone Star MARS Bulletin announces loss of Mrs. Randall and Morales of Roland Belks office. W5NFO reports following Silent Keys: W5BTU, K5VGW, W5HGY and W5GCE. Annual *Navy-MarCorps Picnic Tyler State Park, Sat.-Sun. May 12-13, 1973* for all members, family and interested parties. WN5IEG report arrived late for Dec. W5TOO now located in Dallas. W5YK now residing on Lake Mexia. Wayne is very active on most all bands. *Your reports this month have exceeded all of my fondest* expectations. Thanks to each of you. Thanks to all specially W5KYD, W5YK, W5QGZ, WB5HOL, K5QKM, W5HVF, WB5EEE, W5TI, W5EBC, W5QU, W5GRZ and K5SXU. Traffic: (Jan.)W5QU 275, W5TI 216, WB5EEE 177, W5HVF 23, WB5HOL 10, W5LR 6, W5YK 5, WB5EBC 2. (Dec.) W5QGZ 426, W5TI 218, W5QU 203, WB5EEE 100, K5QKM 15.

OKLAHOMA – SCM, Cecil C. Cash, W5PML – Asst. SCM/SEC: Leonard R. Hollar, WA5FSN. RM: W5RB. PAMs: W5MFX, WB5CWX and K5DLE. It has been brought to my attention that it would be good for the Technicians to have a section of the low end of six meters set aside especially for cw so they might increase their code speed and might have some incentive to upgrade. The way it seems now the Technicians jump on the repeaters on fm and get hung up there. Speaking of cw our cw net held extra sessions during SET operations and scored 204 points. The more active ones on OLZ was WB5BFX/5, K5CBA, WB5FWH and W5RB. W5JJ is running for Mayor of War Acres. Good news from the Northwest in the short grass country. 19 persons met in Beaver Jan. 30 to organize a code and theory class. Billy Jack Overton, an ex-ham, will be working with WA5OUV, W5ONP and W5ONR. The Lawton-Fort Sill Hamfest was a great success. By print time the Woodward Hamfest will be history, however one important date to remember is Apr. 27, 28 and 29 – the West Gulf Convention in Euless, Tex. The convention is being held this time just about in the center of the division which is close enough for anyone interested – don't miss it! Our Communications Mgr. and pres. will be ther. The price was right on CBS "The Price Is Right" on Jan. 30 for the XYL of K5LUJ. Hope you saw the program, I did. Traffic: K5TEY 259, W5RB 129, WA5FSN 68, WA5ZOO 42, W5PML 41, WA5CUJ 33, W5MFX 33, WB5BFX/5 22, WB5DXP 22, W5FKL 19, W5SUG 19, K5OTM 15,

WA5OUV 13, WA5IWM 105AZS 8, K5ZDB 7, K5OCX 6, WB5FIK 3, WA5WRC 3.

SOUTHERN TEXAS – SCM, Arthur R. Ross, W5KR – HARC officers for 1973: W5FEM, pres.; W5AIR, vice-pres.; WA5WYD, secy.; W5DWC, treas.; W5LSE, programs; WB5DDJ, membership. Annual HARC Old Timers Party is May 5. W5KOD, formerly of Houston, is now GW5BCD in Wales. 55 members of SA Club took part in SET. OPS/OBS WB5LDS teaching code and WB5AUB teaching theory to general at Delmar College in Corpus Christi. RM W5ABQ makes urgent request for volunteers as NCS or liaison on new NTS Daytime Nets. ORS W7WAH/5 suffered Murphy's disease at SET time; band switch on DX-60 went out and had broken fuel filter bowl on generator. WB5FMA lost antenna to ice storm but is OK now. OPS WA5BVM assisted in medical emergency; Sister Mary helped located Paraguay Leukemia victim's medicine so it could be delivered in time. OVS K5CWS has second station license, WB5ILJ, has been busy converting T-43s to 2 meters and will put one T-43 on 432 ATV with local group. ORS WA5ZBK made PSHR for first time, reports he made CD party and SET with QRP rig. TSARC did not have formal SET exercise but WB5BWV, WA5YXS and WB5CUR piled up a traffic total of 293 for the two days. Bill, formerly W5KOD, is now GW5BCD, says he will be in Wales about 3 years. Traffic: WB5CUR 205, W5ABQ 173, WB5BWV 172, WA5YXS 137, W7WAH/5 130, W5YAX 105, WA5VBM 99, WA5ZBK 95, WA5YEA 94, WB5AMN 73, K5EJL 70, WB5FDS 47, WB5DBK 43, WA5LNV 39, K5ROZ 36, WB5DQE 35, W5BGF 30, WA3GBU/5 28, W5JVR 27, WA5JFZ 26, W5FTW 23, W5HWY 23, WA5ZBJ 17, WB5BGV 16, W5AIR 15, K5RVF 15, WA5HVI 10, W5UKN 9, K5HUA 8, WA5TJI 8, K5GDH 5, WA5OBT 3, WB5FMA 3, W5KLV 2, W5LBG 2.

CANADIAN DIVISION

ALBERTA – SCM, Don Sutherland, VE6FK – Asst. SCM: Mrs. Donez Booth, VE6YL. SEC: VE6XC. The 1973 SET now is history. I imagine all ECs will be studying the results to avoid the unavoidable bugs that always enter the picture. VE6ATY had a fine scheme in Lethbridge with great publicity. VE6AXH ran into exams. VE6FM had antenna problems in Calgary. The APSN was hampered by extremely poor conditions. The Canadian 40-meter service net went into operation continuously. Thanks fellows for the fine job and excellent cooperation. Thanks also to VE6XC, VE6BAT, VE6AVV, VE6AM, VE6BS and the many others who did a fine job. VE6MH and VE6FK got lost in Vulcan. During emergency in Managua VE6BAT also relayed between Managua and Calif. VE6XC doing a fine job with the Alta. Traffic Net (cw) which meets 3680 kHz 0200Z; Mon., Wed., Fri. at 1900 MST. Traffic: VE6XC 103, VE6BAT 59, VE6FK 57, VE6AM 38, VE6FS 36, VE6ASL 20, VE6ABV 15, VE6AVV 15, VE6YW 14, VE6ALU 10, VE6FV 10, VE6US 9, VE6OY 7, VE6AXH 6, VE6PL 4, VE6RU 4, VE6ADX 1.

BRITISH COLUMBIA – SCM, H.E. Savage, VE7FB – VE7AZ is in South America; VE7PW and XYL to W6-; VE7BR, VE7JY, VE7RV and XYLs to KH6- and VE7MI and XYL to VK-Lands; nice holidays. VE7BD has a son. Aurora Net on 40 becomes the Canadian 40-Meter Net and meets Sat. and Sun. at 1830 GMT, frequency 7149 kHz. Sorry to report the North and West ARC has retired for awhile. This also has happened to the Royal City ARA, both large membership for years. British Columbia Amateur Radio Assn. officers and delegates meet on 3760 kHz at 2100 GMT every Sun. Plans for BCARA Convention in Oct. Vancouver Island Picnic in June near Victoria. Okanagan International Hamfest July 28, 29; Penticton ARC the host. Traffic: VE7QQ 78, VE7BLO 65, VE7TT 60, VE7CCJ 26, VE7SE 6, VE7AXT 3.

MANITOBA – SCM, Steve Fink, VE4FQ – We welcome VE4FO as our new PAM and mgr. of MEPN. Once again, a special thanks on an FB job to VE4QI. MTN is urgently in need of some Winnipeg stations; much traffic has been delayed due to lack of a Wpg. station. VE4MA has been active with Oscar, giving the gang a VE4 contact. Andy is running 75-80 watts to an eight-element Yagi on 145.96 MHz. VE4RV and VE4MP should also be on soon. Our condolences to VE4AP on the passing of his son. WARC has code and theory classes going at CNIB under the direction of VE4VB. MTN (3660 kHz at 0045Z): 28 sessions, 103 QNI, 77 QTC. MEPN

(3765 kHz at 0100Z): 30 sessions, 1138 QNI, 22 QTC. Let's hear about your amateur activity. Traffic: VE4LG 36, VE4PG 33, VE4FQ 19, VE4RRC 17, VE4CR 16, VE4FK 4, VE4LN 4, VE4FJ 3, VE4FO 3, VE4HA 2, VE4IA 2, VE4PA 2, VE4WT 2, VE4DQ 1, VE4LS 1, VE4YC 1.

MARITIME – SCM, W.D. Jones, VE1AMR – PAMs: VE1YO, VO1FX. RMs: VO1CA, VE1RO. Another SET is past and the main activity this year was from VO-Land. Reports indicate VO1CA and company again pulled out all stops. So you missed last year's Ham-in-Army; don't tret there is going to be another this year. Make your plans now for a visit to VO1-Land this summer, more later. The VE1 contest went well this year; results as soon as possible. VO1DI is going great guns on vhf, including working through Oscar. APN reports QNI 175, QTC 89, sessions 37. Traffic: VO1CA 223, VE1AMR 119, CI1ARB 76, VE1DB 51, VE1AFM 12, VE1AMB 1.

