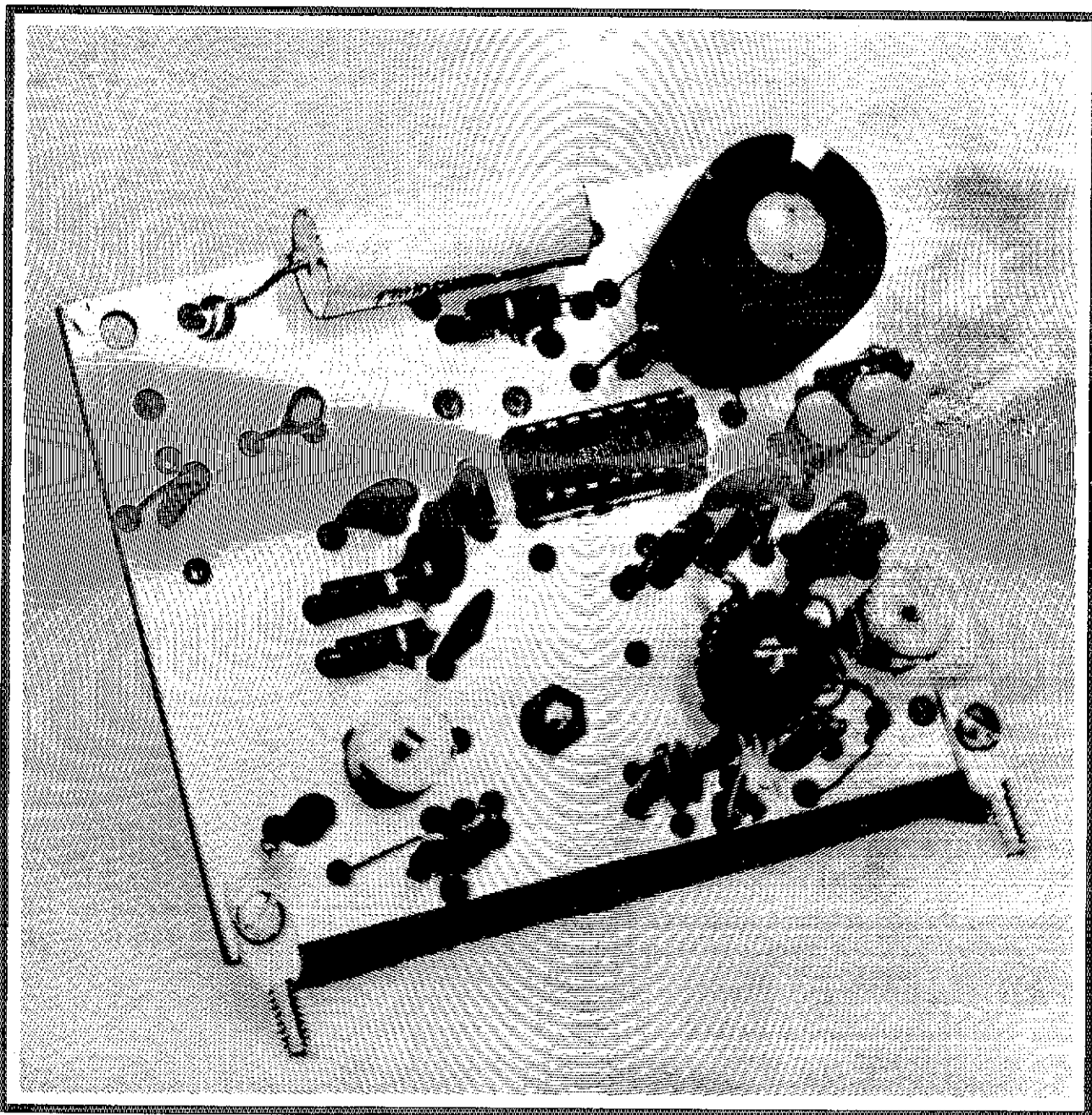


# QST

devoted entirely to Amateur Radio

January 1977 \$1.50



## Understanding Linear ICs

Page 11



# INTRODUCING



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- \*Phase lock-loop (PLL) oscillator circuit minimizes unwanted spurious responses.
- \*Hybrid Digital Frequency Presentation.
- \*Advanced Solid-state design...only 3 tubes.
- \*Built-in AC and 12 VDC power supplies.
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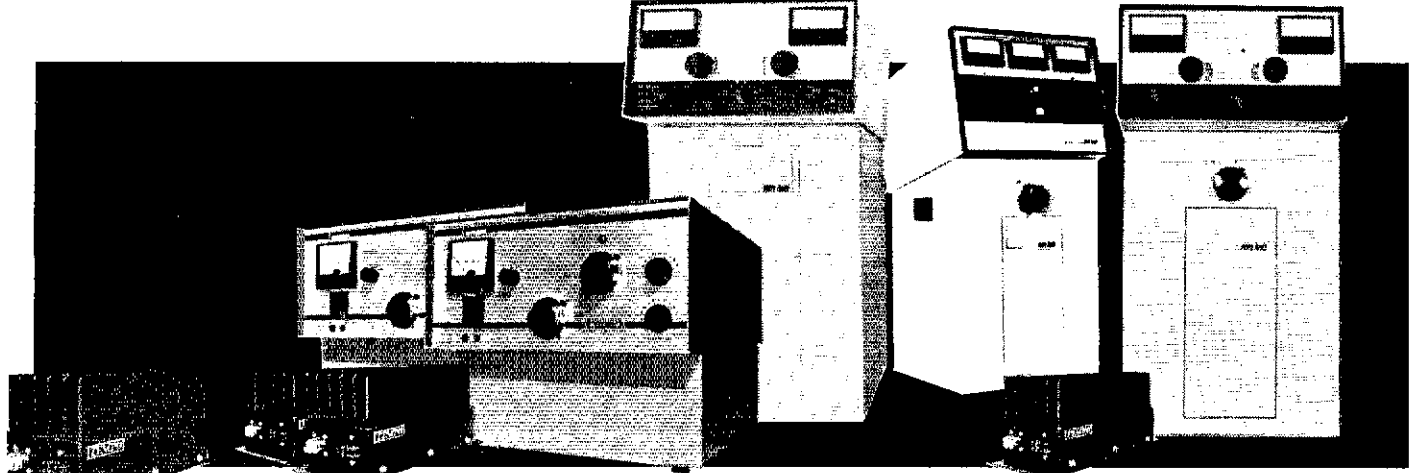
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Tempo 80A10	10W	80W	\$139.	Tempo 30A02	2W	30W	\$ 89.
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Tempo 70D30	30W	70W	\$210.	Tempo 40D01	1W	40W	\$185.
Tempo 70D10	10W	70W	\$240.	Tempo 25D02	2W	25W	\$125.
Tempo 70D02	2W	70W	\$270.	Tempo 10D02	2W	10W	\$ 85.
Tempo 40D10	10W	40W	\$145.	Tempo 10D01	1W	10W	\$125.
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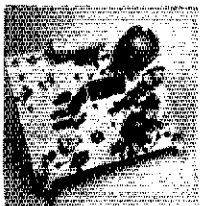
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## THE COVER

Get acquainted with linear IC and transistor arrays. The first part of the story appears on page 11.



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DenTron amateur radio products have always been strikingly individual. This is the result, not of compulsion to be different, but of a dedication to excellence in American craftsmanship. This dedication now extends to one of the worlds finest high performance Military amateur amplifiers.

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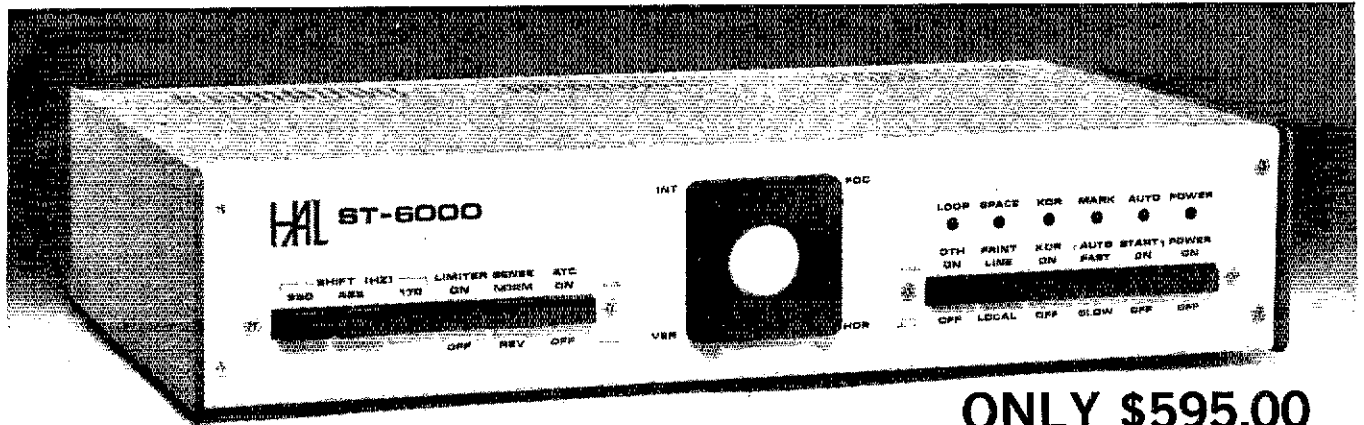


Amplifier in actual operation.

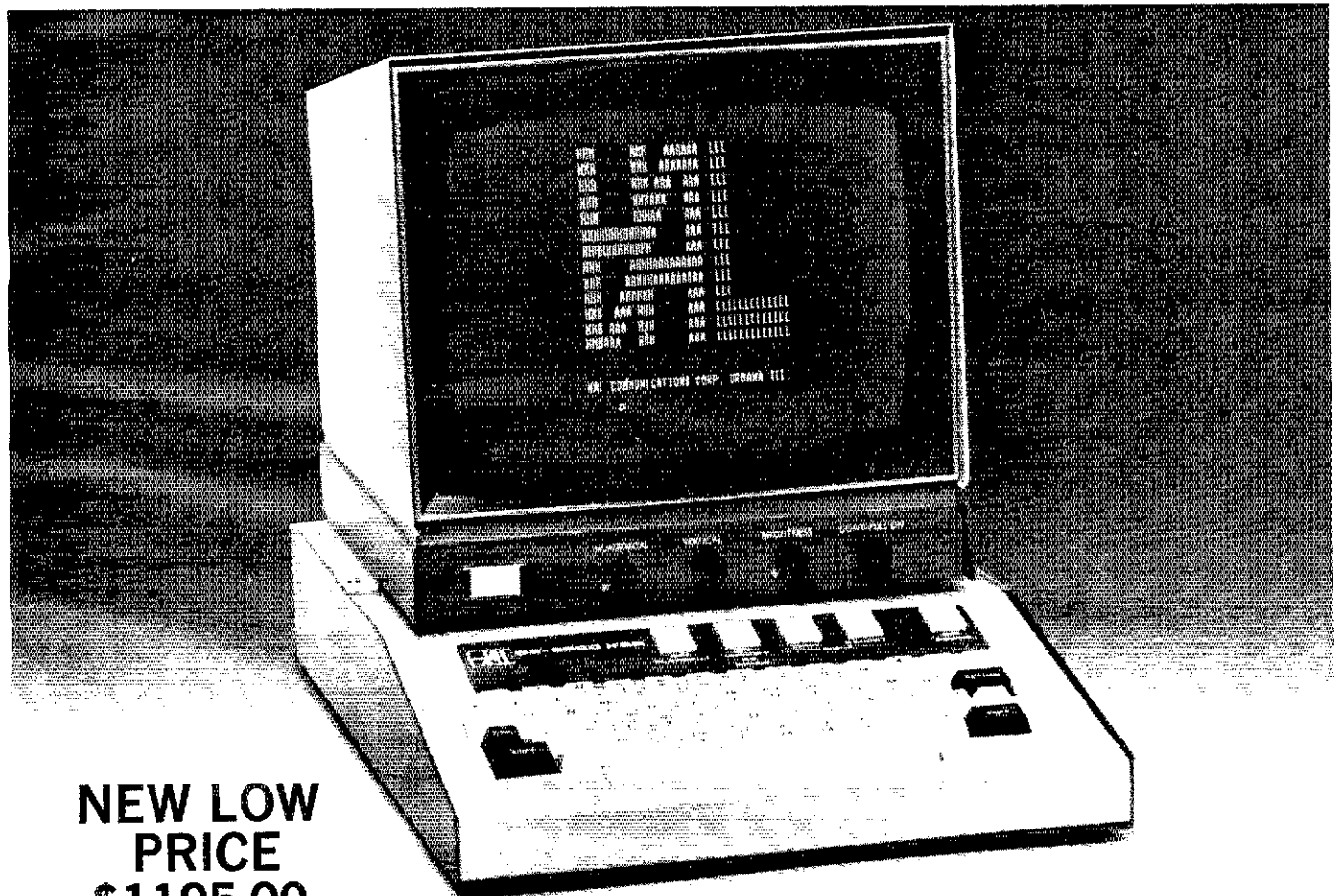
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Featuring Kenwood's New and Unique  
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The TR-7400A may be used on your favorite repeater, no matter what type of squelch system is used. The continuous tone coded squelch (CTCS) may be used for both transmit and receive or for transmit only. Tone burst operation may also be used.

### SYNTHESIZED, 800 CHANNELS

The phase-locked loop (PLL) frequency synthesizer in the TR-7400A divides the 4 MHz bandwidth into 400 channels at intervals of 10 KHz. The frequency may be offset 5 KHz higher with the push of a button, thus providing 800 discrete channels.

### REPEATER OFFSET

A convenient front panel switch offsets the transmit frequency of the TR-7400A up OR down 600 KHz for standard repeater operation. This offset circuit uses digital technology to provide a highly stable offset frequency without spurious response. A dual color LED

indicates the direction of offset from the displayed receive frequency.

### OUTSTANDING RECEIVER PERFORMANCE

Large-sized helical resonators with high Q minimize undesirable interference from outside the 2-meter band. The large helical resonators, 2-pole 10.7 MHz monolithic crystal filter, and MOSFET front-end circuitry combine to give outstanding receiver performance.

### TONE PAD CAPABILITY

A jack is provided to allow convenient connection of a tone pad to the TR-7400A.

### FINAL PROTECTION CIRCUIT

The final transistor in the TR-7400A is protected from antenna impedance mismatch. Excessive reflected power reduces the amount of drive to the final transistor rather than turning off the final stage. This practical feature allows continued safe operation at a reduced power level whether the antenna system becomes opened or shorted.

## TR-7400A Specifications

Range: 144.00 MHz to 147.995 MHz  
Mode: FM  
800 Channels: 5 KHz spaced  
Sensitivity: Better than 0.4  $\mu$ V for 20 dB quieting  
Better than 1  $\mu$ V for 30 dB S/N  
Squelch Sensitivity: Better than 0.25  $\mu$ V  
Selectivity: 12 KHz at -6 dB down  
40 KHz at -70 dB down  
Image Rejection: Better than -70 dB

Spurious Interference: Better than -60 dB

Intermodulation: Better than 66 dB

Receive System: Double conversion

First IF: 10.7 MHz

Second IF: 455 KHz

Audio Output: More than 1.5 Watts (8 ohm load)

RF Output Power: 25 Watts (High)  
5-15 Watts (Low-adjustable)

Antenna impedance: 50 ohms

Frequency Deviation:  $\pm$  5 KHz

Spurious Response: Better than -60 dB

Tone Pad Input Impedance: 600 ohms

Tone Burst Duration: 0.5 to 1.0 sec.

CTCS Range: 88.5 Hz to 156.7 Hz

Microphone: Dynamic, with PTT switch, 500 ohms

Voltage: 11.5 to 16.0V DC (13.8V DC nominal)

Current Drain: Less than 1A in receive (no input signal)

Current Drain: Less than 8A in transmit

Polarity: Negative ground

Temperature Range: -20 to +50 degrees C

Dimensions: 182 mm (7-3/16") wide  
270 mm (10-5/8") deep  
74 mm (2-7/8") high

Net Weight: Approximately 2.8 kg (6.2 lbs.)

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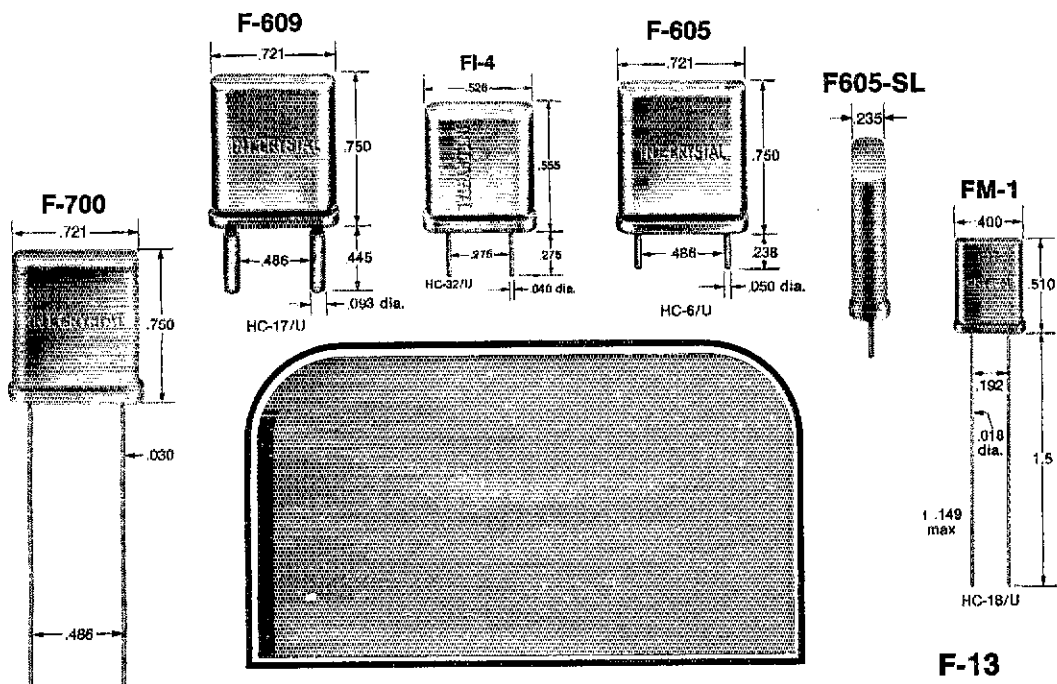
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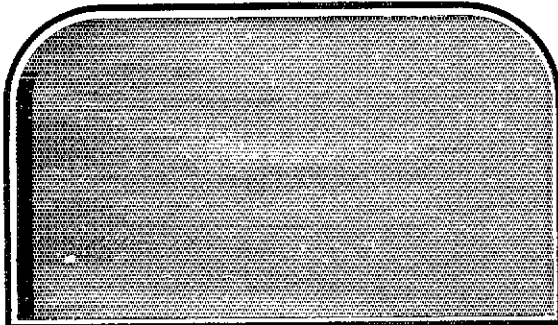
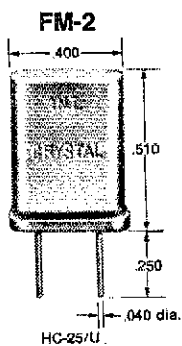


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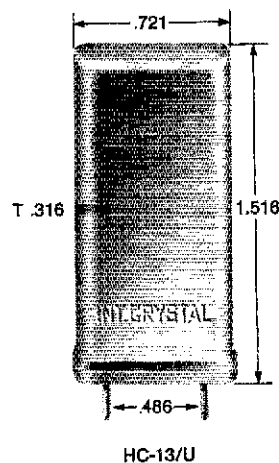
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The American Radio Relay League, Inc., is a noncommercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

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

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

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

All general correspondence should be addressed to the administrative headquarters at Newington, Connecticut 06111.

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# "It Seems to Us..."

## The Tide Has Turned

Beginning in about 1964, and lasting for a full decade, amateur radio in the United States was in a no-growth situation. That is, the number of new amateurs just about equaled the number who were dropping out, and we saw no growth in the total number of amateurs. This trend was apparent also in League membership and in the League's various operating programs, and it caused a great deal of concern amongst us all.

But, to coin a phrase, it's an ill wind that blows no good, and some good things came out of the period of stagnation. For one thing, the League produced *The Ham's Wide World*, which has since been shown to hundreds of thousands of people at local meetings and to several million over TV. This film was aimed at pointing out the romance and the fun of amateur radio. It was a fine film production, and it is still, ten years later, heavily booked for every available copy. On another front, we expanded the editorial content of *QST*, to make the magazine more attractive to would-be amateurs and members. And we had staff seminars on how to write better letters to the membership. Perhaps the most significant result of our period of stagnation was an increased dedication by the League (officers, directors, volunteers, staff) to better service for the membership. The League became more responsive, and we gradually passed from a time of somewhat acute membership unrest to the present situation in which the League generally is getting good marks from its members.

Whether any of these individual ARRL projects played the most crucial role, or even a significant role in amateur radio's resurgence, is difficult to assess. But one development did play an important role, and that was the burgeoning interest in personal communications. CB radio, which itself had been in somewhat of a no-growth situation for several years, suddenly exploded. The Commission was overwhelmed with CB license applications, and the total number of CB licensees rapidly grew to exceed six or seven million. The spectacular growth of CB dismayed some of us amateurs for a while, and there was

the easily understood reaction from many that we were about to be overwhelmed. Headquarters was bombarded by members who insisted that we do something.

Then, equally suddenly, there was another development. Numbers of CBers began to realize that CB was a certain amount of fun, but that it was limited in its horizons. However, we managed to get the word to many of those CBers that there was something to replace it, something whose horizons were unlimited, and that something was amateur radio. Our clubs began to notice a growing interest in ham activities by CBers. Dealers who handled League publications began to find that they were having a difficult time keeping League beginner publications in stock. The number of ARRL Associate Members began to grow. The number of FCC licensees began to inch upward.

The League spotted these trends early in the game and recognized that much assistance could be provided these would-be amateurs if the path toward Novice licensing could be approached in a slightly different fashion. For one thing, some sort of training material was needed which could be used by clubs and other groups to help train the aspirants. For another thing, some solution was needed to the difficulties in licensing, the excessive delays that were occurring simply because the Commission staff at Gettysburg was overloaded with CB and other applications.

And so in early 1976 the League's Board authorized the establishment of a training program, to be administered by the newly established Club and Training Department at ARRL hq. In less than six months a complete new Novice training program was produced. Lesson plans, instructor guides, student guides, code cassettes, a new beginner publication, and a number of other bits and pieces were ready for field test in the summer of 1976 and for full-scale use in the fall. Was all of this effort worthwhile? You bet! This past fall we had some 1400 club groups giving amateur radio training to about 36,000 would-be Novices! A similar program for upgrading is in the works.

The solution to the licensing delay is coming with a little more difficulty. Our original concept was that, with FCC approval, graduates of those training courses which met certain standards could be instantly licensed, cutting the licensing delay to zero! It was, and still is, a good idea. Its goal was to strengthen the Amateur Radio Service. Unfortunately, a commercial publisher has petitioned the FCC not to permit such a program, as he feels that this program would give ARRL an unfair competitive edge over the commercial publishers.

But despite this unfortunate and, we hope, temporary roadblock to a speed-up of Novice licensing, the training program goes on. The number of U.S. amateur licensees is once more growing, and may have hit 300,000 by the end of 1976. If this growth continues, and there is apparently another big Novice class enrollment for the spring of 1977, there are some busy days ahead for all concerned.

There are also many increased responsibilities for all of us. The League's staff and services have got to be augmented, to take care of the growth in membership, and we have already reported some of the steps that are being taken in that direction. Again, as we hinted in the October editorial, it is quite possible that, at its January meeting, the ARRL Board will authorize an increase in the annual dues.

Although our training program is designed to prepare these newcomers for on-the-air operation, not just to get them licenses, a shortage of inexpensive equipment suitable for Novice operation is bound to develop. We hope this responsibility and opportunity will be recognized by industry.

Another responsibility about which we feel quite strongly is that of taking all these newcomers under our respective wings. All of a sudden we are about to be inundated (well, almost) by a larger-than-usual number of newcomers. Many of them will be recruits from CB, where operating practices were different than in amateur radio. If these newcomers to amateur radio are to be absorbed with a minimum amount of disruption to the existing Amateur Radio Service, it behooves us all to give these new Novices a welcoming and helping hand. Each of us licensed for more than six months has suddenly become an "old-timer" and is in a position to help with the continuing amateur radio education of our new compatriots. This responsibility must not be neglected, because amateur radio has the reputation of being a disciplined service, and we want to keep it that way.

Yes, the tide has turned, and we are on the threshold of a new and even more vigorous amateur radio. — WIRU

# League Lines...

ARRL's Board of Directors will be meeting in Hartford during the third week of January, and so if you have comments you wish to make to your director, now's the time to contact him. See page 8 for his address. Some of the topics that will surely come up: preparation for WARC-79; increased services for ARRL members; a possible increase in annual dues; and further changes in FCC regulations.

Instructors of Novice amateur radio courses can now obtain exams and 610 forms in bulk from the FCC, prior to the code test. Full details are available from the Club and Training Department, ARRL.

Instructors of January Novice courses should make sure their courses are registered with the ARRL, to receive all student materials and handouts. Registration cards can be obtained from the Club and Training Department, ARRL.

Six Meter fans take note! A brand new award comes into being on January 1; see Operating News this issue. Particular thanks to the Six Meter International Radio Klub (SMIRK) for sparking the idea!

The FCC has acted on the Third Notice of Inquiry in Docket 20271 (WARC-79 preparation). An extract of that 140-page document which is relevant to the amateur service will be available to any member sending in a self-addressed envelope with 24¢ postage and mentioning "WARC."

Got any ideas for a new name for the Amateur Radio Public Service Corps? ARPS isn't too pronounceable and sounds more like indigestion. ARRL is offering a \$25 gift certificate to the person sending in the best acronym. Judges will be WINJM, WIRU and ARRL PR consultant Don Waters. In case of duplicate submissions, the winner will be selected on the basis of earliest entry received. Deadline for entries is March 31, 1977.

The U.S. now has a reciprocal operating treaty with the Philippines -- more details in Happenings, next month.

Don't miss the tear out page in the back of this issue giving vital information on amateur frequency allocations, license renewals and coming amateur events for 1977.

Visiting Hq in 1977? Offices are open Weekdays 7:30 am to 5:30 pm, closed weekends. WIAW is open 1 pm to 1 am weekdays, Saturday 7 pm to 1 am, Sunday 3 pm to 11 pm. ARRL/WIAW will be closed Dec. 31, 1976, Jan. 1, Feb. 21, Apr. 8, May 30, July 4, Sept. 5, Nov. 24 and Dec. 25 & 26, 1977. Tours for groups may be arranged at other times.

A first -- and hopefully not the last: Carl Wilbur of Sarasota FL was fined \$250 in U.S. District Court for selling an rf power amplifier in violation of FCC rules.

# Understanding Linear ICs

**Part 1:** Frustrated by that confounded building-block syndrome? Well, here's a look at the innards of those inscrutable IC packages!

By Doug DeMaw,\* W1FB

**J**ust what is meant by a "linear" IC? The principal function of ICs under that classification is linear response or amplification. This means that the device has an output which varies in direct proportion to its input. We can appreciate this characteristic by considering a linear amplifier used in an ssb transmitter.

The response of a linear amplifier can be seen in Fig. 1, where the straight line illustrates a linear relationship between the input and output voltages. Linear response ceases when the amplifying device is overdriven (saturation).

Hall and Watts treated the basics of digital and logic ICs in their 1976 *QST* series, but the family of linear ICs received only casual mention in Part 6.<sup>1</sup> This beginner's course is intended as a ground-level introduction to linear ICs and transistor-array ICs. We will scrutinize the inner workings of these *chips* (a common term for ICs) and offer some practical examples of how they can be used in our workshop section of this series. The end product will be a three-IC 20-meter direct-conversion receiver for cw and ssb reception. Circuit boards and/or a parts kit for the project are available from a supplier.<sup>2</sup>

We shall not involve ourselves here with the physics of IC design and fabrication. A practical discussion of that subject is found in RCA's *Linear Integrated Circuits*, Tech. Series IC-42 (available from RCA Solid-State Div., Somerville, NJ 08876). Fig. 2 shows the physical profile and representative circuit of the interior of a simple IC.

## The Building Block Unmasked

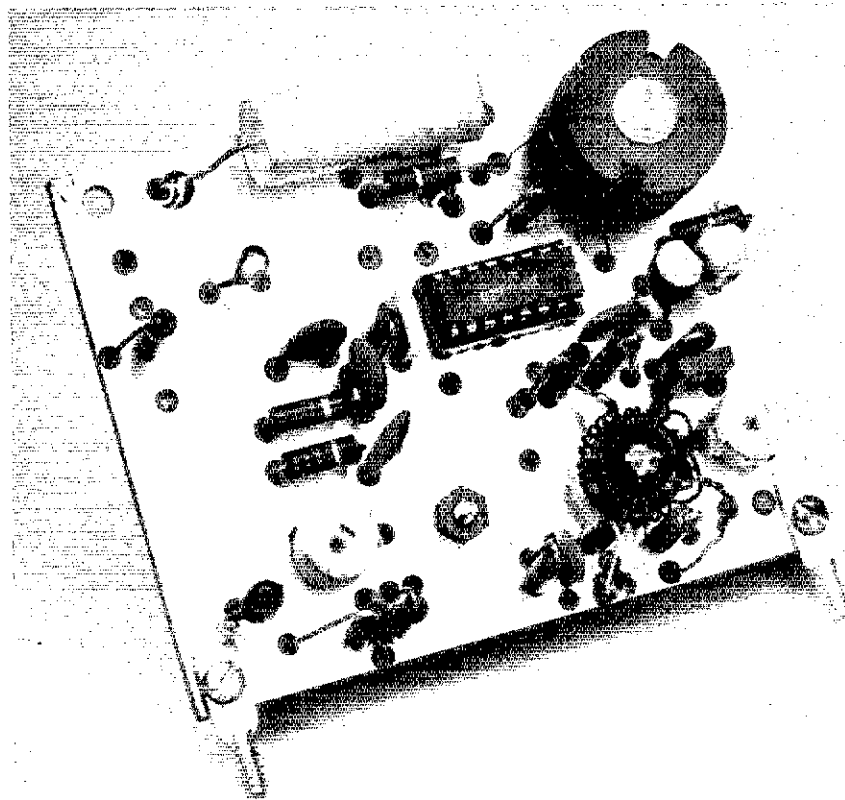
If one were to slice the top off an IC package and peer through a microscope at the exposed electronics within, he or she would see a maze of intricate lines, squares, rectangles and metal strips. In fact, the reader is encouraged to try this

with a discarded IC, as it will provide a better understanding of what resides on an IC *substrate* (foundation). ICs are built in a *monolithic* format (common or single stone, in the classic definition). The substrate or monolith is usually a thin slice of silicon material with dimensions of approximately 0.1 inch square by .01 inch thick. The act of forming a congregation of semiconductor elements (transistors, diodes, capacitors and resistors) on a common chip is not significantly apart from the long-practiced method followed in the fabrication of discrete silicon transistors (planar technology).

Some of the more complex ICs

contain hundreds of transistor elements, all of which perform in concert to fulfill a specific role. Certain linear ICs are called subsystems, as they serve as the main foundation for a-m or fm radios. An example of a subsystem IC, the RCA CA3089E, can be seen in a *QST* article which described a two-meter fm receiver.<sup>3</sup> Some modern automobile radios contain subsystem ICs. They are used to speed assembly and minimize production costs. Conversely, some linear ICs have only three transistors on the substrate. A CA3028A is an example of the latter.

Most linear ICs are biased for Class A operation when placed in an active



\*Technical Editor, *QST*

<sup>1</sup> Footnotes appear on page 15.

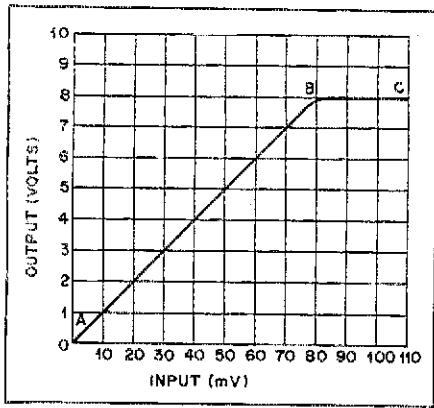


Fig. 1 — The straight line from A to B represents the linear response of a theoretical IC amplifier. The section of the curve from B to C indicates saturation of the amplifier from excessive input voltage.

circuit. This does not mean that all such ICs *must* function as linear amplifiers. Some of these chips can be set up to perform as Class C amplifiers, as we will observe later in the course. However, the principal intent of the manufacturer is to produce an IC that will be used in some linear application.

### The Vista Is Wide

In addition to the subsystem ICs already mentioned, there is a cornucopia of types which fall under the heading of linear ICs. Included are op amps (operational amplifiers), differential amplifiers, mixers, audio preamplifiers, audio power amplifiers and Darlington amplifiers. Additional types are bipolar and field-effect transistor arrays, and there are even some diode-array ICs.

The advantages of having several transistors on one substrate are more than subtle: Greater miniaturization of a circuit is paramount, and because the devices are formed at the same time from a common slice of silicon material,

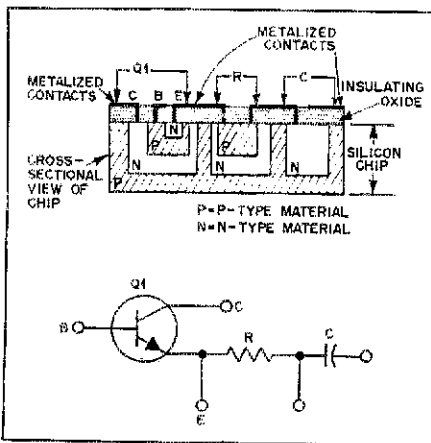


Fig. 2 — Illustration of how a simple IC is formed on a substrate during the manufacturing process. An equivalent electrical circuit is included.

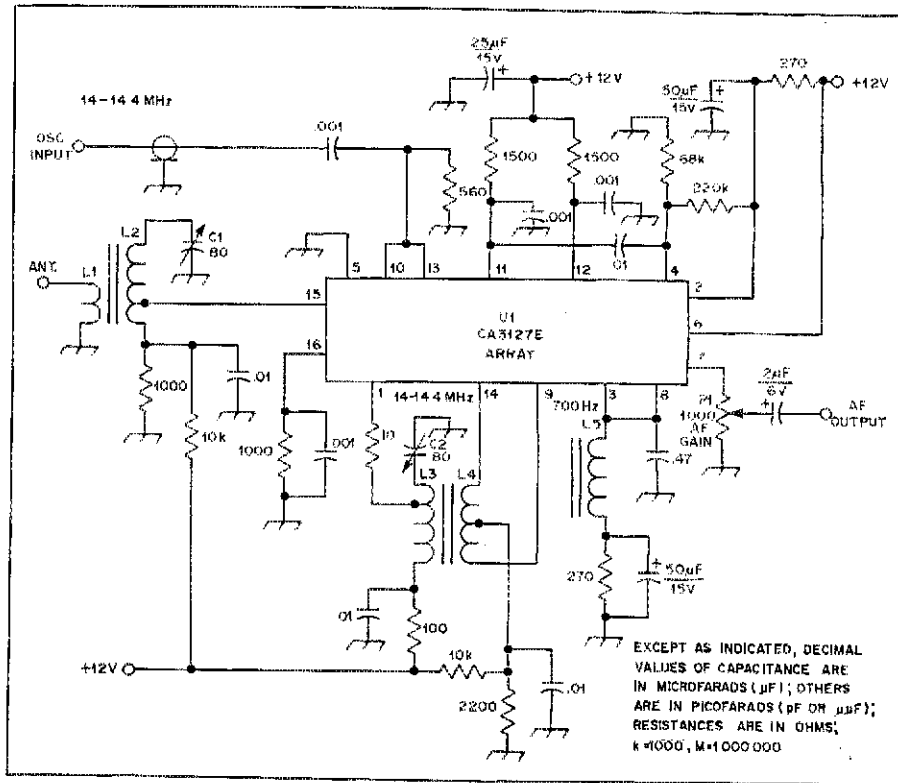


Fig. 3 — ICs are normally depicted as squares, rectangles or triangles in schematic diagrams. This circuit is shown in its entirety in Fig. 4.

they have nearly identical characteristics. The latter is important when matched transistors are needed in a circuit where dynamic balance is a requirement (push-pull amplifiers, balanced mixers and the like). Furthermore, as the operating temperature of the IC changes from variations in internal and external heating, the changes in electrical performance of the internal circuit elements shift in an almost identical manner. This trait makes circuit performance more predictable than would be the case if discrete transistors and/or diodes were employed.

Linear ICs have maximum ratings for voltage, current, temperature and upper frequency, just as discrete transistors and diodes do. Some of these ICs have an  $f_T$  (upper frequency limit at which the gain is unity, or 1) as low as 1 MHz. Others have an  $f_T$  as high as 1200 MHz. (The  $f_T$  rating is based on a bipolar transistor operating as a grounded-emitter (common-emitter) amplifier.)

### Point and Counterpoint

In the vernacular, "You don't get something for nothing, Baby!" Sure, ICs are neat, and they're definitely the "way to go." You wouldn't be considered the sharpest kid in your community if you didn't build your equipment with lots of ICs, but there are some problems attendant to the use of ICs which aren't present to annoy the user of discrete devices

In many circuits the matter of stage-to-stage isolation is a vital consideration if unwanted feedthrough and instability are to be avoided. Employment of "discretes" helps to make this a reality. However, when the manufacturer of an IC decides to plant a medley of solid-state elements on one substrate, he is aware that total inter-element isolation "jest ain't practical." As amateur designers and builders we must deal with unwanted internal capacitances, resistances and diodes. Concerning the latter, numerous diode junctions occur when an IC is built, even though the diodes aren't depicted schematically on the manufacturer's data sheet.

A matter of deep consternation to some builders is the required mental and physical gymnastics necessary when laying out the pc board for a circuit which utilizes a complex IC. It is not easy to keep critical circuits separated from one another or to avoid using numerous wire jumpers between common elements of the board. Finally, total shielding and electrical decoupling of the chip stages is impossible.

It is suggested that those who experiment with ICs should use IC sockets on the pc board. This technique makes troubleshooting much easier, for once a 14- or 16-lead IC is soldered permanently into a circuit board, it's committed totally (unless you find it exhilarating to toil with a solder-sucker tool). Low-profile sockets are recommended for all







helps to keep the VFO energy out of the detector input circuit. Excellent dynamic balance is possible because of the nearly identical electrical characteristics of the two devices on the chip (U1B and U1C). Of course, to obtain maximum benefits in balance it is vital to maintain physical and electrical balance (symmetry) external to the IC. This means that the leads from L4 should be nearly the same length, and the drive to the bases of U1B and U1C should be identical.

At the output of the detector we find a push-pull situation (two 1500-ohm resistors). This maintains the desired balance, but does not dictate that we feed output from U1B and U1C to our audio amplifier in push-pull. We have taken the audio output from the detector and supplied it to U1D in a single-ended manner (quite acceptable).

Local-oscillator energy (BFO energy in this application) is impressed on the emitters of U1B and U1C. A level of 1.5- to 2-volts rms would be about optimum for greatest detector gain (conversion gain), but lesser amounts are OK. We will use less injection voltage in this circuit. Emitter injection is preferable to base injection because it helps to keep the BFO energy from being reradiated through the antenna system. It does, however, call for a higher injection voltage than would be

required at the bases of the detector.

Reradiation is not as significant a consideration with this circuit as it would be if no rf amplifier was employed. U1A in this case helps to isolate the BFO from the antenna. Reradiation of the local oscillator would, of course, present potential interference to a nearby amateur trying to listen to the same station that the reader was copying, since the BFO is approximately on the same frequency as the received signal.

Af energy is supplied to the base of U1D through a .01- $\mu$ F capacitor. U1D performs as a common-collector stage (collector at ac ground). In the correct jargon, such a stage is called an *emitter follower*; meaning that the signal energy follows the emitter element of the transistor.

U1D has a pot-core (also called a cup-core) inductor in the emitter circuit. It is tuned to approximately 700 Hz by means of a 0.47- $\mu$ F mylar capacitor. The tuned circuit provides suitable cw selectivity without materially impairing ssb reception. A 4700-ohm resistor, if placed in parallel with L5, will broaden the response to aid fidelity during ssb reception.

Output from U1D is direct-coupled to another emitter follower (or common collector) stage, U1E. R1 serves as an audio-gain control. Later in the course we will build a 741 op-amp circuit. It

will provide an additional 40 dB of af gain, so that even the weak signals will be easy to copy while using headphones. U1D and U1E provide only enough audio gain to permit one to copy the stronger signals on 20 meters (10  $\mu$ V or stronger).

A double-sided pc board is used for the circuit of Fig. 4. The side on which the components are mounted serves as a ground plane. Be sure to remove the copper from around each circuit-board hole on the ground-plane side, thereby preventing the chance for short-circuiting of the component leads. A small-diameter drill bit (No. 10 or larger) can be used as a router.

Dc voltages are marked on the diagram to aid in troubleshooting the circuit. The indicated voltages were obtained while using a Heath VTVM.

Part 2 of this series will appear in a subsequent issue of *QST*. It will contain more information on linear ICs, and the local oscillator for the 20-meter receiver will be used as the workshop exercise.

**QST**

#### Footnotes

<sup>1</sup> Hall and Watts, "Learning to Work with Integrated Circuits," *QST*, Jan. through July, Oct., 1976.

<sup>2</sup> Circuit boards, negatives, and parts kits for the modules in this course are available from WA9UZO, Box 969, Pueblo, CO 81002.

<sup>3</sup> DeMaw, "A Single-Conversion 2-Meter FM Receiver," *QST* for Aug., 1972.

## Strays



### FAR SCHOLARSHIP RECIPIENTS

Three young amateurs are on their way toward furthering their education with scholarship aid awarded from the Foundation for Amateur Radio's 1976 competition.

Winning the Richard G. Chichester scholarship was Alicia Moore, WB9LAD. Now a sophomore in electrical engineering at Purdue University (IN), her main interest is circuit design. With her enjoyment in antenna experimentation and constructing equipment, she hopes for many opportunities to answer amateur equipment needs. She has already been accepted in the cooperative engineering program, which combines classroom education with on-the-job experience. Yet, Alicia has time for other hobbies including ice skating, sewing and painting — especially that from her American Indian lineage.

Brian Longwell, WB2DSH, received the John W. Gore scholarship. Presently, he is in an electrical engineering program at Corning (NY) Community College and plans to transfer to a four-year

school this fall. Meanwhile, Brian is also enrolled in some of the college's electrical technology courses to gain practical electronics knowledge. Of the award he said, "E. E. requires a great deal of work, thus requiring much motivation. To know that an organization feels I am worth investing in makes it all that much easier."

The Edwin S. Van Deusen scholarship went to Stephen Floyd, WB4YHD. Currently, he attends Northern Virginia Community College and this spring will have an associate degree in electronic engineering technology. His amateur career started in December, 1971, and included Novice roundups and 15-meter work. Steve's primary interest is the technical side of amateur radio, serving with the technical committee of the Northern Virginia FM Association. After NVCC he plans to seek a bachelor's degree at Virginia Polytechnic Institute. — *Auto-Call*

### FEEDBACK

The value shown for capacitor C1 in "The Ugly Duckling" (November, 1976, *QST*) should be 20,000  $\mu$ F, or more, at 50 volts.

One more time — there is still an error in "360° — Steerable Vertical

Phased Arrays" (April, 1976, *QST*). The Feedback in December (page 99) should read "Interchange B and C in upper triangles at relays K5 and K6."



Although Eila Russell, WA8EBS, gave her husband, James Russell, W8BU, a 50-year head start, she's fast catching up in amateur radio proficiency. Back in 1912, Jim started on wireless and held the call 8AL. After World War I was over, they married. As their family grew, the children learned the code one by one to become hams one by one. Mrs. Russell described her motivation: "Grandma decided to share in the fun," so in 1962 she got her Novice ticket. Since then, she has progressed through Technician and General to now hold an Advanced class license. They're both still going strong.

# A Dual-Gate MOSFET Dip Meter

If asked, most hams can think of at least several uses around the shack for a good dip meter. However, not that many own one. Build this simple, inexpensive, high-performance model yourself.

By Frans Bruin \*

Dip meters have been around for quite some time and it's no wonder, because they are handy instruments. Perhaps no other single instrument performs as many tasks as the dip meter. It's useful for antenna measurements, tuned-circuit adjustment, as an absorption wavemeter, a low-power signal source, for determining the values of unknown capacitors and coils, not to mention relative *Q* measurements. The list is almost endless.

Tubes, tunnel diodes, transistors,

\*American University of Beirut, Beirut, Lebanon

FETs and single-gate MOSFETs have all been used for the oscillator portion of the circuit. Most circuits are generally alike with only minor differences. This circuit is somewhat different and deserves a closer look.

## Circuit Details

The circuit shown in Fig. 1 is a grounded-drain Colpitts oscillator employing an RCA n-channel, dual-gate MOSFET. The oscillation level, detected by a diode and amplified by a 2N2222A transistor, is displayed on a 0-1-mA meter. Transconductance of the

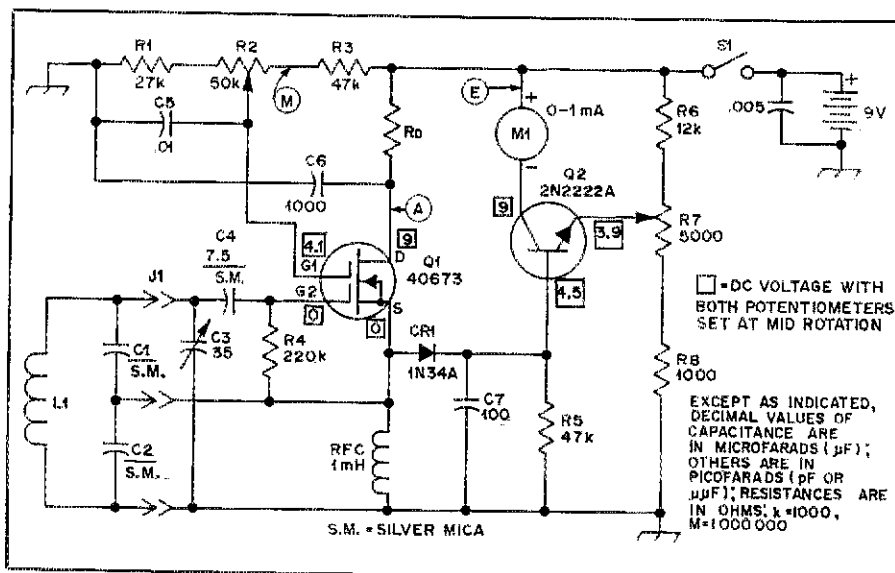
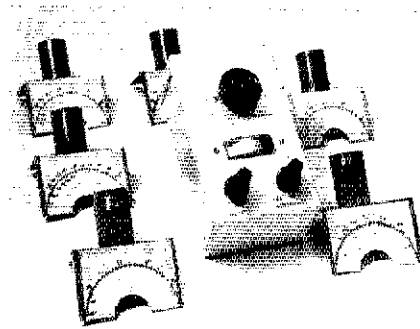


Fig. 1 — Schematic diagram of the dual-gate MOSFET dip meter. All resistors are 1/2-watt composition type. Capacitors are disk ceramic unless noted otherwise.

- C1 — See Table 1.
- C2 — See Table 1.
- C3 — Variable capacitor, 35 pF, Millen 20035 or equiv.
- J1 — Socket, Amphenol type S4.
- L1 — See Table 1 for values. All coils wound on Millen 45004 coil forms.

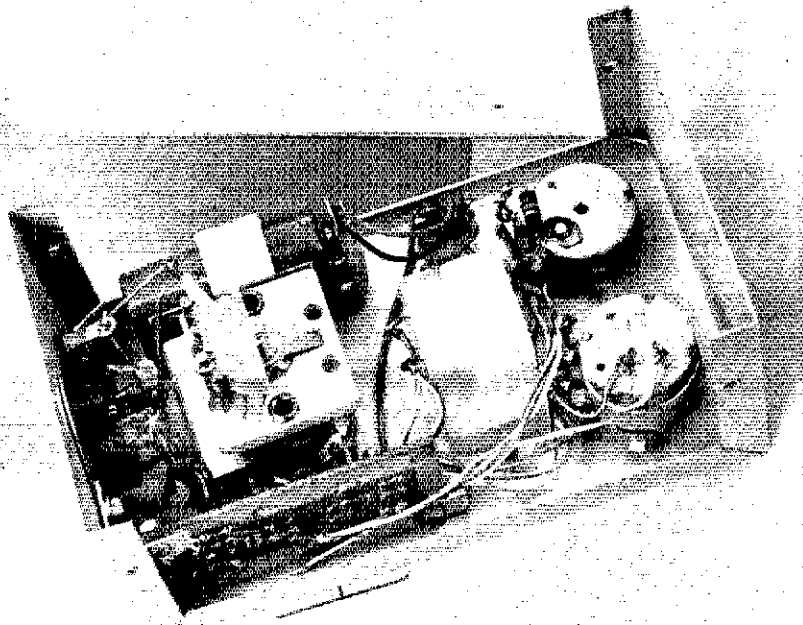
- M1 — Edgewise panel meter, 0-1 mA, Cal-electro DI-905 or equiv.
- Q1 — Dual-gate MOSFET, RCA 40673.
- Q2 — Npn transistor, 2N2222A.
- R2 — Potentiometer, 50 kΩ.
- R7 — Potentiometer, 5000 Ω.
- S1 — Spst on-off switch mounted on R7.

MOSFET, and hence the output signal, is controlled by potentiometer R2 and reaches a maximum of 10-volts peak to peak at the source when  $V_{G2}$  (voltage from gate 2 to source) is set to +5 volts. The meter is adjusted for the desired deflection by R7. R8 must be selected according to the meter used and should be 1 kΩ for a 1-mA meter movement. Frequency of oscillation depends on C1, C2, C3 and L1, and may reach 250 MHz or so when L1 is reduced to a hairpin.

Higher frequencies may be obtained by using a uhf D-MOSFET, such as a Signetics SD300, and by placing C3 and L1 in series in a Clapp-oscillator configuration. The circuit is designed to operate from a 12-volt supply, but it also works fine with a 9-volt transistor-radio type of battery if the drain resistor ( $R_D$ ) is shorted. In either case the unit draws approximately 20 mA.

## Construction

Most of the components that comprise the oscillator and meter-driver circuits are mounted on a circuit board that measures approximately 1-1/4 × 2-1/2 inches. The foil pattern is shown



Interior view of the MOSFET dip meter. Just to the right of the variable capacitor is the edge-wise panel meter. The battery can be seen just above the variable capacitor.

in Fig. 2. A minibox that measures 5-1/2 X 3 X 2-1/2 inches contains the circuit board, variable capacitor, meter, controls and 4-pin coil socket. Nine plug-in coils are used to cover the frequency range from 2.3 to 200 MHz. The coils are wound on Millen 45004 coil forms to which L brackets are mounted for the dial scale. Epoxy cement holds the aluminum brackets to the forms. The use of nine separate coils instead of five or six greatly expands the calibration scales so more accurate frequency measurements may be made. To reduce the fast tuning rate of the variable capacitor, a reduction vernier is used. It was removed from a Japanese vernier dial assembly. An aluminum

bracket supports the variable capacitor inside the box. A rectangular piece of thin Plexiglas is used for the dial. A thin line is scribed down the center of the dial and is colored with a permanent-marking felt pen.

#### Alignment and Other Circuit Ideas

A general-coverage receiver or another dip meter (calibrated) will be required to align the instrument. Plug in the appropriate coil for the range to be calibrated and turn the power switch to the ON position and advance R7 to approximately one-third scale. If a receiver is being used to calibrate the instrument, tune it to the lowest frequency covered by the particular coil in

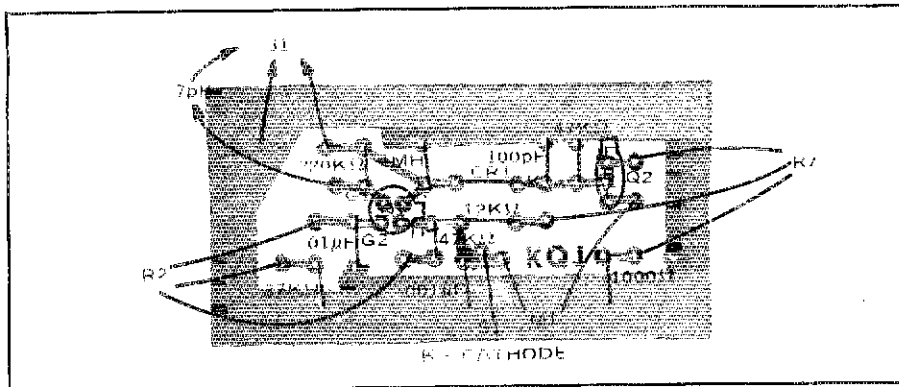


Fig. 2 — Here is the circuit-board pattern for the dip meter — foil side of board. Grey areas represent the unetched copper pattern.

Table 1  
Listed here are the values for C1, C2 and L1.

FREQ. RANGE MHz	C1 pF	C2 pF	L1 TURNS
2.3-4	15	15	71-1/2
3.4-5.1	33	10	39-1/2
4.8-8	10	33	25-1/2
7.9-13	10	33	14-1/2
12.8-21.2	10	33	6-1/2
21-34	10	33	4-1/2
34-60	10	33	2-1/2
60-110	10	33	*
90-200	Not used	Not used	**

\*denotes a 1-1/2-turn coil of No. 18 enam. wire wound on a 1/2-inch form spaced 1/8 inch between turns. It should be placed so that the coil is near the top of the coil form.  
\*\*denotes a hairpin loop made from flashing copper, 3/8-inch wide X 1-7/8-inch total length.

All other coils are wound with No. 24 enam. wire.

use. With the coil of the dip meter in close proximity to the receiver antenna terminal and the variable capacitor fully meshed, the dip-meter oscillator should be heard somewhere close to that frequency. Start by marking this frequency on the paper or thin cardboard dial attached to the plate. Next tune the receiver higher in frequency (approximately 100 kHz on the lower range coils and 1 MHz on the higher frequency ranges) and mark this frequency on the dial. Continue this procedure until the complete range of the particular coil has been marked. Do the same for each of the other coils. If another dip meter is used for the calibration process it should be placed in the DETECTOR mode and used in a similar fashion as that of the receiver outlined above.

This circuit may be used as an absorption wavemeter by inserting a single-pole, single-throw switch at point S on the circuit. With the switch in the open position the oscillator will be inoperative. If it is desired to modulate the rf signal, 100-percent modulation may be obtained by setting R2 for approximately +4 volts at gate 1 and applying a 5-volt peak-to-peak audio signal at point M. Beat notes may be heard with the addition of a small audio transformer and earphone in the meter circuit at point E. Finally, by placing a suitable paramagnetic sample in the coil and applying a modulated-magnetic field, so-called spin resonance<sup>1</sup> may be detected as an audio signal either at point A or E. All of these modifications should be adequately filtered for rf.

#### Footnote

<sup>1</sup> F. Bruin, *Advances in Electronics*, Academic Press, Volume 15, pp. 327-383.

# The DVM/Frequency Counter Becomes a Clock

That digital voltmeter/frequency counter of the Learning ICs series can perform other functions, too, such as telling you the time of day. Add fourteen TTL ICs and make it a three-function instrument.

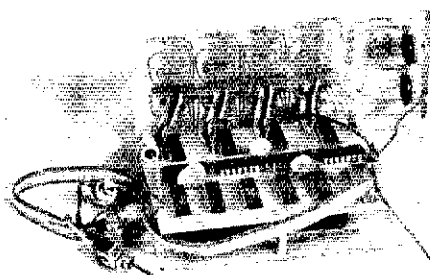
By Robert D. Shriner,\* WA0UZO

While building the DVM/frequency counter,<sup>1</sup> it dawned on me that the major amount of circuitry existed for a digital clock. The power supply, readouts and time base were all there. The only thing required would be a few more ICs, set up to measure time. I selected the clock logic shown in Fig. 1 because it uses the same types of ICs that are used in the DVM/counter and also had 12- or 24-hour capability.

The only sticky little problem was how to switch the information displayed on the readouts from the DVM/counter to the clock adaptor. This was solved when I discovered that all I had to do was wire the additional 7447 ICs in parallel and apply +5 volts to whichever set I wanted to use to display information. The logic that controls the time count is contained in U1 through U6, and power should not be disconnected from these ICs. When you disconnect power to the readout drivers, U7 through U10, do not disrupt the time logic.

As you have learned from Jerry and Chuck,<sup>1</sup> digital logic can be made to perform in many different ways. The clock could have been built using a single chip, as is done in the more advanced circuits, but if you will follow the logic through you will find this project very interesting. I will explain it briefly and hope that you will trace the logic.

Consider how a digital clock must work. First we must display minutes.



The 12/24-hour clock adaptor added to the DVM/counter. The clock circuit board is stacked atop CW-LW4 in this installation, and the vertical board is CW-LW2 (QST for May and February, 1976, respectively). The exact method of mounting the clock board will depend on your original construction. Note that the use of ribbon wire for interconnections gives a neat assembly.

This is easy — U5 will count 0 through 9 and carry 1, and U6 will count 0 through 5 and carry 1. When you speak of time you might say 60 minutes. But when it is displayed you display 59 minutes, and one minute later you display 00 and carry 1.

Now the fun starts; if you have programmed the clock for 24-hour operation, look at the logic required. Assuming we start at midnight, we will display 00:00. Now we must count 0 through 9 hours and 1 hour later carry 1 and we have 10:00. Now we must do it again and we will have 20:00 or 8 o'clock at night. Now we must count to 23:59 and the next minute reset to 00:00.

Here's a stickler for you. If you have

programmed for 12-hour operation, the hours must count 0 through 9 and carry 1, and we have 10:00. Now we must count to 12:59 and reset to 1:00. If you can figure out from the diagram how this is done, you will no longer have to be afraid of any digital logic problem.

Another interesting bit of research for you. Note U1 and U4. Both are the same type of device and are set up to divide by 6, but they use different inputs and outputs. Figure out how this was done. The only reason I did it was to show how you can make digital logic perform the way you want it to.

## Construction

The basic information that you have learned from constructing the DVM/counter will enable you to assemble the clock adaptor with ease. It can be constructed on a pegboard; however, a ready-made circuit board is available.<sup>2</sup>

Sockets for the ICs are not recommended as they cost unnecessary money and the ICs used can first be tested in the DVM/counter. For instance, U7 through U10 can be tested by plugging them into board CW-LW2. If they work okay, then solder the little rascals into the clock board. I have never found that it hurts to solder onto an IC as long as reasonable care is taken to avoid overheating it. Install all parts and jumpers on the clock board following the parts overlay, Fig. 2.

Cut four pieces of ribbon wire (7 conductor) 2-1/2 inches long and carefully solder them to the 7447s on the clock board. Note that on each IC the seven wires are different lengths. Go slowly and do a nice job. Now strip

\*1740 E. 15th St., Pueblo, CO 81001  
<sup>1</sup> Footnotes appear on page 21.

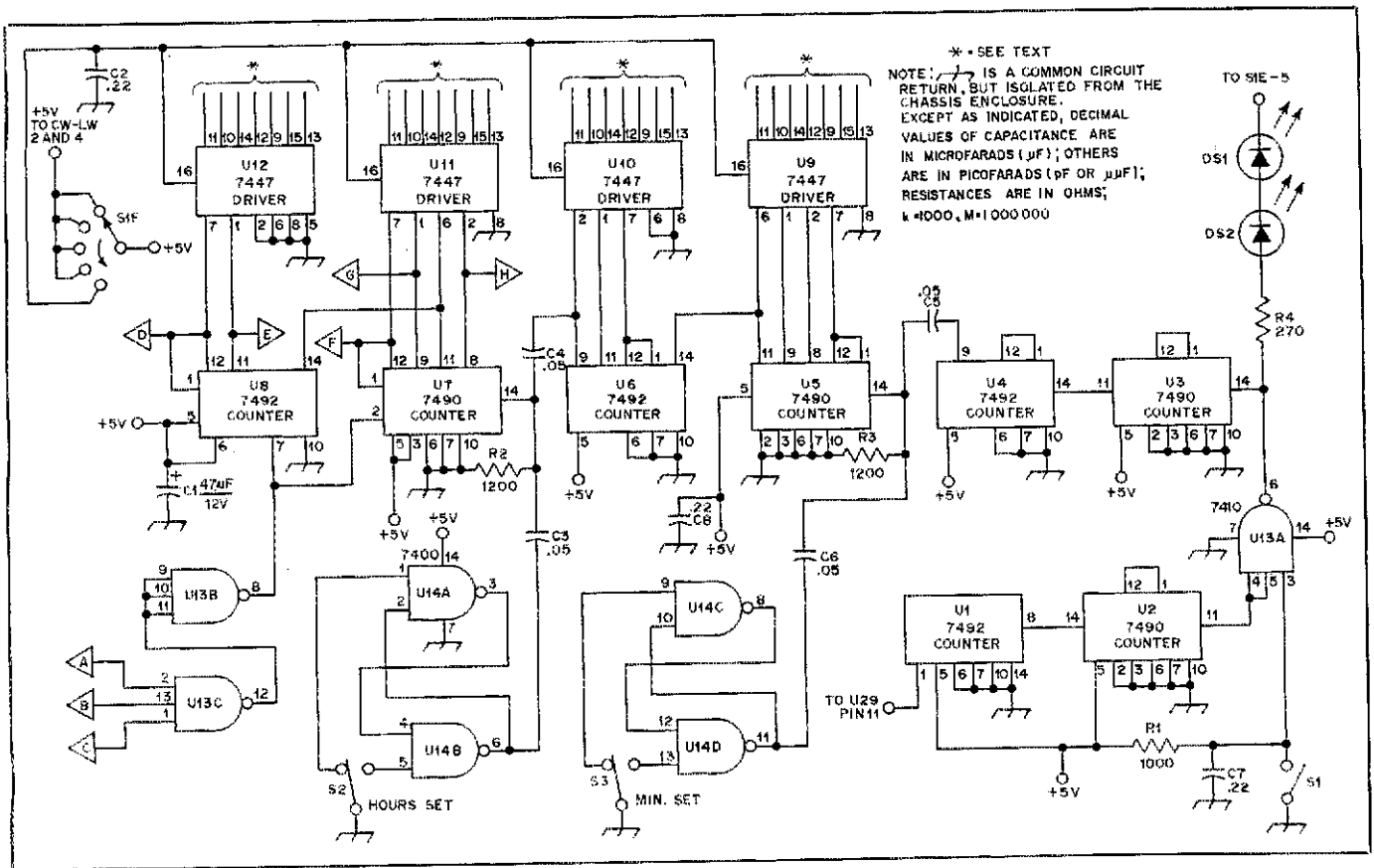


Fig. 1 - Schematic diagram of clock adaptor circuit. The letters A through H appearing in triangles are interconnected with jumpers to obtain either 12- or 24-hour clock operation. For 12-hour display DS1, DS2 - Small light-emitting diodes.  
S1 - Formerly unused pole (see July, 1976, QST, p. 33).

jumper A to D, C to G, and B to F. For 24-hour display jumper A to E and C to H. All ICs are of the TTL family. Part numbers on the diagram are identified for circuit-board placement.

S2, S3 - Spst push-button switch.

about 1/8 inch of insulation from the other end of the wires and solder to the lower end of the 28 1000- $\Omega$  resistors on CW-LW2, matching the pin numbers of the two sets of 7447 ICs.

A single screw and spacer are used on the back of the clock board to support it. Drill a small hole in CW-LW4 to accept this screw. A careful study of the photo will show how this is done.

Decide if you want 12- or 24-hour display and install jumpers as shown on the schematic diagram. If you really want to get fancy, install two clock boards and set one for 12-hour local time and one for a 24-hour UTC display. (One more switch position will be required on the main control switch.)

Connect U1 pin 1 to either the crystal time-base board, pin 11 of U30, or else to pin 6 of U17 on CW-LW3 if you use the 60-Hz time base. Locate a spot for the time-set and seconds-hold switches. These switches should be on the rear of the chassis to keep inquisitive fingers from changing the time-set. A piece of ribbon wire works well here. Shielding is not necessary.

Modify or change the main control switch to the configuration shown on the diagram. The end result of this

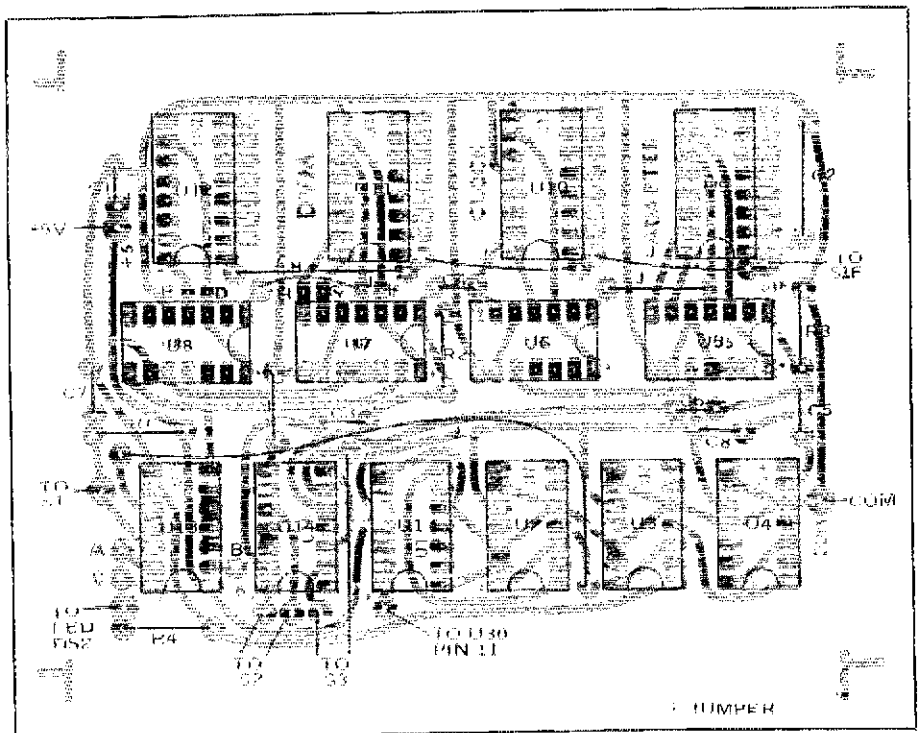


Fig. 2 - Circuit-board etching pattern and parts placement guide for the clock circuit board. The pattern is shown at actual size from the foil side of the board with gray representing copper. J = wire jumper. All components are mounted on the nonfoil side of the board.

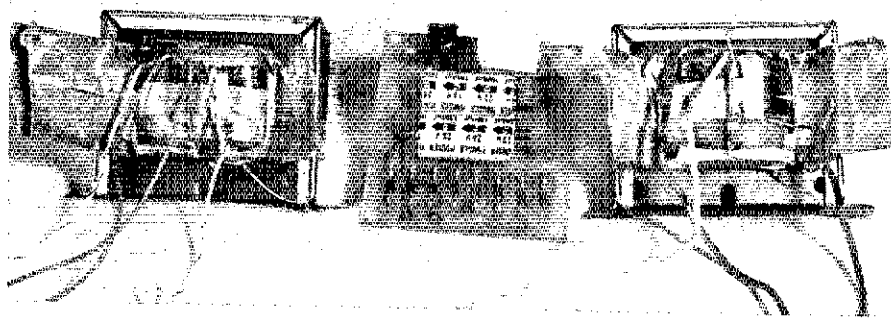


Fig. 3 — Showing the modification to the secondary winding of the power transformer. At the right, the transformer is shown just after opening for surgery; at the left, ready for closure. The newly assembled power-supply board is shown in the center.

modified switch is to allow +5 volts to be switched from CW-LW2 to U9 through U12 of the clock adaptor. In order to save a little juice and to hold down heat, it is best to switch +5 volts off of CW-LW4 when in CLOCK.

A colon may be constructed for your clock by carefully drilling two small holes in CW-LW2 between the two center readouts. Solder DS1 and DS2 together in series, observing polarity, so they are 3/8 inch apart. Insert a piece of insulated hook-up wire into the two holes in CW-LW2, strip about 1/16 inch of insulation off the wires and cement them in the holes. Position them so that the colon LEDs look good and are on the same plane as the readouts. The colon is connected into the circuit so that it flashes once each second and goes out when the instrument is used for a DVM or counter.

### Power-Supply Modification

The original power supply for the DVM/counter used a 32-V ac trans-

former for both the 5- and 12-volt regulated supplies. This worked out fine for the 12-volt supply but the 5-volt supply required a 10-ohm, 10-watt resistor to "burn up" the excess voltage. This created quite a bit of heat in the "shoe box," and caused considerable drift in the voltage-to-frequency converter. I modified the power supply to reduce the voltage for the 5-volt supply so it was within the limits of U2, the regulator, and the resistor is no longer needed. While I was at it, I modified the 12-volt supply. The pass transistor, Q1, is no longer needed.

The first step in making the modification calls for some surgery on the transformer. It is quite easy and only took me about 15 minutes to make the changes on mine. Slip a sharp knife under the paper on the secondary side, cut the paper and fold it back as shown on the right in Fig. 3. Identify the center tap; note that it has two solid wires going to it. Unsolder the flexible wire and separate the two windings.

Solder a flexible wire to each of the solid wires, as shown at the transformer on the left in Fig. 3. Note that the wires for one of the windings are visible. From this winding we will take off some turns, to reduce the voltage. Actually, we will not remove the turns, we will only move the wire shown in the lower right-hand corner of the transformer at the right. Unsolder it and clip the remaining solid wire so it can be laid back out of the way. Now move to the top turn of the visible winding and clip it in about the center. Use an ohmmeter to determine the correct end of this wire to solder onto. Now take a "cheater cord" and apply 117-V ac to the primary and check your two secondaries. You should have 16 volts on one and about 12 volts on the other.

As they say in surgery, we are now ready for closure. Cut a small piece of stiff paper to prevent any shorts and slip it under all the solder joints. Mix up about a spoonful of epoxy cement and dump it on the wound. Fold the paper back over and secure it with a little Scotch tape until the epoxy cement hardens. While waiting for the cement to dry, remove all parts from CW-LW1 and install the parts on a new power supply circuit board,<sup>2</sup> along with the new parts as shown in Figs. 4 and 5.

If you haven't done so yet, make the modification on the readouts as explained by Hall and Watts in July, 1976, *QST*, to power them from an unregulated output voltage. The only difference here is that I used a 5-watt dropping resistor in place of the 2 watt, and installed it on the new power-supply board. Twelve volts is the minimum regulated output that is required, so another resistor, R1, may be added in case your voltage is a little low. About 47 ohms will raise the output by one-half of a volt. If not needed, then merely place a jumper across this point

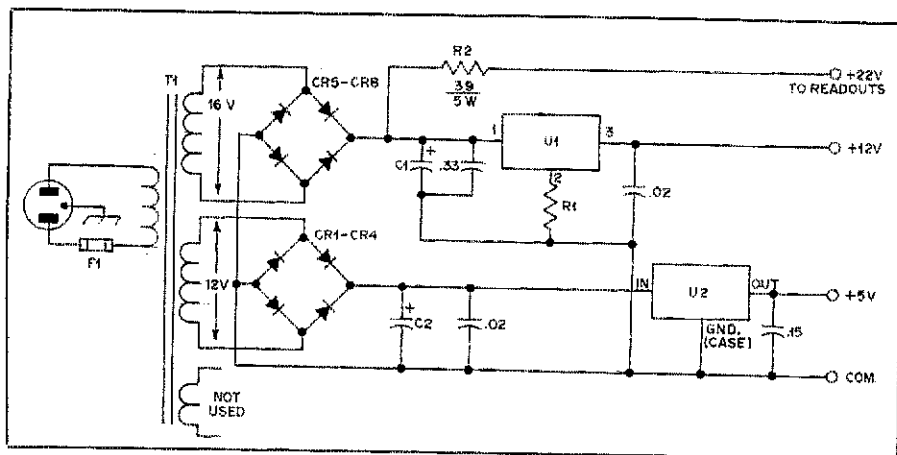


Fig. 4 — Schematic diagram of the complete power supply after modification. Most of the parts shown here may be salvaged from the original power-supply board and mounted on a new board (see Fig. 5).

C1, C2 — 1000  $\mu$ F, 25 V.  
 CR1-CR8, incl. — 1N4003 or equiv.  
 R1 — See text.  
 T1 — Modified transformer; see text.

U1 — LM340/T-12 or 7805 12-volt regulator.  
 U2 — LM309K 5-volt regulator, mounted on heat sink.

### Setting the Clock

The unit is now complete. Apply power to your DVM/counter/clock and set the control switch to CLOCK. If you have tested your ICs and have no wiring errors or poor solder joints, the clock will go right to work. A random number will appear and the colon will be flashing the seconds. All we have to do now is to clear the ICs and set the clock to the correct time.

If the colon is flashing, all is well to this point. Wait one minute and the clock should advance. Close S4 and the clock should stop. Press S3 and the minutes display should advance by one minute. Run the minutes through a complete cycle and the hour should advance by one digit. Press S2 and the hour should advance by one digit. Run the hours through a complete cycle to assure that they are cleared. Open S4 and watch the

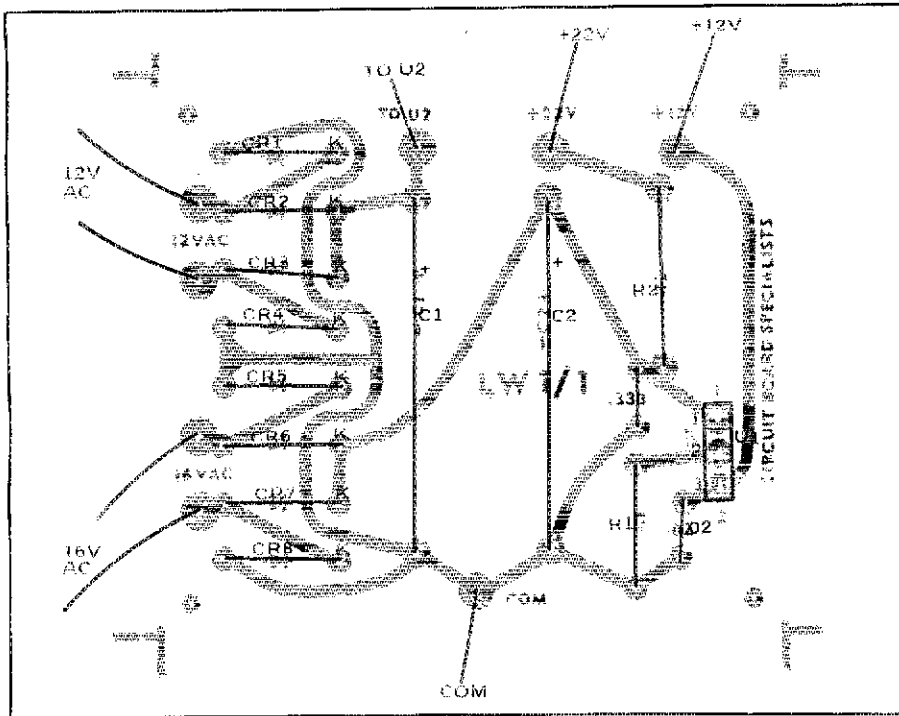



Fig. 5 - Circuit-board etching pattern for the modified power supply of the DVM/counter/clock. Gray represents copper, shown at actual size from the foil side of the board. All components are mounted on the nonfoil side of the board. Ac voltages shown at the left come from T1 after it has been modified (see text). K represents the cathode of a diode.

minutes closely. The instant that it changes, flip S4 to the HOLD position. Your seconds are now set.

Tune in WWV and get the correct time. Advance the minutes to one minute ahead of WWV. Advance the

hours to the correct time. Get your finger on S4 and as WWV beeps the next minute, place S4 in the RUN position. It takes longer to tell how to do it than it does to actually set your clock. Once the clock is set it will keep time as long as you do not turn the instrument off (or until your power goes off for some reason).

### Troubleshooting

If you have tested your ICs, the only problem that you could have is in wiring. Occasionally a 7490 will crop up that won't trigger right. A slight change in the value of R2 or R3, Fig. 1, will correct this. Use a resistance substitution box to determine the best value. To make troubleshooting easier, move the input wire to the 600-kHz output on the crystal time board, and time will really fly. 

### Footnotes

<sup>1</sup>Hall and Watts, "Learning to Work with Integrated Circuits," Parts 1 through 8, *QST*, January through July and October, 1976.

<sup>2</sup>Circuit Board Specialists, P. O. Box 969, Pueblo, CO 81002. At the time of this printing the clock circuit board is available, etched and drilled, for \$5.50 post-paid in the U.S.; the power-supply board, for \$2. For a complete kit of clock-board component parts, add \$16, and for the additional power-supply components, required for the modification, add another \$1.50.

## Strays



□ At a time when citizens band communication has become popular, 13-year-old Dale Baker, of Richardson, TX, went a few steps further - all the way to an Extra Class license as WB5SBH.

While suppressing pressure from his junior-high schoolmates to join in the local CB jargon, he started learning the code on his own in December, 1975. In just one day he had the entire alphabet down along with several punctuation marks. Within 10 days he passed the Novice code test. After passing the written exam, his license arrived in mid-March. The OM, George Baker, WSYR, joked that Dale would have his Extra before Christmas, 1976. That became less so as his code speed steadily increased while he studied the *License Manual and Handbook*.

His first effort at the General class did not meet success, but the second try did and he received the license July 14. Only six days after that, Dale went all the way by passing the Advanced written, Extra code and Extra written tests.

His license came on August 24, 1976, just five months and five days after he became a Novice!

Part of the support and encouragement came from the 108-member Richardson Wireless Klub, which takes a serious responsibility toward upgrading the junior members. Dale's father, an electrical engineer as well as an amateur for 30 years, admits that he was a ready source for answering questions and having a working station to demonstrate many radio principles. He proudly notes, however, that his son's diligent hours of study and practice were the real forces behind the accomplishment.

□ An amateur radio message center was set up to serve an annual meeting of the Maine Conference of the United Church in Auburn, ME. A rig was furnished by WA1MUX, who had assistance from WA1FCM, WA1SCQ and WA1GOU. As previously arranged, K1YXO and WA1JZP were at their stations to relay traffic through the Seagull Net on 3940

kHz. The volume of traffic was not impressive, but a priority message was occasioned by a telephone service break in the Perry, ME, area. Delivering station WA1PXD was especially helpful.

Notably, this same church was the scene of the first church service broadcast on Christmas Sunday in 1921 when amateurs had few operational restrictions. The commercial broadcast pioneer, KDKA in Pittsburgh, PA, did not broadcast its first service until the following week, New Year's Sunday, 1922. For the Maine broadcast Don Dean, 1BYK (now W1BYK), furnished the gear and borrowed an antenna from George Monroe for operation on a wavelength believed to be 198 meters. They were located in the choir loft with an old Edison horn held to a WE23W mic for pickup. Other details were lost when a fire destroyed Don's logs for that period. Although no publicity was attached to the early project, letters were received from listeners throughout Maine.

# A Gated Noise Source

We'll bet you thought noise was a useless commodity, an "ill wind" to be gotten rid of at all costs. But noise, when controlled, is useful for aligning a receiver for best performance.

By Ted E. Hartson,\* WA8ULG

This circuit provides a simple low-cost method to optimize a converter or receiver for best noise figure. The simplicity of this system makes effective tune-up possible without a lot of test equipment.

Numerous articles have described units where noise-figure tests may be made. With the exception of certain thermal-limited diodes (5722, etc.), an absolute value of noise figure is not obtainable with these units; this device is no exception.

Anyone using a classic noise-figure meter soon learns that the tune-up of a system is a cut-and-try procedure where an adjustment is made and its influence is observed by calibrating the system. Then the excess-noise source is applied and the effect evaluated. This is basic-

ly an after-the-fact method of testing after an adjustment is made, and is consequently time consuming.

The gated noise source doesn't require a special detector or any detector at all, other than your ear. By turning the noise source on and off at an audio rate, the ratio of noise contributed by the system to noise of the system *plus* excess noise appears as an audio note. The louder the note, the greater the differential in levels and hence the greater the influence of the excess noise or the better the noise figure.

If greater precision is desired than subjectively listening to the signal, an oscilloscope may be used. Hook the scope vertical input to any point in the audio system of the receiver, such as the speaker terminals. Adjust the scope for a display of several multiples of the train of square pulses. Proceed by ad-

justing the device(s) being tested for greatest vertical deflection.

The result of an adjustment is instantly visible as an increase or decrease in the recovered audio. This method of noise evaluation is by no means new. Most modern automatic-noise-figure meters turn the excess-noise source on and off and then, through rather sophisticated methods, evaluate the results. This technique is sometimes called "V"-parameter testing.

While the method and circuit described here are not exceptional, they represent a fresh approach to noise evaluation. This approach does not require long-term integrating detectors and tedious "twice-power" measurements which, without absolute calibration, can result in no more than simply optimizing the system.

In some cases the available noise generated by this unit may be too great. The output may be reduced by inserting attenuators between the generator output and the device under test or by adding a 2000-ohm potentiometer at the point marked in the circuit (see Fig. 1).

The use of an attenuator is preferred because it reduces the apparent output VSWR of the generator by increasing the return loss. If a control is used it must be returned to its minimum insertion-loss position when starting a test or no signal may be heard.

This circuit uses readily available junk-box parts and may be easily duplicated. The lead placement in and around the diode itself should follow good vhf practices with short leads and direct placement.

Some old-guard vhf enthusiasts will note with alarm that the diode is forward biased and therefore is wired in "backward." Historically a battle over diode polarity has raged for some 15 years through the pages of many ama-

\*2444 West Halbert Rd., Battle Creek, MI 49017

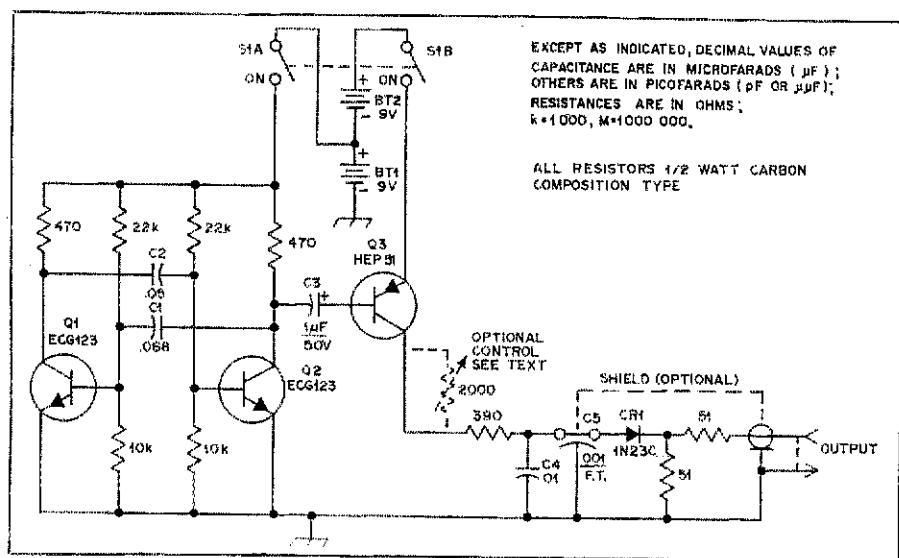


Fig. 1 - Schematic diagram of the gated noise source.

B1, B2 -- 9-volt battery (Eveready 216 or equivalent).

C5 -- .001- $\mu\text{F}$  feedthrough capacitor (Sprague

BH-340).

S1 -- Double-pole, single-throw miniature toggle.



teur publications. The defense for the placement of the diode in this fashion is simply explained. The available gating voltage is not great enough to generate sufficient excess noise when operated in the reverse-bias mode.

The conducting resistance of the diode and the two 51-ohm resistors serve as a network, minimizing the adverse influence of the forward-biased diode.

The technique may also be applied to noise optimizing of TV receivers. The gating rate will be seen as alternating black and white bars on the receiver screen, the darker being the presence of the excess noise. The system is optimized when the maximum differential in shading occurs. This is an excellent method for peaking up uhf-TV front ends.

### Theory of Operation

Q1 and Q2 are used in a cross-coupled multivibrator circuit, operating at approximately 700 Hz. The value of C1 is greater than C2 to cause the duty cycle to favor the conduction of Q2 slightly. When Q2 conducts, the pulse is coupled to Q3 via C3, turning on Q3 and causing current flow through R7, CR1 and R8.

The diode generates broadband noise which is passed through R9 to the output. R7, C4 and C5 form a low-pass filter to prevent high-order harmonics of

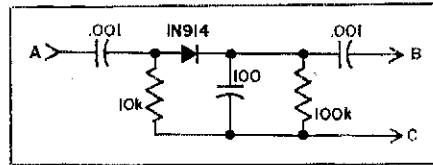


Fig. 2 — A simple detector which may be used when aligning ssb and fm receivers (see text for details).

the switching pulses from appearing in the output.

The influence of stray rf signals entering the device under test through the generator may be minimized by shielding the components shown. A simple box may be built by using pc-board scraps. For best match, this source should be connected directly to the input of the device under test; therefore, the unit is equipped with a male connector. This matching becomes a greater consideration as the frequency of interest increases.

### Addendum

The gated noise source was first developed in November, 1975. Subsequently, some interesting things have been learned regarding its application. Some contemporary receivers and transceivers cannot be operated in the a-m mode, and consequently the noise

source seems not to operate. The detection of noise is the process by which the noise source operates; therefore, it will not work through an fm detector, nor will it work through a product detector, since one of the terms of the detection (the noise) is not coherent.

The "scope" jack on most receivers is loosely coupled to the i-f amplifier, preceding the detector. A wide-band scope connected to this point will show the train of pulses and eliminate the need for aural detection. The alignment of the later i-f stages of a system should have the least impact on the noise performance, and maximum signal response will always occur at the same setting. With this thought in mind, the simple prototype detector will generally work for aural a-m detection. Connect point A to the last i-f amplifier plate or collector. Connect point B to the audio amplifier, at or near the volume control and ground point C. With this arrangement the normal detector output is turned down with the volume control, and the temporary detector provides a-m detection.

The gated noise source has been used for literally hundreds of applications in the past year and has proved to be a powerful yet simple addition to my test bench. While no guarantee of duplication may be made, my units develop approximately 18 dB of excess noise in the region of 50-300 MHz. Q57

## Strays

### Radio Amateur WARC-79 Honor Roll

Here is a list of radio amateurs known to have participated in activities of the Federal Communications Commission's World Administrative Radio Conference Advisory Committee for Amateur Radio (ACAR) during the period May, 1975, through June, 1976. This was Phase I of the committee's work. The list was compiled by

Peter Hurd, K4NSS, based upon committee records. Hams who are involved in Phase II of the WARC-ACAR tasks will be listed in an honor roll to be published later. The following is in alphabetical order by last name.

W5EYB	Roy Albright	W3DXA	John Hansen	W1JAA	Joe Reisert
WB6NMT	Louis Anclaux	W4MB	Robert Haviland*	W4AAW	Clark Rodiman
W1HGI	Norman Bach	K6HCP	Ken Holladay	WB8HEE	Henry Ruh
W1RU	Richard Baldwin*	W6ZH	Herbert Hoover III*	W1NXY	Joseph Santangelo
W0AR	Lee Bergren	K4NSS	Peter M. Hurd (Secretary, ACAR)	W9JUV	Joseph Schroeder
K4KDY	Herb Blaker		George Jacobs	W2QD	John Serafin*
W3PS	Bob Booth	W3ASK	John B. Johnston (Chairman, ACAR)	K4BZF	Ray Simonds
WA3WRS	George Borsari	K3BNS	John Kelleher*	K1CCL	Chester Smith
W0IUF	Tom Clark		Perry Klein	K1ZND	David Sumner
W4KFC	Vic Clark	W4ZC	Richard Kolby	W4OO	Gene Sykes
W4FZ	Earle Cook*	K3JTE	Howard Lorenzen	W3VW	William Taylor
W2TUK	Harry Dannals	K6HIJ	Ben Lowe	W1NLB	Skip Tenney
W3JPT	Charles Dorian*	W3BLC	Fred Matos	WB6JPI	Robert Thornbury
W2ECH	Ed Dunn	K4VQW	Walter Maxwell	W1HDQ	Edward Tilton
W2DEO	James Dupont	W3ICM	Richard McKay	K6LFH	Chuck Townes
W6UF	Bill Eitel	W2DU	Stuart Meyer	K6UQH	William Troetschel
W6GD	F. E. Emerson	K6VGP	Charles D. Mount	W6ISQ	John Troster
WA6GYD	Donald Farwell	W2GHK	Wayne Murphy	W3KMW	William Tynan
WB6KAP	Victor Frank	W4LVC	Katashi Nose	W4BW	Prose Walker (ACAR Chairman, May — Nov., 1975)
W3FU	Fred Friel*	W6OHQ	Bill Orr		
W3OKN	Merle Glunt*	KH6IJ	Bill Page		
K1HZN	John Good	W6SAI	George Perrine		
W4GF	Bill Grenfell	WB4LWX			
W2ALS	Frank Gunther	W9KOI			

\*Designates that the individual was a task force chairman during Phase I, having a major leadership role in work of the Committee.

# A Prototype Pulse-Code Modulation System

What's pulse modulation? A communications system so wide-band it's allowed only above 2300 MHz — but don't leave now. Here's how to generate it, when you go microwave. With satellites and all, you may want to be doing that, some day.

By Vincent Biancomano,\* WB2EZG

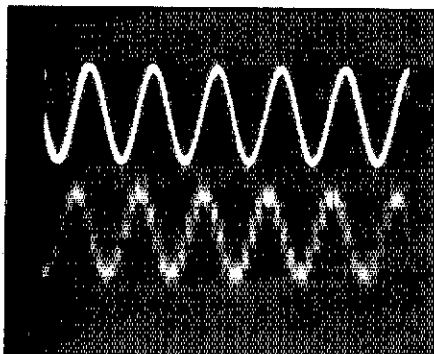
Vast changes in technology usually introduce experimental schemes and, with them, utilization of higher frequencies by radio amateurs. Satellites and moonbounce techniques are two prime examples. As techniques improve, newcomers increase. In relatively short time, the new concept becomes commonplace.

Pulse-code modulation (PCM) types may eventually be as important to the amateur as amplitude modulation, radioteletype, television, frequency modulation or ssb once were or presently are. Those who doubt this are advised to consider the era when single sideband unseated a-m on most amateur bands! Today's frontier is tomorrow's commonplace.

The basic workings and advantages of PCM were set forth in an earlier article,<sup>1</sup> and it would be advantageous to scan this or some other text on digital modulation before continuing. With that elementary knowledge in hand and a moderate electronics background, it is actually possible to construct a working PCM transmitter and receiver.

## Design Philosophy

A good question to ask before embarking on any project is, "What do we want to do?" The purpose in building a lab model is manyfold. It allows us to demonstrate firsthand and step by step the methods used in a standard PCM



1-kHz audio input to the encoder (source) top. Lower trace is the reconstructed signal at Pin 3 of the 4016 in the decoder, delayed .75 ms.

system. This one is as straightforward as possible, with no frills. A single voice channel is encoded and decoded. The model wipes out past difficulties with involvement in a new field. Everyone "gets his feet wet" early with this pilot circuit. The circuit is truly a prototype — a first model to be studied and improved. The circuit performance is not excellent, but adequate. Almost anyone can build it and, with a decent oscilloscope and other test equipment, troubleshoot it.

Integrated circuit logic using CMOS technology is used. This family is characterized by very low power consumption, versatile power-supply requirements, good noise immunity, and moderate cost. TTL logic is cheaper by far, but would draw 10 times the current and would not be designed so easily, because of power-supply restrictions, so take your pick.

Eventually, it is desired to utilize the model on an amateur band. That is a project within a project, because the lowest legal frequency for PCM transmission is 2.3 GHz. With these ideas in mind, we attack the problem.

