When Hallicrafters says "dual receive" we mean SIMULTANEOUSLY! SIMULTANEOUSLY!

That's right—*simultaneous dual receive*! Unlike any other transceiver/VFO combination, the SR-400 Cyclone and HA-20 VFO lets you "Double-Team" the competition in any DX contest. You can "Band-Scan" for a second contact while you are working another. You can set VFO's on two separate DX stations, receive both simultaneously, and be instantly ready to "Tail-End" on either station. And of course, Hallicrafters' winning performance features don't stop here. Get in front of this rig and you'll know. Hallicrafters has built another "great one" in the fine tradition of the HT-32 and HT-37.


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A Subsidiary of Northrop Corporation
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The Only
Microphone
With
Backbone!

The backbone of the Electro-Voice Model 676 is no mere decoration. It's visible proof of the most exciting idea in directional microphones—Continuously Variable-D (CV-D)™.

Here's how it works. We attach a very special tapered tube to the back of the microphone element. This tube automatically varies in effective length with frequency. It's a long tube for lows—a short tube for highs. All this with no moving parts! The tube is always optimum length to most effectively cancel sound arriving from the back of the microphone, regardless of frequency.

This ingenious solution* is years ahead of the common fixed-path design found in most cardioid microphones. It means you pick up less noise and room reverberation, ensuring a crisp signal and optimum vox performance. It also is less sensitive to wind and shock—ideal for field days! There is almost no "proximity effect"... no boosted bass when you must operate extra close.

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But that's not all. The 676 has an exclusive bass control switch built in. Choose flat response (from 40 to 15,000 cps) or tilt off bass 5 or 10 db at 100 cps to eliminate power-robbing lows that reduce efficiency and lower intelligibility. You'll be amazed at the reports of improved audio you'll get when you switch to the E-V 676.

Visit your E-V distributor to see this remarkable new microphone today. And when QRM must be faced squarely, stand up and fight back with the microphone with a backbone (and CV-D)—the new Electro-Voice Model 676 dynamic cardioid!

Model 676 Satin Chrome or TV gray, $99.00 list; in Gold, $94.65 list. Showed on Model 490 Desk Stand, $21.00 list. Model 674 identical except stud-mounted with On-Off switch, $99.00 list. (Less normal trade discounts.)

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Dept. 11820, 631 Cecil Street
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Switch on the DL-1 Dummy Load and tune up; switch it off and operate. No need to unplug. Control the dummy antenna load with a front panel switch or remote control.

All the voltages required for the 32S-3 Transmitter or KWM-2 Transceiver are supplied by the 516F-2 AC Power Supply.

Fixed station, portable or mobile, Collins has a complete line of system components to put more enjoyment into ham radio. And all components, including the power supply, are styled with S-Line eye appeal.
NOVEMBER 1968
VOLUME LII NUMBER 11

PUBLISHED MONTHLY, AS ITS OFFICIAL ORGAN, BY THE
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OFFICIAL ORGAN OF THE INTERNATIONAL AMATEUR RADIO UNION

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It is an incorporated association with 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 essential qualification; ownership of a transmitting station and knowledge of its mode are not prerequisite, although full voting membership is granted to licensed amateurs.

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+Member Executive Committee
"It Seems to Us..."

NOVEMBER TWENTY-SECOND

This is an important date for you to remember.

On this date in 1880, Lillian Russell made her debut.

On this date in 1906, the International Radio Conference meeting in Berlin adopted "SOS" as the international distress signal.

On this date in 1930 radio fans in England heard their first football game by means of a transatlantic broadcast.

On this date in 1935 the China Clipper left on the first official transpacific airmail flight.

And on this date in 1968 amateur radio returns to a system of incentive licensing which was abandoned some fifteen years ago.

We're sure that none of the November 22 historical events occurred without a lot of work and perhaps a few false starts. There certainly has been a lot of work expended in getting incentive licensing back into the amateur radio picture, but let's hope that there are as few false starts as possible when November 22 rolls around.

We must emphasize again that incentive licensing is not new to amateur radio, but because it was in limbo so long it is new to many present-day amateurs. Thus, in effect, we are entering a new era. We are entering an era where there will be divided bands. Small segments are being set aside, in the first step, for exclusive use by holders of the higher classes of license. The basic philosophy behind this system of incentive licensing is to provide a challenge, and added satisfaction for the individual amateur.

With greater skills, the amateur service as a whole will better demonstrate its worth as one of the thirty-eight services competing for spectrum space, and will thus have a better chance of continuing government support for retention of present amateur frequency allocations at any future frequency conference.

Incentive licensing will work best if, in the months ahead, the segments reserved for the Extra and Advanced Class operators show greater and greater occupancy. You can bet that the amateur fraternity as a whole and the FCC staff will be keeping a watchful eye on those segments to see what activity takes place, and to note the growth trends.

You can also bet that the FCC's monitoring stations will be keeping an ear on these new band segments to check unauthorized operation. As originally proposed, the various classes of license were to have distinctive call signs, and it would have been easy to spot a non-Extra working in an Extra segment. But the Commission abandoned the concept of distinctive call signs, and such transgressions, whether deliberate or accidental, will be slightly more difficult to spot. However, each FCC monitoring station has access to central FCC records giving the operator class of each licensee. In addition there is the wide availability of the *Radio Amateur Call Book Magazine*, which shows the license class of each listed amateur. We can thus accomplish a considerable amount of "policing" on our own—remembering, of course, that there can be errors in the *Callbook*.

What happens on November 22 will not, alone and of itself, be the basis for judging the wisdom of returning to the tried-and-true course; it will take some months of experience and evaluation to conclude with any assurance that the program is or is not working. But it is the kickoff date—as notable as the happy November 15, 1945, postwar return of the first ham bands.

We have returned to incentive licensing as one of a number of ways to strengthen amateur radio and give a renewed sense of accomplishment. November 22, 1968, is an important date—we believe it will become in retrospect a good day for us all.
League Lines...

The magic number this month is twenty (20) -- not meters, but kc./kHz from the low end of each band or subband for new W1AW code-practice and bulletin frequencies. Same times, same station, but effective October 27 with the return of standard time the spots to listen for voice bulletins are 1820, 3820, 7220, 14220, 21270, 28520, 50120 and 144120; for c.w. bulletins and code practice, 1820, 3520, 7020, 14020, 21020, 28020, 50020 and 144120. No change for RTTY, or for general ragchewing freqs.

By the time you read this, lapel pins for 25 and 50 years of continuous membership will have been mailed to more than 500 on our roster. Likewise, lapel pins are being mailed to all Life Members -- about the same number. Sorry for the delay, gang, but production of anything seems to take much longer these days than anticipated.

Hope you like the handy-dandy tearout chart, page 64A, to place on the shack wall or under the desk glass as an easy reference on the new regs. We'll probably have another one next year with the 1969-effective rules similarly charted.

One thing to note -- c.w. in the new restricted voice segments is limited to the proper license class; this differs from the years-ago system of incentive licensing where c.w. by any ham was legitimate in the old "Class A" bands.

By now all Full Members in the Central, Hudson, New England, Northwestern, Rocky Mountain, Southwestern and West Gulf Divisions should have received ballots in the current director elections. If yours has not arrived, write the Secretary. Be sure to get 'em marked with the candidate of your choice and back to Hq. by November 20 at the latest for the tellers' count.

Two advisory (to the Board and staff) committees are in process of formation -- one on VHF Repeaters, a second on Contests -- to provide new channels for close and effective member-management relationships in League affairs, and to tap additional sources of expertise among the membership. See page 70 for details, and tell us of candidates ideally suited for either group. This is a test project, and its success will encourage the formation of similar committees in other specialty areas.

A number of amateurs regularly provide gift ARRL memberships at Christmastime -- in some cases to young relatives or friends who are budding hams; in others, to handicapped or overseas amateurs. If the idea strikes you favorably but you don't know personally of a suitable recipient, Hq. keeps a list and can allocate your gift to a worthy case.

A recent Army MARS bulletin cites the need for continuing justification by amateurs of present bands, and the objectives of ARRL and IARU in fostering and promoting public service. It ends, "Those who value amateur radio, desire to insure its future and want a strong and capable spokesman will not only join and promote League membership but strive to assist in accomplishing its objectives."

We get "Where's my QST?" complaints from all over, but never from San Rafael, Ca. Maybe it's because WA6AUD is Postmaster!

10  QST for
A Transceiving Converter For "160"

BY DOUG DEMAW,* W1CER

There is a good chance that the reader has been wanting to try his hand at "top-band" operation now that the privileges on 1.8 MHz have been expanded. Also, since s.s.b. operation has become legal on the 160-meter band, existing equipment can be placed in operation to enable the user to visit this interesting band.

For quite some time it has been practical to generate s.s.b. signals in the v.h.f. and u.h.f. regions of the spectrum by using transmitting converters in combination with an existing 14- or 28-MHz s.s.b. transmitter. The low-band transmitter signal is taken at low power (usually under 5 watts) and mixed with a crystal-controlled oscillator signal to produce the desired sum frequency, e.g., a 14-MHz s.s.b. signal is beat with a crystal-controlled 130-MHz signal to produce 141-MHz s.s.b. energy. Getting from the 75-meter band to 1.8 MHz can be done in a like manner by using the difference frequency of a 5800-kHz crystal-controlled oscillator and that of a 3.8-MHz s.s.b. transceiver. This combination results in a frequency of 2000 kHz. Moving the transceiver's frequency to 4.0 MHz results in a difference frequency of 1.8 MHz, the low end of the 160-meter band. This method is used with the simple 3-tube circuit described here. Receiving is handled in the same manner, beating the incoming 1.8-MHz signal with the 5800-kHz energy to produce an i.f. of 4 MHz, thus utilizing the 75-meter transceiver's receiver section for listening to the 160-meter signals.