ONTARIO – SCM, Holland H. Shepherd, VE3DV – Asst. SCM: *Ed W. Doyle, VE3EWD.* This report written by Asst. SCM VE3EWD. SCM, VE3DV is back from holidays in Spain, and may be found, once again, on the nets and repeaters VE3STP and VE2CRA. SCM bulletins to League appointees will recommence with Apr. edition. Managers of all Ont. nets, regardless of affiliation, are urged to register their nets with ARRL for inclusion in the next edition of the ARRL Net Directory. Registration Form CD-85 may be obtained by writing to League Hq., or to your SCM. Amateurs who worked VE0MO, "HMS Bounty" when she sailed south for making the film, "Mutiny on the Bounty," will be interested to hear that the operator, Al Briscoe, now signing VO1KK from Gander, Nfld. VE3AIU, pres. Bluewater Radio Club credits Repeater VE3GOD with sparking interest in club activity. The club also meets on 3745 kHz Tue. at 1900 EST. AREC continues to grow. Welcome to VE3VP, EC for City of Ottawa. RAQI, the provincial organization of radio amateurs of Que., publishes bilingually in the Journal; so reports editor, VE2AIK. Ont. sponsors of repeaters wishing to have their repeaters in the next edition of the ARRL Repeater Directory, are urged to obtain a copy of ARRL form CD-85A from League Hq., or from your SCM. Only those repeaters which were registered in 1972, or re-registered for up-dated) by May 1, 1973, will be included in the next edition. Windsor UHF ARC now has increased coverage through relocation of Repeater VE3III. Traffic: VE3SB 367, VE3FOZ 225, VE3DPO 153, VE3AWE 151, VE3EHF 107, VE3GJG 102, VE3GFN 80, VE3CYR 66, VE3EWD 66, VE3ASZ 54, VE3GEI 54, VE3FRG 52, VE3ATR 41, VE3GT 32, VE3FGV 26, VE3GBR 24, VE3FXI 22, VE3DVE 17, VE3AUU 16, VE3AKQ 15, VE3DU 15, VE3DH 8.

QUEBEC – SCM, Joe Unsworth, VE2ALE – SEC: VE2BDM. Visitor to Montreal VE6AMC on 2-meter fm. VE2ZH joined gallbladder operation gang. VE2JO on western trip had contact with former VE2BRP in VE7-Land. VE2AKM had words from former VE2AW while working 20 meters and VE2DR wants to experiment with QRP on hf bands. VE2APT claims when XYL VE2DGD has hair curlers on she is a 1296 MHz antenna. VE2OJ reports that QTC is almost nil recently on QON and ECN. VE2DU former NCS of QR Net now living in VE3-Land. VE2BD had wonderful display of antique wireless gear at Jan. MARC meeting. Repeater VE2TA out of operation for awhile – coaxial cable problems. No news items from RAQI! New calls on 2 meters VE2s IS, DHX, DAR. VE6IV leaves VE2-Land for VK. VE2AO baby girl Jan. 2, also VE2ARQ. VE2UK and VE2BR were on the sick list. VE2WF joined the VE2HI PLers in Dec. VE2BRJ and VE2BGX handle QTC into Latuque via QPN. VE2BZV now QTH at Ste. Perpetue. VE2EB active from Shawinigan. Hi to VE2JZ XYL of Gordon formerly VE1YX. VE3FEA in Montreal during Christmas. PSHR: VE2APT 26. Sympathy to the family of VE2UK who passed away Feb. 5. Traffic: (Jan.) VE2DR 104, VE2OJ 57, VE2BP 40, VE2ALE 33, VE2APT 32, VE2EC 27, VE2AJD 11, VE2DLG 9, VE2DEA 3. (Dec.) VE2UY 6.

SASKATCHEWAN – Acting SCM, William H. Parker, VE5CU – SET exercise very successful Jan. 28, 1973 with full province of Sask. participating under one net control station. VE5BO of Prince Albert has been appointed Communications Officer for EMO of that city. Prince Edward Island granted permission by DOC to use prefix CI for the duration of 1973. AREC effective communications support for Sask. Emergency Measures Air Division. NTS again very efficient in the SET. Ham Fest is July 1 week end, to be held in Saskatoon, looks like a gala affair. New PAM is VE5HP. A big thanks to VE5DN for his past management of phone activities. QSO is a very great magazine of the SAskatoon ARL.

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 394, Mamaroneck NY 10543.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't, police, etc. invited to join Society of Wireless Pioneers — W7GAQ/6 Box 530, Santa Rosa CA 95402.

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 WB2MBF, Box 532, West *Hempstead NY 11552*

22ND ANNUAL Dayton Hamvention will be held on April 28, 1973, at Wampler's Dayton Hara Arena. Technical sessions, exhibits, hidden transmitter hunt, flea market, and special *program for the XYL. For info write Dayton Hamvention, Dept.* Q, Box 44, Dayton OH 45401.

GREATER Baltimore Hamboree will be held Sunday April 8 1973 at 10 AM at Calvert Hall College, Putty Hill and Goucher Boulevard, Towson MD (one mile south of Exit 28 of Beltway Interstate 695) Food service, flea market, Registration $2. No *table or percentage. Info: Joe Lochte, 5400 Roland Ave.,* Baltimore MD 21210.

AN INVITATION NYC area hams and SWLs are invited to attend NY Radio Club meetings — 2nd Monday of every month, *Williams Club, 24 E. 39th St. near Madison Ave. at 8 PM — New* members welcome. Interesting programs.

HAMFEST: June 3rd. Save this date for the annual Starved Rock Radio Club Hamfest at Ottawa, Illinois. Write George E. Keith, W9QLZ/W9MKS RFD1, Box 171, Oglesby, IL 61348 for details, or see May QST Hamfest Calendar.

ROCKAWAY ARC annual Spring Auction will be held Friday evening April 27th. At the Hall of Science, Worlds Fair Grounds, Flushing NY at 8 PM. Doors open at 6 PM to accept items for the sale. One dollar donation accepted at the door. For further information contact Al Smith, WA2TAQ PO Box 341, Lynbrook NY 11563.

TRI-STATE Amateur Radio Ops spring buffet takes place on May 5 1973 at 6 PM. Place — the Lamplighter restaurant on Route 22, east of Pittsburgh at Delmont. Come early to meet everybody. YLs and XYLs welcome. Cost — $5 per person.

DELMARVA Hamfest - August 19 1973. Harrington Fairgrounds. Registration fee $2 advance, $3 at the gate. For information write Delmarva Hamfest Inc., Route 2 Box 90, Laurel DE 19956.

QSLs?? America's finest and largest variety. Samples 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

PICTURE QSL cards of your shack, etc. from your photograph. 500, $12.50. 1000, $16.25. Also unusual non-picture designs. Generous sample pack 30c Half pound of samples 60c. Raum's, 4154 Fifth St. Philadelphia PA 19140.

QSLs, samples 10c. Fred Leyden 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 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, Fetty, W2HAZ, PO Box 5237, Trenton NJ 08638. Samples 10c.

COMPLETE QSL catalog, 300 cuts, 10 report forms, ink and stock samples, plus ten sample QSLs, 25c. Cornellson's Quality QSLs, 321 Warren St., N. Babylon, NY 11704

3-D QSLs — Increased returns assure users' satisfaction. Samples 25c (refundable). 3-D QSL Co. Monson 2 Mass. 01057.

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. 2 for $1, 7 for $3. prepaid and guaranteed. Tepabco Box 198T Gallatin TN 37066.

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

QSLs. Second to none. Same day service. Samples 25c. Ray, K7HLR, Box 331, Clearfield UT 84015.

QSL's 300 for $4.95! Samples 15c, Colourcard Box 326 Topanga CA 90290

QSLs — Dime or your present card brings samples. Alkanprint, Box 3494, Scottsdale AZ 85257.

RUBBER stamps, $1.75 includes postage. NJ residents add tax. Clints Radio, W2UDO, 32 Cumberland Ave, Verona NJ 07044.

QSLs — Custom QSLs, brochure 25c, W1FLX QSL Designs, 20 Britton St., Pittsfield MA 01201.

QSLs — Free samples, fast service, good designs. W7IIZ Press, Box 2387, Eugene OR 97402.

EYE-BALL QSL for less than 1c, stop giving away your *expensive QSLs. KØOJW, 814 Riderwood, Hazelwood MO* 63042.

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200 two color QSLs $5.20, stamp for samples. Mark, WB6NKO, 2534 El Tonas Way, Carmichael CA 95608.

CANADIANS free surplus parts catalog. Etco, Box 741, Montreal.

TRX-67 SSB-CW 5-band transceiver. Solid state except for 6146 *finals. Accle power supplies and mike included. Best offer takes* all. VE3BQQ, Wesley Snarr, RR No. 6, Mississauga Ont Canada.

MOULTRIE Amateur Radio Klub, 12th annual hamfest, Wyman Park, Sullivan, IL, April 29 1973. Indoor-outdoor market. Ticket donation $1 in advance, $1.50 at the gate. For information write M.A.R.K. Inc. PO Box 327, Mattoon IL 61938.

ATTENTION New York City area hams — First annual auction of the Radio Society of Greater Brooklyn will be held Sunday, April 29 1973 at 1 PM at the Rockaway Center for the Performing Arts, 90-01 Beach Channel Drive (Opposite McDonalds) Rockaway Park NY 11694. *Doors open at 11 AM* for accepting equipment. Donations $1. For further information call Wayne at (212) 251-7580.

ANTIQUE radio equipment sale and swap session, dinner and program, AWA Spring Meet, April 7, Canandaigua NY. Write for details: Lincoln Cundall, W2QY, 69 Boulevard Parkway, Rochester NY 14612.

CASH paid for your unused tubes and good ham and commercial equipment. Send list to Barry, W2LNI, Barry Electronics, 512 Broadway, NY NY 10012.