## The Encoder

To summarize the contents of the earlier article, the purpose of the encoder (or transmitter as it is loosely called) is to transform analog samples into multidigitized codes. In our model, a sampling rate of 10,000 per second is used to convert each audio sample to a 7-pulse code. Modulating frequencies as high as 5 kHz can be encoded. Normally this would mean we could generate up to  $2^7 = 128$  different levels at the encoder and eventually recover them again at the decoder. However, synchronizing information is needed to inform the decoder when the first 7 bits from an analog sample conversion have ended, and the next group begins. This requires at least one more equivalent bit. So, 8 equivalent pulses are transmitted in the time normally allowed for 7, and thus a practical maximum of 123 levels can be encoded in this particular case.

The heart of the circuit is a *counting-type* encoder. An analog signal is sampled, and simultaneously, a ramp generator and a counter clocked by a 1.28-MHz oscillator (128 times the sampling rate) begins. The sampled voltage and ramp generator's output are compared. When the ramp voltage just exceeds the sampled voltage, the counter is stopped. The output of this binary counter, expressed as 7 parallel

\*1569 Richmond Road, Staten Island, NY 10304

<sup>1</sup> Biancomano, "Pulse Modulation — A New Look at Old Theory," *QST* for March, 1974, p. 44.



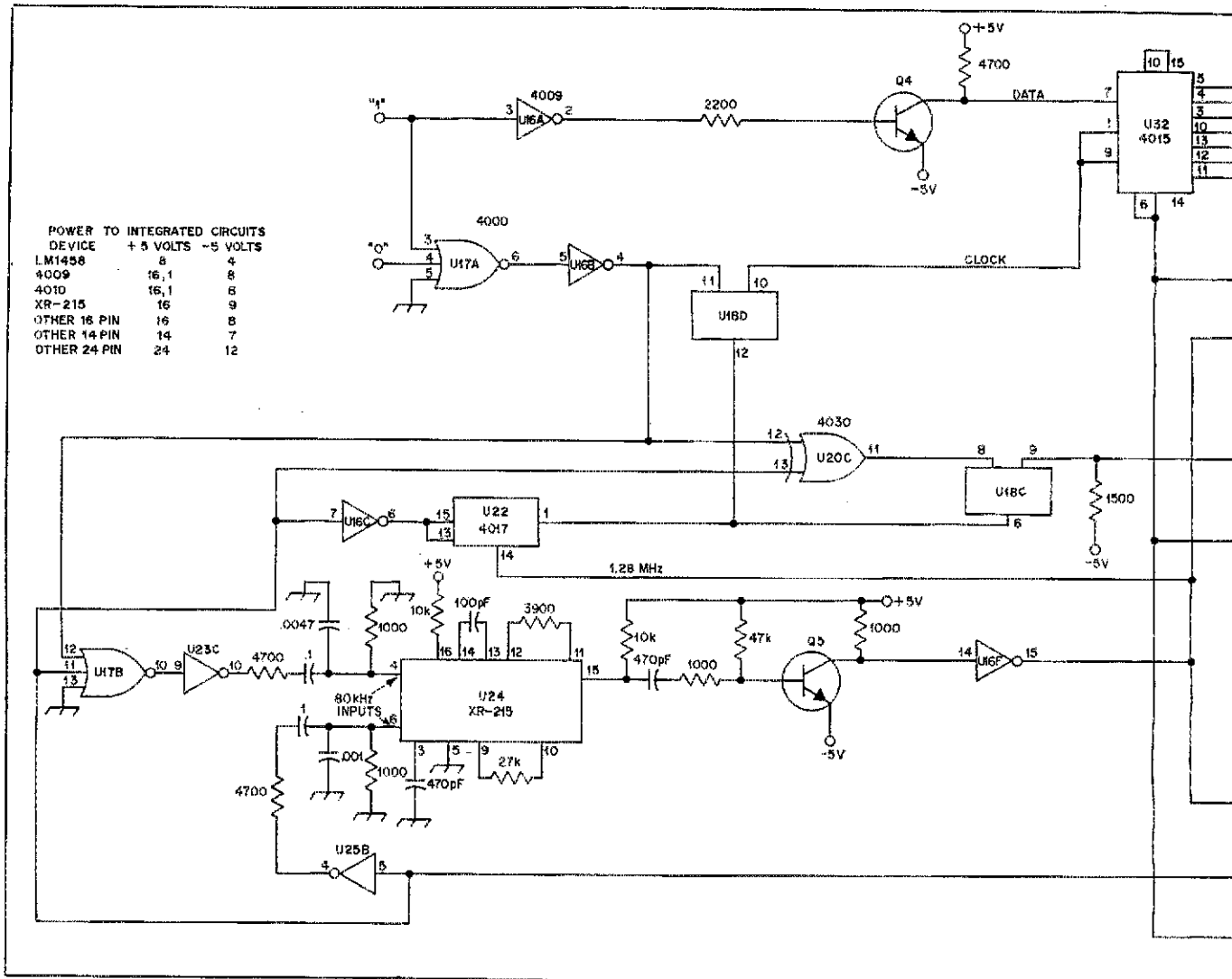


Fig. 2 -- Wiring diagram of the PCM portion of a microwave receiver.

to transmit them by radio. We must convert them into serial form which can be sent one at a time. The parallel bits are transferred to the U8 shift register on the 124 count of the 1.28-MHz clock, after the sampling instant. Remember a maximum of only 123 counts is available for coding analog samples. On count 128 (the beginning of the next sampling instant) the U9 binary counter is reset to zero, and is available for processing the next analog sample.

An 80-kHz clock (derived from U10, U11 and U13) now shifts each stored bit out one by one to Pin 3 of U8. Note that a "1" equals 5 volts; "0" equals -5 volts. These bits are brought to the pulse formatter which separates the 1s from the 0s. This is analogous to frequency-shift keying in RTTY, the method which will be used ultimately in this system. (In the lab, these two points brought to the decoder directly simulate the transmission media.) The pulse-formatter output pulses are all positive-going. Whether they are 1s or 0s

depends on *where* they come from (Q2 or Q3).

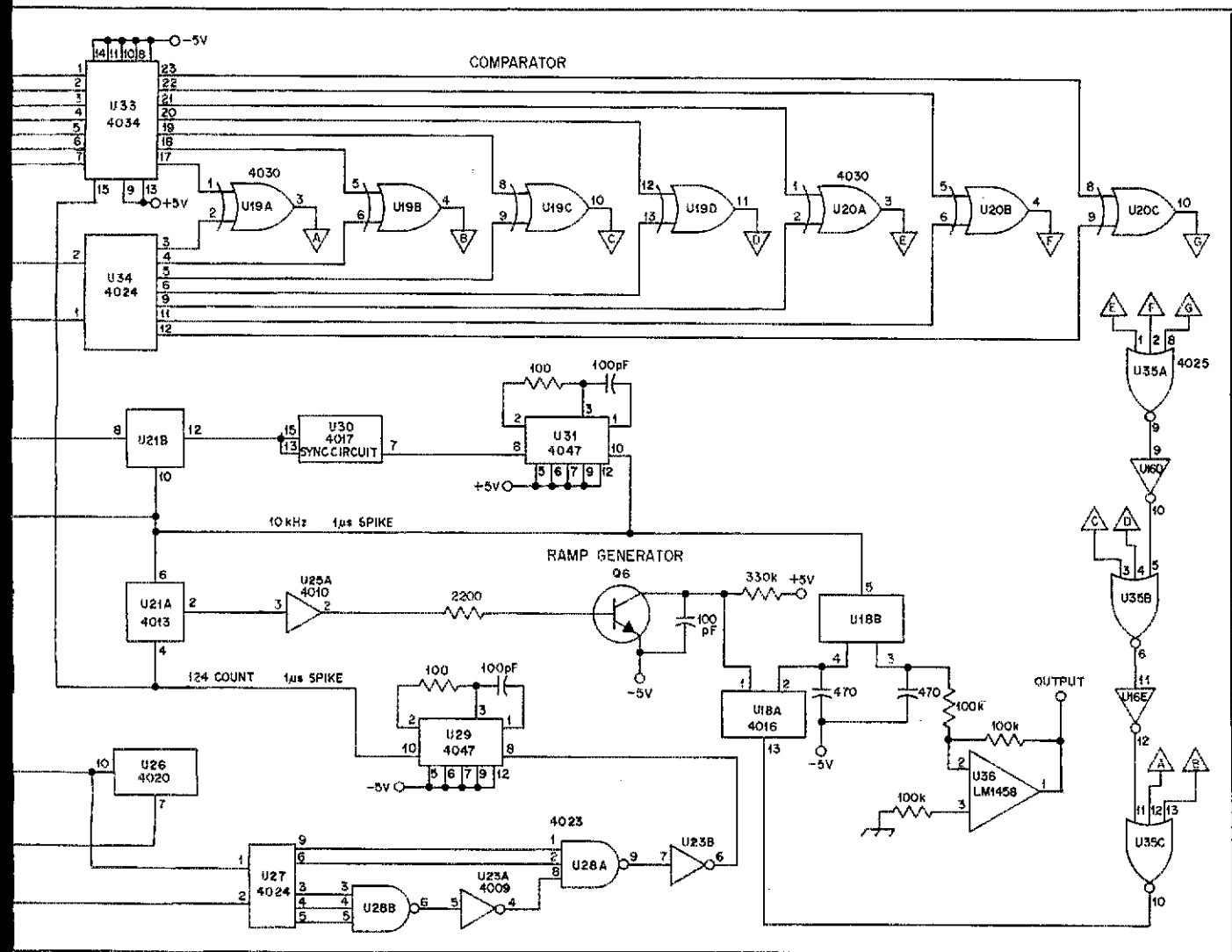
The 124 count is derived from selected outputs of U13. Unfortunately, this cannot be done with the 4020 used in the circuit because not all counter stages are available for use. The transmitter schematic is shown in Fig. 1. A timing diagram is shown photographically. The transmitter uses 15 DIP ICs and 3 transistors. Current drawn is about 80 mA.

### The Decoder

The receiver's job is to convert seven-bit input streams into an analog waveform which approximates the signal sent. This involves a process largely inverse to the one at the transmitter.

The input data consist of seven 1s or 0s plus a blank, which is the sync information. The input circuit regenerates seven serial 1s which clock in the 1s or 0s into a shift register. At the same time a phase-locked loop (PLL) running at about 1.28 MHz attempts to lock

onto the input signal. When it does, the frequency at which the counting-type encoder steps at the transmitter will equal the frequency of the stepping decoder circuit. In addition, circuitry is included to detect the sync information, so that the decoder knows when one "word" ends and the next begins. Thus if the number 50 (binary 0110010) is sent, then 50 is received and stored with no difficulty. The word is changed from a serial word to a parallel word in the shift register. It is transferred to another register before the next sample is processed. As the next sample is processed, the former word is compared to the output of a binary counter which started up during the start of bit 1 (of 7) read-in. Comparison of two parallel 7-bit words is made. When the output of the register equals the output of the binary counter, the parallel-word comparator signals a transmission gate. A ramp generator whose characteristics match those of the ramp in the encoder has started at the beginning of the cycle.



When the gate is pulsed, the value of the ramp at that instant is transmitted through the gate. The value of the original analog sample is recovered at the receiver, plus or minus a dc offset which is unimportant for analog signals.

So much for generalities. As seen in Fig. 2, the 1s are sent through switching transistor, Q4, to the data input of the U32 shift register. The dual 4-stage chip has been wired as a single 8-stage device. Meanwhile, the 1s and 0s are combined through the U17 NOR gate function. However, these signals are not used for clocking in the 1s or 0s directly. Generally, incoming data may be somewhat distorted by noise, path losses and so on, and we must take this into account. The type of distortion we are speaking of relates to "frayed and withered," rising and falling edges of pulses. Thus, incoming pulses are clocked in at their midpoints as shown in the photographs. This increases the probability that the pulses which were sent will be received and stored correctly. Moreover, this is

necessary because the 4015's data input must precede the clock by about 100 ns to be stored correctly.

The manner in which this is done is explained presently. Recall that the counting-type encoder clock runs at 128 times the sampling rate, and therefore, at 16 times the transmission rate (80 kHz). So there are 16 pulses of the 1.28-MHz clock per one period of the 80-kHz signal (or 8 pulses per half cycle of this signal). The 1.28-MHz clock drives the U22 decade counter, and it counts each time the rising edge of the 80-kHz signal emanates from the U26 binary counter. The 5 count pulses the U18 transmission gate thus passing a 1 to the clock input of the U32 (assuming it is a data bit and not sync). The center part of each 80-kHz pulse is thus used for sampling.

Now, what about the sync information? How does the circuit detect and differentiate the sync from the data bits? The 5-count output of U22 also pulses another transmission gate (U18)

which passes the "contents" of a U20 exclusive-OR gate. Pin 11 output is high when a 1 appears at either (but not both) input. With all data bits, nothing appears at Pin 11 of the 4030. Only when Pin 12 stays low and Pin 13 goes high, is there an output. This happens after bit 7 of the data stream when nothing is sent. The U21 is set, enabling the U30 to count to 3. Again, the clocking signal is the 1.28-MHz oscillator. At this time, a total of 8 has been counted by both 4017s. The U30 now fires the U31 one-shot, which will occur at the start of bit 1 of the next 7-bit word. This is how word sync is accomplished.

Frequency sync is accomplished by comparing the frequency and phase of the incoming 80-kHz stream to an internally generated 80-kHz signal. When both are equal, a 1.28-MHz signal available for use in the receiver's counting decoder is established. This is done by using a phase-locked loop. We have a problem here, because the incoming

data consist of 7 cycles of an 80-kHz waveform, when the internal clock consists of 8 cycles for every sampling period. We must fool the loop into comparing two "8-cycle counts." Fundamentally, the period of each bit of the 7 bits is equal to that of each of the 8-bit internal clock. There is but one less count in the former case, which will cause pulling of the local oscillator if not corrected. So the 7 count is brought to an OR gate, as is the count of the internal 80-kHz signal. The output of the OR serves as one signal input to the PLL. At the other comparison input, the internal 80-kHz clock is brought directly.

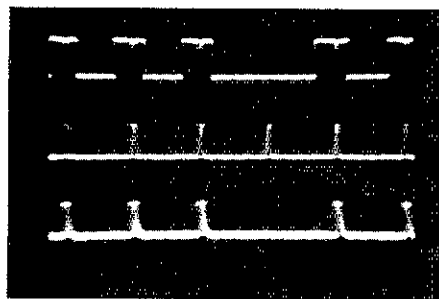
As the loop output attempts to reach a frequency which allows no frequency or phase difference at the input, a condition will be reached whereby the 7 count will be followed in step by the internal 8 count at the output of the OR gate. Thus we are able to achieve both sync and frequency locking in a somewhat unorthodox manner. The PLL used is the Exar XR-215.

Recall that the 7-bit parallel word has been stored in U32. It is now transferred to the U33 parallel bus register on count 124 after the initial sampling instant. At the next sampling time, a 4024 binary counter starts, as does a ramp generator. When U34 reaches a state whereby its parallel output equals that of U33, a pulse is delivered to the U18A transmission gate, Pin 13. The parallel comparators are the gates of the U19 and U20 exclusive-OR arrays.

The value of the ramp is passed to the output of the 4016 at this time. The value is stored on a capacitor, which partially filters it, and serves as the input to a second transmission gate of the 4016, U18B. Then this value is outputted upon the arrival of uniform sampling 10-kHz spikes. Again it is filtered and (for now) brought to a lab-type active filter with a cutoff of 3 to 4 kHz. The value of the sample sent is now recovered, minus a dc offset. Note that the original voltage value of each sample is not likely to be recovered, for many reasons, but it is not important to do so. Since analog signals are processed, it is important that the *relative* values of the samples are preserved from the encoder through the decoder. The receiver uses 21 DIP ICs and 3 transistors. Current drain of the receiver is about 70 mA.

#### Circuit Notes

A point emphasized initially was that the lab model was not the last word in designing a PCM system. It is only a way of evolving a more successful model. Some comments are in order, based upon what the author considers to be circuit weaknesses. Prospective



Midpoint sampling of data. Top — combined 1 and 0 bits, from Pin 4 of U16. Center — sampling pulse, count 5 of the 4017. Bottom — output of the transmission gate. This clocks in the received data to the 4015, and occurs 7 out of 8 times per sampling cycle. Note: it is equally valid to bring the input of the transmission gate high (plus 5 volts) instead of from Pin 4 of U16. However Pin 4 must go to all other inputs shown in the circuit diagram.

designers who wish to use a skeleton of the model just described might consider these notes when building a superior system.

#### Encoder Improvements

One area in need of help concerns the sampling gate and associated circuitry. Its output is frequency sensitive. As the gate is turned on by the 1- $\mu$ s sampling pulse, the input can change in value more for the higher frequencies than for the lower ones. This is because the 1- $\mu$ s time represents a larger part of a cycle in the former case. In addition, the charging time of the capacitor at the output varies with input amplitude. This is because the capacitor charges through the on-resistance of the gate, which increases for small signals. Overall, its performance is good, judged by listening tests, but it could be better. Every little bit helps (no pun intended!).

The most important area in the coder concerns what has *not* been done, however. The ramp generator is essentially linear. This means that if a voltage which is twice the value of a previous sample is coded, its output binary number is twice the value of the previous binary number. In other words, this is *linear quantization*. This is all right, but unfortunately the signal-to-noise ratio in such a system is highly dependent on input amplitude.

Many studies have confirmed that for numerous communication systems, speech amplitudes have a higher probability for centering around low values than higher ones. It would, therefore, make sense to gear the system for processing the high-incidence (low-value) amplitudes with greater accuracy. It is suggested that given the same number of quantizing states, the lower states be moved closer together. With the higher ones left, move them further

apart. The effect is to reduce quantizing noise between low-amplitude highly probable states, even though it might increase for high-amplitude highly unlikely states. The signal-to-noise ratio approaches a steady value over a large variation in signal amplitude. The shape of the quantizing waveform should be nearly logarithmic for this to occur.

There are two ways to implement this nonuniform quantizing method known as *companding*. One is to have a logarithmic-type ramp at both the transmitter and receiver. Note carefully the ramp needs to be logarithmic from 0 to 5 volts, and separately from 0 to -5 volts, not a log curve starting at -5 and ending at +5 volts. The second way to compand is to have a log-type audio stage (compression) and uniformly encode at the transmitter and then uniformly decode and decompress (expansion) at the receiver. The methods used in deriving and building circuits for these curves are subjects unto themselves, so are left to the amateur to explore them.

If one decides to have linear quantizing, the lab model could use a better ramp generator. Ideally, it should swing from the minus supply voltage to the plus supply voltage in .1 millisecond for a full-load (maximum level) sine wave. In practice, the one in the model swings from -5 to 3.5 volts approximately, and it is nearly linear. This is the best one can do for a simple capacitively loaded transistor switch. The effect of this is to reduce the dynamic range of the input to 3.5-volts peak if the wave is symmetrical and to affect the ultimate signal-to-noise ratio somewhat.

#### Decoder Improvements

The receiver can be improved in several areas. Most of the areas have already been mentioned, since portions of the decoder and encoder share circuitry. Unfortunately, the major shortcoming involves the most important part of the decoder, the phase-locked loop. The PLL is necessary to account for variations in master-clock frequency (1.28 MHz) at the encoder. We must keep in mind that it compares two 80-kHz signals in the decoder, to appreciate the problems which should be attacked.

Let it be stated that in the author's opinion, RCA's 4046 PLL would have been the perfect choice if it worked at 1.28 MHz. Despite the claims of RCA that it will work at 1.2-1.5 MHz at the higher supply voltages, no device ever was measured to work reliably above 600-700 kHz. (The author has a circuit for a 4046 which will work at frequencies to 1.7 MHz, but it requires too much additional circuitry.)

The XR-215 will lock for master-clock frequencies from about 1.15 to

1.3 MHz in the lab model and can work up to 25 MHz. It does this at the cost of restricted voltage values for the plus voltage supply. Normally, a loop tracking for 150 kHz is good. After all, crystal oscillators can be made to a specified frequency with a much greater tolerance. Consider, however, that the circuit could conceivably track over a 750-kHz range with no supply restriction, and you have an idea of how good the circuit could be!

Part of the problem concerns the input circuit of the receiver. If the input data's duty cycle has been excessively disturbed by path losses, it could cause a problem when comparing two 80-kHz signals of different duty cycles. Thus, a PLL which has an edge detector is preferable to one comparing every instant of the pulses. The 4046 has this feature, but extra circuits would have to be added to the XR-215. This could be done but if one is reluctant to do that, the only alternative is to look for another PLL. Presently, this is being done.

Again, it is advised that a better sampling circuit be found. Output loading affects the ramp generator waveform at the 4016, further evidence that it is satisfactory but could be better. The ramp itself could also be improved, as previously mentioned.

Inevitably, the encoder and decoder will be in self-contained units. This necessitates the use of an oscillator (preferably crystal) in the encoder. Also desirable are voltage regulators in both units. The suggested filter response at the decoder output would be a band-pass characteristic from 300-3000 Hz with the best skirt selectivity at the high

end that one can obtain. Admittedly the cost of adding some of these items could be prohibitive, but lately, advances in IC technology have offset the expenses. A crystal oscillator can be built for less than ten dollars. Voltage-regulator devices at two dollars each can deliver  $\pm 5$  volts at 1 amp, and no doubt communications-type audio amplifier circuits can be built around commercial devices, if they don't already exist.

CMOS device cost is starting to drop, although phase-locked loops will be expensive for awhile, as an incentive to find another way to synchronize. Total cost for both self-contained units is conservatively estimated at 120 dollars, based on latest available information.

### System Performance

The beauty of PCM lies in the fact that as channel noise increases, speech quality at the decoder remains constant, as long as the signal-power to quantizing noise-power ratio is at least 15 to 20 dB. This is accomplished at the expense of bandwidth, which is at least  $n$  times the modulating frequency, where  $n$  is the number of pulses used for coding a sample.

The signal-to-noise ratio theoretically obtainable is approximately  $(6n + 2)$  dB for a full-load sine wave, and  $(6n - 9)$  dB for speech, using uniform quantizing. One would, therefore, expect a signal-to-noise ratio of 44 dB for sinusoidal input in the lab model. Crude measurements of SNR have yielded slightly more than 40 dB for a full sine wave. The missing 4 dB (44-40) is probably a result of the following: 123 of the 128 levels are used to code, the ramp is not perfectly linear, and the

sampling circuit is not ideal. This applies to both coder and decoder. Component layout is important even at frequencies around 1 MHz, and excessive lead lengths can cause degradation. The lab model still sounds good and this brings us to an interesting point. Subjective listening tests and SNR are correlated, but not to the exact degree one would expect. It is possible for reconstructed speech to sound better than the source input! Subjective tests are as valuable as electrical measurements and serve not only as confirmation of a system's performance, but as additional data.

### Practical Use of Model

There are a few forms of pulse-code modulation, each having its own advantages and shortcomings. The system described here is a standard-type PCM processor, probably not much different from the first model conceived almost 40 years ago. Even so, a wealth of information can be obtained from it. This is one of the few times amateurs can jump on the technological bandwagon almost as quickly as industry has. There is really nothing difficult about digital modulation. All that is needed is a little motivation for expanding our knowledge and there is plenty of that commodity in our ranks.

Amateurs have long been noted for taking a concept and converting it to practicality, and hopefully this project is no exception. While these circuits could be built and used for the home intercom, it is not advised because it is very costly! Advantages could be expected if the system could be put on an rf carrier, however. A next logical step would try to do this.

□□□

## Strays

I would like to get in touch with . . .

- Chess players on 2-meter fm and 40-meter ssb. Stan Obritski, WB2TTY, 75 Augusta St., Irvington, NJ 07111.
- Anyone having a pre-1960 QSL from 9XL, W9YC, or W0YC (University of Minnesota). Dan Eggers, WA7HSI, 10555 Centennial Hall, Univ. of Minnesota, Minneapolis, MN 55455.
- Any hams who are electron microscopists. Karl G. Lickfeld, DL3FMA, 55 Hufelanderstr., D-4300 Essen 1, Germany.
- Others who have built the "Communications Receiver with Digital Read-out" as described in the 1976 *Handbook*, to exchange modifications and discuss design of a compatible ssb/cw

transmitter. William J. Howard, K1LNJ, 74 Golden Shower, NCS, FPO San Francisco, CA 96630.

- Hams who are practicing optometrists or medium-wave DXers. Dr. J. H. Ross, WB2HVA, 37 Sharon Rd., Waterbury, CT 06705.
- Someone who has built or has plans for a high-power, tube-type Tesla coil. Tamara Sesson, 901 E. Tyler, Litchfield, IL 62056.
- Boy Scouts to form a Scout slow net on Novice bands. Paul Schmidt, WB3DHA, 5010 Elsmere Pl., Bethesda, MD 20014.
- Members of university amateur radio clubs to compare notes on equipment and organization. James B. Brady, WB0LKW, Univ. of Iowa ARC, 447 N. Riverside, Apt. S103, Iowa City, IA 52240.
- QSL managers for: N2ITU, N8MI, WV4ITU, NK8ITU, NE6ITU, NA6ITU

and NB6AFC. Phil Smith, WB9PTX, N86 W17303 Hillcrest Dr., Menomonee Falls, WI 53051.

- Amateurs who have had experience installing and maintaining a low-power TV translator system. Ed Hohertz, VE7DKP, Box 171, Hudson Hope, BC V0C 1V0, Canada.
- Other amateurs interested in shooting muzzle-loading firearms. Ike Kerschner, W3AZR, RD 1 Box 181A, Kunkletown, PA 18058.
- Hams to form a Novice and Beginner net for code practice, WAS, General info, and so on. Bob Hajdak, WD8BRF, 1834 Paisley St., Apt. 12, Youngstown, OH 44511.
- Hams who are in broadcasting to start a net. Steven Sellers, WA3ZXX, 115 Pennwood Ave., Pittsburgh, PA 15218, or Rich Ulrich, K2KQO, WABC, 1330 Ave. of the Americas, New York, NY 10019.

# The Microprocessor and Repeater Control

Do you want a repeater that can more effectively meet the changing needs of its users? When your needs change, don't rewire the control system; just reprogram the microcomputer.

By Carl M. Robbins,\* W8JDH

As the interest in microcomputers is growing, several microprocessor-controlled repeaters are appearing across the country. With the microprocessor in control, many changing needs and operating philosophies can be accomplished simply by rewriting the program and entering it into the microprocessor memory. This article describes a simple control-system application for a repeater and provides sample program information that should help you go in this direction when you make the change.

What are some of the features of this

control system? First of all the microprocessor, under program control, causes the transmitter of the repeater to come on when a signal is received by the repeater receiver. Not much different from any repeater. However, it also provides the three-minute timer, the cw i-d timer, the tail or delay at the end of a transmission, and generates the Morse code cw i-d. So there is no need for a separate cw identifier. Of course, the real value of microprocessor control becomes more evident as the complexity of your repeater requirements increases. Some of the other features in this example are a complete autopatch control routine, a remote shutdown, the

ability to generate and send any Morse letter, series of letters or words, a 10-minute i-d reminder signal, and an ac-failure routine. Your particular needs and the manner in which you want them accomplished might vary from this example, and that's the big advantage of this type of control . . . you can change the program.

The KIM-1 microcomputer system made by MOS Technology, Inc., was selected for this purpose because of its ideal characteristics for control applications and its modest cost. However, the principles presented here can be adapted to any of the popular microprocessors available. In any case you will first need

\*263 Glenwood Rd., Wheeling, WV 26003

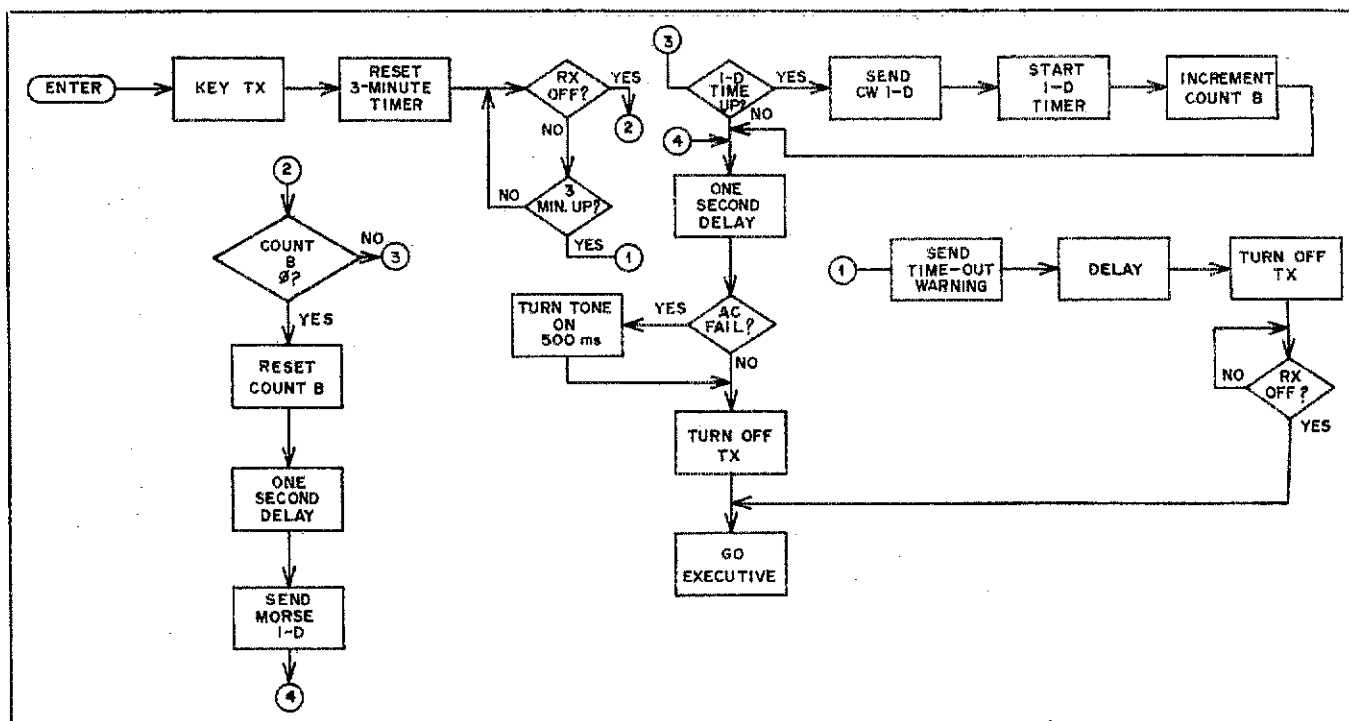


Fig. 1 — Transmitter-control-routine flow chart.



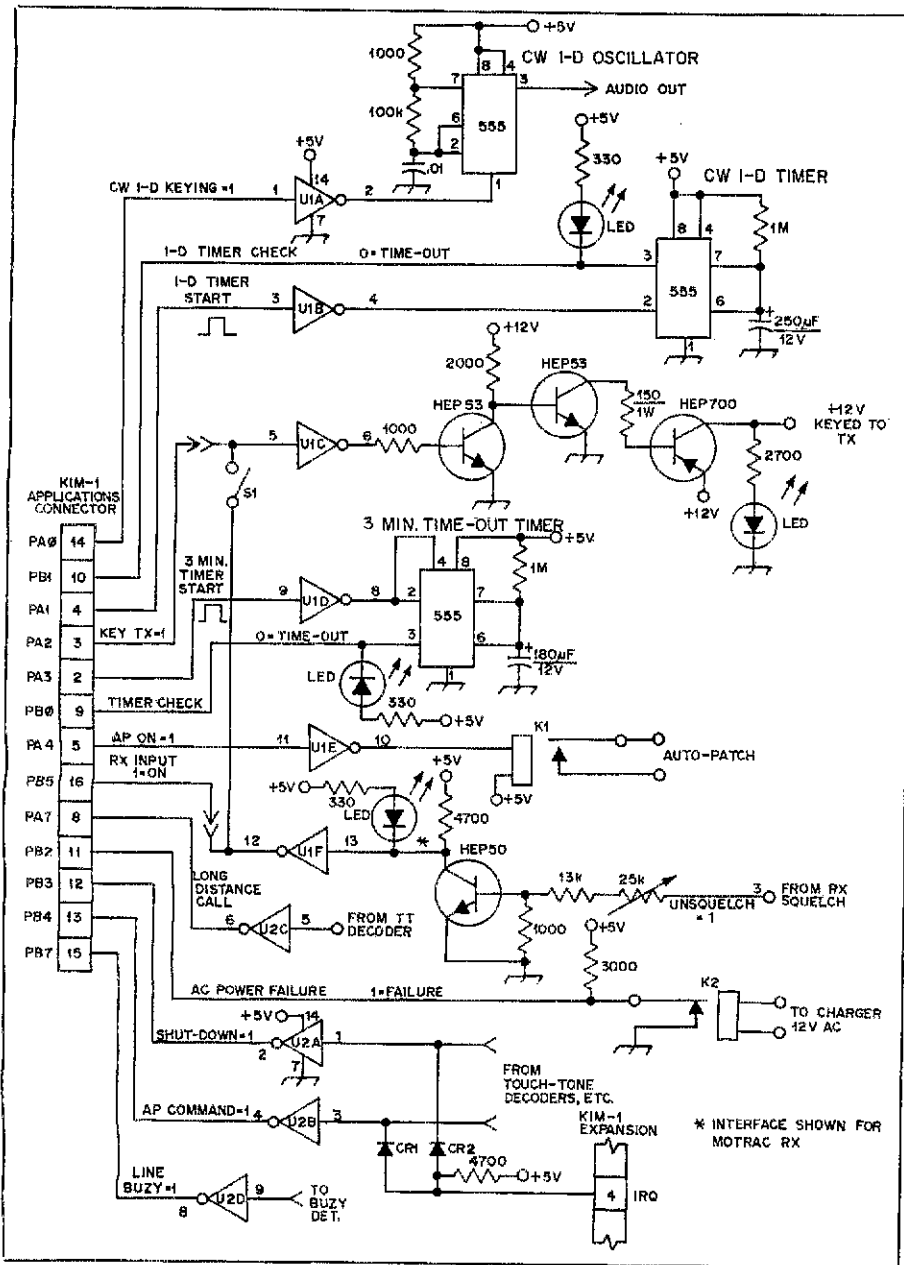


Fig. 2 - Interface circuit for KIM-1 microprocessor and repeater.  
 CR1, CR2 - Small-signal silicon diode such as 1N914.  
 K1 - Clare PRB2510 or equiv.  
 K2 - Clare PRB2513 or equiv.  
 U1, U2 - TTL hex inverter IC, type 7404.

to become familiar with the *instruction set*, which is a list of commands that cause the computer to perform various operations. A logical sequence of these commands to perform a certain task constitutes a program. Next you will need to practice writing short, simple programs. The KIM-1 manual begins with a short program which adds two numbers and proceeds to one which produces musical notes sounding like a weird electronic organ. After you become familiar with the operation of your computer, you can proceed to flow charting. Fig. 1 illustrates a typical flow chart which outlines the way in

which you think your repeater should perform. Flow charting was described in preceding issues.<sup>1</sup> The next step in developing your program would be to define the I/O ports. It is necessary to assign certain functions to certain output ports or pins. This is shown in Fig. 2, where the output ports for the KIM-1 are PA0 through PB7. Fig. 2 is the hardware interface circuit and contains all the control circuitry required except for audio mixing and Touch-Tone decoders. Note that the conventional COR is replaced by a simple solid-state switching circuit as well as the transmitter keying circuit. To conserve program space the three-minute and i-d timing is done with 555 ICs under program control, but the timing func-

tions can be obtained purely by programming, if desired.

To get a basic idea of how the repeater is to operate, observe the flow charts. Fig. 3 is the executive-program chart. When the repeater is idle, the computer will be running continuously in a loop in the executive program. If the repeater receiver is activated by a signal, the instruction GO TX ROUTINE is executed. The transmitter routine is shown in Fig. 1; there you can see that the transmitter is keyed on and the timer started. If the three-minute time is not exceeded or the i-d time is not up and the amateur operator releases his mic button, the program will (after making an ac power-failure check) turn off the transmitter (Fig. 4) and return to the executive program to await another input signal. Thus action was initiated by the repeater receiver being activated.

Another way to cause a change in the program sequence is by what is called an *interrupt*. Most microprocessors have an input pin (IRQ) which, when grounded, causes the running program to halt, certain data to be stored, and the processor to begin a program sequence at a new location usually specified by the user. Fig. 5 shows how this is used for remote shutdown (or disable) and the autopatch. When an interrupt is received from, let's say, a Touch-Tone decoder via CR1 or CR2 (Fig. 2), the processor enters a polling chain to identify the cause for the interrupt. Sometimes this is referred to

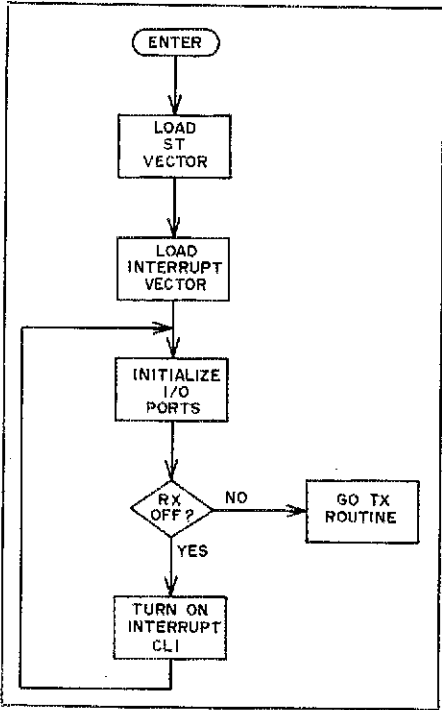


Fig. 3 - Flow diagram for executive routine. When the repeater is idle, the computer will be running continuously in the loop indicated here.

<sup>1</sup>Thomas and Belter, "Meet the Microprocessor," in three parts, *QST* for August, September and October, 1976.

Table 1

LOC. CODE	MACHINE	LABELS	MNE-MONICS	COMMENTS
<i>EXECUTIVE (Fig. 3); 0000-0030</i>				
0000	A9 00	STRT	LDA	Load ST vector
	8D FA 17		STA	Store at 17FA
	A9 1C		LDA	Load ST vector
	8D FB 17		STA	Store at 17FB
	A9 60		LDA	Load interrupt vectors
	8D FE 17		STA	
	A9 00		LDA	
	8D FF 17		STA	
0014	A9 FF	GO	LDA	Initialize I/O ports
	8D 01 17		STA	
	A9 00		LDA	
	8D 00 17		STA	
	A9 00		LDA	
	8D 03 17		STA	
0023	AD 02 17	RX ON	LDA	Look at rx input
	29 20		AND	Mask
	F0 03		BEQ	Is rx off? Yes, JMP GO
	4C CC 02		JMP	No, JMP XMTR
	58		CLI	Turn on interrupt
0030	4C 14 00		JMP	JMP GO
<i>INTERRUPT (Fig. 5); 0060-0074; Vectors 17FE 60-17FF 00</i>				
0060	AD 02 17	INTSVC	LDA	Look for disable command
	29 08		AND	Mask
	F0 03		BEQ	A disable? No, chk next
	4C A0 00		JMP	Yes, JMP SUTDWN (shutdown)
006A	AD 02 17		LDA	Look for auto-patch command
	29 10		AND	Mask
	F0 03		BEQ	Is it AP? No
	4C D6 00		JMP	Yes, JMP APCHECK
0074	40		RTI	Return from interrupt
<i>SHUTDOWN (Fig. 4); 00A0-00D5</i>				
00A0	A9 00	SUTDWN	LDA	Turn tx off
	8D 00 17		STA	Store at 1700
	A9 F8		LDA	Set up 3-second delay
	8D 3D 02		STA	Store at Count A
	20 26 02		JSR	Do a delay
00AD	AD 02 17		LDA	Look at shut-down command
	29 08		AND	Mask
	F0 1C		BEQ	Is command still there? No
	20 26 02		JSR	Yes, do a delay
	20 26 02		JSR	And another
00BA	AD 02 17	SEE	LDA	Look for a turn-on command
	29 08		AND	Mask
	F0 12		BEQ	A turn-on? No, JMP SEE
	A9 F8		LDA	Yes, set up 3-second delay
	8D 3D 02		STA	Store at Count A
	20 26 02		JSR	Do a delay
00C9	AD 02 17		LDA	Look agn at turn-on
	29 08		AND	Mask
	F0 03		BEQ	Command still there? No, JMP SEE
	4C 14 00		JMP	Yes, JMP GO
00D3	4C BA 00		JMP	JMP SEE
<i>APCHK ROUTINE; 00D6-00EA</i>				
00D6	A9 F8	APCHK	LDA	Set up 3-second delay
	8D 3D 02		STA	
	20 26 02		JSR	Do a delay
	AD 02 17		LDA	Look at AP command
	29 10		AND	Mask
	F0 03		BEQ	AP command? No, JMP STRT
	4C 45 03		JMP	Yes, JMP APRT
00E8	4C 00 00		JMP	JMP STRT

CODE ROUTINE; 0200-024A

0200	A0 AA	DASH	LDY	Set up speed (dash) length
0202	EE 00 17	TURNON	INC	Turn tone on
0205	E8	START	INX	Begin delay
	F0 03		BEQ	Finished? Yes, branch +3
	4C 05 02		JMP	No, JMP START
	C8		INX	Begin another delay
	F0 03		BEQ	Finished? Yes, branch +3
	4C 05 02		JMP	No, JMP START
	CE 00 17		DEC	Turn off tone
	A0 EC		LDY	Set up speed (dot spacing)
0216	E8	DDSPCE	INX	Begin delay
	F0 03		BEQ	Finished? Yes, branch +3
	4C 16 02		JMP	No, JMP DDSPCE
	C8		INX	Begin another delay
	F0 03		BEQ	Finished? Yes, branch +3
	4C 16 02		JMP	No, JMP DDSPCE
0222	60		RTS	Return from sub-routine
0226	A0 AA	DELY PAUSE	LDY	Set up delay
0228	E8		INX	Begin delay
	F0 03		BEQ	Finished? Yes, branch +3
	4C 28 02		JMP	No, JMP PAUSE
	C8		INX	Do another delay
	F0 03		BEQ	Finished? Yes, branch +3
	4C 28 02		JMP	No, JMP PAUSE
	EE 3D 02		INC	Increment loop Count A
	F0 03		BEQ	Finished? Yes, branch +3
	4C 28 02		JMP	No, JMP PAUSE
	60		RTS	Return from sub-routine
023D				Storage (Count A)
023E	A0 EC	DOT	LDY	Set up speed (dot length)
	4C 02 02		JMP	JMP TURNON (do a dot)
0246	A0 AA	SPACE	LDY	Set up speed (letter spacing)
0248	4C 16 02		JMP	JMP DDSPCE (do a space)

CODE TABLE; 0250-02B4

0250	20 00 02	CODE	JSR	Dash
	20 3E 02		JSR	Dot
	20 3E 02		JSR	Dot (D completed)
	20 46 02		JSR	Space
	20 3E 02		JSR	Dot (E completed)
	20 46 02		JSR	Space
	20 3E 02		JSR	Dot
	20 00 02		JSR	Dash
	20 00 02		JSR	Dash (W completed)
	20 46 02		JSR	Space
	20 3E 02		JSR	Dot
	20 00 02		JSR	Dash
	20 00 02		JSR	Dash (R completed)
	20 46 02		JSR	Space
	20 00 02		JSR	Dash
	20 00 02		JSR	Dash
	20 00 02		JSR	Dot
	20 3E 02		JSR	Dot (8 completed)
	20 46 02		JSR	Space
	20 3E 02		JSR	Dot
	20 00 02		JSR	Dash (A completed)
	20 46 02		JSR	Space
	20 3E 02		JSR	Dot (E completed)
	20 46 02		JSR	Space
	20 3E 02		JSR	Dot
	20 00 02		JSR	Dash (W completed)
	A9 06		LDA	Reset i-d timer
	8D 00 17		STA	
	A9 04		LDA	Keep tx on
	8D 00 17		STA	

EE B4 02	INC	Increment Count B counter	0381 AD 02 17	OK	LDA	Look at rx input
02B1 4C F2 02	JMP	JMP FINISHED	29 20		AND	
02B4		Storage (Count B)	F0 03		BEQ	Rx on? No, branch +3
<b>TRANSMITTER CONTROL (Fig. 1); 02CC-0339</b>						
02CC A9 04	XMTR	LDA Turn tx on	8D 00 17		STA	
8D 00 17		STA	A9 14		LDA	Reset 3-minute timer cont'd.
02D1 A9 0C	3MT	LDA Start 3-minute timer	8D 00 17		STA	
8D 00 17		STA	0395 AD 02 17	TYME	LDA	Look at 3-minute timer
A9 04		LDA	29 01		AND	
8D 00 17		STA	F0 33		BEQ	Time up? Yes, branch WARNING
02DB AD 02 17	RX	LDA Look at rx input	039C AD 02 17	RXOFF	LDA	No, look at rx input
29 20		AND	29 20		AND	
F0 55		BEQ	F0 24		BEQ	Rx off? Yes, branch LINAMP
4C 0C 03		JMP	A9 14		LDA	No, turn line amp. off
02E5 AD 02 17	ID TIMER	LDA Look at i-d timer	8D 00 17		STA	
29 02		AND	AD 00 17		LDA	Look for long-distance call
F0 03		BEQ	29 80		AND	
4C F2 02		JMP	F0 30		BEQ	Long distance? No, branch TRNOFF
4C 50 02		JMP	03AF A9 04		LDA	Yes, disconnect AP
02F2 A9 FD	FINISHED	LDA Set up delay time	8D 00 17		STA	
8D 3D 02		STA Store at Count A (023D)	03B4 AD 02 17	CEE	LDA	Look at rx input
20 26 02		JSR Do tx-on delay	29 20		AND	
02FA AD 02 17	ACF	LDA Check for ac failure	F0 03		BEQ	Rx on? No, branch TXN
29 04		AND	03BE 4C B4 03		JMP	Yes, JMP CEE
F0 03		BEQ	20 00 02	TXN	JSR	Send a dash
20 00 02		JSR	20 3E 02		JSR	Send a dot (N completed)
0304 A9 00	TXOFF	LDA Turn tx off	4C 04 03		JMP	JMP TXOFF (abort AP)
8D 00 17		STA	03C7 A9 34	LINAMP	LDA	Turn line amp. on
4C 14 00		JMP	8D 00 17		STA	
030C AD 02 17	TIMER CK	LDA Look at 3-minute timer	4C 95 03		JMP	JMP TYME
29 01		AND	03CF AD 02 17	WARNING	LDA	Look at rx input
F0 03		BEQ	29 20		AND	
4C DB 02		JMP	F0 03		BEQ	Rx off? Yes, branch +3
0316 20 00 02	T-O	JSR Do a dash (T completed)	4C CF 03		JMP	No, JMP WARNING
20 46 02		JSR Do a space	20 26 02		JSR	Do a delay
20 00 02		JSR Do a dash	4C 16 03		JMP	JMP T-O
20 00 02		JSR Do a dash	03DF AD 02 17	TRNOFF	LDA	Look for a turn-off command
20 00 02		JSR Do a dash (O completed)	29 10		AND	
A9 00		LDA Turn tx off	F0 AF		BEQ	Turn off? No, GO TYME (-8110)
8D 00 17		STA	20 26 02		JSR	Yes, do 3-second delay
032A AD 02 17	LKAGN	LDA Look at rx input	AD 02 17		LDA	Look agn at command
29 20		AND	29 10		AND	
F0 03		BEQ	F0 A5		BEQ	Still there? No, GO TYME
4C 2A 03		JMP	A9 04		LDA	Yes, turn AP off
4C 14 00		JMP	8D 00 17		STA	
0337 4C C0 17		JMP	03F5 4C 50 02		JMP	JMP CODE (send cw i-d)
<b>AUTO PATCH ROUTINE (Fig. 6); 0345-03F7</b>						
0345 A9 F8	APRT	LDA Set up 3-second delay	8D 3D 02		STA	
8D 3D 02		STA	034A AD 02 17		LDA	Look at buzy signal
034A AD 02 17		LDA	29 80		AND	
29 80		AND	F0 30		BEQ	Line buzy? No, branch OK
F0 30		BEQ	0351 AD 02 17	WAIT	LDA	Yes, look at rx input
0351 AD 02 17	WAIT	LDA	29 20		AND	
29 20		AND	F0 03		BEQ	Rx on? No, branch +3
F0 03		BEQ	4C 51 03		JMP	Yes, JMP WAIT
4C 51 03		JMP	0358 A9 04		LDA	Turn tx on
0358 A9 04		LDA	8D 00 17		STA	Store count
8D 00 17		STA	20 26 02		JSR	Set up delay (1 second)
20 26 02		JSR Do a delay	20 00 02		JSR	Store at Count A
20 00 02		JSR Send a dash	20 3E 02		JSR	Do 1-second delay
20 00 02		JSR Send a dot	20 3E 02		JSR	Send a dot
20 3E 02		JSR Send a dot	20 3E 02		JSR	Send a dot (I completed)
20 3E 02		JSR Send a dot (B completed)	20 46 02		JSR	Do a space
20 46 02		JSR Do a space	20 00 02		JSR	Send a dash
20 00 02		JSR Send a dash	20 3E 02		JSR	Send a dot
20 00 02		JSR Send a dash	20 3E 02		JSR	Send a dot (D completed)
20 3E 02		JSR Send a dot	17E7 4C F2 02		JMP	GO FINISHED
20 3E 02		JSR Send a dot (Z completed)				
037E 4C 04 03		JMP				

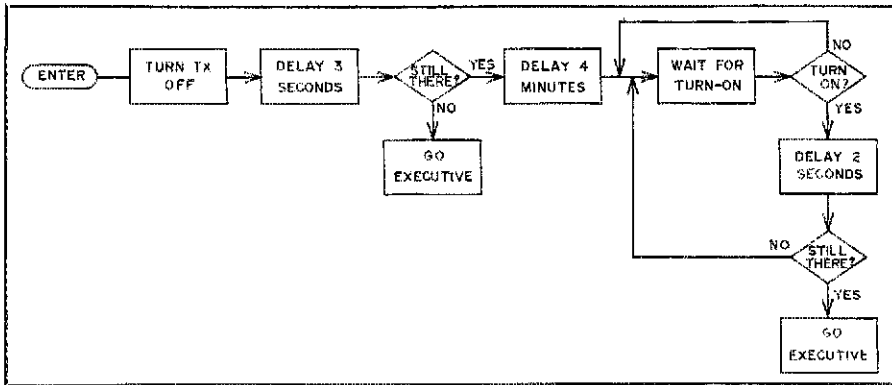


Fig. 4 — Flow chart for shutdown of the transmitter.

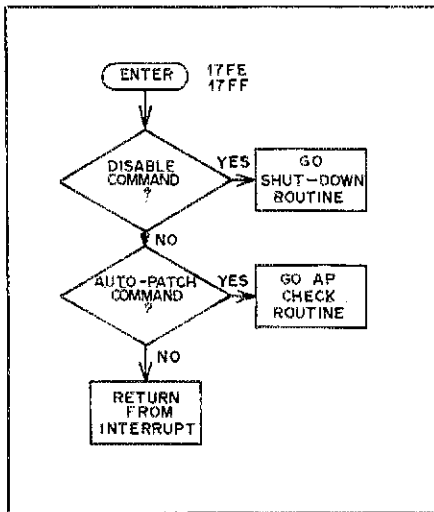


Fig. 5 — Flow diagram for interrupt-polling routine.

as, "Who done it?" If the interrupt was caused by a shutdown command, the program proceeds to Fig. 4, in which case the repeater is turned off and waits in a loop for a turn-on command. If the interrupt was caused by an autopatch command, the program proceeds to Fig. 6 where many things can happen. If the line is "busy" (line autopatch is connected), the repeater will respond with Morse code characters BZ. If not, the patch is activated for the length of the timing period or until a turn-off command is received. Just prior to the timer timing out, the repeater will send the Morse letters 'TO, indicating "You are about to be disconnected." Another feature of the autopatch is that if a long-distance call is attempted by dialing a 1 as the first digit (dial tone and no. 1 decoded), the patch disconnects and sends a Morse letter N indicating

this is a no-no. The other various details of the repeater operation can be seen by studying the flow charts.

Some comments are in order concerning the sample programs of the table. These programs will implement the flow charts shown and are intended to demonstrate how you can write a program for your repeater by knowing the operation of the instruction set for your computer. There are few if any fancy tricks or techniques as might be used by professional programmers. I hope this will encourage those who have no formal programming instruction to give it a try. By following the comment column in the program listing, you can get a basic idea about what the program is doing. The mnemonics and machine codes will vary for different microprocessors, but this information, along with the flow diagrams, should put you well on your way to programming your particular brand of microprocessor. The programs included here occupy less than 1k bytes of memory. As a final note of interest, S1 (Fig. 2) can be closed if the computer is disconnected from the interface while performing maintenance or programming changes. This keeps the repeater on the air, especially for emergencies.

I hope this article will serve as a challenge and promote more interest in microprocessor-controlled repeaters. This can only lead to the subsequent development of better programming and interfacing techniques, resulting in better service to repeater users. QST

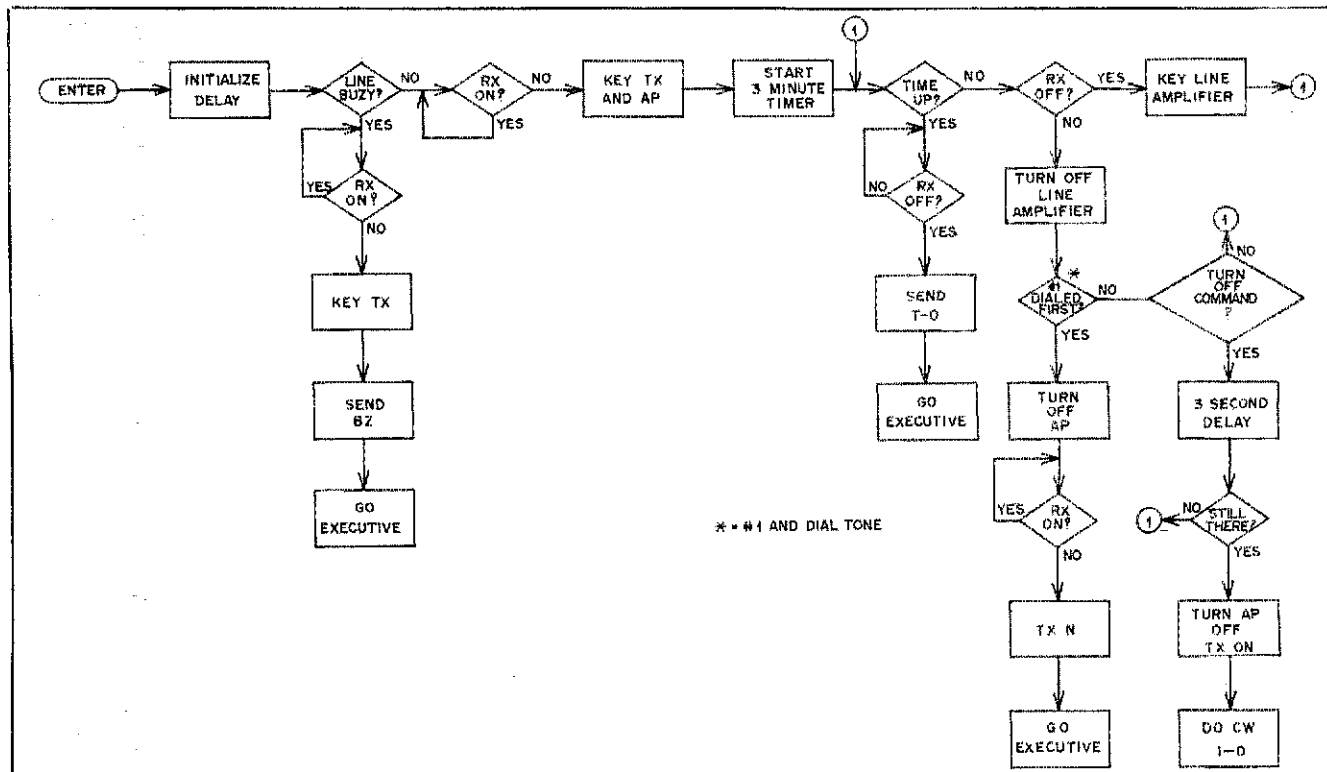


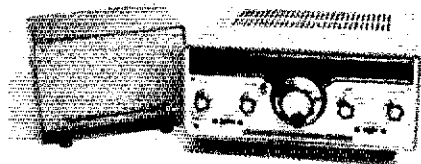
Fig. 6 — Flow chart for autopatch routine.

# Product Review

## The Heathkit HR-1680 Receiver

The Heath Company has a long history of supplying kits of parts for electronic equipment. One of the latest amateur products is the HR-1680, a solid-state, amateur-bands-only receiver. The attractive package somewhat resembles the Heath HW-104 transceiver in appearance, but the receiver is quite different from that in the '104. Instead of using broadband filters in the rf stage of the HR-1680, Heath engineers chose the more conventional scheme, where the tuned circuits in the receiver front end are resonated by means of a panel-mounted PRESELECTOR control. Peaking the rf stage at the exact frequency the receiver is tuned to, rather than having a wide-band filter, seems to help reduce the receiver susceptibility to interference from strong signals adjacent in frequency to the desired signal. The test unit, constructed by the reviewer and tested in the ARRL lab, performed quite well in this regard. The receiver selectivity for ssb reception is obtained in the 3.395-MHz second i-f stage, by use of a 4-pole crystal-lattice filter, rather than the packaged crystal filters used in other Heath equipment such as the SB-104, HW-104 and HW-101. Heath specifies the shape factor of the filter as approximately 2.5. Audio response is shaped for maximum speech intelligibility when the FUNCTION switch is in the WIDE position. With the FUNCTION switch placed in the NARROW position, an active filter reduces the audio bandwidth to 250 Hz, suitable for cw reception. There is no provision for a cw-bandwidth crystal filter in the second i-f stage.

The HR-1680 covers the 80- through 10-meter amateur bands in six selected ranges, each 500-kHz wide. Coverage of the 10-meter band is not complete: The receiver tunes only to 29 MHz. This could be a handicap for the amateur interested in hearing the OSCAR satellite 10-meter downlink signals in the



range of 29.4 to 29.55 MHz. Full 10-meter coverage, as well as coverage of the 160-meter band, would have been appreciated by many hams, but perhaps Heath's intended market will not miss these bands.

Even with inflation increasing at a slower rate, it must have been difficult for Heath to package this receiver for sale in the \$200 price range. Using diode switching for most functions, instead of expensive multiwafer rotary switches, incorporating a crystal filter having discrete crystals instead of a packaged filter, limiting coverage and having the builder construct the VFO, rather than including a prebuilt linear VFO, are some of the ways Heath cut the cost of the receiver. The VFO is worthy of special note, as its warm-up drift was under 75 Hz from a cold start to stabilization. This figure is impressive, since some of the more expensive receivers drift considerably more. Once stabilized, the VFO in the test unit drifted less than 20 Hz over the one-hour period during which its frequency was monitored. The VFO linearity is good.

In addition to a built-in 117- or 220-volt power supply, the receiver may be operated from a nominal 12-volt dc supply. During Hurricane Belle the reviewer was able to chart the course of the hurricane by listening to emergency nets on 75 meters while powering the receiver from an automobile battery in the shack. During periods when the reviewer's

area was without power, it was possible to continue listening. An HR-1680 owner may never appreciate this feature until it is needed, but it sure is nice to have. Those hams who enjoy going into the boondocks to operate, in areas without commercial power, need no further convincing on this point.

Overall, the reviewer has the impression that the HR-1680 packs a lot of performance inside its 12-3/4 x 6-3/4 x 12-inch volume. The noise floor of the receiver was measured at -137 dBm, blocking dynamic range was 108 dB, and IMD two-tone dynamic range was 82 dB, all measured in the ARRL lab.<sup>1</sup> When comparing these parameters with measurements made on the other receivers, one must keep in mind that previous measurements were made on receivers having either 400- or 500-Hz bandwidth i-f filters, whereas the HR-1680 has a minimum i-f selectivity of 2100 Hz. As previously stated, even with a wider i-f bandwidth the HR-1680 outperformed several more expensive receivers tested in the ARRL lab. Spurious responses were noted at several dial settings; the strongest one at 3.737 MHz was strong enough to register 30 dB over S9. Others, at 3.65 and 14.2 MHz, were barely audible when an antenna was connected to the receiver. The reviewer spent a week of evenings assembling the unit. Inexperienced builders may require more time for assembly. No problems were encountered that could be blamed on the receiver. The rf stage tended to oscillate when the receiver was operated on the 80-meter band, but when the leads connected to the PRESELECTOR capacitor were dressed according to the instructions, the problem was solved. — WAIWVK

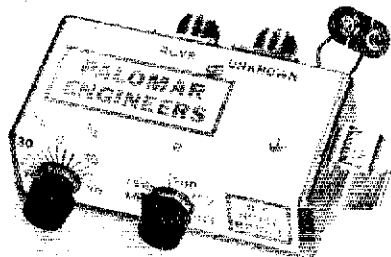
<sup>1</sup> See Hayward, "Defining and Measuring Receiver Dynamic Range," *QST* for July 1975, for information on measuring techniques used.

## HEATHKIT HS-1661 SPEAKER

The model HS-1661 speaker was constructed for use with the HR-1680 receiver, described above. The 9 x 6-5/8 x 5-5/8-inch cabinet is styled to match the current line of Heath ham gear. While a 5 x 7-inch speaker won't provide high-fidelity sound, the quality is well matched for communications use. Price class of this nominal 4-ohm speaker is \$20. — WAIWVK

## PALOMAR ENGINEERS R-X NOISE BRIDGE

Palomar Engineers has added another product to their long list of station accoutrements. It's an R-X noise bridge that will fit in your pocket! The package contains a wide-band



noise generator and an rf impedance bridge. Two "legs" of the bridge are driven equally by the noise generator through a broadband

ferrite transformer. A third leg of the bridge has a calibrated variable resistor and a calibrated variable capacitor in series. The unknown circuit is connected as the fourth leg of the bridge. Three transistors and associated biasing resistors, bypass capacitors and coupling capacitors along with the ferrite transformer are mounted on a small circuit board. This circuit board plus the variable resistor and capacitor are mounted in a die-cast aluminum box which measures 2-1/4 x 4-1/4 x 1-1/4 inches. Protruding from the front panel are the two control shafts and from the rear, two coaxial (type SO-239) fittings. On the right side of the box a clip has been provided for the 9-volt (type 216) battery. A battery is not furnished with the instrument. An on-off switch is located on the variable R control.

As with any R-X bridge a detector is required. The station receiver will work quite well. To make a measurement, connect a cable from the fitting marked RCVR to the receiver, attach the circuit to be measured to the UNKNOWN terminal and turn the unit on. Tune the receiver to the desired measurement frequency. By alternately adjusting the R and  $X_L/X_C$  controls, a null in noise should be obtained if the circuit being measured is within the range of the instrument. A few uses for the instrument include antenna-resonant frequency and impedance measurement, "pruning" transmission lines, and finding the resonant frequency of parallel and series-tuned circuits.

The useful range of the instrument is 1 to 100 MHz. It can measure resistances in the range of 0 to 250 ohms and capacitance  $\pm 70$  pF. It comes complete with a 10-page instruction booklet and is warranted against defects in material and workmanship for a period of one year from the date of original purchase. The price class is \$40. — *WALLNO*

## HEATH HW-2021

The Heath Model HW-2021 is a 2-meter fm transceiver of the hand-held variety. Power output is 1 watt of narrow-band fm. Five crystal positions are available to provide five repeater or simplex channels (more about that later). Power for the unit is obtained from an internal power pack which consists of 10 NiCad batteries. They provide 14 volts when fully charged. The transceiver kit comes with a separate battery charger.

### The Receiver

The receiver has two dual-gate MOSFET rf stages followed by a dual-gate MOSFET mixer stage. The crystal oscillator operates in the 15-MHz region and its output is tripled twice and then amplified before being fed to the mixer stage. Using 146.94 MHz as an example, a crystal-controlled oscillator output of 15.1377 is multiplied to provide a mixer input of 136.24 MHz. With an incoming signal of 146.94 MHz, the resulting output would be at 10.7 MHz which is the intermediate frequency of the receiver. The output of the mixer is fed to a four-pole crystal filter and then to additional i-f amplifiers. We tested the receiver on a number of popular repeater frequencies and found that adjacent channel interference was either nonexistent or minimal. Audio output is rated at one-half watt, which seemed adequate for use in some high-noise environments.

A unique feature of the 2021 is a battery-saver circuit. When the receiver squelch is in operation, a pulsing circuit is used to alternately turn the voltage to the receiver on and off, thereby conserving the battery-charge life. When a signal appears at the antenna, the squelch is opened and the receiver operates with continuous voltage being present.

### The Transmitter

The 15-MHz crystal used for receiving is also employed in the transmitter. Using the same 146.94-MHz example, the oscillator signal at 136.24 MHz is applied to a transmitter mixer. Also fed to this mixer is an OFFSET OSCILLATOR signal (crystal controlled at 10.7 MHz). The resulting output from the mixer, 146.94 MHz, is then amplified

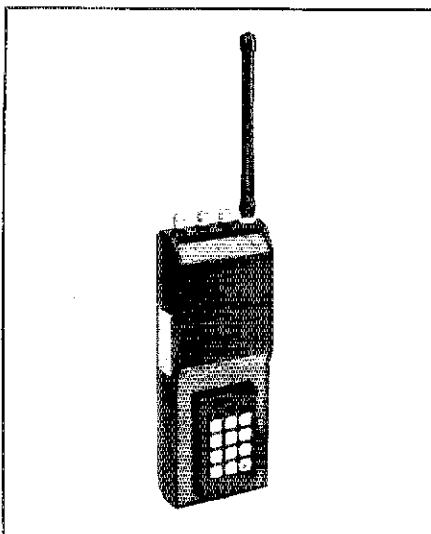
and fed to the antenna. (Incidentally, a solid-state diode T/R switch is used for changing the antenna input from transmit to receive.) The examples of operation and frequency multiplication just described for transmit and receive would be that used for simplex operation. For repeater operation, 600-kHz input/output, the OFFSET OSCILLATOR crystal is at 10.1 MHz so that the resultant transmitter signal would be at 146.34 MHz. The 10.1- or 10.7-MHz crystal is selected via a single-pole, double-throw slide switch. As stated earlier, there are five crystal positions available that provide either five repeater or five simplex channels. The choice of simplex or repeater operation will depend on the position of the 10.1- or 10.7-MHz OFFSET OSCILLATOR switch.

### General Information

The HW-2021 is not like other Heathkits because the transceiver pc board is quite small and components are placed closely together. A goodly amount of caution is required when wiring them into place. This reviewer found that a jeweler's loupe is a handy tool to use when working on small boards. Also, it is important that a small soldering iron be used for construction of this kit. If you have a soldering gun — forget it! This kit requires the use of a SMALL iron with a small tip. The pc board is wired in sections, and I recommend that the procedures described in the step-by-step assembly manual be followed to the letter.

The kit goes together in quick order, even though the parts are tightly crowded together to satisfy the small-size requirements of a hand-held transceiver. The case is plastic with a liner of conductive metal-foil covered paper. The microphone element, a high-impedance type, is mounted adjacent to the 8-ohm speaker. I found that the audio quality on receive and transmit was excellent.

An antenna of the "rubber duckie" variety is provided with it and there is also a separate antenna jack available. I had a problem with the antenna jack because the terminals are made of a "soft" type of metal, lacking spring tension, and they bent after the first insertion of an antenna-jack plug. This meant that, when the plug was removed, there was no connection to the rubber duckie because the jack was open. It took considerable time and research to find the trouble. Another jack was installed but the problem persisted. One



should be on guard for this if the jack is used.

Heath provides tune-up instructions with or without the use of test equipment. I followed the tune-up procedures for "with-out" and they worked — up to a point. There are "netting" capacitors provided for each of the five crystals. As much as I tried, there is no good way to adjust the crystals with an degree of accuracy without the use of a frequency counter. It is true that some repeaters provide on-the-air means for getting users on frequency but such installations are rare. An alternative is to hide yourself off the local two-way radio shop which has a accurate counter and enlist aid in getting the rig on frequency.

Another feature of the HW-2021 is a LED (light-emitting diode) which is mounted just below the antenna. When the audio squelched, the LED blinks, indicating that the battery-saver circuit is functioning. When signal breaks the squelch, the LED comes on continuously. The LED also serves as a battery-condition indicator. When the battery-pack voltage gets too low, the LED goes out, indicating that a recharge is needed.

### Autopatch Encoder

An accessory that is available for the HW-2021 is a tone encoder. This kit (HWA-2021-3) consists of a 12-digit keyboard and necessary circuitry to provide encoded tones for repeater autopatch access and use. The keyboard mounts on the front of the transceiver and has an indicating LED that comes on when the keyboard tones are activated. The kit is designed for use with the HW-2021 but can be used with other rigs that have high-impedance audio input.

### Final Comments

Wiring time for the HW-2021 was 1 1/2 hours. I didn't keep track of tune-up and adjustment time, but it was minimal. There was only one "glitch" of any consequence. The 10.7-MHz crystal was a poor oscillator but Heath quickly sent a replacement for the defective crystal. — *WTICP*

### Heath HW-2021 and HWA-2021-3

Dimensions: (HWD) 9-1/4 x 3-1/4 x 1-7/8 inches.

Weight: 2 pounds.

Operating voltage: 12.5-V dc nominal.

Rf power output: 1 watt.

Receiver sensitivity: 0.75  $\mu$ V for 20 dB quieting.\*

Squelch threshold: 0.3  $\mu$ V.\*

Price class: HW-2021, \$169; HWA-2021-3 (keyboard kit), \$39.

Manufacturer: Heath Co., Benton Harbor, MI 49022.

\*These are manufacturer's ratings, not verified in the ARRL lab.

## THE BARLOW-WADLEY XCR-30 RECEIVER

The Barlow-Wadley XCR-30 portable receiver provides frequency coverage from 500 kHz to 30 MHz. It is powered by six 1-1/2-volt cells (nine volts) which are fitted into a battery case inside the receiver.

The XCR-30 is capable of receiving upper or lower sideband and a-m. CW can be received by placing the receiver in one of the

using the whip. I found during my use of the receiver that the whip did a creditable job.

#### Circuit Details

Fig. 1 provides the general information of signal paths. Assume an incoming signal on 13.7 MHz. With the MHz dial set at 13 MHz, the MHz set oscillator will be at 58.5 MHz. This, mixed with the incoming 13.7-MHz signal, produces the first i-f of 48.8 MHz which is amplified and fed to the 3rd balanced mixer. The 58.5-MHz set-oscillator signal is also fed to another mixer where it is combined with the output of a harmonic generator. The harmonic generator is based on a 1-MHz crystal oscillator which produces a signal at 1-MHz intervals. The only signal appearing in the harmonic filter is the 58.5 and 16th harmonic of the harmonic generator. These signals produce the 42.5-MHz signal which is amplified and fed to the 3rd mixer along with the 44.8-MHz signal. The resultant signal is at 2.3 MHz which is fed to the 2- to 3-MHz interpolation section of the receiver. The kHz dial is calibrated from 0 to 1000 with 0 representing the 3000-kHz tuning position and 1000, the 2000-kHz position. Setting the kHz dial to 700 will, therefore, tune this section of the receiver to the 2300-kHz signal coming from the 3rd mixer.

The maximum audio output power is 400 milliwatts which seems more than adequate, even in noisy outdoor environments. There is also a headphone output available.

Selectivity is rated by the manufacturer at 6 kHz for a-m and 3 kHz for ssb and cw. I found the selectivity adequate for listening, even on the crowded amateur bands (and the 11-meter CB frequencies). The receiver is a full-fledged communications type, not a shortwave toy. I tried the receiver with a separate transmitter and found it would do a noteworthy job.

There are many uses for a portable, general-coverage receiver. I used the receiver to chase down a noisy power-line pole in one

#### The Barlow-Wadley XCR-30

Dimensions (HWD): 7-1/2 x 11-1/2 x 3-7/8 inches.

Power requirements: 9 volts (six, 1-1/2-volt D cells) or the receiver can be run from an external supply, 6- or 12-volts dc, positive ground.

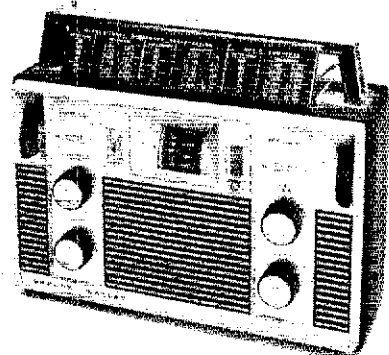
Overall selectivity: 6 kHz on a-m, 3 kHz on ssb.

Image rejection: Better than 50 dB.

Frequency coverage: 500 kHz to 31 MHz.

Price class: \$270, at the time of this review.

Manufacturer: Barlow's Manufacturing Co. Ltd., Johannesburg 44, 11th Road, Kew, Union of South Africa. Distributor, Gilfer Assoc., Inc., P. O. Box 239, Park Ridge, NJ 07656.



sideband modes. There is a fine-tuning adjustment called an SSB CLARIFIER. Two tuning dials are used, one for setting the MHz range in one-MHz increments and the other dial, which is the main-tuning dial, provides 1000-kHz coverage with 10-kHz dial markings. It is easy to tune the receiver to within a kilohertz or two of a predetermined frequency with some accuracy. A volume control and an antenna-peaking control are also located on the front panel. Additionally, there is a ZERO SET control which is used for exact frequency setting to compensate for temperature or humidity variations should such adjustments be necessary.

The built-in antenna is of the telescoping whip variety and is approximately 40-inches long, when fully extended. Provisions are made for an external antenna. But the receiver is designed for maximum performance

instance. In another, the receiver came in handy for on-site antenna work to check a grid-dip meter for proper operation and frequency accuracy. Battery-power consumption is low - 20 mA with no signal up to 200 mA at full audio. - *WJCP*

#### KRONOTEK RF-ACTUATED TIMER - RT-1

If you're tired of buyin' the brew every time you get a bit long-winded, the Kronotek RT-1 i-d reminder may save you from that terrible fate when you time-out the local repeater. The RT-1 is rf-actuated, so you don't have to make connections to the mobile transceiver. Just connect the unit to the car electrical system and set the control for the desired warning time.

The RT-1 can be adjusted, in one-minute and/or five-second increments, from as little as 5 seconds to as long as 2 minutes and 55 seconds. A slide switch on the front of the box allows the user to select manual or automatic starting of the timer. This circuit could save you a few \$\$\$, and could also

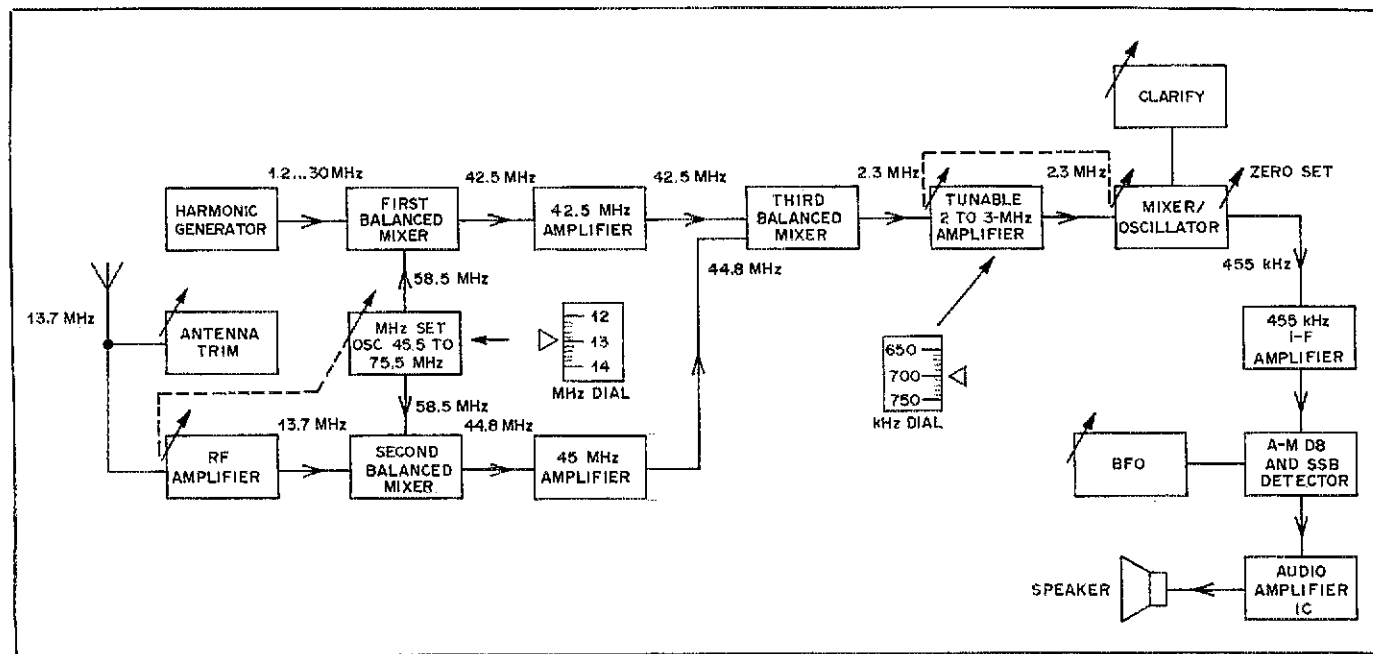
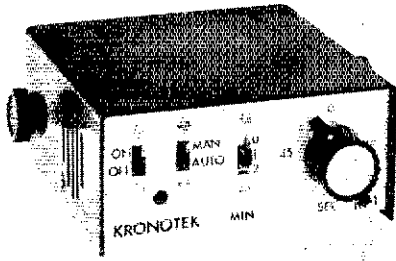


Fig. 1 - Block diagram of the Barlow-Wadley XCR-30 receiver.



protect you from the wrath of your fellow repeater users! Price class for the RT-1 at the time of this review is \$40. For more information write Kronotek, Division of Franklin Universal Corporation, 925 Clifton Ave., Clifton, NJ 07013. - WA6GVC

## NATIONAL SEMICONDUCTOR SC/MP MICROPROCESSOR

Not too long ago National Semiconductor announced its SC/MP microprocessor, better known as SCAMP. Has it sold? You bet, and it's no wonder when you examine the price tag. The kit sells for a relatively inexpensive \$99. As one would expect, it is not as powerful a machine as those in "the high-priced-spread" category - those costing around \$400 or so for a stripped-down version.

The kit comes in the form of a 3-ring notebook. Inside is a hermetically sealed card

containing the 4 X 5-inch circuit board, eight capacitors, seven resistors, six chips, one voltage regulator, one crystal, and one each, 24-pin and 40-pin IC socket, plus a 72-pin edge connector. Sockets are supplied for the central processing unit and the read-only memory chip. Much to the chagrin of some, we used Molex pins for the remainder of the ICs. It's far easier to unplug the IC, rather than have to desolder it should removal be necessary. We've been told that the failure rate for these ICs is low, but knowing our luck. . . .

The board contains (1) a SC/MP microprocessor. It's an 8-bit, single-chip central processing unit housed in a 40-pin dual-in-line ceramic package. The SC/MP features static operation, 46 instruction types, single-byte and double-byte operation, software-controlled interrupt structure, built-in serial input and output ports, bi-directional 8-bit Tri-State parallel data port, and a latched 12-bit Tri-State address port; (2) a read-only memory. This unit is a 4,096-bit ROM organized into 512 bytes, with 8 bits per byte. It is preprogrammed to contain the National "Kitbug" program, which is a monitor and debugging program that assists in the development of the user's application programs. The Kitbug provides routines for input and output with a teleprinter, and it allows examination, modification, and controlled execution of the user's programs; (3) two 1k random-access memories. These two RAMs are organized into 256 four-bit words. Together, they provide 256 eight-bit bytes of static read-and-write memo-

ry for storage of the user's application programs. The transfer of data to and from the RAM section is controlled by the SC/MP microprocessor and Kitbug program; (4) an 8-bit data buffer. This buffer provides the interface between the memory and the SC/MP microprocessor's data lines; (5) a timing crystal. This produces a 1,000-MHz timing signal for the clock circuit which is onboard the SC/MP microprocessor chip. This is the only timing component needed by the clock; (6) a teleprinter-interface device. This IC provides buffer and drive capabilities to implement a 20-mA current loop interface for a teleprinter; (7) a voltage regulator. This regulator provides a stable -7-volt supply for the microprocessor chip, eliminating the need for an extra power supply.

A substantial amount of printed material is also supplied with the kit. This literature is divided into several booklets within the 3-ring binder. These include a SC/MP introduction pamphlet, a *SC/MP Kit User's Manual*, a *SC/MP Technical Description* book and a *SC/MP Programming and Assembler Manual*.

For those who are not adept with a soldering iron, the kit is offered in assembled and tested form under the number *SC-3 Board* (pronounced *skate board*). The price class of the assembled unit is \$125. All of the literature supplied with the SC/MP is likewise supplied with the skate board. Interested? Contact National Semiconductor, 2900 Semiconductor Drive, Santa Clara, California 95051 or any of their local sales offices. - WAILNQ

# Strays



Remember the books by K6ATX relating the adventures of Tommy Rockford, *DX Brings Danger*, *CO Ghost Ship*, and *SOS at Midnight*? The first 300 ARRL-affiliated clubs that send us \$1 for postage along with the name and address of a library will get all three novels sent to that library! They're just right for the junior high and high school levels. Supply is limited, so write ARRL, Newington, CT 06111.

Early explorations of Antarctica relied on amateur radio - it was their only means of communication available. Want to hear more? The Antique Wireless Association has graciously provided Hq. with a 90-minute slide/tape show. If your club would like the set for meeting entertainment, let the Club & Training Department know. Write ARRL, Newington, CT 06111, and please give several alternative dates.

Audio cassettes are available from the various sessions of the 1976 ARRL National Convention at Denver, CO. They may be ordered for \$5 each from "Over and Over," Rte. 5, Box 757, Golden, CO 80401. Order by number according to this schedule: (1) & (2) Microprocessors, (3) Introduction to Amateur Radio, (4) Power Line Noises: Causes and Cures, (6) Ionospheric Modification via Heating, (12) Optical Fiber Communications, (13) FM forum, (14) Printed-Circuit Board Construction, (15) Amateur Radio Public Service Corps forum, (16) Public Relations forum, (18) ARRL forum.

The QSL manager for FAIMB ("How's DX," November, 1976, *QST*) is WA1EUO, not WA1UEO.

## SPACE IDEAS SOUGHT

Do you have an idea for space research? Simple and relatively inexpensive experiments will be especially suited to an upcoming NASA satellite series, LDEF (Long Duration Exposure Facility).

Starting in 1979 and following about every half-year thereafter, a space shuttle will take a cylindrical structure to an altitude of 556 km. Experimental packages will remain on board under austere conditions for six to nine months. Then another shuttle will retrieve it, return to earth, and NASA will return the packages back to their owners.

The Universities Space Research Association, an international consortium, is providing an alternate way of getting aboard. Their program has no deadlines and is not a competition. In fact, they are particularly interested in encouraging experimenters who have not had previous space research experience. Space will be reserved for those whose primary motivation is educational - student groups, for example. If the USRA favorably reviews a proposal, it will fly on the first LDEF launch for which it is ready and can be accommodated. The most important factors that will be considered are the scientific, technological or educational value along with the experiment's appropriateness to LDEF.

About 14 feet by 30 feet, the open aluminum cylinder can accommodate more than 70 experiments. No central power source, data storage, or telemetry will be provided aboard initial launches. The orbital environment, however, provides weightlessness, high vacuum, radiation and particle fluxes. Experiments already suggested include widely diversified areas: for example, communications satellite components, meteorit-

ics, exobiology and solar physics. LDEF experiments can either utilize the environment or study it.

For information on developing ideas, contact USRA, Dr. M. H. Davis, P. O. Box 3006, Boulder, CO 80307.

## STOLEN EQUIPMENT

ICOM IC-22S, serial no. 0182, from car. Glenn Packard, K3ZOT, 28 Bryan St., Haverstown, PA 19083.

Regency HR-122, no. 24-01253, taken November 23, 1976. Claude Edge, W4PLZ, 1178 Firthview Dr., Melbourne, FL 32935.

## CLUB CLASSES

Are you looking for a licensing class in order to upgrade? Know of a person wanting to get in a Novice class? Many classes do start this month. Write to ARRL Club & Training Dept., Newington, CT 06111, and we'll send you a list of classes in your area. - WA1STO

## PSHR FOR NOVICES, TECHS

Attention Novices, Technicians and Section Communications Managers: Novice and Technician traffic-handlers can now qualify for the Public Service Honor Roll listing in *QST*. Novices who can achieve a minimum of 20 points for the month (half of the General-and-above cutoff) should report this activity directly to their SCM, not ARRL Hq. Check page 8 of *QST* for a list of SCMs. Details on the Honor Roll appear in the "Public Service" column of this issue. - WA1WEM



# A New-Look Noise Blanker That Works

Help stamp out noise! Build this blanker for your receiver and chop those pulses.

By S. Henry Frankel,\* WB2DQP

**W**hen I built my Heathkit SB-303 receiver back in 1971, I was tremendously impressed with its sensitivity. I operate a lot of 10-meter a-m among other things, and soon discovered that I could "outheat" all the nearby receivers on the local Civil Preparedness net.

But on several occasions power-line noise levels of S6 and stronger appeared and the noise covered up everything but strong local stations. Listening to the other bands through the interference, I found that the line noise was most disturbing on 10 and 15 meters, diminishing on the lower frequencies. This led to some research on noise blankers that culminated in success only when the Heath Company introduced its SB-104 line.

Apparently the original SB-303 was designed to include a noise blanker, but Heath did not include the circuit when the receiver was placed on the market.

## Ye Old Blanker

I purchased the original Heath noise-blanker board, built the circuit and installed it in my receiver. It didn't work! In the process of finding out why it didn't work, I learned a bit about noise blankers and what they are supposed to do. I found that, in general, noise blankers are designed to do one of two things, either short-circuit a mixer or amplifier stage at the instant of the noise pulse, or cut off the stage so that it will not pass the noise. This called for a pick-off point where the signal being received could be examined for excessive peaks of short duration (noise). The blanker would then develop a

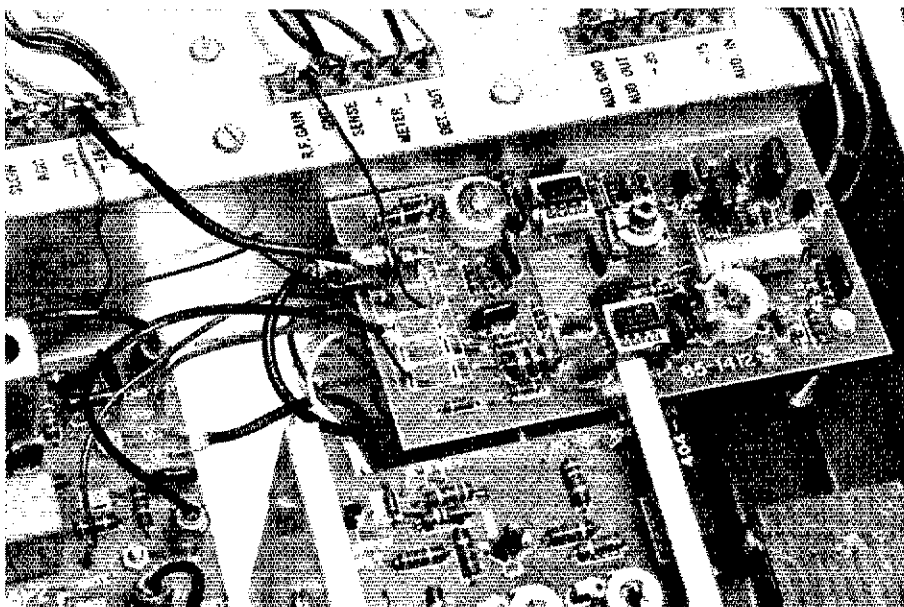
voltage to be applied at a later point in the circuit where the unwanted portion (noise) is quenched. All this is to be accomplished, of course, without deteriorating the signal quality or strength.

The original 303 noise blanker was designed to cut off the second-mixer stage (Q204) by applying a pulse of about 8 volts through R219 (100 ohms) to its "source" element. However, this was ineffective. To prove this I connected a 9-volt transistor battery to the same point on the mixer board. The received signal was not affected in any way, so it is reasonable to surmise that a short-duration pulse, when applied at that point, would never cut off the

stage. I moved the noise-blanker output closer to Q204 (bypassing R219) and found that it became effective for some intermittent noise rejection but still did not eliminate "bad" power-line noise interference.

## One More Time

With the release of the SB-104, Heath announced the availability of an accessory noise blanker in a price class of less than thirty dollars. Having already spent so much time and effort in this direction, it was only natural to give this one a try. Besides, the circuit was designed as a plug-in unit. One can simply connect it in series with the



Here is the noise-blanker board with the circuit mounted in place. Note the slots numbered 1 through 6, which are described in the text.

\*1021 Douglas Ave., Wantagh, NY 11793

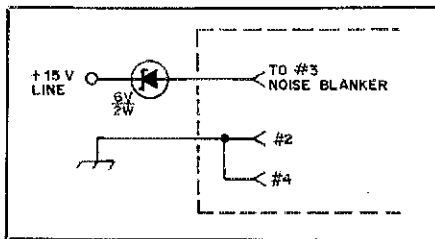


Fig. 1 — Power supply for the SB-303 blander.

signal path between two stages. There is no need to short-circuit or cut off any existing mixer or amplifier.

The unit was assembled easily (on one small board) and installed even more easily in my SB-303. All that needs to be done is to unplug the phono connector from the mixer board (easily reached from above) and plug the noise blander in. Power for the unit is obtained from the receiver 15-volt line through a Zener diode. I used a 6.2-volt Zener diode, but any value which drops the 15-volt supply to 9 or 10 volts will work. For this type of Zener circuit be sure that the cathode end of the diode is connected to the 15-volt line as shown in the schematic (Fig. 1).

### The Blander Assembly

While it may be possible to purchase the Heath circuit board and use parts from a very well-endowed junk box, I think the price of this accessory kit is such that most hams will prefer to order the SBA-104-1. When unpacking the parts, set aside the six-edge connectors, the six-pin connector, the 33-ohm, the 390-ohm and the 560-ohm resistors and the 2.2- $\mu$ H coil — these parts are not required when the blander is used with the SB-303. In addition to the parts supplied with the kit, you will need the Zener diode mentioned earlier for the

power supply, one phono plug, one phono jack (get the type used for a single-hole panel mounting) and a 1500-ohm resistor (1/4-watt preferred).

Follow the assembly instructions provided with the kit except that for R3 use a 1500-ohm resistor in place of the called-for 33 ohms. Also, be sure to mount the control (R15) in a horizontal plane above the circuit board so that it may be adjusted easily from above the board (see photo of components as mounted). Keep the control high enough to prevent contact with the diode (D3) just below. Do not install any of the six circuit-board connectors.

### Notes on Procedure

Note the slots provided on the board for the connectors (which were not installed). Two slots are available for each of the six connection points. Using the slots which are toward the components on the board (away from the nearby edge), connect a bare jumper wire between points numbered 2 and 4, leaving some slack in the jumper above the board. This will be connected later to ground when the unit is installed in the receiver.

The phono jack must be installed (see close-up photo) by first placing its outside or ground lug through slot number 2, using the slot near the edge of the board. Place the jack so that it is in a horizontal plane above the board and so that its inner lug may be connected with a very short bare wire to slot number 1. Use the slot which is away from the edge (toward the components).

The phono plug should then be connected to one end of a six-inch length of coaxial cable (supplied with the kit). The other end of this coaxial cable goes to slots numbered 4 and 5 on

the circuit board. Connect the inner lead to slot 5 and the shield to slot 4 using the slots near the edge of the board.

### Installation

Power for the blander is provided by the receiver. After placing the completed circuit board into the SB-303 behind the RTTY-board bracket and above the crystal filter(s), the power and ground connections may be made. Refer to the photos and connect the Zener diode between the 15-volt terminal and slot number 3 near the edge of the board, using sleeving over the leads of the diode to avoid grounding. Also connect the bare jumper wire previously connected to slots 2 and 4 to a convenient ground terminal on the receiver.