Circuit Data

Looking at the circuit of Fig. 1, $V_{1A}$ operates as a crystal-controlled oscillator to produce a 5800-kHz local-oscillator signal for transmitting and receiving. This stage operates continuously. Output from $V_{1A}$ is fed to the transmitting mixer, $V_{1B}$, and to the receiving mixer, $V_3$. $V_{1B}$ is turned off by means of $K_{1C}$, the changeover relay, during receive. During transmit, 3.5-MHz s.s.b. or c.w. energy is supplied to the cathode of $V_{1B}$, across a 470-ohm resistor. This is mixed with the 5800-kHz local-oscillator output at $V_{1A}$ and results in a 160-meter signal at the output of $V_{1B}$. A high-Q tuned circuit couples the mixer output to the grid of the power amplifier, $V_2$. The 6L46B p.a. stage amplifies the 1.8-MHz signal input power is approximately 35 watts p.e.p.

During receive the local-oscillator energy is fed to the receiving mixer grid ($V_2$) and beats with the incoming 160-meter signal to produce a receiving i.f. of 3.5 to ± 4 MHz, depending upon the dial setting of the 75-meter transceiver. Output from the mixer is routed to the transceiver through $K_{1A}$ and $J_1$. During transmit, $V_3$ is turned off by $K_{1C}$. A double-tuned high-Q input circuit is used at $V_3$ to reduce images, and to lessen the chances of front-end overload from strong local h.c. stations. A band-pass tuned circuit is used at the output of $V_2$ to assure that only the desired i.f. signal reaches the input of the 75-meter transceiver.

Straitforward design is used in the power supply. The 6.3- and 5-volt windings of $T_1$ are series-connected to provide approximately 12 volts for the relay, $K_1$. They must be phased properly to prevent cancellation of the voltages. If no output is obtained, merely reverse one of the windings. The 12 volts a.c. is rectified by $CR_8$ to provide d.c. voltage for $K_1$.

Bias voltage is obtained for $V_2$ by connecting a small 6.3-volt filament transformer back-to-back fashion with the 6.3-volt winding of $T_1$. The 125-volt a.c. output from $T_2$ is rectified and filtered, then routed to $K_1$, the bias-adjust control. It is set to establish a resting plate current of 25 mA. for $V_2$.

* Assistant Technical Editor, QST.

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The metering circuit reads plate current — 200 ma. full scale — by measuring the voltage drop across a 10-ohm 5-percent resistor, R2. The 200-ohm 5-percent metering resistor, R3, provides a full-scale meter reading of 2 volts, corresponding to 200 ma. of current flow through R1. M1 is a 0 to 1-ma. instrument. It reads relative r.f. output voltage when S1 is switched to a r.f. A resistive divider is connected to the output line of the p.a. stage and CR1 rectifies the r.f. which appears at the junction of the two resistors. A 22,000-ohm "linearizing" resistor helps to make the meter respond more uniformly to changes in r.f. voltage. If greater accuracy is desired for the plate-metering circuit, 1-percent resistors can be used at R2 and R3, though the 5-percent resistors should be suitable for this application.

A probe-type neutralizing circuit is used at V2. C5 is actually a stiff piece of bus wire, three inches in length, which is fed through the chassis by means of an insulating bushing. The wire is placed adjacent to the tube's anode, and is in the same plane as the anode. It is moved to and from the tube envelope to vary the capacitance between it and the tube plate. Adjustment of C2 is discussed later.

Construction

An aluminum chassis which measures 12 X 8 X 2½ inches is used as the base for this equipment. A home-made panel and cabinet is used to enclose the unit. The panel is 8 inches high and is 12 inches wide. The top cover is fashioned from perforated aluminum material which was obtained from the hardware store (Reynolds aluminum).

The layout should be apparent from the accompanying photographs. All long runs of r.f. wiring should be made with subminiature coax cable (RG-174/U), grounding the shield braid at each end of the cable.

Checkout and Tune Up

Some provision should be made to reduce the power output of the 75-meter transceiver to be used with this equipment. No more than 5 watts of drive should be necessary; too much drive can damage V1. Approximately 30 r.f. volts will appear between the transmitting mixer cathode and ground when normal 3.8-MHz. drive is applied. Some transceivers are capable of supplying sufficient output on 3.8 MHz, by removing the screen voltage from the p.a. stage. Or, it may be practical to disable the p.a. and borrow some output from the driver stage by means of link coupling. The stout-of-heart may wish to merely turn down the speech gain of the transceiver until the desired power level is reached. This method was used in the A1RL lab while working with a KWM-2, but could lead to disaster if the audio level was inadvertently turned up beyond the desired point.

Before testing the 100-meter unit, make sure that the changeover relay, K1, is connected to the remote keying terminals of the 75-meter equipment by means of J3. Then, connect a 160-meter

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Page 13
Looking into the top of the transceivers, the power supply is at the lower right. Directly ahead of the power transformer is the receiving mixer, V3, and its tuning capacitor, C5. V1 is to the left of V3, just ahead of the filter capacitor. The p.a. section of the unit is at the upper left. C7 is below the chassis, directly under C4. C8, the neutralizing wire, is covered in spaghetti tubing and is visible adjacent to the 6146B tube. Relay K1 is at the lower left.

antenna to J2 and listen for 160-meter signals, atmospheric noise, or Loran pulses. Peak the incoming signal by means of C6. For reception on the low end of the 160-meter band, C6 should be almost fully meshed. The slugs of L4 and L5 should then be adjusted for best signal response. When receiving near the high end of the band, C6 should be near midrange. Coils L6 and L7 form a bandpass circuit and should be stagger-tuned to give uniform response across any desired segment of the 160-meter band, e.g., 1800 to 1900 kHz, or 1900 to 2000 kHz. If the receiving section is performing properly, one should be able to copy a 0.3-μV c.w. signal without difficulty in areas where minimum atmospheric and man-made noise levels prevail. Ordinarily, however, noise levels prevent such weak-signal reception. If no signals can be heard, check V2A to make certain it is working properly. The 5800-kHz. signal can be monitored on a general-coverage receiver to determine if the oscillator is operating.

Attach a 50-ohm dummy load to J2 before testing the transmitter section of the equipment. Set R7 for a resting plate current of 25 ma, for V2. This adjustment should be made without drive applied at J1, but with K1 energized. Next, apply approximately 2 watts of 3.8-MHz. (carrier)

(Continued on page 164)
Direct Conversion
A Neglected Technique

BY WES HAYWARD,* W7ZOL AND DICK BINGHAM,** W7WKR

An amateur activity of increasing popularity is the construction of small, compact equipment for portable operation. Certainly a review of recent amateur literature will reveal significant interest in rigs of the pocket or rucksack variety. Although the construction of a simple solid-state transmitter with an input of a few watts presents no obstacles to the experimenter with minimal experience, the fabrication of a suitable companion receiver does impose some problems. The portable receivers typically in use are of the regenerative type, the regenerative superhet, or a tunable converter operated ahead of a broadcast band superhet. While all of these techniques have the distinct advantage of simplicity, the results obtained are frequently less than optimum, especially when strong signals are encountered.

Another approach to the portable receiver design problem is the direct conversion technique. Basically the direct conversion method involves the applying of the desired r.f. signal and a local oscillator signal to a product detector. The beating of the two signals produces an audio-frequency signal which needs only further amplification in order to be heard.

Examination of the detection process reveals that the true product detector is a linear device. Its output amplitude is nearly proportional to the input signal for all signals of small amplitude as compared to the b.f.o. signal. In any linear system selectivity may be obtained at either a.f. or r.f. In this case the receiver’s selectivity was obtained at audio frequencies by a low-pass filter which is used to eliminate all frequency components above a specified cutoff (about 2 kHz). A simple, high-gain audio amplifier following the audio filter completes the receiver.

A direct conversion receiver of this kind was described by White in 1961. However, this receiver used several tubes, including an r.f. amplifier, and was just about as complicated as a small superhet. By utilizing the high quality, inexpensive semiconductors currently available to the amateur, the basic performance of White’s receiver is achieved with a much simpler circuit.

The unit built by the authors is shown schematically in Fig. 1. It operates in the 3.5-MHz band. This receiver was designed for simplicity and ease of duplication rather than for ultimate performance. Nonetheless, this unit in many ways outperforms many of the less-expensive commercial receivers on the market today.

The antenna is coupled directly to the product detector through a single tuned circuit. With the component values shown, either the 3.5-MHz or 7-MHz band may be tuned. Following the input tuned circuit is the heart of the receiver, a product detector. It consists of four diodes operating in a ring configuration as a double balanced mixer. While typical junction diodes can be used in this circuit, the hot-carrier diodes used by the authors are strongly preferred.

*Display Device Development, Tektronix, Inc., P.O. Box 560, Beaverton, Oregon 97005.
**9021 W. Shorewood Drive, Mercer Island, Washington 98040.


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Fig. 1—Schematic diagram of direct conversion receiver. The 0.01-µf. capacitor is disk ceramic. The 0.1- and 0.5-µf. capacitors are paper or mylar. Polarized capacitors are 15-volt electrolytic. Fixed resistors are ½-watt carbon.

BT—9-volt transistor radio battery.
C₁—365-pf. variable (r.f. variety).
C₃—470-pf. silver mica for 3.5 MHz, 120-pf. silver mica for 7 MHz.
C₄—140-pf. variable for 3.5 MHz, 40-pf. variable for 7 MHz.
C₅—680-pf. silver mica.
CR₁—See text footnote.
J₁, J₂—Insulated banana jacks.
J₃—Phone jack.
L₅, L₆—3-turn link, No. 28 enameled wire, wound on L₅.

Construction

The method of construction of the receiver is not critical with the exception that the local oscillator should be isolated from the rest of the circuit and the high gain of the audio amplifier should be respected.

The receiver is built on a 5 × 7 × 2-inch aluminum chassis. A 6 × 5-inch piece of aluminum is used for the front panel. The authors used a 2½-inch-diameter imported vernier dial although any suitable dial may be employed. The component layout used in the version shown in the photographs is conservative and should be generally followed. Considerable miniaturization is possible if the builder so desires.

Fig. 2—Proper method of winding toroidal transformers, T₁ and T₃.
The oscillator components are mounted on a single circuit board. The FET is hidden below the tuning capacitor, C. Note that the output from L4 is taken through a shielded cable. The insulated shaft coupling shown is a Johnson type 250.