WANTED: All types of tubes. Top prices paid for Varian & Eimac. Jaro Electronics Corp, P.O. Box 414, Orlando, Fla 32802. For fast action call Toll Free: 800-327-7799. Ask for Bob Hoffman.

WANTED: An opportunity to quote your ham needs. 34 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 WA 99336

VERY in-ter-est-ing! Next 6 big issues $1. "The Ham Trader," Sycamore IL 60178

TRANSFORMERS rewound. Jess Price, W4CLJ, 507 Raehn, Orlando FL 32806

WANT wireless (early) magazines and equipment for W4AA historical library. Wayne Nelson, Concord NC 28025

KLEINSCHMIDT Manuals, Mite KSR. Teletypewriter supplies, gears, parts, toroids. SASE list. Typetronics, Box 8873, Ft. Lauderdale FL 33310. W4NYF. Teleprintronics, manuals bought.

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.

WANTED: tubes, transistors, equipment, what have you? Bernard Goldstein, W2MNP, Box 257, Canal Station, New York NY 10013

TOWER climbing safety belt/lanyard $21.50. Prop pitch rotor $65. T/S 175 frequency meters $45. 2M handitalki $50. Coax rf switches multiposition $16-$48. Free list. Link, 1000 Monroe Tpk. Monroe CT 06468.

PREPARE for ham exams! Use Posi-Check. Original, expertly devised, multiple-choice questions and diagrams covering all areas tested in FCC exams. Keyed answers, explanations, IBM sheets for self-testing. All newly revised and up-dated. General Class $4.25, Advanced Class $4.50, Extra Class $4.75. Each applies to its own class only. First class mailing included. Add 25c per copy for air mail. Send check or money order to Posi-Check, P.O. Box 3564, Urbandale, Des Moines IA 50322

FIBREGLASS mast tubing for high frequency antennas. Outside diameters 1.0", 1.4", 1.5", 1.6", 1.4" telescopes inside 1.6". 1' to 10', $2 per foot, each additional foot $1.50, plus shipping. Lengths to 16'. Thermo-Flex, Inc., Box 1184, Salina KS 67401.

WANTED CE200E, HQ180AX, state condition and your lowest price. John Waskowitz, 35-30 73 St., Jackson Hts NY 11372.

DAH-DITTER Electronic keyer. Self completing ac supply, sidetone oscillator, speaker, 5 to 40 wpm, many other features. Wired $44.95. M & M Electronics, 6835 Sunnybrook, NE, Atlanta GA 30328.

SELL Collins KWM2, mint, with 516F2, 516E1, noise blanker, mobile mount, cables. $890. Package only. C. W. Tinsley, 75-561 Donwood Drive, Naperville IL 60540.

WILL buy your unfinished or inoperative amateur related Heathkits. Must be complete. W0WAM, 7928 Hedges, Raytown MO 64138. 816-358-1148.

FOR SALE, QST 1926 to date, $100. You pay shipping. Sencore TF151 in circuit transistor checker $75. K2RCO, Ed Schneider, PO Box C, Brooklyn NY 11204.

HEATH SB303 with cw, a-m filters. $295. W2EYD, 816 Donegal, Toms River NJ 08753.

WANT 5th edition ARRL Handbook. Extras to trade. K6WM, 850 Groff, Pomona CA 91768.

75S3B receiver, a dream, $495. 75A4, 3.1 kc filter, vernier knob, $295. 60 ft. tower $50. Wont last long. Ron Richardson, 525 Chalet West, Millersville MD 21108.

FOR SALE. Teletype 28ASR, dual tape readers, tape winder, storage bin, diagrams, manuals, new cabinet; FRXD reperf/TD unit w/cabinet; DXD strohoscopic test set and message generator; IBM selectric I/O computer terminal new; Tektronix 511AD scope; Hallicrafters SX100 rdceiver; Heath sine/square wave generator; Heath FET VOM; 7000 vct power transformer for kw; Cardwell kw load condenser. This equipment plus many parts at NY location, but contact Gerald Block, WA2YJD, at 436 W. Washington Ave., Madison WI 53703 for details. (608)-257-2612.

CLEANING house. GT550 $295. VOX35C $15. CAL25, $15. AC400, $65. RF550, $50. RV550, $60. SC550, $15. The package $475. Swan 350, $200. 117XC, $65. Swan 500C, $300. SBE34, $229. mike $9. W9HF, 5005 Indiana, Ft. Wayne, IN 46807.

FOR SALE: Drake TR22 fm transceivers. Used less than 6 hours. Two units complete with all accessories and instruction books. $150 each or $250 for the pair. Postpaid from W4ZAE/7, PO Box 112, Ely NV 89301.

WIRELESS sets, parts, catalogs, bought, traded. Laverty, 2815 Geneva St., RDI, Egg Harbor NJ 08215.

GREENE Center Insulators, with or without Balun — A tough number to beat. Free flier. Kaufman Industries, Box 817Q, Reeds Ferry, NH 03054.

TOROIDS 88 or 44 mhy, five for $2.50 postpaid. M. L. Buchanan PO Box 74, Soquel CA 95073.

NEWS: Free sample copy of "World Radio," Amateur Radio's Newspaper. 2509A Donner Way, Sacramento CA 95818.

WANTED: Straight keys and bugs for collection. Give make, model, condition, price. John Elwood, W7GAQ/6, Box 1243, Lancaster CA 93534.

IN4007 diodes with suppression networks, 10 for $2.50, 100 for $22.50. East Coast Electronics, 123 St. Boniface Rd., Cheektowaga NY 14225.

WANT January, February 1921 QSTs in excellent condition suitable for binding. Will pay premium price for premium quality. Marcy, W4ID, 461-3rd Ave., Sea Park, Fau Gallie FL

CX7A new Jan 72 best offer. MN2000 matching unit best offer. Would prefer sale in NY area so rig can be demonstrated. John Hipp PO Box 431, New Milford CT 06776. Tel (203) 354-9735 anytime.

COLLINS 455 kc filters: 2 kc, 4 kc, 8 kc. New 3/$50. GR716C $100, GR916A ant bridge, GR760 $50, GR821A $70, LM14 $15, Lavoie Freq synthesizer $395. W8CV 1910 Longpoint, Pontiac MI 48053.

CERAMIC feedthru capacitors, 1000 pF, solder-in type, 10 @ $1; 1500 pF, ceramic feedthrus, bulkhead mount, 5 @ $1; ferrite beads, 10 @ $1; 3/8-inch ceramic coil forms, without slug, 10 @ $1; 7-120 pF, square ceramic mica trimmer capacitors, 10 @ $1. Postpaid. Sase for list. CPO Surplus, Box 189, Braintree MA 02184.

SALE: Solid oak speaker enclosure set, shelf size unfinished. Sase 2613 Mural Drive, Chamblee GA 30341.

JENNINGS Vacuum Variable, about 5 minimum to over 250 *UF* maximum 23 kV, new $27.50 with end clamps $31.50 PPD. WA0TJR, 1490 Yaqui, Florissant MO 63031.

SB-101, wired, aligned, tested by Heathkit. Cw-filter, HP-23A, SB-640 VFO, manuals. All in excellent condition. $450. Hugo Woerdemann, K6TE, 32759 Seagate Drive, Palos Verdes Peninsula CA 90274. Tel: (213) 377-8307.

TRADE 32S1 xmtr on R4 HQ215 or 51J rcvr, or Swan 160 xcvr. W5BSU, 1210 So. 93 East, Tulsa OK 74112.

MOBILE Ops — Completely shielded ignition system is answer to ignition noise problem. Write for info on shielding kits and components. Summit Enterprises, 36 Winchip Road, Summit NJ 07901.

FOR SALE: Perfect HT32A, SX101A — $175 each or best offer. WB2PMP/1. Tel: (617) 296-0284.

1973 Hobby Electronics Directory. Hundreds of companies, products, and services. Parts, surplus, test equipment, plans, kits and more — $1.50. Newcal Enterprises, Box 323-H, El Segundo CA 90245.

FREE "want" ads! Details, plus 4 big issues — $1. Ham Ads, P. O. Box 46-653Q, L.A. CA 90046.

KWM2, yours is not perfect but it can be easily, write. W0BNF, Box 105, Kearney NE 68847.

WANTED: Type F condensers, also, other misc. Atwater-Kent breadboard parts. Joe Horvath, 522-Third St., San Rafael CA 94901.

WANTED: Hallicrafters SX-42. Charles Crothers, 60 Meriam St., Lexington MA 02173.

HEATH SB220 linear, like new — $300. Just completed wiring one month ago. Less than five hours in time. WA2REQ, S. Giordano, 2274 National Dr., Brooklyn NY 11234. Tel: (212) 763-8726.

HW-16, new, xtals & many xtras — $95; Elco 723 xmtr & Lafayette HA-500 rcvr, relay & many xtras — $85. Jim Norman, 1641C Forrest Ave., Ft. Meade MD 20755, (301) 674-6417.

SWAN 270 factory built-in ac/dc. Hy-gain fold over mobile ant. Heath HM-102 & SB-600. All in perfect condx. K8MPF, 3404 Meadowcroft, Kalamazoo MI 49007. (616) 349-4172.

HALLI SR-400 Cyclone 2 with cooling fan, matching PS-500 ac sup and HA-20 ext. VFO. Can't tell from new, package deal — $800; also Halli SR-150 with matching ac and dc and mobile mount, used, looks good and works. Good package deal — $250. Tom, WA9CIO, 118 Alhambra, Hoffman Est. IL 60172.