### Operation

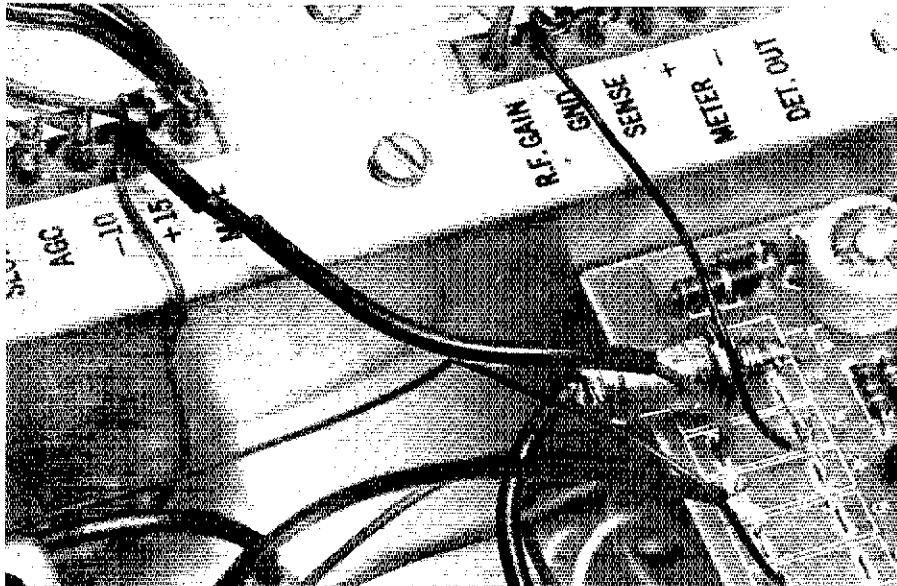
This noise blander does not operate with a threshold control such as used on earlier blanking circuits. It is simply switched on or it remains off. To switch the blander on, ground the lead connected to slot number 6 of the board. The easiest way to do this with the 303 is to run a lead from slot number 6 to a spare phono jack on the rear panel. Then mount a small toggle switch across a phono plug. Place it in the jack and switch the noise blander on and off at the back of the receiver.

The blander is inserted in the receiver signal path by removing the phono plug from the I-F OUT jack on the mixer board and plugging it into the jack on the blander. The phono plug coming from the blander is then plugged into the I-F OUT jack on the mixer.

There is one adjustment which is made on the blander board. This sets the control (R15) for unity gain. It is desirable to set the overall gain at unity, which means that signals come out of the circuit at the same strength at which they entered. To do this a stable signal (the crystal calibrator of the 303 provides a suitable signal) is measured as received without the blander in the circuit. Disconnect the coaxial phono connectors and completely bypass the blander circuit while determining the S-meter reading for the received signal. Then, without disturbing the calibrator or the frequency setting, connect the blander into the receiver circuit with the coaxial cables. It is not necessary to switch the noise blander on. Next, adjust the control (R15) on the blander board to obtain the same S-meter reading as before, thereby setting the blander amplifier for no gain or loss.

### Final Comments

Now for the real test. When noise next descends upon your receiver, switch on the noise blander. You will



Close-up view of the phono-jack connection.

amazed at the ability of this noise blander to eliminate the noise without any apparent loss of signal strength. The blander is especially effective on 10 and 15 meters where it is most needed. Overall, it has proved to be a worthy addition to the already excellent SB-303.

As for using this blander with other receivers, the only considerations are the intermediate frequency used and matching the input and output impedances to the receiver. An associate of mine at the Wantagh Amateur Radio Club (Al Davis, WA2KOC) has connected the SBA104-1 noise blander successfully into his Heath HW101 — a tube-type receiver. For impedance matching he changed C2 from 39 pF to 3 pF, C11 from 10 pF to .01 μF, removed C15 (150 pF), reduced R6 from 2200 ohms to zero (with a

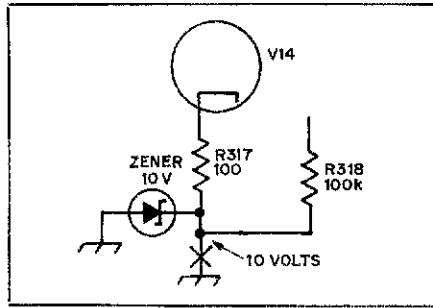


Fig. 2 — HW-101 power supply for the blander.

jumper) and placed a 150-pF trimmer capacitor in place of R3 (33 ohms). The rf cable that connected to the crystal filters of the HW-101 is connected instead to the noise-blander input (without changing the length of the cable)

and the output signal from the blander goes to the crystal filters. Power for the blander board was obtained by lifting the junction of R317 and R318 from ground, and connecting a 10-volt Zener diode from ground to the junction point of the resistors. In this case the anode side of the Zener is grounded and 10 volts may be obtained at the junction point of the resistors and the cathode of the Zener diode (see Fig. 2).

No other changes were necessary, in this case, because the i-f of the HW-101 is the same (3395 kHz) as that of the SB-104 and SB-303. I would be interested to hear from those who modify the circuit to accommodate other intermediate frequencies. Once that is accomplished we may never be plagued by pulse-noise interference again. And that is indeed a truly worthwhile goal! **QST**

## Strays

### ALBERT L. McINTOSH, K7AL

□ With the passing on August 3, 1976, of Albert L. McIntosh, K7AL, we in the amateur service lost one of our most dedicated official supporters. "Mac" was a skilled professional who, for some 30 years, worked primarily on frequency matters and was a most effective U.S. Government delegation spokesman in obtaining and protecting frequency allocations, both international and domestic, for use by the amateur service. Additionally, he was responsible, in whole or in part, for many informal arrangements, particularly in Region 2, which resulted in spectrum availability for amateurs despite moves by other countries to make inroads on amateur bands.

So outstanding was his performance in this field that a special award, newly created by W1RU and W3OKN on behalf of ARRL to recognize similar activities within the amateur ranks, carries his name *in memoriam* — the Albert L. McIntosh Trophy. It will be awarded to the amateur who makes the greatest contribution to our preparation for the 1979 World Administrative Radio Conference.

Born at Denver, Colorado, on May 17, 1914, Al McIntosh moved with his family to California, where he was a founder and trustee of the Hollywood high-school amateur station W6IG. His radio interests were pursued further during a stint in the U.S. Coast Guard, and later as a radiotelegraph operator with American Airlines. When the Federal Communications Commission made an appeal in 1940 for radio operators to perform surveillance of

radiocommunications to guard against clandestine activity, he was one of the first to volunteer and be accepted. The expertise of this amateur-turned-professional was soon recognized in the fledgling National Defense Operations Section and he was transferred to the center of activity at Washington, DC. In 1942, Al was placed in charge of the

identification section of the newly formed Radio Intelligence Division directed by George E. Sterling (W3DF), and consisting of some 130 intercept stations manned largely by radio operators recruited from amateur ranks.

At war's end, Al transferred to FCC frequency management duties and in 1947 became chief of the Frequency Allocation and Treaty Division. This new branch was responsible for determining the frequency allocations necessary for use by all radio stations except federal government, as well as preparation for international conferences, and for implementation of the resulting Radio Regulations. He served as a member of U.S. delegations to numerous ITU conferences, customarily as chief spokesman on frequency matters, and to various other bilateral and multilateral meetings and conferences involving the U.S., Canada, Latin America and Europe. He was later cited by the ITU as one of ten Americans who contributed most to international telecommunications during the period 1945-1965.

In 1959, he moved to the Department of the Army as frequency manager, and in 1961 became chief, Electromagnetic Division, at Fort Huachuca, Arizona, supervising many activities involving the electromagnetic environment as it affected worldwide telecommunication activities of U.S. Forces. It was from this position that he retired two years ago.

During all of his career, Al remained a licensed and active amateur, and held call signs W6IG, W6CYR, W3ZM, XE0AL and K7AL. His last call sign had a special significance to him by representing, in reverse order, his surviving wife Lillian, Al, and his 7 kids.

Our deepest sympathy goes to Lillian and the children.

#### Albert L. McIntosh Trophy

To be awarded to that individual who, in the opinion of the judges, has made the most outstanding contribution to WARC-79 in terms of preparation for and adoption of proposals vital to the ability of the amateur service to function in the public service, to continue as a recognized international medium of goodwill, to provide encouragement to individuals to pursue a career of technical training, and to encourage experimentation and research. With those objectives as guidelines, candidates will be judged according to the following categories.

- a) Preservation of current frequency allocations necessary for: (1) the continuation of amateur radio as an emergency communication service available whenever or wherever needed or requested; (2) fulfillment of the amateur's role in the furtherance of international goodwill and (3) the encouragement of technical training and careers.
- b) Allocation of new frequency spectrum to carry out more effectively the purposes enumerated above.
- c) Preservation of current frequency allocations to carry out extensive experimentation and research.
- d) Allocation of new frequency spectrum in which to promote new ideas and expanded scope of experimentation and research.

Serving as judges to select the winner of the Albert L. McIntosh Trophy will be the president of ARRL, the president of IARU, and the president of IARC (International Amateur Radio Club). Employees of ARRL will not be eligible for the award.

# A Hybrid 20-Meter Quad

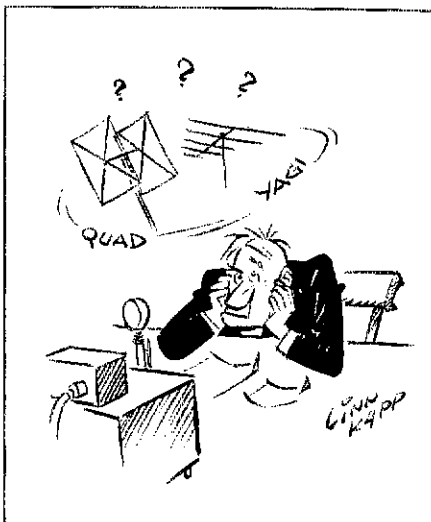
Interested in an unusual antenna? How about a quad and Yagi combined? It's a lot of antenna in a small size.

By Sgt. Ralph J. Volpe,\* USAF, WB8VCS

Very little has been written about the hybrid quad, an antenna design that has been largely neglected by the ham community. One reason may be the lack of data available from the various texts covering antenna design. Working by experiment, I built a 20-meter hybrid which has interested many amateurs. I have received many requests for the specifics of its construction which, in turn, provided the incentive for writing this article.

It must be noted that the design I chose is not the only possible combination in an antenna of the hybrid-quad design, one using both Yagi and full-wavelength loop elements. I do feel that the rewards of building and operating with my particular antenna have demonstrated to others and myself its particular qualities over other two-element arrays, especially for those amateurs looking for performance on a budget.

\*Route 2, Box 123, Oscoda, MI 48750



My antenna, complete and ready to use, cost under 150 dollars. This included all hardware, feed line, rotator, and a ten-foot roof-mounted tripod.

My design was determined from studying the important characteristics of the full-wavelength loop and the half-wavelength dipole in their individual arrays. The spacing for the elements, especially the determination of using a reflector instead of a director, came from design characteristics of the two-element Yagi array. The feed-line impedance and connection is that of a full-wavelength loop array. *The ARRL Antenna Book* furnishes these basics.

## Description

The true advantages of the full-wavelength loop element are realized with a driven element. Through comparison, it was found that the noise level is lessened while signal level increases over that of a dipole. The feed line of a quad driven element may be connected directly without any matching devices and without any appreciable mismatch using either 50- or 70-ohm line. At my QTH, it was easy to make the one and only length adjustment from the peak of the roof where the tripod is mounted. The only test equipment needed is an accurate 70-ohm SWR bridge. The loop makes an excellent match to RG-11/U. Judging from the standing wave demonstrated in Fig. 2, the two-element array provides a match of approximately 70 ohms.

In all probability the two-element quad will outperform the hybrid version. There are two reasons for the design compromise. The first is cost. When working out the original parts list, I found it was far costlier to make the reflector a full-wavelength loop. Also the weight would increase. The balance point would also have to be changed,

and in doing this the wind load of the antenna would increase appreciably, resulting in the need for much heavier hardware, boom and a heavier-duty rotator. All of this adds to the cost of the antenna. The second point to mention would be the added fragility of the full-sized quad versus the hybrid quad.

The diamond configuration works best in ice and wind storms. The entire structure, including the boom, is assembled from lightweight aluminum. Tubing, 1-1/4-inch OD, is used for the boom and mast sections. The quad supports and the reflector element are made from telescoping 1-inch to 3/4-inch tubing. The wire for the driven element is No. 14 aluminum. Insulators are made from wood dowels treated with lacquer for waterproofing. They

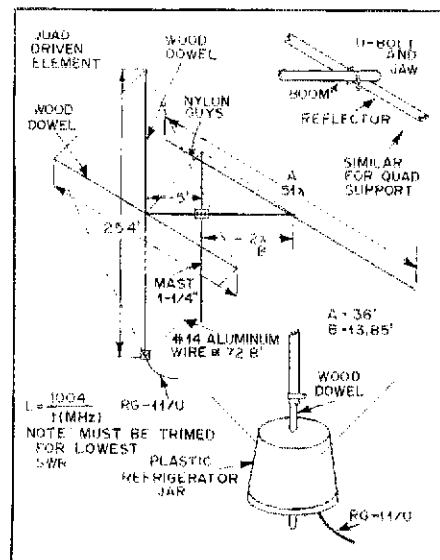


Fig. 1 — Construction details of the hybrid quad.

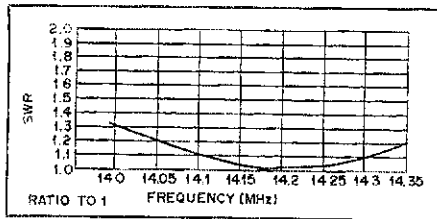


Fig. 2 — Standing-wave ratio versus frequency for the hybrid quad, adjusted for resonance at 14.175 MHz.

are inserted into the 3/4-inch tubing ends and clamped down.

### Construction

The two pieces that make up the quad structure are of telescoping aluminum sections, for an approximate length of 26 feet. Each can be made by using a twelve-foot length of tubing of 1-inch diameter. Into this tube you insert a section of 7/8-inch tubing. Finally, a section of 3/4-inch tubing can be inserted and all three adjusted for the appropriate length. Adjustable clamps such as those for plastic pipe can be used to secure the sections of aluminum. See Fig. 3. The wood-dowel insulators are telescoped into the end openings and clamped down. Small-diameter holes are drilled in the wood dowels. The wire element is threaded through these holes.

The reflector is similarly constructed. The ends of the reflector are capped with plastic furniture-leg caps of appropriate size. The reflector is adjusted for the proper length and balance, then drilled in the center of the 12-foot section of 1-inch tubing. A TV type of U bolt is inserted and fastened to the boom, as are the cross sections of the quad structure.

The dimensions given in Fig. 1 are for 20-meter operation. They can be scaled easily for another band. If a director is used instead of a reflector, the actual spacing will be more critical. A director arrangement will show slightly more gain at its design frequency, with a more restricted bandwidth. Since I was more interested in ease of construction and total bandwidth, I ruled the director out and calculated dimensions for a reflector.

A total spacing of 0.2 wavelength with a reflector length of 0.51 wave-

length provided me with the best forward gain with an acceptable front-to-back ratio over the entire band, using a design frequency of 14.1 MHz. A "guesstimate" of the gain of the array would be 7 dB over a half-wave dipole. This includes the gain of the full-wavelength loop over a dipole as a driven element. My empirical tests show the front-to-back ratio to be approximately 14 dB, with the front-to-side ratio much greater.

The boom is made of 1-1/4-inch tubing (OD), 14 feet in length. As this will show some sagging, a strut support is used from the mast to absorb some of the strain. The boom-to-mast bracket can be fabricated from a piece of aluminum stock with TV-type U bolts and jaws. The mast is extended beyond the boom by four feet and nylon guys are used to connect the elements at the ends of the boom.

A length of 36 feet is used for the reflector. The spacing from the driven element is 13.85 feet. This element should be tightened down while the array is on the ground.

The formula  $1004/f_{MHz}$  can be used to approximate the length of the wire loop. For 20 meters, a length of 74 feet can be used for a start and with the aid of a grid-dip meter, trimmed for the appropriate operating frequency. If 14.175 MHz is used as the center frequency, the curve for standing waves should be very similar to the one shown in Fig. 2. RG-11/U coax will match directly to the quad. Also, 50-ohm cable could be used directly with only a slight mismatch. The transmission line should be connected to the lower corner of the diamond. A plastic refrigerator container was used on my antenna to enclose the antenna-to-transmission-line connections.

The mast is connected more toward the quad element to balance the weight and wind load on the antenna. A distance of from 4 to 6 feet may be determined by trial-and-error.

### Operation

The moment of truth has come. The questions that arise are numerous, and most can be answered by examining the reasons for its construction:

(1) a single-band design for simplicity and efficiency sake, (2) low total cost

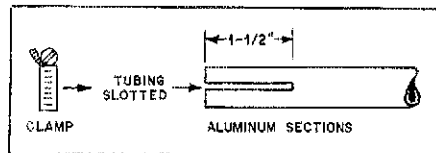


Fig. 3 — Detail of preparing aluminum sections for telescoping. A worm-screw type of hose clamp is used.

of antenna materials and installation, (3) high efficiency and low angle of radiation at lower heights above ground, (4) a low-Q design for a broad bandwidth for full twenty-meter operation without prohibitive standing waves at band edges, (5) avoiding possible ice and wind damage in the structure design, and (6) design, construction and adjustment within the capabilities of any simply equipped station.

In operation I have noticed the specific characteristics of the antenna. There is an excellent front-to-side ratio, an average of 30 or more dB. This has been verified in reception and transmission. The front-to-back ratio is more difficult to determine. The farther away the other station, the more noted is the directional attenuation. Averages range from 12 to as much as 20 dB. When short-skip conditions are in effect, the front-to-back ratio is less.

### Conclusion

I work many DX stations with 30-100 watts on ssb. The reports I received from these amateurs are quite favorable. On this continent, my signals are compared with those of stations using the full power limit. With 1000 watts, I can successfully compete in most of the DX pileups. My antenna is at a very modest height of 32 feet. The rotator I have been able to use without problem is an old TR-2.

I will not try to compare this antenna with those of larger design and complexity. My main desire is to open some thought to an antenna design that may be very useful to the do-it-yourself amateur. If you want an antenna that performs very well at low heights, is very efficient, easily built and adjusted and demonstrates exceptional directivity, this is it. And all this at a cost most of us on a budget can afford.

QST

## Strays

### STOLEN EQUIPMENT

□ Stolen from auto on July 31, 1976. Swan 350, serial no. C560046. Edwin M. Callender, W3NM, 5 W. Lodges Lane, Bala-Cynwyd, PA 19004.

□ Kenwood TS-700A, serial no. 414264, taken from store in unopened carton on Oct. 18, 1976. Ross J. Hansen, WB7BYZ, Ross Distributing Co., 26 South State, Preston, ID 83263.

□ Motorola HT220, series H23FFN, serial no. TP1174C and Motorola Metrum II, serial no. C 064, stolen from locked car in Chicago, IL, on Oct. 19,

1976. R. L. Scott, WB9BUT, 200 W. Chicago Ave., Oak Park, IL 60302.

□ ICOM 22S, serial no. 0017. Ken Keyte, W0TGL, 3812 Windsor Ave., Colorado Springs, CO 80907.

□ IC 20 transceiver, serial no. 7312. Spencer L. McCarty, W2GTI/K2BUV/WR2ALB, 98 Delmar Place, Delmar, NY 12054.

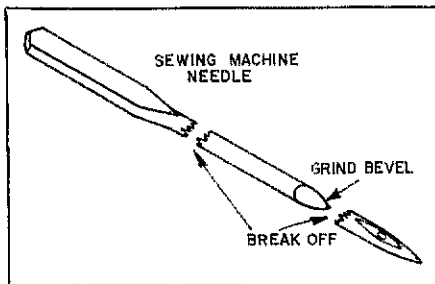
# Hints and Kinks

## REPLACEMENT SOLDERING-IRON TIP

Unable to locate a tip for my Ungar No. 4035 soldering iron, I used a copper boat nail that is threaded with a No. 5-32 die. — *J. Edward Goervey, WA2VTG*

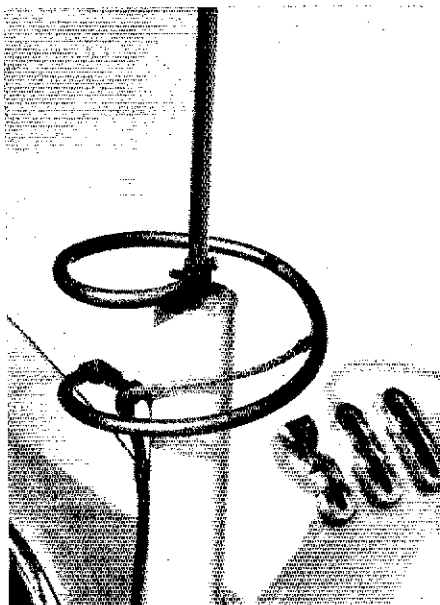
## NEEDLE A SMALL DRILL-BIT?

A sewing-machine needle of the proper diameter may be made into a bit suitable for drilling small holes in printed-circuit boards. Carefully break off the eye and the point of the needle, and grind a beveled edge on the tip, using a sharpening stone, as shown in the drawing. — *Glenn Jacobs, WN7CMZ*

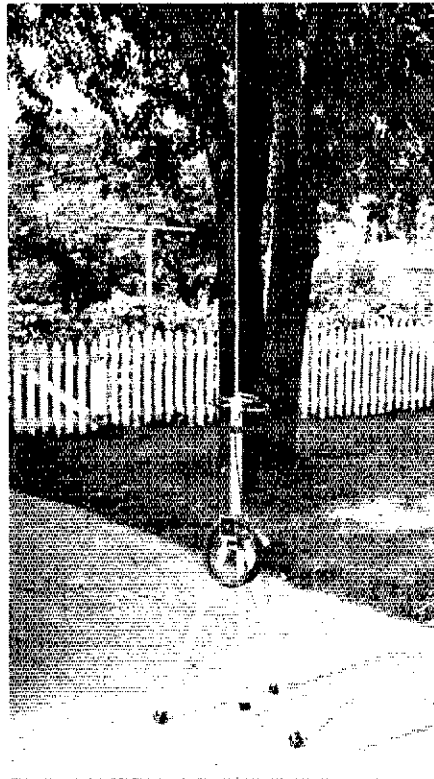


## A 5/8-WAVELENGTH ANTENNA FOR BASE, PORTABLE AND MOBILE USE

I have made versions of this antenna for my car, for permanent installation at home, and another mounted on a camera tripod for use when operating from a portable location. As shown in the photos, the base is a convenient length of a 1-1/4-inch diameter aluminum



tubing, with PVC pipe fittings press fitted into the pipe and acting as insulators. The matching coil is 1-1/4 turns of 5/16-inch copper tubing, 5 inches in diameter. The radiating element is a telescoping automobile whip, whose length is adjusted to approximately 39 inches, and a sliding tap on the coil is used to obtain a minimum SWR. Adjustment is fairly critical, but once the proper length of the whip and correct position of the tap are found, they may be marked by scratching the appropriate metal surface. — *Ralph Netzley, W9WZO*

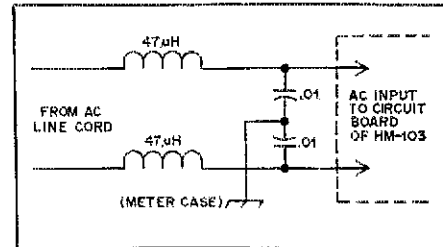


## ALLERGIC TO HAM RADIO?

The day after I buried a length of coaxial cable leading to my tower, I developed a severe rash, similar to hives. The day of installation was very hot, and the cable had lain in the sun for several hours. A consultation with a doctor confirmed that contact with the cable had transferred some of the plasticizer used in the cable jacket to my skin, and I was allergic to the chemical. I had been sweating, and when I dried myself off, the chemical on my hands got all over the upper part of my body. The doctor told me that polyvinylchloride, or PVC, is a very toxic substance and has even caused a rare type of liver cancer. It is wise to wear gloves when handling this material. — *Jim Beedle, W9NIN*

## KEEPING RF OUT OF THE HEATH IM-103 LINE-VOLTAGE MONITOR

I noticed an apparent line-voltage increase whenever I keyed my transmitter and determined that rf was being rectified by D1 in the Heath monitor. A power-line filter was constructed and installed in the unit. As shown in the schematic, the inductors were Nytronics No. RFC-S-47, but any value of rf choke greater than 45  $\mu\text{H}$  may be used, as long as the dc resistance of the coil is less than 5 ohms. My thanks to Tom Baustert, W2HEO, who assisted me in correcting the problem. — *Alan W. McCormick, WA2GTT*



## PUTTING YOUR BUG OR PADDLE IN ITS PLACE — AND KEEPING IT THERE

I keep my bug in place by applying a small amount of rubber cement on the feet and pressing the key down on the desired spot on the table. When I wish to move the key, I just pry it loose from the table. The old cement rubs off easily, leaving no marks on the table. — *M. Crosby Bartlett, K4EU*

## USING A HOCKEY PUCK TO INSTALL WIRE ANTENNAS

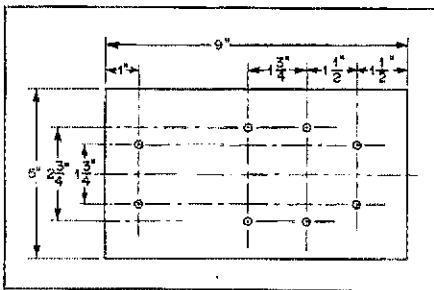
A hole is drilled in the center of a hockey puck, and a string is tied through the hole. By tying the end of a wire antenna to the string and throwing the puck over a tree branch, an antenna may be installed without climbing the tree. The aerodynamic qualities of the hockey puck make it better suited for this application than the commonly used rock or baseball. — *WA4FIB*

## IMPROVING VOX RELAY RESPONSE DURING CW OPERATION OF THE HEATH HW-101 TRANSCEIVER

When attempting to key the HW-101 at speeds over 20 wpm, the VOX relay will not actuate quickly enough, causing the loss of the first dit sent. Replacing R328, a 470K resistor, with a 330K resistor increases the drive to the VOX amplifier tube, V17A. V17A is turned on sooner, and the VOX relay is actuated more rapidly. — *Ed Solovitz, WA2DIW*

## USING THE ALLIANCE U-100 ROTATOR FOR ELEVATING SATELLITE ANTENNAS

While it is possible to communicate through the OSCAR satellites using a fixed antenna elevation of 30 degrees, it is desirable to have some means of adjusting the antenna in order that it may be pointed more directly at the satellite. The rotator used should have a direct readout of angle of elevation and be of the type that allows the rotating mast to pass completely through the body of the rotor. The Alliance model U-100 is one rotator that fulfills these requirements. Dimensions for a mounting plate are shown in the drawing. The 1/4-inch thick aluminum plate is fastened to the support mast with two U-bolts and clamps (Radio Shack No. 15-826). One side of the rotor shell has a protrusion to keep the rotor from sliding down the mast when mounted normally. This part of the casting is removed with the aid of a hacksaw, and the rotor is mounted on the plate. The U-100 was not designed to withstand severe lateral force, and the loads on either side of the unit should be balanced. If it is desired to elevate a very heavy antenna, such as a ten-meter beam, some sort of thrust bearing should be devised to relieve pressure on the rotor bearings. Bear in mind, rotators of this type were designed for occasional turning of TV antennas. The internal gears will not tolerate excessive torque resulting from attempting to elevate a heavy system. — *WA1WVK*



## REMOVING HARD-TO-REACH PA TUBES

In many modern transmitters and transceivers, it is difficult to grasp the final amplifier tubes to remove them from their sockets, due to the tight compartment surrounding the tubes. A modern version of the Chinese finger grip, manufactured by the Kellems Division, Harvey Hubbell Inc., of Stonington, CT, greatly simplifies tube removal. The device, used for industrial applications, is compressed slightly and pushed down over the tube. When pulled up, the braid compresses around the tube envelope, allowing the tube to be removed from its socket. The braid may be removed from the tube by compressing it once again. — *David Higgins, K1BCG*

## RESTORING NICAD CELLS AND BATTERY HOLDERS

The failure mode in NiCad cells is caused by fine conducting whiskers which grow between the electrodes and prevent the cell from

accumulating a charge. A momentary high-current through the cell will sometimes disintegrate the whiskers, allowing the cell to charge normally.

I have successfully restored several cells by charging a 35,000- $\mu$ F capacitor from a 12-volt supply and discharging the capacitor across the cell. After two discharges of the capacitor, each cell was recharged according to the manufacturer's recommendations.

The spring clips in battery holders lose their gripping ability after about a year and should be replaced. A poor connection will result in a small resistance in series with each cell, causing a significant voltage drop when current is drawn from the battery pack. — *Ed Piller, W2KPO*

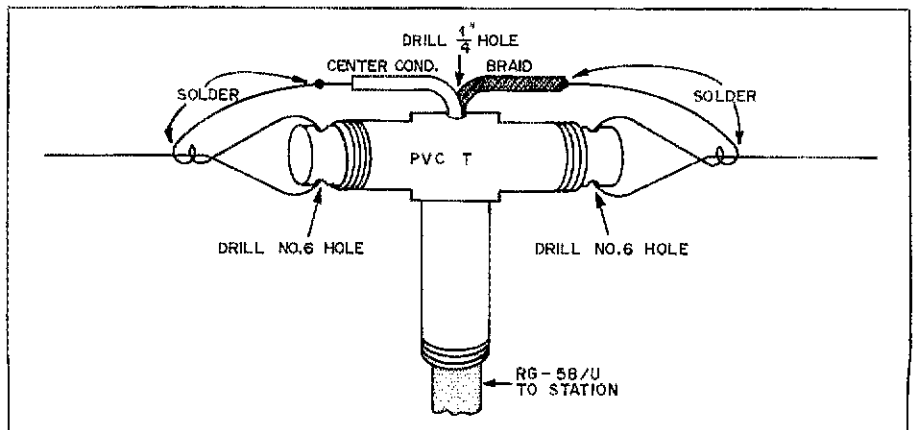
## CENTER INSULATOR FOR DIPOLE ANTENNAS

I'm convinced that I've seen this general idea published elsewhere, and if it has been it is probably worth repeating for the benefit of people who are new to amateur radio. Nearly all amateurs use a half-wavelength dipole on at least one band, and finding a secure center insulator for coaxial feed is not always an easy assignment — if I may inject a truism!

While browsing recently through a local hardware store I spotted some bins filled with white plastic Ts and other unions for use with PVC plumbing pipe. The Ts looked especially interesting, as they came in a variety of sizes (OD). I purchased two medium-size units, took them home, then performed minor surgery so that they would be suitable for my intended purpose.

I drilled two holes at each end of the horizontal part of the T. The two dipole wire elements would be threaded through the holes and secured there. At the top dead center of the T I drilled a larger hole, through which I threaded the RG-58/U feed line. Following the assembly and soldering of the center section of the dipole (see accompanying sketch), I filled the vertical portion of the T with epoxy cement to assure minimum strain and "worrying" of the coax cable where it fanned out above the T to join the dipole elements. The cement was used also to seal the open part of the coax (braid and center conductor), thereby preventing water from entering the cable to degrade it.

Inverted-V enthusiasts may wish to invert the T and use the stem as the halyard connection point for the antenna. If that is done, the entry hole for the coaxial cable will be the one which was used as an exit hole in the first example. — *W1FB*



## TOWARD BETTER-LOOKING PANEL LABELS

Few of us have access to engraving tools and silk-screen equipment for making professional-looking labels on our equipment panels. Yet, most of us feel that a piece of homemade gear that works well deserves to look nice if it is to become a permanent part of the ham station.

Having grown weary of battling with water-transfer and press-on decals over the years (to say little of trying to keep a fresh supply on hand at all times), I turned to the more common practice of using Dymo tape labels. I recalled the rather tired and "hammy" look that I had obtained when using them in the past, and then decided to try a better approach than before: I painted the panel a color that would match the available label-tape colors. The results were considerably more impressive than when I had put, say, black labels on a red panel, blue labels on a black panel, etc. By selecting paint and label colors that were matched closely, the lettering on the labels predominated so that the main body of the labels did not stand out as grotesque rectangles on the panel.

A further improvement came when I trimmed the ends of the labels to an arc by means of scissors. Getting rid of the right-angle corners imparted a more professional look. A pair of fingernail clippers turned out to be a useful tool for that job. — *Doug DeMaw, 8P6EU*

## EASIER INSTALLATION OF CONNECTORS ON COAXIAL CABLE

If difficulty is experienced forcing the vinyl jacket of a coaxial cable into a connector or reducing sleeve, a shot of aerosol silicone spray on the jacket will usually allow the cable to be easily fitted into the connector. — *Lee R. Wical, KH6BZF*

## RECEIVING NOAA WEATHER REPORTS ON TWO-METER FM RIGS

Most two-meter fm transceivers are sufficiently broadbanded to allow reception of NOAA weather reports on either 162.40 or 162.55 MHz by installing the proper receiver oscillator crystal. If the operator travels, it might be useful to have crystals for both frequencies installed in the rig, allowing one to receive current weather information while in transit. — *Bob Migliorino, K2YFE*

# Speak Up, We Can't Hear You!

Who, ME write for QST? Whether your idea is a weekend construction project or an insight into a special ham, you can share it with fellow members by contributing to QST.

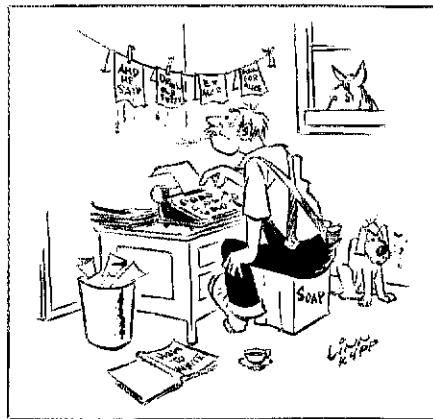
By Jerry Hall,\* K1PLP and Judy Gorski\*\*

**A**t a regular meeting of the Palmer Amateur Radio Club, Lee Johnson, WAØXYZ, was showing off his nifty little 2-meter, direction-finding receiver he had just completed. Several times lately the club repeater had been locked up by some strange signals, and in his spare time Lee had built this receiver to help track down the source. The plan was, after Lee got his receiver built and working, for other club members to duplicate it. That way they could hunt as a team, using their regular 2-meter mobile gear to work direct while tracking down the mysterious offending signals.

Lee was chosen to do the initial work because he had a real knack for laying out electronic circuits. He wasn't what you'd call a true design engineer, although he did read a lot about circuit design. Most of his design ideas came from *QST* articles and the *ARRL Handbook*. You see, Lee was a farmer by profession. He owned some land on which he planted wheat, mostly. And he had a modest amount of livestock. His fellow club members were urging him to write his little receiver up for *QST*. He couldn't be convinced because his formal education ended when he finished high school. He figured anything *he* wrote would be tossed in the wastebasket by the editors of *QST*, because he never did too well in his "English Comp. and Lit." courses.

A housewife with three school-age children, Kathy Keeling, KØXYL, is also a member of the Palmer club. Often

\*Associate Technical Editor  
\*\*Editorial Supervisor



There Lee was, madly deciphering notes written on coffee-stained napkins. He didn't think the editors would appreciate receiving a napkin collection as an article for *QST*.

during the day she gets on 20 meters, just to pass the time. A couple of months ago, she tuned in a signal from a South American amateur calling "CQ, Medical Emergency." She made contact with the ham, a missionary she later found out, and learned that a nearby villager urgently needed a rare drug serum. Without it, he probably could live no more than a few days. Kathy didn't know what to do. As a housewife in the farming community of Palmer, remote from any large cities, what *could* she do?

Suddenly, Kathy realized that the local police authorities might help, or at least advise her what to do. She telephoned the county sheriff, who reacted swiftly. From there on it's history about

how the sheriff made a conference-call hookup to a large medical center 150 miles away, how Kathy acted as a relay between the U.S. doctors and the South American missionary, and how, while Kathy was on the air, the center contacted an official at the U.S. State Department. Through him plans were rapidly completed for air delivery of the needed drug serum, and Kathy, amidst profuse thank-yous, relayed this information to the missionary. By this time she was anxious to sign off so she could dash out to pick up the kids after school and head for the grocery store. She never gave the contact much more thought, until she received a *letter of commendation* from the official at the State Department. *She* had been a part of saving a life!

At the radio club meeting when Lee Johnson was being urged to write up his direction-finding receiver, someone else suggested that Kathy ought to write about her experience, too, and send it to *QST*. "It's not every day," they told her, "that ham radio is directly responsible for saving a life." Kathy became interested. Would *QST* really print something she wrote? She could almost see the byline now at the top of the *QST* page. "By Kathy Keeling, KØXYL." Wouldn't that thrill her family and friends! But never having written for a magazine, she didn't have the faintest idea of how to go about it. "Too much of a hassle," she decided, "especially with the kids and all to take care of." *QST* probably wouldn't be interested, anyway."

Lee and Kathy are fictitious charac-



ters. of course, but their stories are typical of those which often go untold because individuals feel that "QST won't be interested." Or that they "can't write good enough." But look at it this way. QST is not published for the sake of a few editors; it's published for you, as members of the ARRL and as readers of QST. And this is the way the editors at ARRL headquarters view a potential article when it is submitted: "Will the readers be interested?" The editors don't care particularly whether the writer is a farmer or a scientist, a housewife or an experienced journalist. What they do care about is whether the information is worthwhile. Novel or unique construction techniques, design innovations, improved circuits, new developments, a fresh approach to an old subject . . . these command reader interest. And consider, too, that articles are contributions by you, the membership, to your journal. Technical material advances personal knowledge, puts skills to practice, and benefits the radio art. Yet amateur radio is more than digital readouts, integrated circuits, and micro-processors. Personal experiences and emotions keep it human and rooted in real-life substance. People are always interested in reading about dramatic, humorous, common human events as those experiences happen to other people, moment by moment, from their own range of vision, both inner and outer. Maybe the way it's originally submitted is not the greatest, but so what? After all, it's the job of the staff at ARRL hq. to help the writer polish the material so it has appeal and sparkle when it comes out in print. But that's getting ahead of our story.

#### How Can an Idea Become a QST Article?

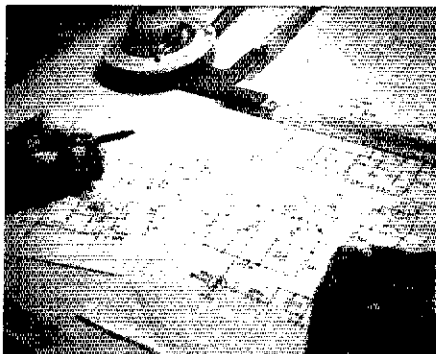
Let's assume that the Palmer club members kept working on Lee and Kathy. Finally around the time coffee and doughnuts were being served, both had agreed to contact QST editors about their ideas. Lee asked those around him for help. Suggestions flowed freely, and there Lee was, madly writing notes on paper napkins, the only writing material within easy grasp. Somebody spilled coffee on his notes, but that didn't bother Lee. At this point, he was determined to go full steam ahead. Later, at home, Lee decided that probably the editors wouldn't be enthralled by receiving his coffee-stained napkins as an article for QST. Instead, he'd work from his notes and write in simple language about where he got his ideas and just how he built his little receiver. "Write it just like you were telling us how to duplicate it," one of the guys at the radio club had told him. "And maybe not everyone who reads about it will want to build it," another sug-



At one of several editorial stops, rough spots in Lee's manuscript that may have been awkward for a reader to follow are smoothed out. The production process for QST articles begins as early as four months in advance of the date of the issue.

gested, "so tell more than just how to build it. Tell some of the background, too, like why the club decided to build the receiver." That wouldn't be hard, Lee figured. Then he'd get one of the other club members to look it over for him, and he'd send that along with the schematic diagram and a couple of Polaroid snapshots to the editors of QST. Maybe they would be interested.

Since Kathy didn't know quite how to go about writing her story, she decided first to send a letter to 225 Main Street, Newington, to see if they'd be interested. Her letter asked how she should go about preparing it, too. A couple of weeks passed, and Kathy hadn't heard a word in answer to her letter. She was getting anxious. "It's true," she told herself, "they're not interested in my story." But soon the postman brought a reply from the



To get all the information into the QST style of presentation, the handling editor had made several changes in Lee's penciled diagram, such as replacing Lee's symbols for a common connection (a triangular arrangement of horizontal lines) with a rake-shaped symbol. In QST terminology, Lee's symbol meant an actual connection to the earth. The editor then handed the drawing over to the draftsman, who redrew it with ink on a large sheet of Mylar.

Editorial/Production Department at Headquarters: Kathy's story certainly did sound promising, but there could be no commitment to publication without first having actual written material to review. QST welcomed manuscripts (that's what the reply called them) on all kinds of amateur-radio-related experiences — humorous accounts, descriptive travelogues, personality interviews, nostalgia recollections, photo stories, even fiction would be considered. "Sometimes," the letter explained, "material sent by a reader/member doesn't work out as a full-fledged QST article, but still it may be useful to the staff in other ways." It might be rewritten into a stray, considered for "Correspondence," digested for "League Lines," extracted for "Happenings" or "Washington Mailbox," or edited into the "Public Service" column. If the subject area was limited in reader appeal or if it was news of regional or local interest, the material might be slotted for a specialized bulletin sent from ARRL headquarters to those most concerned with that subject.

And, although handwritten information was acceptable, a typed manuscript was preferable — double spaced on plain white paper, one side only. Yes, erasures and cross-outs were okay, just as long as the information was clearly readable. "And in addition, we'll be wanting some photographs to include with your article. Photographs," the letter went on to say, "can tell as much or more of the story as written words. Black and white 8 x 10 glossy prints are best, although 5 x 7 prints are suitable." The reply suggested photos of Kathy operating her station, and maybe one of the sheriff (if she could arrange for it). Also, could Kathy obtain a shot or two of the South American missionary at his ham station? They'd like to have those photographs accompany the manuscript when Kathy submitted it. "And please do include the letter of commendation from the State Department, which will be returned to you." Kathy was elated! She set out immediately to get the material together for her article.

#### And in the Technical Department . . .

Meanwhile, Lee's completed manuscript was delivered to the Technical Department at Headquarters. The department secretary typed a letter of acknowledgement to let Lee know his material had arrived safely. The letter asked Lee to please stand by while technical staff members reviewed his article. Glancing up from his work as the letter was brought in for his signature, the Technical Editor immediately signed it and put it in his outgoing mail basket. He began casually leafing through Lee's manuscript. He had intended only to gain an idea of its



xjm189.i5.t was not long ago, that some mysterious signals . . . that's the first line of Lee's edited manuscript as a typist recorded it in coded form on magnetic tape in the IBM composing system. Here the coded instructions are being used to print out the information in *QST* type at a speed of 150 wpm!

content and then lay it aside while he finished his work at hand. But as he looked at the diagram and the Polaroid snapshots he exclaimed to himself, "Hey, this is a nifty little direction-finding receiver!" He was impressed by Lee's construction techniques and thorough design approach. However, the Technical Editor would not make his final decision on accepting or rejecting any article until it had been circulated among all the members of the technical editing staff for comments. It was not possible for every piece of equipment which appeared in *QST* to be constructed and tested at Headquarters, so in addition to considering reader interest and appeal, the staff members would review the material to see that the construction project conformed to good engineering practice and showed no design faults. The Technical Editor placed the folder containing Lee's material in a jacket with other manuscripts which had also come in that day and passed the jacket along to his assistants.

After several working days, the manuscripts made their way back to the Technical Editor for his final review. He looked over each manuscript and the accompanying comment sheets. "Nice workmanship," wrote one editor on his comment sheet about Lee's article. "Good design practices." Another wrote, "Photos NG for *QST*," meaning the quality or composition of the Polaroid snapshots Lee had supplied was not

good enough for publication. "Some rough spots here and there," wrote a third, "but careful editing will fix that." And so it went. Most agreed that Lee's article should be accepted for publication. Another manuscript concerned an electronic keyer. By itself, it had the merits of a good article — but five of the last nine issues of *QST* had carried electronic keyers, and two additional keyer manuscripts were being held for publication. Several readers had written to complain lately about "too many articles on keyers." Reluctantly, the Technical Editor took that manuscript to his secretary and asked her to prepare a letter to the author expressing regret that there was no immediate need for the article. That letter would accompany the manuscript on its return to the writer. The Technical Editor hated the task of returning a manuscript, for each time he knew how disappointed the writer would be. "What we could use," he said half under his breath and half to his secretary, "is a variety of good, earthy construction articles on simple projects that a Novice can build." At the same time he asked his secretary to prepare a letter of acceptance for Lee Johnson.

#### Lee's Article Had Made It!

Lee was stunned by the news. He was shaking with excitement as he continued reading the letter. It explained that no specific date for publication had been set because of a substantial backlog of contributed material

on hand — and that the practice was to schedule articles in accordance with the dates of receipt and to provide a balanced table of contents for each issue of *QST*. The letter gave him the name of the handling editor, the person who would be readying his article for the production process. If Lee had any questions, he should contact that editor directly. And photos for publication would be needed. Could Lee supply 8 × 10 glossy prints of his receiver showing inside and out? Lee knew that man-hams also dabbled in amateur photography so supplying photos would have been no problem for them. But working the farm left little time for that sort of thing; the Polaroid was the only camera he owned. He continued reading. If he couldn't send photos, would he ship his little receiver to Hq. where the staff photographer would take the necessary shots? Of course Lee could do that. He'd box it up right away and mail it. Send it insured, the letter told him, and they'd reimburse him for the shipping costs.

Months passed. Lee had long since sent in his receiver for photos, and they had been returned. When each new issue of *QST* arrived, he eagerly tore off the wrapper and searched the table of contents for his article. But no, it wasn't in any of them. "Maybe they changed their minds," Lee was thinking, "and aren't going to publish it after all." Somewhat dejectedly he dug out the letter from the Technical Editor and reread it. "If you have any questions about your article," it said, "please feel free to contact the handling editor directly." Well, he had questions alright. Why had they decided not to publish his article? Or maybe they had lost it?

On a blustery March day, back came the reply. No, they had not lost his article. It was tentatively planned for appearance in the June issue, and work on readying it for print was already well under way. Lee was relieved, but he thought to himself, "Gosh, that long! That was still three months away." The letter went on to explain that work on technical articles was begun four months prior to the date of the issue in which the material was to appear. Lee was somewhat surprised and a little skeptical. But it was true. Even as Lee was reading the reply, the handling editor was busy on Lee's manuscript. "Boy, this article is a lot better organized than one of those I handled last month," the editor thought to himself. "I had to cut and paste that one and completely rearrange all the text to give a logical presentation. I was afraid the author wouldn't recognize his own article, but he sure did like the way it came out."

Shortly after the first of April, Lee's edited manuscript went to the Editorial

Production Department at Headquarters. The sequence of events which followed within the next few weeks transformed all the bits and pieces of information concerning Lee's receiver — text, drawing, photographs and captions — into a single, eye-catching presentation for the readers of *QST*. And shortly after the first of May, ready-to-print material for the entire June issue would be going from the Headquarters building to the printer. And within three weeks after that, copies of *QST* would be going from the printer to the post office for delivery to the readers.

Lee's article *had* made it! The fellow who just barely squeezed through high-school English had become a *QST* author. And so had Kathy, the housewife with three school-age children. Her article, which was also appearing in the June issue, had traveled a similar circulation path in the Editorial/Production Department at Headquarters to ready it for its *QST* debut. It was marked by generous use of detail, vivid direct quotes from her conversations with the South American missionary, and concrete examples to illustrate her impressions. She really had succeeded in making the scene come to life. Like Lee's, her words had the sound of one person simply talking to another. The serious tone of her topic was in direct contrast to the humorous treatment of message handling by another writer whose material was also scheduled for the June issue. Another companion piece for that issue was a photo feature story of amateur-radio backpacking into the California mountains. Yes, there they all were, each just a story about some personal experience or project in amateur radio, but each a story the writer was telling vividly in crisp black and white in the pages of *QST*.

#### Why Not Write It for *QST*?

Our story could end here but it doesn't, for this could become *your* story. Sit back for a moment and consider all the exciting moments amateur radio has brought to you: How elated you were when that super-colossal signal buster you spent hours building actually worked and how you wanted to tell the world; memories of radio back when you were a teen, 60 years ago; that off-beat operator across town that you love to ragchew with; the contest you and your buddy worked portable from a raft during a hailstorm — and captured last place; or the time you tried to explain your hobby to that classroom of toothless second graders. This is the real stuff of amateur radio that goes untold unless you who experience it take a fling at putting your thoughts and feelings on paper so they can be shared with *QST* readers. You can approach your subject with your



When the layout artist rough-pasted Lee's article, it came up shy of filling four complete pages. "I wish more clubs and individuals would send in short, interesting anecdotes to run as stray fillers," she commented to her assistant. "We're always in need of them." She selected appropriate photo strays to complement Lee's article


heart, your head, your funny bone or your soul. And you may feel even more relaxed if instead of approaching a blank sheet of paper with pen in hand you grab your mic and speak your story into a cassette recorder. Just don't forget to type it out before you send it on its way to Headquarters! And if your knees knock at the thought of doing a solo, why not join up with that buddy and work out a split deal as co-authors. An author's guide is available upon request.

What's in it for you? The personal satisfaction of sharing your knowledge or experience with others of the amateur radio fraternity, for one thing, and perhaps a sense of well being at having contributed in some way to the amateur radio state of the art. We won't promise you fame and fortune, although some authors have become quite well-known through their articles in *QST* and others have been offered well-paying jobs as a result of their display of ingenuity and talents.

ARRL runs on volunteer power. Directors, vice directors, officers, SCMs and SECs, club officers, instructors, public relations assistants and a host of others serve amateur radio without pay. *QST* is the official journal of the

League; its authors, too, are volunteers adding their contribution to the art and science of amateur radio, just as scientists and engineers contribute to *their* journals. Most writers feel it is a distinct honor to have their material appear in *QST*.

You could be the winner of an award, too. For each issue of *QST*, a Cover Plaque Award is given to the author (or co-authors) having the best article in the issue, as voted by the sixteen ARRL directors. The article may be either of a technical nature or of a general-interest nature. This award consists of an engraved plate of the cover of that issue, similar to the printing plate used in its reproduction. The plate is mounted on an attractive hardwood base, and the author's name and call letters are inscribed. (ARRL staff members are ineligible for this award.) The Technical Excellence Award is a silver cup appropriately engraved, and is awarded to the individual amateur who made the most outstanding technical contribution to the amateur state of the art in the year for which it is given. Typically, this award is presented to *QST* authors.

So . . . let us make this *your* story. We'd like to hear from you! 

# Getting to Know OSCAR— from the Ground Up

**Part 1:** With yet another amateur satellite in the final planning stages, there's no time like the present to tune in to the OSCARs. This five-part series will help you explore all you'll need to know about satellite communication.

By Joel P. Kleinman,\* WA1ZUY and Charles J. Harris,\*\* WB2CHO

**T**he Rev. Douglas Millar, WBØNST, of Rutland, ND, has no difficulty pinpointing why he returned to amateur radio after a 10-year lapse: "OSCAR more than anything got me back," he recalls. "It was one of those bugs that really bit me hard."

On the other side of the country, Fred Merry, W2GN, of East Greenbush, NY, had spent half a century as a ham before he tuned in to the amateur satellites. "OSCAR opened up a whole new future in ham radio for me. I got a big thrill out of it, and to this day, I'm still at it," he explains.

When it comes to recounting how they became hams or first had their interest aroused in a certain aspect of their hobby, no two people tell the same story. Asked why they got involved in communication through the OSCAR satellites, however, these two active radio amateurs from different generations and different parts of the country tell remarkably similar tales.

## "It Must Be Pretty Easy"

Active for a few years in Los Angeles, Doug Millar gradually found that competing interests took time away from his hobby — until AMSAT-OSCAR-7 provided a tailor-made excuse to get going again.

"I came across a Stray in *QST* that listed its orbits, and I just started listening at first," he remarks. "I could see that it must be pretty easy, so I started getting some equipment to-

\*OSCAR Education Program Asst., ARRL  
\*\*Club and Training Manager, ARRL

gether." For the Rev. D. Millar, communications through the satellites was a way to start from the ground up in an exciting new aspect of amateur radio. "I got the feeling of being in the 21st century, and really enjoyed the challenge," he says.

Once he got started, the 32-year-old minister wasn't content to sit back and enjoy his newly acquired satellite expertise. "I spent some time thinking about how to use it in church work," he explains, "and came up with a whole different area" — giving youngsters the chance to talk to other parts of the U.S. and the world through the satellites. At a recent Lutheran youth exposition in New Orleans, the Rev. D. Millar taught his charges how to help him track AMSAT-OSCAR-7. As it rose over the horizon, he transmitted while two youngsters aimed the antenna. Among the more notable contacts were several with Third World countries. But, he reports, the kids were most impressed when they bounced signals off the Superdome up to the satellite.

To provide a broadening experience to children in his rural part of North Dakota ("It's 35 miles to the nearest stoplight"), he is working with NASA to give these young people a chance to talk through the ATS-1 satellite, also accessible with amateur equipment.

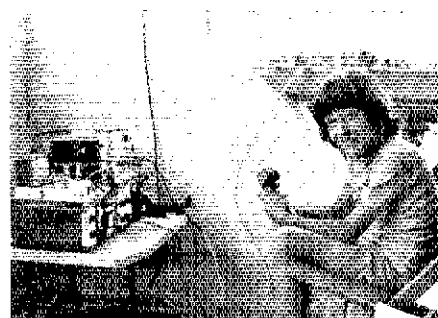
"I really enjoy the challenge of working the satellite," he says, "especially QRP days. My signal gets out extremely well." Never one to avoid a challenge, the Rev. D. Millar is already checking into the modifications he'll

need to use the next AMSAT-OSCAR satellite. Meantime, he will continue his educational pursuits through the two OSCARs now in orbit. "That's one of the professional benefits I get from the satellites," he explains.

## Fred Merry Was Ready

"I had done many things over my 50 years in ham radio," Fred Merry recalls "but DXing and building equipment remained my major interests." As the years passed, he graduated from spark gap to vacuum tubes, from a-m to ssb. By the 1970s, there seemed to be no new horizons left to conquer, and W2GN's enthusiasm for his lifelong hobby was beginning to wane.

"Then came the day I read a *QST* article on OSCAR 6 called 'Are You Ready for the Coming DX?' and I realized they were putting up a satellite you could actually talk through. That



While on vacation in Sardinia in August, 15TDJ worked 29 countries and four continents from this OSCAR station. Eight-year-old Philip is at the mic.



Fred Merry, W2GN, who after a half century as a ham entered the 21st century via the amateur satellites.

started me off. I got on the first day A-O-6 was up," he remembers.

As a former telephone company employee, Fred Merry had wide experience in wire and radiocommunication which tied in with some new advances in amateur radio. "As each came along, I became overzealous," he laughs. But OSCAR was something new, a DXer's dream. The average ham now had the opportunity to work previously unexplored methods of communications which offered great potential. Fred Merry jumped right in.

"For a guy who had been in ham radio a long time, this was something new," he says. "I found it fascinating."

He had heard Sputnik 1 on 20 MHz ("I got a big kick out of that"), but didn't take much note of OSCAR until the March, 1972, *QST* article caught his attention. AMSAT-OSCAR-6 was launched soon thereafter, and W2GN soon established himself as a leader in the ranks of OSCARphiles.

Although he has built the world's first mobile OSCAR station and conducted several unprecedented experiments with the satellites, the East Greenbush, NY, resident says his biggest thrill is the personal contacts he's made through the OSCARS. "The type of fella you speak to seems to be your type of guy — you find yourself talking with a lot of kindred spirits."

Although now approaching his 70th birthday, W2GN is looking forward to the launch of the new A-O-D satellite with as much enthusiasm as one of Doug Millar's kids.

#### Most Within Range

All you'll need to become one of the "kindred souls" on OSCAR is a 10-meter receiver and antenna, and a 2-

meter transmitter — along with a Technician (or higher) license.<sup>1</sup> At last count, there were hams in more than 100 nations of the world using OSCAR, most of whom are within range of the U.S. and Canada. If conditions are right, contacts up to 5,000 miles away can be made through the satellites.

Both OSCARs 6 and 7 contain 2- to 10-meter transponders, which perform like land-based repeaters. They take a small slice of the 2-meter amateur band and translate it exactly to a part of the 10-meter band. Every signal in the uplink passband is reproduced, complete with original chirps and distortion, in the downlink passband. OSCAR 7 also has a Mode B transponder, which alternates daily with the Mode A 2- to 10-meter transponder. In Mode B, OSCAR 7 receives signals on the 70-cm band and translates them to 2 meters.

Although the transponders can handle several modes, the only ones in regular use are cw and ssb. The others are less efficient and should not be used except for experiments sanctioned by AMSAT, the Radio Amateur Satellite Corporation.

#### Finding the OSCARs

Now you have to find the satellites. Both OSCARs are in similar, sun-synchronous polar orbits that bring them about 910 miles (1,500 kilometers) above the earth's surface. The combination of the earth's rotation

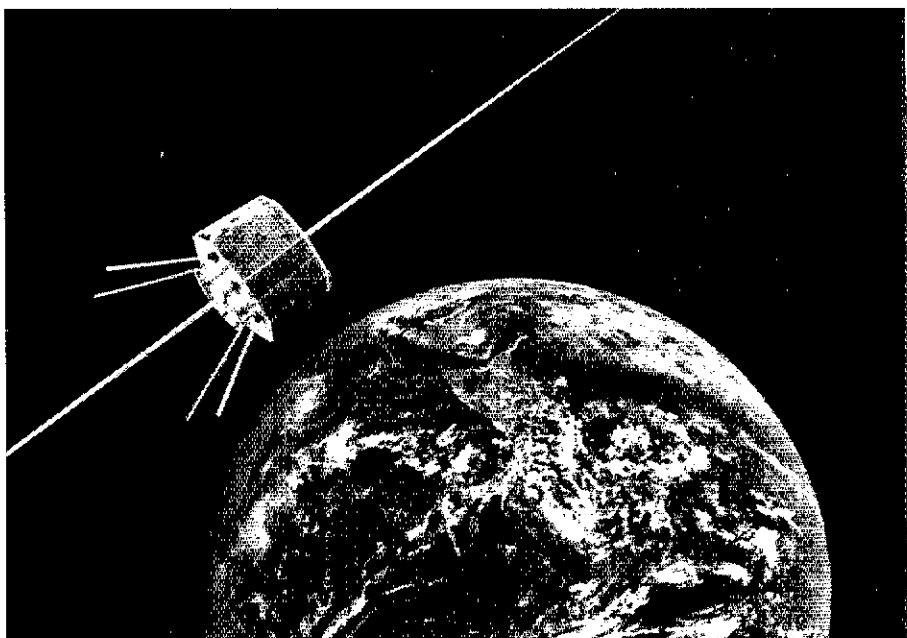
under the orbit and rapid (15,000 mi/h-24,000 km/h) motion of the satellite along its orbit puts each OSCAR within range of a given spot on earth twice each day — the local morning and evening. Two consecutive orbits are within range both times, providing the satellite users a potential of four "band openings" each day for each satellite — band openings predictable to the minute. The only limitations are the current transmitting schedules of the satellites. These can be found elsewhere in this article.

Accessible for up to 25 minutes at a time, signals through OSCAR will be within 100 kHz of each other — no need to tune over three bands searching for the DX. You can even hear your own signal as it comes back through the satellite, allowing for instantaneous fine tuning of your gear.

You need not be an astrophysicist to find the satellites. Creative OSCAR enthusiasts have devised tracking methods that will suit just about everyone's level of expertise. One of the more recent is the ARRL OSCARLOCATOR, a device that allows quick computation of the time the satellites will be within range of your location, be it any place in the Northern Hemisphere. It is available for \$1 postpaid from the ARRL.

Another convenient way to find the satellites is to listen to the daily bulletins over WIAW. Other methods that have proven valuable include a variety of computer predictions (some developed by college students) of where the satellites will be at a given day, with

<sup>1</sup>The FCC has granted Technicians a special authorization to work through OSCAR.



An artist's conception of AMSAT-OSCAR-7, the most sophisticated amateur satellite in orbit. Launched more than two years ago, it was built and is continually monitored by a team of international amateur radio operators.

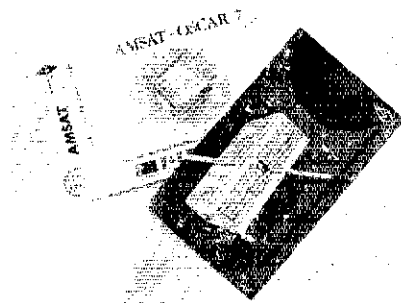
Table 1

Spacecraft Frequencies

SPACECRAFT	UPLINK	DOWNLINK	BEACON
A-O-6	145.900 — 146.000 MHz	29.450 — 29.550 MHz	29.450 MHz
A-O-7			
Mode A	145.850 — 145.950 MHz	29.400 — 29.500 MHz	29.502 MHz
Mode B	432.125 — 432.175 MHz	146.975 — 145.925 MHz	145.972 MHz

Notes

- 1) All date and time references are UTC (formerly GMT).
- 2) OSCAR 6 operates Monday, Thursday and Saturday evenings (ascending passes only) and Sunday mornings (descending passes).
- 3) OSCAR 7 operates in Mode A on odd days of the year, Mode B on even days. Wednesdays are reserved for experimental uses.
- 4) The Mode B transponder turns "upside down." A signal to the low end of the 70-cm input returns on the high end of the 2-meter output, and vice versa. Thus, an upper-sideband signal returns as lower sideband.
- 5) Mode B orbits on Mondays (UTC) have been designated QRP orbits — use maximum of 10 watts of erp when transmitting.



These special QSL cards will be sent to persons sending telemetry signal reports to AMSAT, the Radio Amateur Satellite Corporation, P. O. Box 27, Washington, DC 20044.

altitude and azimuth values for aiming a beam antenna. The Satellabe is a map "slide rule" that gives the track of the satellite, the time it is within range, and both beam headings.

When to Listen

The present schedule has OSCAR 6 turned on for two-way communication on Monday, Thursday and Saturday mornings UTC (Sunday, Wednesday and Friday evenings local time in North America), and Sunday evenings UTC (Sunday mornings local time). OSCAR 7, which celebrated its second anniversary November 15, 1976, may be used on Mode A on odd days of the year (transmitting at around 29.5 MHz) and on Mode B on even days (transmitting at around 145.9 MHz). Mode B orbits that fall on UTC Mondays have been designated QRP orbits — a maximum of 10 watts erp should be used.

Other special QRP orbits have been designated for January and February. Latest information can be obtained from WIAW bulletins or the ARRL.

What can you expect to hear and work through OSCAR? Satellite users inhabit every state and province, and more than 100 nations of the world on seven continents. The low power and simple antennas needed to work the satellites makes them ideal targets for apartment dwellers and others with equipment limitations.

The telemetry on the 10-meter beacons common to both OSCARs tells a great deal about the condition of the satellite. You can record the Morse code numbers at high speed and decode them later at a slower speed. By inserting the numbers into the appropriate formulas, the satellites' vital life signs can be monitored. In this way, the level of functioning of the solar panels and

batteries is kept at peak level.

By sending a telemetry report to AMSAT, Box 27, Washington, DC 20044, the organization that has overseen the last three OSCARs, you will receive a colorful QSL card (as shown) as a confirmation of your report. Other certificates and awards available to OSCAR users include the OSCAR Communicators Club certificate, also from AMSAT, and the "Satellite 1000," or DX Achievement Award, from the ARRL.

Whether you are a DX enthusiast, avid paper-chaser, or a longtime radio amateur like Fred Merry who wants to add a new dimension to his hobby, OSCAR is for you. Successive articles in this series will delve into the basics of transmitting and receiving, antennas, tracking and the many practical uses of the satellites, such as the OSCAR Educational Program.

QST

An OSCAR Glossary

- AMSAT** — The Radio Amateur Satellite Corporation, a nonprofit organization located in Washington, DC; has overseen the development of the last three OSCAR satellites.
- AMSAT-OSCAR-6** — The longest-lived amateur satellite, launched Oct. 15, 1972; has been used by more than 3,000 amateur stations in more than 100 nations.
- AMSAT-OSCAR-7** — The latest and most sophisticated OSCAR; launched Nov. 15, 1974.
- AOS (see also LOS)** — Acquisition of signal — the time you can first hear the satellites, usually just after they rise over the horizon.
- Ascending Node** — The point where the satellites cross the equator traveling north.
- Codestore** — The special system that allows a Morse code message to be placed in a memory storage unit and automatically broadcast with telemetry data.
- Descending Node** — The point where the satellites cross the equator traveling south.
- Doppler Effect** — An apparent shift in frequency caused by the satellite's movement

- toward or away from your location.
- Downlink** — The frequency at which radio signals are received from the satellite.
- ERP** — Effective radiated power — transmitter output after transmission line losses, multiplied by antenna gain.
- Inclination** — The angle at which the satellite crosses the equator.
- Increment** — The number of degrees longitude the satellite appears to move westward at the equator with each orbit. Both satellites have an increment of approximately 28.7 degrees.
- LOS (see also AOS)** — Loss of signal — the time the satellite's signals pass out of range.
- Mode A** — The 2- to 10-m transponder aboard OSCAR 7.
- Mode B** — The 70-cm to 2-m transponder aboard OSCAR 7.
- OSCAR** — Orbiting Satellite Carrying Amateur Radio. There have been seven in the series and more are being built.
- OSCAR Education Program** — A special program that brings live demonstrations of the satellite to classrooms. Teachers use ARRL curriculum materials to ap-

- ply the principles to a wide variety of subject areas.
- Pass** — An orbit of the satellite.
- Passband** — The range of frequencies handled by the satellite's transponder.
- Period** — The time it takes for a complete orbit. Periods of both satellites are approximately 115 minutes.
- QRP Tests** — Special orbits set aside for operating through the satellites while using a maximum of 10-watts erp.
- Sun-Synchronous** — A type of orbit that approximates the sun's apparent movement. Because their orbits are approximately sun-synchronous, OSCARs 6 and 7 can be heard at one location at about the same times each day.
- Telemetry Beacon** — The transmitters aboard each satellite that enable ground stations to monitor the satellites' vital functions.
- Transponder** — The repeater aboard the satellites (OSCAR 7 has two) that retransmits signals it receives on another frequency.
- Uplink** — The frequency at which radio signals are transmitted up to the satellites.

# We've Only Just Begun!

There's a new rhythm in amateur radio, and it's definitely upbeat. 1976 swung in with a crescendo of growth and activity — and the tempo isn't getting any slower!

By Bruce Alan Johnson,\* WA6IDN/WA1ZQP

So what's happenin'? *Growth*, that's what — growth and achievement throughout the Amateur Radio Service! In fact, 1976 might well be considered to be one of the most eventful years in the history of amateur radio.

There's an old Pennsylvania Dutch proverb: "It doesn't depend on size, or a cow would catch a rabbit." Ever heard it? Well, *QST* readers know that this just isn't true in the case of amateur radio: As the editorial in the November issue pointed out, we *must* grow, or we may well lose our hobby in 1980. Responding to this reality, the amateur movement structured itself to meet the growth we anticipated and even to stimulate it. Worldwide, as you can see from the graph, there are presently over 800,000 licensed hams — and it won't be long before we top the one million mark.

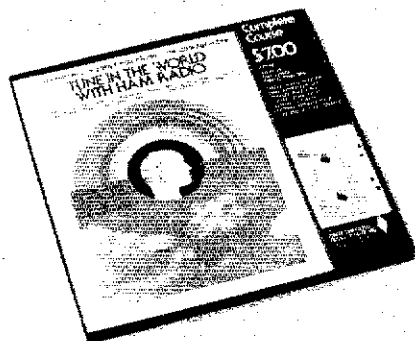
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**1976 might well be considered to be one of the most eventful years in the history of amateur radio.**

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As you read this, over 25,000 students have become amateurs — Novices — and thousands more are enrolled in classes being held in clubhouses, classrooms, garages, kitchens and backyards. Curious as to how so many people could get into ham radio? We feel a major reason is because of the League's dynamic new club and training program outlined in the pages of *QST* in March by General Manager W1RU, and authorized by the Board of Directors. Headquarters came up with dozens of new promotional/training materials and procedures, from introductory handouts to the comprehensive and extremely

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popular *Tune in the World with Ham Radio*. The 250-page *ARRL Instructor's Guide* (complete with slides, student handouts and tests) has become the mainstay of the training program now in progress throughout the U.S. Being one of the program's instructors, this writer can attest that there has never been anything like it for bringing newcomers into the world of amateur radio. But we can't stop there, can we? A new General class course is on the drawing board, and will be available this spring.

The citizens band is loaded with people who want to become a part of a public service like amateur radio, and indeed the CB service has been the source of many of the thousands of students now being taught. League people have manned portable display



booths at CB conventions and gatherings all over the country, answering questions about amateur radio — and helping to offset fears about the license exams. Dave Bell, W6BVN, produced a new film aimed at the CB audience. Entitled *Moving Up to Amateur Radio*, it won a coveted Cindy Award late in 1976. An expanded OSCAR Education Program rounded out the year's efforts for the brand new Club & Training Department.

The new ARRL Outgoing DX QSL Bureau (October 1976 *QST*, page 51) was launched on November 1st, with the DX king Bob White, W1CWX, taking the helm. The bureau is fast becoming one of the most popular ARRL membership services, routing your cards to over 100 countries the best way possible.

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**We *must* grow, or we may well lose our hobby in 1980.**

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A new Administrative Services Department is responding to other ever-increasing changes at Hq.: the temporary storing of the ARRL museum (to make room for the Club and Training Department); the organization and improvement of the mail system within Hq. (we receive over 1,000 pounds a day — and it's going up); and the installation of new offices and an improved telephone system for the growing staff.

The League's "Radio Amateur's Library" of publications represents part of its charter as an educational organization. Two new publications this year were the *ARRL electronics data book* and the *ARRL Ham Radio Operating Guide*. The latter offers chapters on each of the fascinating aspects of ham

radio operating, written by experts in each field. At the end of the year, a new cassette-book package, the *ARRL Code Kit*, was released. It provides guidance and practice material for raising your code speed from 5 to 13 words per minute. The ARRL Communications Department continues to set the pace for the operating amateur. On November 1st, two new categories were opened for achieving the DXCC award: RTTY and 160 meters. And at 0730 that same morning, two gentlemen stepped into the lobby to claim the 160-meter awards! The controversial DXCC Rule 9 was changed, allowing DXers to move all over the nation without losing credits. And there has been a steady increase of DXCC applications.

### It won't be long before amateurs worldwide top the one million mark!

The Simulated Emergency Test (SET) 1976 broke all records in terms of participation and success. The tragic Guatemalan earthquake and Guam typhoon were lessened by the humanitarian efforts of countless amateurs. ARRL hq. sent fm repeaters and hand-held units down to Guatemala to augment the equipment already on the scene. And all were elated to learn that the AREC structure, led by the SCM of the Pacific Section, KH6GQW, really worked. RACES was restructured, essentially returning the service to the control of hams. And finally, the new *Emergency Coordinator Workbook* was published to aid the leadership of the Amateur Radio Emergency Service in doing an even better job in the field.



Awards were up: More than 2500 hams earned the special Bicentennial Worked All States award, and the regular WAS award was up more than 25 percent. The total number of recipients of the Rag Chewers Club and Code Proficiency certificates also rose, many of the latter going to non-hams. Even the five-band WAS was up in spite of generally poor band conditions.

Were you on the air in late July? Then you no doubt remember the

Bicentennial Celebration. In fact, we hope you were one of the more than 2500 amateurs who received special awards for participating in the July 24-25 bonanza. Fittingly, the celebration itself was revolutionary, employing several previously untried techniques to generate activity, some of which will be incorporated into other events in the future.

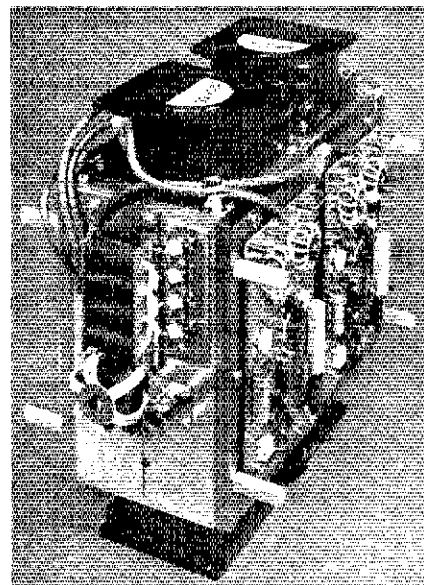
New records in League contests abound. The vhfers lead the pack, leveling old scores from atop mountains and hillocks. Scores in the DX Competition approached those of five years ago, demonstrating advances in antenna hardware development to keep up with ever-worsening sunspot activity. And of course you remember the mosquitoes and burned hot dogs of June! Field Day scores were higher than ever, with more than 16,000 hams participating.

Out front in the red brick fortress housing WIAW, the crew began sending midnight slow-speed bulletins for the benefit of West Coast listeners. Those readers who have been regular monitors of the League's station have no doubt been hampered by the atrocious band conditions of 1976. Well, we noticed them, too! And we began to transmit propagation bulletins as a regular feature of the station's operations. Work on an improved WIAW antenna system commenced, as tradition dictates, in the midst of the New England winter.

### If you still think WARC is a subatomic particle — or an exotic South Seas bird . . .

Our inveterate observer of propagation phenomena, Ed Tilton, W1HDQ, suggests that 1976 will probably be best remembered, by DXers at least, as the year when we finally saw a real upturn in solar activity. We're now into Cycle 21 (no, it's not a new dog food), but we weren't sure of this until midyear. Ed studied the sun every day. Mother Nature would let him for the past two years, and his studies have indicated that the turnaround came on the last day of spring — June 20, 1976. Watch *QST* for more and more propagation material. We'll let you know what's going on up there.

*QST's* technical content continued to stress basic articles for beginners and state-of-the-art topics for more advanced hams. Among the latter were articles on microprocessors, solid-state linear amplifiers, and improved receiver performance. *QST* product reviews now carry dynamic-range specifications for commercial receivers — proof of the staff's interest in protecting amateurs from purchasing inferior equipment.



Alert readers know that the 1976 World Administrative Radio Conference (WARC-79) holds the key to the entire future of the Amateur Radio Service. In fact, it's so important that the November issue carried the unusually long editorial titled, a bit ominously, "Will Amateur Radio Exist in 1980?" If you still think WARC is a subatomic particle — or an exotic South Seas bird — better read the article "Working Toward WARC" in the March 1976 *QST*, IARU Vice President Vic Clark, W4KFC. On February 2 the Amateur Service filed its future requirements for frequency allocations with the FCC WARC Steering Committee. Among the requests a new vlf band (!), three new bands, and expanded satellite segments in uhf — needed in anticipation of the continued growth of amateur radio. FCC's *Report of the WARC Advisory Committee for Amateur Radio* was released in May, stressing the need to fulfill part 97.1 (e) of the FCC Rules and Regulations and encourage the growth of international goodwill. Canadian officials of ARRL have responded to DOC proposals on WARC preparation. The challenges prevail. Now we've got to press on beyond 1976!

And what about the state of amateur radio "over there"? Oh, they're getting the message, too: GROWTH! Both Australia and the Netherlands adopted Novice-type licenses, and Canada has proposed a Novice and Experimental license class. We know that in the case of the Netherlands, the result has been a 25-percent increase in the total amateur population in that country. There is increasing awareness in less-developed countries of the worthwhile self-training role of the Amateur Service. Several countries have applied for IARU membership; some of them are new African

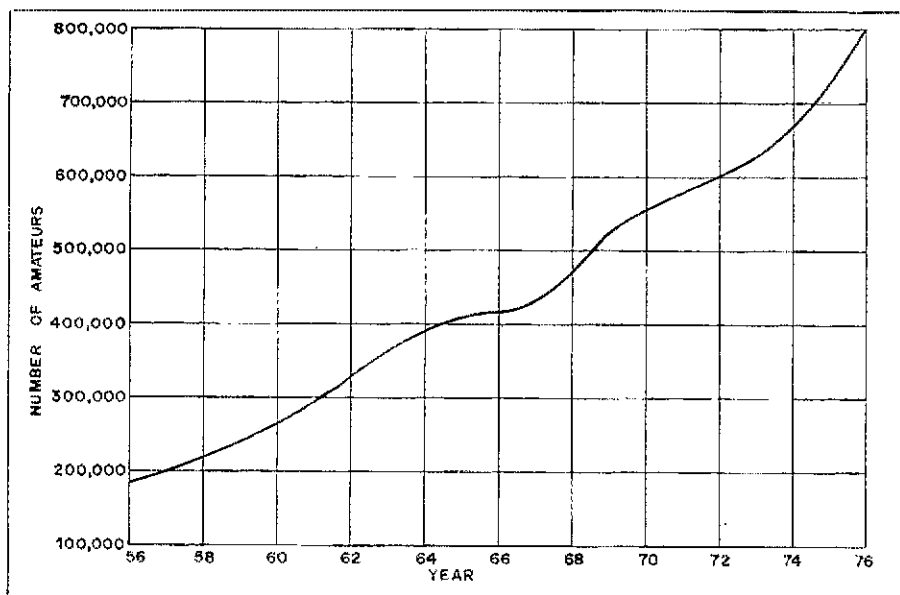


nations. More than 100 countries have now used the OSCARs to establish two-way communications with hams in other lands. Amateur societies in Japan, Austria, Chile, New Zealand and the Dominican Republic celebrated their fiftieth anniversaries in 1976. K2UYH achieved the first Worked All Continents award via moonbounce on 432 MHz, proving that international communications needn't be confined to the hf bands! In April the IARU Region 2 Conference was held in Miami; it was the first time that representatives of all three IARU regions met together. Another achievement on the international scene took place in Botswana when representatives of amateur radio from seven African countries met in June — this was the first IARU conference to be held on the continent of Africa. And IARU President Noel Eaton, VE3CJ, and Vice President Vic Clark, W4KFC, traveled extensively in Europe (including the Soviet Union), exchanging WARC-related ideas with amateurs in other countries.



Here at home our WARC preparations included a revitalized Intruder Watch program, with the Canadian Division (now also known as the Canadian Radio Relay League, to emphasize its Canadian management and direction) launching its counterpart to the successful U.S. program.

The FCC has kept us on our toes, too — so much so that a new *QST* column was begun with the May issue expressly to answer FCC-related questions. "Washington Mailbox" is intended to take the mystery out of the bureaucratism of FCC regulations. The FCC finally acted in the controversial restructuring docket, 20282, and while only a small part of the original proposals has been either adopted or dismissed, to date the tide is running strongly in the direction of the League's single-ladder counterproposals and away from the Commission's original concept of a dual-ladder structure. Novice power was raised to 250-watts input (and others operating in the Novice bands



This graph shows clearly the rapid and steady growth of the Amateur Radio Service over the last 20 years.

were limited to the same level), Technicians were given Novice privileges, by-mail examinations of Technicians were eliminated, and holders of licenses obtained by mail exam were "grandfathered" into a license equivalent to one obtained by FCC-supervised exam. The mandatory one-year waiting time between Novice licenses was also eliminated. Distinctive Novice call signs disappeared, victims of processing problems at the FCC's licensing unit. Specific two-letter call signs became available to certain Extra Class licensees, with the rest to become eligible in 1977. The one-year experience requirement for the Extra Class license was disposed of, making it possible to go from non-ham to Extra in one sitting! New call signs with N and WD prefixes and even "X" suffixes made their way into the ham bands during the year.

**"Growth is the only evidence that there is life!"**

In other actions, the FCC made it optional for an amateur to indicate mobile and/or portable status when identifying an amateur station and proposed to regulate modes of emission by *bandwidth* rather than by emission type — a "deregulation" move which could well have outlawed the use of double-sideband a-m below 28 MHz! Vociferous comment by the League and by individual amateurs has stalled the bandwidth proposal, and encouraged the Commission to start again from scratch.

The ARRL National Convention in Denver set a new record, with more than 2,500 people attending, many of them winning over 600 prizes; tours

were conducted at the National Bureau of Standards Lab; exhibits were held by more than 50 firms, who grossed more orders than ever at a convention. More than 20 sessions were held on subjects ranging from "Optical Fiber Communications" to Wouff Hong initiations (no, of course we can't tell you what goes on there!).

Finally, our message of growth was conveyed eloquently to all by our medium: *QST* itself. The New Look which was launched in January immediately won rave reviews from readers for its larger type, improved graphics and layout, and more interesting content and editorial approach. We began the year knowing that a 128-page magazine in the new format would have the same editorial content as a typical issue in the old, but increased demand for advertising space steadily pushed the page count up. The number of articles grew, too, until we found ourselves with a 192-page blockbuster in December!

So, what's next? At Hq., we're awaiting groundbreaking for a new addition to the building which houses the administrative offices, so we can keep up with the burgeoning interest in amateur radio. With membership in the League increasing at a rate of more than 2000 per month even *before* the graduation of the fall class of new Novices, we know we're going to have to work hard to keep up! There's no time to pat ourselves on the back. The task at hand, to promote the *growth* of our fraternity without sacrificing its *quality*, is demanding enough without such distractions. So we're moving ahead each day. We agree with one of England's leading thinkers of some years back, John Henry Cardinal Newman: "Growth is the only evidence that there is life!"

# The Canadian Winter Rally

It's warm inside with lots of snow outside. For these Ontario amateurs that's their cue to provide communications for this internationally acclaimed event. What better time to show ham radio's public-service potential?

By Michael J. Goldstein,\* VE3GFN

**C**ompetitors, service crews, spectators and radio hams clog the start/finish area while the noise of revving engines, PA systems, WWV receivers and 2-meter mobiles make a terrific din. On a sunny winter day in East Toronto, the rally begins.

As you read this in the comfort of a warm home, several Ontario hams are recalling last year's experience and gearing up themselves to provide communications for the annual Canadian Winter Rally. A motor sport event of international stature, it traditionally runs over the worst roads and wildest weather to be found in southern Ontario. Recently, it has been operated as a selective stage rally. That is, selected portions of road are timed and checkpointed. These "selectives" are barred to routine traffic and can, therefore, be driven in a rather flamboyant manner. Connecting routes between those roads

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M1N 3A4



Selected portions of road are timed and checkpointed . . . and can, therefore, be driven in a rather flamboyant manner.

are driven in a normal fashion.

To be successful this type of rally must have superb communications among the various checkpoints and the rallymaster. The British Empire Motor Club, sponsor of the event, tried long-distance telephone and citizen's band communication. They then discovered amateur radio.

In 1973 Brent Davies of the BEMC came to me since I was emergency coordinator for Toronto. A tape was made of the proposal and circulated to radio clubs across southern Ontario. Everyone seemed enthusiastic. It was decided to use 2-meter fm because of the large number of available mobiles. The route covered 1200 miles between Toronto and Ottawa. So, an organized survey of the entire route was carried out by ham mobiles during a period of several months. Results indicated that the job could be done with several strategically placed relay stations and repeaters: Toronto, VE3RPT; Ottawa Valley, VE3STP and Kingston-Belleville, VE3KBR. The job was done with 100 hams participating and the rally organizers were delighted. Hams were on the "payroll." Brent Davies got his license, VE3EJW.

The 1975 running brought an entirely new route, well outside any repeater's coverage and even extended up into the Algonquin Park canoe country. This one would be tough. Another complete survey was done. Permission was granted to install a Ringo Ranger atop a 250-foot tower at Essonville, south of Bancroft. VE3PQ and VE3HOF did it on the windiest day of the winter. North of Bancroft, at Maynooth, VE3CGD placed several antennas on a 100-foot tower. With base stations at Kinmount and Bancroft, the entire rally route was

covered by simplex, using a repeater only for liaison with Toronto. Hams from Toronto, Oshawa, Ottawa, Kingston-Belleville, Burlington, and Newmarket gave strong support, fielding 65 mobiles to make that year's CWR a huge success. Any route the organizers could dream up would be covered. Brent's wife, Brenda, received her ticket, VE3HUG.

## Preparations

Plans for the 1976 event brought a pleasant surprise — no new routes that had not been previously surveyed. With lots of spare time to prepare, VE3PQ designed and built a four-dipole phased array which was duly installed on the Essonville tower to keep the Ringo company. Essonville base could now keep two circuits going at the same time. Plans were made for a 6-meter link between the Essonville tower and Bancroft base station. It worked fine, but wiped out every TV set at the motel in



Back in the real world, Bob, VE3HCO, operates Toronto Control, VE3CWR.

Bancroft used for the base station. For the first selective in West Toronto, VE3AYR promised six mobiles from Burlington. With TV coverage of that stage anticipated, his cars arrived gaily bedecked by amateur radio posters. As the rally weekend approached, Ed Dunham, VE3AXR, started planning his spaghetti. Ed opens his Cardiff home as a ham haven each year during rally weekend. His spaghetti pot is now a fixture.

Others prepared. A brand-new ham, VE3FVX, started packing for his first rally. As an afterthought, he brought two extra pairs of pants. The Belleville bunch checked out their assigned section of the route, "... what roads ...". Every third call on the rallymaster's telephone tape is from VE3GFN looking for maps, time schedules, car posters and so on. In the studios of CFTR, VE3TL installed a 2-meter receiver. Later, other Toronto stations are puzzled about how CFTR is getting their rally info so quick. The Peterborough club turned off their repeater for the weekend to allow the rally system to use 146.94 MHz as a simplex channel during that weekend of February 14-15.

### Underway

After all has been sorted out, the rally begins. This is really a driver's rally rather than a test of navigation since the assigned route has been published in advance. The first stage is a speed trial on Toronto's west side. There, the Burlington mobiles use VE3RPT to report times, positions and spectator quantities to the rallymaster. Except for liaison back to Toronto, the remainder of rally communications will be on simplex. Proceeding toward Kinmount, the system is checked out. Kinmount Control, VE3DAP/3, reports in. The new phased array covers like a blanket. Still puffing from a shovel and snowshoe session, VE3DLJ and VE3CWO have set up well in advance at the Essonville tower.

VE3FVX arrives at the Kinmount Lake stage, jumps over a snowbank, and tears his pants.

Buller Road is icy and smooth. Competitors fly down the straight sections, and suddenly find their rear axles three feet in the air as a set of frost heaves sends everything in the car flying. One car loses its trunk lid while another drops out with a blown gasket. The slippery roads begin to take their toll.

The rally arrives in Kinmount for lunch. By setting up a mobile rig and power supply on the dining table, the rallymaster is kept up to date. Next is a stop at Kinmount Control for photos. Later, a problem develops in Fortescue — nonrally traffic inside the selective,



Brent, VE3EJW, is ready to roll.

competitors approaching — a priority safety problem. Essonville tower clears the frequency and sorts it out.

The Owen Sound repeater creates QRM on 94 at Essonville, so control shifts to 52 — that new antenna is GOOD. On the last sweep through Irondale that night, competitors pile up behind a steep, icy hill and must be winched up, one at a time, to clear the road. Eventually, further running of Irondale and Fortescue is canceled for the night. The radio system is earning its keep. And such was the traffic on the amateur radio circuit; every crossroad, gas stop and service area had its radio car standing by. Whether it was to call scores to Toronto for rally participants, have a tow truck sent to a disabled car, send servicing information ahead to the service crews, or ask the rallymaster to solve a route problem, the amateurs were always ready.

At Irondale, VE3PJ came down with the flu, so VE3FVX shifted to cover the slot, jumped over a snowbank, and tore his pants.

In the early evening, the rallymaster is deposited at Bancroft's Sword Motel, noting that it "sure beats bouncing around in 'GFN's truck." Throughout the night the Ottawa gang operated the two rigs, handling more traffic; one competitor steamed into a snowbank and another around a corner on a different selective — heading in the wrong direction. Meanwhile, back at the spaghetti pot, VE3BUI arrived with pretty sister in tow to find no spaghetti. VE3GFN also arrived at VE3AXR to find that he had packed the water, the pot, but no coffee.

VE3FVX came in his very last pair of pants, swearing never to jump over a snowbank again. The next morning he jumps over a snowbank and — tears his pants.

### Home Stretch

On early Sunday morning the rally begins the loop back through Kinmount. The Toronto hams filter back to their selectives in the grey dawn with VE3BXH driving all the way in from Orillia for his second shift. He found the road blocked by a truck two miles from the selective. By the time he finds a way around it, the rally is over.

The closing banquet found competitors, marshals, and amateur guests much revived. Many kind words are said about the hams and their communications. In turn, the hams thank the rallymaster for keeping their rally on the rails. All mobiles are promised dash plaques.

We'll be back next year.

QST



At Kinmount Control, VE3DAP/3, the rallymaster checks in with VE3HUG.

# Chart Your Way to Better DX

Want to get more mileage out of your station? A new monthly QST feature will help put your signals on the beam.

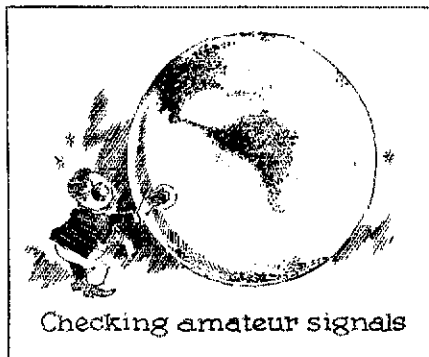
By David Sumner,\* K1ZND

This month you'll find a new way to answer the old question, "How's DX?" As an addition to that regular column, we have a new feature: a set of monthly propagation charts that will help you select the best band, and the best time, for communicating with distant points. The charts, which will be provided each month by the U.S. Department of Commerce Institute for Telecommunication Sciences in Boulder, Colorado, represent the best predictions available of what typical conditions will be like during the month. In combination with the propagation forecast bulletins now being transmitted by WIAW, the charts are a complete guide for the ham who is interested in getting maximum mileage out of his station — *if* he understands them, and knows how to use them.

## Who Should Use the Charts?

Don't assume that we're devoting this amount of QST space to serve the needs of the super-serious DXer, because we're not. He probably knows from experience a lot of the answers that the charts will provide (though we think anyone who studies them will learn a thing or two!). The one who will benefit most is the occasional DXer, or the ham who runs a scheduled contact occasionally with a friend overseas. Now that all licensed amateurs are permitted to operate on at least four high-frequency ham bands, most of us fall into one or both categories.

The real test of the new feature's usefulness will come in February and March, when the ARRL DX Competition takes place. By studying the charts, you should be able to spot band openings which you would have missed



"Whether you're in Kansas City or Pago Pago, time invested studying the curves should pay dividends in your DX score."

otherwise. And the charts are useful for both ends of the circuit. Whether you're in Kansas City or Pago Pago, time invested studying the curves should pay dividends in your DX score.

## What Do the Charts Show?

Propagation is influenced strongly by two factors: the *season of the year* and the *level of solar activity*. The season affects the times of sunrise and sunset at both ends of the circuit, as well as the amount of daylight and darkness which exists along the path taken by the signals. Of course, the season can be predicted perfectly, years in advance.

Predicting the level of solar activity for a given day is much more difficult, especially when you're working as much as 70 days in advance in order to meet a publishing deadline. We considered doing it and decided that it wouldn't be a worthwhile use of QST space. After all, if you're interested in what the bands are going to be like next week,

you can obtain a much more accurate prediction via WIAW than we could ever hope to print. On the other hand, it is possible to make a reasonably accurate prediction of the *median value* of solar activity for the month. This value is reflected in the charts.

The charts show predicted values for two frequency limits which are commonly used in frequency planning. The higher curve shows the *maximum usable frequency* (muf), which is an estimate of the maximum frequency having ionospheric support on 50 percent of more of the days during the month. This value will be exceeded half the time. The lower curve shows the *optimum traffic frequency* (otf), which is an estimate of the frequency having ionospheric support on 90 percent of more of the days during the month. F<sub>2</sub> layer, E layer, and sporadic E propagation are all taken into account by the computer program which generates the charts.

## How Do I Use the Charts?

The charts show the *probability* of ionospheric support between two points at different frequencies and at different times. Two-dozen paths have been selected as being typical of those of interest to the DX-minded amateur. They are listed in Table 1.

In general, the closer the frequency you are using is to the highest frequency being propagated at that moment (with out being *above* it, of course), the stronger the signals will be. Because most amateurs run relatively low power and have relatively small antennas compared to those used on commercial circuits, communication will be possible on long, difficult paths only if the frequency being used is fairly close

\*Assistant General Manager, ARRL

the highest frequency being propagated.