The transformers T1 and T2 are easily fabricated on small toroidal coil forms with reference to the sketch in Fig. 2. Three pieces of No. 28 enameled wire are held together and wound trillarily on each toroid. Fifteen turns are adequate. After winding, the leads are trimmed to about an inch in length and the enamel is removed. Then, using an ohmmeter, the beginning and end of each of the three windings is identified (A, B, C). Winding A is used as the low impedance winding. The beginning of winding B is connected to the end of winding C, providing the center tap for the bifilar high-impedance winding.

Performance

The performance of this receiver is surprisingly good. Sensitivity is adequate and c.w. signals of less than a microvolt may be copied. Stability is superb. The bandwidth is a little broad, but entirely adequate for casual work on the 3.5-MHz band. Several 3.5-MHz, Asian

(Continued on page 159)

1 Approximately 7/16-inch diameter. A kit of two suitable toroids is available for $1.00, postpaid, from Alcom Electronics, 2535 Middlefield Road, Mountain View, California, 94040.
The “MOBILOOP”

--An Improved Multi-band Mobile Antenna System

BY JAMES E. TAYLOR,* W2OZH

Previous designs of low-frequency mobile antennas have emphasized the desirability of decreasing the losses in conventional center-loaded whip antennas. This consideration is of paramount importance because of the extremely small radiation resistance displayed by such antennas. Recent application of loop antennas for fixed-station use reemphasize the importance of loss reduction.

The basic concept of the center-loaded whip antenna can be readily extended to a true loop configuration by feeding at the front bumper of the car, extending the antenna from this point in an arch above the car, and terminating this radiating section with a series-connected coil and tuning capacitor mounted on the rear bumper.

Such an arrangement leaves two primary sources of annoyance: (a) losses in the coil itself; (b) the high r.f. voltages and restriction of bandwidth which result from the relatively high Q of the system.

An obvious direction of development is to reduce the coil inductance still further, thereby reducing its loss and, at the same time, reducing the reactance of the tuning capacitor. This, in turn, will reduce the r.f. voltage across the capacitor—also desirable.

At this point, a logical step suggests itself: Since the loop antenna is inductive, why not eliminate the coil entirely?³

The final arrangement of this system for 75 meters is shown in the sketch, Fig. 1, and in the photograph. Here, it will be seen, the coil is eliminated; we have increased the tuning capacitance (resonance at approximately 80 pf.⁴), and we have further reduced losses in the vertical sections by covering with copper shielding braid, a la W2LBB, which provides lower a.c. resistance. This is now basically a low-impedance system at the drive point, and it was necessary to increase the matching capacitor to 2800 pf. in order to obtain 1:1 s.w.r. indication in the coax line to the transceiver, and thus optimum power transfer.

A tuning capacitor having moderate spacing (about 1/16 inch) is adequate. For direct comparison of antenna current, a relic of “the good old daze” has been exhumed—namely, the

³ Webster, “Mobile Loop Antennas”, QST, June, 1934; also, Mitchell, “Loop-Type Antennas for 75-Meter Mobile”, QST, February, 1931.

⁴ This value agrees reasonably well with that computed for resonating the loop, assuming it to comprise a simple one-turn coil.
Fig. 1—The "Mobiloop" schematic. The "A" sections are standard mobile mast sections. "B" sections are 102-inch Citizens’ Band whips with top ends overlapped 3 inches, wrapped with No. 18 copper welding wire, and soldered. C₀, built up from mica capacitors, is adjusted for matching 50-ohm coax with C₀, a neutralizing-type capacitor, adjusted to resonate the system. For minimum loss, the car body should be securely bonded to both ends of both bumpers and to the chassis.

flashlight bulb. This bulb, when shunted across approximately three inches of the antenna near the feed point, indicates, by its brightness, r.f. current in the antenna. A more valid or less expensive indicator is hard to come by!

**Performance**

Reliable comparative tests of low-frequency mobile antenna systems are rather complicated, due to the variability of propagation conditions with reference to angle of radiation and polarization effects.

The Mobiloop system has performed better than all previous configurations tried. Signal reports in comparison with a center-loaded whip typically favor the new antenna by several S-units. Numerous comparative reports have been obtained where the signal using the Mobiloop has been compared with that using a good 75-meter half-wave dipole. A coax switch was used to change antennas quickly. These comparisons have included operation at night—a time when 75-meter mobile results are, at best, marginal. The results favor the dipole, but typically only by a couple of S-units, despite the fact that the mobile antenna was on the car in the garage!

Mobiloop operating results more than compensate for the aspersions cast because of the nonconventional appearance of the system. The system has now been road-tested on trips covering several thousand miles with consistently superlative results.

A note should be added concerning ignition noise with the loop antenna systems. One might expect that since the receiving sensitivity compared with the simple loaded whip has been increased, the ignition noise level would be similarly increased. Actually, the increase has been smaller than expected. It is surmised that this can be attributed to the known sensi-

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**Strays**

**Stolen Equipment**

A Swan 350 Transceiver Serial No. 685559 was stolen the night of August 16 from a locked car parked in an underground garage at a motel in New Haven, Conn. Please notify P. F. Willingham, WA4EWC, 2543 Warwick Rd., Winston-Salem, N. C. 27104.

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

Providing 2-meter t.m. communications for the six-hour, 15,000-strong Shriner's parade earned Chicago hams accolades from Medinah Temple. Amateurs at 14 locations along the line of march kept the marshal, medical staff and participants in touch and on schedule. Here WA9PYG and K9DOT "man" the control booth during a rehearsal. Others participating were WA9KT, K9AF, W9HEP, W9QKE, K9QJI, W9BNZ, W9HPG, K9BPO, W9KK, K9AZB, K9MRY, W9YLB, W9PPS, K9DQU and W9PKJ.
Absorptive Filter for TV Harmonics

* AND A NOVEL FILTER CONSTRUCTION TECHNIQUE

BY RICHARD WEINREICH,* K5UVU and R. W. CARROLL**

Although the antenna load on a TVI filter usually can be adjusted to match the filter characteristic impedance at the operating frequency, the termination in the stop band is subject to wide variations and usually is unpredictable. The result is that the theoretical attenuation of a filter often isn’t realized in practice. The solution: a high-pass/low-pass circuit arrangement that offers the filter a constant load throughout the stop-band.

Contemporary commercial and military h.f. transmitter specifications often include a requirement for extremely-low radiated-harmonic power. Prior to about 1963 standard procedure was to add a “garden-variety” L-C low-pass filter, but this expedient often gave disappointingly small harmonic reduction. (Indeed, in some cases, certain harmonics would actually become worse!) Fortunately, this problem has come to be understood in recent years, and a discussion of it and its solution follows.

Most low-pass filters are designed to be driven from a purely resistive source impedance and loaded into a resistive termination. The typical transmitter output impedance is resistive only at the frequency to which the transmitter is tuned and is highly reactive at harmonic frequencies. It is quite possible that the transmitter reactance will partially or (in especially unfortunate instances) wholly cancel the filter input reactance at one or more harmonics of the transmission frequency. The results of this mechanism are part of a rather unhappy chapter in filtering.

The solution to this dilemma is to use a low-pass filter which achieves filtering by absorb-

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tion rather than reflection. This approach requires the use of two contiguous filters, one low-pass and one high-pass. The general configuration and its theoretical response are shown in Fig. 1. The theoretical input v.s.w.r. of this filter can be shown to be 1:1 at all frequencies (including harmonic frequencies). As usual, however, the non-ideal nature of “real-world” coils and capacitors precludes this ideal behavior. The problem of fabrication of capacitors with sufficiently low series inductance is especially severe.

The text below discusses a novel and practical means of fabricating an absorptive filter which maintains its effectiveness well into the u.h.f. band.

The Filter and Its Fabrication

Fig. 2 and 3 show the response of a nine-element absorptive TVI filter which was constructed for purposes of comparison using standard high-quality mica capacitors. Although the input v.s.w.r. (Fig. 3) represents an immense improvement over a conventional low-pass filter, filtering effectiveness is seen to be only nominal at u.h.f. and higher.

The performance of the filter fabricated by the means described here is seen to be almost perfect over the same frequency range, by contrast. (See Figs. 4 and 5.) The reason for this improvement is the use of double-clad circuit-board material to fabricate extremely-low-inductance capacitors and interconnects. The details of this mechanical construction are illustrated in the photographs of the hand-made model of the filter. As can be seen, the copper surfaces not only provide low-inductance capacitors and interconnects, but provide a natural r.f. shield as well. The filter shown in the photos is the unit on which the performance checks of Figs. 4 and 5 were made. This filter will handle transmission power up to 1 kilowatt, by actual test. As would be expected, at higher power levels electric-field concentration at

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Fig. 1—General configuration and theoretical response of absorptive TVI filter.
sharp corners cause arcing; this problem is solved by rounding the corners of the pattern at all high-voltage points.

The significant advantages of this construction technique are summarized below:

1) The extremely low inductance associated with planar capacitors and interconnects makes the filter useful well into the u.h.f. band.
2) R.f. shielding is automatically provided when proper layout is used.
3) The cost is low when compared with other TVI-filter approaches having equal power-handling abilities.

**Improvement of Close-In Filter Rejection**

The need for very high rejection relatively close to the filter cut-off frequency often arises. The basic absorptive filter provides an attenuation of approximately 60 db./octave above its cutoff frequency, where \( n \) is the number of reactive elements in the low-pass section of the filter. Filters of practical complexity may not provide sufficient rejection at frequencies close to the edge of the h.f. band—e.g., Channel 2 at 56 MHz.

Experiment has shown that one or more of the shunt capacitors in the low-pass section can be series-tuned at the unwanted harmonic frequencies to provide very deep "holes" in the rejection characteristic. If this is done properly, the passband attenuation and the out-of-band v.s.w.r. are affected very little. It is also possible to achieve substantially the same result by parallel-tuning one of the series coils.