USED amateur equipment — receivers, transmitters, towers, parts, etc. Thousands of items to choose from. Send for our listing, or specify item required for our quotation. Taled Electronics, 1438 Barnum Ave., Stratford CT 06497.

DRAKE TR4, practically new, with carton and guarantee, AC4 & MS4 — $500; R4B, excellent — $325. Les Miller, WA3IKD, 939 Roumfort Rd., Phila PA 19150 (215) 247-7943.

SELL: Heath SB401 transmitter, good condition — $150. Jean Bryan, WA2UZK, 22 Cherry Ave., Cornwall-on-Hudson NY 12520. (914) 434-2692.

SELL KWM-2 Round EMblem Waters Q Mult, DX speech processor, installed. First $700. Henry Vander, WA2SIX, 66 Meridian Rd., Levittown NY 11756.

MOTOROLA HT220 fm handie-talkie, factory modified for 2 meters crystals installed for 34/94, 10/70, 20/80, 94/94. Five watt output. Includes case, 5-1/4-foot "flex-whip" antenna, 2 rapid charge batteries, automatic charger, external antenna adapter, external speaker/PTT microphone with coil cord. Radio can be used as "miniature" base station from 110 V ac. Other non-Motorola accessories included: Dycomm 101-500C 12 V dc amplifier (mobile) Calrad 110 V ac to 12 V dc power supply for base. Will ship all. No Trades. Have manuals for all — $700. Call daytime only or write: L. B. McFadden, WB6EJQ, 765 Geary St., No. 311, San Francisco CA 94109. Area code (415) 474-1394.

SB34, extras — $195; 75A2 — $150. Ned Raub, W1RAN, 12 Deerfield Road, Waterford CT 06385.

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.

THUNDERBOLT 6N2 kilowatt amplifier — $325; Crate — $25; G. E. 450 Accent mobile — $75; EZ-Way RBX-60G tower and tilt post — $225; 6N2 — $25; Kay 240B noise figure meter — $40. Wanted for cash: Mastr hi, uhf mobiles, bases or strips; Micor hi; any late uhf mobile; late model counter; Motorola fm generator; Sony Videorover and color recorder; AR-1500 receiver; Motorola OA-442/GR amplifier. K4GYO, 430 Island Beach Blvd., Merritt Island FL 32952.

SELL: Heights CUA-64 foot crank-up tower — $375; Galaxy GT-550, DC-1000A mobile supply & ac supply, dashmount, cables, Hustler MO-1 40 & 80 mtr coils — $400. Pickup. Al, WØDRL, R. R. 9, Topeka KS 66610. (913) 862-9226.

GALAXY V Mark III with matching P. S. & push-to-talk mike, includes SWR bridge & low-pass filter, like new — $350. Lt Faraone, 112A Ford Island, Honolulu HI 96818.

SALE: Kenwood TS-511-S, PS-511-S, VFO-5-SS, overhauled and new finals. Wanted: SB-200. W4GFZ, (803) 787-5799, P. O. Box 5103, Columbia SC 29250.

TRADE or sell: Heath SB-301, SB-401, factory aligned, excellent condition. Want: Trailbike, boat or $425 cash. K7GGI, Richard Torbenson, 3773 State, Salem OR 97301. (503) 364-1207.

TEN-Tec Argonaut, 405 linear, AC 5 tuner, KR5 keyer all mint. Frank White, WBOY, 19601 N. Park Blvd, Cleveland OH 44122.

SELL: excellent condition CE20A with VFO, VOX, mike, and nb phone patch — $90. You ship. WAØWWI, 801 Anncir, Cloquet MN 55720.

WANTED: good used cassette recorded autio visual theory instruction course. Willis, Rt. 1, Pittsburg TX 75686.

SELL: HQ-110C — $65; Eico 425 Oscilloscope — $30; Aiwa TP-50R 3-inch reel tape recorder — $10. You ship. Dan Schreckengost, 166 Johnson St., Corry PA 16407.

DISCOUNT prices on transceivers, 2 mtr gear, antennas and accessories by Hy-Gain/Galaxy, Standard and Pearce-Simpson/Gladding Wayne Cordell, K4HCS, Blue Ridge Communications, Rt. 3, Weaverville NC 28787. (704) 645-7070.

SCOUT Radio Explorer Post requests donations of used radio gear for Amatuer Club Station. Gifts are tax deductible. Paul Alexander, WB4AVD, R No. 1, Savannah TN 38372. Phone (901) 925-2104.

WIRELESS Collector's Catalog No. 1 — $1. Refundable first order. Midco Q34 Box 1537, Long Beach CA 90815.

BRAND new circuit boards (surplus) with 14-2N3391 transistors plus 49 resistors, 8 electrolytic capacitors, 8 diodes — $3.50 P.P.; ceramic switches 5 pos. heavy duty for linears — $5; 10 mfd — 2500 V. oil capacitors — $8 plus shipping (8 lbs). K4VCP, Bill Collier, 2537 Cannaday Rd. N.E., Roanoke VA 24012.

SELL: Mosley TA33, TA-40-kr conversion — $75; Poly-Comm 2C, 2 meter transceiver, Hy-Gain 8-element beam, a static mike with G stand — $125; Hallcrafters HA-1 Electronic keyer with Vibro-keyer — $75. Write: R. Simon, 1694 Linden Place, North Merrick, NY 11566. Call: 516-538-3877.

DC power supply HP13A kit unassembled in original sealed carton — $55. Thor, Rt. 10, Bx T133, Fort Myers FL 33901.

HEATH HW-16 for sale, excellent condition. With speaker and crystals — $80. Steven Brandt, 1341 East 101 St., Brooklyn NY 11236.

HIGH power components, vacuum variable, plate and fil. transformers, choke, filter caps. Envelope for full information. Earl Eggers, 2105 West 29th., Eugene OR 97405.

HEATHKIT SB-301 w/spkr — $220; SB-401 w/mic — $230; Dummy Load — $10; SWR Meter — $10; New phone patch (unused) — $20; Monitor scope — $50. Will consider trade for old colt pistols or muzzle loader rifles. S. Garwood, No. 16 Main Street, Flanders NJ 07836.

ANYONE having information concerning three tube rel receiver Vintage Thirties made by Radio Engineering Laboratories, New York City contact: W9ZEN, 124 Glen, Oglesby IL 61348.

HW-16, factory aligned, excellent condition, with extras — $90. WN2MRS, Ray, 122 Haig Rd., Valley Stream NY 11581. Lo1-8394.

SELL: SB-101, HP-23A modified for SB-650 use, very good *condition — $345; TA-33 beam* — $70. W2WHK, 210 *Utica* Street, Tonawanda NY 14150. (716) 692-5451.

SELL Swan VX-2 VOX unit for 500 DX — $22; Spectrum International XF-9B 9mz crystal filter — $26. Postpaid. MO only. C. Cooley, WA8TPA, RR 2, Stanton MI 48888.

FOR SALE: R-388/URR Collins receiver — $200; Johnson kilowatt amplifier — $100. Purchaser will pay shipping cost. Jack Hamilton, Route 1, Box 87-B, Sylvester GA 31791.

WANTED: National VFO VX501. Phil D. Jensen, WA7NMC, 154 North Grant Street, American Fork UT 84003.

SELL FT-101 mint, also FL2100 linear, never used. Write for full details. Hope to eyeball former QSOs as DL4VA, 3A0BN, F0IG, at Dayton Hamvention. Look for shirt with WA4WME on *back. Hugh Vandegrift, 4350 Heidelberg, St. Louis MO 63123.*

COLLINS 75A4, Serial 4090; Viking Valiant; Johnson Match Box with directional coupler; Johnson low-pass filter; Shure Mike; TR Switch; Multiphase rf analyzer, speaker and all manuals — $500, complete. WA2BZJ, George Geiger, 150-42 35th Ave., Flushing NY 11354. Phone (212) 359-5445. Certified check or cash & carry only.

SELL: QRP Heath "Mini-Rig" HW-7, mint, factory checked and aligned — $50, plus shipping. Heath Hybrid phone patch HD-15 — $15, plus shipping. WA3TBA, 418 Hickory St., Warren PA 16365.

HEATH linear SB-200 like new — $180; Millen solid-state dipper — $80; Heath solid-state scope IO-102 with Tektronix probe — $95; Millen absorption wavemeters — $25; Heath signal generator IG-102 — $25; Triplett transistor tester 690A — $25; Heath direct reading capacitor meter CM-1 — $25. FOB, Huntsville AL 35810 — K4JK.

FOR SALE: General coverage rcvr BC348,ac,good condx, $50 — shipping extra. WB2VND

SELL: Heath station: SB401 transmitter, SB301 receiver, SB200 linear, SB610 monitor scope. Mint condition — $750. WB8DPC, B. Pryimak, 120 Teakwood, Springboro OH 45066.

MANUALS for Govt surplus gear, $6.50 each; R-390/URR, R-220/URR, R-389/URR, CV-591A/URR, TT-63A/FGC. Hundreds more. S. Consalvo, W3IHD, 4905 Roanne Drive, Washington DC 20021.

FOR SALE: Collins KWM-2, PM-2, 30L1, 312B5. All late model and mint condition — $1125 for all or will sell separately. Galaxy V Mk 1 MK with VOX, Cal. and power supply, speaker — $250. Hy-Gain traps for 5-band trap doublet — $30. C. Jett, 101 Cambridge Ct., Tullahoma TN 37388.