Let's pick an example. Fig. 1 shows the circuit from San Francisco to Washington, DC — not exactly DX, but a familiar basis for discussion. During January 1977, 21 MHz doesn't look very promising; the muf approaches that value only from 1900 to 2100 UTC (2:00 to 4:00 P.M. EST and 11:00 A.M. to 1:00 P.M. PST). The band will be open on some days, but probably only on one or two days a week. If you're on the East Coast and you want to have a regular schedule with Uncle Harry in California, you'd better try another band! Twenty meters (14 MHz) is better: it should be very reliable from 1600 to 2300 UTC, because the fof exceeds 14 MHz for the entire time. But if you run your schedule late, don't be surprised if the band closes on you in mid-sentence; look at how steep the curve is from 2300 to 0300!

If you can't operate on 20 meters you can try 40 or 80, but you may lose some sleep. The 7-MHz band will be most reliable from 0800 to 1000 UTC, which is when the fof pokes just above that value. You'll also find good signals most of the time at 0400 to 0600 UTC, but sometimes the band will be closed, as shown by the fof for those hours. If you're hunting states on the other side of the country for 80-meter WAS your best bet is 0400 UTC, when both the muf and the fof are at their lowest values. Another good time would be 1200 UTC, when the values dip again just before sunrise on the eastern end of the circuit.

Understand it so far? Fine! Let's pick a more difficult example.

Fig. 2 shows the circuit from the Midwest to Western Europe. Here, things get more interesting. If you're

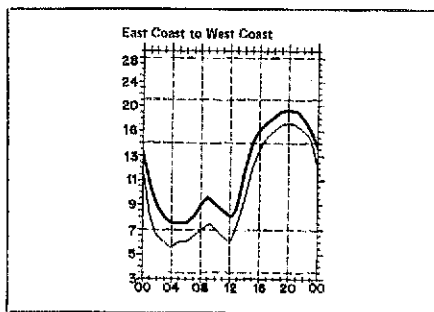


Fig. 1 — The San Francisco to Washington circuit relies heavily on 20 and 40 meters this time of year.

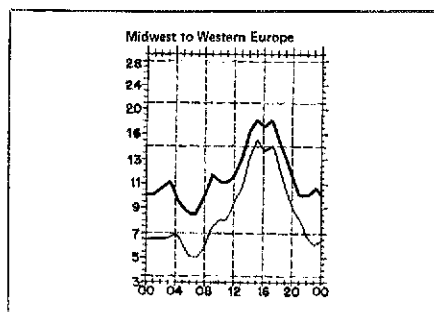


Fig. 2 — Without the help of propagation charts to tell you when to listen, you might not catch the European openings from the Midwest!

looking for 21-MHz DX over this path, you're not going to find it very often, but chances are that if the band opens at all it will happen at 1500 UTC. This is when the muf and fof are both at their highest values. Even faithful 20 meters will be good for only four hours on a typical day, from 1400 to 1800 UTC, as shown by the muf curve. The two best times are 1500 and 1700 UTC, when the fof barely pokes above 14 MHz. And note the trough between the two peaks. It means that if the band closes shortly after 1500 you shouldn't give up, because it may open again an hour later!

Forty meters should be a very interesting band for this path during the hours of darkness, but it's difficult to predict the best time on the basis of Fig. 2 because of the wide gap between the muf and the fof. The band may be open from 2200 until nearly 0900 UTC, and signals are apt to be best from 0600 to 0700, when the muf drops to its lowest value. This is also the best time to look at 80 meters, for the same reason.

By applying the same kind of analysis to the charts on pages 74 and 75, you can get a good picture of what DX propagation will be like for the month. If you combine this analysis with practical experience and an understanding of the capabilities of your own station, you should greatly increase your operating effectiveness without spending a nickel for new amplifiers or antennas. If you also listen to WIAW bulletins regularly for propagation updates, you'll be able to speak knowledgeably about conditions at the next club meeting without having touched a key or microphone all month!

The curves do not reflect assumptions about the gain of your antenna, or about your power level. However, the curves do assume that the antennas at both ends of the circuit have useful radiation at angles as low as two degrees. This is pretty low for amateur work, and if we receive comments from users of the charts that the charts are too optimistic, we'll select a greater

value for the minimum angle. In the meantime you can think about raising your antenna or about installing a good vertical, so as to bring that radiation angle down!

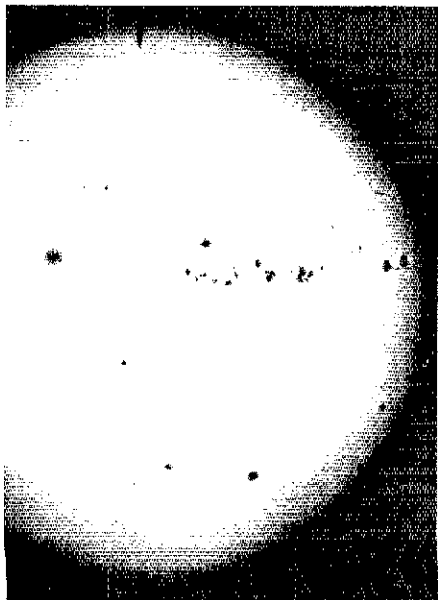
Where station improvements *really* pay off is in increasing the downward gap between the muf and the frequency you are using. If the muf is 11 MHz, 10 kW and a 200-foot tower won't open the 20-meter band for you. However, the improvements you make (not 10 kW, please!) may spell the difference between having a useful signal on 40 meters and being lost in the noise over that path. (Incidentally, if you examine the charts carefully, you'll see why we're pushing so hard for a new ham band at 10 MHz! It would add tremendously to the effectiveness of long-distance amateur communications by filling the tremendous gap between 7 and 14 MHz.)

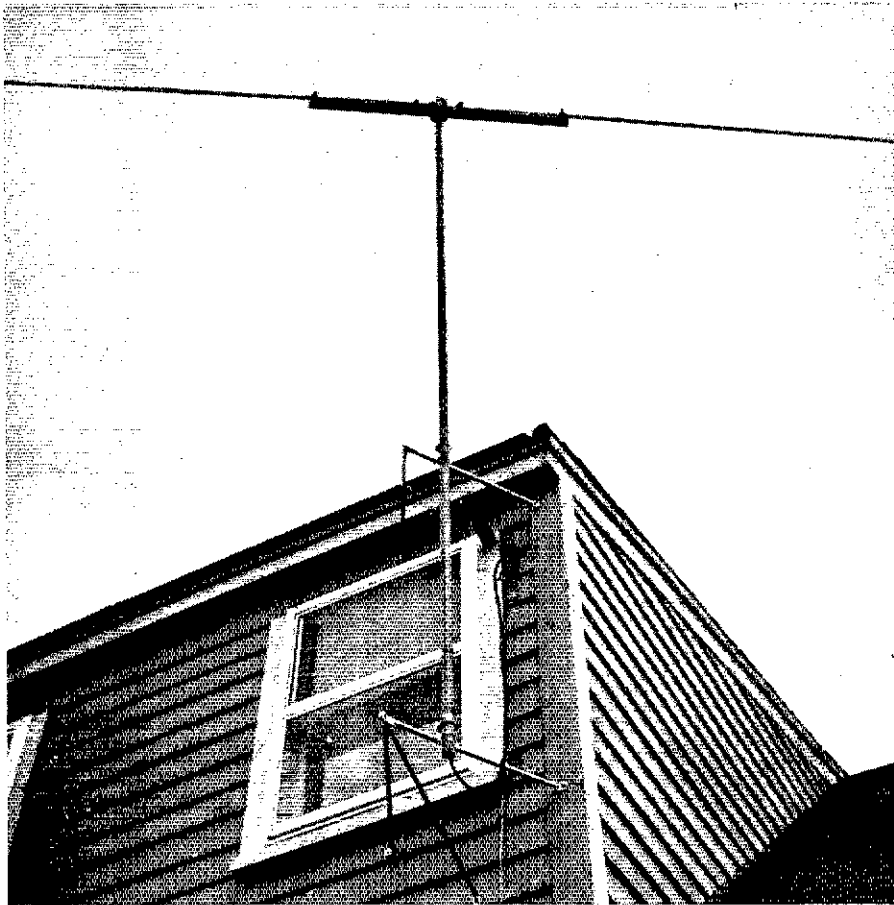
### Will the Charts Be the Same Every Month?

It is our intention to run this feature for the next twelve months and to continue it only if it turns out to be useful to our members. We *do* plan to make improvements in response to comments we receive. We may add special features from time to time, such as sunrise and sunset times for different points on the globe (very useful for 160- and 80-meter DXing) and, for the optimists, curves showing the *highest possible frequency* (hpf), which corresponds to the frequency which will be propagated only 10 percent of the time. The computer will let us play some other games, if there is enough interest.

### What About WIAW?

For years, WIAW has been transmitting a Propagation Forecast Bulletin based upon information received by mail each week from Boulder. Recently we discovered that we could improve these bulletins with a little additional effort. Since October, Ed Tilton, WIHQ, has been writing a weekly WIAW bulletin based on by-mail pre-





By studying the charts you'll be able to spot openings that you might have otherwise missed whether you sometimes run skeds with a friend overseas or are an occasional DXer with a modest station.

dictions and personal observations. These bulletins usually make their appearance on Friday and are repeated on each WIAW bulletin transmission (see schedule on page 89) until the next one is ready. Sometimes events overtake the predictions; then, Ed does a mid-week update in order to avoid "forecasting rain while the sun is out."

The WIAW bulletins will tell you whether conditions are going to be better or worse than the median upon

which the curves are based. With this knowledge, you can crank your own "fudge factor" into the curves.

#### Is Anyone Interested in My Comments?

You bet we are! We want to know if you find this feature useful. Needless to say, space in *QST* is at a premium and we don't want to fill it with things people don't use. Also, while the gang in Boulder couldn't be more cooperative,

Table 1

In the monthly feature, the locations of the points on which the curves are based will be generalized so as to emphasize that they are useful for more than just one city or state. Here is the list of actual points which are used in the computer run. They were selected as being representative of the amateur population in a geographical area. Some corrections can be made on the basis of latitude; the general rule is, the higher the latitude, the lower the muf. If the muf curve is marginal for the band in question for Washington, stations in Miami will have a better chance and stations in Montreal a poorer chance for a band opening.

GENERALIZED LOCATION	ACTUAL LOCATION
East Coast	Washington, DC
Midwest	Kansas City
West Coast	San Francisco
Western Europe	London
Eastern Europe	Kiev, Ukraine
Japan	Tokyo
Australia	Melbourne
South Pacific	Pago Pago, Am. Samoa
South America	Asuncion, Paraguay
Central Asia	New Delhi
Southern Africa	Lusaka, Zambia

they don't run their computer for nothing. We especially want to hear from you if you find the *concept* useful, but we're not giving you the information you need. While we can't promise to customize a curve for the Casper Wyoming - Christmas Island path, we do want to give the best possible service within our space allocation.

While these predictions may seem like a "cookbook" approach to a subject which is shrouded in mystery, they are based on decades of professional experience. The computer program which generates them is revised continually as the base of knowledge about propagation expands. It is our hope that these predictions, along with the occasional articles on propagation which will continue to appear in *QST*, will make the sunspot cycle which is just beginning Cycle 21, the best understood in the history of amateur radio. QST

## Strays

### NEW RADIOSPORT ACTIVITY

□ A DX contest in July? Yes! July 9-10, 1977, will feature a worldwide activity on an International Amateur Radio Union theme. Details now being worked out suggest contacts both within and outside one's own country for points, multipliers for DXCC countries worked on each band, and additional points for nondomestic contacts. A tentative name is the IARU Radiosport Championship. — *WA1STN*

### AMSAT-OSCAR PHASE III

□ The long-awaited Phase III amateur satellite launch will occur in December, 1979. From among 80 international proposals the revolutionary AMSAT-OSCAR spacecraft was selected by the European Space Agency to ride aboard its ARIANE LO2 test flight. The Phase III satellite's elliptical orbit will bring it within range of the entire Northern Hemisphere for the better part of a day, greatly expanding its public service and educational potential. A detailed report on Phase III will appear in a future *QST*. — *WA1ZUY*

### NOTICIAS EN ESPAÑOL

□ Amateur radio information — in Spanish — now appears as a weekly feature of the *Diario Las Americas*. Based in Miami, the daily has an average circulation of 55,000. Members of the Sociedad Internacional de Radio Aficionados (SIRA) are sponsoring and editing the material. Typical articles include public service information, FCC rules and instructional material. Contributors may contact Rafael M. Esteve WA4ZZG, at 302-822-1688, or write SIRA, P. O. Box 480071, Miami, FL 33148.

# Your SCM and How He Is Elected

The SCM has been a fixture in ARRL for over 50 years; yet many hams don't know what he is, who he is, what he does or how he is selected.

By George Hart,\* W1NJM

**S**tarting with this issue of *QST*, a new procedure for selecting Section Communications Managers goes into effect, as ordered by the ARRL Board of Directors. The procedure continues to provide for election by members in a democratic manner; but there are 74 SCMs, 37 of whom must be elected each year, so elections are scheduled quarterly. Before we go into detail, let's cover some basics.

## Just What Is an SCM, Anyway?

The SCM is the operating-administrative head of an ARRL subdivision called a "section." Most states and provinces are sections, along with some U.S. possessions. States with large populations sometimes have more than one section; for example, Massachusetts, New Jersey, Pennsylvania, Florida and Texas each have two, New York has three, California has *nine*. On the other hand, one Canadian section includes four provinces. It all depends on how many ARRL members reside therein and, to some extent, on history and tradition.

The job of the SCM revolves principally around on-the-air operating activities. He performs this job through leadership assistants in the various amateur specialty fields and through individual appointments which only he is authorized to make. The current leadership appointments, besides an assistant SCM, are called Section Emergency Coordinator, Route Manager, Phone Activities Manager and Emergency Coordinator. The individual appointments are Official Relay Station, Official Phone Station, Official Bulletin Station, Official VHF Station and Official Ob-

\*Communications Manager, ARRL

server (not necessarily in order of importance).

The SCM receives monthly reports from all these appointees, from ARRL affiliated clubs, from section net managers and individual amateurs, and from these reports writes a monthly *QST* column which appears in that section of the magazine called "Station Activities" (starts on p. 91 of this issue).

He also is authorized to perform a few nonoperating functions, such as public relations programs, dissemination of amateur radio information to clubs, appointees, members and the general public, participation in convention and hamfest planning, and recruitment and

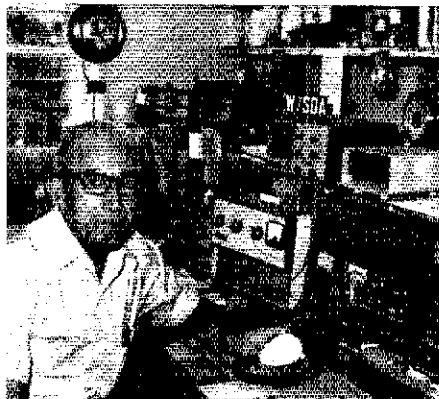
training of new amateurs and ARRL members. In between times (while he is resting), he can issue certificates, conduct correspondence, write bulletins to appointees or newsletters to section members, travel to visit clubs, hamfests, conventions, director-called meetings or nonamateur groups to "sell" amateur radio.

Sound like a big job that ought to command a big salary? It's a big job, all right, but there is no salary. The SCM gets reimbursements for authorized travel and administrative expenses and a few other small nonmonetary fringe benefits, but by and large he does what he does for the pleasure of it, the glory of it, the honor of it and, perhaps most of all, the desire to serve amateur radio in a leadership capacity.

## Elected by the Membership

A job this important requires the consent of those served — the ARRL full members residing in the section. Thus, each SCM elected serves a two-year term and can be reelected as many times as the membership wishes. Our current elder-statesman SCM (W1ALP) was first elected in 1940 and has served ever since. Nobody else approaches that record, but several have been in office for a number of years. On the other hand, quite a few don't last a term, and in such cases the communications manager must appoint an SCM to finish the term. Of the 74 SCMs now in office, six have been appointed, not elected. How come? Because the elected SCM resigned or became a silent key before his term ended. The appointed SCM keeps the office from becoming vacant until the election gears mesh.

All sections now having appointed



Recently elected Wyoming SCM Chester Stanwaity, W7SDA, (the last SCM elected under the old procedures) celebrates his 25th year in amateur radio this July. He has a broad background in net operation and traffic handling as well as RACES operation. W7SDA is a member of the Yellowstone Radio Club, Cody Repeater Club and Billings Radio Association. In addition to considerable activity on 80 and 20 ssb and 2-meter fm, he finds time for his other hobbies of photography and watch and clock repair.

Table 1

SECTION	PRESENT TERM ENDS	FIRST SOLICITATION	SECOND SOLICITATION	CLOSING DATE	MAIL BALLOTS	COUNT BALLOTS	NEW TERM BEGINS
Alberta	Deceased	Jan. '77 QST	Feb. '77 QST	3/10/77	4/1/77	5/20/77	7/1/77
Nevada	Resigned						
Rhode Island	Resigned						
Northern New Jersey	Resigned						
San Joaquin Valley	Resigned						
Canal Zone	Resigned						
Utah	12/10/76						
Maryland-D.C.	1/1/77						
New Hampshire	1/2/77						
Southern Texas	1/27/77	Apr. '77 QST	May '77 QST	6/10/77	7/1/77	8/20/77	10/1/77
Colorado	2/14/77						
San Francisco	3/1/77						
British Columbia	5/1/77						
Sacramento Valley	5/7/77						
Los Angeles	5/19/77						
Georgia	5/22/77						
West Virginia	6/21/77						
Washington	7/2/77						
New Mexico	7/2/77	July '77 QST	Aug. '77 QST	9/10/77	10/1/77	11/20/77	1/1/78
Alabama	7/11/77						
Western Massachusetts	8/11/77						
Alaska	8/17/77						
Santa Barbara	9/2/77						
Kansas	9/5/77						
Tennessee	9/11/77						
Michigan	9/29/77						
East Bay	10/10/77						
Delaware	10/10/77						
Eastern New York	10/21/77	Oct. '77 QST	Nov. '77 QST	12/10/77	1/1/78	2/20/78	4/1/78
Eastern Pennsylvania	10/22/77						
San Diego	10/24/77						
South Dakota	11/1/77						
Louisiana	11/4/77						
North Carolina	11/10/77						
Virginia	11/11/77						
Pacific	11/12/77						
Maritimes/Nfld	12/10/77						
Wisconsin	12/11/77	Jan. '78 QST	Feb. '78 QST	3/10/78	4/1/78	5/20/78	7/1/78
Illinois	12/15/77						
Northern Florida	12/15/77						
Manitoba	1/11/78						
Santa Clara Valley	1/11/78						
Indiana	1/12/78						
Vermont	1/22/78						
Maine	1/28/78						
Oregon	2/1/78						
Southern Florida	2/4/78	Apr. '78 QST	May '78 QST	6/10/78	7/1/78	8/20/78	10/1/78
North Dakota	2/11/78						
West Indies	2/21/78						
Oklahoma	3/20/78						
Minnesota	4/10/78						
Connecticut	4/13/78						
Idaho	4/23/78						
Western New York	4/26/78						
Ohio	4/30/78						
Missouri	5/12/78	July '78 QST	Aug. '78 QST	9/10/78	10/1/78	11/20/78	1/1/79
Southern New Jersey	5/21/78						
Quebec	6/1/78						
South Carolina	6/6/78						
Western Pennsylvania	6/13/78						
Eastern Massachusetts	6/16/78						
Saskatchewan	6/22/78						
Nebraska	7/1/78						
New York City/Long Island	7/5/78						
Montana	9/9/78	Oct. '78 QST	Nov. '78 QST	12/10/78	1/1/79	2/20/79	4/1/79
Mississippi	9/11/78						
Iowa	9/11/78						
Arizona	9/12/78						
Ontario	9/12/78						
Orange	9/12/78						
Northern Texas	9/15/78						
Arkansas	10/12/78						
Kentucky	10/30/78						
Wyoming	11/19/78						

At present, one deceased SCM and five resigned SCMs have been replaced by appointed SCMs. These go into the first solicitation, this issue of Q (see p. 89), and will continue the same schedule every odd-numbered year from now on. Other SCMs elected under the former procedure will serve out their terms (second column) plus extension to the date shown in the last column on the right, after which the schedule of dates shown will be adhered to in future years. Find your section on the left and memorize the schedule so you will know when your SCM is up for reelection.



SCMs are being moved to the top of the list for initial solicitation in this issue (see "Operating News"). This is possible because we are just starting the new procedure, so the members in those sections won't have to wait until the normal term ending to elect the SCM of their choice. Hereafter, however, a resignation or a silent key will require the appointed SCM to serve until the expiration of the term, no matter how long it has to run. There is no "rubber" in this procedure, as there was in the procedure which was abandoned in mid-1976. We'll do our best to make such appointments judiciously and objectively.

### Schedule of Elections

Take a look at the chart, elsewhere in this article. Find your section in the listing in the left-hand column. The next column indicates the issue of *QST* in which the section will be first solicited. The solicitation will be repeated the following month (3rd column). The next four columns indicate the dates ballots (if required) are mailed, on which they are counted (i.e. the date by which they must be returned), and the new term begins.

*Memorize those dates*, or at least the issues in the second column, because from now on your section will be solicited for nominating petitions in that issue of *QST*, every other year. Remember whether your year is even or odd. The repeat solicitation is for the benefit of those who missed it the first time, or members who have just joined our ranks. The solicitations will appear in the "Operating News" department of the magazine, every month except March, June, September and December.

### Voluntary Extension of Term

All present elected SCMs' terms expire prior to the new term beginnings indicated at the right of the chart. Who

is SCM during the interim? The incumbent SCM will be asked to continue until that date, with full prerogatives. If he declines to do so, an SCM will be appointed to serve until the new term beginning. In some cases, this will be for more than six months; in others, three months or less, depending on just when the expiration of term occurs between quarters.

### What If . . . ?

A lot of unscheduled things can happen. The most common one is getting only one valid nominating petition as of the closing date. In this case, the sole candidate is declared elected on that date and the ballot dates are not applicable. The newly elected SCM does not begin his term, however, until the scheduled term-beginning date. If the "lame duck" SCM does not wish to serve out his term, the SCM-elect will be appointed to serve until that time, when he will take over as the elected SCM.

The next most usual thing is resignations or silent keys among SCMs. The solution is very simple and straightforward. The communications manager simply appoints someone, usually the assistant SCM, to serve the remainder of the term. Should resignations immediately following an election make it appear that an SCM is trying in effect to put his personal choice in office, the communications manager has the right to appoint someone other than the assistant SCM.

What happens if *no* nominations result from a solicitation? We don't immediately give up, we try again in the next election cycle, while an appointed SCM (the incumbent, if he's willing) carries on. If still no nominations after the second try, an SCM is appointed to serve the full term. That is, we go through the procedure a maximum of twice. An SCM elected as a result of a

"second try" serves only a year and nine months; the normal schedule is not disturbed. If the membership in the section is too apathetic to name a candidate after four solicitations, they have no gripe coming about having an appointed SCM.

### Pecking Order

The SCM, as such, is not a direct subordinate of the director. The two elected officials serve entirely different purposes in the organization. While both are elected by and ultimately responsible to the membership, the director's function is primarily as a participant in a board which sets the overall policies of the League. The SCM is in charge of ARRL-sponsored operating activities within his own section and has no overall function outside the section. Thus, there is no "pecking order" within our elected officialdom.

However, because SCMs are more often than not looked to by section members as a source of all ARRL information, many directors appoint them assistant directors in order that they might be on mailing lists for special data from Headquarters they would not otherwise automatically receive. As an assistant director, the SCM is indeed a subordinate of the director in policy matters. In operating matters, he is in charge of his section within established policy, rules and guidelines.

### Let Us Begin

Once this new SCM election procedure becomes established (it will be late 1978 before all elections are on the track), it will quickly become standard procedure and, we hope, second nature to all members interested in operating administration. It represents orderliness and efficiency, and is a step forward in our organizational history. So, let us begin. . . .

**QST**

## Strays

### WEST COAST COMPUTER FAIRE CALL FOR PARTICIPATION

Remember old country fairs with home cookin' prizes? Now, computer hobbyists have their chance to compete for prizes in a homebrew competition as part of the First West Coast Computer Faire. The conference and exposition on personal and home computers will be held April 15-17, 1977, in the San Francisco Civic Auditorium.

Papers are invited for the variety of conference sections planned on home

and personal applications, including: amateur radio; education; graphics; computer-driven and -assisted music systems; the physically handicapped; hardware, software, and systems for home word processing; speech synthesis; systems for very small businesses; micro-programmable microprocessors; digital cassette tape standards; program and data input via optical scanning of barcodes; peripherals interface and bus standards; software design, modularization; floppy disc systems; games — alphanumeric and graphic; and discus-

sion sessions for computer club officers, convention organizers, and so on. These or any other ideas should be submitted as soon as possible to:

Jim Warren, Star Route Box 111, Woodside, CA 94062, (415-851-7075) or Bob Reiling, 193 Thompson Square, Mountain View, CA 94043 (415-967-6754).

Besides the homebrew displays, the exposition portion will present more than 200 commercial exhibitors of low-cost and exotic systems, components and peripherals.

## New Directors Chosen by the Members

Each autumn, half of the ARRL divisions hold elections to choose directors and vice directors for two-year terms, to represent them on the League's Board of Directors, the group which makes the big decisions for the organization. Ballots counted on November 20, 1976, brought two new directors and two new vice directors into the "official family."

In the Central Division, the ballot looked the same as two years earlier — the same candidates ran against each other both times. But this year the results were different: Don C. Miller, W9NTP, of Waldron, Indiana, defeated Philip E. Haller, W9HPG, Central Division director since 1963, by 3235 votes to 2321. Don is a video and radar engineer at the Naval Avionics Facility of Indianapolis, and is a director and trustee of the amateur radio club there. Amateur television has been his most visible amateur activity: He's coauthor of the *Slow Scan TV Handbook* and has written many articles for the amateur radio magazines on the subject. Dayton Hamfesters remember his forums on TV there over the past several years; incidentally, Don was the Hamfest's "Ham of the Year" in 1971. Other credits: director, Indiana Amateur TV and UHF Club; director and trustee, Blue River Amateur Radio Society; member, AREC, AMSAT, QCWA. Don, now 53, has been continuously licensed and an ARRL member since 1942.

On the other half of the Central Division ballot, Edmond A. Metzger, W9PRN, won reelection as vice director, the post he's held since 1965, by garnering 3268 votes to 2233 for Kenneth A. Ebner, K9GSC.

Jack D. Gant, W5GM, is the new director from the West Gulf Division; he received 2603 votes to 673 for John A. Sloop, WA5QCW. Jack is 60; lives in Ardmore, Oklahoma; and

works as an independent oil and natural-gas producer. He's been serving as vice director of the Division since 1972 (alongside Roy Albright, W5EYB, who declined to run this trip) and has also been president of the Ardmore Amateur Radio Club. He's had his ham ticket since 1934.

Replacing Jack in the vice-director spot is Douglas N. Brooke, K5YHX, who is 31 years old and lives in Austin, Texas, where he works as radio systems planner for the Texas Parks and Wildlife Department. On the amateur scene, these accomplishments: president, past vice president, past secretary, Austin Amateur Radio Club; chairman, 1976 Texas VHF FM Society Convention; chairman, 1977 ARRL West Gulf Division Convention; assistant EC, Travis County; Navy MARS; RACES liaison station; trustee, WR5AIM; organizing committee, Weather Net; license-class instructor; Life Member, ARRL. Douglas is married to Michele, WB5KZC, and has been licensed since 1959.

The Roanoke Division picked Gay E. Milius, Jr., W4UG, a 65-year-old attorney from Virginia Beach, as its vice director over incumbent Donald B. Morris, W8JM, by 1568 to 1193 votes. Actually, Gay has "been there" before, as alternate director from the Hudson Division in 1949-1950. He was also an assistant director in Hudson earlier. A public relations assistant in the Roanoke Division, currently, W4UG has filled these other posts as well: past president, Westchester (NY) ARA; past president, Washington Mobile Radio Club; past president, Virginia Century Club; president, Virginia Beach ARC; past president, NAS Norfolk Radio Club; co-organizer, Maritime Mobile Service Net; USN Communications Certificate of Recognition, 1964; legal advisor, 1976 ARRL Roanoke Convention; CQ DX Advisory

Committee — and many other leadership roles not only in ham radio but in the legal profession as well. A Life Member of ARRL, Gay may be better recognized by his former calls, W2NJV and W4NJV.

George Diehl, W2IHA, won reelection as vice director of the Hudson Division, chalking up 2561 votes to 865 for George Hawrysko, K2AWA.

The New England Division staged a close one, picking John F. Lindholm, W1DGL, to continue as its vice director by a score of 1601 to 1506 for Fred E. Evans, W1JFF.

Bob Thurston, W7PGY, who has been director from the Northwestern Division since 1965, posted a 2216-to-1086 vote win over Mary E. Lewis, W7QGP, to continue in the position.

Also in the Northwestern Division, Dale T. Justice, K7WWR, was reelected as vice director with 2207 votes to 1051 for Dwight J. Albright, W7HLF.

As we reported in November, Director Stan Zak, K2SJO, of Hudson; John Sullivan, W1HHR, of New England; Phil Wicker, W4ACY, of Roanoke; Chic Cotterell, W0SIN, of Rocky Mountain and John R. Griggs, W6KW, of Southwestern; and Vice Director Maurice O. Carpenter, K0HRZ and Jay A. Holladay, W6EJJ, of Southwestern, all were reelected without membership balloting as the only candidates nominated by the members of their respective divisions for those posts.

On the 20th of this month, the directors new and old, will meet in East Hartford, Connecticut, to hear reports and take action for the continued good of amateur radio and the League. Now is the time for members to write their division director with suggestions for programs and policies they'd like to see enacted; names and addresses are on page 8 of this issue.

### NEW LEGAL RESEARCH GROUP

The doorbell rings. You sign with the JA on 20 and open the door. There stands a deputy with a summons. Seems your neighbor has been hearing you along with Bacharach and thinks your operating is, legally, a nuisance.

You go house-hunting. Ah, a nice development straddling the crest of the highest hill in town. But wait — what's this covenant barring above-ground utilities, outside wires, poles, antennas and towers?

Your friendly rival, Jim, WD6QRM, is taking all the DX away from you in pileups. Solution: Replace your folded dipole with a beam, on a 75-foot tower. But the town says 35 feet is all you can have, unless you fight through to a variance.

Of such things are the nightmares of amateurs composed — and one or another

happens to a few hundred hams and uncounted CBers each year. Hams have been able to call League hq. and get some raw material on past cases, the "Legal Kit." Sometimes we've been able to furnish the names of attorneys nearby who are amateurs, and who are interested in these problems. Sometimes our counsel, Bob Booth, W3PS, has been able to furnish specialized assistance. But the system is a bit random for amateurs, and is virtually unknown to CBers, who share our nightmares.

But now comes the beginning of an organized approach. A meeting during the ARRL National Convention was set up by the Program Committee. There an outline for a nonprofit legal research association was presented by Jon Gallo, WA6PTM, Dan Simon, WA6EJW and Fred Lawson, K6JAN, and received a favorable response. Two additional meetings, in September and October, resulted in the creation of the Personal Communications Foundation. PCF was incorporated on

November 5, 1976, under California nonprofit law and a Board of Trustees composed of lawyers and judges has been selected. Application has been made for tax-exempt status to both state and federal authorities.

#### A Provider of Tools Only

The purpose of PCF is to gather in one place the materials lawyers need to defend amateurs and CBers beset by zoning restrictions, building codes, nuisance suits, RFI/TV problems and the like. Eventually, it will have a list of attorneys which personal communicators can retain for these matters. There will be a library of briefs and a thorough index of previous cases in this field. What PCF is *not* probably equally important: It will *not* be a free lawyer for every ham and CBer."

John Gallo, WA6PTM, is chairman of the Board. Attorney Richard Arnold, W6RNP, vice chairman and Attorney Carl Marko, K5RLP, is executive director. They'll have help from a number of attorneys and judges

\*Manager, Membership Services, ARRL

who are already interested in legal problems peculiar to personal communications. But they also want and need the moral support of laymen who are interested in these problems beyond any immediate personal involvement, and who can help with liaison and committee work. Thus, membership is open to all licensed amateurs, all licensed CBers, and indeed, to anyone with an interest in electronics. A quarterly newsletter featuring developments on the legal frontiers of personal communications is planned. The foundation will actively seek the support of the personal communications industry since it has a definite stake in the favorable outcome of CB and amateur legal problems. And PCF will keep all the personal communications magazines informed on its activities.

Though the organization is based in California, the intent is to be nationwide in scope. Much of its work will be done through liaison committees linking PCF to the amateur fraternity, CB organizations, the Electronics Industries Association and FCC; and through working groups on, for instance, land use, TVI/RFI, federal preemption, nuisance, covenants, and such improper operation as deliberate interference within a personal communications service. Membership on the committees will be chosen insofar as possible on a geographic basis, with laymen as well as judges and attorneys eligible to serve where appropriate.

The founders have already earned their spurs, having invested hundreds of hours and thousands of dollars, in the interest of radio amateurs and CBers. Now, operators in the personal communications services can rally behind these founding fathers. Inquiries may go to Attorney Carl Markov, K6RLP, Executive Director, PCF, 915 West Lancaster Boulevard, Lancaster, California 93534.

## MORE ON PORTABLE AND MOBILE I-Ds

Last month we reported briefly that FCC had made the use of portable and mobile designators optional (that is, if I'm operating from my car I'm no longer required to say "W1UED mobile 1") and had dropped the requirement for advance notice by stations who expect to operate away from home for more than 15 days.

There seems to be one point of confusion which should be cleared up by this quotation from the Report and Order in Docket 20686:

"7) Another objection raised to elimination of the portable/mobile identification requirement, and an objection reflecting a serious misunderstanding of both the proposal and the Commission's Rules, contended that adoption of the portable/mobile identification proposal would result not merely in a limited de facto elimination of amateur call-sign areas, as we conceded in our Notice of Proposed Rule Making, but in the complete elimination of such call-sign areas. That is, it is claimed that amateur licensees moving permanently from one call-sign area to another would no longer be inclined to modify their station licenses to reflect their new station locations, because the incentive to do so — having to identify as a portable station, with its attendant inconvenience — would be gone. Such an objection ignores Section 97.95(a)(2) of the Rules. This section

states that when a station's permanent station location is changed, an application for modification of station license "must be submitted to the Commission prior to any operation and within four months of the move . . ." We have not proposed deletion of Section 97.95(a)(2) of the Rules, and we stress the requirements of that section: Those amateur licensees permanently changing their station locations must modify their licenses to reflect the changes."

The following changes have been made to the Rules in this matter:

1) In 97.87, paragraphs (b) and (c) are deleted, paragraphs (d), (e), (f) and (g) are redesignated (b), (c), (d) and (e), respectively, and paragraph (h) is revised and redesignated paragraph (f) as follows:  
97.87 Station identification.

(f) The identification required by this section shall be given on each frequency being utilized for transmission and shall be transmitted either by telegraphy using the international Morse code, or by telephony using the English language. If the identification required by this section is made by an automatic device used only for identification by telegraphy, the code speed shall not exceed 20 words per minute. The use of a nationally or internationally recognized standard phonetic alphabet as an aid for correct telephone identification is encouraged.

2) In 97.95, paragraph (a)(3) and paragraph (b)(3) are deleted.

3) 97.97 is deleted.

4) In Section 97.99, paragraph (c) is deleted and paragraph (d) is redesignated paragraph (c), as follows:  
Special Provisions.

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

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

5) In 97.311, paragraph (c) is deleted.

## ADVISORY COMMITTEE APPOINTMENTS

President Dannals has announced the makeup of the *Advisory Committees for 1977*. New to the Repeater Committee are W3EZT and WA4WXT. Others continuing to serve are W1GXT, WA2GCX, W5NSQ (chairman), W6GO, WA7WMC, W8GRG, K9LSB, K0TVO and VE3BBW. The Contest Advisory Committee's newcomers are K3ZO, K4PJ and WA7WXY who join WA1SSH, W2FVS, W5MYA, K6YNB (new chairman), K8HLR, W9LTF, W0TR (changed call from WA0CVS) and VE7CC. W3ZNH and W4WSF have been named to the DX Advisory Committee. Others in the group are W1DAL, K2BZT, K5FVA (chairman), W6NJU, W7YTN, WA8ZDF, W9KNI, K0HUD and VE3QA. The Emergency Communications Advisory Committee continues with K1UAQ, WB2EDT, W3PST, WA4PBG, K5SYD as chairman, W6INI, W7IEU, WA8NDY, W9QBH, W0PB and VE5CU as members. More info later.

## BEHIND THE DIAMOND

The pendulum this month swings to the Technical Department, and we introduce to you, *Jerry Hall, K1PLP*, associate technical

editor for *QST*. Jerry has been with ARRL since 1969, first as assistant technical editor, and he was promoted to his present position in February 1973. Jerry is perhaps best known for his work as editor of both the *ARRL Antenna Book* and *Specialized Communications Techniques*. He most recently coauthored (with Chuck Watts, WA6GVC/1) the series "Learning to Work with Integrated Circuits," which ran in eight issues of *QST* during 1976.



Jerry Hall, K1PLP

Before coming to the League, Jerry was a field engineer for Raytheon Company, and in this job he traveled extensively. This is evidenced by the many calls he has held through the years: K0DDW, K51DZ, VP7BK, KZ5DD, KH6EGL, KH6EGQ and K1PLP. Jerry spent 13 years with Raytheon, working chiefly on studies of propagation anomalies of the ionosphere. He gained much experience, both practical and theoretical, with transmission lines and "exotic" antennas such as rhombics, log-periodic arrays, and Sterba curtains. His background has served him well, for he has written many articles on antenna design, propagation and varied electronic circuits. He won the May 1965 *QST* Cover Plaque Award for his article, "The KH6EGL Frequency Standard."

Throughout his travels Jerry has always been at the forefront of amateur radio activity. He received the Public Service Award for his activities during Typhoon Karen in 1962. He made the first two-way, 160-meter contact between the Midway Islands and the U.S. mainland on February 21, 1963, when such operation was first authorized. And during his stay in Hawaii he was Phone Activities Manager and held appointments as Official Observer and Official Bulletin Station.

Jerry resides in Wethersfield, CT, with his wife Caroline. They have four children: Kenneth, Susan, Julie, and Mark. Jerry is very active in the United Methodist Church; he is financial secretary and past chairman of the Council on Ministries, and a member of the adult choir and handbell choir.

Jerry's other pastimes include camping with his family, and amateur astronomy. He also enjoys making his own wine ("strictly legal," he says). Jerry has recently programmed his HP-25 hand-held calculator to play Blackjack; this is not as easy as it sounds, since the program uses all available memory and storage space of the calculator, and a pseudo-random number generator. He did this on his own time, of course, but we can't help wondering if this isn't somehow related to his wine-making hobby. We choose to reserve judgment at this time. — *K1FHN* QST

# YL News and Views

Conducted By Louise Moreau,\* W3WRE



## CLARA—10th Anniversary

The formation of a national club was a "centennial" project of the Ontario Trilliums in 1967. The name CLARA (Canadian Ladies Amateur Radio Association) was chosen because, according to VE3GJH, "the acronym illustrates the meaning - a YL club with a YL name."

The past 10 years have been years of growth: The one-page newsletter in *TOT Topics* grew into the club newsletter *The Clarion*, an acronym for Canadian Ladies Terms of News. A floral emblem was selected for use on club certificates, stickers, pins and patches. Spurred on by assistance at the Midwest YL Convention in 1969, club activity mushroomed: formation of the CLARA Net, sponsoring a walkathon, the first Canadian YL Directory, activity in Field Day, the AC-DC Contest, manning amateur radio booths at science fairs, handling traffic for NWT, assistance with "Operation Santa Claus," and the first CLARA mini-convention in Calgary.

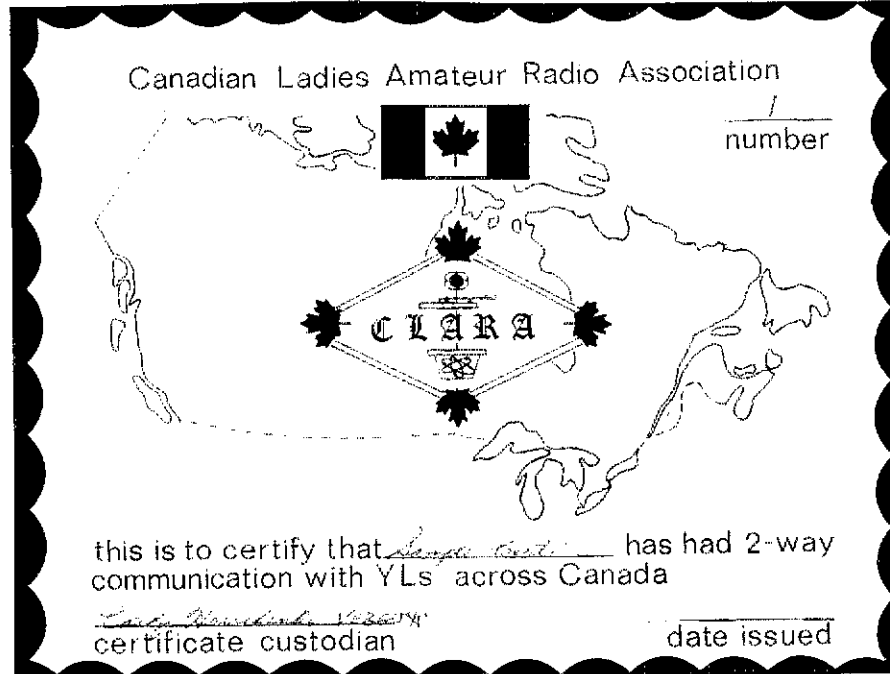
CLARA has initiated a DX YL program whereby a DX YL may be sponsored into the club by a Canadian member. Membership is open to all licensed Canadian YLs and at present all provinces are represented in the club.

Several certificates are sponsored. CLARA is awarded for working YLs across Canada; DXCC-YL, for working 100 YLs in 100 DX countries; and Worked Canadian Families, for working all licensed members of Canadian YL families. The CLARA certificate custodian is

Cathy Hrischenko, VE3GJH.

In 1977, the 10th anniversary of CLARA will be celebrated at a mini-convention and

special YL luncheon within the ARR National Convention to be held in Toronto, Ontario, in June.



CLARA Certificate. Awarded for proof of working VE YL operators across Canada.

## 1976 HOWDY DAYS CONTEST RESULTS

The winners were WA6WZN, 82, YLRL member; LX1TL, 61, non-YLRL member. Scores: W2GLB 78, WA1UJV 75, DJ1TE 74, DJ1EIC 73, K4RNS 59, HB0ARC 59, WB4PXN 57, DK5TT 53, DJ0EK 42, WA4ORK 43, DK2KD 30, WB4FYU 29, WB0JFF 27, DF2KG 27, WA2VIE 23, PY1IFI 23, F5RC 21, PA0HIL 19, WA2DMK 15, WA2RXO 8. Confirmation logs were submitted by DL3LS and DK1HH.

## YLRL DECALS

Beginning in 1977 YLRL will offer decals for use of the membership. These emblems - suitable for use on notebooks and windows or for framing for the shack - will feature the "girl-on-the-world" emblem of *YL Harmonics*, official publication of the club. Priced at 3 for \$1, emblem sale proceeds will be used in the YLRL general fund.

## SOWP YL MEMBERS

The Society of Wireless Pioneers, an organization of communications people who have been commercial operators, now includes 10 women amateur operators. VE3AHV, Barbara Bareham, is the only DX YL member of the group. Others are WA2FGS, W3WRE, W4CQL, W6BDE, WA6LVZ, W6RZA, W6SH,

WB6ZSE, W8NAL. Marie de Forest, WB6ZJR, has been given honorary membership.



VE3GJH, Cathy Hrischenko, active past president of CLARA, and custodian of the club certificates, with OM George, VE3DGX.

## WAS-YL REQUIREMENTS

To answer the many requests this column has received for WAS-YL requirements, the rule require contact with licensed YLs in all states (the District of Columbia may be substituted for Maryland). Send QSLs an alphabetical-by-state list showing calls, date and type of emission with sufficient postage to finance return of QSLs by first class mail to the certificate custodian: Agnes Helsinki, WA3GBJ, RD4 McClain/Timber Road, Belle Vernon, PA 15012.

## FEEDBACK

The call of YLRL 1976 President Myra Cunningham is WA6ISY and not WA6ISQ indicated in "YL News and Views," *QST* November, 1976.

## CQ YL SUPPLEMENTS AVAILABLE

The only work about YLRL and YLs in amateur radio has been updated and is now available. Supplemental pages, slotted for insertion in the book's spiral binder, contain YL material on the 7th international YL Convention of June, 1976, and the YLRL officers up to date through 1977. Those who are interested may acquire the supplement for \$1 from the author/publisher Lou Sando, W5RZJ, 9412 Rio Grande Blvd., N. Albuquerque, NM 87114. The book including the 1977 additions is also available from W5RZJ for \$3.50. This very comprehensive history of YLs is a "must" for a library.

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

## K2UN: Uniting Humanity

The United Nations Amateur Radio Club became the focal point for the historic inauguration of station K2UN on the morning of October 21st. The ceremonies were highlighted by the presence of Mr. Mohamed Mili, the secretary-general of the International Telecommunications Union. He was introduced by Max de Henseler, HB9RS/W2, president of the UNARC. Max fittingly quoted the secretary-general's remarks from the IARU Region I Conference in Warsaw, pointing out that the very presence of the secretary-general of the ITU at the inauguration of K2UN "confirms one of the most important objectives of amateur radio, which is, if I may use your own words, '... an international cooperation which has forged a chain of human brotherhood between all those who by taste or through dedication are devoting the greater part of their leisure time to seeking human contact over the continents and seas beyond differences of language, nationality, religion and political systems.'"

Mr. Mili saluted the humanitarian services rendered by ham operators the world over. But he seemed particularly pleased with the results of radio amateurs' involvement in propagation studies. After observing that the study of propagation theory is in itself a "long and tedious process," the secretary-general expressed his own gratitude, as well as that of the ITU, for scientific work done so far in this field by hams.

ARRL President Harry Dannals, W2TUK/W2HD, also spoke to the distinguished assembly. Harry urged that K2UN set an example to the world of good operating practices and international friendship. "But the most important purpose," said the League's chief executive, "is to use the station to teach people from new and developing countries just what amateur radio is all about."

## JAPAN: FIFTY YEARS OF AMATEUR RADIO

In September the Japan Amateur Radio League celebrated its 50th anniversary with week-long ceremonies in Tokyo. JARL is one of the world's larger amateur societies, with an active and involved membership and a large and dedicated headquarters staff. Equally dedicated are the directors and officers of JARL, with Shozo Hara, JA1AN, as president. Special commemorative ceremonies in Tokyo were attended by about 350 prominent Japanese amateurs, as well as a number of overseas guests. The Royal Crown Prince was also in attendance. Representing various other amateur societies were G3FKM, president of RSGB; VK3KI of WIA and IARU Region 3; ZL2AZ of NZART; VS6GG of HARTS; 4S7EA of RSSL; HS1WR of RAST; HM1BO and HM1FM of KARL; F6CAG of

\*International Services Assistant, ARRL



Mr. Mohamed Mili, secretary-general of the ITU, signs the inaugural log of K2UN, as United Nations Amateur Radio Club President Max de Henseler, HB9RS/W2, looks on. (Photo courtesy of United Nations)

Equipped with three complete stations, K2UN can be operated on all bands from hf through vhf. The equipment was generously loaned by Yaesu-Musen USA, Inc. and by Hy-Gain Electronics Company.

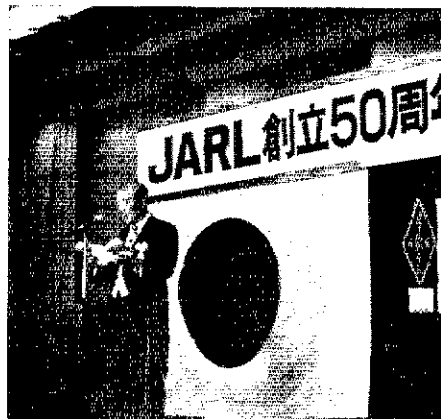
We mentioned above that this was an "historic inauguration"; the words were chosen by the secretary-general himself. In his remarks, Mr. Mili pointed out that the principles of the United Nations are consonant with the role of amateur radio — transcending barriers of language, religion and politics — and that he was pleased that K2UN had been instituted to further these princi-

ples. He struck a vibrant and almost dramatic chord when, after mentioning that all of humanity must be considered as one indivisible whole, Mr. Mili expressed his firm belief that it has been the dream of all the great prophets and philosophers to realize this goal practically. "... I'm sure that if Buddha, Jesus, Mohammed, Socrates, or any of the great philosophers had been able to use amateur radio they would have been delighted, because their fundamental purpose was to arouse all of humanity to consider itself as one indivisible whole. And thanks to amateur radio, this is coming into fruition . . ."

REF; DJ2NH and DL6CG of DARC; and W1RU of ARRL.

In addition to the 50th anniversary celebrations, JA1AN arranged for the overseas guests to address a gathering of Japanese amateurs on the state of amateur radio in the respective countries, while VK3KI and W1RU described WARC preparations on a regional and international level. At the end of the week, the overseas guests went to the foot of Mt. Fuji, where the second annual JA Hamvention was in progress. It was just like hamventions everywhere, with thousands of Japanese amateurs roaming around looking at the new gear on display and snapping up the fabulous bargains in the giant flea market!

The whole week was exceedingly well organized and was a further demonstration of the strength and vitality of JARL and a further indication of the support that amateur radio throughout the world can expect from JARL in preparation for WARC-79. **QST**



JA1AN, Shozo Hara, president of JARL, addressing the formal assembly on the occasion of the 50th anniversary of the Japan Amateur Radio League.

# Correspondence

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

## LEADING THE WAY

□ Just finished your "It Seems to Us" in the November QST and am moved to comment. FB job on the overview and update for those of us who may have been inactive these past few years. Readers who take time to reflect on what you have said will be prepared for the inevitable compromises and individual gains and losses at WARC. Perhaps it is also apparent that to "get along, we must go along" in coalitions which are not in phase lock with our own goals.

Perhaps most importantly, you have conveyed the impression that the ARRL through its membership has led, is leading and will continue to lead the fight for the amateur's interests at WARC. That is pretty heady stuff, considering that we are being defended by volunteer amateurs. But then in 1976, we also were being defended by a loosely knit gathering of volunteer amateurs! Keep your powder dry! — Paul Herndon, K4JLS, Ridge Spring, SC

□ On September 29, 1976, a meeting was held between representatives of the Canadian Radio Television Planning Board and DOC for the purpose of discussing proposals of how to rearrange the frequency allocations between 406 and 960 MHz. This report and those of further meetings will be used as a guide by the DOC to arrive at a final policy to be presented at WARC. From the outcome of the meeting we have learned that 420 to 430 might still be used on a shared basis. The top part from 440 to 450 would be taken away from us to be used by satellite services. This leaves us with 430 to 440 that we can call our own. There are five repeaters and 37 repeater links in operation in the Toronto-Hamilton area. Also, amateur fast-scan TV is quite active in this area. The first amateur TV repeater (VE3TVR) in Canada is being built here and more are on the way.

To my way of thinking, we are just beginning to make use of a giant sleeper. Too bad that we might lose it at WARC, before we have a chance to use it. I suggest we all rally together and try to save this band, because once it is gone, we will never get it back. Discuss it on the air and at your next club meeting. Write letters, ask your club to write letters, and support your amateur organizations. United we stand, divided we fall. — John Vanderryd, VE3CYC, Hamilton, ON

## PROPAGATION PRAISE

□ The bulletin is much more comprehensive than others that I have copied in the past and consequently of much more value. Thank you. — Fred Becker, W1ZH, I copied bulletin number one on RTTY at 2130 UTC, 18 October, 1976, on 20 meters. This service will be very helpful to me. — WB8DVJ. Bravo! Your new WIAW propagation forecast is great. — Harold W. Cornelius, W8ZRY. Yes, I like the new propagation service very much. — W1VRK It certainly fills a need in view of reduced WWV activity in this area. — K4QAM. I think your new propagation bulletins are an excellent idea, particularly at the start of the new cycle. — Richie Dyrack, K2LUQ. I find the propagation forecast bulletins very in-

formational. — Woody Minar, WA1YUZ. You have really filled a long-felt need with the new propagation bulletins. I found the WWV information useful but like the broader coverage in the WIAW format. — Myron Steffy

## GRIPPING GRIPES

□ I am in about 100-percent agreement with Cliff Fleury's letter in the October issue. It seems when the ARRL or FCC decides privileges are to be removed, the General class receives the brunt of it. I dropped out of the ARRL when they advocated their ill-advised incentive-licensing program some years ago. I will rejoin when the League decides it is time to return these privileges to the General class licensee and does something about it. — John Engel, W3UUH, Pittsburgh, PA

□ One of the most important aspects of amateur radio licensing is incentive licensing. It has helped keep high standards of operation in amateur radio. I question whether or not there are any substantial incentives left for Novices to upgrade. When I was a Novice, just five years ago, I had tremendous incentives for upgrading my license. I was limited to 75 watts and crystal control. Having a call sign that identified me as a Novice offered a substantial reason for upgrading my license. The only real incentives left for a Novice to upgrade are increased power, access to more frequencies, and a shorter call (with the Extra). The FCC should not take away any more amateur radio licensing incentives. They should reinstate special Novice call signs and any other incentives possible. — Mickey Driver, WBSIXN, Houston, TX

□ Has the FCC ever done anything so close to perfection that QST did not have criticism of what was done? — Edward C. Jones, Jr., WB2DVL, Somerset, NJ

## INSTANT TEMPORARY

□ I think the assigning of new calls to Novices is somewhat of a joke. I agree entirely with what the FCC is trying to do, but when it comes to an instance like mine, I just don't understand. I was recently assigned WB2CPV as my new Novice call. Just a week ago I took my General class test and passed it. Now I have to wait and wait and wait for my new license for General class privileges, but I still have the same call. My question is why can't the FCC examiner issue you an instant temporary license after passing the test? It sure would eliminate the needless waiting for a new license. — William Crews, WB2CPV/4, Jacksonville, FL

## EXCITED AND ENTHUSIASTIC

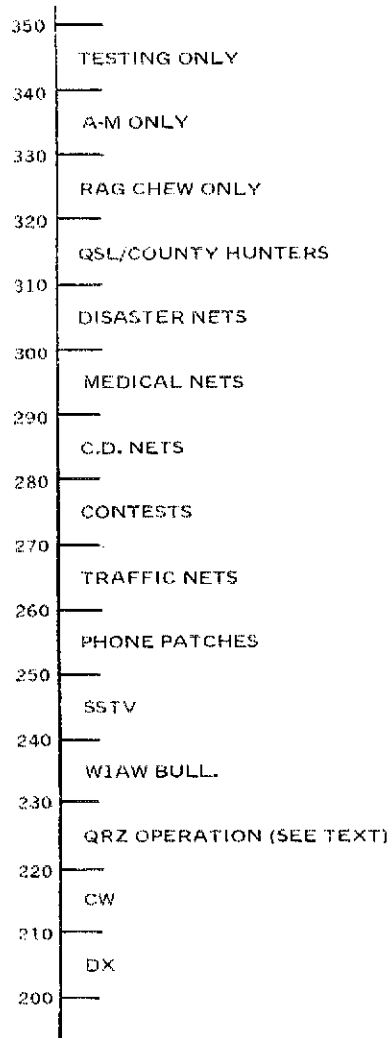
□ I have just recently registered a Novice study class with Headquarters and have received the lesson plans and student handout materials. My class will be 10- to 13-year-olds. There will be about 15 in the class. We plan to use *Tune in the World* for our student study materials. The kids are all excited and enthusi-

astic about getting started. I am quite impressed with the materials sent to me and am looking forward to teaching my first group of amateurs. Thank you for this excellent, much-needed service. It makes me even prouder to be a member of the League. — Neal S. Morris, KQTV, Carbondale, CO

## QRZ THE BAND PLAN?

□ Having spent a miserable weekend with little to do (not my wife's opinion), I tried to do my thing on one of the more popular ham bands. I found there were many other hams trying to do their thing also. Now it seems that they all had different things to do. That's one great thing about ham radio, we all find our niche. Why not consider giving each group of hams that do their very own thing a special niche in the band (see K4BZD's proposed frequency allocation chart). This arrangement could make it easier for all groups to do their thing and, hopefully, easier for me to do my thing (again, not my wife's opinion!). What is my thing? I like to tune up and down the band looking for operators who get on the air and say, "QRZ the frequency." Although I've never heard the frequency come back to them, I keep listening. I need a QSL from there bad! Let's establish a frequency application plan so that each of us can do our thing. — Ed Faber, K4BZD, Columbia, SC

Proposed Frequency Allocation Chart



# Washington Mailbox

Q. Starting November 26, 1976, new rules went into effect governing portable and mobile operation of amateur stations. Can you briefly summarize these new rules?

A. There are two main points to the new rules. First, a U.S. amateur need no longer notify the FCC of portable operation, regardless of the duration of the portable operation (under the old rules, notice was required if the intended portable operation exceeded 15 days). Second, U.S. amateurs operating their stations portable or mobile within the U.S. need no longer identify their transmissions as originating from portable or mobile locations.

Q. In essence, then, there are no new rules; the FCC is simply deleting old rules that are no longer necessary. Right?

A. That is correct. The FCC is committed to deregulation of the Amateur Radio Service. This means that the Commission is seeking to eliminate, consistent with the public interest, those rules and regulations which are not absolutely essential to the proper administration of the Amateur Radio Service. The rules governing notice of intended portable operation and portable and mobile identification procedures have never been shown to be of use to the Commission in enforcing its rules.

An amateur may still identify his station as portable or mobile if he chooses to do so, but it is strictly the amateur's choice; there is no longer an FCC requirement to do so.

Indeed, there may be times when it is advantageous to the amateur to indicate his portable or mobile status; for example, during operating contests, or when determining radio wave propagation conditions.

Q. Do U.S. amateurs have to notify the FCC of intended operation outside of the U.S.?

A. No. Of course, a reciprocal operating permit must be obtained from the country in which the U.S. amateur intends to operate, but the FCC need not be notified.

Q. What about an alien amateur operating in the U.S. under a reciprocal permit issued by the FCC? Formerly he would have to transmit the call sign issued to him by his country's licensing authorities followed by a slant sign (/) and the U.S. amateur call sign prefix letter (or letters) and number appropriate to the location of his station (for example, VE1SH operating in Maryland would sign VE1SH/W3). How would he be affected by the new rules?

A. Alien amateurs operating in the U.S. must still follow the above identification procedures; however, they are freed from the requirement of giving advance notice of portable operation within the U.S. (97.313).

In all cases, whether the amateur was originally licensed by the FCC, or the holder of a reciprocal permit issued by the FCC, he

must be sure that the FCC has a record of his current mailing address. The Commission must have a way of getting in touch with a licensee in case a violation occurs (97.42).

Q. Under the old rules, when an amateur changed his permanent station location, he had an incentive to modify his station license to show that new location; otherwise he would have to indicate his portable status whenever he identified, and this is generally regarded as inconvenient. Under the rules as now stated, this incentive would no longer be there. Is it the FCC's intention that an amateur need no longer modify his license when moving to a new permanent station location?

A. No, it is not. Many amateurs have raised this question, and it reflects a serious misunderstanding of this rule's deletion, and of the FCC's rules in general. In fact, section 97.95 (a) (2) of the FCC rules says that when a licensee changes his or her station's permanent location, an application for modification of the station license must be submitted to the Commission. This rule has not been deleted. Those amateur licensees who intend to permanently change their station location must modify their licenses to reflect this change.

[Note: Send your FCC questions to Hal Steinman, K1FHN, ARRL, Newington, CT 06111. Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL, have been approved by FCC staff. Interpretations contained herein concur with those of the Amateur and Citizens Division of the FCC. Numbers in parentheses refer to specific sections of the FCC rules.]

QST

## Coming Conventions

January 22-23

Florida State, Miami, FL

February 12-13

Southeastern Division, Orlando, FL

May 21-22

New York State, Rochester, NY

May 21-22

Wisconsin State, Lake Delton, WI

May 28-29

Tennessee State, Knoxville, TN

June 3-5

ARRL National, Toronto, Ontario

June 18-19

Georgia State, Atlanta, GA

July 2-3

West Virginia State, Jackson's Mill, WV

July 9-10

Roanoke Division, Norfolk, VA

July 16-17

West Gulf Division, Austin, TX

July 30-31

Northwestern Division, Seattle, WA

September 23-25

New England Division, Hartford, CT

October 7-9

Midwest Division, Wichita, KS

October 7-9

Southwestern Division, Santa Maria, CA

### FLORIDA STATE CONVENTION/ TROPICAL HAMBOREE

January 22-23, 1977, Miami, Florida

The old adage, "two's company, three's a crowd," goes up in smoke during the weekend

of January 22-23: Sunny Miami, ARRL and Hamboree are the winning threesome for 1977. Grab the XYL and your friends; take that winter vacation with ham fun, too. Miami and Miami Beach attractions provide interesting activities before, during and after Hamboree - Se aquarium, Vizcaya, Museum of Science and Planetarium, dog racing, horse racing, Jai Alai and Theater of Performing Arts for a start. Visit W4NVU at the Museum of Science. A drive to historic Key West via the Overseas Highway will be a long-remembered experience. How about a trip to the Caribbean following the convention? Tours by air and sea depart regularly from Miami.

Convention activities will be held at the Miami Municipal Auditorium, 499 Biscayne Boulevard (U.S. 1). The program will cover all interests in amateur radio. Special presentations will be given by Armin Meyer, W3ACE, former U.S. Ambassador to Japan, Iran and Lebanon; Ellen White, W1YL, ARRL deputy communications manager, and Perry F. Williams, W1UED, manager, Membership Services, ARRL hq. The ARRL Forum will be conducted by Larry Price, W4RA, Southeastern Division director, with latest news from the January ARRL Board Meeting.

Manufacturers and distributors will display all their bright, shiny, new equipment. The traditional Hamboree Swap Shop will be jammed with every imaginable item you may wish to obtain. Exhibits and meetings have been planned by AMSAT, QSL Bureaus, MARS, nets and clubs. Main prize awards include two hf transceivers, two vhf transceivers and two linears, plus many more each hour. The ladies have not been forgotten as the program includes exhibits and demonstrations for them, as well as a main award of a one-carat diamond ring, with other goodies every hour.

Special hotel rates have been obtained from the following: *Howard Johnson Downtown Motor Lodge*, 200 S.E. 2nd Avenue,

Miami, Florida 33131. Rates: \$25 single, \$29 double, \$33 triple, \$37 quad. One-night deposit in advance required. Toll-free number (specify Tropical Hamboree) 800-654-2000. Deposits may be made in your area through H. J. Reserve-a-Check or sent directly to hotel. *Dupont Plaza Hotel*, 300 Biscayne Boulevard Way, Miami, Florida 33131. Rates: \$25 single, \$29 double. No deposit required if arrival before 6 P.M. Special reservation card must be used, send request to Hamboree Committee.

To guarantee special rates all reservations for hotels should be in by January 10, 1977.

Convention sponsors will provide courtesy bus service Saturday and Sunday from hotels to the auditorium and from nearby parking lots should auditorium parking be filled.

Convention/Hamboree Registration - \$2 advance, \$2.50 at door. Swap tables: \$3 per table, 1 day or \$5 per table, 2 days.

Checks for registration and swap tables should be made payable to Dade Radio Club and mailed with request to Convention/Hamboree Committee, P. O. Box 520073, Biscayne Annex, Miami, Florida 33152.

### SOUTHEASTERN DIVISION CONVENTION

February 12-13, 1977, Orlando, Florida

The Orlando Amateur Radio Club is able to trace its history of hamfests back to the "fabulous twenties" as described in one of the issues of *QST* of that period - and it is with great pride that O.A.R.C. announces its second annual "Hamcation" and is honored to present the ARRL Southeastern Division Convention.

"Hamcation 77" promises to eclipse all previous Orlando hamfests. A hard-working committee headed by General Chairman Al Canning, WB4HAK, has scheduled many attractions and events to entice hams to plan their family vacation in the Orlando area

where all members of the family can enjoy the wonders of Disney World, Sea World, Circus World, Cape Kennedy and the Atlantic and Gulf beaches. Last year's event brought visitors from 35 states and seven foreign countries.

The convention will host ARRL President Harry Dannals, W2HD, Lew McCoy, W1ICP and Larry Price, W4RA, Southeastern Division director. Forums are scheduled on Saturday from 1 to 4 P.M. The ARRL will also have a large display booth exhibiting publications and miscellaneous items.

The Antique Wireless Association will sponsor their Southern Regional Convention in cooperation with "Hamcation 77." A large exhibit of early wireless gear will be displayed and a gathering of "olde tyme" radio aficionados is scheduled.

The site of "Hamcation 77" is the same as 1976, except O.A.R.C. has contracted for the entire Sheraton Twin Towers Convention Center with approximately 50,000 square feet of exhibition area. There will be 350 swap tables available starting Friday evening at 6 P.M. At this writing, over 50 exhibitors have signified their intention of displaying all their latest products. The Ladies Program Committees have planned many innovations to keep the ladies occupied with demonstrations, fashion shows and shopping trips to the many wonderful areas near Orlando.

In cooperation with the Miami office, FCC will conduct examinations for Novice and upgrading. All applications must be made by January 21 on FCC form 610. Both check or money order for \$4 and form 610 should then be sent to: FCC, 51 S.W. First Avenue,

Miami, Florida 33130. Please note on application that the exam will be taken at the ARRL Southeastern Division Convention, Orlando, Florida, on February 12-13, 1977. FCC officials are also scheduled for forums during the "Hamcation."

For Sheraton Twin Towers reservations write directly to: The Sheraton Towers, 5780 Major Blvd., Orlando, Florida 32805. Rooms - single \$28, double \$36 per day. For a complete hamfest information package including nearby hotel/motel rates and other detailed information, please send s.a.s.c. to Hamfest Secretary, Georgia Denman, K4ZXS 405 Enka Way, Orlando, Florida 32811.

PLAN NOW! Treat yourself to a real ham vacation in sunny Florida and let your family make you think you are the only one enjoying it! (P.S. Disney World, etc.!!!) **QST**

## Hamfest Calendar

**Indiana:** The Annual Fort Wayne Winter Hamfest is at Shiloh Hall, north of Fort Wayne on January 23, from 8 A.M.-4 P.M. local time. Early parking is available. This yearly event is sponsored by the Allen County Amateur Radio Technical Society (AC-

ARTS). Admission \$1.50 advanced; \$2 at door. Table space is available at \$1 per half table (about 4 ft). For info or tickets (table reservations held until 9:30) write Hamfest Chairman, AC-ARTS, Inc., P. O. Box 342, Fort Wayne, IN 46801.

**Ohio:** A Mid-Winter Hamfest Auction is February 6 at the Richland County Fairgrounds, Mansfield. Flea market, auction. Large heated building. Doors open at 8 A.M. Talk-in 34/94 and 52/52. Tickets \$1.50 in advance; \$2 at door. Contact Harry Fritchen, K8JPF, 120 Homewood, Mansfield, OH 44906 or phone 419-529-2801 or 419-529-1441.

**Texas:** The Texas VHF-FM Society's

winter meeting is February 4-6 at the Holiday Inn, Emerald Beach, 1102 S. Shoreline, Corpus Christi. For further info write James Linthicum, W5LCN, 1802 Daly, Corpus Christi, TX 78412.

**Wisconsin:** The 5th annual Mid-Winter Swapfest of the West Allis Radio Amateur Club is Saturday, January 22, at 8 A.M. at the Waukesha County Expo Center. Tickets \$1.50 advanced; \$2 at door. Reserved tables by advanced reservation only - \$1.50 per 4-ft table. Nonreserved tables; first-come, first-served. Talk-in on 146.52 MHz. Directions 1-94 to Waukesha Co. F. south to FT. west to Expo. For info and tickets write WARAC, P. O. Box 1072, Milwaukee, WI 53201. **QST**

## Strays



### JAMBOREE ON THE AIR

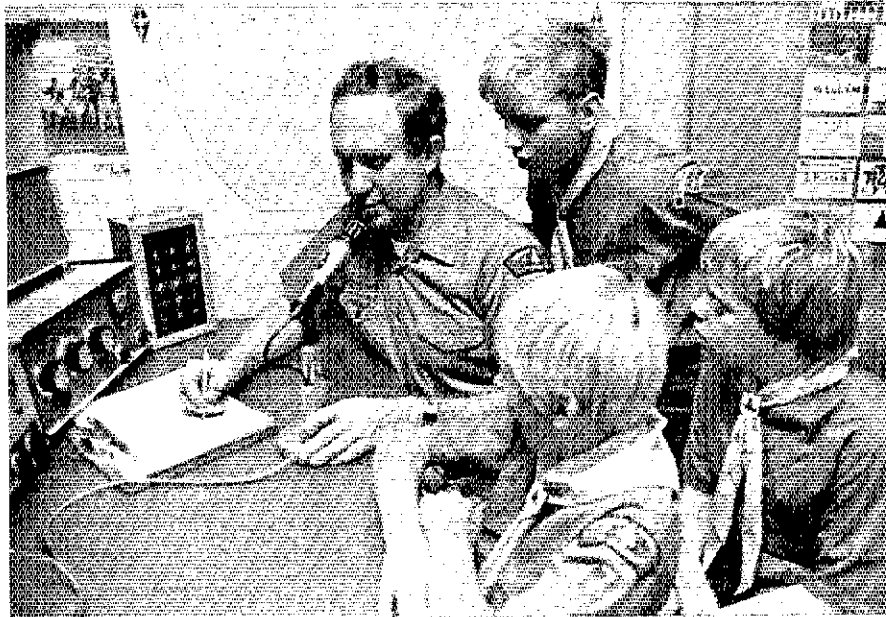
o "How do you camp out?" "What merit badges do you have?" Scouts all around the country and world got a first-hand look at amateur radio during the annual Boy Scout Jamboree On The Air (JOTA) held the

weekend of October 16-17, 1976. Not a contest, the activity is designed to promote comparisons and contrasts among Scouts. Some units made it part of other events. At the Explorer Air Show in Pascagoula, MS, KMSBSA was operated by the Jackson County (MS) Amateur Radio Club, the Mississippi

Coast Amateur Radio Association, and the Mobile (AL) Amateur Radio Club, Inc. The demonstration included OSCAR communications. Up in Champaign, IL, the Scoutmaster of Troop 7, K9QZ1, operated portable from their camp during an Order of the Arrow meeting.



Among the worldwide participants of JOTA were these Scouts from High Wycombe in Buckinghamshire, England, together here at G2DRT. (Geoff Gomme photo)



Scouts of Troop 7 in Champaign, IL, gather at K9QZ1 to participate in JOTA. (John Dixon photo)



# FM Repeater News

Conducted By Lew McCoy,\* W1ICP/WR1ABH

## Self-Policing—Are We?

It is a sad commentary on our times when a fine repeater like the Mount Wilson machine, WR6ABE, has to take the action it has. What are we talking about? Read the following news release from WR6ABE.

### Open Letter to All MWRA Members

WR6ABE will be leaving the air for 60 days. This letter explains the background leading up to this action and some future considerations on the operation of ABE.

For the last two to three years, the operation on ABE has been slowly deteriorating. Burt has always felt that his repeater should be fun and enjoyable with a relaxed operation that would encourage casual conversation and a pleasant, easy-going interaction between users. But this same casual, relaxed operation that is so enjoyable (if used by adult "caring" people), is also attractive to certain people. These people only enjoy taking advantage of this relaxed state to dominate or abuse other operators. The relaxed state is not conducive to correcting (or educating) these people who do not seem to possess any feelings for other people, but in fact, this state seems to attract them.

In general, the "good" users will not compete with these individuals and will (and have) simply move to another repeater or go away altogether. Burt, with all good intentions, has insisted that the repeater stay on, that he would keep it on and that the users (through the MWRA) control the misfits. This approach has proven to be almost totally unsuccessful. The situation has only worsened.

The present state of the repeater can best be described by the current feelings of Burt. He called me last Monday (Oct. 18), after a particularly bad Sunday, and said (almost in tears), "I have spent 15 years of my life getting what I consider a good operating repeater working and reliable and I can't stand to listen to it. It is almost entirely dominated by drunkards, mentally deranged sickies and individuals who have no feelings for their fellowman whatever. I will not put up with it anymore. Unless you want to take over the mess I will turn it off forever." His observation of the types of individuals using the repeater may be a little severe, but something is surely wrong. I don't enjoy listening or using the repeater either. It has deteriorated far below the amateur practice of courtesy and goodwill to fellowman and, in my opinion, has even dropped below typical CB operation in Los Angeles. It's abominable.

Monday's telephone conversation between Burt and myself continued and it became very clear to me that not only was Burt serious about turning it off, he was even more serious about removing his personal involvement from the responsibility of the day-to-day operation. I have, for the last five years or so, had control privileges on ABE but have always tried to follow the basic desires of

Burt and even though I have not always agreed, the control of the repeater has, in general, stayed within these guidelines.

Over the last several months (years), various techniques have been tried to correct the operating practices of certain individuals. None have been universally successful. At the present time, about 12 people dominate the repeater, almost all from base stations, and all operate without significant regard for other users. Not that their operation is grossly illegal in the FCC sense, they i-d and will occasionally even let breaking stations through, but their conduct, language and subject matter are, in general, deplorable and obnoxious, or at least selfish. The overall complaint could best be described by stating that these individuals use the repeater for their own platform. It is their only outlet for their mental frustrations (which appear to be extensive). They are parasites in that they use the repeater (and some users), rather than utilize the repeater and talk with its users.

Before assuming the responsibility offered by Burt, I requested advice from a number of amateurs I consider to be concerned, unselfish and mature people. All agreed that the problem is deplorable but almost all agreed that there are good amateurs on two meters and that they would return to ABE if it could be "cleaned up." Not all users on two meters are poor or inferior operators. Even those that came to "two" directly from CB without passing GO, came because ham radio offered something better (not found on ABE, however). There is hope.

Along with responsibility comes authority. Burt is too nice; too sensitive. He cares about the feelings of everybody. Well, I don't. But I am going to do everything I can to improve ABE — to restore it to the proud, clean and constructive repeater it should be. (This must be an election year!)

My first act is to remove the repeater from the air for 60 days. My analysis of our parasites has indicated that they need and require a host. Removing the repeater from the air will require them to seek another host. They will migrate to other repeaters and with luck, they will like it there and stay there. ABE will leave the air at midnight, October 31, 1976, and will return the morning of January 1, 1977. This is only a start. When the repeater returns next year, it will be different.

The repeater will be forced to behave. A tight group of control operators will be trained and "ordained." This group will have the power to enforce (by various means, including shutting off the repeater) certain rules on the operation and behavior that will be used on the repeater. Subject matter will be censored as well as language and operating procedures. Freedom of speech and "right-to-use" will have no precedence. The decision of the control operators is absolute and without appeal. If you don't like it, use some other repeater. This difficult, arbitrary and strict control will last for as long as it takes. It is

hoped that out of the war will emerge a group of users with an attitude and behavioral pattern that will set a new standard for ABE. Those that are attracted to a tightly controlled repeater will survive and continue demanding from new users a high level of performance. Therefore, it is hoped that the tight control, censorship, and other direct user controls will only be necessary for a few months. It will be self-perpetuating. In a few years, the cycle may have to be repeated. It may not always work.

Again, ABE is trying something new — users' attitude adjustment. To my knowledge, it's never been done. We have a good "handle" on jammers and jammer-related problems and I feel that Paul and his team can thwart the threat of unidentified, illegal and destructive use of the repeater. Tight control will be established to ensure that "legal" users will behave. If it doesn't work to my satisfaction, then, indeed, ABE will go dark.

The MWRA is in full support of this operation and under the leadership of Dave Farrone, WA6KOS, will flourish.

During the 60-day off time, a select group of people I respect will be meeting to formulate and document a set of desired operational procedures. This same group will also nominate individuals for the control operators. The candidate operators will be interviewed, educated, trained and tested to insure they understand what is expected and how to handle anticipated problems and situations. If you wish to participate, please contact me.

The possibility that another repeater will appear on ABE's frequencies during the off time has been anticipated. This action, by some thoughtless individual, would tend to negate the purpose of shutting ABE down. Simplex operation on either the input or output is encouraged but an ABE replacement is uncalled for. The down time has been coordinated with the SCRA (the repeater council) and there is no possibility of ABE losing its sanction. In fact, the SCRA is carefully watching the experiment for possible application to other repeaters.

It is my firm conviction that ABE can and will become a worthwhile contribution to amateur radio. I ask your indulgence during the off time and even more so during the start-up next year. Patience, understanding and, if not cooperation, at least tolerance are requested.

See (talk) to you all on our pleasant WR6ABE next year. — Bob Thornburg, WB6JPI

QST

### Band Plans

We have had some complaints about the League repeater band plans as described in October, 1976 QST. It should be pointed out that the ARRL recommended plans are not in use everywhere. Before putting a repeater on the air be sure to check with your local frequency coordinator.

\*VRAC Liaison, ARRL hq.

# Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1BZJ, Lester L. Irons, Mendon, MA  
 W1DEL, Hugh W. Roberts, Randolph, MA  
 K1NIW, Lindell H. Onsruth, White River Jct., VT  
 W1PRS, Henry C. Ouellette, Leominster, MA  
 W1QQE, Everett A. Hill, Hudson, MA  
 W1WL, Arthur C. Egan, Northampton, MA  
 K1ZRZ, David W. Kent, Hanson, MA  
 K2AB, Edwin A. O'Brien, Ozone Park, NY  
 WA2BWY, Larrison W. Hamilton, Burlington, NJ  
 W2HIS, Angelo Sterchele, Vineland, NJ  
 W2HYH, Arthur M. Schermer, New York, NY  
 W2JDN, Edward J. Hall, Southampton, NY  
 W2MGN, Charles F. Spreemann, Dix Hills, NY  
 W2WOF, William H. Grant, Glen Head, NY  
 W3HAG, Frank P. Harrer, Lansdale, PA  
 W3MWD, Nelson Mayne, Baltimore, MD  
 W3PB, Paul H. Krantz, Philadelphia, PA  
 W3VU, Edward E. Jones, Glen Burnie, MD  
 Ex-WN4BQF, Charles Dorgay, Elgin, SC  
 WA4CIA, Louie O. Goss, Lexington, KY  
 K4DA, Herbert C. MacDonald, North Palm Beach, FL  
 W4DGU, Norman B. Lee, Lattimore, NC  
 W4FBX, William M. Corns, Gardendale, AL  
 WB4FYT, Robert S. Hayes, Daytona Beach, FL  
 W4GDB, Henry L. Watkins, Big Stone Gap, VA  
 K4KDC, Earl L. Gorden, Lake Worth, FL  
 W4NDT, Robert J. Eberly, Annandale, VA  
 K4TMR, Vernon L. Fulton, Winston-Salem, NC  
 W4UJA, Proctor A. "Buddy" Sugg, Tampa, FL  
 K5CIL, Ervin E. "Gene" Chunn, Waco, TX  
 K5DAB, Ruth A. Hargett, Carlsbad, NM

WB5EYT, Thomas J. Kennedy, Nederland, TX  
 W5GHR, Ralph N. Weeks, Port Arthur, TX  
 W5HRO, Harry C. Spoor, Jr., Houston, TX  
 W5HXG, Haskell E. Dykes, Enid, OK  
 K5LGU, Drexel M. Boho, Ft. Worth, TX  
 WB5MOH, Jean L. Pitts, Houston, TX  
 W5RJI, Joe Odstrcil, Stamford, TX  
 W5TF, \*Hank H. Hay, Oklahoma City, OK  
 W5UVB, Walter A. Lombard, Beaumont, TX  
 Ex-W6BRI, Frank E. Wheeler, Port Hueneme, CA  
 W6BTG, Donald L. Elton, Sacramento, CA  
 W6EXO, Ernest F. Roux, Bakersfield, CA  
 W6FQZ, Harris Stone, Richmond, CA  
 W6JE, Herbert C. Grundell, San Luis Obispo, CA  
 K6KRS, Paul C. Ignatow, Ceres, CA  
 W6OVE, Donald H. Powell, Haythorne, CA  
 W6QXR, Robert E. White, El Monte, CA  
 W6SS, Herbert L. Bassett, Walnut Creek, CA  
 WA6TCM, Milton R. Brice, Thousand Oaks, CA  
 W6TIX, Claford T. Hill, Bard, CA  
 K6UAA, Jack A. Walbert, Sunnyvale, CA  
 W7A1, Frank R. Startzell, Scottsdale, AZ  
 W7CNJ, A. Crawford David, Seattle, WA  
 KL7FPK, William D. Nelson, Fairbanks, AK  
 WA7FXD, Edgar A. Vacca, Salem, OR  
 KL7HMJ, Burl D. Meers, Kenai, AK  
 W7HTC, Arthur M. Franz, Sun City, AZ  
 K7JVZ, Donald M. Burrell, Lakeport, CA  
 W7LLO, Robert E. Heinsman, Tucson, AZ  
 WA7LTP, Edward V. Gruber, Bremerton, WA  
 W7MD, Faz W. Salhaney, Great Falls, MT  
 W7SDI, Franklin E. Bart, Carlin, NV  
 WN7YGZ, John J. Brill, Vida, OR  
 W8CYQ, John R. Fertal, Royal Oak, MI

W8KJK, Armand Gimbel, Cleveland, OH  
 K8KPS, Ellsworth H. Wyer, Quincy, OH  
 WB8OTV, Alfred P. Ricker, Jr., Grass Lake, MI  
 W9CWB, Martin A. Yuriga, Gary, IN  
 W9FTH, Walter G. Harmer, Fond Du Lac, WI  
 K9JHS, Alfred T. Rehorst, Milwaukee, WI  
 K9LTK, Robert C. Humphrey, N. Aurora, IL  
 WB9NNQ, William I. Reece, Bourbon, IN  
 K9SIW, Herbert Bufe, Moline, IL  
 WA9WRL, Martin A. Petersen, Kenosha, WI  
 W9AJP, Howard W. Bond, Jr., Berkeley, MO  
 WA9BJG, Dale E. Rider, Alma, NE  
 W9GEZ, Harold C. Moore, Manchester, MO  
 W9LWS, Carn G. Eaton, Scottsbluff, NE  
 K9OWW, Lloyd B. Stoaks, Grinnell, IA  
 WB9UMD, Arthur L. Knudson, Denver, CO  
 WA9ZMJ, Cecil F. Sherman, Tracy, IA  
 VE1BF, John G. Jay, Halifax, NS  
 VE1CN, John W. Bond, Cape Breton County, NS  
 VE1FD, John B. O'Reilly, Dartmouth, NS  
 VE3AOS, Len Horsfall, Portland, ON  
 VE3BBR, Ian K. Walmley, Oshawa, ON  
 VE3EVI, John W. Paulowich, Hamilton, ON  
 VE3GI, Walter G. Sheppard, Willowdale, ON  
 VE3HZF, Joyce Farrant, Toronto, ON  
 VE3VD, Erich Bartmann, Severn Bridge, ON  
 VE6FV, Gilbert S. Hunter, Stettler, AB  
 VE6PP, Rev. Joseph E. McGrane, Morinville, AB  
 VO1LU, H. M. Mercer, Bareneed, NF  
 DJ1MF, Oskar Birkel, Mannheim, Germany  
 G2DDD, E. C. Cosh, Sussex, England

\*Life Member, ARRL

## 50 Years Ago

January, 1927

- To eliminate confusion as to whether the amateur station you hear signing 1AB is in France or the U.S. or Tanna Tuva (there are as yet no prefixes), the IARU has completed and announces a list of two-letter "intermediates" as continent and country identifiers. For example, we have OH (Oceania-Hawaii), ED (Europe-Denmark) and NU (North America-United States).
- The broadcast receiver business is still booming, and we are taken through a typical factory to learn about mass-production methods.
- Crystal control is the coming thing, even if the crystal costs nearly half the total for a new rig. Two transmitter designs are presented by John Clayton — one with a.c. on the plate, which still gives better stability than a self-rectified circuit.
- But "battery eliminators" are also the trend, and GE has brought out the UX-213 full-wave rectifier, plus a UX-874 regulator which will help keep down the "yoop" on our signals.
- David Grimes says that in our rush to add tuned r.f. stages for selectivity, we have overlooked some advantages in the old reflex circuits such as "tuned inverse duplex."
- Technical Editor Kruse continues his disertation on the development of various tube circuits, with attention this month to the Armstrong and Meissner designs. He also shows us a fairly simple 5-meter receiver design.
- A new vacuum-tube relay has a plate constructed of two dissimilar metal strips, which close and produce output when they are bombarded with electrons caused by an incoming signal.

## 25 Years Ago

January, 1952

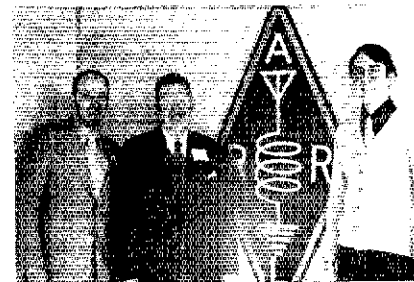
- The new Extra Class license is available as of January 1, but ARRL members are still unhappy at the scheduled demise of the Advanced Class at the end of this year, and the League has filed another petition with FCC seeking its retention.
- A "Novice Roundup" is the new League operating activity to help welcome newcomers to the fold. And this month sees the first "YL News and Views" column, as instructed by the Board of Directors, under the competent editorship of Eleanor Wilson, W1QON.
- TVI just won't go away, so it is being attacked on several fronts. W1DF analyzes pi-network design for output circuits and shows how, properly applied, it can reduce interference problems. FCC announces its "Plan for Handling TVI," created by the Field Engineering and Monitoring Division under George Turner, W3AP; a double-barreled approach calls for manufacturer installation of hi-pass filters, and local committees of amateurs and servicemen to handle complaints.
- Mobile is a growing field, and W1JEQ has designed a rig for civil defense providing 3 channels on ten meters, with the control box on the steering column. W6ZV overwhelms us with envy in pictures and description of his high-power installation, using two PE75s in series and a double-whip antenna on the car trunk, with special loading coils constructed after he burned out two or three manufactured jobs.
- The Novice can upgrade the simple rig he built from earlier QSTs with an 807 amplifier from W1TS's ideas: it's breadboard, but copper screen covers the board for good grounding and shielding.
- You can improve 420-Mc. reception with the r.f. amplifiers W1HDQ has designed based on tuning lines. — W1RW

## Strays



### REPEATER DIRECTORY UPDATE

The time has come to start work on the new repeater directory and we need your input. Your repeater is not listed or is listed incorrectly in the present directory, we have no way of knowing about it unless we hear from you. Also, we would like to bring our listing of frequency coordinators and repeater coordinators up-to-date. You can do us a favor by checking the listings (at the end of the repeater listings in the current directory) and if you know of a change, please inform us incidentally, the new directory won't be out until late spring and we have a plentiful supply of the current edition. Don't forget, it is free. To receive your copy by first-class mail please send an addressed envelope, six by nine inches, with forty-six cents postage.



160-meter DXCC is here! Of course, award no. 1 went to "Mr. 160," Stew Perry, W1BB (center). Ralph Green, W1HGT (left), received no. 2 while accompanying Stew on the visit to Hq. on Nov. 1, effective date of the award. The DXCC program is now administered by Dave Newkirk, WA1VCG (right).

# How's DX?



Conducted By Rod Newkirk,\* W9BRD

## Of Rocky Point, Cabbages and Kings

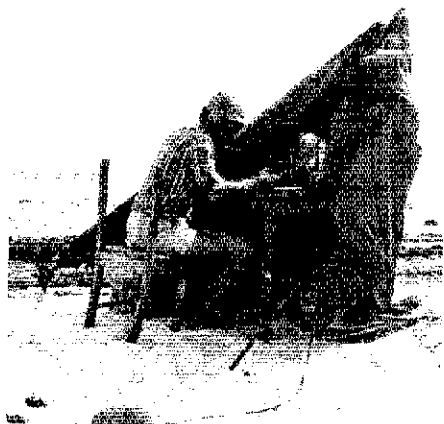
Come to think of it, somebody somewhere had to build and test the fancy high-frequency designs operated all these years by W2LYH, K2GMF and buddies at Riverhead and Rocky Point. Our recent nostalgia on the subject flushed WB2GTE, formerly W3BGO, out of RCA's old workbench woodwork. First licensed as 1BKS in the '20s, Ray can't help reminiscing:

"Your account of imminent hf QSB at old RP/RD hit a soft spot with me. I retired in 1970 after forty fascinating years with RCA. As an equipment tester, I progressed from simple shipboard and aircraft rigs through exotic secret wartime designs, the TV boom and computerized Apollo moonshot stuff. Among the countless devices I worked on were those old 40-kw jobs pictured in November's 'How's.' We called 'em 20-40s because output dropped to 20 kW at their top 24-MHz range. They were built to key at hundreds of wpm, and each had four watercooled UV207s in the final. They ran night and day, year after year, with very little trouble. By 1931 there were 125 circuits serviced by 20-40s. When we had a bunch of 'em fired up on simultaneous test at Chicopee Falls, their submerged loads really steamed up the river. [Low-key ecology in those days. - Ed.] One thing that strikes me is that there were several hundred testers working at that plant using plate

voltages up to 22,000 and I don't recall a single electrocution. Now I do my hamming with an old 900-watt RCA 813 outfit picked up for fifty bucks. Also have 2500 hours of flying time logged in five planes but my current kick is studying Japanese to keep up with a daughter living in JA-land." And with a flock of other interests WB2GTE still finds time to perform as SCM for ARRL's busy Southern New Jersey section.

By the way, W2LYH points out that OM Beverage, one of the wireless pioneers we mentioned as frequenting the Point in its early years, still lives in nearby Stony Brook. Any real OT knows that Dr. Bev crossed the pond as 2BML in the great ARRL transatlantics of yore. Local pal W9PBI, Illinois State Police Radio retired, vividly remembers dynamic ex-2BML troubleshooting an antenna installation at Goose Bay during World War II. "Doc was called up to VO-land to figure out why we couldn't keep a simple radio circuit open to Presque Isle, Maine," recalls Rosie. "The intermediate distance, poor ground and peculiar propagation really had us stumped. He quickly solved our problem with one of his famous Beverage hookups. To this day I can still see that remarkable gent dashing through the subarctic night checking standing waves with a neon lamp on the end of a stick."

Doc, OB, how about lending our club a hand next Field Day? We just can't seem to cut the mess on 40.



HK0AA, organized by Sundsvall DX Group of Sweden and sponsored by Northern California DX Foundation, was a DXpeditionary highlight of the old year. Here SM0AGD sorts a queue on the windswept beach of Bajo Nuevo. K6AHV and HK0BKX joined Erik in the June effort which included a stop at Serrana Bank.