**Design Formulas**

The design formulas for the basic absorptive filter and the resonant traps are given in Fig. 2—Attenuation curve of filter using mica capacitors (cutoff frequency 32 MHz). Dashed extension of the low-pass curve shows response before using series trap to provide an attenuation peak in Channel 2.
increasing the inductance of \( L_1 \) and \( L_2 \) and reducing \( L_3 \). The computed values of \( L_1 \) and \( L_2 \) were increased by approximately 10 to 15 percent, and \( L_3 \) was reduced by 15 to 20 percent. This resulted in a v.s.w.r. under 1.25:1 and good pass-band characteristics as shown in Fig. 6. The second series trap was set at 60 MHz to pull in a "pop-up" in the response. Originally this trap had been set to the third harmonic of 10 meters. This, however, produced very little attenuation between Channels 2 and 6.

In cases where the antenna reactance at a harmonic frequency is such as to produce an effective low-impedance series resonance at the input of the low-pass portion of the filter, the filter will not function properly. (It does, however, provide protection against a high-impedance resonance at the low-pass input.) In the event that a low-impedance antenna-filter resonance does occur it can be changed

**Experimental Results**

So far, sixteen of these filters have been built for use locally. The results indicate that the six-pole filter shown in Fig. 6 is the best overall filter from the standpoint of all-channel protection. This makes it easy to use two series-tuned traps, giving a very steep cutoff.

When series coils were added to \( C_2 \) and \( C_3 \) of the low-pass section, the resulting v.s.w.r. was 2.5:1 at 10 meters. This was corrected by

![Diagram](image)

**Fig. 4**—Circuit of the p.c.-board filter shown in the photographs. The board used is MIL-P-13949D, FL-GT-0662" C-2/2-11017, Class 1, Grade A, Polychem Bud Division. Capacitance between copper surfaces is 10 pf. per square inch. Values are as follows for a design cutoff frequency of 40 Mc. and rejection peak in Channel 2:

- \( C_1 = 52 \) pf.
- \( C_2 = 73 \) pf.
- \( C_3 = 126 \) pf.
- \( L_1 = 0.3 \) \( \mu \)h.
- \( L_2 = 0.125 \) \( \mu \)h.
- \( L_3 = 0.52 \) \( \mu \)h.

into a high-impedance resonance by changing the length of the feed line by a quarter wavelength at the harmonic frequency. Cases where the "wrong" kind of resonance occurs are probably quite rare, however, Fig. 7 shows the v.s.w.r. measured on a typical beam antenna installation, both with and without the filter that is shown in the same figure. A set of data for a vertical antenna is given in Fig. 8. The potential problem of low-impedance antenna-filter resonance is obviously not occurring in either of these cases.

**Construction and Test Techniques**

If good performance above 100 MHz is not a necessity, this filter can be built using con-
TABLE I
Filter Design Formulas

(a) Basic Absorptive Filters

\[ \omega_c = 2\pi f_0 \]
\[ f_c = \text{cut-off freq.} \]
\[ R_o = \text{effective load resistance due to antenna} \]

All reactances are positive and are computed at \( f_c \), i.e. \( X_L = \omega_c L \), \( X_C = \frac{1}{\omega_c C} \)

2-POLE FILTER

\[ X_{L3} = 1.414 R_0 \]
\[ X_{C3} = X_{L3} \]
\[ X_{C1} = 1.414 R_0 \]
\[ X_{L1} = X_{C1} \]

3-POLE FILTER

\[ X_{C3} = X_{L3} = 0.5 R_0 \]
\[ X_{L3} = X_{C1} = 1.189 X_{C3} \]
\[ X_{C3} = X_{L1} = 2 X_{L3} \]

4-POLE FILTER

\[ X_{L4} = \frac{R_o}{0.383} = X_{C2} \]
\[ X_{C4} = X_{L2} = \frac{X_{L4}}{2.435} \]
\[ X_{C4} = X_{L2} = 0.585 X_{C4} \]
\[ X_{C3} = X_{L4} = \frac{X_{L8}}{0.415} \]

(b) Formulas for Resonant Traps

\( X(\omega_c) \) = Design value of reactance at the cutoff frequency \( (f_c) \).

See (a) above.

\( f_{trap} \) = Trap frequency

All reactances computed at \( f_c \).

Series Trap (Shunt capacitor of filter series-tuned)

\[ X_L = \frac{X(\omega_c)}{\left( \frac{f_{trap}}{f_c} \right)^2 - 1} \]

Parallel Trap (Series coil of filter parallel-tuned)

\[ X_C = X(\omega_c) \left[ \left( \frac{f_{trap}}{f_c} \right)^2 - 1 \right] \]

\[ X_L = \frac{X_C X(\omega_c)}{X_C + X(\omega_c)} \]
ventional fixed capacitors. Copper-clad Teflon board may not be readily available in small quantities from many supply houses. Regular fiber-glass-insulated board is satisfactory for low power. One such filter has been used with an SB-100 transceiver running 100 watts out. Although the Q of the fiberglass capacitors will be lower than that of Teflon-dielectric capacitors, this should not greatly affect the type of filter described here.

Test equipment needed to build this filter at home includes a reasonably-accurate grid-dip oscillator, a v.s.w.r. bridge, a reactance chart, or the ARRL Lightning Calculator (for L, C, and f), a 50-ohm dummy load, and your transmitter.

Once the value of a given capacitor has been calculated, the next step is to determine the capacitance per square inch of the double-clad circuit board you have. This is done by connecting one end of a coil of known inductance to one side of the circuit board, and the other coil lead to the other side of the circuit board. Use the grid-dip oscillator, coupled lightly to the coil, to determine the resonant frequency of the coil and the circuit-board capacitor. When the frequency is known, the total capacitance can be determined by working the Lightning calculator or by looking the capacitance up on a reactance chart. The total capacitance divided by the number of square inches on one side of the circuit board gives the capacitance per square inch. Once this figure is determined, capacitors of almost any value can be laid out with a ruler!

High voltages can be developed across capacitors in a series-tuned circuit, so the copper material should be trimmed back at least \( \frac{1}{8} \) inch from all edges of a board, except those that will be soldered to ground, to prevent arcing. The capacitor surfaces should be kept smooth and sharp corners should be avoided.

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**Fig. 7**—Setup and results of measurement on a 3-element beam, height 45 feet, with 70-foot feed line. Results of measurements both with and without the filter are shown.
If the filter box is made of double-clad fiberglass board, both sides should be bonded together with copper stripped from another piece of board. Stripped copper foil may be cleaned with a razor blade before soldering. To remove copper foil from a board, use a straight edge and a sharp scribe to score the thin copper foil. When the copper foil has been cut, use a razor blade to lift a corner. Careful heating with a soldering iron will reduce the effort required to separate the copper from the board. This technique of bonding two pieces of board or two sides of a piece of board can also be used to interconnect two capacitors when construction in one plane would require too much area. Stray inductance must be minimized and sufficient clearance must be maintained for arc-over protection.

Capacitors with Teflon dielectric have been used in filters passing up to 2 kw. p.e.p. The only failure to date has been one 10-watt termi-

minating load when the filter was connected to a mismatched load with a 15:1 v.s.w.r.

One further word of caution: No low-pass filter will be fully effective until the transmitter with which it is used is properly shielded and all leads filtered. In a recent operating test in a Channel 2 fringe area transceivers of four different makes were operated, and none had adequate shielding or filtering, as they stood, to allow the low-pass filter to do its job properly.

The terminating loads for the high-pass section of the filter can be made from 2-watt, 10-percent tolerance composition resistors. Almost any dissipation rating can be obtained by suitable series-parallel combinations. For example, a 16-watt, 50-ohm load could be built as shown in Fig. 9. This load should handle the harmonic energy of a signal with peak fundamental power of 2 kilowatts. With this load, the harmonic energy will see a v.s.w.r. under 2:1 up to 400 MHz. For low power (under 300 watts p.e.p.), a pair of 2-watt 100-

Fig. 9—Dummy load for the high-pass section of the filter.

We'd like to thank Bob Telefsen, W0KME, for helping straighten out the manuscript.

Change in GEOALERT Broadcasts from WWV—WWVH

On October 1, 1968, the system for broadcasting GEOALERTS (see March, 1968, QST, page 21) by WWV and WWVH was slightly modified, the procedure now being as follows:

GEOALERTS for a given day are first broadcast at 0418 GMT by WWV, then at 0448 GMT by WWVH. The broadcasts are repeated at hourly intervals until the new alert is issued. The message begins with the prefix GEO in Morse, followed by three sets of code groups which indicate, respectively, observations or forecasts of solar events, time of occurrence of solar events, and time of occurrence of geophysical events. The codes are:

First three-letter group:

EEE—No forecast or STRATWARM observation.

III—FLARES expected.

SSS—PROTON FLARE expected.

TTT—MASTORM expected.

UUU—FLARES and MAGSTORM expected.

VVV—PROTON FLARE and MAGSTORM expected.

HHH—STRATWARM observed.

DDD—STRATWARM observed and FLARES expected.

BBB—STRATWARM observed and PROTON FLARE expected.

MMM—STRATWARM observed and MAGSTORM expected.

Second three-letter group (PROTON EVENT):

MMM—00-06 GMT day before alert issued.

TTT—06-12 GMT day before alert issued.

HHH—12-18 GMT day before alert issued.

SSS—18-24 GMT day before alert issued.

III—00-04 GMT day of issue.

GGG—in progress.

EEE—Nil.

Third three-letter group (GEOMAGNETIC STORM):

UUU—00-06 GMT day before alert issued.

AAA—06-12 GMT day before alert issued.

BBB—12-18 GMT day before alert issued.

DDD—18-24 GMT day before alert issued.

NNN—00-04 GMT day of issue.

PPP—in progress.

EEE—Nil.

November 1968
A Divide-By-Four Frequency Divider
For 100-kHz. Calibrators

BY E. H. CONKLIN,* KS6KA

With the coming of the new subbands, a new problem has been added to the old one of frequency calibration, which formerly fell largely on even 100-kHz. points. It is now desirable to have calibration markers at least every 25 kHz., if not at more frequent intervals.

If your receiver has a 100-kHz. calibrator, the desired markers can be readily produced by adding integrated-circuit J-K flip-flops. A single flip-flop will divide by two and produce 50-kHz. markers, two flip-flops will divide by four and produce 25-kHz. markers, and four flip-flops can be made to divide by ten and produce 10-kHz. markers. All three arrangements produce strong harmonics well beyond 30 MHz.