2N3632's — 13 watts out on 2 meters, good up to 400 MHz, with specs, $3 each, three for $7.50. WA2KOI, Lloyd Schoenig, 207 Woodlawn Ave., Williamstown NJ 08094.

FOR SALE by owner. Signal One CX7A six months old, best offer over $1800; Collins 30L1; Collins 312B4; RCA WO-505A scope; Regency HR-2S; Robot model 70 monitor and model 80 camera with two lenses. K4GGE, (919) 492-0854.

NEEDED: Tech manual for BC-348-M USASC Radio receiver, will accept tech manual for complete BC-348 series of radio receivers. Willing to pay for reproduction and postage. Robert F. Jambor, 149 Sandford St., New Brunswick NJ 08902.

SELL: Johnson Viking Ranger I, serial no. 66843, instruction book & 2 extra crystals, mint condition — $89. FOB. D. F. Edwards Jr., WB9FML, 211 Cullen Avenue, Evansville IN 47715. Tel: (812) 479-0969.

FOR SALE: Hw-16 — $80; Eico 723 — $20; Electronic T-R switch — $30; Eico 718 — $60; Calrod SWR and power meter — $15, *plus many extras. James McClellan, Rt. 1, Box 1477, Avon* Park FL 33825.

MUST sell Drake 2NT — $90; Hallicrafters SX130 Comm. rcvr — $75, both mint with manuals and cartons, no shipping. Frank Ainoris, WB2JYP, 1838 Lincoln Ave., Holbrook NY 11741.

ESTATE of K4JIB, Galaxy V MK II with microphone and phone patch — $275; matching linear amplifier — $275. c/o WB4BAP, 250 The Highlands, Tuscaloosa AL 35401.

SWAN 350, xtal calibrator, ac & dc supplies, excellent condx, Best offer, u ship. WA1EUF, 78 Delaware Ave., Manchester NH 03104.

SELL UTC CG 308/115-220 Pri . . See 4800/6000/7000 at 1/2-amp. W2EZM. (609) 663-8137.

JOHNSON Navigator: f/w, clean — $70, you ship. W9LIZ/Ø 819B Bong, Duluth MN 55811. Tel: (218) 722-8761.

HRO-60, "B" Slicer, 9 coils, college, make offer. WAØWYX, 3514 Skyline, Des Moines IA 50310.

WANTED: F455J-08/05 Collins filter. W7CE, 3816 Southeast Lafayette, Portland OR 97202.

SELL Drake *R-4B* and spkr — $350; 2B — $150; SB401 and xtals — $225. You pay freight. Saunders your manual adr? Douglas Turnbull, W1CGG, 75 C Greenend Ave., Middletown RI 02840. (401) 847-8000, x 2871.

COMPLETE station, HX-500 exciter provides ssb a-m cw fm fsk modes, Eldico SSB-100F linear with self-contained modulation monitor, SX-111, HQ180 ac, Waters 384 dummy load, Heath SWR bridge, Heath Hybrid phone patch, 5 pos. B&W coaxial switch, Turner 454C microphone, 1 kW Johnson and 100 W *Drake low-pass filters, 3 coax relays with dpdt aux contacts,* Telrex TC-99D Tri-band beam, E-Z Way tower with motorized hoist and CD Ham-M rotor. Take all for $1750 or make offer for item you need. W2NLU, 24 Juilliard Drive, Plainview NY 11803. Contact for detailed description or to arrange viewing. (516) 681-2255.

WANTED: Drake L4B, MN2000, C4. Separately or together. K3HID, 423 Waring, State College PA 16801.

SIGNAL One CX7A *used 3 mo.* — $1450. Peter Williamson, 132 Winthrop St., Augusta ME 04330. K1RES (207) 622-1949.

FOR information contact W3USG, Jerry Croft, 414 West Penn Street Ext., Bedford PA 15522.

HALLICRAFTERS SR-150 and PS-150 — $275; Gonset 3212 2-meter power amplifier — $125; Poly-Comm 62-B — $100. All in good condition with manuals. John A. Kammerer, W2WRI, 23 New Street, Katonah NY 10536. (914) 232-8349.

SELL: TR-4 w/mb and mobile supply — $495, firm takes both, will ship. Write: WB6WQA, Redondo Beach CA 90278.

SELL Drake 2-B — $149. Dick Seibel, 151 Weber Ave., Trenton NJ 08638.

WANTED: *Parts for or cannibalized General Electric Voice* Commander II's and III's. WAØJUM, Box 59, Mobridge SD 57601.

FOR SALE: Kenwood TS511s, w. ac supply — $260; QST's 1954 to 1971 — $1.20, year; Johnson TR 250-39 — $15. Silber, 915 Ransom, Ripon WI 54971.

HEATHKIT HW-12, mic, speaker — $70; SB-601 — $50; 4CX1000A — $50; Hy-Gain 15-el. 2m — $25. You ship or will arrange pickup-delivery. Stephen Powlishen, WA1FFO, 53 Oak Street, East Hartford CT 06118. (203) 568-6580.

WANTED, someone to repair a National radio receiver, model AN/WRR-2-A. Have manual. Will deliver and pick up. Fred Danner, P. O. Box 35, Clementon NJ 08021.

SELL SB301 cw filter, SB401, mint condx recondx by Heath Co., manuals xtal mike — $425. Adam Holzmiller, 390 N. McElroy Rd., Mansfield OH 44905.

SELL Heathkit HP-14 mobile power supply for HA-14 linear — $45. WA3OOC, Ray Woodcock, 67A Nickolas Rd., Framingham MA 01701.

SALE: Heath equipment. HW-12 with mobile power supply and antenna — $100; SB-101 and ac power supply — $325; SB-220 2 kW linear — $350; Apache TX1 with SB-10 — $125; Heath Twoer — $15; Capacitor checker ITI1 — $25; VTVM IM-13 — $25; Volt ohmmeter V 7A — $15; SWR bridge AM-2 — $12; Phone patch HD-15 — $18; Transistor diode checker IT-27 — $4; Hammarlund receiver HQ-110 with spkr — $96; Superior volt ohmmeter — $8; Knight tube checker — $10; BC-224 D receiver with PS — $60. You pay shipping. Also antique radios and horn-type speakers. Sase for list. Estate of K8OYZ, 417 East Broadway, Three Rivers MI 49093.

SELL: A superb revt, 75A-4 (SN 5325), mint, VCZ mods, 3 filters, spkr, must be seen — $475; 32S-1 (SN 363), mint with 516F-2 (SN 21753) — $375; Henry 2KD-3 (SN E147J8), mint with pwr supply (SN B1234J8) and 2 new finned 3-500Zs — $575; also Hy-Gain 400 Rotor and Waters dummy load — Wattmeter 374; prefer pick-up sale. Ed Schmults, W2VNA, 9 Turner Dr., Chappaqua NY 10514. (914) 666-2087.

LAW student, first year, Temple Univ.; BSEE, Univ. of Penna., 4 years experience in communications engineering; MBA, Temple Univ.; age 26, desires law related summer position. Resume on request. K3MNJ, J. Talens, 8361 Langdon St., Phila PA 19152.

REGENCY HR-2, twelve channels, fully crystalled, preamp, a/c supply, Nicad field pack, charger, antenna — $280; 10w/50w Dycomm — $70. Bruce Berg, WB2IUE, 13 Lisa Lane, Cherry HILL NJ 08003.

SELL: Heath Scanalyzer SB-620, mint condx, factory aligned, used 1 hr, — $100. M.O. W9ALP, Les Arndt, 4522 So. Kedvale, Chicago IL 60632.

YAESU FLDX-400 transmitter, perfect condition. First check $225, will ship. WA2ODI, John Harrison, 3938 Franklin Ave., Seaford NY 11783.

1946 to date, complete bound sets of QSTs. Best offer. W7KYQ, 915 N. 79th, Seattle WA 98103.

WANTED: Squires — Sanders SS-1BS receiver. C. E. Whitemore, 5021 Jurupa Ave., No. 9, Riberside CA 92504.

VIDEO adapter converts your oscilloscope into flexible 1024 letter RTTY readout for under $400. High performance hf frequency synthesizer replaces VFO and delivers clean rf output with calibration accuracy, stability, and resolution 100 times better than today's best amateur rigs. "Morsaverter" system lets you send and receive Morse code with your Teletype. Write for full information. Petit Logic Systems, Box 51, Oak Harbor WA 98277.

YOUR call letters engraved on a hardwood plaque — $5, postpaid. Tony Vitolo, WB4BKU, 2756 Tanglewood Drive, Snellville GA 30278.

SELL: HRO-60, eleven coils, Sleet-o-jet, hand W 390; HT32B, mainliner TU, teletype model 19, typing reperf., long runs of QST, CQ, 73, Ham Radio, many handbooks. One kW audio to two kW rf plate mod. xformer. Hi-volt xformer 2500-2000 c.t. sec., 120 V PRI. 500 mA. F. Meisch, W8SNO, Rt. 2, Mt. Vernon AR 72111.

WANT: R4A T4X — reasonable. Sell: 3600-0-3600 x fmrs 1.7 amp — $40, with 110/200 primary. W9AIH, 814 4th St. S, Virginia MN 55792.

MISSIONARY Society urgently needs towers, linears, exciters, receivers, beams for Liberia. Donated gear welcome or send absolute low price. Gifts tax deductible. Ambassadors for Christ, Box 366, Condordia Seminary, Springfield IL 62702.