## GETTING 'EM ON THE WALL

**NORTH AMERICA:** For fast and solid pasteboard production "How's" helpers Ws 4LVP 7HPI, WA8FIO, Wbs 4WHE 0CJ and VE3FEA nominate these reliable QSLers of the Month: CT4AT, Djs 3KRJOA 8SW, DK6NI/HB0, HP1AC, 10s GKU H CJ, IS0DRD, JAs 2MGE 4PE, JE3JDV/mm, JH1JLR, JW5NM, KJ6DL, LU8ADK, OE5BRL, OX3ZM, OZ7HT, PYS 4AZM 7ADL 7ZAY 9TN, ST2SA, UA0IAZ, UKs 5QBE 0CBE, VKs 2GW 9XX, YPs 1MPW 1PTL 2KA, VR3AN, W1GNC/V P9, WA4CBN/8R1, WB9AJF/6Ys, YJ8KG, YO9KAG, UY2RTW, YV4A00, ZL2s ACP AGY VT, 5W1AZ, 7SL5CQ, 8R1J, 9Ms 2LN 2MH 6KT and 9V1NR, as well as QSL tenders Ws 1YRC 5JLU 5QPX 6RGG 7OK, K6VIB, WA6AHF and WB5HVY. Any commendable quickies out your way? . . . Alpl! Parenthesized petitioners seek the secret of coaxing mail from targets specified: (W4UMF) 5As 1TG of 1957, 4TT '58; (K4SMX) DL7AH; (K5GOE) VP2KR, WB5OTK/6Y; (WB0CGJ) TF3SV '74, VR6TC '74; (SV1IG) A9XV, CE3QC, CX4BD, GD4CCL, KG6JBB, TJ1BB, XW8CO, ZB2A, 3V8WA, 9V1SN; (W. Martinez, N. 552 Moore, Veradale, Washington 99037) VR1RO. Any clues for this crew? . . . WB0MNV offers clerical services as QSL aide to needful ops at the DX end, the rarer the better. . . Effective January 1, 1977, QSLs for KV4AA will be handled by Yasme Foundation, P. O. Box 2025, Castro Valley, California 94546, with WA6AHF proprietor. (W6KG) . . . I endeavor to promptly answer

QSLs received direct but understanding of a DX station's QSL expenses and time problems is sincerely appreciated. Self-addressed, stamped envelopes, or s.a.e. plus International Reply Coupons when appropriate, please. (KV4AA) . . . After all the official pros and cons, it appears that International Reply Coupons old or new will continue redeemable. (WCDXB) . . . With radio conditions generally so poor I expected some easing in my QSL chores but those pasteboards keep rolling in. My list of QSL clients at the far end now has reached 140 after thirteen years on the job. (W3HNK) . . . VP2LAW says he must refuse many QSLs sent to him because of excessive postage due. Evidently the St. Lucia post office charges recipients double any missing postage. My card came back marked "refused" but with no notation of reason. The only solution seems to be extra stamps on your envelopes. (WA8FIO) . . . I'd like to close my VP2AGA, ZF1WL and 8P6DR QSL files for operation from December 16, 1970, to October 4, 1973. Anyone still need confirmation? (G3RWL) . . . After 21 years of providing outgoing QSL bureau service for W/Ks, I'm ceasing operations effective December 31, 1976. (W9RKP) . . . Calls such as the HP9XFM/mm mentioned by W7HPI are not known here. Our licensing authority does not issue the HP9 prefix. (HP1AC) . . . Save your stamps - K2AA knows nothing about WG1 QSL matters. (KP4BDL)

**ASIA:** Logs from TAs HY and ZB come through slowly. At this writing I have the latter's records for operation through April, 1976. Patience, please. By the way, DXers should use their *Callbooks* more carefully. W5QPW and WA5QPX receive too much of my mail. (W5QPX) . . . Those who QSOd

KA1IW of Iwo Jima between September 24 and October 3, 1976, may QSL me direct: D. Turner, Box 652, Pt. Reyes Sta., California 94956. (ex-KA1IW) . . . I attempted to QSL my four thousand 9V1RF contacts 100 percent. Contacts still needing cards can reach me at the address listed for my old W9GHK call. (W9CW) . . . All QSLs received for my current six-month stay on Masirah Island will be answered. They can reach me via RSGB or direct to G4BVH. (A4XVK) . . . J1JLY, 14,233 kHz at 1025 UTC, displays one of the newer Japanese prefixes. (VERON) . . . Jordan's DXers operated commemoratively in November using the JY7 prefix, suffixes unchanged. For example, QSL JY7ABC to JY5ABC (VERON) . . . Received cards from UA0IAZ and UK0CBE seven months after QSO, rather rapid response from the U.S.S.R. (W7HPI) . . . Still plenty of blank QSLs on hand for my KA8AA activity. Ship self-addressed, stamped envelope plus QSO details to my new St. Louis QTH. (WB0AOF) . . . I'm now in my sixteenth year as QSL manager for 9N1MM, perhaps the longest such association in amateur radio. Please note my new mailing address. (W3KVQ-W2KV) . . . Amateur Radio Association of Bahrain received permission from our licensing agency for its members to substitute the prefix A9Z for A9X in mid-December; e.g., A9XC became A9ZC on December 16th in commemoration of Bahrain National Day. (A9XS) . . . As of March 5, 1976, I am no longer QSL manager for HZ1AB except for QSOs in a few logs dating from 1750 UTC July 10, 1975, through 1812 on the March date. (WA6AHF) **EUROPE:** I find that when it rains it pours where Russian QSLs are concerned. No U-cards for a whole year, then sixteen in one ARRL Bureau shipment. UK2PAT led the

pack with a three-month return. Some of the gang report problems confirming Bulgaria but no trouble at this end, four LZ cards on file. (WA1UIX/8) . . . Recent HV1CN QSOs via OSCAR can be confirmed through 15TDJ. (VERON) . . . GD3KGC's QSLing was held up by delayed stock from the printer. (WCDXB) . . . I'll take care of my Portugal confirmations when I return to the States shortly. Those without s.a.s.e. will be answered via bureaus. (WA7ZLC/CT1) . . . Russian antarctic stations, lately signing 4K calls, probably won't be able to get their cards into bureau channels for a year or more. (VERON)

**OCEANIA:** My total QSL returns for operation as KH6IAC are 87 percent, not too bad. Just about equal for W/K-land and DX points. So far, back in New England, cards are returning at a 36-percent clip. When KL7HQY comes through, I'll have WAS. (WA1YUZ) . . . I'll answer all QSLs received here for KG6JED. (WD8CUU)

**SOUTH AMERICA:** As CE0AE's QSL manager I've sent out many cards to DX stations with IRCs included but returns are very poor. Fr. Dave is trying to achieve ARRL's Five-Band DXCC so I'm pleading with the overseas gang to answer his QSLs. All cards sent to me for CE0AE get prompt reply. Please note my new address: RD 2, Box 5A, York Haven, Pennsylvania 17370. (WA3HUP) . . . Please call DXers' attention to my change of call sign from LU8AJG. (LU1BR)

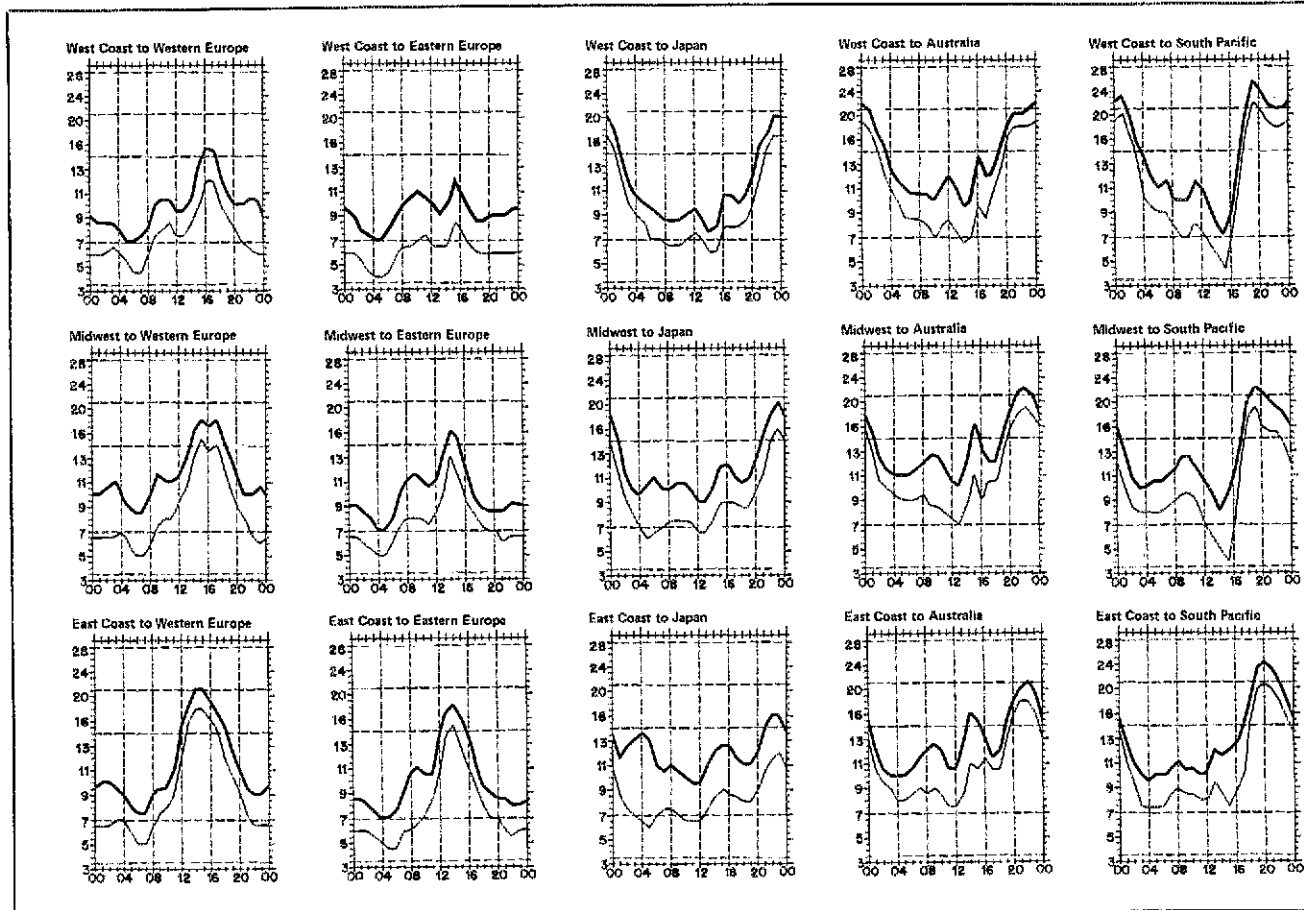
**AFRICA:** QSOs with Marion Island's ZS2MI from May, 1975, through May '76 may be confirmed via ZS6s BBF or CE. (VERON) . . . Don't blame W1AM for late XT2AG cards. Necessary QSO data from Upper Volta has been delayed. (WCDXB) . . . 9J12 was Zambia's November special, 9J2CB signing



ZS1CZ helps represent South Africa's 20-meter YL contingent from cozy Cape Town quarters. Dr. Ailie Tronson was among many prominent DXers visited by VE3AU1 on a recent worldwide tour.

9J12CB. (DXNS) . . . Now for specific QTH suggestions but be aware that each recommendation is not necessarily accurate, complete or "official" . . .  
 A9XBJ, c/o Bahrain Telephones, P. O. Box 14, Manama, Bahrain  
 CE3BIX, Box 13630, Santiago, Chile  
 CE9s BSB BSD BSH (via CE2M2)  
 CN8BD, A. Hadaghri, Box 160, Agadir, Morocco  
 CT6FSM, P. O. Box 584, Viseu, Portugal  
 DJ0UP/VP2 (to DJ0UP)

DK5EG/ET3, W. Motzkus, Box 5711, Addis Ababa, Ethiopia  
 DL7PD/VP2 (to DL7PD)  
 EL2T, C. Unglesbee, VOA Liberia, APO, New York, New York 09155  
 EP2HE, Box 3019, Teheran, Iran  
 EP2MY, Box 907, Teheran, Iran  
 FG0CXV/FS7 (via W4PRO)  
 FH8CY, Y. Segueineau, B. P. 50, Dzaoudzi, Mayotte  
 FR7BE, B. P. 137, Tampon, Reunion  
 HI8XIM, P. O. Box 905, Santo Domingo, D. R.  
 HP1MU, P. O. Box 3398, Panama City 4, Panama  
 IS0PXP, G. Parpinello, Box 39, Alghero, Sardinia, Italy  
 JY5MB, Box 299, Amman, Jordan  
 JY5RBA, Box 839, Zarka, Jordan  
 K41IF/C6A (via W4KA)  
 ex-KA8AA, W. Mest, WB0AOF, 8747 Glenwood Dr., St. Louis, Missouri 63126  
 ex-KH6GLU-FW8DY (to VK4LX)  
 OA4AK, G. Bernacer, P. O. Box 3845, Lima, Peru  
 OX3LM, Box K-3930, Groennedal, Greenland  
 PY3APH, C. Buss, Caixa Postal 20, Sao Borja 97670, RS, Brazil  
 PY7ZAY, Caixa Postal 183, Campino Grande PB, Brazil  
 SM5DIC/4U (to SM5DIC)  
 SM0AGD/S2 (via SM3XS)  
 SV1IG, A. Panos, 4-6 Voltairou St., Athens 411, Greece  
 TD7GI, Box 762, Guatemala City, Guatemala  
 VP1FOC, M. Carter, W4ZMQ/5, 631 Old Spanish Tr., Waveland, Mississippi 39576  
 VP1PTL, P. O. Box 826, Belize, Belize  
 VP8s PC PI, P. O. Box 113, Port Stanley, Falkland Islands



When are the bands open? These charts predict this month's average propagation conditions for high-frequency circuits between the U.S. and various overseas points. On 50 percent of the days of the

month, the highest frequency propagated will be at least as high as the upper curve. On 90 percent of the days of the month, it will be at least as high as the lower curve. See January 1977

VR4DN, D. Newman, P. O. Box 81, Honiara, Guadalcanal, Solomons  
 WØEXD/KC4 (see YBØABV)  
 WA5UKR/YV5 (via W3HNK)  
 WA7ZLC/CT1 (to WA7ZLC)  
 WB4KZG/KC6 (via WA7ZTL)  
 WB4JG/6Y5 (via K4QMQ)  
 WB6KBF/HKØ (to K6JR)  
 WB9BZL/TI8 (via WA9UNR)  
 WG4MW, Box 27, FPO, New York, New York 09573  
 WN3BKR/HK4, Box 877, Medellin, Colombia  
 YBØABV, Dr. R. Brown, KØDX/4, 11104 Seaglade Dr., Pensacola, Florida 32507  
 YN1RWG, R. Goularte, Box 327, Managua, Nicaragua  
 YS1GMG, Box 062067, San Salvador, El Salvador  
 YV1BVI, Box 1788, Maracaibo, Venezuela  
 ZD8JAM, Box 4308, Patrick AFB, Florida 32925  
 9G1KL, P. O. Box 1332, Kumasi, Ghana  
 9L1CD, Box 113, Freetown, Sierra Leone  
 9N1MM, E. Błaszczyk, W3KVQ, 539 Fairhill Dr., Churchville, Pennsylvania 28966  
 A4XGQ (G3MGW) FØATX (DK7MB)  
 A4XVK (G4BVH) FG7AN (WA3EDS)  
 A51PN (W3KVO) FG7WO (W4KA)  
 A9XB (G3WWW) FM7AV (F6BFH)  
 A9ZC (see text) FØNA (VO1FB)  
 C29MS (K4MQG) G4FLD (W3HNK)  
 C31KR (F6FCS) HBØBHA (DLØKL)  
 CEØAE (see text) HUI DX (W2KF)  
 CT2BS (WA4CAD) HZ1AB (see text)  
 CZ2RV (VE2RV) IZ9AF (IT9AF)  
 D6AB (F6CXT) JA8UI/PZ (JA8AHA)  
 DA1UM/LX (ON5NT) K6JMZ/VQ9 (W7OK)  
 EL2R (WA4HHG) KA1IW (see text)  
 EL8N (SM4CWY) KC6DK (K7DDY)  
 EP2SV (WA6AHF) KG6JBX (KH6IDL)  
 KG6JED (WD8CUU) KV4AA (WA6AHF)

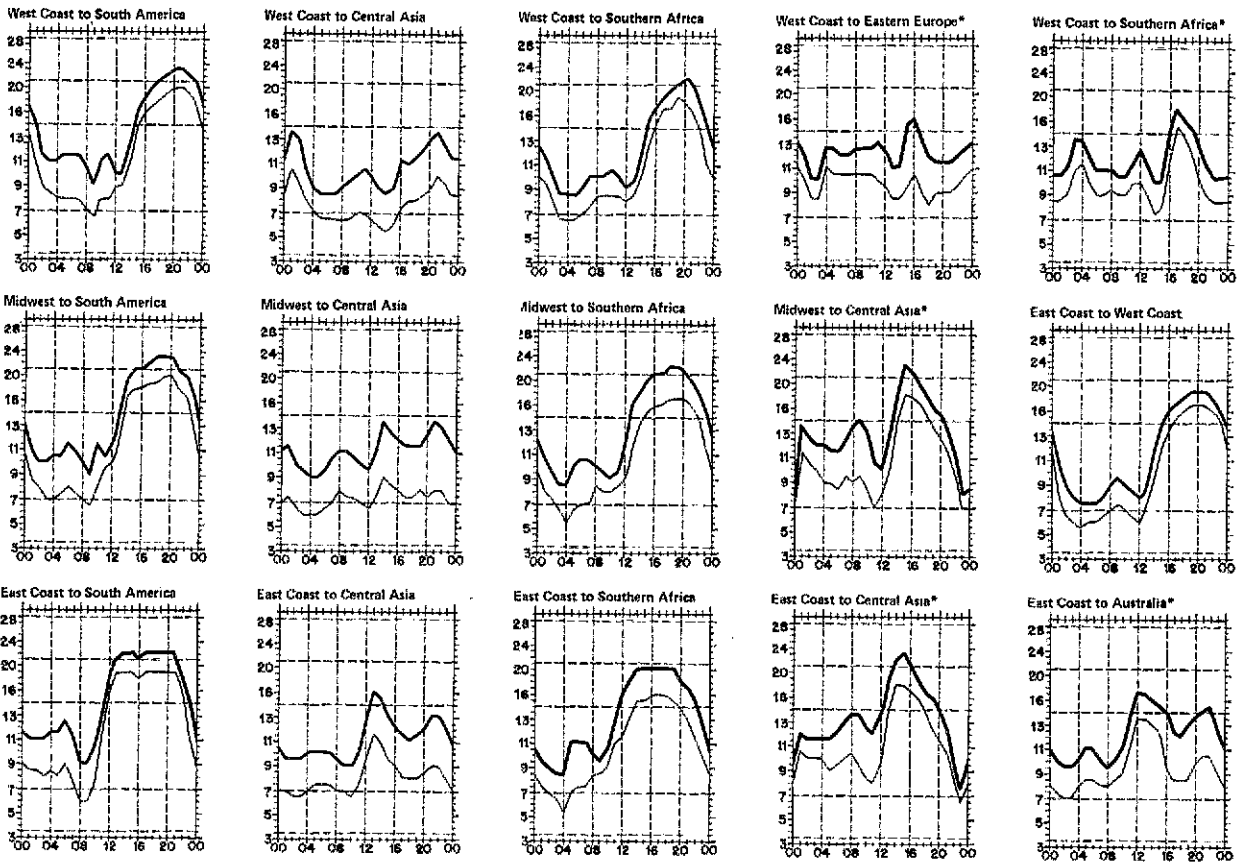


5B4CR has a TH3 on the outside end of this Larnaca layout. When his favorite DX bands go blotto, Thanos can key up a 2-meter repeater in Israel, another in Jordan, etc., with that handy FT221. K1ZND, donor of this photo, visited Cyprus last year and reports a thriving amateur radio there.

KG6RT (W6IAE) LU1BR (LU8AJG)  
 KH6IAC (WA1YUZ) LU4AL (LU2AFH)  
 KL7IKG (WA4LJJ) OA4Y (RCP)  
 KP4JV (K6SDR) ON8UH (W3HMK)

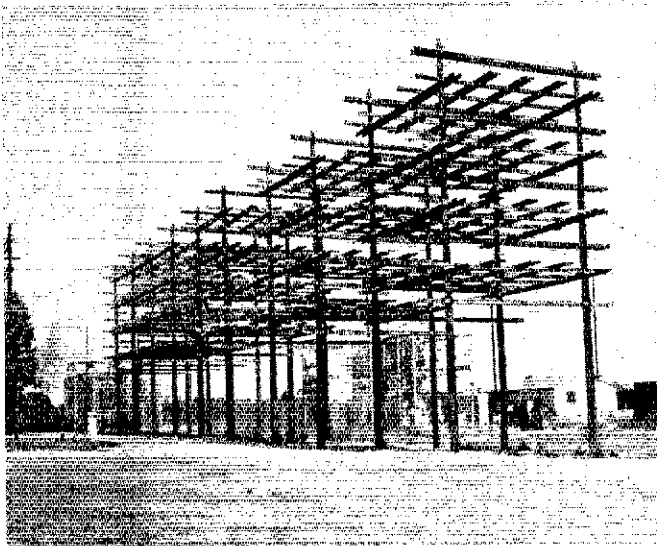
PI8CM (W5AT) VS6DO (K4CIA)  
 PJ8CO (K1CO) W6KG/AJ3 (WA6AHF)  
 PJ8UQ (W1UQ) WA1RFM/VP9 (RSB)  
 PJ9MM (W1GNC) YKØA (SPØRT)  
 PI9YN (W9YNT) YS1MAE (W2KF)  
 PJØA (VERONA) ZD9K (ZS3AD)  
 PYØZAE (PY1CK) ZF1IK (W4JIK)  
 SPØDXC (SP7HT) ZF1JA (A9XBJ)  
 TA1MB (WA1EÜO) ZF1RE (WBSURN)  
 TA2ETV (DJØRR) ZF1WL (see text)  
 TA2ZB (DJ9ZB) ZF1WW (K3DPQ)  
 TU4RV (G5RV) ZP9AC (ØE3FFA)  
 TY9ER (DL8DC) ZS2ND (K2TXJ)  
 VC9UM (VE4VV) 4Z4DZ (W7TE)  
 VE2ZN/SU (VE2YM) 5N5NAS (WB9MFC)  
 VP2AGA (see text) 5W1AB (W4KA)  
 VP2DH (W8HM) 5W1AZ (WA6AHF)  
 VP2GEB (GC2CNC) 6W8PZ (DK3IA)  
 VP2KY (VE2DCY) 7SL5DN (SL5DN)  
 VP2LAW (see text) 7X2EPM (ARA)  
 VP2SJ (WB8JEY) 8P6DR (see text)  
 VP2VDH (K6SDR) 8PØA (WA4RRB)  
 VP5A (K4UTE) 9J2GE (G3USE)  
 VP5BER (W8IMZ) 9J2LC (I4UVA)  
 VP5IZ (WA4SGF) 9L1BH (SM3CX5)  
 VP5T (W4GDG) 9V1RF (W9CW)  
 VP8OL (WB4ASV) 9V1SN (G3VAO)  
 VR3AR (WA7GQA)

Donors of the preceding data include Ws ICDC ICW 4KA 4LVP 5QPX 6KG 6QL 6YKS 7HPI 9GHK, Ks 4MZE 5GOE, WAs 1SQB 1VCG 1YUZ 8FIO, WB4s JZT WHE, KP4BDL and HP1AC with plenty of help from DX-oriented publications of clubs, groups and individuals to be credited subsequently. More! . . . Conspicuous by its absence this season is announcement of the customary 160-Meter Transatlantic/Transpacific Tests scheduled and popularized by W1BB and colleagues since the early '30s. Now that the 1.8- to 2.0-MHz range has become just another dandy DX band producing its

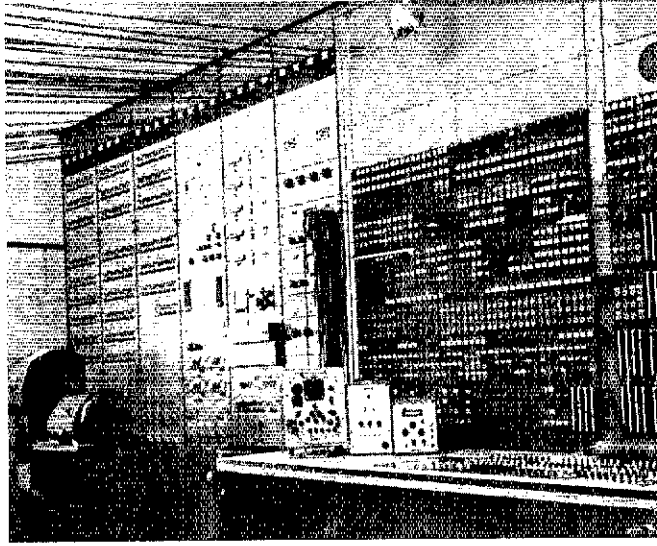


QST, page 58, for a complete explanation. The horizontal axis shows Universal Coordinated Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Tele-

communication Sciences, Boulder, Colorado. These predictions for January 1977 assume a sunspot number of eight, which corresponds to a 2800-MHz solar flux of 70.



RCA's New York point-to-point complex at Rocky Point and Riverhead developed the shortwave art to gargantuan proportions. At left, one of three huge transmission-line superstructures at the Point; right, a receiver control board at Riverhead. Now that commercials



need no longer depend on the ionosphere and all its vagaries such high-frequency DX factories are rapidly fading into communications history. (W2LYH photos)

own DXCCs - Ws 1BB 1HGT 8LRL and KV4FZ were first in line for certification - consensus has it that the promotional purpose of such tests no longer exists. Stew even considers phasing out his juicy *160-Meter DX Bulletin* but many of the gang may feel this is going too far - hi! We suggest you ship s.a.s.e. to W1BB for his latest newsletter and inform him of your thoughts on top-band matters.

### DXAC NOTES

In an October, 1976, letter to the Communications Manager, the Chairman of the DX Advisory Committee forwarded the following recommendations of his committee:

- 1) DXCC Rule 9 should state "All stations must be contacted from the same country."
- 2) This change in Rule 9 should be applied retroactively upon application. (Note: Heretofore, movement was allowed between countries. It is not the intention of DXAC to strip anyone of credits allowed under the previous system.)
- 3) Only one call per DXCC should be allowed; however, a transfer of credits will be permitted from one call to another after permanent residence has been established, and upon application.

Because of objections by some committee members, the DXAC specifically does not recommend any change in Rule 9 when applied to SBDXCC. Rather, we have chosen to examine this as a separate question, and a recommendation will be forthcoming.

The above recommendations were accepted by the Communications Manager. For more information on the function of the DXAC, see p. 90 of *QST* for December, 1974.

### DXCC NOTES

We regret the absence of DXCC totals this issue of *QST*. The backlog caused by the preparation time for December's Annual DXCC listing has made it possible for us to process only those DXCC applications received through the first work week of October, 1976. Rather than present an abbreviated listing in this issue, we'll return next month with the full listing in a new, more attractive format.

In reference to the acceptance of a change in DXCC Rule 9 (see DXAC Notes), please do not make application for country credits

under the new "countrywide" Rule 9 until the official announcement of its implementation has appeared in a subsequent issue of *QST*.

### OVERSEAS QSL SERVICE NOTES

In the October, 1976, announcement of the ARRL Membership Overseas QSL Service, a list of some 126 countries was shown for which QSL forwarding service could be provided. The following list shows additions that have been made since the article was written as well as clarification of places that cards can be forwarded to:

- |               |                      |
|---------------|----------------------|
| Afghanistan   | Indonesia            |
| Alaska        | ITU-Geneva           |
| Angola        | Jan Mayen            |
| Antigua       | Lesotho              |
| Ascension Is. | New Caledonia        |
| Cayman Is.    | Northern Ireland     |
| Rep. of China | San Marino           |
| Congo Rep.    | Scotland             |
| Dominica      | Sierra Leone         |
| Egypt         | St. Helena           |
| Falkland Is.  | St. Lucia            |
| French Guiana | Svalbard             |
| Grenada       | United Arab Emirates |
| Guadeloupe    | Wales                |
| Guyana        |                      |
| Hawaiian Is.  |                      |

If there is no listing for a country, it means that currently no distribution point exists to send QSLs. Cards received for such areas will be held until such time as a distribution point does exist.

Expansion of the Overseas QSL Service now includes the acceptance of QSLs for a station licensed to an ARRL affiliated club. Generally, since no *QST* address labels are available for such a club station, the QSLs that are sent should include a note indicating the club name. Club secretaries might check to see that their club's affiliation papers are current.

Another expansion of the QSL Service is the exchange of cards between U.S. and Canadian stations.

It will be helpful to our incoming-mail section if the *QST* address label and \$1 were attached to one of the individual's cards when QSLs are sent for forwarding. Trim the address label down to the edges and tack, but not glue, it and the \$1 to the QSL card. This will give a quick and positive identification of the person sending in the cards and greatly speed up the incoming-mail processing.

QSLs sent in for forwarding should be sorted and filed in alphabetical order by prefix. The 160 sorting bins are arranged in

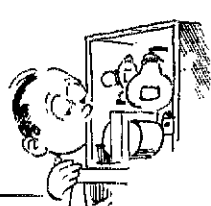
that order and having the cards the same way speeds up the sorting. Also, while the thoughtfulness of some in putting rubber bands or paper clips around the individual groups of cards is appreciated and might seem helpful, it actually slows down the processing time since they simply have to be taken off and discarded. - W1CW



The new ARRL Membership Overseas QSL Service at the end of the first week of operation. In the first weekly mailing, 193 parcels containing some 23,000 QSLs, went to 147 different societies and addresses. On the left is W1CW, manager, Overseas QSL Service, with aide Sue Reynolds. Sue looks mighty happy to have the job done for the week.

## Strays

DON'T SHOOT TROUBLE IN A TRANSMITTER WHEN TIRED OR SLEEPY



# The World Above 50 MHz



Conducted By  
William A. Tynan,\* W3KMY

## The VHF SS

The most popular of the three vhf contests sponsored each year by the ARRL is the January SS. Perhaps one reason for its popularity is that club competition provides a stimulus for many stations, not otherwise known for their enthusiastic participation in contests, to get on the air and submit logs. Many more, however, may not be members of ARRL affiliated clubs or may belong to clubs that normally don't participate in operating events. It is particularly to these people that this is addressed.

Having just acquired one of the 2-meter multimode rigs, perhaps you've just wet your feet in vhf. Or possibly you have no vhf equipment except for an fm transceiver. Maybe you are one of the old-timers who still have an a-m/cw vhf rig tucked somewhere in the dark reaches of the basement. Whatever your specific situation, get on the air January 8 and 9. The complete rules, including details

of the new simplified exchange, are in December *QST*.

What about the antenna, you ask? It's true that in most parts of the country January is not the best time of year for antenna work. It's also true, especially at frequencies above 50 MHz, that a proper antenna is of utmost importance. But don't let lack of a "good" antenna keep you off the air. Perhaps you have a vertical for 2-meter fm and are aware that most other 2-meter work is done with horizontal polarization. True, your vertical will put you at a disadvantage, but you will be heard and you will be able to work stations within perhaps 50 to 100 miles. In fact, you may be able to cover greater distances with crossed polarization on ssb or cw than you can on fm. Are you minus an antenna for the band you intend to operate? Check out the commercial antenna stock at a local dealer. On the other hand, you can always roll your

own. A number of simple and effective designs can be found in the ARRL *Handbook* or *VHF Manual*. If you can't put your antenna up outside, try it indoors. Should for some reason all of these measures prove not feasible, see if you can get one of your hf antennas to load up. If unsuccessful at first, try adding or subtracting a short length of line.

Don't overlook fm simplex operation. Particularly on 2 meters, fm is where the masses are. Thus, you can run up your contact total on fm and then use whatever else you have put together for ssb, cw or a-m to add some multipliers.

Despite the state of your vhf facilities, get on for the SS and no matter what your score, submit your log as tangible evidence of band occupancy. Everyone knows how vital this is in these years leading to WARC-79.

CU in the contest.

## 600-POINT 6-METER AWARD

Following the urgings of K5ZMS of SMIRK through West Gulf Division Director Roy Albright, W5EYB, the League has just instituted a new operating award specifically for 6 meters. Details appear in "Operating News," this issue of *QST*. What we would like to do here is to implore all 6-meter operators to take advantage of the award. Don't wait until the beginning of the summer Es season; the January VHF SS is a good time to start. Remember, the more people trying for the award, the more activity we will have on the band. After all, isn't that the main purpose of such awards? CU on 6!

## NORTHEAST VHF ASSOCIATION PICNIC

As we plow through slush and snow, memories of summer events often help brace us against the chill northerly winds. The 1976 NEVHF affair was held at Mt. Tom on August 29 with some two-dozen vhfers and an equal number of family and friends present. Amidst the hot dogs and conviviality, the group chose its new officers: W1FJH, president; K1HTV, vice-president; K1WHS, secretary; W1GXT, treasurer. The gang urged continued concentration on particular bands on specific nights of the week. Present activity nights are Monday, 2 meters; Tuesday, 1-1/4 meters; Wednesday, 70 cm — with most of the action peaking about 2100 local time. Next year's picnic will be held at the same location the weekend following the Central States VHF Conference.

## ON THE BANDS

6 Meters — Those 6-meter stalwarts who stuck it out during the lean months of fall were

treated to some pretty good Es for the time of year. Our intrepid Las Vegas reporter, K7ICW, notes openings each lasting about a half hour on October 2 and 21. The first was to Oregon, while the second brought in Texas stations. From Omaha WA0MRH reports weak, short openings on October 7 and 22 but the real fun, John says, was on November 2 with a four-hour blast which included PA, MD, OH, KY, NC, FL, LA, TN, AL, TX, and finally AZ. Even with the widespread nature of the opening, John notes that there was not enough activity to really take advantage of the good conditions. How about some more SMIRK nets to spur activity? WIBOM comes up with another good one. This time it was October 27 which yielded a good Midwest

opening, netting John QSOs with 10 stations — all with good strong signals including WB0ISK who managed an S9 into Connecticut using an ICOM 502 (3 watts). From St. Petersburg, FL, WA1VA1/4 tells us about a short opening on October 4 to W1HOY/KP4. From the Pacific Northwest, we hear from an old friend WA4MMP now /7 in Portland, OR. Bill confirms the October 2 opening, reported by K7ICW, as lasting about 30 minutes and concentrating in southern California and Nevada. About the time you read this, WA4MMP should be signing /6 in San Diego. Particularly during times of the year when Es is less commonplace than it is during the peak months, it is very interesting to compare operating reports with the data submitted by WA5IYX of San Antonio. Pat's combined 6-meter TV observations show openings on October 1, 2, 6, 7, 10, 20, 21, 26 and 31. He notes that in 1975, there was only one opening during September and October — quite an improvement!

A note from K5ZMS, SMIRK No. 1, states that Kenwood will be marketing a TS-600 (6-meter cousin to the popular 2-meter TS-700) on a trial basis. They also plan to offer a 6-meter transverter, the TV-506. Both products should be available by the time this appears in print.

A very interesting letter from JE1RXJ tells of the success of the first DXpedition of the Japanese SMIRK contingent. Takeshi relates that group, including JA1LZK, JR1MOK, JR1PSX, JR1SWX, JE1HYR and himself, journeyed to Ogasawara Island about 500 miles south of Tokyo. From August 1 to 9 they worked 3200 6-meter stations, most of which were in the Japanese home islands but they also had QSOs with Guam, Saipan, Korea, and Marcus Island.

Also from Japan comes late word via JA1VOK that numerous TE contacts were made between Japan and Australia around October 23. An example is the work of JH1ECU who managed two-ways with VK7s JG, JV and ZAH along with a string of VK3s. He also heard some VK2s.

While in the DX vein, perhaps some may still need the QSL address for VP2LAW. It's P. O. Box 91 Castries, St. Lucia, Windward Islands. I am sure that John would appreciate a few IRCs.



WA4GPM adjusts the position of his 80-element collinear for 2-meter EME.

\*Send reports to Bill Tynan, W3KMY, P. O. Box 117, Burtonsville, MD 20730 or call 301-384-6736 and record your message.

## Terrestrial Two-Way Records

6 Meters: LU3EX - JA6FR	12,000 Miles - March 24, 1956
2 Meters: WA6JRA - KH6GRU	2591 Miles - July 29, 1973
1-1/4 Meters: W6NLZ - KH6UK	2540 Miles - June 22, 1959
70 Cm: W0DRL - K1PXE	1210 Miles - August 16, 1971
23 Cm: K5LLL - K4NTD	847 Miles - January 27, 1975
13 Cm: G3LQR - OZ9OR	472 Miles - June 30, 1976
9 Cm: ZL2WB - ZL2TMJ	278 Miles - February 2, 1975
5 Cm: W6IFE/6 - K6HIJ/6	214 Miles - June 18, 1970
3 Cm: G4BRS - GM3OXX	324 Miles - August 14, 1976
1.25 Cm: G3BNL - G3EEZ	96 Miles - September 14, 1975

2 Meters - As anticipated, our October editorial "Let's Get Together" has sparked some comments as well as some signs of progress. I understand from several sources that the gang in California has already decided to shift to 145.1 as their prime rallying spot above 145 MHz. The SWOT group, which pioneered the use of 145.1, has been enthusiastic in its support. Some in the East have been sympathetic but not much has happened yet to break the long attachment to 145.025. For example, WA2PVV writes from Valatie in upstate New York that he favors 145.025 as the national calling frequency for ssb, 145.005 for cw and 145.1 for EME! [Editor's Note: FCC could help this division so much by letting us all get together in the first 500 kHz of the band.] To illustrate another sectional opinion, I cite a letter from WB0PXA in Estes Park, CO. He notes that most of the new 2-meter ssb operators in the Denver area are using their fm antennas to congregate on 145.8 MHz. The apparent reason for choosing this unorthodox frequency is that their fm antennas do not work properly much lower in the band. Our correspondent seems to be under the impression that the same logic is working all over the country and that it's only a matter of time before most 2-meter ssb activity will be around 145.8 with vertical antennas. It is hoped that this will not be the case, for like in any pursuit "you get out of it about what you put in." Fellows using such installations will not derive the benefits that 2-meter ssb has to offer. I daresay that reasonably good installations in the Denver area could be working stations in the states of TX, OK, KS, NE and WY on a regular basis. A "good" installation in this instance is defined as 100 watts to a horizontal antenna having an honest gain of 10 dB or more located at least 30 feet above ground. If the Denver gang will put out some effort and get in there where the rest of the country is (145.1 and 144.110), there's no telling how much fun they can have. And if we have "E skip" this summer, as we did last summer, things could be exciting indeed!

From Italy comes a tale of how one lone yhf operator solved his isolation by turning an insurmountable obstacle into an advantage. IASN tells us of the case of IW1AHH whose license limits him to 10 watts and operation only on 2 meters. The ham in question lives at Gourmayeur, which is situated in a basin surrounded by high mountains. One such mountain is Mount Bianco, a 14,500-foot Alpine peak. IW1AHH uses 6-watts output to a 44-element array tilted up at a 23-degree angle toward the peak. By reflecting his signals from the sheer wall below the peak, he gets consistent coverage into north-central Italy. With tropo enhancement, he can work down the Italian boot and into Yugoslavia. But that's not all. Via knife-edge diffraction, he can also work regularly to the north into France and Switzerland. With tropo enhancement, stations as far away as the British Isles have been contacted. It is hoped this story may serve as an object lesson for others with

"impossible" yhf locations.

Almost every month we hear of new converts to 2-meter EME. The most recent are WA4GPM and WA9DOT. So, if you are looking for Virginia or Wisconsin, these two can probably accommodate you. WA9DOT has been off 2 meters for about five years and decided to return with a bang. Jim's first EME QSO was with - you guessed it - W6PO. As with the multitude of others who have tread the same road, it was a real thrill for Jim to have a successful exchange with Bob. Like the others, he has gone on to work several more stations in short order. The antenna at WA9DOT is four, 14-element KLMs. The story from WA4GPM is almost the same except that Buzz is using an 80-element collinear with which he is hearing his own echoes about 50 percent of the time.

For many, m.s. is a principal source of 2-meter thrills. One of these is W5JTL of Vicksburg, MS. George is looking for m.s. skeds with anyone within range. Also looking for schedules, but of the long-haul tropo type, is WA2PVV in Valatie, NY. Bill prefers Friday and Saturday evenings between 2200 and midnight local time. He is operating an attended ssb beacon on 145.025 during these hours. A new net is being formed in North Carolina on Tuesdays at 2000 local time on 145.025. Control for the North Carolina 2-Meter Single Sideband Net, as it's called, will be one of a number of stations in the Greensboro area. All within range are welcome. While on the subject of nets, one which attracts many check-ins over a very wide area is the Midwest Sideband Net which is held on 145.020 at 2100 Eastern Time on Tuesdays, Thursdays and Sundays. The center for this net is usually south-central Ohio. Another big net is held along the East Coast each Sunday morning at 1000. Frequency for this one is 145.025.

1-1/4 Meters - K6JKQ reports from Stockton that 222 MHz is alive and well on the West Coast. Dave says that he has 200 watts to a KLM beam. Others active on the band are K6IBY, WA6VQJ, W6CFC (who after 80 years still climbs his own tower), WA6ARC and WA6JIC. Reporting from El Paso, WA5QCP says that he believes there is little interest in 1-1/4 in his area and blames, in part, government restrictions which apply near White Sands Missile Range for the situation. If you think that there is no one out in your part of the country interested in 220, you ought to check with Lee, WA5MFZ, of Edgewood, NM. She is about as an enthusiastic a 1-1/4 operator as one can find anywhere. As for those government restrictions, they can and have been overcome, in some instances, by individual application. With regard to Lee and Fred, WA5MFZ and W5FF, we spoke a little too soon in showing the photo of their 32-foot dish last month. They are not ready for business as indicated since they took the monster down for the winter to prevent damage from high winds. It should be up and ready to go again by spring, however.

As a demonstration of what can be done on 1-1/4, W1JAA is now up to seven states with only 3-watts output. We know that we'll hear a lot more from Joe before long.

70 Cm - As chronicled by *The 432 EME News* published each month by K2UYH and VE7BBG, the world of 70 EME continues to be one of new accomplishments. Everyone has heard, of course, of the fine work of the Pack Rats' HK1TL operation, but don't get the idea that things are dull between DX-peditions because nothing could be farther from the truth. Each month there are new records set and new states worked. As an illustration, take the first 70-cm contact ever between Australia and Luxembourg. In late September VK2AMW and LX1DB made the grade on cw. Signals were so good that they tried ssb but couldn't quite make it in that mode. Another first was a 70-cm QSO between Texas and Connecticut. The parties involved in this one were WB5LUA and W1SL.

K3BPP of the Pack Rats has developed an equation for calculating the polarization shift which takes place on EME circuits strictly as a result of the geometry involved without Faraday rotation. The equation is a little long to reproduce here but anyone needing a copy may send an s.a.s.e. to K2UYH.

Tropo continues to be an exciting mode

for many 70-cm operators. Reporting a number of 2-meter contacts in early October from his area of Lincoln, NE, WB0UT notes that on the same occasion W0NGG accomplished 70-cm QSOs with WB5LUA and W5HN, both of Dallas. Another area of the country where tropo is frequently above average is along the Great Lakes. In this instance, 439.25 ATV is the beneficiary according to a report from WA8TLZ in Oregon, OH. Dave says that he has exchanged pictures with W3POS of Erie, PA, on 26 occasions during the 1976 season. WA8TLZ notes that there are over 100 stations operational on 70-cm ATV in Ohio alone.

## TRANSEQUATORIAL SIGNALS HEARD ON 146 MHz

On Sunday evening Venezuelan Time, YV5ZZ noted that TE signals from Argentina were particularly good on 6 meters. After working a number of stations in the Cordoba area, Ed next listened for OSCAR 7 which was in Mode A that evening. He was surprised to be able to receive signals, including those of LU7DJZ, through the satellite at least 10 minutes before normal AOS. That was on Orbit 9062A which crossed the equator at 63 degrees west at 0051 UTC November 8. Since he was even able to hear a fluttery signal from his own transmissions before AOS, Ed reasoned that TE could be extending as high in frequency as 2 meters. Upon listening on the 145.9 uplink band, he heard very clearly about 6 dB above the noise, the uplink signal of LU7DJZ. The signal displayed the characteristic flutter usually associated with TE and there seems little doubt that transequatorial propagation was responsible for reception of the 2-meter uplink transmissions of LU7DJZ over the 3100-mile path. YV5ZZ tried listening for U.S. stations accessing the satellite as it went farther north but heard nothing.

Next will come schedules between YV5ZZ and LU7DJZ in hopes of making what must be the first 2-meter TE contact. Good luck fellows.

## 70-Cm Standing

Figures are states, call areas and best DX in miles.

W1JAA	20	9	2670	K4VOW	5	4	200
K1PXE	19	8	2600	W4AWS	4	2	75
K1HTV	17	5	810	W5RCI	19	6	88
WATFO	16	5	680	K5JL	17	6	120
W1SFL	15	3	2650	WB5LUA	12	8	176
WA1MUG*	15	5	740	W5HN	12	8	146
K3EAV/J	14	6	700	W5SWV	9	3	91
K1BFA	13	5	710	K5LLL	7	3	161
K1JIX	13	5	620	W5GVE	7	3	96
W1JTK	12	4	715	W5LPV	7	2	95
W1HDD	11	4	380	W5UKD	6	2	59
K2UYH	31	9	10600	K5UCM	5	2	93
K2ACQ	34	8	925	W5DD	5	2	85
K2LGI	22	8	2300	W6GHXW	6	4	750
W2AZL	21	7	1000	W6DUJ	4	2	36
K2CBA	20	8	2570	K7ICW	4	2	23
W2BLV	20	6	812	W7JRG	3	2	42
W2CLL	20	6	750	K8UGA	28	8	960
K2RIW	20	10	2800	K8DEO	24	7	77
W2OMS	19	6	725	W8YIO	22	7	65
K2VDK	18	6	750	W8HVX	19	7	66
WA2EMB	18	6	700	W8CVQ	13	7	62
WA2GK	17	6	745	W8MNT	13	7	60
K2ARO	16	6	740	W8RGI	10	6	42
W2DUJ	14	4	570	W8VHG	10	6	62
K2DVS	15	5	734	W8IDU	10	5	63
K2YCO	15	6	675	W8QDE	8	5	50
W2CNS	14	6	525	W8FWF	8	5	45
K2BF	12	4	325	W9WCD	22	9	172
WA2EUS	10	4	330	K9HMB	21	8	83
W3RIE	21	7	850	W9HUV	19	7	78
K3IUV	18	5	720	K9JIF	16	7	69
W3HMV	16	5	700	W9JY	15	6	55
W3TMZ	16	6	2410	W9AAG	15	5	40
K3WHC	12	6	2450	K9AJI	12	5	43
W3OMY	11	7	850	W0DRL	24	9	142
W3CJL	10	5	450	K9FLM	24	6	125
K3SWZ	10	6	2422	W0LER	18	6	100
W3JUG	9	4	400	W0PV	15	5	70
W4FJ	23	8	2430	W0LCN	13	4	70
K4QIF	23	7	1065	W6YZS	9	4	800
W4NFS	22	8	2400	K0DAS	7	4	65
K4EJQ	20	7	800	VE2HW	6	3	73
W4HJZ	15	5	350	VE3DKW	19	7	94
K4SUM	15	5	462	VE3EVW	12	6	52
W4VHH	15	4	750	VE3ONT*	11	7	30
K4GL	12	5	720	VE3AIR	9	5	30
WA4GPM	11	4	—	VE3ECC	7	5	51
K4NTD	9	2	863	VE3BBG	12	—	—
K1F1/4	9	4	860				
K4IXC	5	2	800				

\*Club station



# Public Service

Conducted By Robert J. Halprin,\* WA1WEM

## Highlights - NTS Staff Meetings

Two National Traffic System staff meetings were held on the same weekend, October 23-24, 1976, and the following is a short rundown of the proceedings.

The Eastern Area Staff held their formal meeting in Hartford, CT, and those in attendance were W2FR (Chairman and TCC director), K2KIR (EAN mgr.), WA8MCR (DEAN, CTN and 8RN-D mgr.), W1QYY WA1PGY (first region net mgrs.), W2MTA WB2EMU (second region mgrs.), WB2FWW/3 (third region), W4SHJ WA9NEW/4 (fourth region), W8PMJ (eighth region) and member-at-large WA1FCM. Representing ARRL hq. were WINJM and W1YL. Other observers were WA1MSK WA1VEI and WA2PJJ. The following is a *brief* chronology of events taken from notes made by WINJM.

Discussion of a proposed national area staff.

WA1FCM announced his resignation from the staff. Subsequent election of new MALs; VE3SB and K2KTK join W4UQ.

WINJM detailed a proposed 24-hour NTS schedule for inclusion in the revised *Public Service Communications* manual.

W2MTA presented a comprehensive committee report on streamlining NTS - the committee's report was accepted by staff.

W2FR announced that he was not a candidate for reelection as chairman. Nominations and balloting followed. K2KIR was elected as the new chairman. WB2EMU moved a vote of thanks to W2FR for his past efforts.

WA8MCR expressed his wish to relinquish his post as 8RN-D manager and recommendations were made to the communications manager for a replacement.

A motion was carried to delete the post of assistant CTN manager, with the daytime area net manager already carrying out this function.

WA9NEW announced his resignation as 4RN-D manager because of transfer to New

England and staff recommended WB4OBZ as the new manager.

Discussion (with no formal action) concerning regional and area communications coordinators and national emergency coordinator. Such officials would replace present managers, but would have jurisdiction over emergency preparedness in addition to NTS.

Discussion concerning the need for a new statistic to reflect how well each region does in area net representation. It was agreed by the communications manager to include another column in the monthly NTS statistics for this purpose, on a trial basis (see column 7).

It was voted to eliminate CTN and replace it with appropriate daytime TCC schedules. The exact schedule will be coordinated with the three area staffs.

Ways and means of generating more traffic, led by W8PMJ.

Discussion that staff should work more closely with section-level officials to deal more with the basics, especially the reliability of message delivery.

Motions were passed to thank W2FR for his service as staff chairman and WA1FCM for his service as MAL.

The Central Area Staff met in St. Louis, MO, and those attending were W0AM (Chairman and member-at-large), WB4EKJ (DCAN mgr.), W5GHP (TCC director), WA5IQU W5KLV (fifth region mgrs.), WB9KTR (ninth region), K0AEM WB0HOX (tenth region), W9QLW (member-at-large) and WA1WEM (ARRL hq.). The following is a *summary* from notes taken by WA1WEM.

Modernization of NTS structure, getting new blood into NTS, discussion of a 24-hour NTS cycle; a proposal by K0AEM to eliminate region nets - have section reps report directly into area net. This proposal was defeated but it was the sense of the staff that changes are needed in the structure. A daytime TCC was unanimously approved.

Staff agreed (following consultation with

CAN mgr. W0HT) to experiment with a dual session of CAN during periods of heavy traffic, such as Christmas or in emergencies. Region net managers are also encouraged to have traffic split up by area on the region nets. Staff felt that more liaison was needed with the Red Cross at all levels; perhaps to generate NTS traffic on a quarterly schedule.

Discussion of better communication needed between staff members, as well as the three staffs and Hq. Additional mailings to be undertaken by Hq.

Election of MALs and staff chairman - W5MI W9QLW and W0AM all retained.

Staff recommended that the ARRL message format be changed to become more compatible with military (MARS) format.

Discussion of CAN station capabilities.

It was the sense of the staff that all region and area managers appoint an assistant manager, someone who could assume the leadership of the net, should the manager be ill or incapacitated or forced to resign.

K0AEM announced his resignation as TEN manager and after extensive discussion K0CVD was recommended to succeed him. Voting also took place for a new 9RN-D manager - WB9FOT was recommended.

Staff requested the Communications Department to look into making available special awards or plaques for region or area managers with long tenure and for liaison and net control stations exhibiting exceptional reliability.

A motion was carried that the NTS routing instructions be changed so that all Florida traffic be routed to RN5. Staff indicated that all Florida traffic coming into CAN will be routed to RN5.

Changes in the CAS terms of reference were made; daytime and evening members officially included.

Discussion of SET. Staff felt that NTS should run continuously, that last year's "business as usual" plan didn't work too well.

## PUBLIC SERVICE DIARY

- Tazewell, VA - July 9. Three people lost their lives and three others were injured when a tanker truck carrying 8,000 gallons of gasoline collided with a train. WB4HMX provided emergency communications and also alerted the local press of the accident. (WB4JPS)
- Hobart, IN - July 20. WB9HCH activated his community's AREC/RACES group when both the police and fire department lost electrical service during a severe storm. Fifteen amateurs were instrumental in providing a 10-kW generator. (WB9HCH, EC Lake Co.)
- Jackson, WY - August 21. While riding her horse, a young girl was seriously injured in an isolated section of Wyoming. WA6LJO/7 used 20-meter ssb to contact K5KZX, who phoned the Jackson Sheriff's Department. A helicopter was on the scene shortly afterward. (WA7WDC)
- Lake Washington, WA - September 9.

\*Asst. Communications Mgr., ARRL

Amateurs assisted medical teams and police to locate a number of missing persons during a bike-a-thon. A net on 28/88 coordinated first-aid activities for the more than one thousand participants. (K7DPO)

□ Tower, MN - September 14-17. The Minnesota Dept. of Natural Resources and the St. Louis Co. c.d. requested help from hams when a raging forest fire consumed about 6,000 acres of land. Twenty-one amateurs relayed requests for heavy equipment, food, water and assisted the more than 200 firefighters in the field. (K0ZXE, SCM MN)

□ Guam - October 1. KG6JCB was awakened early in the morning by a neighbor whose home was on fire. Telephone service had not been restored since Typhoon Pamela, so KG6JCB called for help on two-meter simplex. He was answered by K1LNJ/KG6 who summoned the fire department. (KH6GQW, SCM Pacific)

□ Taquitz Canyon, CA - October 18. RACES supplied communications for the Riverside Mountain Rescue Unit who were providing medical assistance to an ill hiker. Both the

Palm Springs and Crestline repeaters were used since skip on 75 meters prevented the use of that band. The victim was taken out by helicopter the following morning. (W6AQB, SEC Orange)

□ Chicago, IL - October 19. WA9BTV chased and cornered two burglars on the Northwest side of Chicago while reporting the pair's movements to the police. Twelve minutes after the 16/76 autopatch was dialed by WB9YGR, an arrest was made. (WA9LRJ)

□ Venezuela - October 19. A number of amateurs arranged for urgently needed medicine to be shipped to a critically ill asthma victim. W5UAW, WB5HVY and YV5MM/3 were instrumental in saving the child's life. (WB5DCY, SCM MS)

□ Clark Co., IN - October 20. The Jeffersonville, IN, AREC net was activated for a March of Dimes walk-a-thon. During the event, a girl was struck by a car and with the help of mobile units was transported to a local hospital. (WA9TJS)

□ Lexington, KY - October 20. WA4MXO assisted an ill motorist who was stranded in

near-freezing weather. (WB4WKP)

Repeater Log. According to reports received to date, repeaters were used to report 40 traffic accidents and related occurrences, two fires, two disturbances, one search, one burglary, one medical emergency and one rescue. Repeaters involved were WR3ACM, WR4ACO, WR5s ABA ABY ADC ADP, WR6ACJ, WR7s ABY ADD, WR9s ACX AEC.

For October, 33 Section Emergency Coordinators reported a total AREC membership of 13,192. At this time in 1975, 40 reports were submitted, with a membership totaling 14,908. Sections reporting were Alta, Ariz, Ark, Colo, Conn, Del, ENY, EMass, Ga, Ind, Kans, Ky, Mich, Miss, NLI, NC, NFla, NNI, NTex, Ohio, Okla, Ont, Org, SV, SDgo, SCV, Sask, SFla, SNJ, Utah, Va, WMass, WPa.

Don't forget the Simulated Emergency Test this month; check December QST for details.

## NATIONAL TRAFFIC SYSTEM

EAS's recommendation for a statistical listing to show how the regions fare on the area nets is reflected by the new column seven. Unfortunately, thanks to the U.S. Postal Service, we only have a partial report from K7NHL/PAN, hence no rep. statistics for those evening region nets. October was the second consecutive month of 100-percent representation by the three area nets on CTN. New Managers: VE2WT (ECN), WB4OBZ (4RN-D), WB9FOT (9RN-D), K0CVD (TEN). Our thanks to VE3AWE, WA9NEW/4, WB9NVN and K0AEM for a job well done. WB4PNY, the original 4RN-D manager, is now back in the fold. 4RN-D's alternate frequency is 3935 kHz. New assistant managers: WA2WKH (2RN-D), WB5NKD (RN5-D) and WA6MBZ (RN6). All net managers are urged to appoint an assistant. A plethora of certificates has been issued recently, among them - 1RN-D: W1BVR W1DGL W1GUN W1UKR, K1BCS K1BQB K1PAD K1TVT, WA1FCM WA1MJE WA1MUX WA1RFT WA1RLP WA1UDB WA1UOT WA1UOU WA1VEI; 4RN-D: WA4KXZ, WB4PNY; 4RN-E: K4BKX. Sixty DEAN certificates were issued: W1DGL W1UKR, WA1FCM WA1IQG WA1ICN WA1MHJ WA1MJE WA1PGY WA1POY WA1QKD WA1SQB WA1VEI WA1VPE WA7ETN/1, W2ET, K2BHL, WA2SYR WA2UWA WA2UYK WA2WKH, WB2ASD WB2EMU, W3CWC, K3GJL, WA3ATQ WA3EOP WA3PZO WA3QOZ WA3THT WA3WUL WA3YJG WA3ZAS WA3ZUO, W4SUS W4WNY, K4EZH K4FTB, WA4EPJ WA4POQ, WB4ARJ WB4OBZ, WB4DL W8PTT, K8IKD, WA8HG, WB8CIU WB8DKQ WB8HWE WB8KWD WB8MZZ WB8QXN, WA9NEW/4, VE2DQE VE2UN, VE3FRG VE3FQZ VE3GFN VE3GJG VE3GOL VE3UOT. Congratulations to all.

## October Reports

(Evening sessions)  
(Daytime sessions)

	1	2	3	4	5	6	7
EAN	31	1459	47.0	1.227	95.1		
EAN	62	590	9.5	.533	94.6		
CAN	31	1127	36.4	1.035	100.0		
CAN	56	136	2.4	.139	78.5		
PAN	31	973	31.4	.837			
PAN	62	124	2.0	.149	83.8		
1RN							96.7
1RN	31	197	4.4	.310	82.9	90.3	
2RN	86	480	5.5	.486	90.9	87.1	
2RN	62	273	4.4	.334	91.0	87.1	
3RN	62	348	5.6	.381	95.7	96.7	
3RN	31	125	4.0	.492	95.7	100.0	
4RN	57	484	8.5	.368	89.9	100.0	
4RN	62	279	4.5	.276	67.3	100.0	
RN5							
RN5	31	153	4.9	.224	90.7	88.7	
RN6	62	544	8.7	.344	100.0		
RN6	31	181	5.8	.242	89.4	96.7	
RN7	59	326	5.5	.040	79.4		
RN7	60	84	1.4	.309	46.5	88.7	
8RN	44	221	5.0	.283	65.0	90.3	
8RN	31	107	3.4	.465	86.0	98.3	
9RN	61	587	9.6	.460	95.1	100.0	
9RN							
TEN	53	353	6.6	.371	52.3	100.0	
TRN	28	46	1.6	.105	32.2	88.7	
ECN	61	236	3.8	.350	95.1	100.0	
TWN	62	436	7.0	.342	98.1		
TWN	13	32	2.4	.163	29.0	66.1	

CTN	31	254	8.2	.349	100.0
TCC	118 <sup>1</sup>	595			
Eastern					
TCC	88 <sup>1</sup>	593			
Central					
TCC	117 <sup>1</sup>	657			
Pacific					
Sections:					
	4104	15964	3.8		
Summary	5395	27904	5.1		
Record	5476	31117	16.4		

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

<sup>2</sup> Section and local nets reporting (133): BCEN (BC), OPN (ON), WQV/UHF (PG), AENB AEND AENM AENR AENW (AL), ASN (AK), ATEN HARC (AZ), AMBN APN ARN (AR), NCN SCN (CA), CWN (CO, WY), CN CPN NVHFN (CT), FAST FMTN FPTN GN NFPN GFN QFNS SPARC TPTN (FL), CVEN GAREC GBSN GSN GTN (GA), IMN MTN (ID; MT), ILN (IL), IMO (IN), I75MN TLCN (IA), KWN QKS SS (KS), MKPN KRN KTN KYN (KY), LSN LTN (LA), MSSN PTN SGN (ME), MDCN (MD), EMRPN GNBN WMN WMPN (MA, RI), HEN KCAN MACS MNN M1GM QMN WSSN (MI), MSN MSPN MSSN PWX PAW (MN), MTN (MS), NHVTN (NH, VT), BARTEN NJN NJPN (NJ), NAN SVN (NM), NLI NLIPN NLS WDN (NY), BRTMN CFARS CN CNN PX NCSSBN RARS-2 SCSSBN (NC, SC), BN COAREC-10 MASER ONN OGN OSN OSSBN (OH), OAN OFON OLZ OPEN OTWN STN (OK), NSN OSN (OR), EPA EPAEP TPN PFN PFTN WPA (PA), SDN (SD), ETTMN TN TPN (TN), TEX TTN (TX), SUN UCN (UT), VFN VSN (VA), WVN WVPN (WV), BWN WIN WNN WSN (WI).

1 - NET	5 - RATE
2 - SESSIONS	6 - % REP.
3 - TRAFFIC	7 - % REP. TO AREA NET
4 - AVG.	

## Transcontinental Corps

All members were saddened by the passing of Red Kruse, W9LXC. Red was active in TCC for close to 20 years, including five years as TCC Director. This outstanding operator will be sorely missed on the circuits.

October was TCC-E's best month for sked successes and reports in a long time, particularly due to the FB efforts of Asst. Director VE3SB. TCC-Pacific has lost the world-famous WA7WXY to the exciting world of politics; student government, that is. W5GHP has appointed W5UGE as his assistant director. W2FR issued a first-time TCC-E certificate to WA3VBM.

	1	2	3	4	5
Eastern	124	95.2	1643	595	
Central	93	94.6	1169	593	
Pacific	124	94.4	1319	657	
Summary	341	94.7	4131	1845	

1 - AREA	4 - TRAFFIC
2 - FUNCTIONS	5 - OUT-OF-NET TRAFFIC
3 - % SUCCESSFUL	

## TCC Roster

The TCC roster (October): Eastern Area (W2FR, Dir.) - W1s NJM QYY, K1EIR, WA1s MSK UGJ WEM, W2s FR GKZ MTA, K2s HI/VE2 SIL/1, WA2s ICB PJL UYK, WB2UBW, K3MVO, WA3s SXU VBM, W4UQ, K4KNP, W8s GLC LTA PMJ, WB8ITT, VE3s GOL SB, Central Area (W5GHP, Dir.) - WB4s LCR SKI, W5s GHP MI RB UGE UJJ, K5s TFG TTC, WA5IU, W9s CXY DND NXG, WA9EED, W89s NOZ TWT, W0s AM HH HJ, K0s AEM CVD, WA0TNN, Pacific Area (K5MAT, Dir.) - W5RE, K5MAT, WB5KSS, W6s BGF EOT MLF TYM VZT, W6HW, W7s DZX GHT KZ, K7s IWD NHL QFG, WA7WXY, W0s ETT IW LQ, K0s DRL TER, WA0KKR/7, W0s DJY QOT, VE7ZK.

## Independent Nets (October)

	1	2	3	4
Clearing House	31	293	517	
Hit & Bounce	62	1056	467	
Hit & Bounce Slow	31	77	60	
IMRA	26	377	944	
Mike Farad	25	53	46	
North American SSB	26	73	252	
Washington Region PON	14	66	253	
75 Meter ISSB	31	496	1369	
7290 Traffic	40	277	1912	
1 - NET	3 - TRAFFIC			
2 - SESSIONS	4 - CHECK-INS			

## Public Service Honor Roll Oct. 1976

This listing is available to amateurs whose public service performance during the month indicated qualifies for 40 or more total points in the following nine categories (as reported to their SCM). Please note maximum points for each category: (1) Checking into cw nets, 1 point each, max. 10; (2) Checking into phone/RTTY nets, 1 point each, max. 10; (3) NCS cw nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned liaison, 3 points each, max. 12; (6) Phone patches, 1 point each, max. 20; (7) Making BPL, 3 points regardless of traffic total; (8) Handling emergency traffic directly with a disaster area, 1 point each message; (9) Serving as net manager for entire month, 5 points.

71	WB5KGP	K4BKX	WB8DQX	WA4PSL
62	WB2VTT	WB4DBK	WB8KKJ	K5TTC
61	WA1MSK	WA4EPJ	K9ZTV	W6AUC
60	AA1VEI	WB4IGX	K0MRI	WB6UZK
59	WB2CT	W4OQG	WB0TAQ	W7DAN
58	WB5NKO	W5GHP	VE1AAO	WA8JXP
57	WA5YEA	WB5PTH	48	W9NXG
56	W7OCX	AA1VEI	W6RNL	WB9QKH
55	WB8JGW	WB2CT	VE3JGJ	W9SFL
54	WB9RWZ	WA2ECO	55	W00YH
53	WB0HOX	WB5NKO	WA2SLF	VE1AVL
52	K00NK	WA5YEA	WA2ZJP	VE1BDT
60	K0CVD	W7OCX	54	K4FLR
59	WA2BMI	WB8JGW	WA3SXU	WB4SKI
58	WA3JGJ	WB9RWZ	53	WA7MEL
57	WA5RKU	WB0HOX	52	K0EVH
56	WB5AMN	K00NK	52	AB0MA
55	K1PAD	K0CVD	46	VE4UO
54	W6INH	WA2BMI	51	WB4OXT
53	WA6TVA	WA3JGJ	50	K4YFC
52	WB9ICH	WA5RKU	45	VE3FGT
51	WA4FBI	59	50	WB6FTY
50	WB5NUM	58	AA1UDB	WB9QOT
49	WA1FCM	K1PAD	AA1VGP	41
48	W2MLC	W6INH	AB2ASD	44
47	WA2WKH	WA6TVA	W5UJE	W1BVR
46		WB9ICH	WB6JIK	WA1MJE
45		57	W7VSE	W3IPX
44		56	WA1FCM	K3OIO
43		55	W2MLC	K3KAW
42		54	WA2WKH	K3ORJ
41		53	WA1FCM	WB2LZN
40		52	W2MLC	WA3OGM
39		51	WA2WKH	WB4FHT
38		50	WA1FCM	K3YHR
37		49	W2MLC	WB4EKJ
36		48	WA2WKH	W7GHT
35		47		WB4GHU
34		46		WB4HHX
33		45		WB4LCR
32		44		WA2DIW

## Brass Pounders League October 1976

BPL Medallions (See December, 1973 QST p. 59) have been awarded to the following amateurs since last month's listings: WA5VBM, WA7JRC, W9IOH.

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.

## Winners of BPL Certificates for Oct. Traffic

	1	2	3	4	5	6
W3CUL	428	1566	1920	41	3955	
W9WYX	53	976	399	577	2005	
W3VVR	268	186	436	16	906	
K0YFK		449	449	449	898	
K9CPM		439	37	362	838	
W4MEE	4	371	305	11	691	
WB4ARJ	4	276	323	5	608	
WB4SKI	21	284	278	8	592	
WB6EIG	9	261	247	7	522	
WA4JDH	1	256	246	2	505	
W3CUL		344	1190	1444	33	3011
W3VVR		242	186	382	12	822
(Aug.)						
K0YFK			370		370	740
(Sept.)						

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

W0FIR	306	WA3JYG	12
WA3ATQ	242	KX8BCF	11
W5TI	186	WB0IBS	11
W9IOH	171	WA9VGV	10
K4WC	141	WA3JYG	12
		(Aug.)	

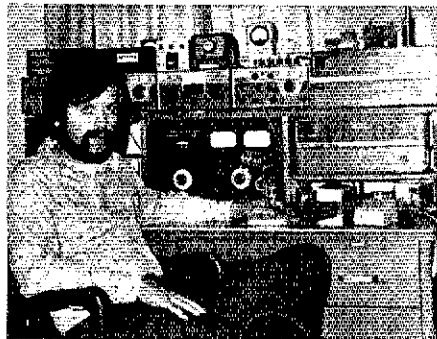
1 - CALL	4 - SENT
2 - ORIG.	5 - DEL.
3 - RECD.	6 - TOTAL

# 1976 September VHF QSO Party Results

Know what happened on the vhf bands last September or how long the September QSO Party has been in existence? This report answers those questions and more.

By Bill Jennings,\* WA1AHI and Jim Cain,\*\* WA1STN

*"With September the start of a new radio season, ARRL is pleased to announce its third vhf activity of the year. Like the successful May and January tests, this is an invitation to all amateurs who can work any or all vhf bands (50 Mc. or above) . . . to see what stations can be worked and what vhf DX is possible. States for WAS, a test for new antennas and a renewal of friendships in the vhf circle are all made possible by this same event."*



Russ Bentson, K6KLY, single-operator section leader in the Santa Clara Valley section. Russ amassed 292 contacts total, employing each of the bands between 50 and 1296 MHz inclusive.

Thus read the announcement for the first September VHF QSO Party, held in 1948. The results of that Party appeared in the February, 1949, issue of *QST*, and showed 98 individual station entries, with the majority reporting activity on 6 and 2 meters. Only three stations reported 220-MHz activity and one pioneer reported being on 450. That is not to say that experimental work was not going on in the higher bands (the same issue of *QST* listed DX records for bands up to and including 21,000 MHz) but that the reported upper limit used in the contest was 450 MHz.

Twenty-eight years later, the September 11 and 12, 1976 VHF QSO Party produced 223 individual stations on the air with nearly half of them active on 220 MHz and above. In fact, one QSO was reported on 10 GHz by K7AUO/7, while more than a handful of stations reported successful contacts on 1296 and 2400 MHz.

"Lousy propagation conditions" seemed to be the dominant theme of the comments received but, despite any

help denied us by the ionosphere, continued improvements in equipment and operating techniques helped make up the difference. Eight new division records show up in the all-time record listings elsewhere in this report; three single-operator marks fell, headed by the new national record set by K6YNB/6. Having lead his section every year since 1968 and having also battered the division record every time with the exception of 1973 in the Southwestern Division, Wayne is no newcomer to this kind of performance.

K6KLY now holds the Pacific Division record at 13k and W8ZCO operated K8III to a new Great Lakes mark of nearly 14,000 points. On the multi-operator side of the ledger, new all-time marks were set in 1976 in the Dakota, Delta, Hudson, Pacific and Southeastern Divisions.

Perennial leaders in the West Gulf Division, W5WAX and K5WVX, now hold both single and multi-op marks there. Not bad for an "off" weekend.

Advances in equipment, operating

techniques or any other changing parameters do not seem to hold the key to the fascination of working the lesser-populated higher frequencies. Ask WIJSM, who was listed in the first September Party in 1948 and continues to participate and report right up to 1976, why he competes year after year. His answer might parallel the following statement from the *QST* report of twenty-eight years ago: "Vhf enthusiasts had their third opportunity . . . to match skill and equipment against others in their respective ARRL sections during the VHF QSO Party of September. . . ."

## Soapbox

Conditions were super terrible out here. No E skip, dry ground wave combined with no local activity, and very poor scatter on 6. Never heard a thing from the west (AAØTRO). My four-year-old daughter came in and asked me what I was doing, while operating in the contest. I said just trying to talk to people. She then asked "Why, Daddy?" (W3TMZ). Heard 13 sections on 432, worked 9 but I can't complain about that with only 10 watts to a low Yagi. Two meters was almost exactly the same as in June, El Stinko. Maybe January will be the fooler. Strange thing was that I only worked one less section in Sept. than in June when I was mountaintopping with our club. . . . Maybe a good QTH is not as important as a newcomer (me) is lead to believe (WB8IJW). WOW! What a difference from the East Coast operations. . . . Getting over 4 sections with a modest station is a bear! . . . Many of the "multi-moders" on 2 ssb are still vertically polarized. This hurt DXing quite a bit. Let's hope they get those antennas over soon (WA4MMP/7). First sort of small DXpedition for me and was a ball.

\*Communications Assistant, ARRL

\*\*Asst. Communications Mgr., ARRL

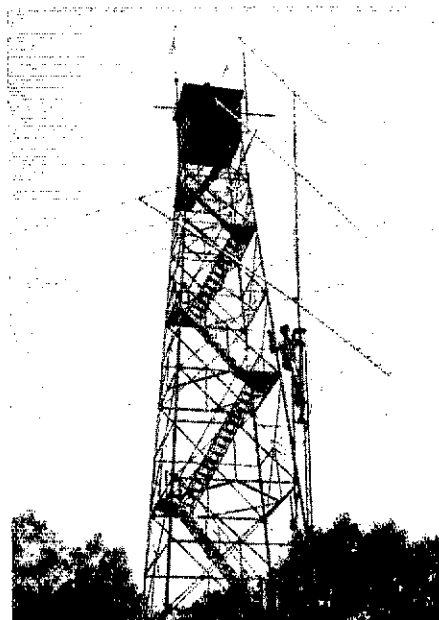
**Multipliers Per Band**

Min. Sections MHz	30 50	15 144	4 220	3 432	1 1215	Min. Sections MHz	30 50	15 144	4 220	3 432	1 1215	Min. Sections MHz	30 50	15 144	4 220	3 432	1 1215	
WA1FFO	16	23		17		K2EVJ	12	1			4	K4QIF			12		11	
K1HTV		22				WA3QPX	14	16	5	4		W4UCH	9	9	3		4	
WA1LOU		17				W3BHG		12		8		W4FS/4					8	
W1AVV		18				W3CGV	3	2		3		K5WVX	6	11			4	
AA1KIR	18	10	2	2	2	W2FCL/3	18	14	3			W6BXO	9	8	5		5	
W1JAA	10	13	5	17		W3HMU	16	15	11	17	4	WA6VEF	5	11	6		6	
K1OJQ		19	4			WA3KPS	12	18	3			K6IBY			7			
W1MX	19	15	8	13		WA3AXV	11	14		16		K6YNB/6	13	12	8		8	
K1WHS	23	23	6	13		WA3JUF		18	5	7	4	K6KLY	11	11	6		7	
W1YTW	10	18	9	7		K3RYL		16		13		WB6KAP	8	8	4		7	
K1MNS	20	18	4	11		K3HTZ	3	18		6		K6GSS/6	11	11	7		8	
W1FMF	13	13	3	4		K3SWZ		12		11		AB6NMT	10	11	6			
WA2UXW/1	22	17	7	9		K3KPV	21	20	3	10		W6YKM	11	11	2		3	
K1GYT	28	13				W3AD/3		16				WA6JUD/7	11	8	1		4	
W2SZ/1	26	21	13	17	3	W3TMZ		19		18		W7LYE/7	11	4	2		3	
WB2FKJ/2	24	21	4	7	1	AC3KMV	14	14		9		WB8BKC	6	8			6	
WA2RAT		23				W3GHX		12		5		K8III	28	22				
K2OVS	9	16		11		W3PGA/3	12	12	6	10		K8UQA						14
K2RIW				18		WA3LOS	12	15	5			WB8JW		16			9	
WA2SLY		18				W3OMY	6	17		3		W8AEC		14			8	
WB2GDZ		16				W3GNR/3		17				K3IVO/8	16	15	2			
W2OMS				20		W4ISS	3	4		4		K9HDE	11	6	1		5	
WB2CUT		17				WB4EXW	8	6		4		K9OXY	2	5			3	
WA2SNA	19	22	12	16		K1FJM/4		12		10		WA9HCZ		4			3	
K2OWR	28	22	15	16		W4VHH		7		6		W0NGG	1	4			1	
WA2UDT/2	13	19				W4IQQ/4	8	6		3		W0OHP	1	4				
W2EIF	12	20	10	11	2	WA4LDU	9	4			1	VE3BQN	5	14	4		14	
W3CXU/2		15				W4BFB/4	24	14	4	4		VE3DSS	6	17				
K2BWR	16	18	10	12		WB4JGG/4	19	12		6		VE3EXR	4	6			4	
K2LGJ				16		WA4GPM	18	18		13		VE3FVN		16				
K2JIQ		15				K2UOP/4	10	11		3	1							

I think my 432 contact with K6YNB is a tropo record for the West Coast at 600 plus miles. Was nice to have people calling ME - learning to live with 40 mph winds, etc. (WA6JUD/7). Contests under near-minimal conditions strip away all illusions of greatness for the moderately equipped stations, mainly Me (WA3KPS). About halfway through the contest the kW transformer blew up and we jury-rigged another power supply yielding about 500 watts. We sure missed the extra 3 dB after that (W5GVE and K5UGM). Putting the beams at 90 feet really helped pull out the weak stations. Tnx to all the Chicago-land stations for swinging their beams northwest to hand out contest points (WA9JFM). Two-meter activity on ssb was up from previous years, although New England activity above 145 MHz was poor (WA2WPC). Conditions were great! About average for a January SS on Saturday, with clouds and cool winds. The weather cleared on Sunday and with it came a little local inversion which boosted signals to the west and southwest. Local activity on 2-meter ssb and cw was better than ever (VE3DSS). In July I had my thirteenth birthday, in August I got my amateur radio license, and in September I entered my first contest (WB9LOE). Overall, the contest was very interesting and a much better experience for me than last year. One disappointment was

the apparent lack of participation by many well-qualified vhfers. Two of my local friends dropped out of the contest because they couldn't compete with the "kW's" on the mountaintops here in the southeast (/4). These high-powered portables seemed to dominate the

contest and at times filled the first 20 kHz of 6 meters and also made 146.5 useless (WA4DLU). I still have difficulty in attracting attention up here in Ottawa, but I was pleased to finally work NNJ in a contest, although SNJ has still eluded me (VE3FVN). If we're going to



At left, Barry, WB4IZR, works atop the fold-over tower, which is dwarfed by the fire watchtower in the background from which Dave, WA4ALJ, at the right, operates the 2-meter and 432 stations. This operation was run under the call WB4JGG/4 and placed second in the multi-operator category in the Tennessee section.

Scores are listed in order, single-operator stations first within each section. From left to right: call, score, number of QSOs, number of multipliers, bands operated (A-50 MHz, B-144 MHz, C-220 MHz, D-420 MHz, E-1215 MHz, F-2304 MHz, G-3300 MHz, H-5 GHz, I-10 GHz).

State	Call	Score	QSOs	Mults	Bands
U.S.A.	QEA,30Q,UXA,VBS,opr(s)	66,447-806-69-ABCD	4	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s))
Alabama	K2OWR (+WA2DBD,WB2S UJJ, WIK,Y31-63-81-ABCD WA2UDT/2(+WB2LDE), 380B-119-32-AB	1140-60-19-AB WA4CQG 189-9-8 WBANCN/4 (+WB4S EOW,NFA) 1464-61-24-AB	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)
California	WA1FFO 16,632-254-56-ABD K1HTV 3080-140-22-B WA1LOU 1377-81-17-B W1AVY 1206-67-18-B WA1GTP 1032-43-24-AB K1ZKR 1027-79-13-A WA1WVK 550-50-11-B WA1GVN 338-25-13-AB W1WEE 92-23-4-B	1140-60-19-AB WA4CQG 189-9-8 WBANCN/4 (+WB4S EOW,NFA) 1464-61-24-AB	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)
Connecticut	W2EIF 12,925-182-55-ABCD W3CXU/2 720-42-1-8 W2HXF 372-29-12-8D K2BWR (+K2ZKJ) 8736-121-66-ABCD WB2LCC(+WA2S AWO,IVC) 1199-109-11-AB	1140-60-19-AB WA4CQG 189-9-8 WBANCN/4 (+WB4S EOW,NFA) 1464-61-24-AB	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)
Eastern Massachusetts	W1JAA 5670-85-45-ABCD AA1KR 4964-138-34-ABCD K1OJQ 2185-84-23-8D WA1DIT 189-21-9-B W1MX (W2QHC,WB2MZE,WA4TTG,opr(s)) 12,045-180-55-ABCD	1140-60-19-AB WA4CQG 189-9-8 WBANCN/4 (+WB4S EOW,NFA) 1464-61-24-AB	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)
Maine	K1WHS 12,220-158-65-ABCD W1YTW 3598-108-44-ABCD	1140-60-19-AB WA4CQG 189-9-8 WBANCN/4 (+WB4S EOW,NFA) 1464-61-24-AB	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)
New Hampshire	K1TMS 11,501-194-53-ABCD W1FMF 5049-138-33-ABCD W1JSM 112-16-7-B	1140-60-19-AB WA4CQG 189-9-8 WBANCN/4 (+WB4S EOW,NFA) 1464-61-24-AB	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)
Rhode Island	WA2UXW/1 (+WA1WEH,WA2S BLM,LOA) 11,440-182-55-ABCD	1140-60-19-AB WA4CQG 189-9-8 WBANCN/4 (+WB4S EOW,NFA) 1464-61-24-AB	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)
Vermont	K1GYT 4961-121-41-AB W1LAIM 777-37-21-AB K1LLJ 24-6-4-B W1IMAG (+WA1S JEX,NBU, AK1UYU,WN2CFC) 1620-81-20-AB	1140-60-19-AB WA4CQG 189-9-8 WBANCN/4 (+WB4S EOW,NFA) 1464-61-24-AB	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)
Western Massachusetts	WA1UOL/1 702-54-13-AB W1STR 403-31-13-AB WA1AP 170-17-10-B W2S2/L (K1QQB,WAL1JOU, NWW,UGE,WA2S AXV,UJK,WB2S RXP,GSW,QC1,QDP,opr(s)) 49,680-532-80-ABCD	1140-60-19-AB WA4CQG 189-9-8 WBANCN/4 (+WB4S EOW,NFA) 1464-61-24-AB	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)
2	Eastern New York	WA2WPC 3277-111-29-ABD WB2CQY 1600-80-20-AB WA2ZPX 370-37-10-A W2IP 84-14-6-B WB2JMN/2 6-3-2-B WB2FKJ/2 (WA1TGG,K2DNT, W2S CXC,HCO,HHC,WAZ2PT, WB2 DVV,ELL) 23,484-391-57-ABCD K8BRC,opr(s)	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)
New York City-Long Island	WA2RAT 8796-252-23-B K2JVS 5184-120-36-ABD K7HIW 2380-57-20-DF WA2SLY 1476-82-18-B WB2SLZ 1024-64-16-B WA2BP 1000-100-10-B WA2EUS 396-28-11-8D W2GF 142-22-6-B K2YGM 98-14-7-B WA2SRH 98-14-7-B WA2YUS 51-17-3-B WR21SB 40-10-4-B	1140-60-19-AB WA4CQG 189-9-8 WBANCN/4 (+WB4S EOW,NFA) 1464-61-24-AB	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)
Northern New Jersey	W2OMY 2200-55-20-D WB2CUT 1853-109-17-B WB2WH 480-48-10-B WA2SNA (K2S BUC,K1YUJ, WA2S ANQ,JCP,RIV,UPK,WB2S	1140-60-19-AB WA4CQG 189-9-8 WBANCN/4 (+WB4S EOW,NFA) 1464-61-24-AB	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)
3	Delaware	WA3QPK 4631-107-39-ABCD W3BHC 17,640-206-63-ABCD WA3KPS 6930-199-33-ABCD WA3AXV 6765-122-41-ABD W3JUF 5882-131-34-8D K3RYL 3161-78-25-B K3HTZ 2862-95-27-ABD W3JIT 2775-111-25-AB K3IWK 2700-92-25-AB K3SWZ 1863-63-25-8D W3ELQ 1032-122-8-BC K3GAS 533-38-13-ABCD WA3JGP 432-32-13-ABCD W3EFL 430-43-10-AB WA3BRW 186-31-6-B W3AJF 140-14-10-AB W3AWA (WA3KFT,opr) 120-23-5-ABC WA3KFT 18-5-3-ABC K3KPV (+WB2YEH,WA3S LBI, PUL,IUL,VUN,WAK,WTM, WB3CFL) 19,880-352-54-ABCD K3QJY (WB3AMV) 2682-179-13-ABCD W3HZU (K3S GD),SUI,SZY, W3AXC,WB3S AVC,BWG,opr(s)) 2124-18-18-AB W3ADJ/3 (K3HEC,W3OLV,WA3S HLP,U LR,UNS,WPA,WB3BHC, W3EJY,opr(s)) 1808-113-16-B WB2ENJ/3 (WA2JUH + 10000) 14-7-2-A	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)
Maryland-D.C.	W3TMZ 7141-145-37-8D AC3KMV 5549-153-37-AB11 W3GHX 1428-69-17-8D WA3NNZ 754-58-13-B W3ALU 684-56-12-8D WA3JUC 637-49-13-B W3MNS 627-54-11-ABC W3HGX 600-100-6-B W3JPT 597-74-8-AB AC3DOS (W4HU,opr) 111-37-3-B W3PGA/3 (K3S FME,FRX,PHH, ROJ,YZ,opr(s)) 8140-19-33 H2J,LAW,OTZ,WN3S BGS,BIT,opr(s)) 9120-198-40-ABCD WB3LOS (K4SI,WA2PCC, G3SLZ,opr(s)) 4864-146-32-ABC	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)	
4	Southern New Jersey	WA4NPL 1140-60-19-AB WA4CQG 189-9-8 WBANCN/4 (+WB4S EOW,NFA) 1464-61-24-AB	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)
Georgia	WA4NJP 3193-103-31-ABD W4ISS 385-25-11-ABD W4WDH 283-9-9-B W4SHL 42-14-3-B W4VO/4 (K4CKS,W44PFT,WB4S AEG,KEY,YWK,opr(s)) 6028-274-22-AB WA4FBH (+WA4APG,WB4CMD) 2888-142-19-ABD W4IMQ (+W4RS) 72-24-3-B WA4NSB/4 (+WB4AYB) 15-15-1-B	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)	
Kentucky	W4SMU 444-74-6-B WA4PI 224-24-9-8D	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)	
North Carolina	WB4EXW 2196-115-18-ABD K1FJA/4 124-79-2-8D WB4IXU 605-55-11-AB W4VHH 572-34-13-8D WB4LDO/4 363-33-11-B	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)	
Northern Florida	W4CSS 16-8-2-AB	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)	
South Carolina	WB4NBK 128-16-8-AB W4VRV 126-18-7-AB W4IQQ/4 (K4PXE, W4S NOB, ZW, WA4LIQ,WB4QDL, W4UBB,opr(s)) 2465-141-17-ABD WB4TGM (+WA4VJQ,WB4S EFLZ,FDU,JHE) 693-77-9-AB	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)	
Tennessee	WA4LDU 1400-96-14-ABE WA4IAX 189-27-7-AB W4BFB/4 (K4BSW,LVY,MQG, PKV,SAN,SLC, WAFKT, WA4S APD,ICM,JPQ,VCC,WB4S CCV, IZPL,TA,PCS,WN4S CJA,NPB, TLX,opr(s)) 26,726-551-45-ABCD WB4IGG/4 (+WA4ALJ,WB4IZR) 9435-245-37-ABD	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)	
Virginia	WA4GPM 11,417-193-49-ABD K2JOP/4 3478-128-25-ABDE K4QIF 354-83-26-8D WA4LJQ 3340-160-20-ABCD W4UCH 2295-73-27-ABDE K4FTO 765-51-15-AB W4QVY 386-97-4-B W4F5/4 336-21-8-B K4EVH 183-61-3-B W4HU 62-31-2-B WA4EPJ 30-5-5-ABD	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)	
5	Mississippi	W4MPC/5 420-32-12-ABD	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)
Oklahoma	K5WVX (+K5BXG,AC5WAX) 1932-84-21-ABD	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)	
Western Pennsylvania	W3OMY 1716-63-25-ABD W3D 65-13-5-AB W3HID 63-9-5-A W3GNR/3 (+K3S TFLZDR, WA3BUX) 1564-92-17-B	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)	
Southern Texas	W5GVF (+K5UGC) 82-41-2-B	6	6	WA4NPL WA4CQG WBANCN/4 (+WB4S EOW,NFA)	
6	California	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD
East Bay	W6GJV (+WB6S HQK,PKA) 4284-204-21-AB	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	
Los Angeles	W6GJV (+WB6S HQK,PKA) 4284-204-21-AB	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	
Orange	K6IBY 126-9-7-C	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	
Santa Barbara	K6YNB/6 34,013-657-43-ABCD AD6QPH/6 180-18-9-ABCD	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	
Santa Clara Valley	K6KLY 13,098-292-37-ABCD W6GKAP 4401-131-27-ABCD K6QAX 1634-76-19-ABC WB6EMR 136-34-4-B W6YX (WA6ITU,opr) 100-20-5-B K6GSS/6 (+WB6S HCL,KBZ,PY1) 25,080-607-38-ABCD	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	
7	San Diego	A8ENMT 2511-84-27-ABC NB6AFC (K6SDR,opr) 168-28-6-A W6KBD 10-5-2-B	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD
San Francisco	W6KRG 4026-183-22-AB	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	
San Joaquin Valley	W6YKM 8235-292-27-ABCD W6OPD 416-31-13-ABC	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	
Sacramento Valley	W6SUOS 124-31-4-B	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	
8	Arizona	K9DKW/7 930-62-15-AB	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD
Idaho	K7ZCB/7 2-2-1-B	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	
Oregon	WA6JUD/7 4056-159-24-ABCD K7HSJ 343-46-7-ABCD W7TYR 342-31-9-ABCD W7AMMP/7 136-34-4-AB K7AVO/7 (K7UWH, W7S ADV,BKN, K8M,UOM,opr(s)) 1134-63-14-ABD-FGH	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	
Washington	W7LYE/7 (K7S KOT,YRQ, W7S DNU,SLS, WA7NAB,opr(s)) 8740-408-20-ABCD W7PQE/7 (+W7S2N) 426-71-6-AB	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	
9	Illinois	K9HDE 3243-123-23-ABCD W9LEF 2704-104-26-AB W9IV 550-50-11-AB W9ABA 56-14-4-B	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD
Indiana	WB9CEP 1738-144-12-AB WB9SKA 108-35-3-B W9MME 48-18-3-AB WB9UC/9 (WB9S GEU,GEX, GEY,GF,A,opr(s)) WB9OLE (+WA9AW,WB9GIG) 2025-139-15-AB	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	
Wisconsin	WA9JFM 1023-93-11-B K9OXY 440-38-10-ABD WA9LZM 387-41-9-ABE WA9HCZ 266-32-7-8D WB9JUD 12-6-2-B	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	
10	Iowa	WB9NZA 208-26-8-AB	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD
Kansas	AA8TRO 32-8-4-AB	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	
Minnesota	W9OHU 322-46-7-B K1WVE/9 124-31-4-AB W9MWW/9 (WA9QWY, WB9S RSJ,SJ,TXA,opr(s)) 294-49-6-AB	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	
Nebraska	W9BNG 392-51-7-ABDE W9OHP 294-47-6-ABE WB9UT 275-53-5-8D WA9MRH 45-9-4-A K9KKV (WB9YW, WB9S DGF, VFM, WN9QGS, opr(s)) 192-48-4-AB	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	
CANADA	WB25IH/VE1 (+WA2OMT, WB2DST) 660-33-20-AB	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	
Ontario	VE3BQN (VE3ABG, opr) 6364-146-37-ABCD VE3DSS 2898-126-23-AB VE3FGU 1243-113-11-B VE3EKR 910-60-14-8D VE3FVN 720-45-16-B VE3FHK (+VE3FHU) 1848-84-27-AB	6	6	WA8HPY 836-44-19-AB WA8TJL 826-59-14-B WRNJS 464-121-4-B WABQGS 420-42-10-A WBJRN 288-72-4-B WBCCI(WBULC,WA8AYB, JEN,LXJ,WOLC,WXT,opr(s)) W6RKO 4644-137-27-ABCD WA6VEF/6 (+WA6S BMV,PY2) 21,840-702-28-ABCD	

have January band conditions, at least start the contest at 2 P.M.! And I was complaining about the June contest conditions (WB2CUT). The contest was cancelled for this operator by the excellent activity on 432 MHz and by a coastal opening late Sunday which made working K4QIF on 1296 much easier than normal (W3HMU). Best score ever. Highlight was 200 plus mile contact with W7LYE/7 near Olympia, Washington, on 222 MHz (K7HSJ). I know these scores are not impressive by any means, but conditions on 2-meter cw and ssb were very poor and this is the band that we normally work. Those of us from Lincoln, NE, who entered the contest, just got tired of not seeing any Nebraska stations in the list of operating stations. We had fun anyway

**Division Leaders**

SINGLE OP	DIVISION	MULTI-OP
W3HMU	Atlantic	K3KPV
K9HDE	Central	W88HUC/9
W0OHU	Dakota	W0MXW/0
WA4LDU	Delta	W4BFB/4
K8III	Great Lakes	W8CCI
WA2RAT	Hudson	WA2SNA
W0NGG	Midwest	K0KKV
WA1FFO	New England	W2SZ/1
WA6JUD/7	Northwestern	W7LYE/7
K6KLY	Pacific	K6GSS/6
WA4GPM	Roanoke	K3IVO/8
	Rocky Mtn.	
WA4NJP	Southeastern	W4VO/4
K6YNB/6	Southwestern	W6GVV
	West Gulf	K5WVX
VE3BQN	Canadian	VE3FHK

**All-Time Division Leaders**

SINGLE OPERATOR			MULTI-OPERATOR			
CALL	SCORE	YEAR	CALL	SCORE	YEAR	
K3IPM	24,596	69	W3JZY/3	43,080	62	
K9KFR	7210	69	K9HMB	29,820	72	
W0OHU	1044	72	W0MXW/0	294	76	
WB4JGG/4	4860	72	W4BFB/4	26,726	76	
K8III	13,900	76	Great Lakes	44,019	73	
K2OWR	32,720	73	Hudson	66,447	76	
K0SBY	2052	61	Midwest	W0LB/0	1290	66
K1WHS	20,242	68	New England	WA1MUG	132,396	74
K0MST	4216	72	Northwestern	WA7NAN	8759	75
K6KLY	13,098	76	Pacific	K6GSS/6	25,080	76
K4PCL/4	12,838	72	Roanoke	WA8PLZ/8	65,700	70
W0EVZ	546	64	Rocky Mtn.	W0DK/0	1080	64
WA4NJP	4551	72	Southeastern	W4VO/4	6028	76
K6YNB/6	34,013	76	Southwestern	WA6UMI/6	9648	74
K5WVX	4900	72	West Gulf	K5WVX	5181	73
VE3ASO	18,816	73	Canadian	VE3ONT	43,413	74

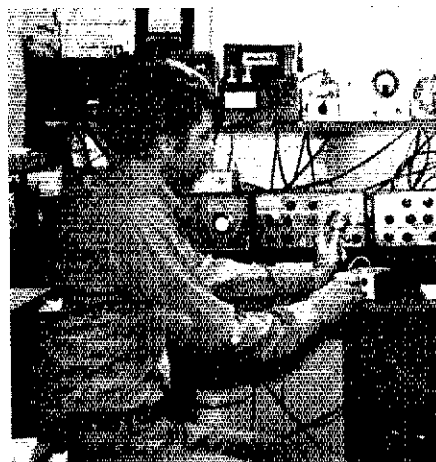
next contest and working on 1296 gear (WB2QQQ/WA2SNA). Conditions on the bands could have been better, but it seemed like most of the potential contacts were out enjoying the great fall weather. I spent some of the contest hours painting the house. . . . My plans are to start working 432 and 1296 as soon as I can get my gear together. Also plan to improve the 2445 setup (WA9LZM). We have a good two-meter cw/ssb station put together now. After many frustrating months of redesigning a commercial-antenna system (known locally as the disaster of June '77), adding a linear, and improving the receiver, our station isn't far from being one of the better ones on two. . . . The high point of our weekend came near the end of our operations. K3ZDR took a lot of razzing from the crew, when he insisted that he was hearing a GW3 call. Nevertheless, he persisted and finally worked a GW3/W9 in the Illinois section to justify our work and confidence in our station. It's a pity the fm contesters will never experience that surge of pride and satisfaction we got from having "our" rig work long haul without an opening (W3GNR/3). Did you ever try to send CQ on cw while shelling peanuts (K1FJM/4). Contesting on 146.52 is difficult for obvious reasons. Many, many times, I stood by while semi-local mobiles were in QSO or distant bases

were in my line of fire. It's a "party line" and must be treated as such. A few others were contesting on .52 and seemed to be taking the same precautions (K8ZES). Ran three hours on 2 meters with a shorted feed line - wondered why all I heard were K2RTH and WA2RAT (K2OVS). Operation below 146 MHz generally very cour-

teous, however. fm operation, being limited to essentially 146.52 very uncomfortable. . . . I would therefore recommend since 2-meter fm is so channelized, that the contests be limited to 144-146 MHz. It is also an unfair advantage for a station to obtain the number of contacts possible on 146.52 by stepping on everyone else to become "king of the pileup" (WA2RAT). Stations that called CQ or QRZ over and over, but only listened a second or two between, missed many contacts and created difficult conditions for many. I found that by listening I was able to make many contacts that they missed and I was using less power and less sophisticated equipment (WA3ELQ). Low power, low antennas, low activity (except 2-meter cw - Great!), low number of hours of operation yielded lowest score yet. But we'll be back next time. After 14 years of vhf contesting can't quit now (WA2UDT).