Circuit Details

Fig. 1 and the photograph show a 25-kHz. unit, put together in a few minutes, for installation in the Collins 758-3 receiver. This circuit should work in other receivers, provided a suitable value is chosen for $R_i$.

$C_R$ rectifies the 6.3-volt a.c. output of the receiver’s filament line, and $C_1$, $R_1$ and $C_2$ filter the resulting pulsating d.c. and provide the proper operating potential (less than 5 volts maximum) for the Fairchild 9005 dual J-K flip-flop. $C_2$ couples the output of the set’s calibrator to the clock input, $C_F$, of the first flip-flop, $F_{1a}$. The output, $Q$, of $F_{1a}$ is coupled to the clock input, $C_F$, of the second flip-flop, $F_{1b}$, and the output, $Q$, of the latter is coupled through a very small capacitor (the one formerly used to connect the plate of the calibrator tube to the antenna) to the antenna lead.

Construction and Installation

The frequency divider was built on a 1¾ X 2-inch prepunched Vectorbord. Although additional holes had to be drilled to mount the IC, circuit board is now available with ¾-inch spacing between holes, making it possible to directly mount dual-in-line ICs. In the writer’s 758-3 the board was mounted under the socket.

Only a handful of components make up the 25-kHz., divide-by-four calibrator and power supply. The gadget can easily be converted into a 10-kHz., divide-by-ten calibrator by installing another IC to the left of the one shown and rewiring the unit (Fig. 2B). Parts arrangement is not critical, permitting any convenient layout to be used.

of the calibrator, $V_2$, but there is no reason why the divider cannot be installed at another spot if the builder so desires.

To wire the unit in the 758-3, perform the following steps:

1) Connect the ground end of the divider to the function switch ($S_1$) end of the calibrator’s cathode resistor, $R_C$.
2) Connect the anode of $C_R$ to pin 4 (6.3 volts a.c.) of $V_1$.
3) Connect $C_2$ to pin 5 (plate) of $V_2$.
4) Disconnect the lead (not $R_m$) going to the antenna from pin 5 of $V_2$ and connect it to the output ($Q$ of $F_{1b}$) of the divider.

To install the divider in other receivers, follow the next four steps:

1) Connect the anode of $C_R$, to the hot side of the 6.3-volt a.c. filament line. If the a.c. input is greater than 6.3 volts (for instance, if the receiver has a 12.6-volt filament supply), increase the value of $R_1$ so that the voltage applied to the IC will be 5 volts or less.
2) Connect $C_2$ to the calibrator output.
3) Disconnect the output coupling capacitor from the calibrator and connect it to the output (Q of FF1a) of the divider.

4) If the function switch turns the calibrator on by completing the cathode circuit of the calibrator, connect the ground end of the divider to the switch side of the cathode circuit. This will permit the divider to be turned on by the function switch. If the calibrator is not turned on as mentioned (for example, if it is controlled by switching the B-plus lead), connect the ground end of the divider to the receiver ground. With this hookup the divider will run all the time; however, it won’t put out signals unless the calibrator is turned on.

Use

Some amateur equipment does not have the 1-kHz, dial accuracy of the Collins and Heathkit sets. In these cases, there may be difficulty in identifying which 25-kHz harmonic is being heard. If so, frequency division can be stopped by grounding the J and K terminals on FF1a. Some decade ICs do not have this facility, and some flip-flops require a plus Vcc voltage on J and K or on S and C to stop frequency division. In any event, plus Vcc voltage on the IC input (CP) will stop the dividing action and probably leave enough leakage for one to recognize the 100-kHz harmonics.

Without a temperature-controlled calibrator crystal, one cannot place great reliance on the crystal accuracy, especially during the first hour of receiver warm-up. During this period it is best to make frequent checks of the calibrator against WWV.

There is another source of error, the dial calibration between check points. In my Collins 75S-3 this error varies from zero to 350 Hz. and back again to as much as zero to 1 kHz. and back again, generally in a fairly smooth curve between end points on the dial. Many receivers and transceivers have a greater error. This error can easily be measured and logged for future reference, particularly if the new frequency divider is built to produce 10-kHz or 5-kHz harmonics.

Other Arrangements

There are several decade divider circuits for the Fairchild 9093 and similar flip-flops that toggle or divide when the J and K inputs are at a plus voltage. A simple circuit consisting of four flip-flops and an AND gate (two diodes and a resistor) is shown in Fig. 2A. The gate can be eliminated by using the more complicated wiring of Fig. 2B. If 5-kHz harmonics are desired, half of a dual J-K flip-flop can be used before or after the decade divider.

Although at $7.45 the Fairchild 9093 is more expensive than some dual J-K flip-flops, it was chosen because it operates easily from sine waves, saw-tooth waves, and other wave forms. Less expensive types can be used, of course, but they may require a squaring amplifier or trigger between the crystal oscillator and the first flip-flop. Some of the attractively-priced units include the Motorola MC790P dual J-K flip-flop at $2.00, the Motorola 5-volt MC838 decade divider at $7.55, the Signetics L3521A dual J-K flip-flop at $2.48, and the Signetics NS280A decade divider at $8.30.2

Signetics, 811 East Aques Ave., Sunnyvale, California 94087.
ICKEY—An Integrated-Circuit Electronic Keyer with Dot and Dash Memories

“ICKEY” is a keyer with both dot and dash memories, and can be actuated either by a single-lever paddle, as shown, or by a dual-lever key for “squeeze” operation.

Carrying the Micro-TO a step (or maybe two) farther, ICKEY will insert either a dot among dashes or a dash among dots. With the “squeeze” keying technique, this means fewer motions for some characters, an operating simplification once you get the hang of it.

Since preparing this article, the author has added another feature—automatic spacing of the correct length between letters. Two more inexpensive IC packages and an extremely simple change in the circuit given here are all it takes. Details in an early issue.

BY FRANK VAN CLEEF,* WIWCG

Several years ago I sat looking at the schematic diagram of a transistorized electronic keyer with dot and dash memories, dreaming of the smooth, effortless code soon to be mine, not to mention the relatively miniscule amount of power needed. Since the junk box was well stocked (and cold cash hard to come by) many liberal substitutions were intended. After much fussing and fretting, the keyer was finally put into operation, only to prove discouragingly r.f.-sensitive. The plain old self-completing keyer was plugged back into the rig, and all further key-building activity was temporarily suspended.

New interest in a key project was sparked by Chet Opal's article on the Micro-TO keyer,1 using integrated circuits. The attractive possibility of adding an integrated-circuit memory to this excellent keyer resulted in the circuits presented here. No special parts are needed, apart from the output relay and the ICs themselves. The Motorola MC700-series industrial integrated circuits were used, both because of the low cost and because they are readily available. Unfortunately, the ICs do not come with data sheets and if you must know what's inside the things, you will have to write to Motorola for the information.

**Operation**

Since the basic keyer, which includes the time base, dot and dash generators, relay output and monitor, is almost identical to the Micro-TO keyer, not much will be said about it. As Chet points out, a memoryless keyer with a free-running time base can be a problem to use, but since memories have been added, the time base is left free-running to enhance spacing between characters. When the paddle is depressed to either the dot or the dash side, the corresponding memory is actuated, and at the next pulse from the time base the requested character begins. At the end of the character, the memory is reset and the keyer is ready for

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Fig. 1—Circuit diagram of the keyer. Fixed resistors are 1/2-watt composition; resistances are in ohms; K = 1000. Except as indicated, capacitances are in μf. Fixed capacitors with polarity indicated are electrolytic; others not listed below are disk ceramic.

Logical 1 (high) 3.6 volts and logical 0 (low) 0.3 volt, approximately. Logic rules for all gates: Any input high gives low output (NOT); all inputs low give high output (NAND). Integrated circuits are designated A, B, C, D, E, F; to identify gates included in a particular unit. Pin numbers are shown alongside.

A, B, C—Quad 2-input gate (Motorola MC724P).
D—Triple 3-input gate (Motorola MC728P).
E—Dual JK flip-flop (Motorola MC790P).
C₁, C₂—Mylar.
C₃—Dipped silver mica.

CR₁—Any small silicon diode.
CR₂, CR₃, CR₄—Silicon, 1 amp., 50 p.r.v.
CR₅—Zener, 5.6 volts.
K₁—Reed relay (Magnecraft W102X1).
Q₁—HEP52 (Motorola).
Q₂, Q₃, Q₄, Q₆—2N706.
Q₅—HEP51 (Motorola).
Q₇, Q₈—2N268 or equivalent.
R₁, R₂, R₃—For text reference.
R₄—100,000-ohm control, linear taper.
S₁—S.p.d.t. toggle.
S₂—S.p.s.s.t. toggle.
T₁—Transistor output, 500 ohms to voice coil, center-tapped primary.
T₂—6.3-volt, 1.2-amp. filament transformer.

The Circuit

At this point, a few definitions will save a lot of words. A "character" is a dot or a dash. A
This view from the rear shows the ICs and associated components. The rear panel, foreground, has jack connections for external circuits, including one for the monitor speaker. (These jacks are not shown explicitly in the circuit diagram.) The variable resistor and switch at the top right of the rear panel are for the optional weight circuit of Fig. 2.

"set" memory is one storing a dot (or a dash). Since the memory circuit is symmetrical, it will be explained for dots, and it will be assumed unless stated otherwise that the dash side operates in a similar fashion. And, throughout the discussion of the circuit, "high" means a voltage greater than about 2 volts positive to ground, while "low" means a voltage less than 0.5 volt positive to ground. All of the gates used follow the same logical rules—all inputs low result in a high output; one input high results in a low output. Any unused input must be connected to ground to prevent it from affecting the other inputs in any way. Keeping these things in mind, we will go on to the details.