RBL — $30; RBS — $30; RAK — $30; 639A — $50; DZ — $25; NC183D — $110; SX24 — $35; SRR11 — $100; S36 — $125. Pickup only, sase — W6CRG, 11007 Explorer Road, La Mesa CA 92041.

FOR SALE: Heathkit "Warrior" HA-10 linear, coaxial relay, extra rectifier tubes — $110, clean. LaRue Cleveland, 8100 Pine Creek Drive, Evansville IN 47710.

LATE model SB-301. Absolutely mint, complete with speaker and all filters — $225. Adams, 1402 West 13th St., Panama City FL 32401.

HEATH HW-10A with crystal calibrator, excellent — $45. 2-meter a-m xmtr — $15, disassembled. B&W-1000A, 813sGG with supply, manual — $65. WB2EYZ. (212) 256-5014.

SELL Hallicrafters HT-37, excellent condition — $130, FOB. W9MZC, 26 Princeton Circle, Longmont CO 80501.

SELL: CV-89/UR-8A RTTY Audio TU with tuning scope. W7EU. (801) 277-7309.

SELL: R-390 w/manuals in excellent working condition — $325. Jess Wallis, 3531 Valley View, Bloomington IN 47401. (812) 332-1345.

jSR-150 installed, 1966 Chrysler Imperial, hitch springs for heavy towing, Neutronics antenna, desk power supply — all $1700. Central Electronics 200 V — $325. M. G. Del Baglivo, M.D., 20 Centre Ave., Secaucus NH 07094.

LAFAYETTE HA-350 receiver, excellent — $75, Hunter Bandit 2000A, good condition — $200. Philip Schwebler, W9GCG, 4536 N50 St., Milwaukee WI 53218.

DRAKE 2B with Q-mult and calibrator; Gonset GSB-100, GSB-201; CTG Magnum-Six for Heath equipment; SB-650, Twoer, Swan 412 dc supply; TBS 160-meter tuner; Tandberg 64X tape deck. Sase for details. Charles Secrest, WA8ASV, 4245 Meadowlark, Flint MI 48504. (313) 732-4235.

CHOKE R17A — $3.50; FC15A — $12; Ameco TX62 with VFO new — $120; Elco Keyer — $50; TS323 with ac supply, spare parts — $60, BC453 — $4; CB walky-talky, two watt, ac supply — $30; AN-ARW-75 — $20. W8SYB, 5000 Hall, Amarillo TX 79109.

NOVICE rig, Drake R4B, with extra xtals, transmitter w/ 16 xtals, SWR meter, key, headset — $300. Heath 1M-11 VTVM — $25. Heath GR-54 — $50. Cashiers Check. Lawrence Diemer, 1981 Teehan Lane, Baldwin NY 11510.

SELL: Heathkit SB-300, SB-401, SB-600, mike, cables, manuals, complete — $475; Motorola 80-D 150 MHz, draws 3 — $110; QST 1931-72 — $5/year. W2AAF, 29 Midwood Road, Stonybrook NY 11790. (516) 751-8236.

NOVICES For WAS or QSL: Send available time, frequencies to — WN4WUY, Frank Griffin, 5217 Germanton Rd., Winston-Salem NC 27105.

FOR SALE: R-391/URR receiver, excellent condition, asking — $600. Ralph Moorhouse, 331 Hickory St., West Melbourne FL 32901.

WANTED: Heath SB-640. Prefer tube type LMO. No junkers. George Lee, 400 Helane Dr., Longview TX 75601.

FOR SALE: Lafayette PF-30 fm receiver. Absolutely mint, 30-50 MHz, you ship — $55. WA1ISX.

DX-60B with mike, mint — $56. P. C. Noble, W1BVR, Box 5, Lanesboro MA 01237.

NEW unused Kenwood R599 receiver, in original box with instructions — $300, postpaid. WA2BSI, Box 2323, So. Hackensack NJ 07601.

CRYSTALS airmailed: General purpose, MARS, Novice calibrators, accurate; FT-243 pairs for QSO and calibration (3703-3747) — $3.50; (7103-7147), (7035-7065), (7027-7048) — $2.95 pair; Novice, active, FT-243, all frequencies, minimum five 40 m, 15 m, 10 m — $.99 each; 80 m — $1.59. Cover bands inexpensively — rock solid, less than five 80 m — $1.75 other — $1.50. General purpose: FT-243 .01% 32 pF, 3500-8600 — $1.90 each, (five — $1.75), (nets ten same — $1.45), 1700-3499, 8601-13000 fundamentals, 10,000-30,000 overtones — $2.95, $.50 each for .005%, $.75 for HC-6/u above 2000. Airmail $.15/crystal — 1st ct. — $.10. Free order-listing. Bob Woods, WØLPS. Since 1933. C-W Crystals, Marshfield MO 65706.

SELL: Collins 30L-1, excellent with manual and new 811A's — $375, prefer local sale, but will ship. R. R. Boring, K6IZB, 5437 Middlecrest Rd., Palos Verdes Penin CA 90274. (213) 377-2357.

SELL: Heathkit SB-301 receiver, SB-600 speaker, SBA-301-2 cw filter, SBA-300-3 6-meter converter, perfect operating condition, complete — $240; SB-401 transmitter, HDP-21A matching mike, excellent — $240; HM-102 wattmeter — $10, with transmitter, — $20, done. Dan Rosen, WA2ITH, 5 Milburn St., Hicksville NY 11801. (516) 681-9161.

PHILADELPHIA Area: HQ-100 receiver, with 100KC calibrator and speaker — $90; Knight T-150A transmitter — $60. Both in perfect condition. Made DXCC with this combo. W3YJG. (215) 745-4850.

SB-301 — $250; SB-401 — $250, both for $440, excellent condition; Swan 270B, 14A converter, Shure 401A — $390, two months old. FOB, W7YOF, 1000 E. Broadmor Dr., Tempe AZ 85282.

SELL: Galaxy III transceiver, ac power, speaker, console — $150; Realistic DX-150 receiver, — $45. K6IZ, 30238 Via Victoria, Palos Verdes CA 90274.

SELL — Complete Johnson 6 & 2 meter station, minus receiver, good condition — $225. J. J. Anania, WA2QHI, 10-30 River Road, Fairlawn NJ 07410. (201) 796-1892.

WANTED: All-band transceiver. WB4ORH, 3007 Brandemere, Tallahassee FL 32303. (904) 385-3281.

jCOLLINS Mechanical filter, 455FA05, 500 cycle BW, for 75S3B. Unused, in original Collins carton — $35. J. M. Hoffer, W1DL, 24 Cherry Road, Framingham MA 01701.

SIGNAL/One/Alpha-80: used CX7A, mint — $1295, one month warranty; New Demo CX7A — $1495, 90 day warranty; Alpha-70 vapor 10-160 meters, 70-air — $995, 90 day warranty. Payne Radio, Box 525, Springfield TN 37172. Days (615) 384-5573. Notes (615) 384-5643.

jYAESU FT-2 auto with seven channels of crystals, used 1 month — $350; new factory wired Hal MKB-1 Morse keyboard — $260; Heath SB-10 sideband generator — $35. You pay shipping. Want mint 32ASR. K3TML, 27 Sheldon St., Wilkes Barre PA 18703.

QST collection for sale May to December 63 and complete 64 through 72, and CQ complete 64 through 70, all excellent condition. Your offer. Joseph Thiel, K2CIT, 14 Crest Drive Bound Brook NJ 08805.

WANT Squire-Sanders SS1R, unmodified with instruction manual. Will pay up to $425 for good clean specimen. W9MC. Would trade my clean TR-4 even.

SELL: SK-100, with spkr — $125; DX-60B — $70, both for — $180. You ship. WN6OHF, Phil Nelson, 2140 Sierra Pl., Ukiah CA 95482.

SELL: Heathkit SB-620 Scanalyzer — $85; full-size, 3 15-meter beam — $20; 2-element mini-beam 10-15-20 meters — $35. W9VYD, John Robinson, 286 Ingram, Northfield IL 60093.

jHW-16, excellent operating condition — $90, aligned 12/72, manual many xtals included. Marvin Silverman, 4 Cambridge Road, Great Neck NY 11023. (516) 466-5733.

GLADDING-25, 2-meter fm, with ac power supply — $200. K2KOS, Joseph McCaffrey, 135 Montgomery St., Jersey City NJ 07302.

QST's — Sept. 1919, March 1920, plus Sept. 1921 through Dec. 1950, complete. For sale as a lot only — $140. Also, have 1922, 1923, 1928, 1930 Call Books, Dept of Commerce Bulletin 74, 1924 Edition. Make offer. W6ALF, 1236 E. Union Ave., Fullerton CA 92631.

NOVICES: HW11, 6 xtals, low pass, Morgain antenna, excellent — $125. Mike Halpern, 14 Andover Dr., Syosset NY 11791.

MANUALS for ham gear made, last 25 years. Copies $3 up. Send sase for quote. WØJJK, Jobby Industry, Box 864, Council Bluffs IA 51501.

NOVICE crystals — new freqs. 24-hr. shipment. Free flyer. Nat Stinnette Electronics, Tavares FL 32778.

GROUNDED grid filament chokes, 30 amps — $5. Plate chokes 800 mA — $3. 3-30MCS, PPUSA48. William Deane, 8831 Sovereign Rd., San Diego CA 92123.