K1FJM/4 at Coast Guard Air Station in Elizabeth City, North Carolina. Pete Heins managed 61 QSOs on 2 and 18 on 432 for 2134 total points and second place in North Carolina.



Steve Powlishe, WA1FFO, with 254 QSOs and 56 sections totaling 16,632 points earned first place in the Connecticut section.

**Feedback**

June VHF QSO Party (page 8 November QST): VE3ONT was incorrectly listed as single operator when the operation was really multi-operator. VE3ONT thus becomes the Ontario section leader and Canadian Division leader in the multi-op category, and VE3FHK becomes the Ontario section leader and Canadian Division leader in the single-op category. WA8CL assumes the number-ten spot in the top-ten box on page 89.

W2CNS/8 was correctly shown as the Roanoke Division leader for the 1976 June Party but should also have appeared in the all-time division leader box on page 93 (instead of W4BFB, who was incorrectly listed).

W0SEA was incorrectly listed as Midwest Division single-operator leader; the actual leader was W0MRH.

In the Ontario section VE3AV should have been VE3FVN; score remains the same.

**Top Ten**

SINGLE OP		MULTI-OP	
K6YNB/6	34,013	WA2SNA	66,447
W3HMU	17,640	K2OWR	57,591
WA1FFO	16,632	W2SZ/1	49,680
K8III	13,900	W4BFB/4	26,726
K6KLY	13,098	K6GSS/6	25,080
W2EIF	12,925	WB2FKJ/2	23,484
K1WHS	12,220	WA6VEF/6	21,840
K1MNS	11,501	K3KPV	19,980
WA4GPM	11,417	W8CCI	17,064
W6YKM	8235	W1MX	12,045

# Contest Disqualification Criteria and Club Competition Rules

Here's how you play the game when it comes to contesting — both individually and via the affiliated-club aggregate route — for this brand new year.

Various ARRL operating contests held each year are built around rules by which participants must abide. Through the years, means of enforcing those rules in a manner fair to all participants have evolved into a set of guidelines based primarily on recommendations of the ARRL Contest Advisory Committee. Those guidelines are called the disqualification criteria, and are used as the basis for examination of possible rules infractions. The Headquarters Awards Committee, composed of seven active staff members, provides a recommendation in each case to the Communications Manager, with whom responsibility for the final decision lies.

What follows are those disqualification criteria, along with rules for club competition in ARRL contests. The disqualification criteria apply to all ARRL operating activities, and the club competition applies to the VHF Sweepstakes, the DX Competition, and the November Sweepstakes. Rules for all contests throughout the coming year will refer the reader to this page concerning rules enforcement and club competition.

## Club Competition

Only ARRL affiliated clubs may participate in the club competition. A member must be listed in the regular score listings before he can be counted for a club.

In order for a club to be listed, two points must be met:

a) At least three entries from members of the club must be submitted.

b) All members wishing to be included in the club scores must indicate the club name on their summary sheet and the club letter (if one is sent in accordance with the previous paragraph)

must indicate that said member is eligible to compete for the club.

Members eligible to compete:

a) Bona fide club members living up to 50 miles from the club affiliation address need not attend any minimum number of club meetings. However, to be considered bona fide, a member must be active in club affairs.

b) Members residing between 50 and 175 miles from the club affiliation address must attend at least 50 percent of the in-person club meetings during the year immediately prior to the date of the contest. If, however, he has not been a member for a year's time, he must have attended at least 50 percent of the meetings since he became a member.

c) Members living outside of 175 miles and/or members operating stations outside of 175 miles may not compete in the club competition.

Scores of members meeting the requirements of sections a, b and c may be submitted for club credit. Single- and multi-operator station scores may be counted. At a guest-operated single-operator station, both the guest-operator and the station licensee must be members of the same club in order to count the score for that club. At multi-operator stations at least 66 percent of the operators must be members of the same club in order for the score to count for that club.

In conjunction with the 50-percent attendance rule, the club must hold at least four in-person meetings per year.

It is not within the intent of these rules that a club should vote out a member or a member resign and then be voted back into the club later in order that he can meet the 50-percent attendance rule.

The highest affiliated-club entry will be awarded a gavel.

The highest single-operator cw score and the highest single-operator phone score in any club entry will be rewarded with a club certificate where at least three single-operator cw and/or three single-operator phone scores are submitted.

## Disqualifications

If the claimed score of a participant is reduced by two percent or more, the log may be disqualified. Score reduction does not include correction of arithmetic errors.

Score reductions may be made for taking credit for unconfirmed QSOs and/or multipliers, duplicate contacts, banned countries, and/or other scoring discrepancies.

If a participant is disqualified, he will be barred from submitting an entry in the next annual running of that specific contest, e.g., disqualification from the 1975 phone SS prohibits submission of an entry for the 1976 phone SS, but 1976 cw SS participation is OK.

The calls of all disqualified participants will be listed in the QST report of the contest.

Any participant on the borderline of disqualification but not actually disqualified, may receive a warning letter from the Communications Manager.

For each duplicate contact that is removed from the log by Hq., a penalty of three additional contacts will be exacted. The penalty will not, however, be considered as part of the two-percent disqualification criteria.

In all cases of question, the decisions of the ARRL Awards Committee are final.





each other's license class you can drop the /N and /T for the duration of the QSO; brevity is the name of the game!

### Scoring and Rules

Count one point for each contact (you may work a station only once, regardless of band); add your ARRL Code Proficiency credit, then multiply by the total number of multipliers (sections + countries) worked. And remember, KH6 KL7 KP4/KV4 KZ5 and VE districts are sections and *cannot* be counted a second time as a foreign country. If you work 100 stations in 31 sections + 3 foreign countries and have an ARRL (not FCC) Code Proficiency credit of 10 wpm from W1AW or W6OWP, then your score is 100-plus-10 X total multipliers (31 + 3) or 34, for a total of 3740 points. For details on the Code Proficiency program, see Op News of this issue. You may work DX stations for contest credit; a multiplier of 1 is earned for each separate foreign country worked.

Read the rules carefully. Keep a check sheet of stations worked (we have Operating Aid 6 available free) so that you don't have duplicate QSOs. Log sheets, Op Aid 6 and a summary sheet are now available from your ARRL headquarters. *Unless first-class postage is included with your request, log sheets will be sent by third-class mail.* To aid us in getting these forms to you as quickly as possible, please be sure to include with each request a self-addressed and stamped envelope containing: your full name, call and mailing address complete with Zip code. We

suggest a minimum of 13-cents postage attached. This will assure your receiving three log sheets (enough for 300 QSOs), one Op Aid 6 and a summary sheet. Using this as a guideline, you can adjust the postage according to the number of logs you anticipate needing.

B C N U in the NR!

### Rules

1) *Eligibility:* The contest is open to all radio amateurs in the ARRL sections listed on page 8 of *QST*.

2) *Time:* All contacts must be made during the contest period starting at 0001 Coordinated Universal Time on the first Saturday of February and continuing until 2359 Coordinated Universal Time the second Sunday of February. Time may be divided as desired but *must not exceed 30 hours total*. Off periods *may not be less than 15 minutes* at a time. Times on and off *must be entered in your log*.

3) *QSOs:* Contacts must include certain information sent in the form as shown in the example. QSOs may take place on the 80-, 40-, 15-, and 10-meter bands. Crossband contacts are not permitted. Novices and Technicians work any amateur stations; others work Novices and Technicians only. Valid points can be scored by contacting stations not working in the contest, upon acceptance of your RST and section and receipt of an RST and section/country. A station may be worked only once, regardless of band.

4) *Scoring:* Each exchange counts one point. Only one point may be earned by contacting any one station,

regardless of the frequency band. The number of ARRL sections (see page 8 of any *QST*) + foreign countries worked during the contest is the "total multiplier." Yukon-N.W.T. (VE8) also counts as a multiplier. A fixed scoring credit may be earned by entrants who hold the ARRL Code Proficiency certificates. FCC code credit *cannot* be used in lieu of the above. If an entrant does not hold an ARRL CP Award, he can apply for credit by attaching to his Novice Roundup report a copy of the qualifying run from W1AW or W6OWP for January or February. CP credit equals the wpm speed indicated on the latest ARRL certificate or sticker held by the entrant. The final score equals the "total points" plus "ARRL Code Proficiency credit" multiplied by the "total multiplier."

5) *Reporting:* Contest work must be reported on forms from the ARRL. Reporting forms will be sent free upon request. Indicate starting and ending times for each period on the air. All NR reports become the property of ARRL and none can be returned. Entries must be mailed to ARRL hq., 225 Main St., Newington, CT 06111, no later than March 15, 1977.

6) *Awards:* A certificate will be given to the highest scoring Novice and Technician in each ARRL section. Multi-operator or General class licensees and above are not eligible for awards. However, a box containing the TOP-TEN W/VE higher-class licensees will be incorporated in the results. And should participation warrant, a similar box will show TOP-TEN DX entrants. QST

## Strays

Show your support. You can stimulate awareness about our hobby while helping to assure a complete preparation and presentation by amateurs, for amateurs, at the 1979 World Administrative Radio Conference. Proceeds from these bumper stickers go in a special ARRL fund to aid in vital conference expenses. They're available for \$1 each, postpaid, from ARRL hq., Newington, CT 06111.

# Tune In the World with Ham Radio

AMERICAN RADIO RELAY LEAGUE, NEWINGTON, CT.

### October CD Parties: High-Claimed Scores

The following are high-claimed scores. They read, from left to right, call sign, score, contacts, sections, time of operation. Final scores will appear in the January CD Bulletin.

CW	W1AF (WA1UJK, opr)	W8LNO	134,505-434-61-15	AASHNN	106,445-342-61-12	K0GXK	92,800-320-58- 9
WA7WXY	WA4KKP	W9NA	133,895-432-61-10	WB6JFD	105,090-335-62-16	WB0QOT	90,990-330-54- 9
K4PUZ	W4YLU	W0LQ	132,990-423-62-17	WA7VCE	104,890-355-68-12	WA1MHJ/2	72,875-272-53- 9
W6RTT (WA6OTU, opr)	W4BTZ	W6IKW	127,100-404-62-18	W4KFC	104,135-346-59- 6	K3ORW	66,515-247-53-12
	246,510-741-66-20	K4VYF	122,240-376-64-10			W3FCS	57,120-200-56-10
WA6RTG/5	236,600-728-65-20	W9JOO	119,970-387-62-18			WB8KI	55,860-223-49-12
AA9ITB	233,675-712-65-19	W4JHF	118,800-427-55-14	PHONE		W89HAD	54,060-200-53- 4
W6SOR	224,320-695-64-20	W4JHF	118,755-377-63-19	K3OIO	160,960-498-64-11	W4BTZ	52,000-201-50- 8
AB6PKA	215,820-649-66-20	AD4BAI	112,800-369-60-10	WB2RKK	157,075-607-61-18	W9JOO	51,875-195-53-13
W7TML	213,525-655-65-20	W0SS	110,035-369-59-10	WA4KKP	104,725-350-59-11	K4TXJ	50,715-200-49-10
AB9QOT	210,735-662-63-17	AB9NME	108,500-345-62-14	WB9KMQ	104,440-369-56-15	W1YK (multi-op)	126,260-422-59-14
		W5VAH	106,790-382-59-20	W7TML	93,810-316-59-11		
	W3IN						
	WA1QNF						

# QST Abbreviations for Terms

An i-f system? Acceptable NF? Applied emf? If such abbreviations stump you, keep this list handy.

A — ampere  
 ac — alternating current  
 A/D — analog-to-digital  
 af — audio frequency  
 afc — automatic frequency control  
 atsk — audio frequency-shift keying  
 agc — automatic gain control  
 alc — automatic load (or level) control  
 a-m — amplitude modulation  
 AMSAT — Radio Amateur Satellite Corporation  
 anl — automatic noise limiter  
 ARC — amateur radio club  
 AREC — Amateur Radio Emergency Corps  
 ARPSC — Amateur Radio Public Service Corps  
 a.s.a.p. — as soon as possible  
 ASCII — American Standard Code for Information Interchange  
 ATV — amateur television  
 avc — automatic volume control  
 AWG — American wire gauge  
 bc — broadcast  
 BCD — binary-coded decimal  
 bci — broadcast interference  
 bcl — broadcast listener  
 BFO — beat-frequency oscillator  
 BPL — Brass Pounders League  
 CB — citizens band  
 CCIR — International Radio Consultative Committee  
 ccw — counterclockwise  
 c.d. — civil defense  
 CD — Communications Department (ARRL)  
 CMOS or COSMOS — complimentary-symmetry metal-oxide semiconductor  
 coax — coaxial cable, connector  
 COR — carrier-operated relay  
 CP — Code Proficiency (award)  
 CR — cathode ray  
 CRT — cathode-ray tube  
 ct — center tap  
 CTCSS — continuous tone-controlled squelch system  
 cw — continuous wave (code), clockwise  
 D/A — digital-to-analog  
 dB — decibel  
 dBd — antenna gain referenced to a dipole  
 dBm — decibel referred to 1 milliwatt  
 dc — direct current  
 DF — direction finder  
 DIP — dual in-line package  
 DOC — Department of Communications (Canadian)  
 dpdt — double-pole double-throw  
 dpst — double-pole single-throw  
 dsb — double sideband  
 DVM — digital voltmeter  
 DX — long distance  
 DXCC — DX Century Club  
 EC — Emergency Coordinator  
 ECL — emitter-coupled logic  
 ECO — electron-coupled oscillator  
 EME — earth-moon-earth  
 emf — electromotive force (voltage)  
 EMP — electromagnetic pulse  
 erp — effective radiated power  
 FAX — facsimile  
 FCC — Federal Communications Commission  
 ED — Field Day  
 FET — field-effect transistor  
 FF — flip-flop  
 fm — frequency modulation  
 FMT — frequency measuring test  
 fot — optimum working frequency  
 fsk — frequency-shift keying  
 GBA — give better address  
 GDO — grid-dip or gate-dip oscillator  
 GHz — gigahertz  
 gnd — ground  
 H — henry

HAAT — height above average terrain  
 hf — high frequency  
 HFO — heterodyne frequency oscillator  
 Hz — hertz  
 IARU — International Amateur Radio Union  
 IC — integrated circuit  
 ID — inside diameter  
 i-f — intermediate frequency  
 in./s — inch per second  
 IRC — International Reply Coupon  
 ITU — International Telecommunication Union  
 IW — Intruder Watch  
 JFET — junction field-effect transistor  
 k — kilo  
 kc — kilocycle  
 kHz — kilohertz  
 km/h — kilometers per hour  
 kW — kilowatt  
 LED — light-emitting diode  
 lf — low frequency  
 LMO — linear master oscillator  
 LO — local oscillator  
 LORAN — long-range navigation  
 LP — log periodic  
 lsb — lower sideband  
 LSB — least-significant bit  
 LSI — large-scale integration  
 luf — lowest usable frequency  
 mA — milliamperes  
 MARS — Military Affiliate Radio System  
 Mc — megacycle  
 muf — medium frequency  
 mH — millihenry  
 MHz — megahertz  
 mic — microphone  
 mix — mixer  
 mm — millimeter  
 MO — master oscillator  
 MOSFET — metal oxide semiconductor field-effect transistor  
 ms — millisecond  
 m.s. — meteor scatter  
 MSB — most-significant bit  
 MSI — medium-scale integration  
 muf — maximum usable frequency  
 MUX — multiplex  
 mV — millivolt  
 mW — milliwatt  
 nbfm — narrow-band frequency modulation  
 n.c. — no connection  
 NC — normally closed  
 NCS — Net Control Station  
 NF — noise figure  
 NO — normally open  
 npn — negative-positive-negative  
 NPRM — Notice of Proposed Rule Making  
 ns — nanosecond  
 NTS — National Traffic System (ARRL)  
 OBS — Official Bulletin Station  
 OD — outside diameter  
 OO — Official Observer  
 op amp — operational amplifier  
 OPS — Official Phone Station  
 ORS — Official Relay Station  
 osc — oscillator  
 OSCAR — orbiting satellite carrying amateur radio  
 OVS — Official VHF Station  
 oz — ounce  
 PA — power amplifier  
 pc — printed or etched circuit board  
 PEP — peak-envelope power  
 PEV — peak-envelope voltage  
 pF — picofarad  
 PIV — peak-inverse voltage  
 pk — peak  
 pk-pk — peak-to-peak  
 PL — private line  
 PLL — phase-locked loop  
 pm — phase modulation  
 pnp — positive-negative-positive

pot — potentiometer  
 PKV — peak-reverse voltage  
 PSHR — Public Service Honor Roll  
 PTO — permeability-tuned oscillator  
 PTT — push-to-talk  
 QRP — low power  
 QRPP — extremely low power  
 RACES — Radio Amateur Civil Emergency Service  
 RCC — Rag Chewers Club  
 rcvr — receiver  
 rf — radio frequency  
 rfc — radio-frequency choke  
 RFI — radio-frequency interference  
 RM — Route Manager  
 RM-(number) — FCC rulemaking  
 rms — root-mean-square  
 RO — Radio Officer (c.d.)  
 RST — readability-strength-tone  
 RTL — resistor-transistor logic  
 RTTY — radioteletype  
 s — second  
 s.a.e. — self-addressed envelope  
 s.a.s.e. — stamped s.a.e.  
 SCM — Section Communications Manager  
 SCR — silicon-controlled rectifier  
 SEC — Section Emergency Coordinator  
 S&T — simulated emergency test  
 S.M. — silver mica (capacitor)  
 SNR — signal-to-noise ratio  
 spdt — single-pole double-throw  
 spst — single-pole single-throw  
 SS — Sweepstakes (contest)  
 ssb — single sideband  
 SSTV — slow-scan TV  
 SWL — short-wave listener  
 SWR — standing-wave ratio  
 sync — synchronous, synchronizing  
 TCC — Transcontinental Corps  
 TD — transmitting distributor  
 TE — transequatorial (propagation)  
 ttc — traffic  
 tpi — turns per inch  
 T-R — transmit-receive  
 TTL or T<sup>2</sup>L — transistor-transistor logic  
 TTY — teletype  
 TV — television  
 TVI — television interference  
 uhf — ultra-high frequency  
 UJT — unijunction transistor  
 usb — upper sideband  
 UTC — Universal Coordinated Time  
 V — volt  
 VCO — voltage-controlled oscillator  
 VCXO — voltage-controlled crystal oscillator  
 VFO — variable frequency oscillator  
 vhf — very high frequency  
 vlf — very low frequency  
 VOM — volt-ohm-milliammeter  
 VOX — voice-operated break-in  
 VR — voltage regulator  
 VTVM — vacuum-tube voltmeter  
 VXO — variable crystal oscillator  
 W — watt  
 WAC — Worked All Continents  
 WARC — World Administrative Radio Conference  
 WAS — Worked All States  
 wbfm — wide-band fm  
 wpm — words per minute  
 ww — wire wound  
 xevr — transceiver  
 xmtr — transmitter  
 xtal — crystal  
 μ — micro (10<sup>-6</sup>)  
 Ω — ohm  
 β — beta  
 °C — degrees Celsius  
 °F — degrees Fahrenheit  
 °K — degrees Kelvin

# Operating News

Conducted By George Hart,\* W1NJM

## A New Six-Meter Operating Award

Back in September of 1976, at a meeting of the ARRL Executive Committee, West Gulf Division Director Roy Albright, W5EYB, brought up the subject of issuing an award recognizing the achievement of working ten or more countries on six meters. At that meeting the Executive Committee voted that the Headquarters Awards Committee study the matter. (The HAC, a group of active experienced staff hams, advises the communications manager on a variety of matters in the field of contests and awards.)

Realizing that the basic idea behind such a tangible award was the encouragement of 50-MHz activity, the HAC has done somewhat more than study the matter. What has evolved from much discussion is the format of an award with a modest degree of difficulty — an award which offers a real challenge but yet is attainable (hopefully!) in a concentrated effort during one season on six. Meet your new 600-Point 6-Meter Award, birth date January 1, 1977!

Let's get down to brass tacks. Just who do you work on six, and how do you figure the points? Basically, there are just three variables built into the scoring system: QSOs, ARRL sections, and countries. Each new contact

counts 2 points, new sections earn 6, new "countries" tally 25. Using ARRL sections in the format of an award is something brand new in the Awards Program, giving participants a reason to work more than one W6, W4, W1 . . . when the band opens. For the purpose of this new award, each of the following areas count as a separate "section": Labrador, Newfoundland, New Brunswick, Nova Scotia, Prince Edward Island, VE8. Countries for this award include Canada, the United States, Hawaii, Alaska, the Canal Zone, the U.S. Virgin Islands, Guantanamo Bay and Puerto Rico, as well as other areas defined in the ARRL Countries List. Work Alaska and you've earned both section points and country points (likewise Hawaii, the Pacific section).

The application form for this new award will furnish necessary information regarding the ARRL Field Organization. Most states are single sections, but seven states have two or more of 'em — California, Florida, Massachusetts, New Jersey, New York, Pennsylvania and Texas. If you're not familiar with sections, or those who you work don't know what section they're in, the application form will solve your problem — assuming you know

the country from which the operation is taking place!

The rules, in brief: (1) only one contact per station; (2) contacts must all be made from the same location, or from locations no two of which are more than 25 miles apart; (3) the confirmations (no photocopies) must confirm two-way communication on six meters on or after January 1, 1977; (4) contacts made through "repeater" devices or any other power-relay method are not acceptable; (5) sufficient funds must be included for safe return of the cards; (6) applicants in the U.S., Puerto Rico and U.S. possessions, and Canada, must be ARRL members.

The form will also ask you to note the period of activity represented by the application. If demand is sufficient, early consideration will be given to making seals or endorsements available denoting repeat qualification.

Plan for a good period of activity January 8-9 in the VHF Sweepstakes, the first major operating period within which to start adding up those points. Other significant dates to reserve on your calendar are June 11-12 and September 10-11, the two VHF QSO Parties. Pass the word — and get on six! — W1YL

## WIAW OPERATING SCHEDULE

Operating-visiting hours are Monday through Friday 1 P.M. to 1 A.M., Saturday 7 P.M. to 1 A.M. and Sunday 3 P.M. to 11 P.M. (all local Eastern time). The station address is 225 Main St., Newington, CT 06111 (about 7 miles south of Hartford). Maps with local street details and the general contact schedule are available upon request. All frequencies shown are approximate. If you wish to operate, you must have your original operator's license with you. The station will be closed Dec. 24-25, Dec. 31, 1976; Jan. 1, Feb. 21, Apr. 8, 1977.

Staff: Chief Operator/ARRL Asst. Communications Mgr. C. R. Bender, W1WPR; Alan Bloom, WA3JSU; Chris Schenck, WB2SEZ.

In a communications emergency monitor WIAW for special bulletins as follows (times in UTC):

Phone: On the hour.  
RTTY: At 15 minutes past the hour.  
CW: On the half hour.

## Code Practice

Approximate frequencies: 1.82 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. Details on Qualifying Runs appear monthly in QST Operating Events. The 0230Z practice is omitted four times a year on designated nights when Frequency Measuring Tests are sent in this period.

Speeds	EST	UTC
5-7½-10-13-20-25	9 A.M. MWF 9:30 P.M. TThSSu	1400Z MWF 0230Z MWFSu
10-13-15	4 P.M. M-F 7:30 P.M. Dy	2100Z M-F 0030Z Dy

\*Communications Manager, ARRL

35-30-25-20-15

9:30 P.M. MWF 0230Z TThS  
9 A.M. TTh 1400Z TTh

To improve your fist by sending in step with WIAW (but not over the air!) and to allow checking the accuracy of your copy on certain tapes, note the UTC dates and QST text to be sent in the 0230Z practice from the issue of QST 2 calendar months past.

1/7 It Seems to Us	1/25 Public Service
1/13 Correspondence	1/28 World Above
1/17 League Lines	2/2 YL News

## Bulletins

Columns indicate times in EST-PST-UTC(Z).

Phone Bulletins (1.82 3.99 7.29 14.29 21.39 28.59 50.19 145.588 MHz):

2100 Dy	1800 Dy	0200Z Dy
2330 M-S	2030 M-S	0430Z T-Su

CW Bulletins at 18 wpm (1.82 3.58 7.08 14.08 21.08 28.08 50.08 145.588 MHz):

1630 M-F	1330 M-F	2130Z M-F
2000 Dy	1700 Dy	0100Z Dy

CW Bulletins at 10 wpm (same frequencies as above):

0000 T-Su	2100 M-S	0500Z T-Su
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RTTY Bulletins at 170-Hz shift are repeated at 850-Hz shift when time permits (3.625 7.095 14.095 21.095 28.095 MHz):

1730 M-F	1430 M-F	2230Z M-F
2300 M-S	2000 M-S	0400Z T-Su

OSCAR Bulletins (18 wpm on cw frequencies):

0840 M-F	0540 M-F	1340Z M-F
1400 M-F	1100 M-F	1900Z M-F
1600 Su	1300 Su	2100Z Su

## OSCAR RTTY:

1700 Su 1400 Su 2200Z Su

## SCM ELECTION NOTICE

To all ARRL members in the Alberta, Nevada, Rhode Island, Northern New Jersey, San Joaquin Valley, Canal Zone, Utah, Maryland-DC and New Hampshire sections: You are hereby solicited for nominating petitions pursuant to an election for Section Communications Manager. A petition, to be valid, must contain the signatures of five or more full ARRL members residing in the section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures on that petition. No member may sign more than one petition. It is advisable to have a few more than five signatures on each petition.

Petition forms (CD-129) are available on request from ARRL headquarters but are not required. The following form is suggested.

(Place and date)  
225 Main St., Newington, CT 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  
(Signature . . . Call . . . City . . . Zip . . .)

SCM candidates must have been a member of the League for a continuous term of at least two years and a licensed amateur of General class or higher (Canadian Advanced Amateur Certificate) immediately prior to receipt of petition at Headquarters.

Petitions must have been received at Headquarters on or before 5:30 P.M. Eastern Local Time, March 10, 1977.

Wherever more than one member is nominated in a single section, ballots will be mailed

from Headquarters on April 1, returns counted on May 24, and SCMs elected as a result of the above procedures will take office July 1, 1977.

If only one valid petition is received for a section, that nominee shall be declared

elected without opposition, for a two-year term beginning July 1, 1977.

If no petitions are received for a section by the specified closing date, such section will be resolicited in July QST, and an SCM elected through the resolicitation process will

serve a term of 18 months.

Vacancies in any SCM office between elections are filled by appointment by the communications manager.

You are urged to take the initiative and file a nominating petition immediately.

# Operating Events

## JANUARY

1: Straight-Key Night, full 24-hour UTC, rules p. 81 Dec.

5: West Coast Qualifying Run, W6OWP prime, W6ZRI alternate, 10-35 wpm at 0500Z (Universal Coordinated Time, abbreviated UTC, Z used as a designator), on approximately 3590/7090 kHz. This is 2100 PST the night of January 4 (9 P.M. PST). 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 P.M. local Pacific time. Underline one minute of the highest speed copied, certify that the copy was made without aid and sent to ARRL for grading. Please include your full name, call (if any) and complete mailing address. A large addressed stamped envelope would be helpful.

8-9: VHF SS, p. 87 Dec. YU-DX Contest, p. 99 Dec. Lions Contest cw, in honor of founder Melvin Jones, sponsored by the Santos Lions Club Ponta da Praia; phone following weekend. Full 48-hour period, UTC, operate only 30 hours (maximum of four off periods). Single op, single band, single op, multiband, multi-multi; 80 through 10 meters. PY stations will send RST and abbreviation of the PY state, all others send RST only. QSOs with stations on different continents count 3 points on 20 and 15 meters, 6 points on 80, 40 or 10. QSOs with the same continent count 1 point on 20 and 15, 2 points on other bands. Same continent QSOs count 1 point. Multipliers are all the Brazilian states and territories and all countries (count only once even if worked on other bands). Diplomas. Usual log format. Attach a QSL to your entry addressed to Santos Lions Club Ponta da Praia Contest, within 30 days following the end of the contest. Send to Box 11, 11100 Santos SP, Brazil.

15-16: "Hunting Lions in the Air Contest," p. 99 Dec. Melvin Jones Lions Contest phone, see above.

15-17: CD Party cw, appointees only, starts 2300Z, ends 0500Z.

22-23: OOTC QSO Party cw, all modes but only one contact per station on each band. VE/W stations receive one point per contact per band and a multiplier of 1 per state (D.C. counts as a "state" for this event). Outside the 48 continental states and Canada, score 3 points per contact and the same multiplier of 1 per state. Foreign stations contacting stations outside of their own country receive a multiplier of 3 for each country. Recommended frequencies are 60 kHz above the low edge of each cw band, plus 1810 kHz. Suggested phone frequencies are 1815 3900 7230 14280 21375 28525 plus vhf phone bands. Al Simmons, W6MI, will handle the cw QSO Party. Glenn Means, W6AQ/7, 226 S. Penn Ave., Prescott, AZ 86301 will coordinate the Phone Party.

22-24: CD Party phone, see above.

29-30: Simulated Emergency Test, p. 82 Dec. French Contest cw, phone Feb. 26-27. Note the following changes in the rules as appeared in the Dec. issue. The contest period will run the full 48 hours UTC, single ops permitted 36 hours of operation. Figure score on each band separately and then add each band total to derive the final score. QSOs between stations on the same continent are not permitted on 80 during the first quarter of each hour, on 40 during the second quarter, on 20 during the third quarter, on 15 and ten during the last quarter hour. See p. 99 Dec. for additional info. CQ 160-Meter Contest, p. 99

Dec. OOTC QSO Party phone, see Jan. 22-23 listing.

30-31: Classic Radio Exchange (formerly Nostalgia Radio Exchange), sponsored by the Southeast Amateur Radio Club, K8EMY, open to all. A Class Radio is any equipment built since 1945 but at least ten years old. Operating period 1800Z Sun. Jan. 30 to 0100Z Mon. Jan. 31. Exchange your name, RST, state-province/foreign country, transmitter type (homebrew send P.A. tube, i.e., 6L6), and other interesting pleasantries. The same station may be worked on each mode on each band. No a-m below 21 MHz. Cw call CQ CX, phone call CQ exchange. Noncontestants may be worked for credit. Suggested freqs.: cw up 60 kHz from low-band edges, phone 3910 7280 14280 21380 28580, novice 3720 7120 21120 28120. Scoring: add the numbers of different transmitters, states-provinces/countries for each band; multiply by total no. of QSOs. Multiply THAT total by classic multiplier: total years old of your transmitter and receiver (if transmitter, multiply years old by 2). Different equipment combinations may be used. Figure scores separately for each band and combine for total score. Certificates for highest score, longest DX, most equipment combinations, oldest equipment, and "unusual achievements" (like working KC4 with a Meissner Signal Shifter). Send logs, comments, anecdotes, photos, etc., to Stu Stephens, W8KAJ, 2386 Queenston Rd., Cleveland Heights, OH 44118.

## FEBRUARY

3: West Coast Qualifying Run.

5-6: DX Competition phone, p. 88 Dec.

5-13: Novice Roundup, rules this issue.

12-13: New Hampshire QSO Party, sponsored by the Concord Brasspounders Inc. W1OC, to promote the Worked New Hampshire Award. Operating periods are 2000Z Feb. 12 to 0500Z Feb. 13, and 1400Z Feb. 13 to 0200Z Feb. 14. Stations may be worked once per band per mode. NH stations may work each other. NH stations send RS(T) and county. Out-of-state stations send RS(T), ARRL section or country. NH stations score 1 point per QSO, multiplied by the number of ARRL sections plus countries plus NH counties. Others score 5 points per NH QSO, times the no. of NH counties. Suggested frequencies are cw 1810 3555 7055 14055 21055 28130, phone 1820 3935 3975 7235 14280 21380 28575, Novice 3730 7130 21130 28130, vhf 50.115 145.015 fm simplex (no repeaters). Awards. Mailing deadline is March 14, send your entry with a large s.a.s.e. for results and/or award to: Concord Brasspounders Inc., C. Holloway, 9 Via Tranquilla, Concord, NH 03301. Ten-Ten International Net Winter QSO Party, full 48-hour period UTC. Open to all amateurs (nonmembers ineligible for awards). Exchange name, QTH, and 10-10 number if a member. Members score 1 point per QSO, add a point if with a member. Give the name of your chapter for chapter credit. Send logs to Grace Dunlap, K5MRU, Box 445, LaFeria, Texas 78559. Entries must be postmarked no later than March 31. QCWA QSO Party, 20th annual, starts 2300Z Feb. 11 and ends 2300Z Feb. 13. A contact with another QCWA member counts 1 point. Contacts with the QCWA memorial station W2MM/6 count 2 points. (Contacts made with captive lists of stations, such as local nets, are invalid.) A multiplier of one for each state, province, U.S. possession, country or political subdivision designated by a call sign

prefix, i.e. VK2 VK3 KP4 KV4. (JA1 and JH1, being the same, would only count as a single multiplier.) Each state counts as an additional multiplier. All contacts must be with QCWA members. Suggested frequencies: phone 1805-1825 3940-3960 7240-7260 14240-14260 14280-14300 21340-21360 28640-28660, cw 1805-1825 3540-3560 7040-7060 14040-14060 21040-21060 28040-28060. Exchange QSO number, QTH name and QCWA-membership number. Logs should be mailed no later than Feb. 20 to Ralph Cabanillas, Jr., W6LL, 2359 Creston Dr., Hollywood, CA 90068.

13: Frequency Measuring Test, open to all begins with a callup at 0230 and 0530 UTC February 13. Remember, this is the evening before, February 12, local time! The period for measurement start at 0237 (20 meters) 0245 (40 meters) and 0253 (80 meters); for the late run, 0537, 0545 and 0553, respectively. Each measuring period lasts five 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 14,180, 7038 and 3522 kHz; late-run frequencies 14,118, 7099 and 3546 kHz. Your report must be received by February 24 to qualify for the May QST report of the competition. WIAW will start transmitting the official results in a special bulletin February 25.

16: WIAW Qualifying Run.

19-20: DX Competition cw, p. 88 Dec. YL/OM Contest phone, sponsored by the Young Ladies Radio League, starts 1800Z Feb. 19, ends 1800Z Feb. 20 (cw session March 5-6). Open to all licensed OMs and YLs throughout the world. All bands, crossband not permitted nor do net contacts count. Exchange QSO no., RS(T), section or country. Entries in your log must show band worked at the time of contact, time/date. Each mode a separate contest. One point for each station (stations may be worked just once regardless of band). Multiply total contacts by the number of different sections and countries worked. Contestants running 150-watts input or less on cw and 300-watt ssb PEP or less on phone, multiply results by 1.25. Copies of logs, showing claimed scores, must be signed by the operator and postmarked on or before March 24. They must be received by the contest manager (YLRL v.p. no later than April 10, 1977. Send to Carol Bourne, WA9NEJ, 362 Hawthorne St., Glean, IL 60137.

26-27: French Contest phone, see Jan. 29-30 listing plus p. 99 Dec.

## MARCH

2: West Coast Qualifying Run.

5-6: DX Competition, phone. YL/OM Contest, cw.

12-13: Commonwealth Contest, cw. Main QSO Party.

13: South Dakota QSO Party.

17: WIAW Qualifying Run.

19-20: DX Competition, cw.

21: WIAW Morning Qualifying Run.

26-27: BARTG RTTY Contest. WPX SSB.

Apr. 16-17: CD Party, cw.

Apr. 23-24: CD Party, phone.

May 14: FMT.

June 11-12: VHF QSO Party.

June 25-26: FIELD DAY!

July 9-10: Bicentennial Celebration +1.

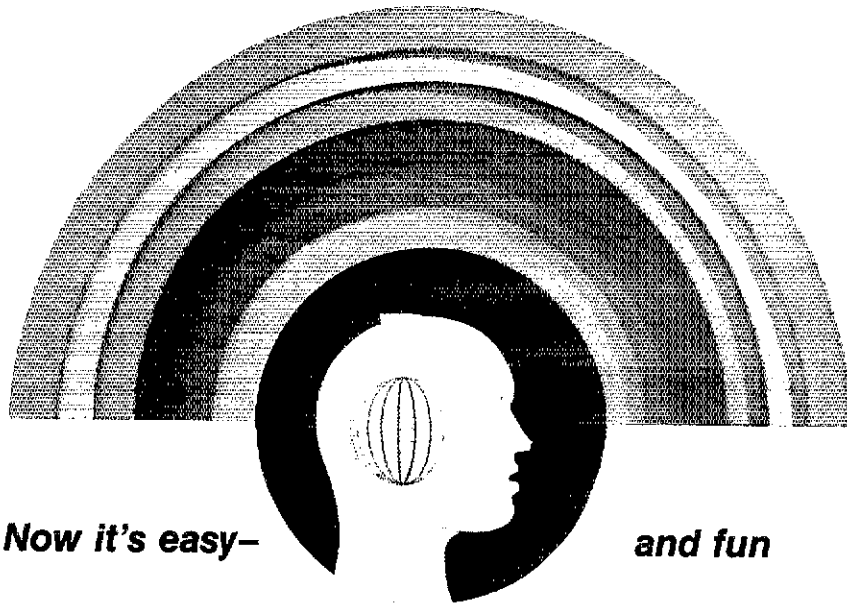
Sep. 10-11: VHF QSO Party.

Nov. 5-6: SS, cw.

Nov. 19-20: SS, phone.



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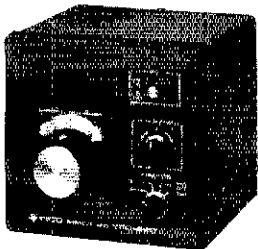
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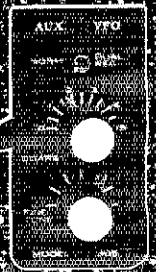
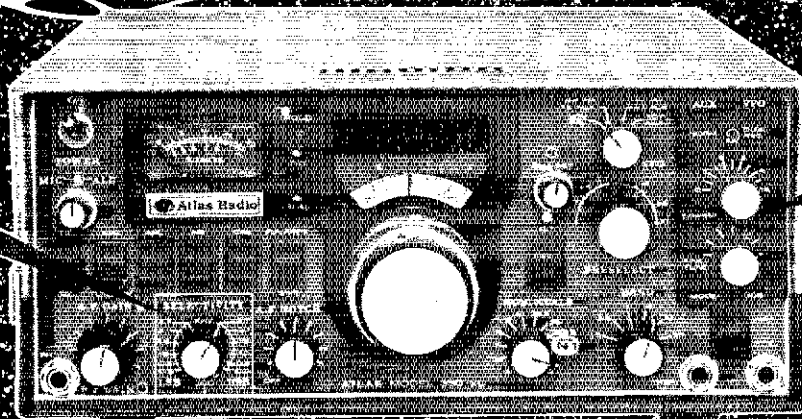


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# ATLAS 350 XL

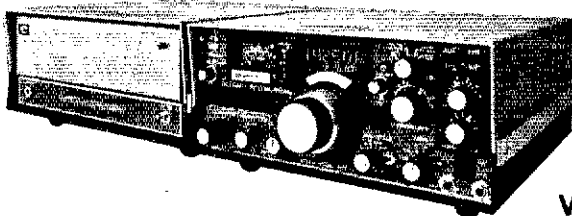
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• 10-160 METERS

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# ATLAS 350-XL

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- SSB TRANSCEIVER
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- 10 THROUGH 160 METER COVERAGE



Illustrated with optional AC supply, auxiliary VFO, digital and dial.

The all new Atlas 350-XL has all the exciting new features you want, plus superior performance and selectivity control never before possible.

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Full coverage of all six amateur bands in 500 kHz segments. Primary frequency control provides highly stable operation. Also included is provision for adding up to 10 additional 500 kHz segments between 2 to 22 mHz by plugging in auxiliary crystals.

## 350 WATTS

P.E.P. and CW input. Enough power to work the world barefoot!

## SELECTIVITY CONTROL (Standard feature)



This amazing new breakthrough in filter design is truly the filter of the future. Selectivity control on the front panel provides control of bandwidth as well as selection of upper or lower sideband, or double sideband. Continuously variable from 300 to 2700 Hz bandwidth. Shape factor is better

than 1.7, with ultimate rejection better than 130 dB. Selectivity for SSB can be set for maximum voice fidelity at 2700 Hz bandwidth, providing transmission and reception of audio from 300 to 3000 Hz, or it can be narrowed down to 2400, 2100 or even 1500 Hz if necessary to reduce adjacent channel QRM. Selectivity can be narrowed gradually to as little as 300 Hz for CW reception.

This amazing new breakthrough in filter design is by Bob Crawford and Eckert Argo of Consulting Engineers. Atlas Radio is privileged to be first to offer this "programmable filter" in the radio communication field and for sometime to come will be the only one.

## DIGITAL DIAL READOUT

The Atlas 350-XL has space provided for quick installation of this plug-in accessory. Provides precise frequency readout to 1/10 of a kHz. All L.E.D. Dot Matrix 6 digit display.

## MODES OF OPERATION

Standard features: lower or upper sideband, push-to-talk or VOX operation, full break-in or semi-break-in CW operation.

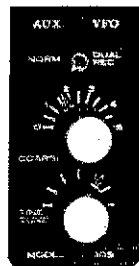
## RECEIVER INCREMENTAL TUNING

This standard feature enables you to receive up to 5 kHz above or below your transmitting frequency.

## AUDIO FREQUENCY NOTCH FILTER (Standard feature)

## PLUG-IN AUXILIARY VFO or CRYSTAL OSCILLATOR (Optional)

Auxiliary VFO is plugged into the space provided on the front panel of the 350-XL. You have a second tuneable VFO with same tuning ranges as primary VFO for tuning to a separate transmit or receive frequency. L.E.D.'s indicate which VFO, primary or sec-



ondary, will be used for receive and transmit.

Or instead of the auxiliary VFO a Crystal Oscillator may be plugged into the front panel. Eleven crystal sockets are available with a vernier control for exact frequency setting.

## SAME PLUG-IN-AND-GO MOBILE FEATURE AS OUR FAMOUS 210x/215x

The 350-XL has its own optional Mobile Mounting Bracket for quick, easy plug-in or removal from your car. All connections are made automatically.

## IDEAL FOR DESKTOP OR MOBILE OPERATION

Measuring just 5 in. high x 12 in. wide x 12 1/2 in. deep, and weighing only 13 pounds, the Atlas 350-XL offers more features, performance and value than any other transceiver, regardless of size, on the market today!

## MANY MORE SPECIAL FEATURES

See your dealer or write for the 350-XL brochure with complete list of features, capabilities, and specifications.

**Basic price model 350-XL ..... \$995.**  
Digital Dial Frequency display and Auxiliary VFO, as illustrated, are optional accessories.

## 350-XL ACCESSORIES

### • 350-PS MATCHING AC SUPPLY

Includes front facing speaker and phone jack. Provides 14 volts filtered and regulated D.C. for both low current and high current circuits of the 350-XL. Internal space provided for future installation of accessories such as CW Keyer, Speech Processor, Phone Patch, etc. Operates on 100-130 or 200-260 volts, 50-60 Hz. . \$195.

### • DIGITAL DIAL

### • PLUG-IN AUXILIARY VFO, MODEL 305

### • PLUG-IN AUXILIARY OSCILLATOR, MODEL 311

### • PLUG-IN MOBILE MOUNTING KIT

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who was complimented for his help. WA3SOR and K3UHF handle the news for the BARC Modulator. With the nets — sessions/tfc/QNI avg: MEPN 4/87/19.8. Toppers W3ADQ K3ORW. Others WB3BUA W3DKX W3HWZ WA31V W3JQN and WA3PRW. MDCN 18/57/20.8. Top honor rollers AA3YKK WA3YB K3RW W3AQA and W3DKX. WR PON 14/66/18. MDC PON 4/26/28.7. W3CDD reports a successful QCWA convention in Houston. WA3FYZ is helping Novice WB3BDU. W3ZNV again welcomes EST. W3IDF sports an excellent phone patch. W3BHE active with PP to So. America. WA3RSK has a 1300 foot antenna. W3WBV haunts 2 mtrs. WA3UJW moved to Frederick. W31RH loses and gains members to the transient military. K3HPG interested in OBS. WA3KCY went at it in the CQ WW Phone Test. WA3UYF finds added teaching jobs curtail activities. News of T-MARC WA3WGF, pres.; W3ENL, VP ops. K3GEG, VP Tech.; W3E27, K3GUW and W3AZD, dir. WB3BT moves back to N.J. WA35JS and WA3YB have the eastern shore at the top. K3ORW takes over at PAM Jan. 1. WB3CES is studying to upgrade his license. WA3EOP keeps the rig hot at W3CWC. WA3PRW uses the Frederick rpt for Public Service duty. AA3YKK is a multi mode man. WB3BUA is eyeing new antennas. W31HM is 3RN liaison. AC8BY/3 leads the tlc men this month. W3JQN immensely delighted at host for ten year olders birthday parties. Traffic: AC8BY/3 179. WA3UYB 118. W3FA 111. AA3YKK 80. WB3BT 70. WA35JS 68. WB3BUA 58. W31HM 54. WA3EOP 53. WA3UYF 39. W3IDF 29. W3FVZ 26. WA3PRW 20. K3ORW 7. WA3FYZ 2. W3BHE 1.

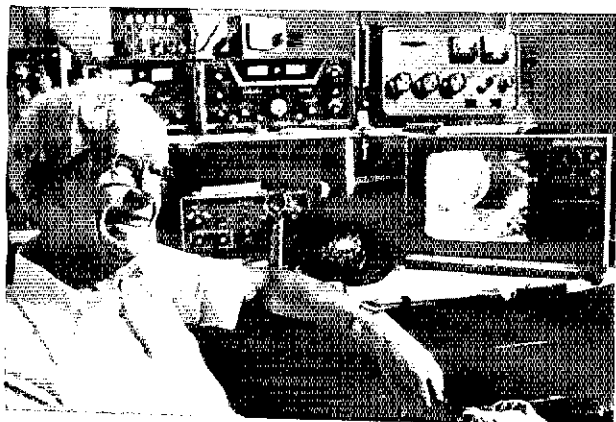
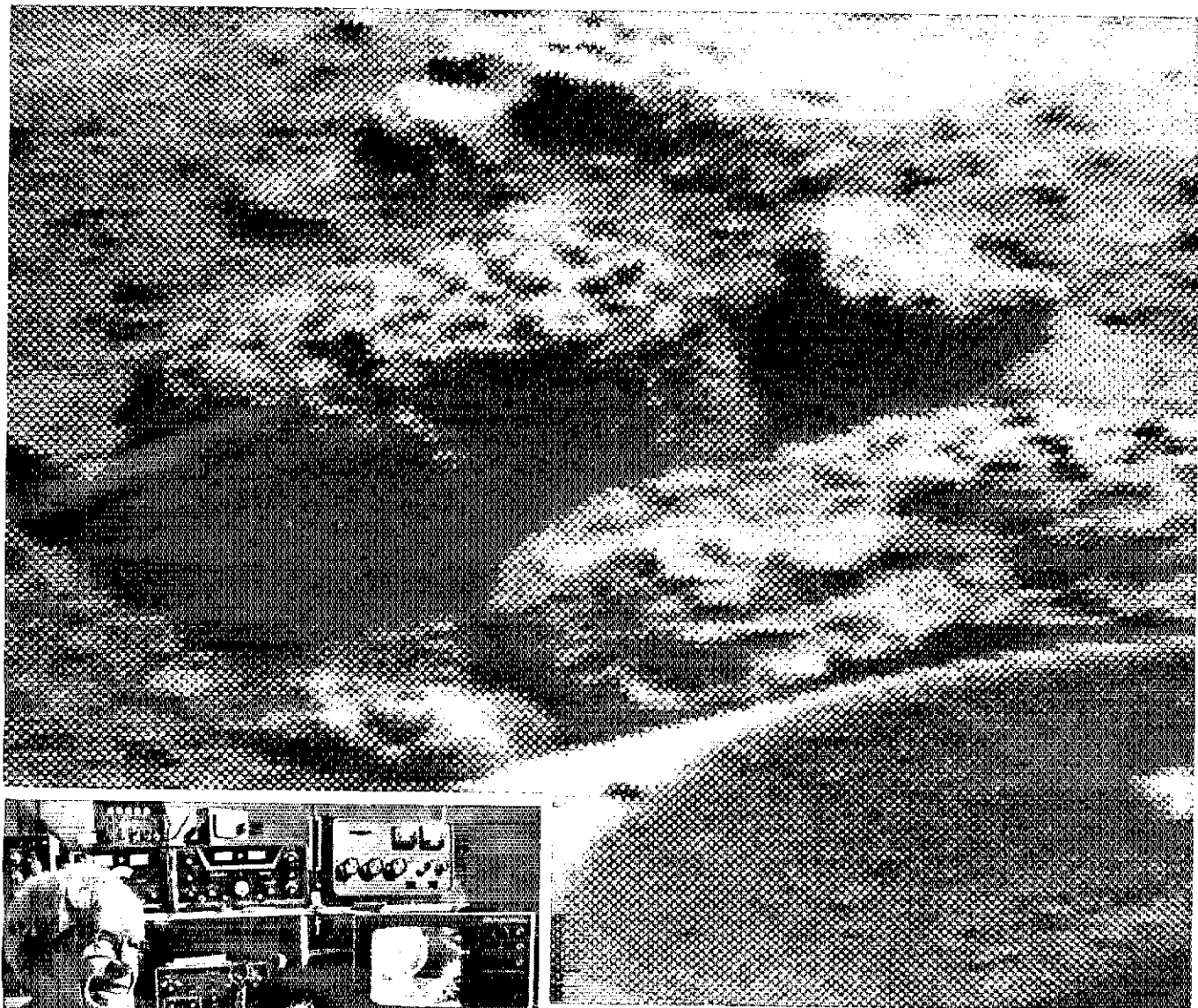
**SOUTHERN NEW JERSEY:** SCM, Raymond F. Clancy, WB2GTE — K3YHR won a Swan transceiver at SJRA's picnic. WA2ZZX active in AREC RACES NJPN RCC. W2HAZ put to work Kenwood twins but lost ant. in storm. K3JDC repairing ant. for S5. WB2CMV reports Boy Scout troop all hams. WB2IDU applies for COJ realigned cbr. 2 xmt'r. has resigned as our SEC, moving to FL. K2UYH puts out monthly activity rpt. on 432 MHz EME info on calls, skeds, condx. Shore Points ARC new Novices; WN2HUH WN21AD WN2AIG. WN21AB. K2KH now W2CQ. WA2AML K2TGN K2VRK have micro-processors. Stone Harbor ARK Net meets Wed. 6-8:30 PM on 3.917 MHz. Club will sponsor a Novice class, contact W2EA WA2YSW for info. Congrats to Tri-City Radio Assn., W2AZ, pres. on ARRL affiliation. West Jersey ARC K2SQS, WB2LCC, WB2LBT members put on a broadcast about ham radio over Crossfire Program, WFIL Phila. Gloucester Co. ARC's WA2FGS YL gave a history of YL hams at Hudson Div. Convention, sez K2HPV. We now have 24-hour WX reports from Phila. Govt. FM radio station on 162 MHz which covers range of approx. 50 miles from Phila. Traffic: W2J1 39, WA2AWU 38, WB2LCC 26, K2BG 11, WA2ZZX 10, WB2GTE 2.

**WESTERN NEW YORK:** SCM, Joseph M. Hood, K2YAH — Asst. SCM: William W. Thompson, W2MTA, SEC: WB2EDT. As I write this report I am in the midst of remodeling the QTH and this is being compiled under less than ideal conditions so please bear with me; things should be back to normal in a couple of months. WA2PUU reports the RAGS ham fest was an FB success. Thanks to RaRa for the opportunity to speak at their Oct. meeting. Had a chance to show the new Club and Training Dept. film "Moving Up to Ham Radio" which was well received. Regret to report WA2LPA is a 51 year old guy. RAGS donated an ARRL test library to the Salence Fré Library in memory of WA2LPA. Adding to the list of those teaching novice courses are those being given by RAGS WB2EAK at Eastwood Jr. High, WA2TCZ WA2TQF, WB2VMS, and K2DNN at George Washington School in Elmira. WB2JWD for the Skyline RC at the BOCES Clinton St. building, and by WB2WMB and WA2SPF in Fulton. W2CYG is a new E-3a Class and will be applying for a two-letter call. WA2AIV reports that the Western District Net on the 04/64 repeater went to a daily schedule on Nov. 1st. This net is very successful for one which has been operating for only four months. W2EWF reports successful Halloween party. Novice activity effort which ran for evenings. Coordination with police maintained by having a fixed station located at a police headquarters. WA2ZJP is building an accu-keyer and memory. Congratulations to W2JUV who was elected ARATS historian. Finally, remember the show and tell night held by ARATS? Well, K2UJ won the prize for best of the show — guessed it — real best anchor! Traffic: W2FR 156, W2OE 137, WA2HSB 87, WA2TPC 61, W2PZL 43, WA2AIV 39, WA2ZJP 35, W2RQF 29, W2UYE 21, W2FZK 16, WB2BOJ 12, WA2LUF 12, K2OFV 10, WB2GIX 8.

**WESTERN PENNSYLVANIA:** SCM, Donald J. Myszewski, K3CSD — SEC: W3ZUL, SECs: K3SMK WA3LJW. BSM: K3SMB. RMS: W2KAT/3 W3NEM W3LOS W3KUN.

Net	KHz	Time/Days
WPA CW Traffic	3585.0	7:00 PM Dy
WPA Phone Traffic	3983.0	6:30 PM Dy
WPA RACES	3993.0	9:00 AM Su

The Simulated Emergency Test (SET) will be held this month. Are you ready in your county? The following counties DO NOT have an Emergency Coordinator: Bedford, Clearfield, Erie, Forest, Fulton, Jefferson, Potter, Somerset, Venango, and Warren. Last year the WPA Section placed fourth in the nation for the SET. What would happen if all counties participated? We'll find out deep report, we note the Silent K of K3VFE. The Crawford AR Society received their new club call c W3MIE. The South Hill Brass Pounders & Modulator have an interesting club project building receivers with WA3TF5 overseeing the project. K3GG5 is a proud owner of a SB-230 Linear. The North Hills AR officers for 1977 are: K31ZQ, pres.; K3YVO, vice pres.; W3TVD, secy. Traffic: W31ZQ, W3QVM, act K3UWQ, dir. The WPA Phone & Traffic Net established in Oct. 1976 is open to any WPA member along with the WPA CW Traffic Net. Both nets exist to serve you and any message handling needs. The following have upgraded licenses: Novice WB2EKE; technical WA3ZCB WA3ZKM WB3BCD WB3CHG WB3BNI WB3ATC WB3BY; General WA3WXT WB3BBB; WA3ZUF WA3ZZS WA3ZYA; Advanced WB3CDI WA3SLX WA3HSR WA3NCC K3LRI W3TPM WA3UCP K3LTN WA3PES K3ATZ K3VQV; Ext K3QHO W3LOD K3KSB. Congrats to all. K3YAK has been elected pres. of the WPA Repeater Council Indiana ARC reports K3UCW K3CML W3MM W3FVJ K3YCI and K3TOM active on RTTY. Also the Foothills ARC reports W3MGH W3GDH W3KH WA3SDK and WA3FFS active on 145.30 MHz w/ FAX. The WPA Phone & Traffic Net had 20 sessions in Oct. and handled 5 messages with 173 QNI. T



## Bob Walton WBØJGJ Works Mars on SSTV

During the recent Viking I and Viking II Mars Operation, pictures of Mars received by NASA's Jet Propulsion Lab were relayed via SSTV to the ham bands by off-duty personnel.

Bob Walton, WBØJGJ was among the SSTV'rs fortunate enough to receive and record on tape, these historic pictures. The photo above shows the Martian

landscape taken by Viking II. Bob used a Robot Model 400 SSTV converter, an audio tape recorder, and an old TV set to receive these pictures off his receiver. His total investment to view and record the most momentous event to date in man's history: \$700.

SSTV is the most exciting development in amateur radio since single sideband! For complete information on SSTV and Robot equipment, write or call us and we'll send you our special SSTV Fact Pack!

### ATTENTION SSTV'rs

NASA's Jet Propulsion Laboratory has made souvenir audio tape cassettes with highlights of all video transmissions from Viking I & II. For your copy send \$3.75 to:

Dick Plety  
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WPA CW Traffic Net had 31 sessions, handled 116 messages with 354 QNT. Traffic: WA3VBM 388, W2KAT 73 229, W3EGJ 108, K3RKK 89, WA3JHP 37, K3CDO 30, W3CGR 19, W3CR 17, W3UT 17, K3NMB 16, W3IDO 15, W3HDH 14, W3TIN 14, W3KUN 11, W3ATG 11, W3SN 8, W3ELZ 6, W3LOS 6, K3HCT 5, W3KQD 5, WA3MDY 5, W3YD 5, AA3JUD 5, W3LOD 2.

## CENTRAL DIVISION

ILLINOIS: SCM, Edmond A. Metzger, W9PRN - Asst. SCM: Harry Studer, W9RYU. SEC: W9AES. RM: K9ZTV. PAM: WA9KFK. Cook County EC: W9HPG.

Net - Freq.	Time(Z)/Days	Sess.	QNT	QTC
ILN - 3690	0330/000 Dy	52	218	235
NCNP - 3915	1200 M-S	26	643	119
NCNP - 3915	1700 M-S	26	588	110
IEN - 3940	1400 Su	-	-	5
Ill Phone - 3915	2145 Dy	31	933	271
ISSB	14277 1400 M-F	20	254	164

W9BVN's new QTH is Fort Lauderdale, FL. He will work for the circuit administrator. W8BADA now W8YEN. WA9OBP has a new keyer. The new officers of the RHO-Epsilon Amateur Radio Club are: WB9AJZ WB9KZP and W8BYM. New Novice heard is WB9YJC. WA9GBW received his Extra Class license. WA9BTY and WA9YGR helped in the capture of 2 robbery suspects in the Chicago area. The Ill. Chapter of the QCWA held their meeting and dinner in Bloomington on Oct. 30. The League's Executive Committee has approved the application of the University of Chicago Amateur Radio Society for ARRL affiliation. WR9AHM in Decatur will soon be on 147.70/10. WA9TZW K9GZA WB9NPC and K9CZK are the new officers of the Kishwaukee Radio Club. WA9HUY is recuperating after a minor hospital stay. New Novices graduating from the Schaumburg Amateur Radio Club classes are WB9YB WB9YYW WB9YYX WB9YYZ and WB9YYY. The Rockford Amateur Radio Assn. elected WB9PBR WN9TMO WN9STF WB9HHH WB9PCA W9COX and W8BAV as their new officers for the coming year. On Oct. 15, ANSAS's four year mission for the end of the day completed its 18,300 orbit and still going strong. Governor and Mrs. Walker cooperated with the Bicentennial Relay committee of the QCWA and forwarded via amateur radio their congratulations to the new President-elect Jimmy Carter from the State Capitol in Springfield, IL. WB9VFV was appointed Asst. EC of Valleyburg. WA9BIS is the only BPL licensee this month. Traffic: (Oct.) W9NXG 293, WB9TWT 158, W9NJP 146, WA9VGV 137, WA9JFF 132, W9OK 118, W9HOT 116, W89SNA 110, WA9KFK 106, WA9OBP 98, K9ZTV 95, W9KR 86, W89NOZ 66, W9LNG 58, W9ZAV 55, W9OYL 43, WA9AQN 38, WA9DED 33, W8RYU 22, WA9JG 19, W9PRN 18, W89NM 8, W89ELP 7, W89NO 4, K9DDA 2. (Sept.) WB9PHM 4.

INDIANA: SCM, M. P. Hunter, WA9EU - SEC: W9UMH. W9JOD reports he has received the Bicentennial WAS award. W89THY reports North Vigo H. S. station K9TNY now active in traffic and will soon be on RTTY. W89HCH reports several AREC members have completed radiological monitoring and cardiopulmonary resuscitation classes. W9JOT reports the Ft. Wayne Radio Club now has over 300 members and claims 75-100 persons per meeting - very FB! The Central Area Staff of NTS met at St. Louis with W89KTR, 9RN mgr. and W9QLW, M.A.L., attending. W89FOT was appointed as new 9RN mgr. The ARPSO LO bulletin shows IN ranks second in the Class I (30 or more ECs) standings. W9 speaks very well for W89M and his outstanding EC program. Much activity has been reported in the CD and QWWW contests. Several new IX2 calls have recently appeared. Also the clubs continue with good training as exhibited by the number of upgrades and new Novices. W89OMX has resigned as QIN mgr. and has been replaced by W9LTU. W89OZ has passed his Extra class exam. Traffic: (Oct.) W9NKG 241, W9YB 475, W9IOH 354, W89KTR 255, W9GGW 228, W89OZW 170, W9LTU 152, W89FOT 138, W89PIR 123, W9QLW 123, W89SQH 120, W9HUF 85, W89IHR 63, W89SKA 61, W89DIX 42, K9TKE 38, W8E1 34, WA9TJS 34, W8DKP 25, W9JG 24, AA9TB 23, WA9QC 20, K9EG 15, W89GR 15, W89CH 15, W89CH 15, W89CZ 13, K9NWD 13, W89NU 10, W89OQI 10, W89JQ 9, W89HCH 9, K9RGF 9, W8DZC 8, W89GS 8, WA9WME 7, K9DIY 6, K9QWK 5, W89TH 5, W89SWB 5, W89BD 3, WA9FCM 3, W9CMT 2, K9HMC 2, W89LTJ 1. (Sept.) K9HMC 8, W9CMT 3.

WISCONSIN: SCM, Roy A. Pedersen, K9FHI - SEC: K9PKQ. PAMs: W9AYK W9IEM K9UTQ. RMs: W89ICH K9KSA W9MFG K9LGU. Nets, Freq. Time QNT, QTC, Mer.: BWN, 3985 kHz, 1145Z M-S, 515 465, W9AYK; BEN, 3985 kHz, 1700Z Dy, 709, 90 W9IEM; W89N, 3985 kHz, 2300Z Dy, 1366, 283 K9UTQ; WNN, 3725 kHz, 1315Z Dy, 132, 13 W89CH; W89I, 3662 kHz, 2330Z MWF, no activity K9KSA; WIN-E, 3662 kHz, 0000Z Dy, 279, 132 W9MFG; WIN-L, 3662 kHz, 0300Z Dy, 242, 35 K9LGU; WI EX PO, 3925 kHz, 1701Z M-F, 590, 28 WA9NIX. W89N certificate to W89JJP W89RWZ Ground Hog party a smashing success with 108 to dinner; the brook hawks to K9GJC and W9LUB and auctioned off for \$52.00 to W9WYJ. Who will get it next year? OPS to W89SXX. W89LYX new Tech. from RRRR, Novice W89YMO. OPS ORS to W89SHK. WNN certificate to W89RWZ. Has your club had a change of officers? Let your SCM know. Let's have generated traffic on the new check-in nets. Don't forget WI QSO Party coming up next spring. BWN certificate to W89JSW. BEN certificate to W89RWZ. W89YXY W89YXX new Novices in Portage. W89QZB W89SEI upgraded to Tech. K9CPM made BPL. W9ZBD has new TH6 up 70-feet. W89SE owner of FT221. Eleven MARRA hams helped with the cancer bike-athon in Madison which was a huge success. Let's have a lot of participation in the 1977 SET. Does your county have an EC? Why not give it try. I would appreciate all Section Net certificate holders to have them endorsed. Traffic: (Oct.) K9CPM 838, W9DND 219, W89SL 155, K9MZO 152, W9PYV 147, W89RWZ 101, K9FHI 100, K9LGU 90, W89PY 86, W89ICH 66, W9AYK 61, W9MFG 61, W89SHK 59, W9IEM 52, K9UTQ 49, W9IHW 44, W89JSW 47, W89HLS 37, WA9NDV 31, W89PY 27, W89RRV 23, WA9QVT 19, W9ZBD 17, K9JP 16, AB9OEC 16, W89QKH 16, W89SXX 14, K9AN 9, W9KHH 3, W89SEJ 2, W89NME 1. (Sept.) W89KPX 30, W9MFG 29.

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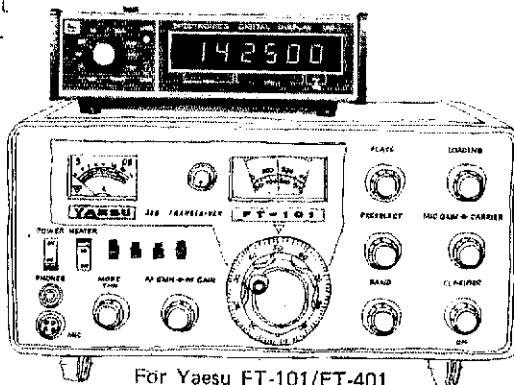
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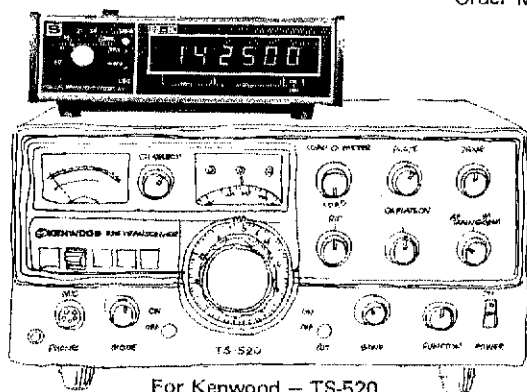
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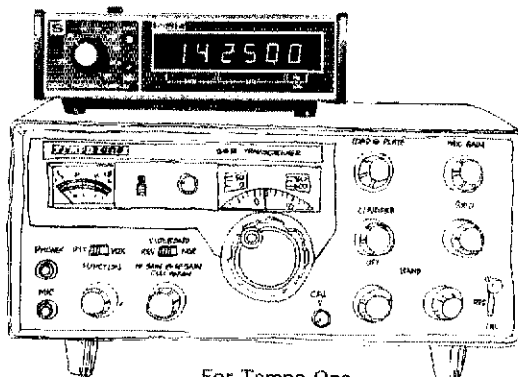
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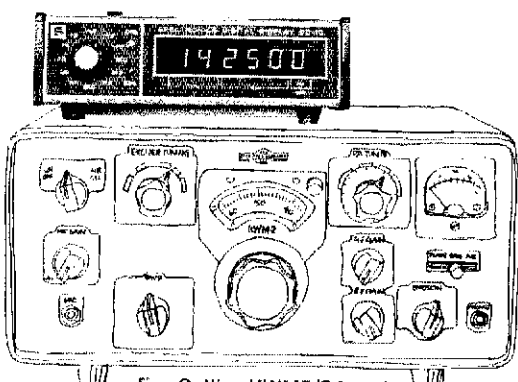
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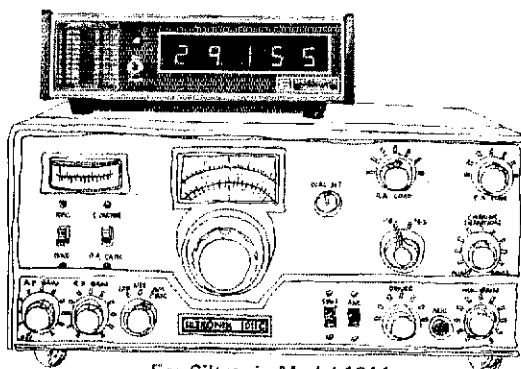
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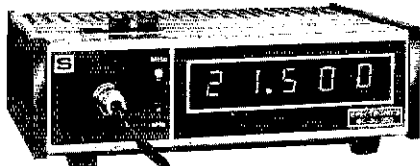
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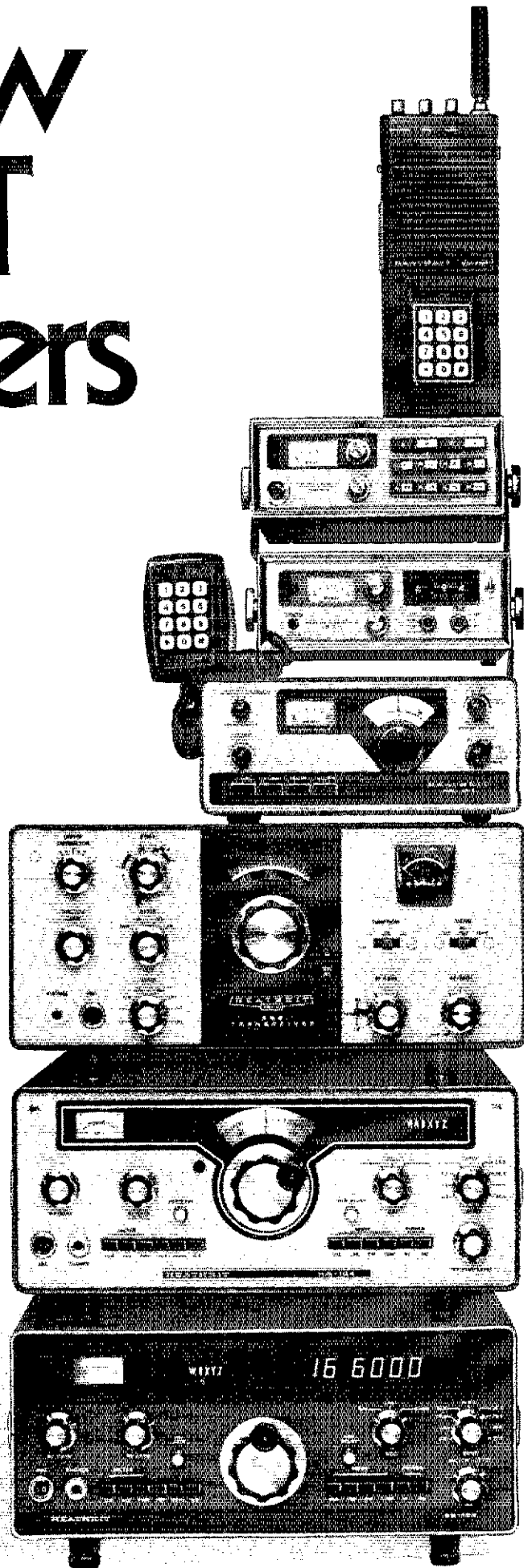
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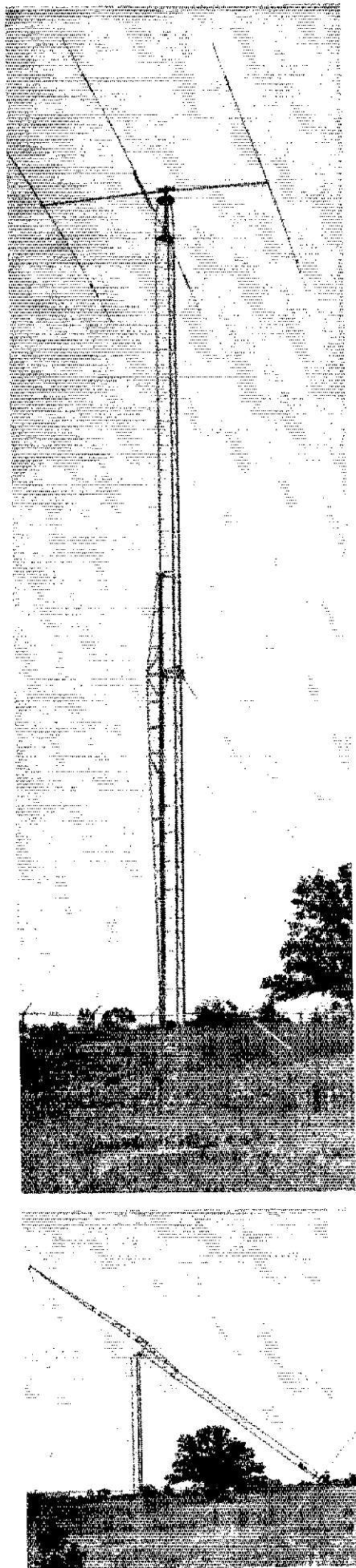
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## DAKOTA DIVISION

**MINNESOTA:** SCM, Frank Leppa, K0ZXE - SEC: WA0FZ. PAMS: K0ZBI WA0YVT WB0HOX. RMs: K0CVD WB0LDW WB0FOQ. OBS: W0HW. Active MN net are: 1205 PM daily 3945, MSPN, K0ZBI, ttc, MN & USA. 9 AM - 5 PM M-F, 3925, PAW, WA0YVT, also Sat. 9-noon, 5:30 PM daily 3710, MSS, WB0FOQ, ttc, MN & training, 5:45 PM daily 3925, MSPN, WB0HOX, ttc, MN & USA. 6:30 PM daily, 3685, MSN, K0CVD, ttc, MN & USA. 10:15 PM daily, 3585, MSN2, WB0LDW, ttc, MN & USA. Amateurs in Brainerd are putting together a 46/06 repeater. Prospective users contact K0MAH at the Community College with possible contributions. MN Navy MARS is looking for new members outside the Twin City Metro area. Contact K0LAV or WB0LJF for info. Congrats to AB0LDW, new MSN2 mgr. and a grateful thanks to WB0JAG, retiring RM. Everyone is invited to check into the newly formed Winona 10-X net, Su. 2000 CST on 28.725 MHz. ARRL affiliation has been extended to Heartland, Northern Lakes, and Duluth JUNES radio clubs. Congratulations! Worthington Amateurs have graduated to Novice: WB0GRL, WB0GQP, WB0PRD, WB0TOJ, WB0TQL. Techs: WB0OPZ and have 36 Novice students. WB0WNJ is a General and K0RMX is an Advanced. AB0MAO isn't sending with his left foot. He hopes to shed his cast soon. MN placed 12th in total traffic this last year, nationally. Thanks go to all the MN members who made this happen. Have a great year in 1977. Traffic: AB0HOX 263, K0CVD 161, WA0YVT 122, W0HKF 110, AB0LDW 83, K0ZXE 70, WB0OUH 62, K0ZBI 59, WB0PKG 54, WB0FOQ 46, WB0LSI 44, AB0MAO 42, WB0CPC 36, WB0UW 30, W0HZU 30, WA0TFC 30, W0HIG 28, WB0NZB 27, W0HQJ 25, K0RIZ 24, WA0URW 21, WB0SIO 17, WA0S 18, WB0OPZ 13, WB0GZ 14, W0OPX 10, K0GNI 8, W0UMX 6, WA0JPR 6, K0CSE 5, K0RMX 5, K0FLT 4, W0OXN 2, WB0WCZ 1, K0SXQ 1.

**NORTH DAKOTA:** SCM, Mark J. Worcester, WA0WLP - OBS: K0PVG, K0PYZ gave list of new calls in area: Novice W0NVRO WB0WHE; General: WB0RCW WB0OAJ WB0QHC WB0RMS WB0RMR WB0RVE WB0VKG and WB0WRN. Two more waiting license and one waiting code test. WA0EWW back in Bismarck. Correct time for 10m. SS sked at 0330Z-0430Z, until K0PDE at Williston expected to join the group soon. The Bismarck Ham Club is having a 10 mtr. sked at 0330Z Sun. evenings at 28,600. WA0YSF at Cavalier lost some of his Antenna Farm. Net - kHz CDT/Days Sess. QNI QTC  
DATA 1996.5 1700 M-F 3 403 67  
WA0SUF 1800 S-S 5 56  
Goose River - 1990.0 0900 Su 5 56  
W0CDO  
Traffic: WA0SUF 60, K0PYZ 51, WB0BMG 6, W0DM 5.

**SOUTH DAKOTA:** SCM, Edward C. Gray, WA0CPX - K0OTZ and XYL WB0NRK have moved from Rapid City to Watertown. Black Hills ARC officers for the new year are WA0LEH, pres.; WB0AC, vice-pres.; WB0JHD, secy.; K0CKK, treas. They also have a Novice class with 30 prospective amateurs. Mitchell and the PLARC also report big attendance at licensing classes. Other clubs holding license classes should let the SCM know so they can be publicized and requests can be referred back to the local club. Interest is increasing in two meter satellite work. Signals expected on the band before long. K0GZZ WANRE WB0JHD K0VKM as well as a number of the Sioux Falls amateurs are or will be on shortly. K0BMM is on two meters from Phillip. Net reports: Morning Net: QNI 626, QTC 55, NJQ 718 and 21; Evening Net: 1467 and 45. Traffic: W0EVQ 126, WA0VRE 60, W0HOJ 57, W0IG 24, W0DVB 7.

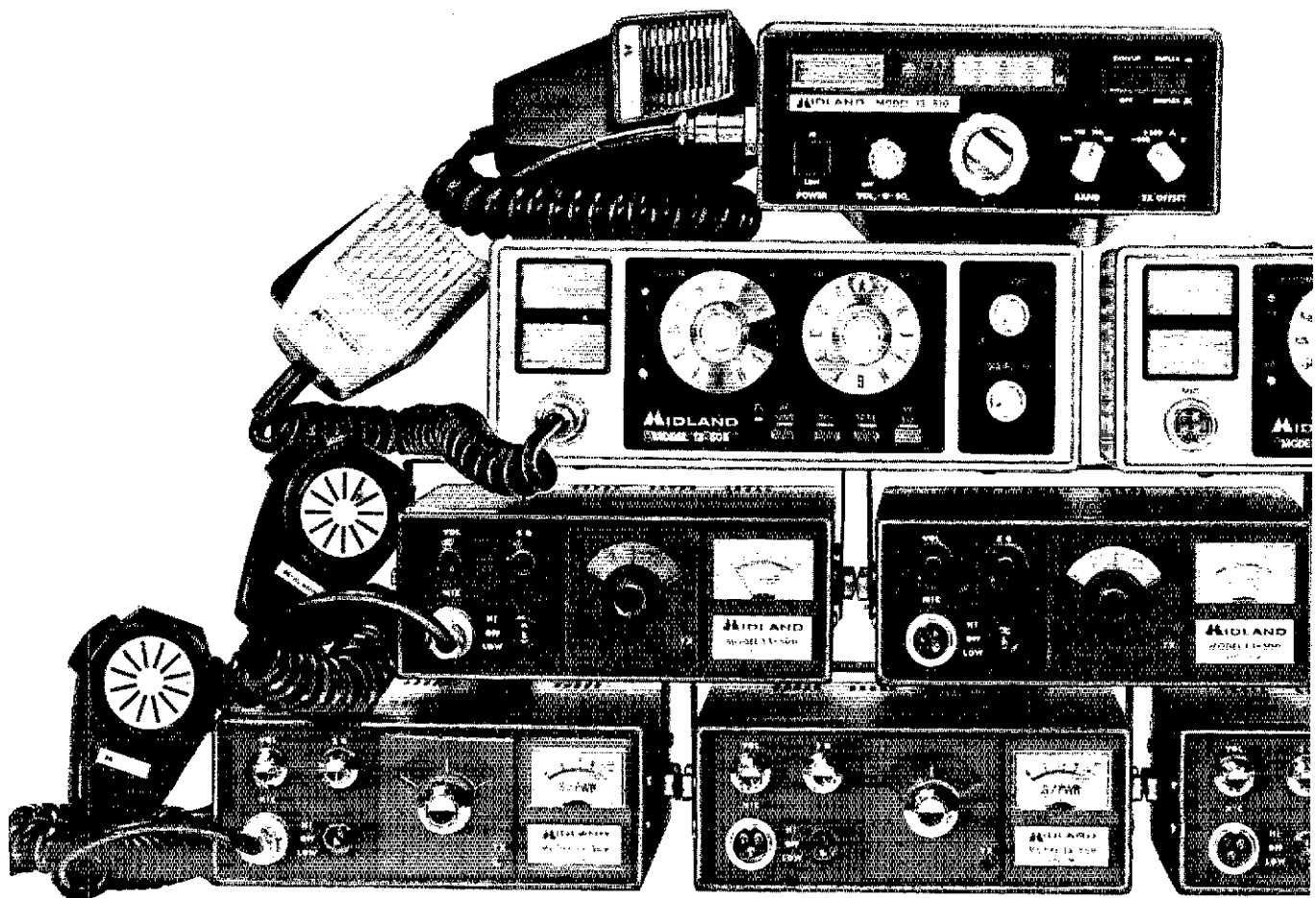
## DELTA DIVISION

**ARKANSAS:** SCM, S. M. Pokorny, W5UAU - SEC: W5VNV. PAMS: W5POH W5ZWZ. RM: W5MYZ. Nets, kHz, Time/Day, QNI, QTC, Wlg: ARN 399, 0030/Dy, 527, 53, K5FV, WZK, 1760, 0100/Dy, W5MYZ: APRN 357, 7:20/M-S, 780, 40, W5PH: N5Bird 3928, 2230/M-F, 548, 17, W5ZWZ. New repeaters: W5AKF, Jasper 145.01/61. W5AMN, El Dorado S. AR ARC 147.93/33. New ECs: W5G5W, Drew Co. W5PBZ, Benton Co. Renewals: OBS K5GKN, OPS W5B5LF, CRSS W5H5D, W5DRD, W5EIJ, W5MYZ, W5ST, W5SHY, W55RTG. Code and theory classes in progress by 5. AR ARC, OZARC, NWAARC, Ft. Smith ARC, Jonesboro ARC, and Melbourne. W5KL participated in Oct. CD Party phone and cw. Welcome to new hams: W5S5 UUV, UZG UZU, VAX VAY, VAZ VDA, VDE, VDO, VEU, VEV, VEW, VEX, VEY, VGS, VJH, VJL, VJJ, VJK, VJW, VLV, VLM, VMM, VMS, VOF, W5S5 URM, UYK, VJZ, VGU. W5B5GVE now Extra Class. Traffic: W5POH 29, W5UAU 25, W5EIJ 10, W5G5VE 4, W5B5ZR 4, W5KL 4, W5SHY 3, W5B5D 2.

**LOUISIANA:** SCM, Robert P. Schmidt, W5GHP - Asst. SCM, John Solivestre, W5SNY. SEC: W5B5CIQ. RM: W5APRI. PAM: W5B5KF, VHF PAM: W5VBX. New officers SELARC, Hammond are W5B5MXE, pres.; W5STQX, vice-pres.; W5B5FB5, secy-treas. W5VRO has new inverted V, is very active on 40-80. W5B5PC, up and around again after illness. W5B5KF, LTN Net Mgr. reports long skip on 39.10 disrupting the LFN. LTN thinking about changing time from 6:45 PM to possibly 6:15, or 6:30. Bob would appreciate info from members on this possible time change. Congratulations to Delta DX Club on their fine score for FD. BRARC had successful auction Nov. 12th. Their upgrade classes were very successful. At the New Orleans Hamfest, certificates were awarded to W5ARRN, W4RKP, and W4YQS. The New Orleans VHF Club now has 285 members, still adding more. The Monroe Hamfest in Nov. was well attended. Congratulations to the Twin Cities Club for this Event. Remember SET is this month Jan. 29 and 30. You help is needed. Check with your EC, SEC, W5B5CIQ. Net - Freq. Time/Days QNI QTC Manage  
LGN - 3615 7 & 10 PM Dy 330 188 W5B5PR  
LTN - 3910 6:45 PM Dy 147 67 W5B5KF  
LGN - 3703 8:30 PM M-F 98 17 W5ASNV  
LGN - 3587.5 7:00 PM Su 14 22 W5B5FH  
Traffic: (Oct.) W5GHP 248, W5STQ 210, K5TTC 199, W5B5PR 109, W5MNI 87, K5TTC 81, W5B5PR 63, W5ASNV, W5SNVB 56, W4VVE 55, W5B5KE 32, W5B5LR 18, W5B5OO 18, W5YN 5, W5AZZA 4. (Sept.) K5TTC 165.

**MISSISSIPPI:** SCM, W. L. Appleby, W5B5DCY - Sep. late report. Appointments: W5EDT W5B5QCA Obs.





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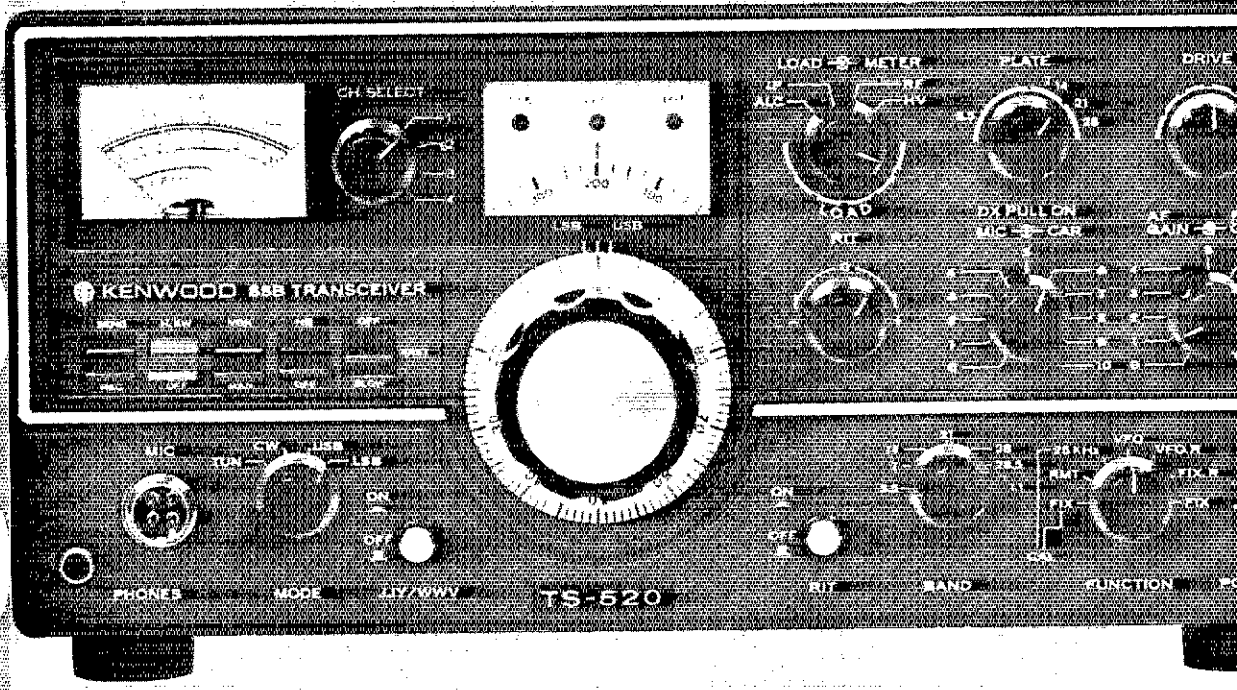
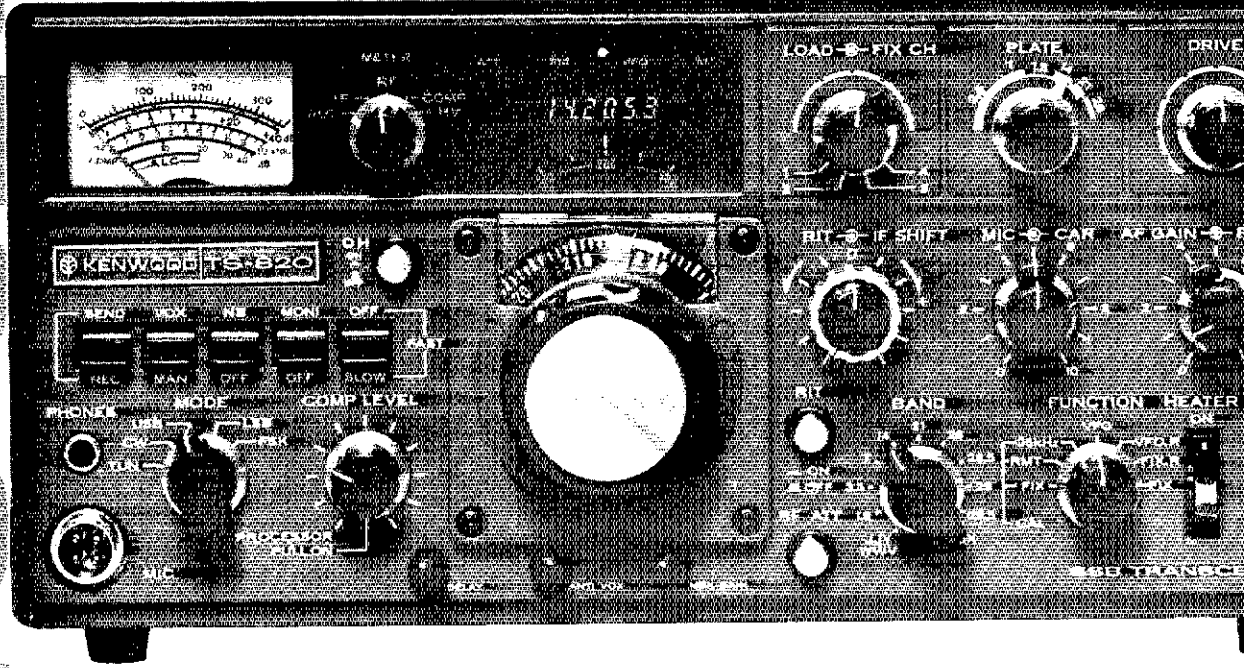
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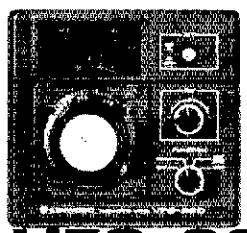
**IF SHIFT** • The IF SHIFT control varies the IF passband without changing the receive frequency. Enables the operator to eliminate unwanted signals by moving them out of the passband of the receiver. This feature alone makes the TS-820 the pacesetter that it is.