**Dot Memory**

Gates nor 1 and nor 2 are interconnected to form a bistable flip-flop. In the idle condition, the output of nor 1 is high and the output of nor 2 is low. The output of nor set is also low, due to the high on input 1 through Rr. The output of nor reset is low at this time. When the paddle is operated to the dot side, pin 1 of nor set is grounded, making all its inputs low and its output high. This high, applied to pin 6 of nor 1, makes pin 5 of nor 1 go low, which in turn

Ultra-compact construction was not attempted in this keyer, although the volume could be reduced considerably if desired. The power supply occupies the rear section of the 4 x 5 x 6 box. The integrated circuits are mounted on the insulating circuit board near the front panel.
causes the output of DSR 2 to go high, thus holding DSR 1 in the present state, with its output low. The dot memory is now set. The operation of DASH SET, DASH 1 and DASH 2 is identical for storing a dash.

**Sequence And Control**

The gates DOT NEXT and DASH NEXT insure that the first memory actuated is the first memory cleared. Both of these gates have a low output when neither memory is set. If a dash has been previously memorized (pin 5 of DASH 1 low), the high from pin 14 of DASH NEXT to pin 13 of DOT NEXT prevents a dot from being sent at this time. If no dash has been memorized, the low at pin 13 of DOT NEXT, together with the low to pin 12 from DOT 1 when set by the paddle, causes the output of DOT NEXT to go high. This high to pin 7 of DOT KEY makes its output low, allowing DOT KEY to begin keying a dot at the next pulse from the time base. Operation for a dash is similar, except that the high output from DASH NEXT activates both DOT KEY and DASH KEY to form a dash.

**Reset**

Either memory must be reset immediately upon completion of its character, and this is the function of gates INV, DOT RESET and DASH RESET. The output of gate INV, which is high during key down, is an input to all three of these gates, and at the end of a character an extremely fast pulse is delivered to the dot or the dash memory, depending upon which character was being sent. The 200-pF capacitor is an important factor in determining the length of this pulse, which must be neither too long nor too short. The memory that sets the reset pulse is determined by input 6 to DOT RESET and input 12 to DASH RESET. Both of these inputs cannot be high at the same time. Assuming from the previous discussion that a dot is being sent, the output of DOT NEXT is high, forcing the output of DASH NEXT low (through input 13 of DASH NEXT), regardless of the state of DASH 1 and DASH 2. The low from DASH NEXT to pin 6 of DOT RESET allows the fast reset pulse to be applied to DOT SET and DOT 2, forcing a reset of the dot memory regardless of the state of the paddle, and allowing a dash to be sent next if the dash memory is set. If the reset pulse is too long, the dash memory might be reset immediately after the dot memory is reset, due to the change in output from DOT NEXT. If the paddle is held continuously to the dot side, the dot memory stays set except during the extremely short reset pulse. If a squeeze paddle is used with both contacts closed simultaneously, then during the reset of one character the memory for the other character is allowed to take control, resulting in alternate dots and dashes.

**Power Supply**

Early consideration was given to a regulated power supply, to provide a ripple-free tone from the monitor. It proved to be a necessity as well, to keep the large change in load during key-down conditions from affecting the pulse generator. Three Nicad cells of the "D" size could probably be used if a silicon diode were placed in series with the battery to drop the resulting 4.12 volts down to 3.62 volts. Whatever power arrangements are made, the circuit should be supplied with about 3.6 volts d.c. at 250 ma., with minimal ripple.

**Construction**

No special effort was made to miniaturize the keyer. The unit is housed in a 6 × 4 × 5-inch aluminum utility box with plenty of room to spare. A piece of unpunched, unclad epoxy fiberglass board was obtained, and all components were mounted on this board by drilling holes for the leads and then connecting to them on the other side of the board. Layout is not critical, but it seems better not to crowd the ICs too closely together, or it will be difficult to get the wiring connected to them. Due care should be exercised when soldering to the pins of the ICs—use a low-wattage iron and complete the soldering operation as quickly as possible. The transistors used were readily obtainable from the same source as the integrated circuits, but any high-frequency silicon transistors should be satisfactory. The driver transistor, Q6, in the power supply should be capable of at least 300 mw. dissipation. No difficulty with r.f. sensitivity has been encountered so far, using the amount of bypassing shown.

The keyer has been used on the air almost every night for the past several months, with very satisfying results. The speed control is not particularly linear, but the values of R5 and R4 can be adjusted to provide almost any desired range. No weight control is necessary with this type of key, although one could be added if desired (Fig. 2). Some difficulty in getting the proper weight was experienced in the beginning at my station, and the problem turned out to be a slightly-long time constant in the differential keying circuit of the transmitter in 1962.

I wish to thank Bob Spindel, WARIUSN, for the advice, helpful criticism, and moral support he supplied during the construction and testing of the keyer.

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8 A simple heat sink for use during soldering can be made from a small piece of copper sheet. See “Hints & Kinks,” QST, September, 1962.
Antipodal Reception
of
Oscar Signals

BY RAPHAEL SOIFER, K2QBW

Oscar-Australia, a transmitting satellite designed and built by Australian amateurs, is tentatively scheduled for launch sometime this winter. The inclusion of a ten-meter transmitter as part of the package opens the way for many amateurs not equipped for v.h.f. operation to experience the fun of participating in amateur satellite experiments.

Such experiments are particularly interesting at high-frequencies because of the many interactions which take place between satellite signals and the-ionosphere, giving rise to propagational peculiarities which can be observed by the alert listener. This area has held this writer’s interest for a good many years — in fact since the first Sputniks let loose on 20,005 MHz. in 1957.

Of the strange things that happen to signals as they pass through the ionosphere, perhaps none is so fascinating to observe as the antipodal reception effect — literally, propagation leading to an increase in received signal strength (or even the sudden reappearance of a signal) as the satellite passes above a point exactly at the opposite side of the earth from the receiving station. This effect was first reported in print by W5LFL, then a graduate student at Stanford, in the March 1958 issue of Proceedings of the I.R.E. I personally noted the antipodal reception effect during approximately 10% of the 20-MHz. satellite passes observed at K2QBW during the International Geophysical Year, 1957-58.

In its typical occurrence, the satellite signal would peak at S7 or S8 while the transmitter was directly overhead, and then would gradually fade out entirely as the transmitter approached and passed through the radio horizon on its way around the world. About forty minutes later, while the satellite was somewhere over the eastern Indian Ocean some 12,000 miles away, the signal would pop out of the noise, reach S2 or S3 with a somewhat fuzzy e.w. note, then fade out again after perhaps two minutes. Then, silence again until the satellite reappeared over the midwestern U.S.A. on its next regular pass.

What is particularly strange about this is that there is often antipodal reception in the absence of skip at shorter ranges. Why should a satellite signal fade out around 2000 miles range (radio horizon) only to reappear at 12,000 miles? Why not 4000 or 6000 or 9000 miles? For a transmitter located within or above the propagating layers of the ionosphere, what we have come to expect about skip zones from conventional earthbound transmitters does not always apply. As may be seen from Fig. 1, some of the signal waves emanating from the satellite are very nearly tangential to the ionosphere, resulting in a skip zone (for those waves) which is very nearly infinite — no signal reflected to earth except for scatter. This would show an increase at the antipodes because of the convergence of such waves from all directions. Such ionospheric scatter would also explain the fuzzy note. Is this the only cause of antipodal reception? Probably not, but it is typical of the strange things which can be encountered in this field. Lessons learned from antipodal reception and similar satellite experiments have been of significant value to shortwave broadcasters and others concerned with improving h.f. propagation performance.

Antipodal reception has also been observed (although very rarely) at 144 MHz, in connection with earlier Oscars. As yet, no fully satisfactory explanation of these v.h.f. sightings is available, and the existence of an Oscar-Australis with transmission on both bands at once may help to provide more clues.

It is the purpose of this article to call the attention of amateurs to these phenomena in advance of the Oscar-Australis launching to permit them time to design experiments of their own which make use of this amateur radio transmitter in outer space. It is entirely fitting that

* Mail address for correspondence.

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American amateurs take an active role in antipodal reception, since the transmitter will have been built by hams in Australia, the nearest country to the antipodes for much of the United States. Truly, this will be an international amateur event.

The output of the h.f. transmitter aboard Oscar-Australis will be approximately one watt to a dipole antenna at a frequency of 29.450 MHz. Emission will consist of a series of telemetry tones using double sideband, full-carrier a.m. At present, this transmitter is slated to be command-operated, but it is expected to be on the air during most of the time that the batteries are operative. This is, of course, purely a telemetry beacon and no ground-based signals will be retransmitted as with Oscars II and IV.

I have gathered together in Table I the kind of information which would be of particular interest in connection with antipodal reception observations. In addition to your own experiments possibly involving additional kinds of information, you may wish to keep a log modeled after Table I which should be submitted to Project Oscar, Foothill College, Los Altos Hills, California after the 29-MHz transmitter has gone silent.

Antipodal listening periods should, of course, be scheduled to center around times approximately one-half an orbital period before and after the time of the nearest satellite approach during any series of passes. Project Oscar will collect any such logs received and send them on to me, and I will compare them to see if any patterns emerge. I shall focus my attention on: correlation between occurrence and strength of antipodal signals and observed ionospheric conditions; comparison of different paths and locations for occurrence of antipodal effects; and characteristics of antipodal signals.

Owing to the large volume of regular tracking reports expected by Oscar Headquarters, it is important that these antipodal logs be kept separately and sent in at the conclusion of the satellite's active life. It will be difficult, if not impossible, for Oscar personnel to pull these out from the tracking data should they become intermixed.

If you have specialized equipment required to make particularly sophisticated observations of received signals, by all means go ahead. However, all that is really required for sending in a meaningful log and having some fun is a good receiver, an accurate clock, a reasonably good antenna, and orbital predictions from W1AW or self-generated from your own tracking data. Good luck!

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**Table I**

**Log Data for Antipodal Reception Experiments:**

**General**
- Name, call, address
- Latitude and longitude of receiving station
- Receiving equipment for 29 MHz.
- Antenna and height above ground (or surrounding terrain)

**For Each Listening Period Logged**
- Beginning and ending times of listening period (GMT only)
- Beam azimuth (if any) in degrees from true north
- Was antipodal reception observed? (Yes/No)
- If Yes: Times signal In/Out (GMT)
  - Maximum strength (db, above noise)
  - Signal characteristics (Doppler, fading, frequency dispersion, etc.)
- Satellite position (at center of listening period or time of maximum received antipodal signal strength—specify which):
  - Subsatellite point (latitude, longitude)
  - Altitude (statute miles)
- Band conditions during listening period:
  - Was ten meters open or closed?
  - If open, where to? How strong?
- Any other comments, including special or v.h.f. observations.