GRADUATE Studies; sell: Eico 753, matching ac supply, book, *very clean, works well — $145; 20-meter Heath* single*bander,* Heath dc supply, books, mint — $119; Hewlett-Packard 325B noise/distortion Analyser, book, good condition — $115. Prices include shipping 48 states. WB2LRS/6, 5025 Thacher Road, Ojai CA 93023.

FOR SALE: Heath SB-400 — $285; SB-200 — $189; Drake 2B, plus Q multiplier — $179. Will pack, you pay shipping charges. W2EDX, 36 Winchip Road, Summit NJ 07901.

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COMPUTER expert wanted: need assitance in building a mini-computer. Write: Jesse Newton, 1071 Prosser Ave., Prosser WA 99350.

HEATH HR-10B, A-2 — $49. 9N2RIO, 5 Edgehill Close, Bronxville NY 10708.

3000+ watt PEP Henry 3k perfect, pair new spare finals, will demo with wattmeter, no shipping — $800; ew filter 75S3B, 500 cycles — $40. WB9FJX, 774 Easy St., Glendale Heights IL 60137. Phone (312) 858-4324.

NATIONAL HRO-500 solid-state receiver, 1968, and speaker for sale to close husband's estate. Mint condition, original cost — $1300. Will only consider reasonable fair offers. Write Mrs. Roger Williams, 1811 Sussex Lane, Winston-Salem NC 27104.

HEATH SB-200, perfect — $180; unused 572B tubes 4/$35; UTC model S4S kW tranformer with matching S3S choke, see commercial catalogs for specs — $40. Will deliver in 150-mile radius. Dave Hachadoorian, K1JYN, 10 Orville Drive, Middletown RI 02840.

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SELL HRO 60 with 80-40-20-15-10 coils, you pick up — $150; HW 16 with Novice crystals — $60. Daniels Ridge St., Lansford PA 18232.

HALLICRAFTERS HT-18 cw/fm/VFO Exciter 80-10 m — $45; Hartman 2 m 100W amplifier — $35; Teledynamics 220 mc, 100 W amplifier — $35; 1296 mc kilowatt amplifier — $225. Swap vht/uhf gear, list sase. W4API, Box 4095, Arlington VA 22204.

WANTED: Swan RC-2 trunk mount kit, 410 VFO, Drake RV-4 VFO, Hallicrafter — 20 VFO, SR-400 Cyclone late model. D. B. Whittemore, W2CUZ, 36 Masterton Rd., Bronxville NY 10708.

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SELL: Drake R4A, T4XB, MS-4, AC3, Heath SB-200, SR-601, *SR-620, HM-102, HD-15. Wud like to sell as unit.* Send sase for info. K3ARM, 202 Stanton Road, Wilmington DE 19804.

SELL: NCL2000, excellent condition, includes two new spare 8122 tubes — $350; Ranger II, factory wired, like new — $90. *W2DNE, 12 Doris Road, New Hartford NY 13413.*

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GONSET 2 m Sidewinder (900 A), new stacked Squalo, manuals — $195; Heath Sixer (HW29A), dc supply, manuals — $35; new stacked 6 m Squalo — $28. Keith Johnson, 214 Bell, Cary IL 60013.

FOR SALE: Gonset Communicator IV — $125; FT-100 — $225; Collins 75A4, serial 3915 — $290; new 5CS1500 — $140; vacuum variable capacitors — $25. W6HHN, 3467 Rambow, Palo Alto CA 94306.

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GOING QRT: wish to sell entire ham shack. Lot includes junk box, antennae, rotors, tower, cables, relay racks, miscellaneous equipment, and features like new two bay, forced air cooled *desk-top Emcor console containing Ranger-2, HQ-180AC with 6* m converter, coax switching, SWR metering, mains power monitor, chronometer, speaker, and custom audio patch provisions with space for further additions. Best offer takes lot. Will FOB your carrier. Bob Tortolini, 61 Brookline Street, Lynn *MA 01902.*

SPEECH amplifier for Heath SB-400 and WB-401 plug-in module AU3, no wiring necessary — $14.50, plus postage. American Sales Company, 5358 Floria Drive, Swartz Creek MI 48473.

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DRAKE TR3, ac supply — $375; DC, new — $99. WA2CRO, Box 27, Burnt Hills NY 12027.

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SELLING: SB-401, crystal pack, HDP21A mike — $259; Drake 2C, 2CQ — $180; Gold Line wattmeter — $20; brand new Heath VTVM IM-28 — $125; Vibroplex keyer paddle — $14; Digital clock — $10; Knight SWR meter — $8. All units perfect with manuals. Jeff Mason, WB4NDO/5, 2801 Echo Trail, Edmond OK 73034. Phone nights (405) 341-7746.

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TV camera with self-contained microwave transmitter. Ac o Nicad powered, 10 to 1 zoom. Spare Vidicons, parts and circui *boards — $375. Rack mounting NC183D factory modified to* dual diversity use. Excellent condition but needs alignment - $100. W2RLG, 42 Union St., Matawan NJ 07747. Tel. (201) 566-9238.

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WANTED: Collins mechanical filter for 75A4. No. F455 J-0! *Hans Frandsen, K9QCH, Rt. 1 Bx. 314, Fort Byron IL 61275.*

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COUNSELOR: Operator with general license to teach ham radio at Pennsylvania co-ed camp. Have completely equipped ham station. Write: Trail's End Camp, 215 Adams Street, Brooklyn NY 11201.

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FM-210 Galaxy xcvr, ac-210 ps, 10 xtals (all Sentry), bracket, cables for ac, 5w & 10w operation, updated by Galaxy 1972, all manuals, price — $125 firm, incl. shipping insured 48 states. Tom Donohoe, W2NJS, 45 Gramercy Park, NYC NY 10010. (212) 673-3458.

SELL: Drake TR-3, AC-3, RV-3, Heathkit HW-30 (twoer), Ten-Tec PM-3A. All mint condition. College expenses, must sell, best offer. Craig Johnson, WA0TYS, 824 Second St., Sauk Center MN 56378. (612) 352-2459.

HEATHKIT 1-102 solid-state oscilloscope, excellent condition — $120; Johnson KW match box, no SWR coupler, excellent condition — $85. Will ship, certified check only. W2HC. (516) 333-1079.

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STANDARD SR-C826 m, several xtals, gain ant. — $260; Heath HM-11 SWR meter — $5. Pete, W7JLS, 3751 So Nellis No. 63, Las Vegas NV 89121.

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HEATH HW-100 transceiver, HP-23A ac, HDP-23A mike, excellent condition, hardly used — $225 or best offer. M.J. Coyner, WA3LIE, 1225 Evergreen, Wilmington DE 19803.

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SIGNAL/ONE CX-7A, excellent condition. K1VTM. (203) 224-4581.

HEATH SB-200, linear amplifier, mint condition, one-year old. Will deliver within 200 miles — $200. J. Horwath, WA1RHA, 245 Bruce St., Lawrence MA 01841. (617) 687-2240.

FOR SALE: Heathkit DX-100B transmitter, Astatic D-104 mike, National NC-183 receiver with National speaker — $150. R. W. Norton, 4065 A. Foothill Road, Santa Barbara CA 93110. (805) 967-5340. W6GLW.

FOR SALE: Hammerlund 4-20 transmitter, 4-11 modulator, Collins 310C-2 exciter, Millen rf-power amplifier, SB200, SB401. W1SJ, 306 Peck St., New Haven CT 06513.

WANTED: Do you have old HT-32 series xmtr beyond repair.? Will buy the level indicator meter, good condx. Herb Berg, 5625 West Brooklyn Place, Milw. WI 53216.

FOR SALE: Heathkit DX-100B transmitter, Astatic D-104 mike, National NC-183 receiver with National speaker — $150. R. W. Norton, 4065 A. Foothill Road, Santa Barbara CA 93110. (805) 967-5340. W6GLW.

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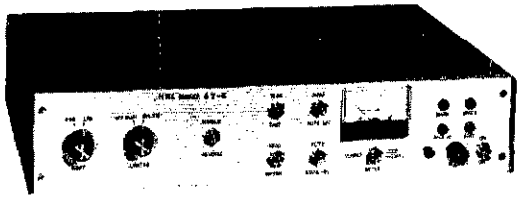

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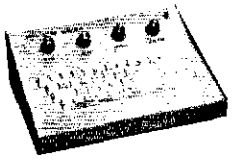

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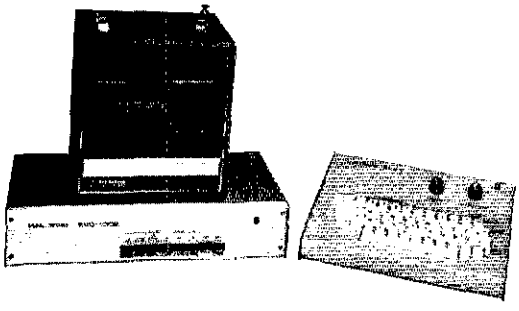