**PLL** • The TS-820 employs the latest phase lock loop circuitry. The single conversion receiver section performs superb protection against unwanted cross-modulation. And now PLL allows the frequency to remain the same when switching sidebands (USB, LSB, CW) and eliminates having to recalibrate each time.

**RECEIVER SELECTIVITY:**  
 SSB 2.4 kHz (-6 dB)  
 4.4 kHz (-60 dB)  
 CW\* 0.5 kHz (-6 dB)  
 1.8 kHz (-60 dB)  
 \*(with optional CW filter installed)  
**IMAGE RATIO:** 160-15 meters: Better than 60 dB  
 10 meters: Better than 50 dB  
**IF REJECTION:** Better than 80 dB  
**POWER REQUIREMENTS** (120/220 VAC, 50/60 Hz, 13.8 VDC (with optional DS-1A DC-DC converter))  
**POWER CONSUMPTION:** Transmit: 260 Watts  
 Receive: 26 Watts (heaters off)  
**DIMENSIONS:** 13-1/8" W x 6" H x 13-3/16" D  
**WEIGHT:** 35.2 lbs (16 kg)

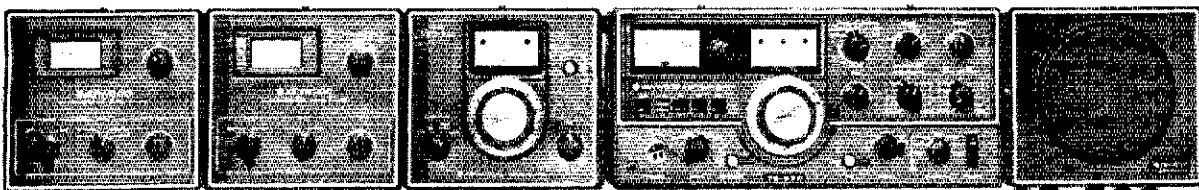
## TS-820 Specifications

**FREQUENCY RANGE:** 1.8-29.7 MHz (160 - 10 meters)  
**MODES:** USB, LSB, CW, FSK  
**INPUT POWER:** 200W PEP on SSB  
 180 W DC on CW  
 100 W DC on FSK  
**ANTENNA IMPEDANCE:** 50-75 ohms, unbalanced  
**CARRIER SUPPRESSION:** Better than 40 dB  
**SIDE BAND SUPPRESSION:** Better than 80 dB  
**SPIRIOUS RADIATION:** Greater than -60 dB (Harmonics more than -40 dB)  
**RECEIVER SENSITIVITY:** Better than 0.25uV



## VFO-820

Solid state remote VFO designed exclusively for use with the TS-820 "Pacesetter". Contains its own RIT circuit and control switch . . . is fully compatible with the optional digital display in the TS-820.



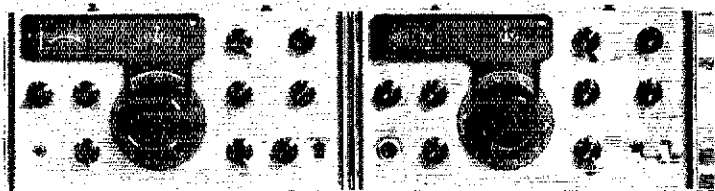
Subject to FCC certification

As a TS-520 owner, you go on the air with a sense of pride and confidence. Thousands of these precision-built beauties are in operation all over the world . . . in ham shacks, field day sites, in DX and contest stations and in countless mobile installations. No other rig has ever offered the performance, dependability, versatility and value that is built into every KENWOOD TS-520.

You have certainly heard the TS-520's clean signal on the air and have probably heard a lot of glowing praise by other hams. So if you don't already own a 520, maybe it's time you did.

**MODES:** USB, LSB, CW  
**POWER:** 200 watts PEP input on SSB, 160 watts DC input on CW  
**ANTENNA IMPEDANCE:** 50-75 Ohms, unbalanced  
**CARRIER SUPPRESSION:** Better than -45 dB  
**UNWANTED SIDE BAND SUPPRESSION:** Better than -40 dB  
**HARMONIC RADIATION:** Better than -40 dB  
**AF RESPONSE:** 400 to 2600 Hz (-6 dB)  
**AUDIO INPUT SENSITIVITY:** 0.25uV for 10 dB (S+N)/N

**SELECTIVITY:** SSB 2.4 kHz (-6 dB), 4.4 kHz (-60 dB), CW, 0.5 kHz (-6 dB), 1.5 kHz (-60 dB) (with accessory filter)  
**FREQUENCY STABILITY:** 100 Hz per 30 minutes after warmup  
**IMAGE RATIO:** Better than 50 dB  
**IF REJECTION:** Better than 50 dB  
**TUBE & SEMICONDUCTOR COMPLEMENT:**  
 3 tubes (2 x 5-2001, 12BY7A), 1 IC, 18 FET, 44 transistors, 84 diodes  
**DIMENSIONS:** 13.1" W x 5.9" H x 13.2" D  
**WEIGHT:** 35.2 lbs.



## R-599D T-599D

The R-599D is the most complete receiver ever offered. It is entirely solid state and covers the full amateur band, 10 thru 160 meters, CW, LSB, USB, AM and FM. The T-599D transmits CW, LSB, USB and AM, has only 3 vacuum tubes, built-in power supply and full metering.

Because of the larger number of controls and dual VFOs, the combination offers flexibility impossible to duplicate with most transceivers . . . for example, transmitting and receiving on different frequencies, no matter how far apart.



PRESENTING THE  
**NEW**  
**2-METER PORTABLE**  
 INTERNAL NI-CAD BATTERY OPERATED  
**SYNTHESIZED RADIO**

FROM  
**WILSON**

**WE-800**  
 PORTABLE

**\$389<sup>00</sup>**



Note: Not available for sale. FCC certification pending. Orders accepted as soon as certification granted.

**WILSON'S NEW WE-800 2M RADIO**

Wilson's New Portable 800 Channel 2 Meter Synthesized Radio that can go anywhere with you • 12 watts output in automobile • 2 watt output with internal Ni-Cad Battery Pack (10 "AA" Ni-Cads for Portable use) • Ni-Cads charge when used in auto • Cmos low current drain synthesizer Rx 45 Milliamps, 2 watt Tx 450 Milliamps.

- Uses Wilson's standard BP-1 Battery Pack (Batteries not included) and includes mounting bracket and microphone.
- Covers frequency range 144-148 MHz in 5 Hz steps • 600 KHz off-set up or down • 6 Channels sub-audible tones available as option • Size 8-1/4" x 6-3/4" x 1-7/8" • weight 1 lb. 15 ounces.

**450 & 220 HAND HELDS**

**MODEL 4502 . . . \$299.95**

FREQUENCY RANGE 420 - 450 MHz

- 6 Channel Operation
- Individual Trimmers on all TX/RX Crystals
- All Crystals Plug In
- 12 KHz Ceramic Filter
- 21.4 and 455 KC IF
- .3 Microvolt Sensitivity for 20 dB Quieting
- Weight: 1 lb. 4 oz. less Battery
- Battery Indicator
- Size: 8 7/8 x 1 3/4 x 2 7/8
- Switchable 1 & 1.8 Watts Output @ 12 VDC
- Current Drain: RX 15 MA, TX 500 MA
- Microswitch Mike Button
- Unbreakable Lexan® Case

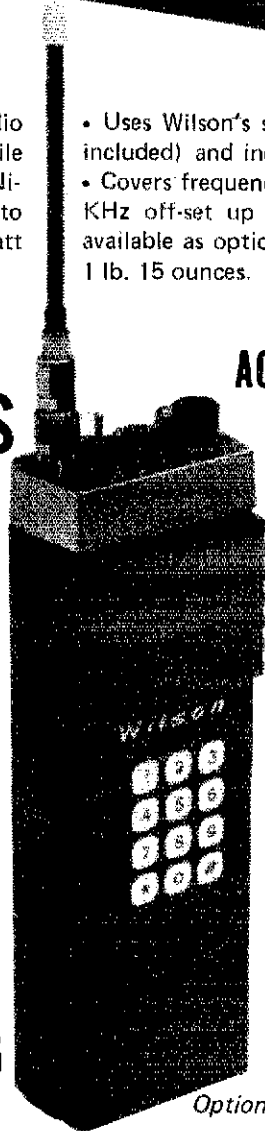
**EACH UNIT INCLUDES FLEX ANTENNA AND SIMPLEX XTAL FREQ. INSTALLED DURING SPECIAL. 446.00 or 223.50 MHz.**

FREQUENCY RANGE 220 - 225 MHz

- 6 Channel Operation
- Individual Trimmers on all TX/RX Crystals
- All Crystals Plug In
- 12 KHz Ceramic Filter
- 10.7 and 455 KC IF
- .3 Microvolt Sensitivity for 20 dB Quieting
- Weight: 1 lb. 4 oz. less Battery
- Battery Indicator
- Size: 8 7/8 x 1 3/4 x 2 7/8
- Switchable 1 & 2.5 Watts Output @ 12 VDC
- Current Drain: RX 15 MA, TX 400 MA
- Microswitch Mike Button
- Unbreakable Lexan® Case

**BOTH MODELS USE THE SAME ACCESSORIES AS 1405.**

**MODEL 2202 . . . \$219.95**



**ACCESSORIES & OPTIONS**

- ★ Battery Charger (BC-1)
- ★ 10 ea. AA Ni-Cad Battery Pack (BP-1)
- ★ Extra Battery Tray (BT-1)
- ★ Leather Case for 1402 (LC-1)
- ★ Leather Case for 1405, 2202, 4502 (LC-2)
- ★ Speaker Mike (SM-2) 6 pin connector
- ★ TE-1 Sub-Audible Tone Encoder, installed
- ★ TE-2 Sub-Audible Tone Encoder/Decoder, installed
- ★ TTP - Touch-Tone Pad - installation free if ordered at time of purchase of radio
- ★ 10.7 KC Monolithic Xtal Filter (XF-1)

*(Photo Shown with Optional Touch-Tone Pad)*



**Wilson Electronics Corp.**

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# WHY WAIT???

## BE ON THE AIR NOW WITH A Wilson Electronics Corp.

### HAND HELD

Wilson 2 meter Hand Held radios . . . The dependable ones . . . proven performance for the discriminating Ham who insists on quality and value.

Two models are available: the 2.5 watt model 1402SM, and the switchable 1 watt or 5 watt model 1405SM . . . options include Touch-Tone Pad, Battery Charger, Battery Packs, Speaker Mike, Leather Case, and Tone options.

Join the thousands of amateurs now using Wilson . . . the radio that goes where you do.

**FAST DELIVERY!!**

#### 1405 SM

- 6 Channel Operation
- Individual Trimmers on all TX/RX Crystals
- All Crystals Plug In
- 12 KHz Ceramic Filter
- 10.7 and 455 KC IF
- .3 Microvolt Sensitivity for 20 dB Quieting
- Weight: 1 lb. 4 oz. less Battery
- Battery Indicator
- Size: 8 7/8 x 1 3/4 x 2 7/8
- Switchable 1 & 5 Watts Minimum Output @ 12 VDC
- Current Drain: RX 14 MA TX 400 MA (1w) 900 MA (5W)
- Microswitch Mike Button
- Unbreakable Lexan Case



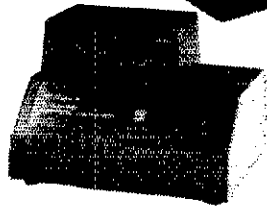
**\$249<sup>95</sup>**

**1405SM  
HAND HELD  
5 WATT  
TRANSCEIVER  
144-148 MHz**

**SPECIAL ON EACH RADIO INCLUDES:**

- Flex Antenna
- 52/52 Xtal

*Shown with  
Optional  
Leather Case*



**BC-1 NI-CAD BATTERY CHARGER  
WITH REGULAR AND  
TRICKLE CHARGE FEATURE**

**\*\*\* USE THIS HANDY CLIP-AND-MAIL ORDER FORM FOR JANUARY SPECIAL SALE \*\*\***

- \* 1402 SM @ \$179.95
- \* 1405 SM @ 249.95
- \* 2202 SM @ 219.95
- \* 4502 SM @ 299.95
- \* BC-1 @ 39.95
- \* BP-1 @ 16.95
- \* BT-1 @ 6.75
- \* LC-1 @ 14.95
- \* LC-2 @ 14.95
- \* SM-2 @ 26.95
- \* TE-1 \* @ 59.95
- \* TE-2 \* @ 100.00
- \* TT-P @ 59.95
- \* XF-1 @ 12.95
- \* Factory XTAL Installation Netting @ \$7.50/Radio
- \* Specify Frequency

TX or RX XTALS @ \$4.25 ea. (Common 2M Frequencies only)  
 MARS, CAP, 220, or 450 XTALS @ \$10.00 ea.

**Shipping and Handling Prepaid for January Sale**  
 Nevada Residents Add Sales Tax

Please Equip Transceivers as  
 As Follows

	XTALS RX	XTALS RX
A		
B		
C		
D		
E		
F		

\* Amount Enclosed \$ \_\_\_\_\_  Check  Money Order  
 BAC  Master Charge

\* Card # \_\_\_\_\_ Exp. Date: \_\_\_\_\_

\* Name \_\_\_\_\_

\* Address \_\_\_\_\_

\* City \_\_\_\_\_

\* State \_\_\_\_\_ Zip \_\_\_\_\_

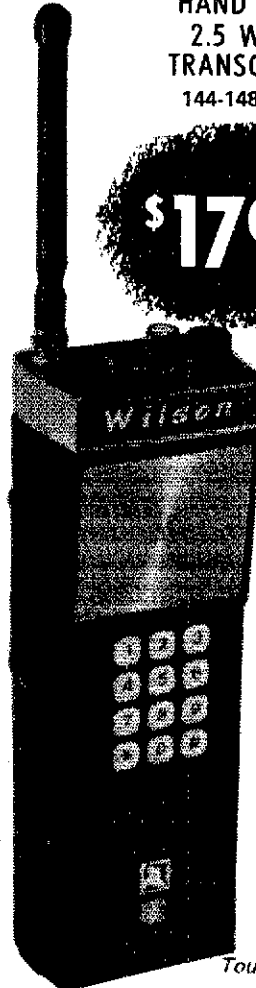
\* Phone AC \_\_\_\_\_

\* Signature \_\_\_\_\_

**WILSON ELECTRONICS CORP.**  
4288 SO. POLARIS • LAS VEGAS • NEVADA • 89103

#### 1402SM HAND HELD 2.5 WATT TRANSCEIVER 144-148 MHz

**\$179<sup>95</sup>**



#### 1402 SM

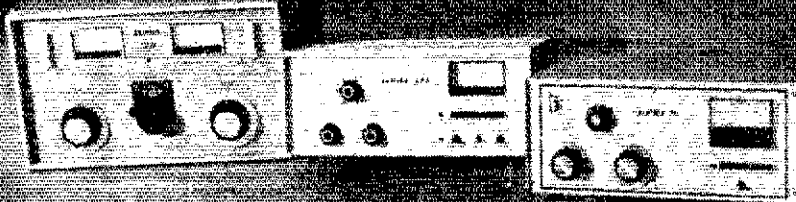
- 6 Channel Operation
- Individual Trimmers on all TX/RX Crystals
- All Crystals Plug In
- 12 KHz Ceramic Filter
- 10.7 IF and 455 KC IF
- .3 Microvolt Sensitivity for 20 dB Quieting
- Weight: 1 lb. 4 oz. less Battery
- 5-Meter/Battery Indicator
- Size: 8 7/8 x 1 7/8 x 2 7/8
- 2.5 Watts Minimum Output @ 12 VDC
- Current Drain RX 14 MA TX 500 MA
- Microswitch Mike Button
- High Impact Plastic Case

*Shown With  
Optional  
Touch-Tone Pad*

Valid January 1-31 only

# ALPHA POWER

... FOR THAT BIG SIGNAL



## ALPHA 77D

### 'THE ULTIMATE'

- Runs cold and whisper-quiet in all modes at maximum legal power.
  - Full 10-160 meter coverage.
  - Built-in QSK system.
  - Vacuum tuning and relays.
  - Remarkably compact for its power capability.
  - Finest in a long line of superb linears.
  - The STANDARD OF EXCELLENCE around the world.
- \$2995

## ALPHA 374

### 'NO TUNE UP'

- Smallest & lightest true locked-key kilowatt.
  - 10-80 meter operation with no tune up at all, thanks to factory set bandpass filters.
  - Auxiliary front panel TUNE & LOAD controls for optimizing output with mismatched loads.
  - Thoroughly proven in three years' contest, DX, RTTY, SSTV, and general use worldwide.
- \$1395

## ALPHA 76

### 'RUGGED VALUE'

- Rock-crusher, locked-key kilowatt at moderate cost.
  - 2+ KW PEP SSB.
  - 10 thru 160 meters.
  - Smooth, quick tune-up.
  - 250 W. Novice option, on request.
  - 45 pound transformer!
- \$985



## ALPHA/VOMAX

### 'TOPS IN TALK POWER'

- New split-band speech processor is actually more effective than rf clippers!
  - Extremely low distortion.
  - Easy to use with any rig.
  - Money-back guarantee!
- \$179.50 (12 VDC); AC supply \$10.



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Wide selection - Large stock  
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K5VXV VHF PAM; WB5NGF OO; W5NRRY ORS 11; WB5TZN W4MPC/5 OVSS; W5TXA WB55XK ORS; W5EMS OPS. MSBN Picnic smashing success, MTN NCS WB5MTQ, W5SYZV K5RRG K5OAF W5WZ W5EDT W5LSG, really doing FB job. W5TIF took lightning hit in shack. W5KXV, now W5KXV, WB5HUY has 300 DX countries confirmed. WB5KU, MTN OBS going into USA. Tombigbee ARC Novice classes started. K5FZL WB5UJAN KH6EL heard VHF FM. WB5KDV W5JTL W4MPC/5 WB5LKC WB5KDV heard on vhf ssb. WA4KVR/4 WB5NGF WA5IMU W5GMZ WB5EQZ now on MTN. VHF Class V OOS needed. WB5ZC, WB5KXV at Memphis Hamfest. MTN certs issued to K5RRG W5TXA/5 WA4KVR/5. DRN5 reports new MS check-ins. Monroe Co. ARC officers K5IKB, pres.; K5ORE, vice-pres.; WA5SIM, secy-treas. Welcome new MS amateurs WB5 VBC VGV VGD VLN VMQ VGN VGV VGU VNU VUJ VUQ VUJ UOR UYN UXY USN VBO VAD VBU UX7 UVRZRT, vice-pres. WB5VCH, VCH VDL VFE VHE VFS VKG VPP VNM VCF VCK VCL VCI VEK VGM VMW VDI VIG UOO UWW UJW URU UTXM UTT VAQ VCJ VCS VDK VCK UQQ URU UTV UVB UWG UXR VCE VCM VCG. M5N Sept. QNI 87, QTC 18; Miss-Lou WX Net QNI 84; MSBN QNI 1187, QTC 68; MTN QNI 216, QTC 73. Traffic: (Sept.) WB5FHA 13, WB5MTQ 10, WB5RRG 149, WB4DUJ 110, W5EDT 81, WB5NPM 47, WB5DCY 29, W5LSG 17, W5YTN 9, W5SYZV 8, W5TXA 7, W5NCS 5, WB5NGF 5, WB5SNB 4, K4VXV 4, WB5EIN 3.

**TENNESSEE:** SCM, O. D. Keaton, WA4GLS - SEC; WB4DYJ, PAM; WB4PRF, RM; WB4DUJ. Net - Freq. Time(Z)Days Sess. QNI QTC Manager  
TPN - 3.980 1140 M-F 85 7625 234  
WA4EWW 1245 M-F  
W4PFP 0130 M-5  
WB4YPO 1500 SSUW  
TTV 3.635 0130 Dy 31 184 58  
K4VFC  
ETVHFEN - 50.4 2000 MWF 12 31 2  
WB4WZJ  
ETVHFEN - 145.2 2000 TTh 9 39 2  
WB4DZG  
MTTMMN - 28.8 0200 TF 9 69 0  
W4EAY  
WB4YFN - 146.370230 MF 9 260 6  
WA4VXX - 146.97  
TCBACWN  
146.16 - 146.76 0200 W 5 259 0  
W4CYL

The current officers of the Tennessee Council of Amateur Radio Clubs are: WA4CDH, chmn.; WB4ZS, vice-chmn.; WB4WFE, secy-treas. We are very sorry to have K4KCK move to ID but our loss is their gain, good luck. The Tennessee Repeater Advisory Committee members are as follows: WA4LE WB4NIR WB4YID WA4VXX WB4WZK WB4DUJ WA4ZOK. Please contact this committee when you need advice concerning vhf problems. Traffic: K4CYN 19, K4VFC 159, K4VRC 149, WB4DUJ 110, WA4CNY 103, WA4OGG 64, WB4PRF 58, WA4DKC 39, K4JSE 39, WB4BKF 30, WA4GLS 29, WB4GBI 24, W4CYL 20, WB4ZS 20, WA4RUW 19, WB4YPO 18, WB4MPJ 15, K4KCK 12, WB4WHE 12, WB4DDV 9, K4VVE 9, K4LUMW 8, W4PSN 6, W4TVV 6, W4SGI 4, W4VJW 4, K4AMC 3, W4CK 3.

## GREAT LAKES DIVISION

**KENTUCKY:** SCM, Ted Huddle, W4CIF -- Net QNI QTC Net QNI QTC  
KRN 354 26 KYN 464 158  
MKPN 938 96 60ARC 69 2  
KTN 1352 138 SEKEN 48 2  
KYN now has a very FB operating procedure manual for new and probers. If you are wondering what all those strange procedures are, drop K4LUM a line for a copy. K4CIN reports a new club in the Sandy Valley Area. Officers are: WA4CMP, pres.; K4CIN, vice-pres.; WB4TRO, secy. The annual section meeting will be Jan. 23 at the Brownsboro Road Holiday Inn in Louisville. K4CIN may be returning to Amateur Radio. Traffic: WB4IGX 87, K4TXC 112, K4HRE 94, WB4ECB 73, WA4IGS 68, WA4SAC 60, WB4QVS 58, W4BAZ 55, WB4AUN 53, WB4EOR 50, W4CID 48, K4UNW 36, WA4JTE 31, WA4NAR 27, WA4AVV 24, WB4JMQ 21, W4IQZ 19, K4FUM 15, WA4JAV 15, WA4FAT 12, WA4AGH 9, WB4KTR 8, K4AVX 7, K4HOE 1.

**MICHIGAN:** SCM, A. L. Baker, W8TZZ - SEC; WBMPD. RMS: W8JYA W8RNC. PAMS: WB8JX  
K8LINE, VHF PAM; WA8WVV. Net - Freq. Time(Z)Days QNI Tfc. Sess  
MACS - 393 3 1800 Dy 954 274 35  
GMN - 3653 2300/0300 Dy 972 256 91  
BR/MEN - 3930 2230 Dy 757 93 31  
W55BN - 3935 0001 Dy 866 78 31  
GLETN - 3952 0230 Dy 650 76 31  
UPEN - 3922 2230 Dy 335 50 36  
MGM - 50 0001 Dy 258 41 23  
MNN - 3720 2230 Dy 85 17 19  
MIAREC - 3932 2300 S 103 11 5  
VHF PAM 410 5 17

In order to provide a balanced traffic structure within the section, several Route Manager appointments which did not have a phone equivalent have been cancelled. This month's bidding reflects these changes. Time changes AGAIN, please check your net listing. MACS - Amateur of the month: W8FZL - July. W8HKL - Aug., W8BLOE - Sept. State AREC net now one year old. Appears to be a success. MI QSO Ptv results: US trophy winner W8GNR, State trophy winners: WA8PPD, SSB, W8PRC, CW. VHF Plaque W8BRNQ, club trophy to L. Aude Creek. W8BDKQ's new, Interstate Side Band Net mgr. SEMAHA to start Amateur classes in Jan. See WB8L5V for details. Who's Who report: K8GJED now W8DCUJ, W8BLW now W8SOP, W8NSHL/8 now W8DCQJ. Traffic: (Oct.) W8RIT 216, W8RDKG 212, K8LINE 118, W8GQJ 101, W8BJX 85, W8GLC 85, W8KQU/8 85, W8BPOL 80, W8MU 77, W8WZF 75, W8BRV 69, W8BOE 66, K8DYI 65, W8OW 63, W8YIQ 61, K8WRJ 52, W8NOH 51, W8DHB 47, W8ATBL 42, W8VPV 41, W8TZZ 40, W8UFS 40, K8ZJU 37, W8BNC 31, W8RTN 31, W8BYDZ 31, W8VIZ 29, W8FB3 27, W8JY 25, K8JED 25, W8DJS 21, W8JUP 20, W8PDP 19, W8BHB 18, W8WWM 18, W8SDH 14, W8UFS 13, K8GXV 11, W8UIC 11, K8AMU 10, K8BZL 10, K8DTG 10, W8BEYM 10, K8JHA 9, W8TBP 9, W8HKL 8, W88VAI 8, W8DCN 7, W8QBE 7, K8RNP 7, W8RNG 7, W8BNE 6, W8JAX 6, W8LOU 6, W8SOP 5, W8FXR 5, W8WVV 5, W8BML 4, K8SWW 4, W8BCUJ 3, W8BTP 3, W8BTA 3, W8WV 3, W8OC 2, W8JLD 2, W8BLOE 2, W8ZAV 2, W8AGK 1. (Sept.) W8BNC 62, W8KXZ 13, W8LW 10, W8RIF 8.

# Hy-Gain verticals stand alone.

Hy-Gain multi-band vertical amateur antennas are entirely self-supporting. They require no towers or guys and go up in just a few square feet yet they offer remarkable performance. Their omnidirectional pattern means no rotator is required. Hy-Gain verticals go up easily with just a few hand tools and their cost is surprisingly low.

See your Hy-Gain dealer for the antennas that give you the performance you want. Take minimum space and have your kind of price. Hy-Gain verticals.

## 18HT 6-80 meters.

The only vertical antenna on the market offering multi-band performance without traps. The Hy-Gain 18HT utilizes a unique stub decoupling system to maximize efficiency, frequency stability and band isolation. It also offers a 50 ohm input impedance for all bands.

The 18HT features automatic band switching, 1/4 wavelength performance on 40 and 80 meters, 1 1/4 wavelength on 10 and 15 meters. Maximum legal power rating on all bands. It is entirely self-supporting and requires no guys. Heavy duty, slotted, taper swaged, aircraft quality aluminum with full circumference compression clamps is used for radiators. The 24' tower is all rugged, hot-dip galvanized steel and all hardware is iridized for corrosion resistance. Special hinged base for easy raising and lowering. **Order No. 182**

## 18AVT/WB 10-80 meters.

The Hy-Gain 18AVT/WB gives you true wide-band performance in limited space. And now we've made it even better. The 18AVT/WB now has an improved 80 meter coil and an over-size corona ball on the whip to eliminate wasteful and noise corona discharge.

This antenna is rated in excess of maximum legal power 10-40 meters and up to 1 KW PEP on 80 meters. Entirely self-supporting, requires no guys. All tubing is slotted, taper swaged, aircraft quality aluminum with full circumference compression clamps.

The 18AVT/WB has automatic band switching and utilizes three air dielectric Hy-Q

traps for exceedingly stable performance and true 1/4 wave resonance on all bands. May be roof mounted with Hy-Gain 14RMQ kit. Recessed SO-239 connector prevents moisture deterioration. 12" heavy duty mast support bracket.

## Order No. 386

### 14AVQ/WB 10-40 meters.

The Hy-Gain 14AVQ/WB uses the same trap design as the famous Hy-Gain Thunderbird beams. 3 separate air dielectric Hy-Q traps with oversize coils for superb stability and 1/4 wave resonance on all bands. Automatic band switching.

An extremely low angle of radiation is utilized for superior DX performance. Taper swaged, slotted aircraft quality aluminum tubing. Entirely self-supporting, no guys required. Recessed SO-239 connector prevents moisture damage. 12" heavy duty mast support bracket. Roof mount with Hy-Gain 14RMQ kit.

## Order No. 385

### 12AVQ 10, 15 and 20 meters.

The 12AVQ also uses Thunderbird design air

dielectric traps for extremely Hy-Q performance. This is the way to go for inexpensive tri-band performance in limited space. Entirely self-supporting, requires no guys.

For superior DX transmission, the 12AVQ uses a very low radiation angle. Has automatic band switching. Aircraft quality, slotted taper swaged aluminum tubing. Recessed SO-239 connector prevents moisture damage. Heavy duty 12" mast bracket. Roof mount with Hy-Gain 12RMQ kit. **Order No. 384**

### 18V 10-80 meters.

High efficiency, low cost vertical with quality construction for long life. Easily tuned to any 10-80 meter band by adjusting feed point at base inductor. An exceptional value.

18' radiator of heavy gauge aluminum tubing. Mounts on any 1-5/8" mast. Self-supporting, requires no guys. Easily erected, portable. 12" heavy duty mast bracket. Roof mounts with 14RMQ kit.

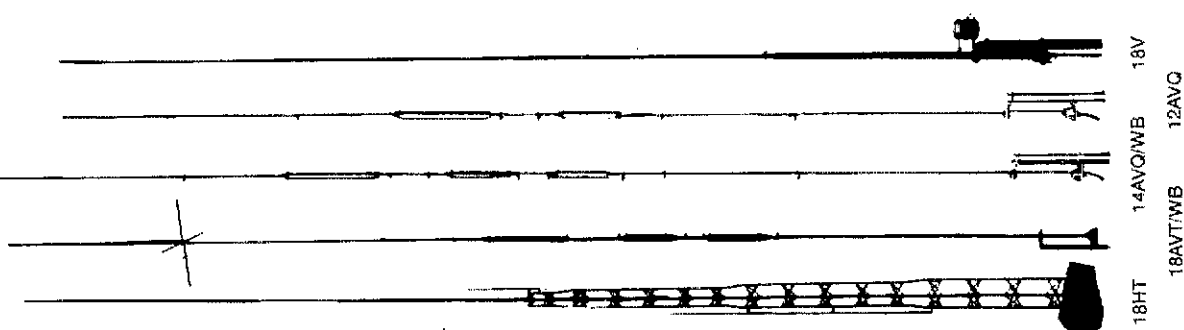
## Order No. 193

## HY-GAIN VERTICAL ANTENNA SPECIFICATION COMPARISON

	18HT	18AVT/WB	14AVQ/WB	12AVQ	18V
<b>Electrical</b>					
Max. power input	1 KW AM 2 KW PEP	1 KW AM 2 KW PEP (1 KW PEP on 80)	1 KW AM	1 KW AM	250 watts AM 500 watts PEP
<b>VSWR</b>	2:1 or less 50 ohms	2:1 or less 50 ohms	2:1 or less 50 ohms	2:1 or less 50 ohms	2:1 or less 50 ohms
<b>Mechanical</b>					
Height	50'	25'	18'	13'6"	18'
Shipping Weight	96.7 lbs.	10.7 lbs.	8.2 lbs.	7 lbs.	4.6 lbs.
Mast Diameter	None required	1 1/8"	1 1/8"	1 1/8"	1 1/8"



Hy-Gain Electronics Corporation 8601 Northeast Highway Six: Lincoln, NE 68505  
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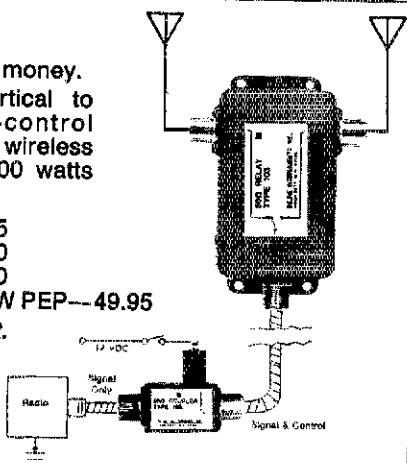
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Union County ARC, Erie ARS, Gould RC, are newh affiliated clubs. WB8PAV is in KL7-Land for the winter! Lake Erie ARA officers: WB8JYR, pres. WB8APD & WB8URX, vice-pres.; WB8CQA, secy. WB8GRG, treas. LEARA, Cuyahoga ARS, & Western Reserve Repeater Assn. provided communications for Cleveland's program. Cambridge ARC gave demonstrations to Boy Scouts Oct. 16 & 23. Central OH AREC had 29 members and 4 repeaters on the Sunrider 400 Road Rally. K8DIU/EL2EB is looking for a traffic sked from Liberia 14045 kHz 2215Z Tue. EAN(D) certificates issued to WB8DIL WB8PTT WB8HGH WB8CJU K8IKD WB8KWD WB8HWE WB8MZZ WB8QXN K8IDX certificates issued to WB8MRL WB8OMQ WB8DCX WB8QFR K8BYR WB8KWD K8IKD WB8CJU WB8DIL WB8PTT WB8MZZ WA8HGH WB8QXN K8LGA WBALS. K8BCF, Belmont County Fair, made SPL Traffic: WB8MJ 303, WB8DIL 237, WB8MRL 196, WB8LTA 169, WB8JGW 168, WB8MCR 154, WB8KKI 131, WA8JPK 125, WB8KQD 120, WB8BCF 111, WB8PTT 110, WB8OMQ 84, AA8TYF 79, WA8SSI 76, K8BYR 70, WA8RQQ 66, WB8CJU 61, WB8TRK 61, K8LGA 56, K8LXA 55, WA8VWH 54, WB8ZK 49, AD8MLO 48, WB8JD 42, WB8CKM 39, AC8CHT 36, WB8OE 34, WB8VR 32, WB8PTT 31, WB8LZE 30, WB8VYI 30, WB8VYK 29, WB8PTT 27, AB8KQJ 23, WB8FG 22, WB8GGR 15, WB8UIN 17, WB8TGL 16, WB8RW 15, WA8GPO 15, WA8MAZ 14, WB8UIM 14, WB8DQ 13, K8QYR 12, WB8HL 11, WB8COS 11, WA8BOV 10, K8CKY 9, WB8DCX 8, W8PNC 8, W8NUJL 8, AC8IBX 6, WB8QXQ 6, WA8TSX 4, WB8WEK 4, WB8IBZ 3, K8ONA 3, WBALS 1, WB8QXN 1.

### HUDSON DIVISION

EASTERN NEW YORK: SCM, Gary J. Ferdinand, AA2PJL — SEC: K2AVQ, Asst. SEC: WB2VUK, RMS: K2OYG WB2IXW. PAMS: WB2QEI WR2EMU. OBS reports received from WB2FRV, WA2PAU, WB2HZZ. EC report from WA2VLA. WB2STZ now using a new FT101B. A nice placard can be had from the League to advertise our existence in public service events—designed by W2GTI. Maple Hill High continues to get FB publicity, this time in CQ mag. AB2QOH reports his Bicentennial WAS. Congrats! WB2NKN did some operating from St. Andrews Church in a recent Poughkeepsie demo. Pearl River High ARC elected new officers: WA2YLN, WB2WBO, WA2EAF, WA2EUG, WN2EYS. AA2YIM now getting used to a new FYO key and an Accu-keyer. W2YJR reports operating now in cw traffic nets, particularly ESS (3590 at 6 PM), Asst. Mgr. WA2PAU says that the NY Public Operations Net is looking for NCS and alternate NCS. All are invited to join in the traffic fun and informats. Albany ARA Novice Class off to a great start. Initial enrollment is 70! AA2PJL now a Life Member of ARRL. WB2CUC sporting a quad up 40 feet. To those running Novice classes — form 610 is available from the League if FCC is slow. Traffic: AA2PJL 230, W2YJR 143, WB2TGL 16, WB2EMU 86, WB2RUZ 68, AA2YIM 53, AB2QOH 28, WB2EKM 18, WA2CJY 8, WA2PAU 8, WB2CUC 5.

NEW YORK CITY — LONG ISLAND: SCM, John H. Smale, WB2CHY — Asst. SCM: Art Malatzky, WB2WFJ. SEC: K2HTX. RM: WB2LZN. PAM: WA2ECO. The following are major AREC/RACES Nets, join one:

Bronx	28.64 MHz	50.35 MHz	146.88 fm
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Richmond			146.88 fm
New York	29.5 MHz		146.88 fm
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Nassau	28.72 MHz		145.68 am
W. Suffolk	28.73 MHz		145.59 am
(Hunt)	28.65 MHz		147.21 fm
(Smith)			147.21 fm
(Babylon)	28.61 MHz		146.94 fm
E. Suffolk			146.82 fm

Note: Net times between 2000 and 2100 local on Mon. Now is the time to start preparing for the SET coming up on Jan. 29 and 30. Check with your local EC to find out what's happening. If you don't know who your local EC is, contact K2HTX and he will be glad to steer you in the right direction. WA2THV now in L.A. He graduated from Syracuse in May and now makes his permanent home in CA. We all wish Eric good luck in his new career. W2AIR/WA2BT1 on Governor's Island lost all their ant. during Belle and hope to be back on the air soon. WA2PQX/6 was in the NLI area and visited WA2JZX and WB2CHY. Babylon AREC is looking for new members. W2HXT visited his son in England and also took a side visit to Belgium, France and Switzerland. WIN officers are: W2YD, pres.; WB2RKK, vice-pres.; W2WH, secy.; W25HM, treas.; W2FVS WA2UOO W2RHN W2Z2 W2AZO, dir. Members are wanted for WIN; for further info, contact any of the officers. WA2YEI has a homebrew "D" and is also using an MC80 broadcast mic on the air. WA2HSQ/WB2AMU spent two weeks in the Canadian Maritimes operating portable and mobile. The highlight of the trip was meeting VE1BFL. W3DBQ getting back into things. W2GP/W2NB1 helped put up his new ant. Officers for the Univ. of PA ARC are WB2BTA, pres.; WA2BFW, vice-pres.; WA8AZL, treas.; WA3GV5, secy. Both WB2BTA and WA2BFW are from NLI. WA2CJG was 4th Countrywide in the 1975 ARRL DX Test in low power cw. K2UYG has also been assigned the call K2TT. Congratulations to WB2NDI and K2PQY new OO V. Officers for 1977 for Great South Bay ARC are WA2VX, pres.; WB2DQH, vice-pres.; WA2PUG, secy.; WB2P, treas.; WA2KAW/WB2CHY, WA2SUG, board. Suffolk County ARC holding Novice classes. contact WA2AHB for further info. WA2JFA will be retiring to FL. K2MFY teaching an Adult Educ. Course at Bethpage H.S. for the Novice License, registration will be 1/17/77 with start date of 1/26/77 and last nine weeks: Traffic (Oct.) WA2WKH 264, W2EC 250, WA2ECO 208, WB2LZN 193, W2VYH 92, WA2BMI 61, W2MLC 58, K2GCS 5A, WA2JCS 50, W2DBQ 6, W2FVS 6, K2JFE 3, WA2CSR 5, WA2YEI 5, W2HXT 4, WA2HSQ 3, WA2PL1 1. (Sept.) AA2BRF 175, WA2BMI 62, AB25JG 48. (Aug.) WA2JZX 22.

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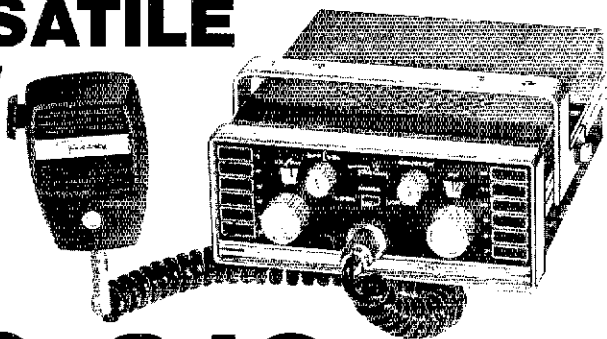
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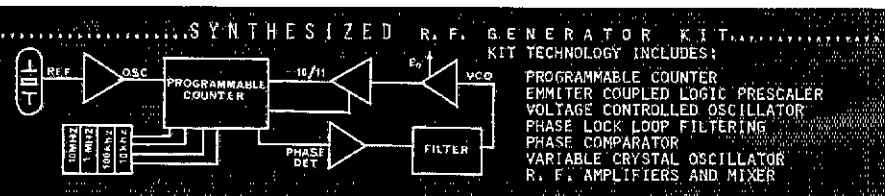
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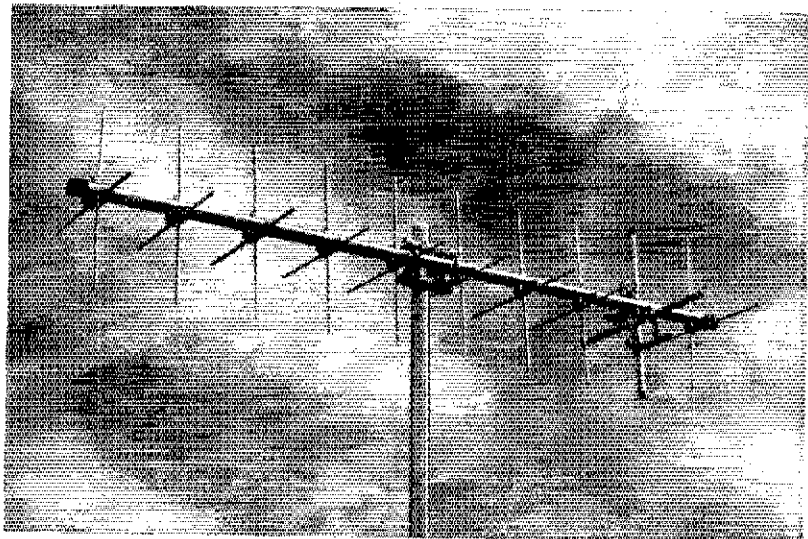
**NORTHERN NEW JERSEY: SCM, Louis J. Amoroso**  
**W2ZZ** —  
Net — Freq. Time(PM)/Days Sess. QNI QST  
Manager  
NJN — 3695 7:00 Dy 31 381 12  
WB2CS 10:00 Dy 31 176 5  
NJN — 3695  
WB2CST 8:15 Dy 27 120 1  
NJSN — 3730  
WA2WIW 6:00 Dy 31 646 28  
NJPN — 3950  
WA2SLF 9:00 AM Su 4 104 4  
NJPN — 3950  
WA2SLF  
PVTN — 145.7 8:00 Dy 31 170 20  
WA2OPY  
SEC: WB2PBO, PAMS: WA2OPY WA2SLF and WB2VTT. RMs: WA2WIW and WB2CST. OVS report from AA2GEZ and OQ reports from W2TPJ WB2CS and W2NR. This month's PSHR list includes WB2VTT, WB2CST, AB2ASD, WA2SLF, WB2RMK and WA2DIW. WA2YUR is a new EC and will take care of Paterson and vicinity. He is also a new member of NJPN and Advanced. WB2RMK got his Extra and is now using the TS-520. WN2EPR, WB2QXA and WA2NPN passed the General. WA2PCF passed the Advanced and WA2ZAZ went from Novice to Advanced in one day. Congratulations to all. WA2QNI moving back to NJN. WA2ERZ moving to Upper Saddle River. WA2KFE moved to Manasquan. We regret to report that WB2EPE is a Silent Key. He will be missed by his many friends. WA2RYD operating from W9VT. WA2LJK and K2BJG won the 53rd Club hidden transmitter hunt. DX totals now up to 182. WB2EIU made WAC. WB2YIQ rec'd his Bi-Centennial award. WA2ESN has made a number of TVI studies. He monitors 52.525 MHz and can give his interesting results to those who are interested. K2BHL enjoying his new SB-230. WB2IX is a new ham in Pompton Lakes. W2JDH building a homebrew beam. All nets will be active in this year. SET. Let's all support our SEC and his fine group of ECs in this year's operation. Traffic: (Oct.) AB2CS 422, AB2ASD 343, WB2VTT 115, WA2SLF 100, K2BHL 92, WA2NPP 76, W2CJU 69, WA2KFE 52, WA2RMZ 48, WB2HSR 44, WB2RMK 44, W2BLM 40, K2ZF 36, WA2FJ 33, AA2CC 29, WA2PCF 24, WA2DF 20, WA2FZ 19, W2ZL 19, WA2DIW 17, WA2OPY 17, W2Z 16, WA2CAK 14, WA2DLZ 13, W2ODV 10, WA2YWK 10, WA2SRQ 6, WA2GJU 5, AA2AYY 4, WA2FUI 4, WA2UOO 4. (Sept.) AB2ASD 252, WA2BAW 34, W2CVW 20, WB2HSR 17, WA2OPY 15, WA2FUI 7, W2JDH 2.

**MIDWEST DIVISION**

**IOWA:** SCM, Max R. Otto, W0LFF — SEC: W0IYW, PAM/VHF: W0QVW, PAM/VHF: K0LKH. The ARSARden Club at Omaha staged a very fine ARSAR Midwest Convention. Congrats to W0FZO and K0MGE on receiving the Midwest Amateur of the Year Award. W0EMA won a TS-520, and W0BLIA Dention tuner. WA4CDN now with Motorola and also VP of Mount Pleasant Club. W0AMG, Storm Lake may go up to 500-ft. W0AEH new location at Cedar Rapids. New Novice: W0GWS, W0GWS, W0GWS, W0GWS, W0GWS. The RWRA at Mt. Ayr had a CW contest for members. W0CQU has 25 in his Novice class. New EC: W0VVB, W0VUU, K0UJ, W0AMD. The American Diabetes Assn. got an assist from the Des Moines AR with their Bike-a-thon. The Central IA 2M Net now Central IA AREC Net with 50 check-ins. Eastern J. DX Assn. officers: W0FHE, pres.; W0VCR, vesp. W0VDX, secy-treas. W0PCO moved to Dallas and W0QUT to Minneapolis. K0GXR rounding up Novices in Clinton. Ft. Dodge Club meets 3rd Thur. at Community College. W0BX helping Red Cross with a band dipole. Congrats to W0JYK, W0FENL and W0LYI on Advanced tickets. New QCs: K0CIC, W0TGG and K0BGA. Evening session of IA 75M net at 2300Z until spring. W0IYW and W0YOG got Gov. Ray's msg to Mr. Carter on its way. IA 75M (noon) QNI 1578, QTC 98; (eve) QNI 1237, QTC 71. TLC (CW) QNI 339, QTC 94, Sess. 61. Traffic: W0AQU 244, K0EVH 123, W0YLS 104, W0SS 103, W0LY 39, W0BLM 17, W0LFF 9, W0WB 8, W0MOQ 4, K0DBW 2.

**KANSAS:** SCM, Robert M. Summers, K0BXF — SEC: W0K1, PAMS: W0VSW, W0BCL, RM: K0MRI, VHF PAM: W0EDA. The Hiawatha group participated in communications connected with the annual parade in the Hiawathes spirit. Plus spirit is alive in Hiawatha. GKS-SS is building slowly. If you are interested in improving your CW skills as well as pick up a few pointers on traffic handling — 3735 kHz daily at 8 PM. Mr. W0WXY reports a QNI for Oct. of 88 and 20 messages handled. They could use some of you more experienced stations as liaison though. For the more proficient: GKS 3010 kHz daily 7 and 10 PM. K0MRI reporting a QNI of 508 and QTC 209. The Kansas WX net under the watchful eye of W0LBE. QNI 708 and QTC 244. For the latest in weather or what — why not? QNI 6:00 PM daily 2930 kHz. Kansas Phone Net QNI 244, QTC 25 and K5BN QNI 1192, QTC 198. Mgr. WA055 kept busy compiling reports and editing our fine quarterly publication for the Kansas Amateur Radio Public Service Corps, with the capable assistance of K0MRI and probably others behind the scenes. Many thanks to Ken's XYL for many hours of waiting on Ken. The Central States TX net, W0JMB Mgr., QNI 784, QTC 60 and many thanks to that Nebr. Kansan Tex for his mentorship of the net and to all for a Good Night. Traffic: W0FIR 313, WA2VEN/9 155, W0LKA 10, W0OYH 89, W0H1 82, W0LBB 67, W0GHI 63, W0RFF 62, K0MRI 59, W0MLE 57, K0BXF 45, W0VSE 45, W0GSG 41, K0KDE 41, W0PB 37, W0BLUN 24, K0PCC 21, W0KVP 20, W0BLI 19, W0PCL 17, W0OCL 17, W0OCL 16, W0K1 15, W0VSRQ 8, W0GOX 7, W0NYG 3.

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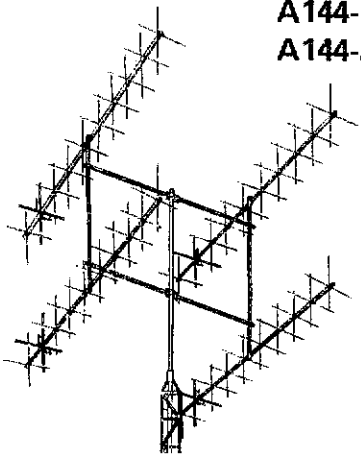
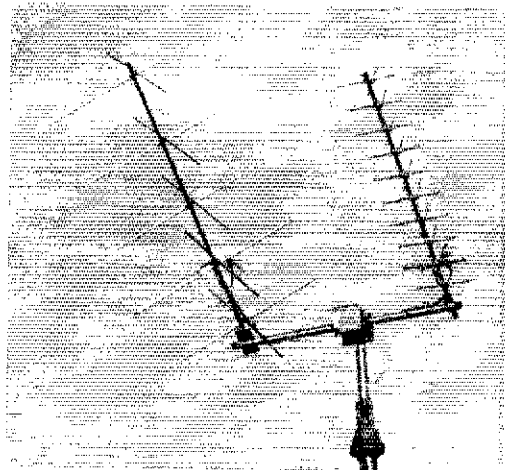
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*Here's some of the proof . . .*

**K4EME** — This is my second TRITON IV. They are excellent xceivers! **WABICK** — Luv it. Dynamite! **W9NXU** — I am very thrilled with this unit, it is great. I think you have scooped the field. **WAGAYA** — I like CW and full break-in. (Beautiful) **K3TFU** — I love the unit. **WA3VEZ** — Rig is just great. Combined with your service makes a super transceiver. **WNOSED** — Beautiful radio to use. Magnificent CW filter! Just a pure joy. **W8IIT** — I have had my TRITON IV for two months and am delighted with it. **YN1MBV** — It is a very nice rig. **W3GTX** — New features very welcome. **W0BYC** — Bought one of the first TRITON II, like it so well I updated it with a TRITON IV. **W2TBK** — It is absolutely fantastic. **W80P1** — I am pleased with the rig. **WA3CJA** — Very-very-very nice. Good audio quality. **W5ZBC** — The most outstanding rig I have ever used. **K8CJQ** — Excellent rig, Good filters. **W7BKK** — Very happy . . . getting excellent quality reports. **W2CET** — Power-signal reports good. **WB2UEH** — I like the compactness and appearance. **VE3IBK** — An excellent rig with superior receiving quality. **K4IVM** — I think it is tops. **WA4LOG** — I've become so used to dip, peak and adjust, this TRITON is a beautiful new experience. **KL7IHW** — Easy to set up—works great. **K4JXD** — Seems to be very FB rig. **WA7KHE** — Fantastic performance. Thanks for a fine rig. **WB4BPG** — No problems—fine rig. **VE1BZ** — Good work. **W9HQT** — Receiver better than expected, CW break-in is super. **W0AP** — Tremendous transceiver. I appreciate your engineering. **WA2ZRO** — Wonderful. **K0SFV** — Real nice rig. You thought of almost every feature and built it in. **KQ9DQ** — Beautiful. **W80JQ** — Beautiful radio; however, your ads do not do justice to the radio. **WN5SOH** — Very sophisticated—Easiest tuning rig ever. Very glad I bought it. **K30JV** — Very impressed. **W4LZP** — Very good results. Put out 100 watts as good as 300 watt rigs. **WA4DQY** — I think the TRITON IV is great. **W6QXN** — Appreciate full CW break-in. **W0INH** — Enjoy light weight. **VE3CYK** — I am extremely pleased with the clarity of receiver and after putting rig on the air, received unsolicited compliments on the audio quality of the transmitter. **K4PHY** — Was 3rd in USA, first in fourth district in WWCQ contest. **W8RYU** — Own Argonaut. Both fine rigs. **W4CDA** — Compact, light weight, good engineering. **WB2WZG** — TRITON IV is the most versatile CW/SSB radio I have ever used. **WB2FMV** — Outstanding. Highly pleased with performance. **W8ACZ** — A real nice rig. I have owned about every other make. **W5EGK** — Works nicely. **WB4ECO** — I tried this rig, a pleasure to operate. **WA4YRK** — Excellent reports on audio. **WB8NKB** — Wonderful. **W9QPQ** — An excellent rig. Love it. **W8SOP** — Makes running SSB nets a real breeze. Also good on CW nets. **WL7IRT** — Fantastic rig. **W4MDB** — Has rekindled my interest and enthusiasm in Amateur Radio to an extent I hadn't thought possible. It far out distances any competitive product at any price. **W6EYR** — Very nice. Been a ham for 45 years and now solid state perfection. **W2RPH** — Excellent rig. **WN0TDK** — TRITON IV is a fabulous piece of equipment. **W5V1W** — Very nice rig **WB2LQF** — Wow! **W9JCV** — Tnx for giving us a FB piece of equipment made in the USA. **W8GHO** — Very pleased. **K4KXB** — Seems to have everything desired. **W4SZ** — A pleasure to operate. **W2FKF** — Greatest rig I ever had. So far in a month 34 QSO's without one miss. Been a ham since 1922. **W4GVC** — Nothing but complements. **WB9EZE** — Well pleased with performance and simplicity of operation. **K4ETI** — Rig is great. **W8CWN** — Man! what a rig. I've had this call since 1929. Never saw anything like it and I've seen them all! **WB2MZU** — Seems like everything the S----- O--- was supposed to be at one third the price. **WNOVHE** — I think it is a very good rig. **WB9FTD** — Break-in CW is very impressive. **K0CBA** — I believe it is one of the finest HF transceivers on the market. I can't tell you how pleased I am with the noise blanker. I can get on the air from my home station again for the first time in a few years. Other rigs with noise blankers just didn't hack it. **WA7YHW** — I am very pleased with this equipment. It is certainly of high quality. **W71IA** — Excellent equipment. **WBORWA** — Couldn't be more pleased with it. It certainly has performed beautifully and is all I expected and more. **WB4QJT** — Like it very much — keep up the good work. **WN1VX** — Really impressed with looks and performance. **W0NC** — Very FB rig. Performs up to specifications, an excellent design. **K8PBZ** — Already have TRITON II and IV. **W7KD** — This little "T-4" is smooth as silk . . . I've received some very flattering reports about transmitter voice quality and the CW operation is the greatest. **WN8TTO** — I found that the TRITON IV was the best rig on the market for around \$800. I love it! **W2IBK** — It is absolutely fantastic. **W8FEI** — Am amazed at receiver performance. I thought I had a top notch receiver with the H-----! **W1FYM** — Your guarantee is refreshingly proper. **W8MOK** — Sure makes a guy look twice at his old tube type gear. **W1TFS** — Finest CW ever, CW selectivity very good. **WB61VR** — Very satisfied with TRITON IV. Just what I was looking for to use on my yacht. Thanks. **W8BONP** — Also have a TRITON II. I am pleased that Al Kahn and the good guys at TEN-TEC thought of the CW operator! **W2EMX** — Excellent Amateur gear meets and exceeds advertised claims. **W0AMI** — It looks like there is nothing left to be desired. It is beautiful. **W8SE** — The receive function is outstanding. It is superb in transmit. **W1BV** — In love with this fantastic gem. It's so easy and a pleasure to operate. **W6ASH** — Very happy with performance. Particularly impressed with full break-in and light weight. **WAOIMS** — By far the best rig I have ever operated. I am glad I decided on the TRITON IV and not one of the other transceivers on the market. **W8HQO** — Thank you gentlemen.

Add your name to the growing list. See your TEN-TEC dealer or write for full details.



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*Richard K. Dickey*

R. K. Dickey  
Professional Electrical Engineer  
(Designer of the world's first frequency counter at Berkeley Scientific, 1949)

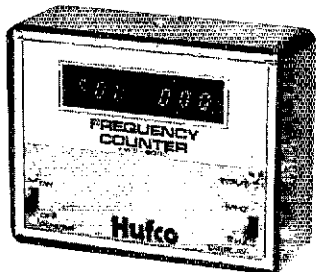
**Thank-you, Mr. Dickey.**

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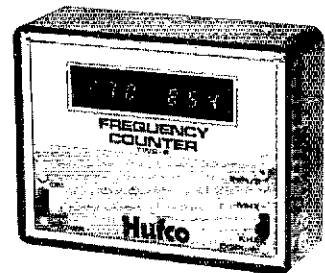
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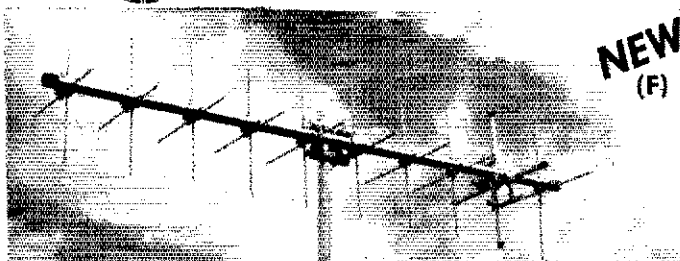
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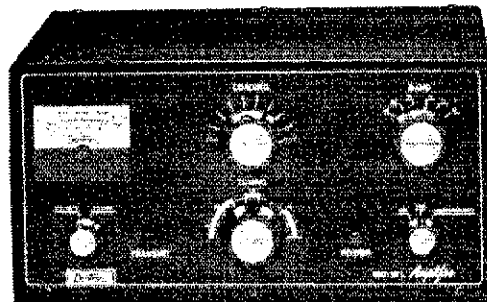


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ARX-2, 137-160 MHz, 4 lbs., 112"

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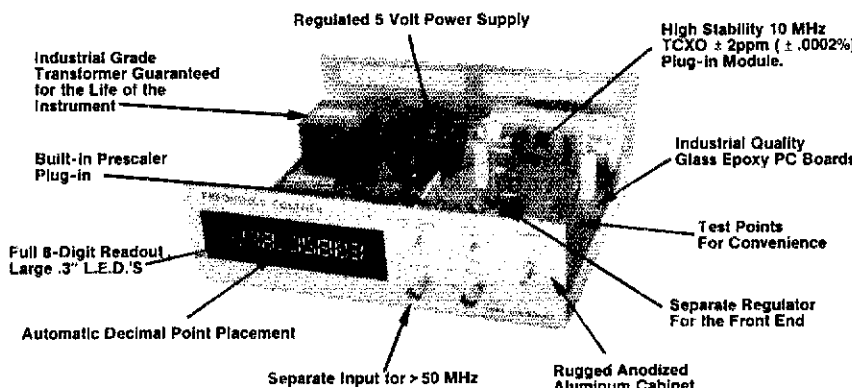
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received their ARKL Affiliation Charter. Idaho's SEC W7JMH made the Charter presentation to the club's pres. WA7VPW. W7IY has his WAC confirmed, congrats. Pocatello ARC reports 80 persons attended their Oct. meeting. Pocatello's Novice N meets on 21.15 MHz each Sun. at 7 PM. The club is also sponsoring a license class at their local school. WA6KKB/7 has a most unique license plate, a WA6 issued by ID. Traffic: W7GHY 229, W7GBO 97, W7IY 2.

**MONTANA:** SCM, Robert Iso, W7LR — The Clark's Forest Valley Amateur Wireless Society has been formed. New Novices in Bridger are: WN7NFJ WN7NFK WN7NFL. Butte Club active in many ways: new quarters; Novice classes; many new hams. W7BXL K7CHY W7LR and others helped on the Governor relay message. The Hudson Bay Repeater is W7AIL. Bozeman hams are testing the Eaglehead repeater. We need more Montana help on DRN7. New appointments: ECs WB7EBK W7ROE W7IYN. PAM: W7DEO. ORS: K7CTI. Asst. SCM: Ed Bodenberger. WA7PZO. Traffic: W7TGU 70, K6CHY 63, W7LR 12, WA7PZO 10.

**OREGON:** SCM, Dwight J. Albright, W7HLF — Asst. SCM: Leland McIntosh, WA7UJU. SEC: WA7UHC. Net — Freq. QNC QTC Sess. Mgr.

Net — Freq.	QNC	QTC	Sess.	Mgr.
BSN — 3908	589	62	31	WA7SSO
NSN — 3701	457	180	31	WA7UJO
OSN — 3585	164	87	31	K7IWD
AREC — 3993.5	480	14	31	WA7NEQ
JCAREC — 147.06	74	12	31	WA7TAE

Thanks to K7SCQ W7QMU K7TMS WA7WZM and others for helping WB7NPP get up antennas in time for SS. Charly did FB in SS. The GCWA W7DEG Salem picked up the msg from Governor Straub to Carter (W3FA for relay on). Band condx vy hd had to relay before getting it into PAN. W7GHT helped (ID) relay. WB7NJK received ticket. WB7DSK FB CBS station, also assist Hillsboro Police in communications in city for Halloween season. K7TJR looking at designs 220. fm rigs. W7DAN had fun in Oct. CD party. A call you won't forget WB7FFB heard in Jackson CO. WB6PTI rolls TT 18 Wheeler through OR late at night. WA7TAE W7TJJ buddies of his QSO. W7CHN surprised W7HLF with QSO. CHN old time Morse. op Postal Telegraph (both employees) and also. Two mags is proving to the AREC net to be a big help 3993.5 to 146.34/94 for liaison when conditions are tough. Stagger the traffic; don't try to send it all at one time some one else might need the repeater. Traffic: W7VSE 219, K7OUF 171, K7NTS 116, WA7UJO 98, W7DAN 84, WA7TXV 62, K7QGF 58, W7GUH 47, W7HLF 43, WB7CBA 25, W7LT 14, WB7DSK 6.

**WASHINGTON:** SCM, Mary E. Lewis, W7QGP —

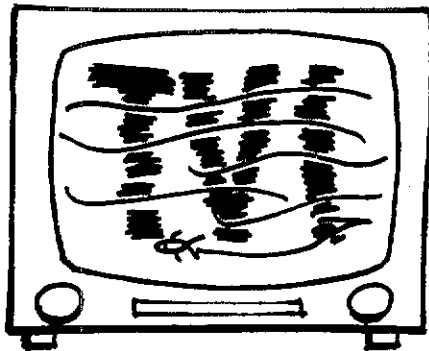
Net — Freq.	Time	QNC	QTC	Sess.
Manager				
NSN — 3590	0130	345	126	31
K7QZA				
NTN — 3970	11:30	1574	101	31
W7PWP				
NWSSB — 3945	18:30	834	73	31
WA7RCR				
WARTS — 3970	17:30	1462	142	31
W7QGP				
NSN — 3701	0200	457	180	31
WA7UJO				

RN7 on 3560 at 0145 and 0345Z. Daytime Region 7 Net needs check-ins per word from net mgr. NWSSB new officers are: WA7RCR, net mgr.; WA7LQV, secy-treas.; W7IEU, K7OLV, W7YYS, K7AJT and K7SUQ, dir. W7JIE very active on Intruder Watch. W7AXT is in the Forest Hill Rest Home with back problems. W7VRO had high score for WA State QSO Party '76 and WA7UQG a close second. New officers for Dial Twister ARC are: K7AOZ, pres.; W7EQJ, vice-pres.; WB7AVD, secy.; WA7QWR, treas.; W7BE, 3rd officer; K7VNT and W7CZA, dir. Note when in Spokane 76/76 is a calling freq. with 46, 52 and 24 used as simplex freq. and 3494 repeater. Bears Net Sun. 3935 kHz, 12:30 check-ins are welcome. Mt. Baker ARC WA7UGB, pres.; WA7ZWG, vice-pres.; WA7QGN, secy.; WA7QK, treas.; WB7TB K7INM, 3rd officer, board. Bellingham High School ARC new call is WB7NPS. W7BUN has a new 100-ft. tower and multi-band beam. W7PWP back hammering after a summer of burying power cables, building a Bar-B-Q and fishing. Traffic: W7DZX 494, K7OZA 99, WA7BBD 72, W7LG 57, W7APS 49, W7BUN 39, W7HAD 28, W7GB 27, W7AIB 15, WA7GV8 4.

**PACIFIC DIVISION**

**EAST BAY:** SCM, Charles R. Breeding, K6UWR — Asst. SCMs: W6ZF, VE2AQV, SEC: W6IHL, Asst. SEC: WB6DSI. New appointments: W6GJW and WA6CEH OOS; WB6JIX and WB6KQU OOPS. WB6UZX has taken over the duties of Asst. Mgr. of NCN, has been appointed RM. SEC W6IHL says a meeting of ECs was held in San Leandro. K6ITL, Regional EC was present. The following made NCN Honor Roll: WA6BFL, WA6BMV, WA6JIK, W6JPG, K6PBG, W6TYM, WB6UZX and WB6VEW. With a new four-element 20-meter beam and working over the other antennas WA6DIL all set for SS. At the Oct. meeting of the Northern Calif. Contest Club, 85 members present getting set for SS. WB6DXR building a new linear. WA6CSD and W6DMY running Novice classes at the Silverado AR Society. Sorry to learn WA6AMB is leaving Napa for Half Moon Bay. K6OKO working on 2-meter RTTY. CCRC lists the following new calls: WA6KWX, WA6KYN, WN6LAA, WB6KXD, WB6LBV, WN6LBX, WN6LDA, WN6LCF, WB6LNM, WB6LNL, WA6LNG, WN6LNO, WN6LMQ, WB6LMI, WN6QML, WN6QMZ, WB6QCC and WN6ONX. A new club forming in the Front on area called South Bay Amateur Radio Society. For info call WB6TBK at (415) 657-2923. Traffic: K6HW 290, WB6JIK 160, K6JZR 149, W6TYM 141, WB6JK 95, WB6UZX 62, WA6BMV 12, K6TPB 12, WB6VEF 9.

**NEVADA:** SCM, Leonard M. Norman, W7PBV — SEC: K7ZAU. Thanks to the many who have expressed their confidence in W6PWB and K7ZAU. Many things have happened in the NV Section this summer. W7ZT and KYL completed a world tour of many countries. A new Radio Amateur Club, known as Desert Riders Rescue Club was formed, complete with a four-wheel drive command post unit and several radio equipped two wheel units. Club Station call: W7JLN. W7JUO busy chasing DX with 240 countries confirmed. W7MWF and KYL WB7BDX have a radi

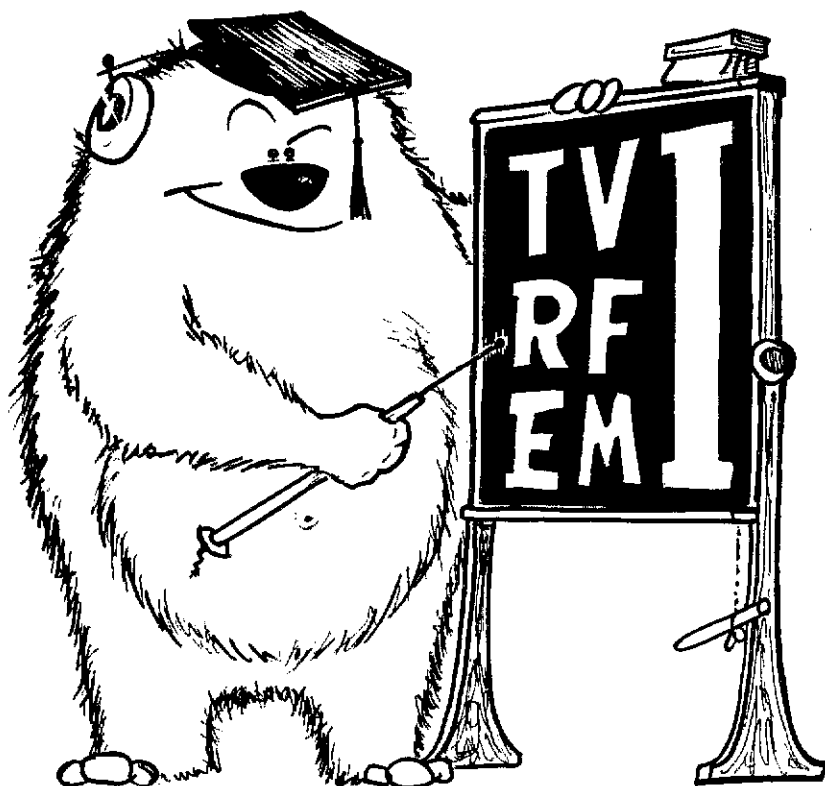


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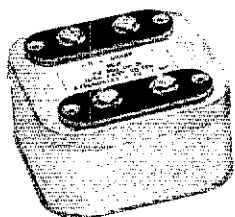
The study of interference to consumer products such as TV sets, hi-fis, and the like from radio transmitters is a complex subject. For a primer, see p. 11, "QST Magazine" for March, 1976. We do know that radiation interference can be greatly reduced and perhaps eliminated by the use of a well-engineered, quality-built TVI filter. The low-pass type for the transmitter is at times not enough...a high-pass type for the TV set may also be required. But, here's the rub! If a filter is not properly designed and engineered, it may not work like a filter at all. At the R. L. Drake Company, we've been designing and building filters for over 30 years...since before the days of "Uncle Miltie." And, these are real filters...not toys.

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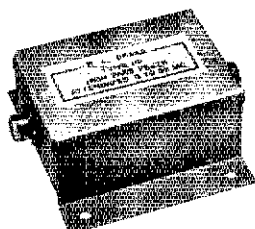


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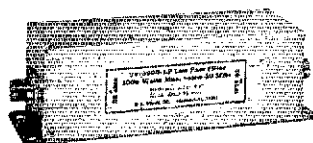


**TV-75-HP**  
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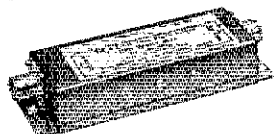
**TV-3300-LP**

1000 watts max. below 30 MHz. Attenuation better than 80 dB above 41 MHz. Helps TV i-f interference, as well as TV front-end problems.



**TV-5200-LP**

200 watts to 52 MHz. Ideal for six meters. For operation below six meters, use TV-3300-LP or TV-42-LP.



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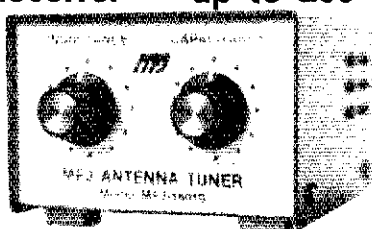
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equipped trailer and have been touring the many scenic NV sites. W7BDX W7EJF W7FDZ W7WVF W7PSV WA7TWL/7 and WA7UGI enjoyed the hospitality of many KH6 radio amateurs and a tour of a COMSAT site on the north shore, Island of Oahu, Hawaii. K7ZOK and YL7GND attended the World Convention in Hawaii and toured many of the Islands. W7RBV is a Silent Key, our condolences to WA7IGU and family. All NV Radio Amateurs are urged to submit station activity, on or before the first of each month. League appointments are available to those who are qualified and interested.

**PACIFIC:** SCM, Pat Corrigan, KH6GGW — RM: KH6JAC. EC Hawaii Isle: KH6HOU. Now that our Bicentennial year is gone, we hope for more great adventures in Am. Radio '77. Hawaii Matchiki Trout KH6JAC (RM) reminds that WPTN now meeting 7/Th/Sat. 14110 at 0700 UTC and Sun. at 0001. We still need added stns for QNI, then we go back to 7 days. Maui ARC did superb job of PR at County Fair in Oct. KH6s ILA BYG and IJS set up plans for an expedition to Kailua City in Nov. Lots of KH6s active in sweepstakes this past fall. ARRL has a new sign available for PR and exhibits if you just write HQ. K5AG and W6KTE visited on returning from Asia. There will be many new classes for prospective hams this year. Find out in your local area so you can answer inquiries. KH6ILT up on RTTY on 2m. KH6AN sounds good on 19/79 rpt now, with relocation of rpt. Emerg. ARC will have annual gen. membership meeting this month.

**SACRAMENTO VALLEY:** SCM, Norman Wilson, AA6JVD — SEC: W6SMU. New officers for the Radio Amateur Mobile Society are: W6ESZ, pres.; WA6JNL, vice-pres.; Carol Fellers, secy.; W6RTK, treas.; W6QHP, WA6TE and WA6RWR, dir. The El Dorado ARC provided communications for the Heart Fund Cyclopedia while the Greater Empire ARC (Chico) worked with the Diabetes Bike-tour. The Tahoe AK Assn. had a class with 32 enrolled with W7GO as instructor. The Northern Amateur Relay Council now an ARRL affiliated radio club. W6JRT W6MRQ and W6MMR recently upgraded from the Novice ranks. AA6JVD is completing the memory for the Accu-Keeper. K6BLI teamed with K6SG to multi-op during the S5 contest. W6NLU manages a little 2-meter work from his store and dreams of big beams and more time. Traffic: W6RSP 184, W6DEF 43.

**SAN FRANCISCO:** SCM, Rusty Epps, W6OAT — W6KHI and W6FLV, whose first son was born during the '75 ARRL DX Test, evened the score with second son born during the '76 CQ WW DX Test. W6NBI and W6NBJ are raising eyebrows using those call signs on 20M phone ops. The good news is they're both generalists. The Petaluma DX & ES has its new HW101 on at club stn. W6EGE. Congrats to W6RNL who qualified for ARRL's 40 wpm code proficiency award. W6GGR busy with Red Cross work and speeches about his work following the Guatemala earthquake. W6GEE is a new ham in Fortuna; W6RWE (ex-W6ZGM) is new in Santa Rosa. W6VYI (K6UC W6SNN) PZI JCS TMS SVU & UPV supplied extra communications for Petaluma police dept. on Halloween night. Traffic: W6RNL 198, W6PL 189, K6TP 147, W6NL 80, W6LUPV 54, W6GGR 20.

**SAN JOAQUIN VALLEY:** SCM, Charles McConnell, W6DPD — SEC: WA6HNO. WA6YAB OPS. Tulare Co. ARC meets 4th Fri. at Redwood HS, Visalia. W6LBR, pres.; W6MGG, vice-pres.; W6MUV, secy. treas. Madera ARC meets 2nd Tue. at the Courthouse. K6KLV, pres. Central Valley RC meets 2nd Thur. at VFW Hall in Delano. W6VVGZ, pres.; W6UZ, vice-pres.; K6JCV, secy.; W6UBA, pr. W6BGT teaches license class. Congrats to AA6BXI W6RQF W6BLS on new Tech licenses. W6QKP has Atlas 210X & teaches FARC license class with 104 students. W6JPL has new Collins Lite and W6GHC a Cynare 300R. W6GZT teaches license class in Hanford with 53 students. W6GRV now W6GR. K6MGX not breaking radio silence. WA6RXI has an IC 225. Hope everyone found new gear they wanted under the Christmas tree. W6MHD waiting for his 20m beam to arrive. AC6YKS K6OZI W6BITM are getting on 160 m. W6GPF in the Navy. Have a Happy New Year. Traffic: (Oct.) WA6R 132, AA6R 6, W6BAM 7, K6PSJ 5. (Sept.) WA6RXI 24, K6PSJ 9, W6MGG 4.

**SANTA CLARA VALLEY:** SCM, Jim Maxwell, W6CF — SEC: WA6RXB. WA6UC W6RFF made 25HR. Welcome new ORS W6HBT, now tapping regularly on NCN. Thanks to W6VZT for taking on this column last month during my vacation! WA6TUF, who recently completed his WAS the hard way through Oscar, now has 5 continents confirmed via the orbiter. Thanks for the structure for the next year is hearing completion under the watchful eye of K6GSJ. OD K6CGF shortened his call to K6PU (gasp!), a sweet sounding call on cw. K6GZK stands willing to send info re membership in the SCV VHF Repeater Society, W6ADE, to interested users. Membership not only supports operation of ADE but also brings an excellent benefit to the club. Next year is W6ASH says SPECS net did bangup job of supporting another March of Dimes Walkathon in Oct. Others helping out were K6YT WA6ROM W6OCP W6LSN WA6LJ W6AIN W6GGW W6GGSZ W6BJX K6SEM WA6AAJ W6GJPH and Father Walter Harper. W6BIZ reports working into Fresno via 2M during Oct. from his King City location. Another new repeater gearing up for 220 says W6SP (ex-W6ASA). The new rig WR6AWC will use the 74/34 pair. W6GZR new editor of the Palo Alto ARA PARAGraphs, interested in whipping up activity in the 160 to 190 kHz band. Any takers? Meanwhile, PARAGraphs ex-editor W6GCS/3 still promoting, with the establishment of a 2M simplex channel for his fellow colleagues in latest project. NCDXC pres. W6GX reports the 1977 Fresno International DX Convention will be held Apr 1 thru 3. This again sponsored by the Northern CA gang, with K6SSJ at the helm as convention chairman. Interested in hearing details of SCV emergency preparedness activities? Your SCM (W6CF), SEC (WA6RXB) and Regional EC (K6ILT) have txs, will travel. Traffic: (Oct.) W6YBV 219, W6NW 66, W6RFF 65, WA6UC 63, W6VZT 62, W6HBT 22, W6GNB 6, WA6HAD 3, W6ZRI 5, W6CF 4. (Sept.) W6OII 39, W6HBT 34, W6RMI 18, WA6HAD 3.

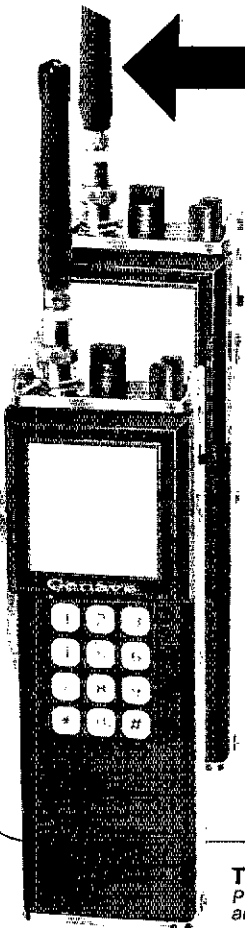
## ROANOKE DIVISION

**NORTH CAROLINA:** SCM, Chuck Brydges, W4WXZ — SEC: W4CHF. PAM: W4OFO. VHF PAM: K4GHR.

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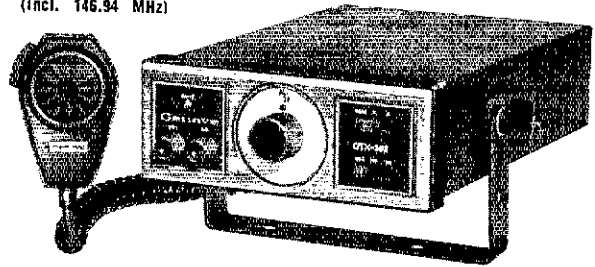
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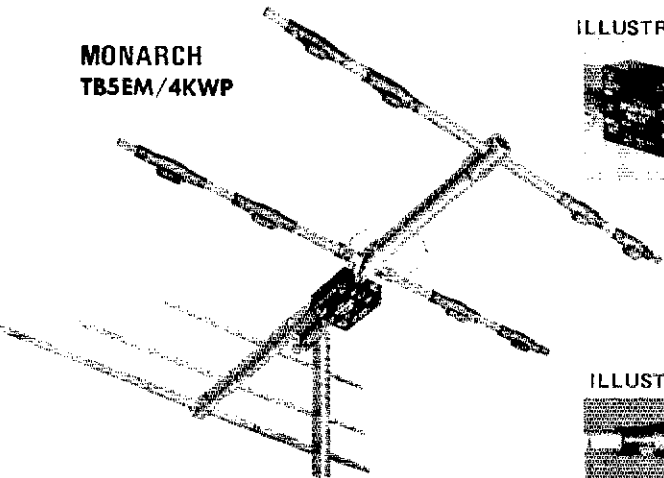
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### ROCKY MOUNTAIN DIVISION

**COLORADO:** SCM, Clyde G. Penney, WA0HLQ - 50FLQ. RM: W89HCK. PAMS: K9CNY. WA0YGC reports no new equipment being heard on the air are W8LQ with his Triton IV, K8PV with a Kenwood TS-520, W89TAQ with new Heath Phone patch, W8RE with new HT-106, K8HPF with IC-225, W8QN with forty-four element, 2-meter array and W8ERR with new Atlas 210X. W8HXB has joined good many other NTS operators on 2 meters! Newly elected officers for the Denver Radio Club are: W89HWG, pres.; K8LMD, vice-pres.; W89HDM, secy; W89HWP, treas. Congratulations to W89CXW who recently received a plaque from ARRL in recognition of 50 years of continuous membership in the League Net Tfc. for Oct.: Hi Noon QNI 833, QTC 31, informals 103, QNF 967, 30 sessions; Columbine QNI 1246, QTI 144, informals 344, QNF 1708, mir Traffic: (Oct.) W8WVX 2005, K8YFK 898, AB9GQ 305, W89BS 220, W89JD 215, W89TAQ 195, W89L 92, W8RE 81, K8PVI 70, W89DJY 62, W89GOT 62, W89XB 61, K8LME 56, K8WZN 56, W89RE 55, K8TIV 55, W89CNA 51, W89UMZ 48, K8MDT 44, W89FW 40, W89MCL 37, W89LZO 28, W89BAL 27, W89L 27, W89YCD 27, W89ETT 25, W89FP 20, W89DN 12, W89LFQ 10, W89WP 9, W89DFM 7, W89ED 5, K8CNY 4, K8SPR 4, W89GW 2, K8PHE 2, W89OII 2, W89HLQ 1. (Sept.) K8YFK 740, W89OE 125, W89KLE 100, W89LQ 53, W89MCL 19, W89MY 11.

**NEW MEXICO:** SCM, Edward Hart, Jr., W5RE - Asst. SCM: Joe T. Knight, W5PDY. SEC: W5ALR. RMs: K8KPS W5VDH. PAMS: W5PNY W5DMG, NMRRR meets at 6:00 PM local daily on 3940 kHz reporter 952 QNI with t.c. 72. SSVN meets at 7:15 PM local on 3585 kHz, QNI 273, t.c. 208. W5K55 rpt. good backpacking DX with Wilson HT from Lake Peak a 12,402 feet. W5JNC reports 580 check-ins and msgs. on NM Breakfast Club, 07:30 local, 3940 kHz. W8RE transplant in CO sez high socked in for winter. Cabrio Pk. Rpt. 16/74 going strong. Umcarran, M 28/88 getting good rpts on 1440. M-t. rpt. 07/8 testing in Socorro. Congrats to new YL FeAnA W5XFO. QCWA Net, 40 QNI, 1 QSL. Traffic: W5DAD 306, W5JOV 301, W5UJH 295, K5MAT 209, K8KPS 150, W5ENI 136, W5KSS 115, W5PDY 38, W5QNR 26, W5DMG 14, W5SOH 6, W5SMY 2.

**UTAH:** SCM, Ervin Greene, W7EU - Welcome to WA7BEG as UT EC. We regret the passing of W7BRV one of our most entertaining and loyal hams. WA7TI has a new 85-ft tower and on RTTY handling MAR traffic. WA7SYV added another 20-ft. to his tower and a new 20-meter beam. K7DEQ opened a new amateur radio and computer component store. A new 2-meter SSB net is being established at 2000 local time on 145.1 MHz. All on ssp are invited to check in. Fr P.M. mobile hunts start at 1930 local time at Liberty park. Tune on 147.05. New repeater up on the north end of UT and So. ID WR7AIC on .04-.64. WB7DM qualified for a ICN net certificate. The gang going on 10-70 RTTY. Austerlitz. The repeater working well, most of the stations are on 24 hour monitor. Plans are being made to tie into all of the EOCs for emergency traffic handling. Best wishes for the New Year and the Holiday Season. Traffic: WA7JRC 77, WA7MEL 67, WA7TEH 55, W7OCX 29, K7CVB 17, W7EU 8, W7KHY 6, W7BE 5.

**WYOMING:** SCM, Joe Ernst, W7VB -- Congratulations and a hearty welcome to new WY SCM, W7SDA "Chet" Starwalt, of Powell, WY. Longtime Net Mgr for the WY QCI and very active WY amateur radio. Chet took over as SCM Nov. 19th. K7SLM of Casper is new Net Mgr. for the WY Cowboy Net meeting M-F at 6:45 PM MDT, on a new frequency 3923 having moved from 3950 Nov. 1st. K7TAL left Laramie for Grand Coulee, WA. K7ITH left for Yuma, AZ. Will be back with the birds in spring. K7AHC vacations in CANON. WA7N leaves for CA for two months. W7CSK returned from hunting in time to help W7SQT with the Governors message on the Bicentennial and 60-year Anniversary of the first Presidential relay via amateur radio. Thank you all to your help in the past two years. Traffic: W7TZK 372, K7VWA 201.

### SOUTHEASTERN DIVISION

**ALABAMA:** SCM, Jim Brashear, WB4EKJ - W4ZE "saved the day" for AL by arranging for Gov. Wallace to originate a message to Pres-elect Carter in connection with the QCWA 1976 Bicentennial Relay. WA4MGL for new NM of ARRL. K4HJM invites those in the Anniston area to join them Sat. mornings at local restaurant for breakfast. He also reports the Cheaha repeater receiving high praise from a wide area in the southeast and is really missed the few times has failed. Contrats to K4HYI on receiving his Exh ticket. The Twin Base ARC set a goal of 76 club members and a new ham. WA4JLJ on 09/76 and he met the member goal and possibly the new hams goal congratulations to them. The Muscle Shoals AR recently overhauled their repeater. The Mobile AR received their supply of QSL cards for the Sister Cities International Convention 1976, station N45CI. The UAB club station held its dedication program recently. WB4DWB is pres. The club call is WB4TJX. The Birmingham ARC will have about 3 times as much space for their radio room after moving to their new facility. The Tuscaloosa ARC had about 50 prospective hams show up for their new Novice class. Appointed WA4EDW and WA4HGD as OBS. Endorse K4AOZ, OBS. Reports WA4JLJ on 09/76. Traffic: (Oct.) WA4JDH 505, WB4EKJ 448, W4RGS 194, WA4RND 110, WA4EUD 92, WA4TMG 60, WA4JJ 52, K4AOZ 49, K4LYY 37, W4RCF 24, K4UMD 11, WA4RMP 6, K4CUU 4, W4TIV 4, WA4RAJ 1 (Sept.) K4AOZ 63, W4MHO 6, WB4AYO 2. (Aug. WB4AYO 10.

**CANAL ZONE:** SCM, Roderick J. Ister, K2SPI - A Election Committee has been formed to elect new



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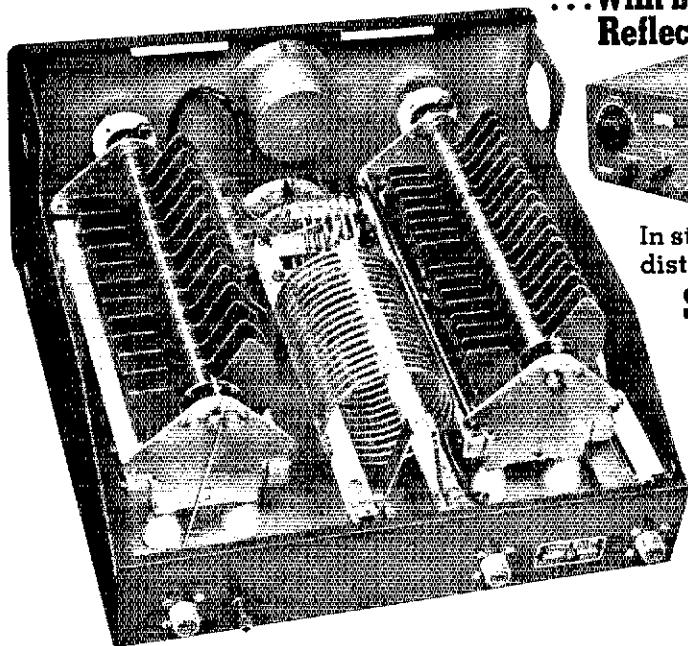
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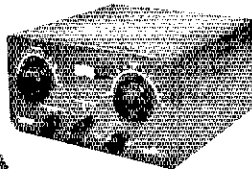
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officers for the new year 1977. Final voting will take place at the Dec. meeting, and all indications look toward K2Z5F as prime candidate for Pres. Plans are underway for this year's hamfest, which will take place at the Curundu Junior HS in mid-Feb. Funds have been allocated by the CZARA for door prizes, and all indications point toward an even better hamfest than last year. I must resign my office as SCM, effective immediately, as a result of new assignment instructions from the States. K2Z5V has been requested to assume my duties as SCM, and I wish him much success with his new assignment. Thanks to all for the cooperation received during my reign as SCM.

**GEORGIA:** SCM, A. H. Stakely, K4WC - SEC: K4YRL, PAM: K4JNL, RM: K4FLR. Congrats to WA4BZY selected G5BN Amateur of the Year. K4FLR WB4HHX make P5HR. Macon meeting of G5BN elects WA4AKU, pres. WA4BZY, veep; AC4HON K4JNL, K4ZYK, dir. G7N 30 sess. in Oct. QNI 165, QTC 23, great job by WB4HHX. GSN, QNI 436, QTC 240, good job by K4FLR who put out a fine net bulletin. G5BN QNI 2108, QTC 218 for a record breaking month. WA4AKU continues to manage a superb operation. GAREC QNI 96, QTC 12, good job by K4YRL. CEN No. 1 QNI 11, QTC 11 with 2 GEN No. 981. Two fine nets thanks to WA4IMQ. AREC report shows 526 AREC members, 9 ECs reporting and 7 nets going, thanks to SEC. WB4HHX wants old G7N records to compare with present reports. 40-mtr quad works FB for WA4JM. WA4LGM settling in new house in Macon. WA4ACV new Advanced. WA4JIB new General. 44 Macon area folks. WA4BZY has been club with WA4BZY, adm. WA4GH, training mgr. CSC net on Wed. 2300Z 146.52 simplex. Scientific-Atlanta ARC now ARRL affiliated with CE2RO/W4 pres. WA4PK new in Cedartown. K4WJB now on 2. WA4MFL new ham in Rockmart. SE DX Club officers, K4K2P, pres.: K4SMX, veep: WA8TZ, secy.: WA4VP, treas.: WA4MWT, act. mgr. WA4SS has impressive 432 ardy. WA4RR graduated from computer school and working on 432 gear. Also says 145,020 good ssb activity. WA4O74 won all three VHF QSO parties this year and set n w SE Div. records. Rome hamfest great success. Traffic: K4WC 287, WB4WQL 113, K4FLR 89, K4NM 7, WB4HHX 68, WA4JU 27, AC4HON 18, WA4ALI 16, WA4GND 14, WB4SP 12, WB4TEK 13, WA4DC 9, WB4ACV 8, WA4JM 6, WA4LH 5, K4PIK 5, WA4SHL 4, WB6VTK/4, W4LGM 3.