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**November 1968**
The FS-1 makes a neat package in its “papered” 6 x 8 x 2-inch chassis. A variety of high-accuracy marker frequencies is available, switch selected. Simple temperature compensation in the oscillator circuit maintains the basic crystal oscillator frequency constant to within a few parts in ten million over the normal range of room temperatures.

The Mainline FS-1 Secondary Frequency Standard

By IRVIN M. HOFF* W6FFC

High stability through the use of an h.f. close-tolerance crystal with simple temperature compensation, and high reliability in frequency division because of integrated-circuit flip-flops—these are outstanding features of the frequency standard described in this article. The assorted frequency markers take care of practically any amateur requirement.

Every amateur needs some sort of device to tell him what frequency he is on. In many cases the receiver alone is sufficient, since most modern receivers are quite stable and have good frequency readouts compared with even the best receivers of 10-15 years ago. This has been accomplished in part by going to “ham-bands-only” receivers instead of the general-coverage type formerly popular.

However, unless you are content to rely entirely upon the receiver dial or upon your fellow amateur’s accuracy, you will probably want something that will at least mark the band edges with reasonable accuracy. In other cases, you will want special calibration points for net operation, schedules, and activities such as MARS. Consequently, many receivers come equipped with a 100-kHz. calibrator—or, at least, such an accessory is available.

For most purposes, these calibrators are quite adequate, but there are some problems involved with the typical calibrator already installed in the receiver:

1) It is usually difficult to set. The trimmer in most calibrators is such a coarse adjustment that it is quite hard to find exactly the right setting. If the calibrator could be adjusted to match WWV easily, it would help a lot.

2) In practically every instance, you have to raise the lid, at least, to get at the adjustment. I’ve often wondered why no manufacturer makes a front-panel screwdriver adjustment available. In one popular receiver, you have to turn the entire receiver upside down to get at an adjustment hole in the bottom!

3) It doesn’t hold frequency well. This is caused by a combination of circumstances, one being that the operator is usually reluctant to

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Fig. 1—Illustrative curve of frequency vs. temperature for an AT-cut crystal designed for 0.0005 percent frequency tolerance over a temperature range of -10 to +60 degrees C. (Adapted from information in International Crystal Co. Crystal Bulletin, Vol. 1 No. 1.)
on the integrated-circuit layout drawings (bottom) is the same on all ICs of the same type; additional connections are shown in the main circuit diagram. Output marked “B” from FU (not used, as shown) is available for v.h.f. use if desired.

C, — Composite, silver mica and N750 (see text).
C, = 0.8-4.5-pf. glass piston trimmer (JFD VC21G).
CR, — Zener, 4.7 volts, 1 watt; (1N4732 or equivalent).
Not required for flashlight-cell supply.
CR, — Zener, 4.3 volts, 1 watt; (1N4731 or equivalent)
FF, FF, FF, FF, — Clock ed flip-flop (Motorola MC 845P).
FF, FF, FF, — Divide (Texas Instruments SN-7490N).

leave the receiver running 24 hours a day—
which would help tremendously in the stability of the receiver as well as the stability of the calibrator. While the receiver will be approximately at room temperature until turned on, the chassis and the air surrounding the 100-
kHz crystal, as well as the calibrator components, will eventually be well above room temperature. This, of course, causes the calibrator frequency to change.

Thus the 100-kHz calibrator really should be readjusted to WWV whenever it is to be used for reasonably accurate checks. For finding the band edges, it is probably quite ade-
quate. Most followers on voice wouldn’t dream of getting within perhaps 3 kHz. of the band edge anyway, and most on e.w. wouldn’t stick their necks out to get within 1-1.5 kHz. of the edges. But for s.s.b. nets, 500-1000 Hz. would be totally inadequate. For many other purposes much more accuracy than this is desired, in addition to which the 100-kHz. marker points are entirely insufficient. We can’t all operate on 3600, 14,300, and other even-hundred kHz. frequencies.

So we start looking around for something that will put out additional markers—hopefully, with additional accuracy.

Q, Q, incl.—N-p-n, v.h.f. type (Fairchild 2N4274, Mo-
torola MPS2369, etc.).
R, — Not required for flashlight-cell supply; see text.
S, — D.p.d. t. miniature.
S, — Miniature ceramic rotary, 1 section, 2 poles, 6
positions, non-shorting (Centralab PA-2003).
Y, — 4000-kc. low-drift crystal (International HA-1).

High-Frequency Crystals
A basic problem with the 100-kHz. crystal is its inherent instability with wide temperature changes. Although the crystal cut used for low frequencies (usually the “5-degree X” cut) can give a zero temperature-vs.-frequency coefficient at a selected temperature, the coefficient rapidly becomes poor either side of the design temperature.

For holding frequency over a wide temperature range, high-frequency AT-cut crystals are much superior, and most of the better commercial frequency standards these days use crystals in the vicinity of 5 MHz.

Fig. 1 is a typical curve of frequency vs. temperature for a high-frequency AT cut such as is used for the International Crystal Corp. type HA-1 crystal.1 Note that in the region of 50 de-
1International Crystal Manufacturing Company, Inc.,
10 North Lee, Oklahoma City, Oklahoma 73102.
ipated—as in a mobile installation inside the trunk of an auto where the temperature may get very high in the summer and very low in the winter—we find that it is quite easy to get excellent temperature compensation for normal room temperatures of, say, 60-90 degrees F.

The amount various crystals would drift, with no compensation, over a 60-90 degree F. variation is surely open to speculation. The primary reason why the FS-1 frequency standard was designed, however, was that the 100-kHz. crystals are entirely unsuitable for precision work unless used in an oven, and even then rarely compare favorably with the results obtained with the HA-1 crystal used in the FS-1 circuit. Although the following figures represent maximum frequency deviation with temperature variations (−22 to +110 degrees F.) for excess of those amateurs would be likely to encounter in the home, they are at least representative of the relative drift from one grade of crystal to another supplied by the same manufacturer. As such, they are adequate for comparative purposes:

<table>
<thead>
<tr>
<th>Crystal Type</th>
<th>Frequency Deviation</th>
<th>Stability</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-kHz. crystal ($13)</td>
<td>± 0.02 percent</td>
<td>General Purpose 4-MHz. crystal ($1.00)</td>
</tr>
<tr>
<td>Commercial Standard 4-MHz. crystal ($6)</td>
<td>± 0.003 percent</td>
<td>HA-1 4-MHz. crystal ($9)</td>
</tr>
</tbody>
</table>

If you could compare the harmonics of these with WWV, you would find the HA-1 could be up to forty times as stable as the more expensive 100-kHz. crystal, up to ten times more stable than the General-Purpose type, and up to six times more stable than the Commercial Standard. Regardless of how you interpret the figures, the fact remains the HA-1 is a superior type of crystal.

Converting these figures to something useful, we can take some data furnished with a recently-purchased HA-1 crystal (such data is now furnished by the manufacturer with each HA-1). The data indicates that at 15 MHz. you would get around 1 Hz. change for each degree Fahrenheit change. Now you can imagine how much drift you would get with a 100-kHz. crystal with, say, a 10-degree F. change—not much of a change when you start firing up radio equipment!—and can understand why, for precision work, the 100-kHz. crystal without close temperature control is so unreliable, and why the HA-1 crystal was chosen for the FS-1. Even in an oven of the type amateurs are likely to use, the temperature might vary enough so that a 100-kHz. crystal would drift 10-20 cycles when compared with WWV on 15 MHz. The FS-1 with no oven will stay within 1 or 2 cycles indefinitely at normal room temperatures with the slight compensation described later.

If we select a 4000-kHz. crystal, we could leave it running continuously and none of the harmonics would fall directly in any amateur band or on any WWV frequency. The only real hitch is that 4000 kHz., as such, doesn’t do you much good. It might mark the top end of the 80-meter band, or enable you to find 28.0 MHz., but that’s hardly enough to create much interest. So we need a method of converting this stable frequency into useful markers.

Here is where micrologic circuits enter the picture. A number of articles have described how a “flip-flop” can be used to divide by 2, or how several flip-flops can be combined to
provide decade dividers that divide by 10.\(^4\)\(^4\) (You can also get other divisors, such as 5.) We shall not go into this aspect, then, but instead will show how the integrated flip-flops may be used, rather than delving into why they work.

**The Mainline FS-1 Secondary Frequency Standard**

The circuit used for the FS-1 standard, Fig. 2, has a Colpits oscillator with a 4000-kHz. crystal. The output is taken from a tap on the emitter resistance so the oscillator will be lightly loaded for best stability. A buffer amplifier then feeds the 4000-kHz. signal into the first of the micrologic stages. This stage divides by 2 for 2000-kHz. output. The next stage divides by 2 again for 1000-kHz. output, which then goes into a decade divider with 100-kHz. output. Following another decade divider for 10-kHz. output, we then go either to a third decade divider for 1-kHz. output, or to another flip-flop for 5-kHz. output, followed by a final stage of divide-by-2 for 2.5-kHz. output.

Dependent upon which of these outputs you select, you have available 4, 2, or 1 MHz., and 100, 10, 5, 2.5 or 1 kHz. A 6-position switch is used, and for 3-30-MHz. work just the last six outputs were selected for our purposes. Those interested in v.h.f. or u.h.f. probably would want the 1-MHz. and possibly the 2-MHz. outputs rather than the 1- and 2.5-kHz. outputs.

The output of the selector switch goes to a lightly-loaded buffer amplifier which acts like a low-power switch to drive the output stage. This stage, which has a small collector resistor for a stiff load, switches very hard from on to off, making excellent square-wave output with very strong harmonics. The second section, \(S_{\text{on}}\), of the selector switch is used to prevent the following logic from toggling; thus you only get the output frequencies you have selected. If this section isn’t used, the leakage through the switch will create weak markings in the receiver at the other points. While this switch section may be omitted, the results make using it worth while.