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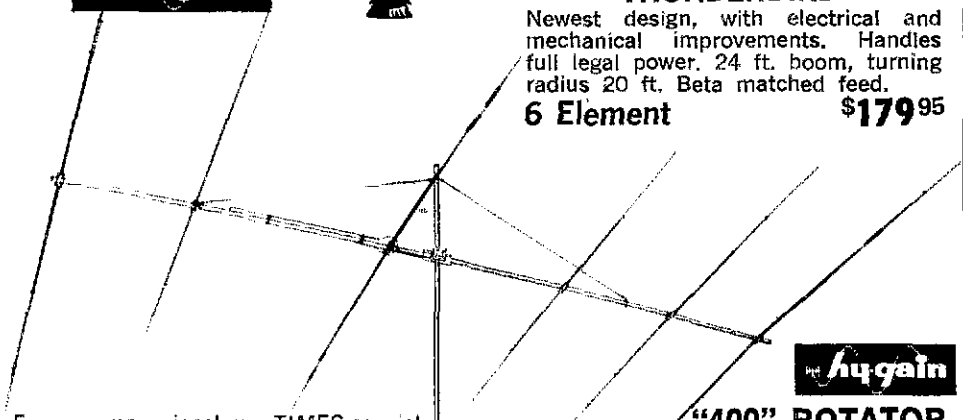

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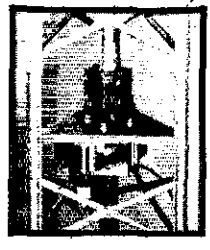

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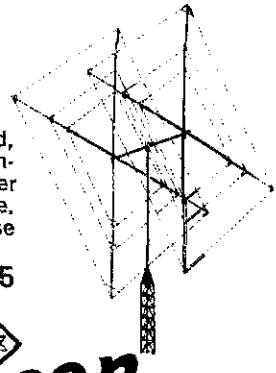

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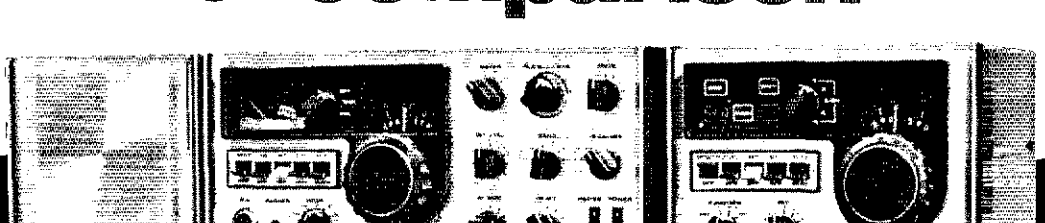

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TS-900

FEATURES: • Break - in CW with sidetone • Built - in 100 KHz and 25 KHz crystal oscillator • Built - in RIT and RIT indicator light • Built - in RTTY frequency shift for FSK • Built - in noise blanker • Built - in VOX • Modular construction — repair in or out of equipment • RF AGC to prevent front end overload to strong signals • Completely solid state except final section • 1 KHz readout

GENERAL SPECIFICATIONS: • Frequency Range: 2 - 30 MHz Amatuer Bands and WWV • Mode: SSB, CW, or FSK • Power Output: 150 watts PEP nominal into 50 ohms for SSB, 100 watts nominal into 50 ohms for CW, 50 watts nominal into 50 ohms for FSK • Frequency Stability: Within 100 Hz during any 15 minute period after warmup. Within ± 2 KHz during the first hour after 1 minute of warmup • Receiver Sensitivity: 0.5 microvolts for a 10 db (signal + noise)/noise ratio • Receiver Selectivity: SSB and FSK — 2.2 KHz bandwidth (6 db down), 4.4 KHz bandwidth (60 db down), CW — 0.5 KHz bandwidth (6db down), 1.5 KHz bandwidth (60 db down), (with optional CW filter installed) • Dimensions: 12.6" wide × 5.5" high × 12.6" deep • Weight: 26.5 pounds (32.5 pounds shipping weight) • Price: TS - 900 $745.00, PS - 900 (AC Supply) $110.00, DS - 900 (DC Supply) $130.00, VFO - 900 (Remote VFO) $195.00.

THE KENWOOD R-599 RECEIVER . . . 1.8 to 29.7 MHz (Amateur Bands) • Dial readout to ½ KHz • Special detectors for SSB, AM, and FM • Transceive operation with T-599 • Built-in 100 KHz and 25 KHz calibrators • Built-in 500 cycle CW filter • Provision for 2 meter and 6 meter coverage with accessory self-contained converters • 120/240 VAC or 12 VDC operation • All solid state • R-599 — $345.00 Converters — $31.00 S-599 — $16.00.

THE KENWOOD T-599 TRANSMITTER . . . Clear, stable, selectable sideband, AM and CW • 4-way VFO flexibility *plus RIT when used with the R-599* • *Amplified ALC* • Built-in VOX • Full metering • Built-in CW sidetone monitor and semi-automatic break-in CW • Built-in power supply for 120/240 VAC operation • Only 3 vacuum tubes • 200 watts PEP input nominal • Full amateur band coverage (3.5 to 30 MHz). T-599 — $395.00

THE KENWOOD TS-511S TRANSCEIVER . . . a powerful five band transceiver (3.5 to 30 MHz, amateur bands) for operation on SSB and CW • Built-in VOX • Built-in crystal calibrator • Built-in noise blanker • Receiver Incremental Tuning (RIT) • 1 KHz frequency readout • Eight pole filter • Exceptional stability • Provisions for installation of an accessory high selectivity CW filter • 500 watts PEP input for SSB • .5 μv sensitivity nominal • Full metering — Cathode current (IP), plate voltage (HV), ALC, and relative power output (RF) as well as an S-meter • Amplified ALC • Heavy duty 120/240 VAC external power supply. TS-511S — $415.00 PS-511S — $105.00 VFO-5SS — $105.00 CW-1 — $39.00

See the Kenwood line at the following dealers: CALIFORNIA Communications Headquarters, San Diego • Henry Radio, Anaheim • Henry Radio, Los Angeles • Webster Radio, Fresno • COLORADO Radio Communication Co., Arvada • FLORIDA Amateur Radio Center, Miami • Amateur-Wholesale Electronics, Miami • Slep Electronics Co., Ellenton • ILLINOIS Erickson Communications, Chicago • Klaus Radio Peoria • Spectrosonics, Chicago • INDIANA Graham Electronics, Indianapolis • Radio Distributing, South Bend • IOWA Hobby Industry, Council Bluffs • KANSAS Associated Radio Communications, Overland Park • LOUISIANA Electronic Exchange, Metairie • Trionics, New Orleans • MAINE Down East Ham Shack, Lewiston • MARYLAND Professional Electronics, Baltimore • MICHIGAN Electronic Distributors, Muskegon • Radio Supply & Engineering, Detroit • MINNESOTA Electronic Center, Minneapolis • MISSOURI Ham Radio Center, St. Louis • Henry Radio, Butler • MONTANA Conley Radio Supply, Billings • NEW JERSEY Simon Sideband, Oak Ridge • NEW YORK Adirondack Radio Supply, Amsterdam Harrison Radio, Farmingdale and NYC • NORTH CAROLINA Freck Radio & Supply, Asheville • Vickers Electronics, Durham • OHIO Amateur Electronic Supply, Cleveland • Communications World, Cleveland Queen City Electronics, Cincinnati • Srepco Electronics, Dayton • OKLAHOMA Derrick Electronics, Broken Arrow • Radio, Tulsa • OREGON Portland Radio Supply, Portland • PENNSYLVANIA JRS Distributors, York • Kass Electronics, Drexel Hill • SOUTH DAKOTA Burghardt Amateur Center, Watertown • TEXAS Douglas Electronics, Corpus Christi • Industrial Distributors, Dallas • Ed Juge Electronics Fort Worth and Dallas • Madison Electronics, Houston • UTAH Manwill Supply, Salt Lake City • WASHINGTON Amateur Radio Supply, Seattle • WISCONSIN Amateur Electronic Supply, Milwaukee

(Prices subject to change without notice)

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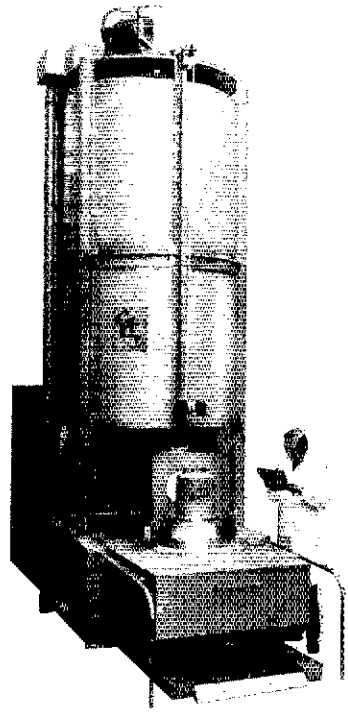

This is the world's most powerful shortwave transmitter.

This compact, single tube amplifier, located in the EIMAC facility, develops over 1300 kilowatts of 100% modulated carrier. It is quickly and easily tunable over the range of 15 to 30 MHz. Drive power at the grid of the tube is less than 5 kilowatts.

Using a single EIMAC X-2159 super-power tetrode in a Continental Electronics transmission line-cavity configuration, this amplifier combines high power gain with excellent operating stability and complete freedom from circuit parasitics.

A single amplifier stage using two EIMAC X-2159 tubes is capable of over 2.5 megawatts of 100% modulated carrier. Two amplifiers combined would make a 5 megawatt transmitter a practical reality.

The EIMAC X-2159 super-power tetrode is designed for MF and HF broadcast service, VLF communications, SSB linear service and extremely high power pulse modulator applications.

The X-2159 is another example of tomorrow's tube that's ready today at EIMAC. For complete information, contact EIMAC Division of Varian, 301 Industrial Way, San Carlos, California 94070. Or any of the more than 30 Varian/EIMAC Electron Tube and Device Group Sales Offices throughout the world.

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