**NORTHERN FLORIDA:** SCM, Frank M. Butler, Jr.,

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QFN - 3651 0000/0300 Dy W4MEE  
QFNS - 3715 0100 Dy WB4GHU  
Gov. Askew originated one of first Governor-to-traffic nets. WB4JIM made arrangements. WA4SZ was QCWA chmn. for this joint ARRL/QCWA project to get messages from all 50 governors. WA4EYW and WB4FHT earned Gator Net certificates. WA4DXW new EC of Alachua Co., WA4JU apptd. DBS. K4GJ named Gator-of-the-Month on GN. Upgrading this month. WA4SE extra. WA4BSI WB4GHU WB4GND WB4RBR and WA4WCG Advanced: WA4HJW WA4PMU and WA4UFP General. WB4QBB/N earned ARRL CP15. WB4SKI WA4WKL set up VHF RTTY link to handle Fair traffic. WB4CFQ designing new repeater for PARC, using microprocessor control. PARC establishing scholarship fund. WA4UFP coordinator. WB4STD active on 2415. K4RJM WA44NR operate 2m FM from rare Holmes & Liberty counties. Marianna rpt. 07/67, new call is WR4AWY. WA4WCG's XYL now WA4WJA. WCG K4KPA earned DXCC. K4BZS WA4WOU new in Live Oak. WB4PHT handled traffic during Boys' Ranch Open House. WA4HLP first to make WA5/RTTY single band, under 100 watts. New JA WA4GE officers: W4ME pres. K4OAC WA4IWO & K4BED. RANGE provided comm. for Cancer Bike-a-thon; Pasco Co. AREC likewise for a Walk-a-Thon. WA4LE now living in Brooksville. Traffic: (Oct.) WB4SKI 592, WA4JL 244, WB4GHU 228, WA4FB 218, WA4EYW 205, WA4EYU 184, WA4LDM 173, K4KUJ 135, WB4FHT 121, WB4NM 112, WB4FJ 95, K4BRS 88, WA4KIX 72, WB4NJI 54, WA4RH 43, WB4DTS 41, K4OER 36, K4DDY 33, WB4QBB 32, WA4GR 28, WA4JU 23, AB4DXN 18, WA4I 17, WA4TNC 15, WA4MGO 13, WB4ADL 10, WA4HHC 10, WA4DFP 7, WA4HOL 7, K4IEX 7, WB4VAP 7, K4RNS 6. (Sept.) WN4JMM 22.

**SOUTHERN FLORIDA:** SCM, Woodrow Huddleston  
K4SCL - SEC: WB4ALH, Asst. SEC: W4WYR. RMs  
K4EBE W4MEE. PAMs: WA4NE W4QGX. New  
appointment this month: WA4LGM. News ap-  
pointments: WA4HJW OPS OPS. W4DVO QRS. Congrat  
all. W4MIM is new manager of Pinellas Emergency Net  
10-meter branch, meeting 9 PM Thur. Pinellas ARES  
held a drill Oct. 24 in cooperation with Pinellas  
County Civil Defense, with 39 radio amateurs handling  
209 messages in 2 hours in addition to finding  
hidden transmitter. A picnic after the drill topped off  
the day's activity. Welcome to our newest team of  
father-and-son Novices WA4QGS and WB4WUM. Bot  
are active on QFNS and hope to have a second  
son/brother qualified as Novice by Christmas. K4WP  
new head of Suncoast Chapter of 10-10 International  
Club. WB4ZP is head of new State Mgr. News ap-  
pointments on 2375 at 8 PM Tu. WA4BMC advises the  
Information Center for Mobile Amateur Radio Award  
Club. Ask her for info on County Hunting. K4TH has  
added a new T520 to his station. K4DRN and  
WB4YDA are both breaking into 2 meters with  
GT-X-2005. WB4ALH is sporting a new T5700A  
WA4GAC. 3.6E club station has added  
T520 and kw amplifier. Traffic: (Oct.) W4MEE 691  
T520 421, K4TH 325, WA4NE 219, W4EH 211,  
K4SJK 202, W4WYR 201, WA4SCK 173, WA4WDI  
144, WB4WYG 131, WB4AID 114, W4NFK 91,  
W4JHF 96, K4CFV 75, WB4HJW 70, K4SJA 61,  
WB5GDW/4 51, W4IR 47, K4LDM 42, WB4CDQ 31,  
WA4QM 28, WA4QGS 26, K4ELK 22, WB4FVN 11,  
WA4GNI 17, K4DRH 14, W4NTE 13, W4SMK 11,  
K4ITR 5. (Sept.) WA4UQG 17, W4MML 4.

**WEST INDIES:** SCM David Novoa, KP4BDL & SEC  
KP4CV. New appointments: OOs: KP4s RK CO G  
DHW. DBS: KP4RK and KV4FZ. Still need OOs to  
implement strong self-discipline program. Also looking  
for ECs in several areas. Station appointments  
course available. We are working for this year's Section  
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house and its pres. KP4HG is giving a Novice course

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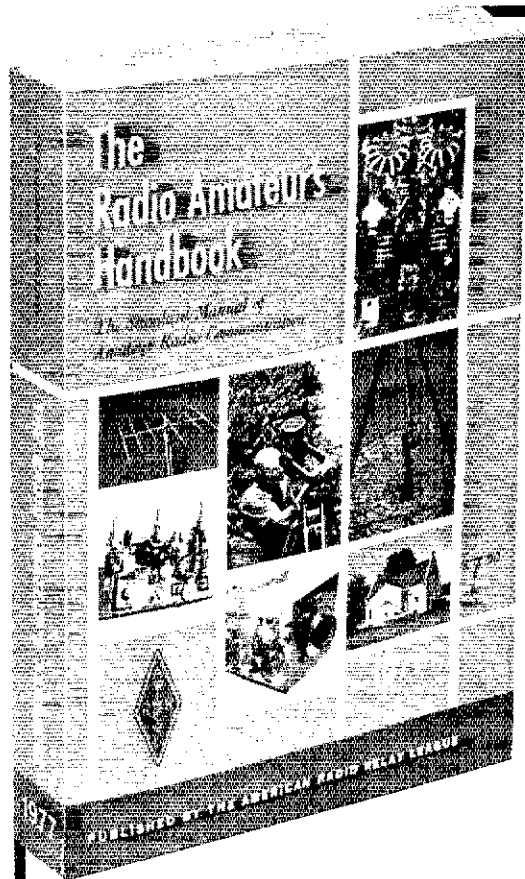
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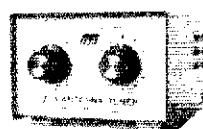


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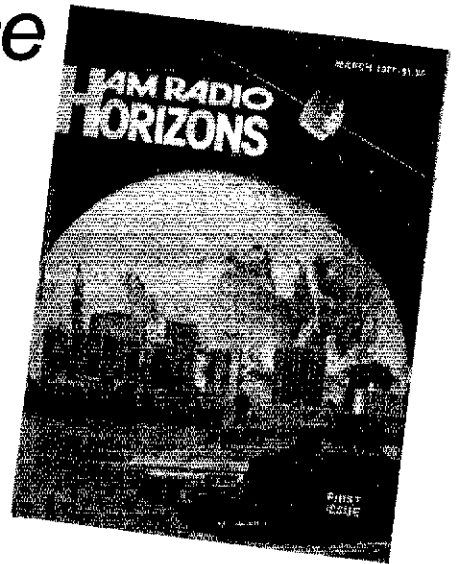
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MT-1 Matching xlmr	DC-4 DC supply	95	DX-20 Transmitter	34
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<b>BRIMSTONE</b>	TR-22 2m FM Xcvr	149	SB-10 SSB adaptor	75
144 2m FM Xcvr	TR-22C 2m FM Xcvr	169	HX-10 Transmitter	179
<b>CENTRAL ELECTRONICS</b>	AC-10 AC supply	34	HX-30 6m Xmtr	149
10A Exciter	AA-10 10w amp	34	SB-400 Transmitter	225
20A Exciter	<b>DYCOMM</b>		SB-401 Transmitter	249
<b>CLEGG/SQUIRES-SANDERS</b>	500D 2m FM amp	\$ 49	HA-10 Linear	175
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Thor 6 6m linear (RF)	30 Modulator	39	HW-32A 20m Xcvr	85
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418 DC supply/mod	<b>GALAXY/GLOBE/WRL</b>		SB-101 Xcvr	329
Zeus VHF Xmtr	Galaxy 300 Xcvr	\$129	SB-650 Freq display	149
Interceptor VHF Rcvr	PSA-300C AC supply	39	HW-17 2m AM Xcvr	89
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Allbander HF tuner	Galaxy V Xcvr	189	HP-10 DC supply	24
Venus 6m transmitter	Galaxy V Mk II Xcvr	229	HP-13 DC supply	45
416 AC supply	Galaxy V Mk III Xcvr	259	HP-13A DC supply	49
SS Booster	GT-550 Xcvr	279	HP-13B DC supply	54
Apollo Linear	GT-550A Xcvr	299	HP-23 AC supply	45
22'er FM (ser 25)	AC-35 AC supply	69	HO-13 Hamscan	69
<b>COLLINS</b>	AC-400 AC supply	75	HW-2021 2m FM HT	149
75A-3 Ham Rcvr	DC-35 DC supply	65	HA-201 2m FM amp	24
75S-1 Ham Rcvr	RV-1 Remote VFO	59	<b>ICOM</b>	
75S-3 Ham Rcvr	RV-550 Remote VFO	69	IC-230 2m synth Xcvr	\$339
75S-3B Rcvr (round)	VR-35 VOX	12	IC-21 2m FM Xcvr	249
32S-3 Transmitter	SC-550 Speaker	12	IC-21A 2m FM Xcvr	289
30L-1 Linear	DAC-35 Deluxe console	75	IC-22A 2m FM Xcvr	189
312B-3 Speaker	F-3 CW filter	24	IC-502 6m SSB Xcvr	199
KWM-1 20-10m Xcvr	Economy AC supply	39	IC-3PS AC supply	79
516F-1 AC supply	R-1530 SW Rcvr	1195	<b>JOHNSON</b>	
516E-1 DC supply	<b>GONSET</b>		Valiant II Transmitter	\$189
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KWM-2/blnker	Comm III 2m Xcvr	89	6N2 VHF transmitter	89
KWM-2/blnker/rej tng	Comm III 6m Xcvr	89	6N2 Conv (250-43)	29
KWM-2A Xcvr (round)	Comm IV 6m Xcvr	109	<b>KLM</b>	
516F-2 AC supply	Comm IV 2m Xcvr	109	PA-10-70B 2m amp	\$ 89
PM-2 Portable AC ps	GC-105 2m Xcvr	109	PA-2-70B 2m amp	109
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160-VX 160m Xvtr	SX-122 SW Rcvr	\$225	PS-900 AC supply	89
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2A Ham Rcvr	HT-44 Transmitter	159	<b>KNIGHT</b>	
78Q Spkr/Q-mult	SR-160 80-20m Xcvr	169	TR-108 2m Xcvr	\$ 79
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2CS Speaker	MR-150 Rack mt	15	400-12M DC ps (TR-4)	\$ 69
R-4 Ham Rcvr	SR-400 Cyclone II Xcvr	475	350-12 DC supply	59
R-4A Ham Rcvr	SR-400 Cyclone III Xcvr	649	Century 400 DC ps	69
R-4B Ham Rcvr	SR-500 Xcvr	199	<b>MILLEN</b>	
MS-4 Speaker	P-500AC AC supply	75	90652 SS dipper	\$ 99
SW-4A SWL Rcvr	P-500DC DC supply	75	<b>MOTOROLA</b>	
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SC-6 6m conv	FPM-300 Mk II Xcvr	395	<b>NATIONAL</b>	
CPS-1 Conv ps	P-26 AC supply	45	NC-300-C2 2m conv/cab	\$ 49
SDC-1 VHF calibrator	<b>HAMMARLUND</b>		NC-300-C6 6m converter	29
CC-1 Conv console	HQ-110 Ham Rcvr	\$109	NCX-5 Xcvr	279
RV-3 Remote VFO	HQ-110A/VHF Ham Rcvr	219	NCX-5 Mk II Xcvr	299

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NOXD DC supply	75	14U 2m FM Xcvr	279	<b>TEN TEC</b>	
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HR-2B 2m FM Xcvr	169	SS-200 Xcvr	489	SP-2 Speaker	12
HR-2MS 2m FM Xcvr	189	PS-20 AC supply	95	315 Ham Rcvr	169
HR-2S 2m FM Xcvr	229	160m Remote VFO	89	<b>TPL</b>	
HR-212 2m FM HT	185	350 Xcvr (late)	269	502B 2m amp	\$109
HRT-2 2m FM HT	119	500C Xcvr	329	<b>VARITRONICS</b>	
AR-2 2m FM amp	89	700CX Xcvr	459	IC-2F 2m FM Xcvr	\$129
HR-6 6m FM Xcvr	145	117XC AC supply/spkr	95	IC-3P AC supply	39
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80A SSVT camera	259	512 DC supply	69	FT-101B Xcvr	549
70 SSVT monitor	239	405 MARS oscillator	39	FT-101B/tan/CW filter	679
70A SSVT monitor	259	410C Remote VFO	99	FT-101 Remote VFO	75
61VF Fast scan mon	349	508 Remote VFO	159	FTDX-560 Xcvr	429
<b>SBE</b>		600T Transmitter	369	FTDX-570 Xcvr	449
SB-33 Xcvr	\$159	600R Ham Rcvr	299	FT-401B Xcvr	499
SB-34 80-15m Xcvr	239	600S Speaker	19	FRDX-400SD Ham Rcvr	319
SB-36/AC Xcvr	449	250C 6m Xcvr	339	FR-101S/VHF Ham Rcvr	450
SB-144 2m FM Xcvr	169	210 Remote VFO	69	FL-101 Transmitter	449
SB-450 TRC 450 Xcvr	175	TV-2B 2m Xvtr (50 MHz)	249	SP-400 Speaker	15
SB-450 450 FM Xcvr	179	FM-2XA 2m FM Xcvr	169	SP-560 Speaker	15
<b>SINGER</b>		FM-120A 2m FM ps	219	FC-2 2m converter	29
PR-1 Panadaptor	\$ 89	FP-1 Phone patch	44	FT-2 Auto 2m FM Xcvr	199
<b>STANDARD</b>		<b>TEMPO</b>		200R 2m synth Xcvr	269
146A 2m FM HT	\$189	AC/One AC supply	\$ 75	10-25-76	

(1) ALL LISTED ITEMS ARE SUBJECT TO PRIOR SALE. (2) AES reserves the right to sell listed power supplies with their companion transceivers only, not separately, depending on the number available at the time. (3) To insure quality, all used gear is serviced and made ready for shipment after your order is received. Please allow for a possible delay of 5 to 10 working days.

The following items are NEW Close-outs, Overstock merchandise, New displays, etc. Most are factory-sealed, all carry New warranties. Limited quantity. First come, first served. Terms of sale: Payment in full with order or Mastercharge, no trades.

<b>AMECO</b>	reg. NOW	<b>REGENCY</b>	reg. NOW
TX-62 6 & 2m Xmtr	\$159 119	HR-212 2m FM Xcvr	\$259 199
<b>ATLAS</b>	reg. NOW	HR-2S 2m FM ac xcvr/scan	349 249
DD-6 Digital readout	\$199 99	ACT-W-10 Whamo scanner	329 229
DD-6B Digital readout	229 179	Also works on 2m FM	
<b>BRIMSTONE</b>	reg. NOW	DFS-5K Dig freq selector	199 149
144 2m FM Xcvr NEW	\$650 489	<b>SBE</b>	reg. NOW
<b>CLEGG</b>	reg. NOW	SB-450 450 MHz FM Xcvr	\$999 199
FM-21 220 MHz FM Xcvr	\$319 199	Scanvision SSVT system	\$999 499
FM-27B 2m FM Xcvr	479 349	SB-LCTV SSVT camera only	469 269
22'er FM ser 25 2m Xcvr	384 234	<b>STANDARD</b>	reg. NOW
031 8A 12v supply, spkr	89 69	146A 2w 2m FM HT	\$298 229
<b>COMCRAFT</b>	reg. NOW	Horizon 2 2m FM Xcvr	298 188
CST-50 2m/220 FM Xcvr	\$869 669	826M 2m FM Xcvr	359 189
CTR-144 2m FM/AM Xcvr	489 289	Horizon 29 CB Xcvr	229 159
<b>DRAKE</b>	reg. NOW	<b>SWAN</b>	reg. NOW
2C 80-10m Ham Receiver	\$295 249	300B 80-10m Xcvr w/ps	\$569 469
L-4B 80-10m linear	885 439	300B/SS16 16-pole filter	639 539
TR-22C 2m FM Xcvr DEMO	229 179	508 Remote VFO	269 169
SCC-1 VHF calibrator	26 19	160X 160m Xcvr	489 389
CC-1 Converter console	49 39	117XC AC supply/spkr	159 129
9BLT-144D 2m tnk mt ant	27 14	117X Basic AC supply	114 89
SSR-1 Shortwave Rcvr	350 299	PS-10 AC supply	99 79
<b>EBC</b>	reg. NOW	SS-100 80-10m Xcvr	699 489
144 Jr. 2m FM synth Xcvr	\$599 399	SS-200 As above, 200W PEP	779 549
<b>ETO</b>	reg. NOW	SS-208 Remote VFO	269 169
274 80-10m linear	\$985 745	MB-80 80m Xcvr	299 225
77D 160-10m linear	2995 2450	MB-40 40m Xcvr	299 199
<b>EICO</b>	reg. NOW	P-1215A AC supply	75 69
751W AC supply wired	\$109 59	600R 80-10m Rcvr	439 349
752K DC supply kit	79 39	600R Custom Rcvr	599 449
<b>GALAXY</b>	reg. NOW	600R Custom USED*	599 399
GT-550A 80-10m Xcvr	\$595 395	600R Custom/SS16 USED*	659 449
AC-400 AC supply	99 89	b00T 80-10m Xmtr	649 449
G-1800 DC supply	129 99	600T USED*	649 399
RV-550A Remote VFO	95 89	FM-1210A 2m FM Xcvr	319 199
<b>HALLICRAFTERS</b>	reg. NOW	1040V 40-10m vert ant	111 79
MR-400A Mobile mt -SR-400	\$ 89 39	MB-40H 2 el 40m beam	199 149
HA-20 Remote VFO console	199 159	TB-3 Tri-band 3 el beam	108 89
<b>HY-GAIN</b>	reg. NOW	*Factory reconditioned - with new warranty.	
400 Rotor	\$229 199	<b>TEN-TEC</b>	reg. NOW
<b>ITC</b>	reg. NOW	TX-100 CW Xmtr	\$109 71
Multi-2000 2m FM/SSB Xcvr	\$695 495	315 80-10m Rcvr	249 189
<b>KLM</b>	reg. NOW	Triton I 80-10m Xcvr	579 449
Multi-2000A 2m FM/SSB Xcvr	\$679 545	Triton II 80-10m Xcvr	669 539
<b>KENWOOD</b>	reg. NOW	KR-40 Squeeze keyer DEMO	99 79
R-599 80-10m Rcvr	\$349 299	<b>VARITRONICS</b>	reg. NOW
R-599A 80-10m Rcvr	459 379	FD2M-2A 2m FM port Xcvr	\$250 89
VFO-5SS Ext VFO - TS-511S	105 75	FM-20M Mobile 10w 2m amp	150 29
TS-700A 2m SSB/FM Xcvr	700 629	FM-20BM As above, but AC	235 49
<b>NYE</b>	reg. NOW	PA-50 Mk I 50w 2m amp	129 49
250-23-4 275w matchbox	\$202 149	<b>YAESU</b>	reg. NOW

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ed for second term as pres. of Imperial Valley ARA. Up-graded to Tech: WA6OUA, W6MAR is now K6NA. Traffic: (Oct.) WB6FTY 210, AG6JES 153, W6BGF 34, W6DEY 26, W6PZU 25, WA6IHK 2. (Sept.) W6PZU 251.

**SANTA BARBARA:** SCM, D. Paul Gagnon, WA6DEI — K6YNB has been busy with ARRL Contest Advisory Committee activities and is charter member of the new Southern Calif. Contest Club along with K6QPH. Contest officer for membership information. WA6MBZ is Asst. Mgr. of the W6BOD. WA6MBZ has completed a 220 Repeater in SB. W6PRP was active in the CQ WW DX Test. K6TOD has a new FT101EE. KH6IQU living in Orcutt. WA6WYD handled 29 MARS msgs. K5BNH is NCS for the new YL net on WR6AFI Mon. at 2030 local. WA6DEI spoke at Pointsettia ARC on new licensing plans. W6SZH spoke at SBARC on Printed Circuit Boards. W6BBDV joined the ranks of the married. WR6ASW born 3/4/94 in Santa Maria with autopatch, thanks to W6KPS, PSHR: AB6CWE 27, WA6VBS 34, WA6DEI 37. Traffic: WB5KPL 176, WA6MBZ 101, AB6CWE 92, WA6VBS 84, W6JTA 36, WA6DEI 13, AD6QPH 4.

**WEST GULF DIVISION**

**NORTHERN TEXAS:** SCM, Ted Helthecker, W5EJ — Asst. SCM: Ruth Chance, WA5VJW. SEC: W5DWL. Hey guys, and girls how about spending a 13 cent stamp and ten cents in more time on station activities, your interest in becoming an EC, OBS, OVS, OVS, OPS, OO, or just plain wanting to help or take part in activities in our section? We need all of you to make the North Texas Section great! New appointments: OBS: K5FOG W5BOO. OOs: W5DWL W5OPX. Member of KC Club Fort Worth W5AZL was elected to the rank of Univ. of Pennsylvania ARC, congratulations. WN5SOJ, new OBS. Copperas Cove, interested in traffic nets. Welcome and recruit some more of your amateur friends. We are planning to start some new CW traffic nets for North TX. Time and frequency to be announced later. We will have at least one low speed net for "out of practice" amateurs who would like to handle traffic, with a short session on "Net Procedures and Traffic Handling." Red River Valley ARC reports 6 new Novices. Let us know of your activities. W5GB Amarillo ARC will start training classes for General and Advanced after Jan. 1. "ARTS" is a net that moves traffic coast to coast, monitored daily on 7060 kHz, W511 says join us and get the traffic flowing. If you have tlc, just give a call on frequency and someone will be there to assist you. 7290 and Texas Traffic net met at Lake Whitney State Park for their annual gathering, over 30 amateurs attending. Thanks to WBAUU for helping make it a success. Texoma Hamarama was held Oct. 29-31 with 890 registered. Joint Texas/Oklahoma SCM meeting. Lengthy discussion of the Univ. of procedures. A great aid to this problem is to read and live by an ARRL book titled "The Radio Amateur's Operating Manual" which can be purchased from ARRL or just about any store that sells radio equip. The Wichita Amateur Radio Society operated club station WA5CTD at the county fair, ran phone patches and traffic for visitors, 2-meter operations to direct people and a demonstration of Fast Scan TV given by W5LJCN proved very interesting to the public and as a result, many signed up for the Novice classes. New firm, "Moving Up to Amateur Radio" is being well received in the North TX area, anyone interested in showing the film contact PR, WA5VJW. It is a very informative film for your Novice classes or anyone interested in obtaining an Amateur license. Novice schools in the Fort Worth and Dallas area are full with a long waiting list. Traffic: W511 381, W5KLV 153, W5BPN 70, WA5VJW 70, K5SOR 23, W5YK 22, WA5INJ 19, WA5VJX 6, W5EJ 5.

**OKLAHOMA:** SCM, Leonard Holtar, WA5FSN — Your SCM spent some time on the road in Oct. visiting Bartlesville, Shawnee, Miami and Ponca City Clubs. Visited with a bunch of fine hard-working people, doing their best to promote amateur radio. Presented EC Certificates to K5KXL at Shawnee and W5ZWM at Ponca City. K5KXL replaces W5HQX at Shawnee. With W5ZWM, new at Ponca City, this makes two new areas in OK covered this past month. New officers Enid ARC: W5SLUZ, pres.; W5LUV, vice-pres.; K5CAV, secy. W5BNC, W5BNDK and W5N9AY all upgraded. W5WTN, new at Watonga. W5SOZ new OBS for Miami. Rptr. RM W5CZ very ably represented the SCM in working with GCWA and the Governors congratulatory message to Pres. Carter. The following net reports for Oct. are printed for your information and comparison later. STN 566 QNI, 179 GTC; OTWN 453 QNI, 11 GTC; OFON 446 QNI, 93 GTC; OL 2 187 QNI, 63 GTC; OAN 148 QNI, 36 GTC. Traffic: W5BNDK 344, W5RC 217, W5RB 182, W5BNC 178, W5BKG 93, W5AZH 91, K5KXL 38, W5SUG 36, WA5FSN 30, W5FKL 19, W5SELG 13, W5BVL 12, W5FFW 9, W5UJCN 9, WA5OUV 8, K5CAY 4, W5JJ 2.

**SOUTHERN TEXAS:** SCM, Arthur R. Ross, W5KR — SEC: W5TQP. Asst. SCM/PAM: W5SAMN. RM: W5UGU. OO reports this month: W5BFMA WA5LTQ W5VAH. OVS reports: K5LZJ WA5QCP. SEC W5TQP says his 29,000th Amateur Radio contact was with WA5NSJ; also requesting more EC reports. W5BTNN is new EC and RO for Brazoria County; is assisting in Novice class at Lake Jackson. 17 aspirants. EC W5TFW has joined Silent Keys. ORS W5LYH enjoyed portable operation at South Texas State Fair in Oct., reports much good PR and some traffic; says 16 students passed code and awaiting Novice exams. OPS K5RVF enjoyed eyeball QSOs with some hams in Eastern and Western Europe this past summer. ORS/EC W5UJW says Austin ARC auction was great success. OPS W5VBM had a wonderful 4-day visit from YL OA4CYC. RM W5UGU has new two-element circular polarized 2-meter antenna for Oscar work. Asst. SCM W5SAMN tells of grand job by Houston Amateur Ops in providing communications for "Main Street '76" parade thru; HT's and the Civil Defense 2585 rpt; quite effective. OVS K5LZJ has new Novices W5WKA W5XGP. WA4VLS and Tech-nician W5XHG in Cleveland. EC/ORS W5BFMA ready for high volume RTTY traffic, can interface other modes. From Hamtides. Tideland ARS: Novice class at College of the Mainland started at 16, holding at 9; General class started at 21, holding at 19. Traffic: (Oct.) WA5VBM 342, W5UGU 227, K5HZR 201, WA5YEA 148, WA5RKU 128, K5ZSI 120, W5BNUJ 62, W5AC 47, WA5JYH 37, K5RCZ 34, W5SAMN 33, W5QO 28, W5TQP 23, W5LTV 10, W5BTNN 9, K5RVF 3. (Sept.) WA5RKU 144, W5UJW 117, W5SAMN 28.

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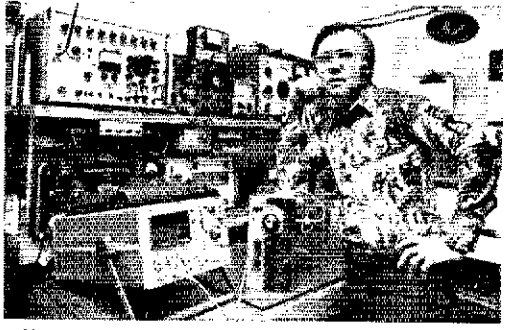
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- Marine bands xtal kit ..... 57.20
- MARS bands xtal kit ..... 26.00
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- Time & freq std, WWV xtal kit ..... 26.00
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- TR-72 2m FM Xcvr ..... 320.00
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Later, Splatter tried to sell his station: first through the classifieds, and when that didn't work he dragged the stuff to a hamfest. After spending a day in the rain, he wound up practically giving it away because there was no one there who was really looking for the equipment he had for sale.

Then thanks to Sparkie, a local ham, Splatter found out about Buyers & Sellers: the ham radio brokerage. Buyers & Sellers offers the largest selection of used gear anywhere. If they don't have what you're looking for when you call, they take down your name, address, and phone number and will contact you when the rig comes in. You won't get burned on a deal either because Buyers & Sellers' Mail Purchase Guarantee insures you of a good rig every time.

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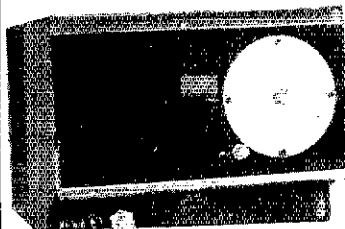
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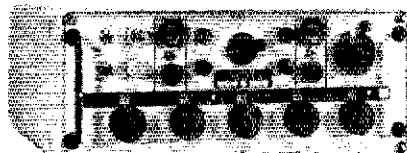
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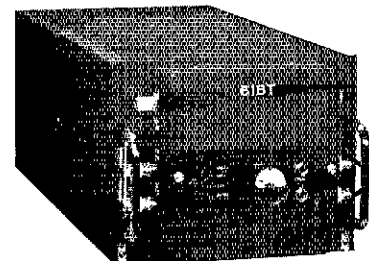
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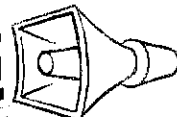
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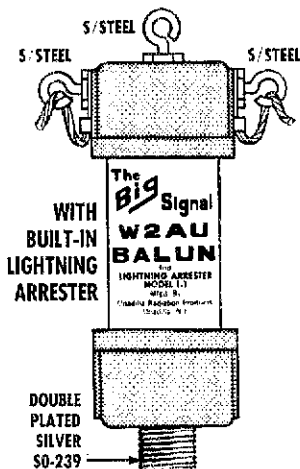
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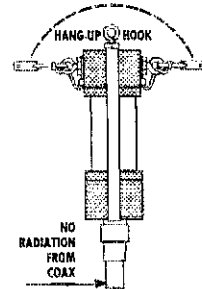
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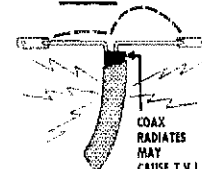
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The originator of the Balun with a built-in lightning arrester and hang up hook.

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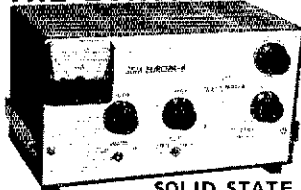
We'll GUARANTEE no other balun, at any price, has all these features.

UNADILLA RADIATION PRODUCTS, Tel: 315-437-6444

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TWX 710-541-0493  
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## THE EUROPA "B"



## OSCAR—TROPO "TWO METERS" EME—FM

The EUROPA "B", a SSB-CW-AM-FM-FSK 28 Mhz to 144 Mhz TRANSVERTER with 200 WATTS input on 144 Mhz for 200 mw of 28 Mhz drive. The Converter provides 30 db of gain on TWO meters with a 2 db noise figure. A direct plug-in to YAESU equipment, the EUROPA "B" can be used with any gear having a 28 Mhz capability.

Special Sale SAVE \$40.00 Regular Price \$299.95  
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## NYE VIKING KEYS

Best for beginners . . . preferred by pro's!

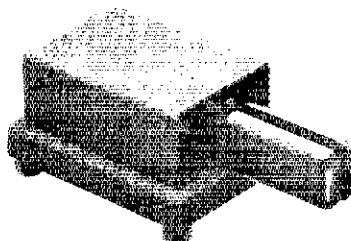


**NYE VIKING SPEED-X**  
Sure-handed, smooth operating!  
Eight different models priced from \$6.65. No. 114-310-003 is shown, left: **\$8.25**

## SUPER SQUEEZE KEY

The fast, comfortable, easy key for you "side swipers!" Has finger-fitting paddles, gold-plated contacts! SSK-3 has sub-base to mount any SPEED-X key, \$26.95. SSK-1 (shown right) **\$23.95**

By the manufacturer of NYE VIKING Low Pass Filters, Phone Patches and Antenna Impedance-matching Tuners.



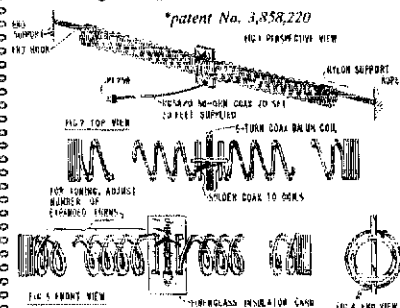
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a lot of antenna in a little space

new Slinky<sup>®</sup> dipole\* with helical loading radiates a good signal at 1/10 wavelength long!



\*patent No. 3,858,220

- This electrically small 80/75, 40, & 20 meter antenna operates at any length from 24 to 70 feet • no extra balun or transmatch needed • portable—erects & stores in minutes • small enough to fit in attic or apartment • full legal power • low SWR over complete 80/75, 40, & 20 meter bands • much lower atmospheric noise pickup than a vertical and needs no radials • kit includes a pair of specially-made 4-inch dia. by 4-inch long coils, containing 335 feet of radiating conductor, balun, 50 ft. RG58/U coax, PL259 connector, nylon rope & instruction manual • now in use by US Dept. of State, US Army, radio schools, plus thousands of hams the world over.

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## AMATEUR: ANTENNAS • ROTORS • TOWERS

### 3 CRANK-UP TOWER MODELS AVAILABLE

#### TT-45 FREESTANDING CRANK-UP TOWER, 45 Ft.

The TT-45 will support 9 sq. ft. at a height of 39 ft. freestanding when properly bracketed to a house or wall at the 8 ft. level. The loads decrease as the tower extension Mast is lengthened. (Loads are based at 50 mph and load permitted on the tower decreases with increases in wind speed over 50 mph). The tower can be completely freestanding with our new concrete or tower rotating bases, which allow the use of our raising fixture. Using these accessories, the towers can be installed by one man easily.

List . . . \$310.00

#### FOR THE TOWERING SIGNAL - WILSON'S SST-64 GUYED CRANK-UP TOWER, 64 Ft.

All steel tubing is galvanized plated and conforms to ASTM specifications for years of maintenance free service. The SST-64 is made of 4 sections, being 4.5", 3.5", 2.5" and 2". These large diameters give unexcelled strength and virtually makes the thin push-up poles a thing of the past. The large loads of today's antennas make the Wilson SST-64 the best value on the market today.

List . . . \$375.00

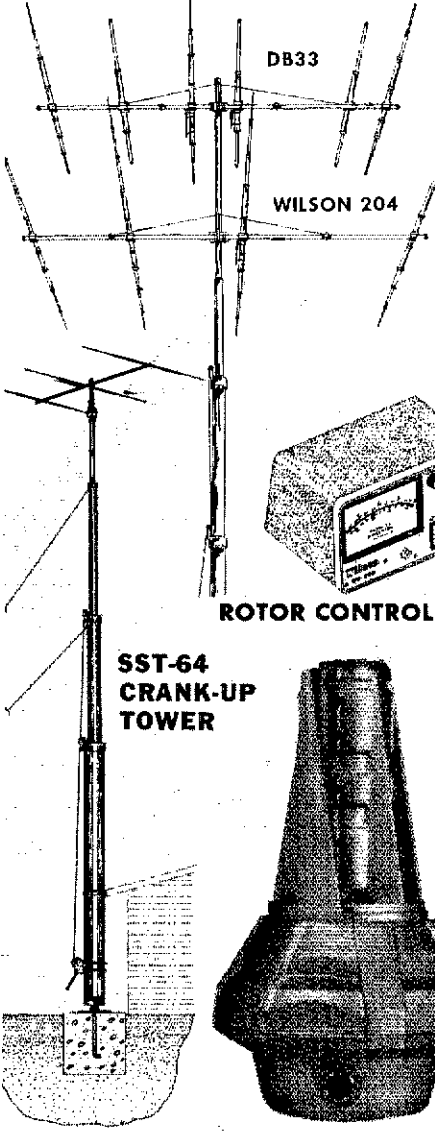
#### THE WILSON GT-46 GUYED CRANK-UP TOWER, 46 Ft.

The GT-46 features quality construction and materials, with the stability of the Guyed System.

#### FEATURES OF THE GT-46:

- Low cost • High capacity • all steel. Conforms to ASTM (American Standard of Testing Materials)
- Fully galvanized • 800 lb. winch standard • Guy kits available for factory recommended installations • 2000 lb. raising cable standard (Aircraft Quality) • Can be roof mounted for extra height
- Great looking, slim flag pole design, for the ecology minded.

List . . . \$219.00



### AMATEUR ANTENNAS

The Wilson 204 is the best and most economical antenna of its type on the market. Four elements on a 26' boom plus a Gamma Match (no balun required) make for high performance on CW & phone across the entire 20 meter band. The 204 Monobander is built rugged at the high stress points. Using taper swaged slotted tubing permits larger diameter tubing where it counts, for maximum strength with minimum wind loading.

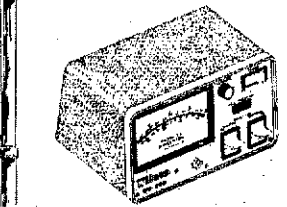
The DB33 is the newest addition to the Wilson line of antennas. Designed for the amateur who wants a lightweight economical antenna package, the DB33 complements the M204 for an excellent DXers combination.

- All Wilson Monoband and Duoband beams have the following common features:
- Taper Swaged Tubing
  - Full Compression Clamps
  - No Holes Drilled in Elements
  - 2" or 3" Aluminum Booms
  - Adjustable 52 Ω Gamma Match
  - Quality Aluminum
  - Handle 4kw
  - Heavy Extruded Element to Boom Mount

### WR 1000 ROTOR

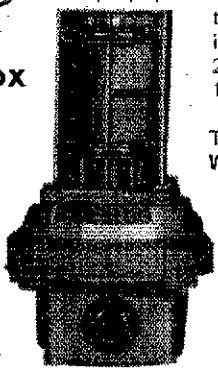
The Rotor everyone has been waiting years for — capable of the largest arrays up to 25 sq. ft. — Superior to prop pitches — Full 4,000 inch lbs. of turning torque. Braking system requires 12,000 inch lbs. before over-riding — accepts 2" - 3" masts — Weighs 60 lbs. — Size: 11" diameter, 19" high.

The Finest Rotor in the Market Today  
WR 1000 . . . . . \$429.00 List

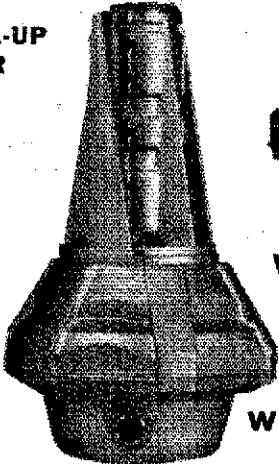


ROTOR CONTROL BOX

### SST-64 CRANK-UP TOWER



WR 500 ROTOR



WR 1000 ROTOR

### WR 500 ROTOR

The Wilson WR500 Rotor has 780 inch lbs. of turning torque before stalling.

In addition, a Special Braking System requires 1300 inch lbs. of torque before windmilling— This is more than twice the braking ability of the other comparable rotor being marketed.

Full 98 Steel Ball Bearing raceway assures elimination of side torque jamming when Rotor is mounted in line with the mast.

Recommended for antennas of 7.5 sq. ft. or less . . . weighs 20 lbs.

The  
WR500 Rotor . . \$119.95 List

#### WILSON AMATEUR ANTENNA SPECIFICATIONS

Model No.	Frequency	Boom Length (ft.)	Number Elements	Longest Elements (ft.)	Turning Radius (ft.)	Surface Area (sq. ft.)	Wind Loading at 80 MPH (lbs.)	Assembled Weight (lbs.)	Shipping Weight (lbs.)	Price
M340	40	40	3	70'0"	39'0"	15	300	180	230	\$749.00
M620	20	56	6	38'0"	32'0"	10.5	210	98	123	420.00
M520	20	40	5	36'4"	27'0"	8.75	175	74	96	298.00
M204	20	26	4	36'4"	22'6"	6.8	136	42	48	169.00
M203	20	19	3	38'0"	20'5"	5.25	105	35	40	129.00
M155	15	26	5	24'3"	18'0"	9.0	100	41	44	159.00
M154	15	18	4	24'3"	15'9"	4.0	80	30	35	109.00
M152	15	17	3	24'3"	14'0"	3.0	60	21	24	89.00
M108	10	40	8	18'0"	22'0"	5.6	110	49	77	219.00
M106	10	31	6	19'0"	16'1"	4.0	80	34	36	119.00
M105	10	26	5	18'0"	15'8"	3.0	60	29	32	109.00
M103	10	17 1/2	3	18'0"	10'0"	2.0	40	10	12	39.00
DB54	20	40	5	38'4"	27'0"	12.75	255	94	119	349.00
DB43	15	19	4	24'3"	15'8"	6.0	120	36	43	149.00
	10		3	18'0"						
DB33	15	17	3	24'3"	12'2"	4.5	90	30	33	109.00
	10		3	18'0"						

## AVAILABLE THRU YOUR LOCAL DEALER

FOR THE NAME OF YOUR NEAREST AMATEUR DEALER

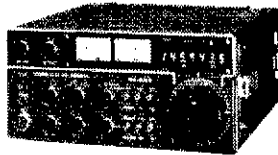


OR FOR A FREE CATALOG OF THE ABOVE PRODUCTS, CONTACT:

# Wilson Electronics Corp.

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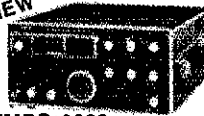
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PLEASE WRITE FOR COMPLETE INFORMATION  
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A BRILLIANT NEW SSB TRANSCEIVER  
PROVIDING AN UNBEATABLE COMBINA-  
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TRANSCEIVER  
MODEL SRC-146A**

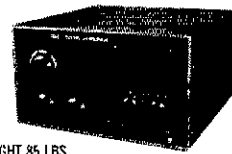
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COMPLETELY WIRED &  
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OUR PRICE \$279.00  
Quantities Limited

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\$39.95

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Output Voltage	13.6 ± .2VDC
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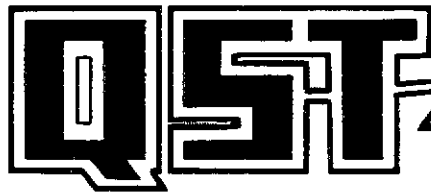
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**FM144-10SXRII**



**NEW!** 6 METER FM50-10SXRII



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51.000-53.995 MHz. 600 channels  
Introductory Price **\$389.00**



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**TONE ENCODER/DECODER**  
SC-10 . . . 10 CHANNELS . . . DUAL TONE  
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Touch-Tone Pad  
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- **MONITOR LAMPS:** 2 LED'S on front panel indicate (1) incoming signal-channel busy, and (2) un-lock condition of phase locked loop.
- **DUPLEX FREQUENCY OFFSET:** 600KHz plus or minus, 5KHz steps. Plus simplex, any frequency.
- **MODULAR COMMERCIAL GRADE CONSTRUCTION:** 6 unitized modules eliminate stray coupling and facilitate ease of maintenance.
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- **HIGH/LOW POWER OUTPUT:** 15 watts and 1 watt, switch selected. Low power may be adjusted anywhere between 1 watt and 15 watts.
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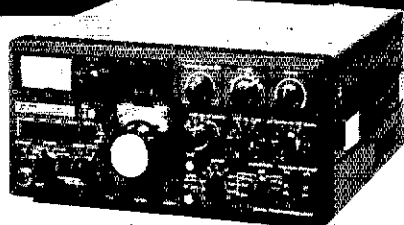
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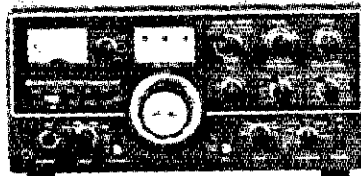


**Webster** says:  
radio, inc.

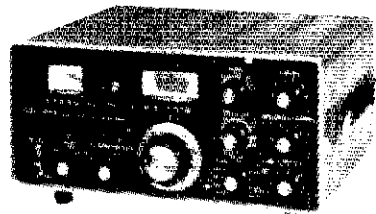
Everything from A to Z  
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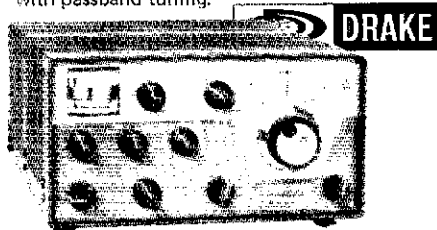
The TS-820 **KENWOOD** \$830.  
160 thru 10 meter. Solid state Transceiver  
with passband tuning.



The TS-520 **KENWOOD** \$629.  
Transceiver. Solid state 80 thru 10 meters.



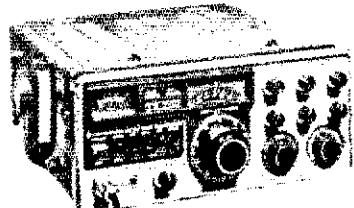
The FT-101E YAESU Transceiver  
with new RF Speech Processor.  
Solid state 160 thru 10 meters. **\$749\***  
\*FT-101EE (less processor) \$659.  
\*FT-101EX (less accessories) \$599



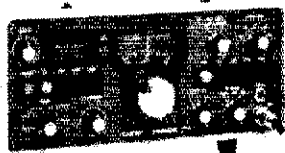
The TR-4C **DRAKE** Transceiver. 80  
thru 10 meters AC/PS. **\$599.**



The FT-221 YAESU Transceiver **\$679.**  
Solid state 2 meters SSB/FM/CW/AM



The TS-700 **KENWOOD**  
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The FT-620B YAESU Transceiver  
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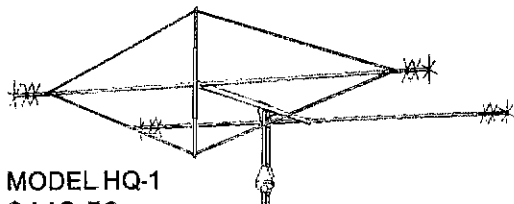
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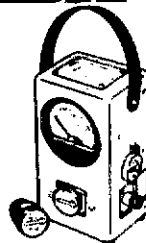
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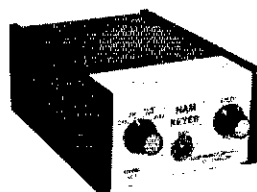
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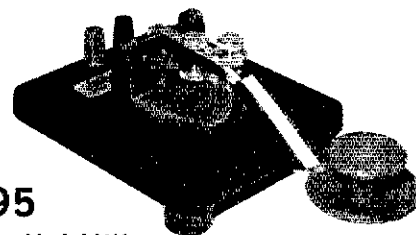


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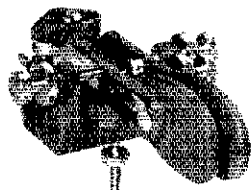
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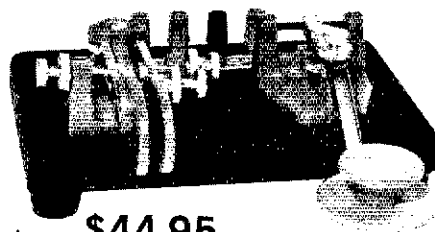
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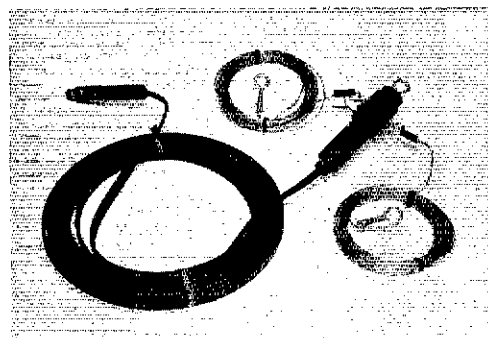
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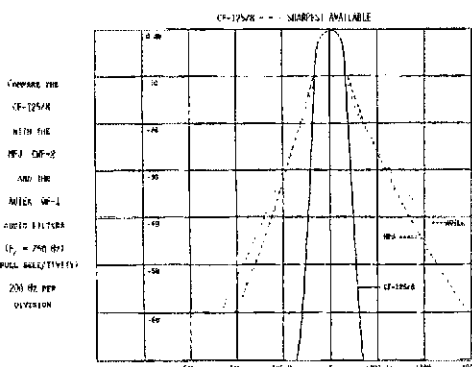
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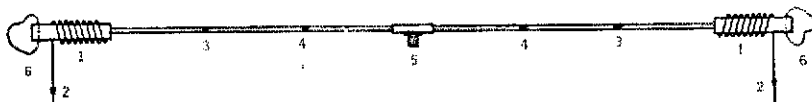
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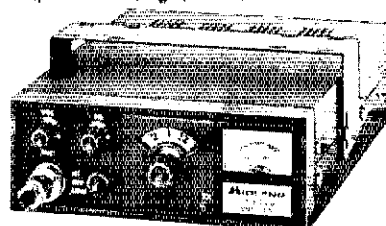
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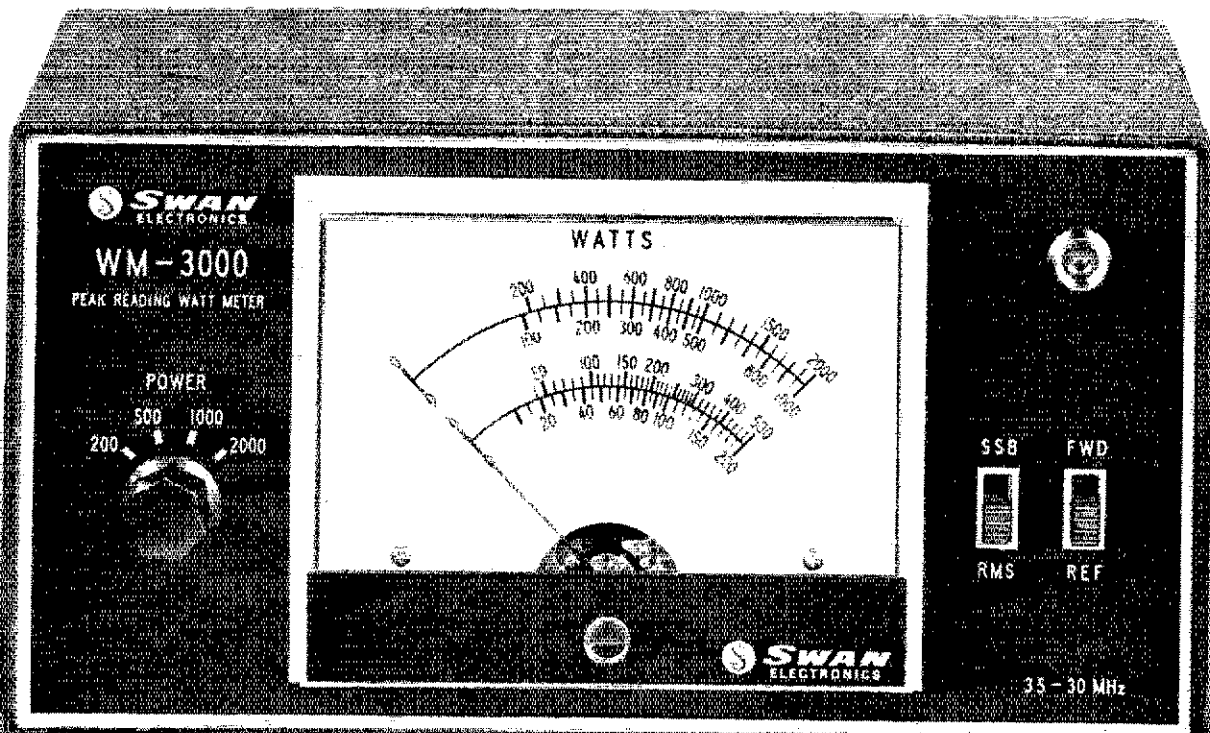
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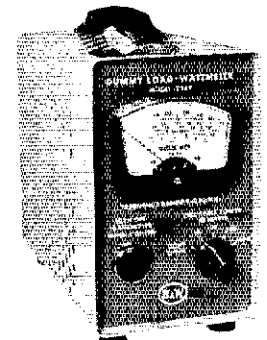
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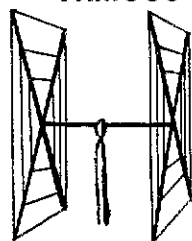
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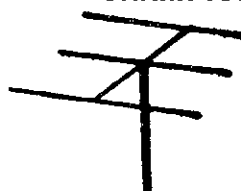
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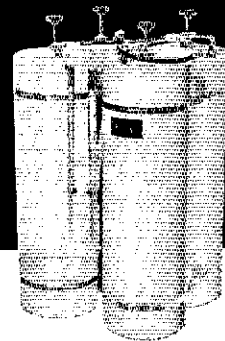
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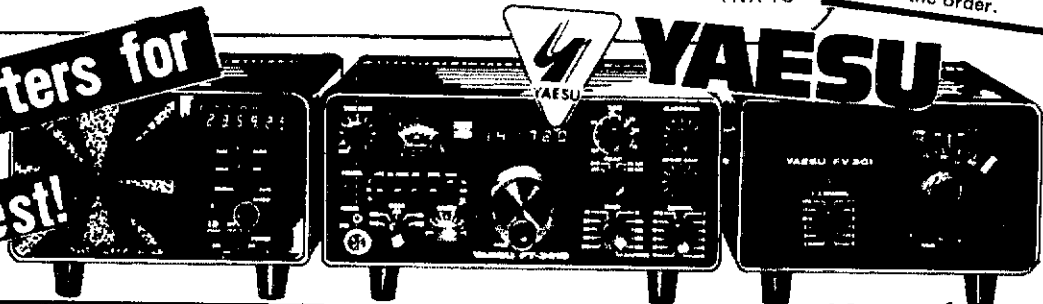
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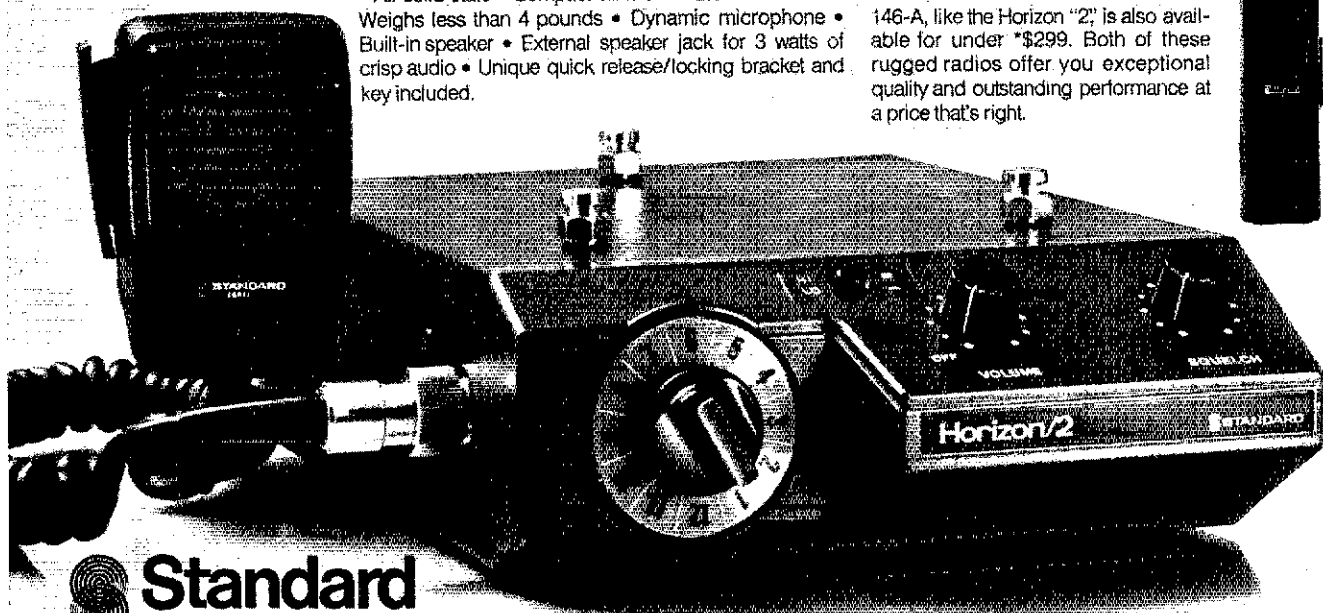
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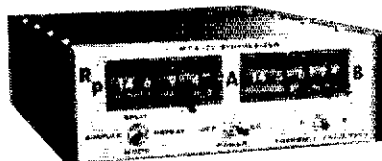
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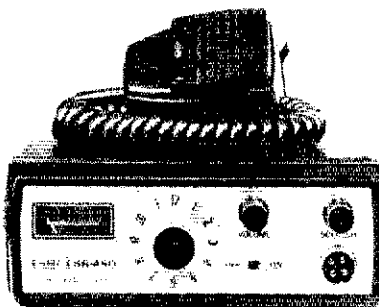
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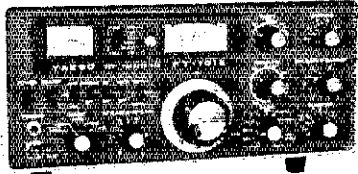
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- FR-101 Digital Receiver . . . . . 629.00
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- YD-844 Base stn microphone . . . . . 29.00
- YD-846 Hand microphone. . . . . 16.00

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- FTV-650B 6m transverter . . . . . 189.00
- FTV-250 2m transverter . . . . . 219.00
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- YC-500-S 500 MHz counter - 1 PPM. 365.00
- YC-500-E 500 MHz - 0.02 PPM . . . . . 475.00
- YC-601 Digital readout (101/401) . . . . . 179.00
- YO-100 Monitor scope . . . . . 199.00
- YP-150 150w Dummy load/wattmeter 74.00
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- 200R 10w synthesized 2m FM Xcvr. . . . . 449.00
- Mobile mtg bkt for 200R . . . . . 19.00
- FT-620B 6m SSB/CW/AM Xcvr . . . . . 449.00
- PB-142A Marker unit. . . . . 33.00
- XF-90B AM filter. . . . . 45.00
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(2) The Ham-Ad rate is 60 cents per word. A special rate of 20 cents per word will apply to individuals who want to dispose of or acquire personal ham gear, on a one-to-one, one-time basis.

(3) 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.

(4) Closing date for Ham-Ads is the 20th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A name or call must appear in each ad.

(6) New "commercial" advertisers must submit a production sample of their product (which will be returned) and furnish a statement in writing that they will respond appropriately to customer complaints and will stand by and support all claims and specifications mentioned in their advertising, before their ad can appear.

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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. 2012 Rockingham St., McLean VA 22101.

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EDITING a club paper? Need public relations help? You should belong to the Amateur Radio News Service. For information write: Doris Dennstaedt, WA3HEN, 303 N. Hammonds Ferry Rd., Linthicum Heights MD 21090.

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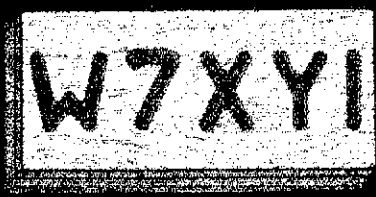
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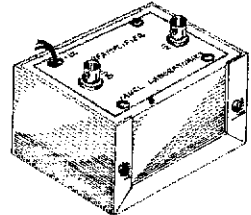
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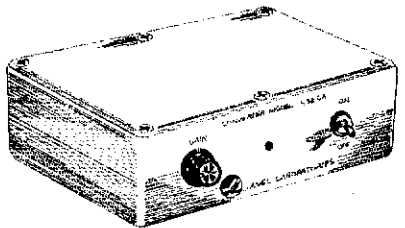


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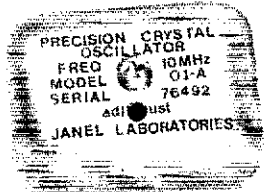
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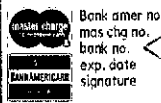


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QST, Ham Radio, 73, and CQ issues at 20c each, including USA shipping. Lockheed ARC, 2814 Empire, Burbank CA 91504.

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GROUNDING grid filament chokes 30 amp — \$5; plate chokes 800 mA — \$4; 2 amp — \$6; PPUSA48, William Deane, 8831 Sovereign Rd., San Diego, CA 92123.

WILL pay \$150 for Heath SB-401. Bill Downs, KOMNA, 4805 Sullivan, Wichita KS 67204, 316-838-5385.

WANTED: Hammarlund HQ-180 Tom Gibson, P. O. Box 784, Dodge City KS 67801, 316-227-3851.

YAESU FTDX400 Transceiver, \$325; FV-400S, \$75; FLDX2000, \$195. Heath HA-201, \$30; HD-15, \$30. UPS collect. Thurber, 372 Crabapple, Wright-Patterson AFB, Ohio 45433.

NEED No. 38 DCC (double cotton covered) wire also March 1932 issue of QST. WBERG, 1397 Washington Circle, Forestville OH 45230.

NEW TR4C, RV4C, 4-PNB never used with warranty cards. Like new TR4C, M5-4, AC-4, K4KJC POB 249, Franklin TN 37064. 615-794-5380 evenings.

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COLLINS: KWM-2, RF clipping, Swan AC supply with DC module \$695; 75A-4 noise blanker, 500, 3.5, 6 kHz filters \$395; R-390A/URR \$495. Swan 250C, 117XC \$325. Clear AM 22'er \$95. 6 N 2 \$65. B&W 5 band KW 1000H-A, LPA-MU-2 \$135. Ham-M rotors \$75. Motorola AM-494/GR 2 meter KW \$315. KLM 5el 20 meter beam, balun \$125. Hy-Gain Triband quad \$75. Rohn 25G sections \$23. All manuals, other small stuff. K2EVW, 711 Shore Road, Northfield NJ 08225.

FOR SALE: Regency HR-6 like new with accessories. Used 2hr. On \$2,225. Also 2 Cush Craft 3 ele 6m beams. Good condx. Andrew Mueller, WB9GAC, W12668 Donges Bay Rd., Germantown WI 53022.

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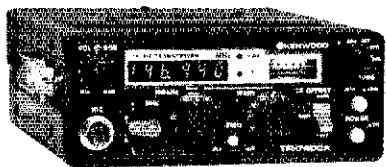
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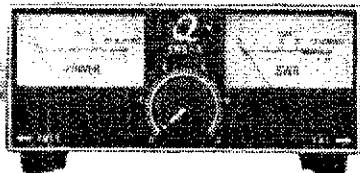
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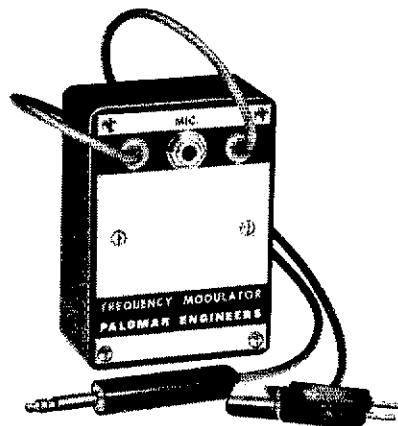
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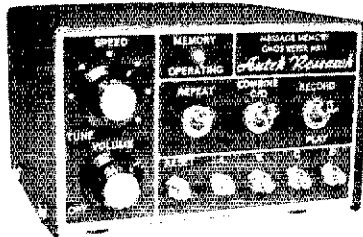
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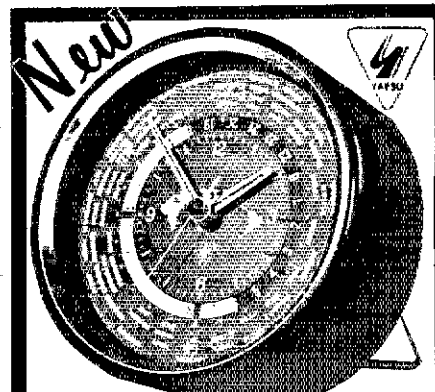
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★ Preselector 80 to 10M, L1-20 Handbook p. 265 ..... 15.00  
★ AN RF-Sensed Antenna Changeover Relay, RFC1, 2 T1, QST Aug. 1976 p. 22 ..... 5.00  
★ Tuna-Tin 2 WAS with a 40 meter half-wattter L1, 2, T1, QST May 1976 p. 15 ..... 4.25  
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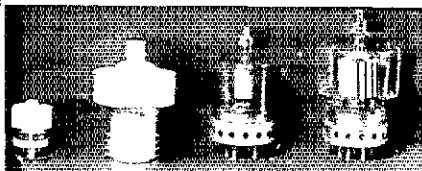
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WANTED: Atlas 210 or Triton IV, have to trade TR4C, Drake transceiver, with MS4 power supply. Anybody got a deal — Phone 920-0273. WA3ERD, P. Lasplna, 33 Gloria Ann Smith Dr., Bricktown NJ 08723.

SELL: TMC CV-891A single-sideband converter. Very good with manual — \$80. E. Newman, 19 Robin Hood Ct., Nesconset NY 11767.

WANTED: 500 cycle filter for 75A4. N. Konos, 8-1/2 Summit Ave., Salem MA 01970.

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B & W 51-SB sub adapter w/manual — \$75. WA4EVM, 9705 Lomond Dr., Manassas VA 22110. 703-361-4390.

FOR SALE: Heathkit HW-16 with VFO — \$135. W8BRTG, 906 Broadway, Bedford OH 44146. 216-232-8132.

10-Meter fm. Motorola U51GGT, control head, cables, microphone, crystals (29.6 MHz), \$100, plus shipping. Dan Baker, 832 Partridge, Mount Prospect IL 60056.

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SELL: TS-700A, mint, 4 mos. VOX-3, preamp — \$50; FT-520B, 6 mos, calib, preamp — \$375. Box 506, Alvin TX 77511.

WANTED: ASR33 teletype. Guy Black, W4PSJ, 12317 Hanger Rd., Fairfax VA 22030. 703-278-8074.

WANTED: HRO-500 manual. Buy or rent to copy. Dennis McAuley, Box 23, FPO NY 09571.

HEATHKIT HW-101, HP23A PS, speaker, microphone and SWR meter. With all manuals — \$300. Will ship. Howard Iken, WA2VLLQ, 212-471-2614.

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KW1, excellent except trouble in modulation section — \$500; you pick up or pay shipping and crating. K4HVL, Fuller, 4970 Sandersville Rd., Old Hickory TN 37138. Phone 615-847-2655.

WANTED: Pampered SB-220, prefer Greater Boston area. Write WIGLY, 114 Exeter Rd., North Hampton NH 03862.

HEATH SB 104, cw filter, noise blanker, spkr, power supply. Factory Mod. A beauty to operate, 1st — \$750, takes all, you ship. K0MK5, 615 N. Clay, Liberal KS 67901, 316-624-6129.

HWA-202-1 new — \$30; HQ-MO-AC, mint — \$165; SXG2 — \$100; DX20 — \$25; ATI — \$25; all good; T-150 poor, best offer; oscilloscope — \$20, you ship. Wanted: SB200 and SB accessories, K1WGN, Steve Siter, 488 Marshall Street, Paxton MA 01612.

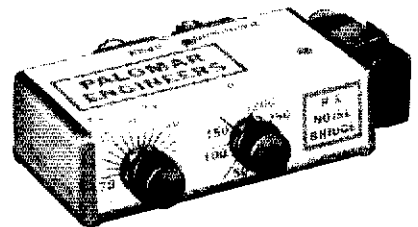
WANTED: Elevation drive with accurate indicator for large EME antenna. Sam, WA7TDU, 2419 Wlard St., Klamath Falls OR 97601. 503-882-3662.

DRAKE SSR-1 nearly new — \$299 or consider trade for matchbox or 2M transceiver. Haarsager, WA0KKR, Box 103, Boise ID 83701.

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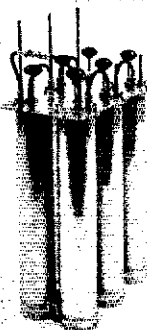
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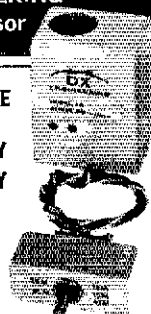
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F-37	400	140	.37	1.25
F-23	190	60	.23	1.10

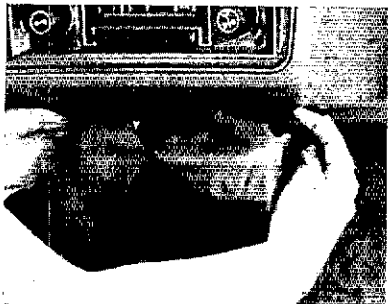
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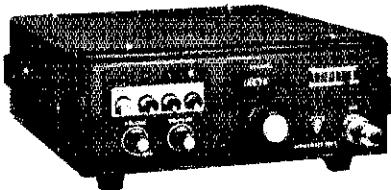
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WANTED: Heathkit VF-1 VFO in mint cond. Neal, WA4TQJ, 134 "B" Route, 4 Ozark AL 36360.

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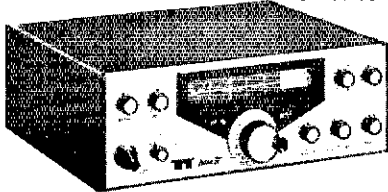
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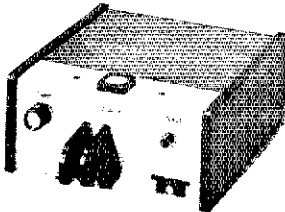
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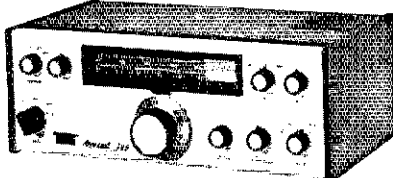
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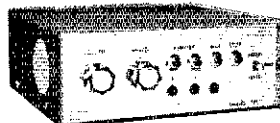
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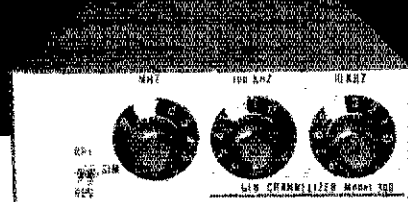
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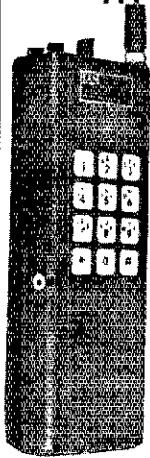
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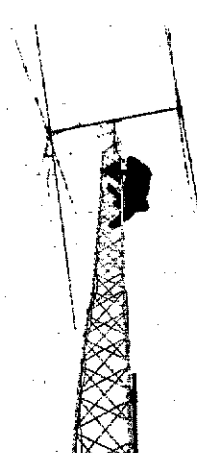
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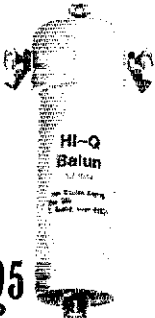
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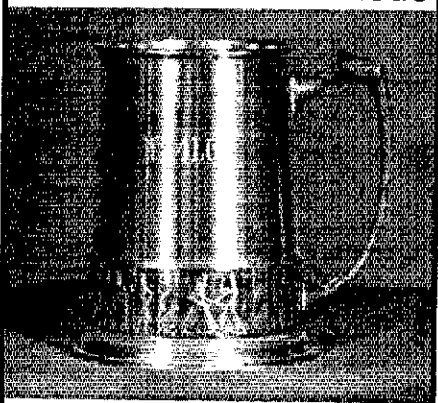


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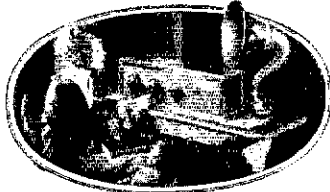


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# NEWS

# BULLETIN



## "S-E-R-V-I-C-E is our MOST IMPORTANT PRODUCT"

### DEAR OM:

If you're in the market for a new or used piece of HAM RADIO equipment, and in the process of "Shopping Around" for the "BEST DEAL" you can get — you no doubt realize that there are TWO IMPORTANT FACTORS to consider — the PRODUCT and the DEALER — or, in other words, WHAT you buy and WHERE or from whom you buy it! Furthermore, if you're truly a "Smart Shopper" — you probably take into account such variables as Price, Performance, Features, Quality, Resale-Value and SERVICE-ABILITY when making your comparison of the various makes & models available. And, if you're really ON TOP OF THINGS, you KNOW that there IS much-much MORE to a "GOOD DEAL" than just the "lowest price" — that, in the final analysis, the REPUTATION of the dealer standing behind YOU and your purchase is worth as much or MORE than the quality of the product itself.

Now, assuming that you AGREE WITH US up to this point, you're probably a little more than CURIOUS about our operation, and WHAT kind of a "DEAL" we've got to offer YOU!! To begin with, at BURGHARDT AMATEUR CENTER in Watertown, South Dakota — of all places — our whole structure of business is built upon a foundation of FRIENDSHIP and PERSONAL S-E-R-V-I-C-E. We do not "PRETEND" to be "Big Operators" or "Wheeler-Dealers" as this would defeat our whole purpose in giving you the kind of FAST, DEPENDABLE SERVICE that you would expect — and you GET — from a company whose reputation as "AMERICA'S MOST RELIABLE AMATEUR RADIO DEALER" is on the line every day of the year. On the other hand, we are BY NO MEANS a small nor inexperienced outfit just out to make a "fast buck" by selling one or two lines of HAM RADIO equipment, while the major portion of our enterprise may be devoted to other areas of communications — or entirely unrelated. Simply stated — "HAM RADIO IS OUR ONLY BUSINESS!!"

IN FACT, Stan Burghardt, WØIT, has been serving the nation as your DIRECT LINE to virtually EVERY MAJOR LINE of HAM RADIO gear since the fall of 1937 from our CENTRAL LOCATION here in the Midwest offering his customers both the LATEST and the BEST in amateur equipment. And, TODAY — with nearly 40-Years of S-E-R-V-I-C-E behind us — we still STOCK & SELL and GUARANTEE and SERVICE all of the familiar brand names that are a factor on the modern ham market — PLUS, we carry

a COMPLETE LINE of operating aids and accessories to fill nearly every ham's needs. BUT, it's not so much WHAT we sell — rather HOW we sell it that's worth your consideration.

First of all, when it comes to FAST DELIVERY, HONEST DEALING and DEPENDABLE SERVICE — we don't just advertise it — WE GIVE IT!! We ALWAYS ship your order the same day it crosses our desk, and we WILL BE HONEST with YOU — right from the start! We ARE in this business to make a living — but NOT at YOUR expense. Our prices on new & used equipment are "down-to-earth" in the sense that they SQUARELY reflect the "REALISTIC" value of the merchandise WHEN you take into account the fact that we truly "SERVICE WHAT WE SELL" — and many that we don't!! OUR POLICY on the handling of defective merchandise is WELL-KNOWN to those who have dealt with us before — when we say "SERVICE with a smile" — we MEAN IT — and it's YOUR smile that we're after. It's always our aim to PLEASE because we KNOW (and YOU know) that THERE IS NO SUBSTITUTE for "GOOD" S-E-R-V-I-C-E!!

Furthermore, when you deal with us, you ALWAYS receive our prompt, PERSONAL attention and INDIVIDUAL concern. Each and every letter or phone call puts you in INSTANT TOUCH with a licensed ham who is READY, WILLING and ABLE to give your order or inquiry his UNDIVIDED ATTENTION — not put you on "HOLD!!" We approach every new transaction with a "fresh frame-of-mind" (we'll try "ANYTHING" once) and you'll always find us willing to COOPERATE with YOU to the limit. You won't catch us using any stereo-typed methods or responses in our conduct of business either, because we KNOW that THERE ARE NO SHORT-CUTS IN GIVING "GOOD" SERVICE!!

In conclusion, we realize that WATERTOWN may not exactly appeal to you as the "crossroads of the country" — but, it may well be (or become) YOUR "cornerstone of CONTENTMENT!!" We most certainly are ON THE MAP — and WE WILL go a long-long way to take VERY GOOD CARE of YOU and make you feel "WELCOME." Above all else, your CONFIDENCE in us is our MOST IMPORTANT asset — just as S-E-R-V-I-C-E is our MOST IMPORTANT PRODUCT, and, in terms of "dollars 'n' cents" — these will never be discounted. All WE ASK for is the "OPPORTUNITY" to serve YOU — whatever YOUR NEEDS may be — and we look forward to hearing from you soon.

73's STAN BURGHARDT WØIT BILL BURGHARDT WBØNBO JIM SMITH WBØMJY ERV HEIMBUCK KØOTZ

WE'RE FOR REAL . . . THERE'S NO DOUBT ABOUT IT!

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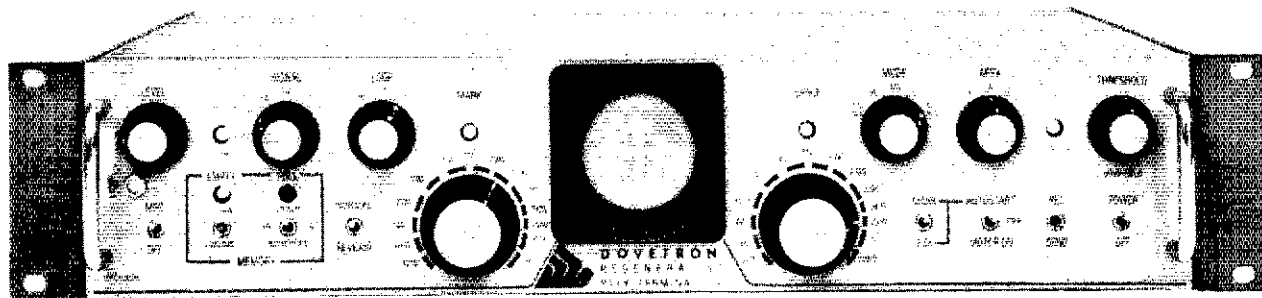
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"America's Most Reliable Amateur Radio Dealer"

Your Full-Line Ham Dealer Where S-E-R-V-I-C-E is our most important product.

# THE REGENERATIVE "E" BY DOVETRON

## REGENERATION, SPEED-CONVERSION & BUFFER STORAGE



### THE MPC-1000R REGENERATIVE RTTY TERMINAL UNIT

The MPC-1000R REGENERATIVE Terminal Unit features automatic MULTIPATH CORRECTION, IN-BAND DIVERSITY operation, SIGNAL REGENERATION, up-down SPEED CONVERSION, automatic BLANK or LTRS CHARACTER generation and variable CHARACTER RATE.

An 80 character FIFO buffer MEMORY provides a full line of storage and may be PRELOADED and RECIRCULATED. Preloading of the memory may be accomplished from either the local keyboard or the incoming signal.

A unique Character Rate over-ride and TD INHIBIT circuit prevents character over-runs during down-speed conversion.

The crystal-controlled UART REGENERATOR may be programmed for 5, 6, 7 or 8 level codes, PARITY and the various stop-bit options. The UART's tri-state mode may be utilized to generate a PHASING pulse for crypto peripherals.

The phase-continuous AFSK Tone Keyer may be preset with three different combinations of Mark and Space tones, which are operator-selectable from the front panel.

The optional Station Identifier (TID-100) may be programmed in Morse, Baudot or ASCII codes and used in either a narrow or full shift configuration.

The internal high level loop supply is strappable for 60 or 20 mils operation. EIA, MIL and TTL FSK outputs are available simultaneously.

Signal and propagation analysis is provided by a 2 inch AM CRT cross display, whose intensity is automatically adjusted to the ambient light level by a front panel light sensor.

LEDs monitor the status of the high level loop, the Mark and Space channels, the Memory section and the TD Inhibit and Signal Loss circuits.

The automatic Markhold Threshold may be manually controlled for optimum copy of signals buried in noise.

The variable tone channels are CONTINUOUSLY tuneable from 1200 Hz to 3100 Hz and the front panel VFOs are calibrated at the most commonly used tone frequencies.

An isolated and balanced 600 ohm input is provided for easy interfacing and all system functions are remoted to the rear panel.

CMOS digital circuits in the Multipath Corrector and Regenerator section guarantee high immunity to noise pulses associated with local teleprinters.

Designed for 50 to 400 Hz operation, the MPC-1000R carries a one-year warranty on land, sea or in the air.

An inquiry on your letterhead or QSL will bring all the other features and complete specifications, or call 213-682-3705.



627 Fremont Ave., South Pasadena 91030

MPC-1000R  
Amateur: \$745.00 CIA

MPC-1000R  
Commercial: \$995.00\*

\*OEM discounts available

Specifications and prices subject to change without notice.



# License Renewal Information

- 1) Apply on FCC form 610 and attach the original or a photocopy of your license — a copy is preferable from the amateur's standpoint. FCC form 610 can be obtained from any District FCC Office or from ARRL headquarters (s.a.s.e. PLEASE!).
- 2) Include the proper fees. The fee schedule for the Amateur Radio Service, effective March 1, 1975, is as follows: (1) Initial license, renewal, new class of operator license, \$4; (2) Modification of license without renewal, \$3; (3) Modification of license with renewal, \$4; Special call sign, plus any other applicable fee, \$25; (5) Duplicate station license, \$2.
- 3) Mail completed form 610, photocopy of license and proper fee to FCC, Box 1020, Gettysburg, PA 17325.
- 4) Retain all cashed checks (and copies of everything, if possible) as proof of filing before expiration. If you file before the expiration date of the license, you may continue to operate beyond the expiration

date and until the new license arrives. After expiration there is a one-year grace period in which you may renew your license without retesting; however, you must wait until the new license arrives to operate. After the one-year grace period expires, the tests must be taken again. Under normal, uncomplicated circumstances, application should be made approximately 90 days before expiration; however, renewal can be applied for at any time during the term of the license.

5) There are some pitfalls that will result in a long delay. They can all be avoided by reading the instruction sheet of form 610 carefully. For instance, you must specify a station location by whatever means necessary to locate it. If you receive your mail General Delivery, you might want to draw a map giving landmarks. If you check the yes box in the question relating to a criminal record, then you must prepare a statement giving certain details for each conviction. Five minutes spent reading form 610 could save up to five months of useless waiting. Do not forget

to sign and date the application.

6) Some cases may not be simple and straightforward. If, after having read this material, the instruction sheet for form 610, and the 610 itself, you are still uncertain of what to do, then please drop a note to the Membership Services Department, ARRL, including an outline of your problem and a daytime telephone number if possible.

7) There seems to be some confusion over the difference between the mailing address and the station location. They do not have to be the same. If both are the same, you still must fill in both spaces and the station location must be a geographically identifiable spot and not a box number. The mailing address is the one to which the FCC will send official mail and it is the one that will be listed in the *Callbook*. The station location is where you will be setting up a fixed station — its location will determine the call sign given.

8) For repeater licensing information, write ARRL headquarters.

# U.S. Amateur Frequency and Mode Allocations

**Power Limits:** All U.S. amateurs are limited to 250-watts dc input in the Novice segments. On all other segments, with certain exceptions in the 160-meter and 420-MHz bands, one-kilowatt dc input is permitted. At all times the power level should be kept down to that necessary to maintain communications. (revised as of July 23, 1976)

## BANDWIDTH LIMITATIONS

**FREQUENCY (OR PHASE) MODULATION:** On frequencies below 29.0 MHz and between 50.1 and 52.5 MHz the bandwidth of F3 emission shall not exceed that of an A3

emission having the same audio characteristics.

**TELEVISION:** On frequencies below 50 MHz, the bandwidth of A5 and F5 emissions

shall not exceed that of an A3 single sideband emission. Between 50 and 225 MHz, single sideband or double sideband A5 may be used and the bandwidth shall not exceed that of an A3 single sideband or double sideband signal respectively. The bandwidth of F5 emission shall not exceed that of an A3 single sideband emission. Below 225 MHz, A3 and A5 emissions may be used simultaneously on the same carrier frequency provided the total bandwidth does not exceed that of an A3 double sideband emission.

**RTTY:** When using frequency-shift keying, the shift shall be less than 900 Hz. With audio frequency-shift keying, the highest fundamental modulating frequency shall not exceed 3000 Hz and the audio frequency shift shall be less than 900 Hz.

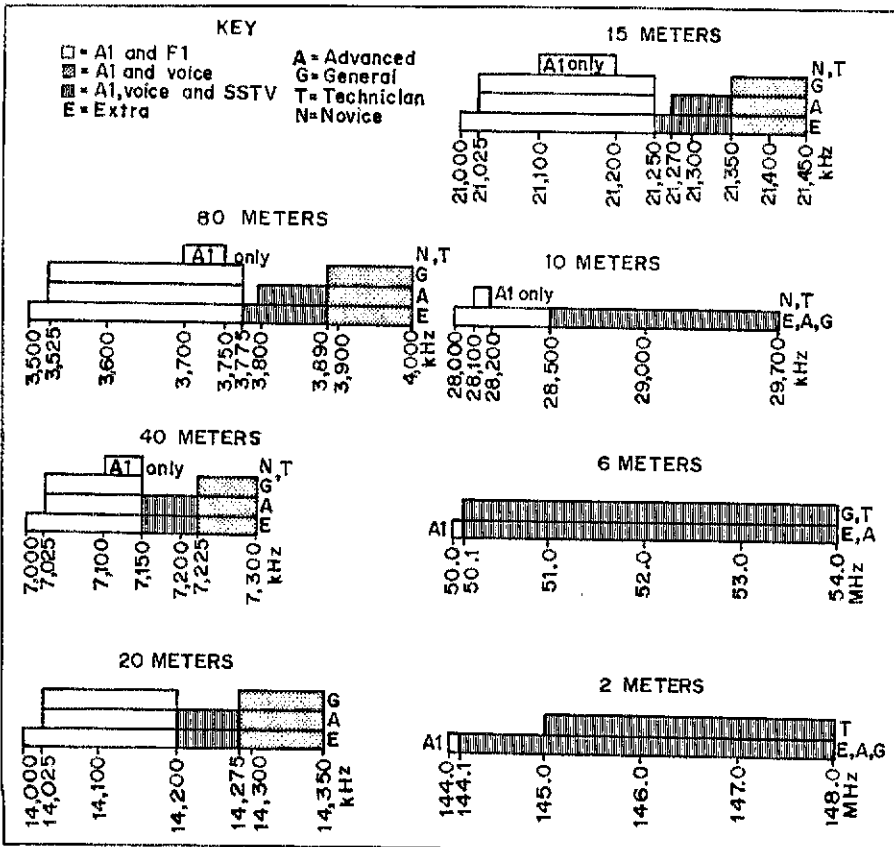
**ALL MODES:** The carrier frequency plus modulating frequencies must be contained within amateur allocations and within appropriate subbands.

**NOTE:** Some amateur bands are shared with other services. Some geographical limitations exist for the 220- and 420-MHz bands. For details, and for information on specialized modes, see *ARRL License Manual*. For information on repeaters, see *License Manual* and *Repeater Directory*.

**160 METERS:** Extra, Advanced and General may use some segments at 1.8-2.0 MHz. Limitations are on a geographical basis; see *License Manual* or request form S15A from ARRL hq.

Other — All modes except as noted.  
Extra, Advanced, General, Technician.

MHz	GHZ (1 GHz - 1000 MHz)
220 - 225*	10.0 - 10.5*
420 - 450*	24.0 - 24.25
1215 - 1300*	48.0 - 50.0
2300 - 2450	71.0 - 76.0
3300 - 3500	165.0 - 170.0
5650 - 5925	240.0 - 250.0
*Pulse not permitted	All above 300





## MAJOR ARRL OPERATING EVENTS AND CONVENTIONS — 1977



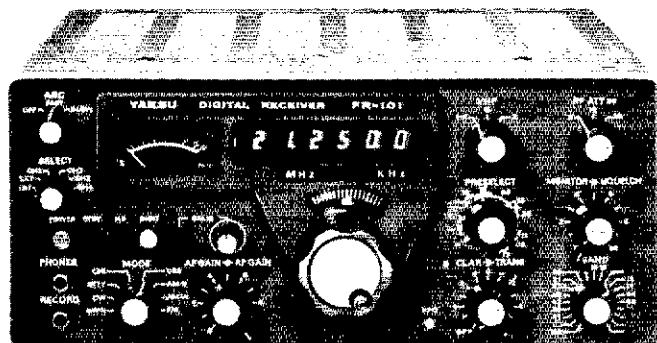
(The month shown indicates the issue of *QST* carrying contest rules. Check *QST* monthly for updates.)

JANUARY	FEBRUARY	MARCH	APRIL
<p>1 SKN (Dec.)</p> <p>4 West Coast Qual. Run</p> <p>6-9 SAROC, Las Vegas</p> <p>8-9 VHF SS (Dec.)</p> <p>10 W1AW Qual. Run</p> <p>15-16 CD Party, cw</p> <p>22-23 CD Party, phone</p> <p style="padding-left: 20px;"><i>FL State Conv., Miami</i></p> <p>29-30 SET (Dec.)</p>	<p>2 West Coast Qual. Run</p> <p>4-6 DX Competition, phone (Dec.)</p> <p>4-13 Novice Roundup (Jan.)</p> <p>12 FMT (Jan.)</p> <p>12-13 SE Div. Conv., Orlando</p> <p>15 W1AW Qual. Run</p> <p>18-20 DX Competition, cw (Dec.)</p>	<p>1 West Coast Qual. Run</p> <p>4-6 DX Competition, phone (Dec.)</p> <p>16 W1AW Qual. Run</p> <p>18-20 DX Competition, cw (Dec.)</p> <p style="padding-left: 20px;"><i>Vero Beach Hamfest, FL</i></p> <p style="padding-left: 20px;"><i>Ft. Walton Beach Hamfest, FL</i></p> <p>21 W1AW Morning Qual. Run</p>	<p>6 West Coast Qual. Run</p> <p>14 W1AW Qual. Run</p> <p>16-17 CD Party, cw</p> <p>23-24 CD Party, phone</p> <p>24 W1AW Special Qual. Run</p> <p>30-May 1 Dayton Hamvention</p>
MAY	JUNE	JULY	AUGUST
<p>3 West Coast Qual. Run</p> <p>13 FMT (Apr.)</p> <p>16 W1AW Qual. Run</p> <p>21-22 NY State Conv., Rochester</p> <p style="padding-left: 20px;"><i>WI State Conv., Lake Delton</i></p> <p>28-29 Durhamfest, NC</p> <p style="padding-left: 20px;"><i>TN State Conv., Knoxville</i></p>	<p>1 West Coast Qual. Run</p> <p>3-5 National Conv., Toronto</p> <p>5 Starved Rock RC Hamfest, Princeton, IL</p> <p>11-12 VHF OSO Party (May)</p> <p>12 Six Meter Club of Chicago Hamfest, Willow Spring, IL</p> <p>14 W1AW Qual. Run (+40 wpm)</p> <p>18-19 GA State/Atlanta Hamfestival</p> <p>19-25 Amateur Radio Week</p> <p>22 W1AW Morning Qual. Run</p> <p>25-26 Field Day (May)</p>	<p>4 SKN (June)</p> <p>WV State Conv., Jackson's Mill</p> <p>5 West Coast Qual. Run</p> <p>9-10 IARU Radiosport Championship (June)</p> <p style="padding-left: 20px;"><i>Roanoke Div. Conv., Norfolk</i></p> <p>10 Indianapolis Hamfest</p> <p>13 W1AW Qual. Run</p> <p>16-17 West Gulf Div. Conv., Austin</p> <p style="padding-left: 20px;"><i>Western Carolina Hamfest, Asheville</i></p> <p>30-31 NW Div. Conv., Seattle</p> <p style="padding-left: 20px;"><i>Communications Expo '77 Hamfest, Greensboro, NC</i></p>	<p>3 West Coast Qual. Run</p> <p>14 Hamfesters Radio Club Hamfest, Willow Spring, IL</p> <p>18 W1AW Qual. Run</p> <p>27-28 Radio Expo, Chicago</p>
SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
<p>6 West Coast Qual. Run (+40 wpm)</p> <p>10-11 VHF OSO Party (Aug.)</p> <p style="padding-left: 20px;"><i>Meibourne, FL Hamfest</i></p> <p>12 W1AW Qual. Run</p> <p>17 FMT (Aug.)</p> <p>20 W1AW Morning Qual. Run</p> <p>23-25 NE Div. Conv., Hartford</p>	<p>1-2 "Open" CD Party, cw (Sept.)</p> <p>5 West Coast Qual. Run</p> <p>8-9 Midwest Div. Conv., Wichita</p> <p style="padding-left: 20px;"><i>SW Div. Conv., Santa Maria</i></p> <p>15-16 "Open" CD Party, phone (Sept.)</p> <p>18 W1AW Qual. Run</p> <p>23 W1AW Special Qual. Run</p>	<p>1 West Coast Qual. Run</p> <p>4 FMT (Oct.)</p> <p>5-6 Sweepstakes, cw (Oct.)</p> <p>16 W1AW Qual. Run</p> <p>19-20 Sweepstakes, phone (Oct.)</p>	<p>3-4 160-Meter Contest (Nov.)</p> <p>7 West Coast Qual. Run</p> <p>10-11 10-Meter Contest (Nov.)</p> <p>15 W1AW Qual. Run (+40 wpm)</p> <p>28 W1AW Morning Qual. Run</p> <p>31 SKN (Dec.)</p>

# YAESU Deluxe "101" Series The Ultimate Station Combination



FL-101 Transmitter



FR-101 Digital Readout Receiver

- 160 thru 10 Meter coverage with two auxiliary bands
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- Reliable, plug-in circuit boards
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- Built-in, fully adjustable VOX
- Automatic break-in CW operation with sidetone
- Indicator light for internal VFO operation
- Provision for optional RF speech processor

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- Many, many more super features found only in receivers at three times its price! See at your dealer, or write us for brochure



FRG-7 Receiver



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