Alternative inputs for the power-supply voltage are shown on the schematic. The first (1) turns the voltage on and off. The other


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**Fig. 3—Added potentiometer for controlling the output amplitude. Components aside from the potentiometer are shown in Fig. 1.**

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(2) leaves the voltage running continuously and merely turns off the first logic stage so there is no output other than 4 MHz., which will not affect the receiver unless it is tuned very close to that frequency.

It is easy to temperature-compensate this circuit for really superior stability. Using a 10-pf. N750 temperature-compensating capacitor, my drift has not been over 1-1.5 Hz. in the past month when compared with WWV on 15 Me.—approximately 1 part in 107. Greater stability than this would be unnecessary for typical amateur use (I am already having difficulty measuring the drift even with a digital counter with oven-controlled clock!).

**How Strong Is the Output?**

On the 1-MHz. output, the 30th harmonic (10 meters) practically pins my S meter. As 10 meters is the 30,000th harmonic of 1 kHz., the output will be much less in this position, but in my case was still 89. The unit was hand-carried to ARRL Hq., where it was run through its paces. It gave very strong markers on the 2-meter band, and good usable markers on the 450-MHz. unit at ARRL. This will help in weak-signal work in areas where it is difficult to get markers to set receivers and transmitters for schedules.

The 1-kHz. output is strong enough to run a pair of headphones, and can be used as an audio reference tone for setting a variable audio oscillator. You can also substitute a 3400-kHz. crystal for the 4000-kHz. one and get markers at 350 and 2125 Hz. on the last two positions, to an accuracy far greater than ever would be needed. This would be of particular interest to those on RTTY (thanks to W4ZAG for this idea!).

**Components and Construction Techniques**

Most any type of high-speed high-frequency transistor (n-p-n type) will work. The Fairchild 2N4274 or Motorola MPS2360 are excellent for the purpose. The Motorola 2EP57 and others will also be suitable. The 4000-kHz. crystal was specified for room temperature, 32-pf. load, and 1.700 case (wire leads for soldering). The 0.8- to 4.5-pf. glass trimmer (JFD VC21GY) gives an excellent vernier action for accurate frequency adjustment with respect to WWV. With a prefabricated printed-circuit board\(^6\) most of the work is already accomplished and the entire unit can be constructed in less than one evening’s time. Only a few holes need be drilled in the chassis for the various switches and the output jack. The author used imitation-wood "shelf paper" over his chassis; it is attractive and

\(^6\)A kit of all the parts needed to construct this unit, including the printed-circuit board but less the power supply, is available from Truman Boerkel, KB8UG, (FS-1 Group), Newark Industrial Electronics Corp., 211 South Division Ave., Grand Rapids, Michigan 49507. The circuit board is $9.25; components, $76.79; board and components complete, $77.00. All prices include postage.
professional-looking, and at the same time offers some thermal insulation of the unit for better short-term stability. A bottom plate was covered similarly. The shelf paper can be obtained at nearly any hardware or department store. "Rub-on" decals were then affixed for the final touches.

The circuit board is suspended inside the chassis on little "1/4" brackets holding it to the sides so the chassis top is not used. (W4ZAG used 1-inch 6-32 bolts with extra nuts on to hold the board off the chassis.) The chassis size is somewhat larger than the board to facilitate easy removal.

**Power Supply**

The flip-flops and the decade dividers are designed to operate at up to +5.5 volts input. We originally planned to use a 5.1-volt Zener, but the cheaper Zeners are only 10 percent types, and we felt this was coming too close to the 5.5-volt limit. Also, by using 4.7 volts it is possible to use either external batteries or an a.c.-operated power supply.

You can use three flashlight cells in series if you like; this is just right for 4.7 volts. The current drain of the FS-1 is approximately 140 ma., and in intermittent operation "D" cells will last a long time (this is about one-third the current of a normal 2-cell flashlight bulb).

With the proper dropping resistor, $R_1$, to limit the current, you can use practically any low-voltage power supply. $R_1$ should be selected to limit the current to 150-180 ma. This allows the Zener in the FS-1 to pull 10-40 ma. for best regulation. The following are typical resistor values for various voltage sources:

- 9-volt source: 24 ohms, 6.5 watts
- 12-volt source: 43 ohms, 6.5 watts
- 15-volt source: 56 ohms, 11 watts
- 24-volt source: 120 ohms, 11 watts

**Receiver Connections**

There are various ways in which the unit may be connected to the receiver. Probably the best way is to put a "T" connector on the antenna-changeover relay where the receiver is connected. For a while the author had it connected directly to an antenna selector switch in a vacant spot. One day (as you can guess by now!) the switch was accidently left on that particular position and a full kilowatt of carrier put on the transmitter for tuning on another band. It took only a few moments for the truth to sink in as to why the transmitter wouldn't load right, but by this time the damage had been done. Quite surprisingly, all that happened was that the last two transistors blew out. This involved approximately $81$ total repair costs. W4ZAG accidentally did the same thing, so now all of us have it connected directly to the receiver instead of through some antenna selector switch.

To most easily check against WWV, some means of making the strength of the signal from the standard equal to that of WWV is beneficial, so that optimum beat-note amplitude will result. If desired, you can include the optional circuit shown in Fig. 3. You can also try different switch positions.

**Selecting the Temperature-Compensating Capacitor**

The capacitance of $C_1$ in the diagram will be approximately 30 pf. In four of these units built and tested all over the United States—Florida, New York, California and Michigan —the value of this capacitor has varied from about 27 to 33 pf. It is merely to get the piston trimmer within range of adjustment to WWV. You will probably need to hand-pick a capacitor that will allow this to occur. This only takes a few minutes, and thereafter the piston trimmer will be quite adequate, giving outstanding vernier tuning.

$C_1$ is actually several small capacitors in parallel. In the author's case, it is a 10-pf. N750 in parallel with a 22-pf. fixed no-drift capacitor. We suggest you start with this combination. If the piston trimmer will not quite reach WWV, try 15 pf. in place of 22 pf. You will soon get the right combination.

To temperature-compensate the circuit, first let the FS-1 run for several days if you are using an a.c. power source, or use it for several days in intermittent operation if you are using flashlight batteries. Then when the room is about as cold as it normally ever gets, carefully set it to WWV. Turn to the receiver's a.s.b. position and tune for some pleasing audio note, such as 1000 Hz. (It is best to use the 500-Hz. selectivity setting, if you have one.) Turn on the FS-1 and carefully adjust the trimmer for the same audio tone. As you approach the exact tone, the S meter will waver slowly back and forth as the bands come into phase and go out. You'll never be able to completely stop the S meter for long, due to atmospheric effects on the incoming WWV frequency. When you have zeroed the best you can, count the beats in, say, a 30-second period. If it comes out to be 30 beats, you are only 1 Hz. off, and that's about as close as you can get. Then go about your business.

Hours later, when the room is about as warm as it will get (and while the WWV signal is still usable), come back and try counting beats again. If there has been a change, very carefully adjust the trimmer, noting whether you are turning it clockwise or counterclockwise to adjust the frequency correctly. If clockwise, the frequency increased with temperature, and that probably would be caused by too much negative temperature compensation. Remove the 10-pf. N750 capacitor and replace it with a 5-pf. N750. Try this system for the next few days. It should now be just right; so far, no-

(Continued on page 12)
An R.F.-Actuated C.W. Monitor

BY LEWIS G. MCCOY, * W11CP

A simple method of monitoring your fist

As any ham quickly discovers, it is very difficult to send c.w. with properly formed and spaced characters without monitoring one's own sending. Even the most experienced c.w. operator likes to monitor his "fist." The majority of c.w. operators above the Novice grade make most of their contacts on the same frequency as the station they are working. This in turn means that they can use their receivers to monitor their sending. This usually entails lowering the r.f. and audio gain controls on the receiver to prevent r.f. overload of the receiver, but it is possible to monitor in this fashion.

However, in the case of the Novice, receiver monitoring is difficult because Novice contacts are usually made on different frequencies since the two stations are both crystal-controlled and it is unlikely that both crystals are on the same frequency. In order for a Novice to monitor his fist he must have a monitor separate from his receiver.

This article describes the construction of a monitor that will enable the user to monitor his sending. One point that bears mentioning is a definition of the word "monitoring" as we are using it. The device described here will not monitor the actual transmitted signal. It will provide an audio tone that will enable the user to form the code characters correctly. Methods of monitoring the transmitted signal are described in detail in The Radio Amateur's Handbook and won't be treated here.

Monitor Details

The monitor shown in the photographs and in Fig. 1 requires no internal connections to either the station transmitter or receiver. The monitor is connected to the coaxial output lead of the transmitter. A very small amount of the r.f. output voltage is rectified by CR1 and this rectified voltage is used to power a multivibrator tone oscillator in the monitor. When the transmitter is keyed, the tone oscillator is turned on and off at whatever rate the key is operated. Audio from the tone oscillator is fed to the station headphones, which should be plugged into J3. P1 is plugged into the receiver headphone jack so that when the transmitter isn't keyed, audio from the receiver is fed through the monitor to the phones.

Some hams prefer speaker operation rather than headphones so this monitor has an audio amplifier and speaker as part of the unit. The amplifier obtains its power from a 9-volt battery. If desired, the monitor can be used as a code-practice oscillator by connecting a key to TB1 terminals 1 and 2. Speaker audio is more than adequate for code practice groups.

Getting The Parts

All of the items used in constructing the monitor are standard items available from most radio parts distributors. Q1, Q2, and Q3 are shown as 2N406 or 803003, the latter being a general replacement type. It should be mentioned that

* Novice Editor

Having trouble monitoring your sending? Here is a transistorized r.f.-actuated c.w. monitor that can easily be applied to any transmitter. While described for the Novice, many General Class hams will want to add this unit to their transceivers if they don’t have a "side-tone" oscillator.
the 2N406 costs about 35 cents and the replacement type is about three times that figure so it would pay to shop around. The main reason we point this out is that if you go to a radio store and ask for a 2N406, the clerk may give you an SK3008 and tell you it is the same transistor. It will do the same job as a 2N406 but the cost isn’t the same. Along the same lines, a breadboard version was built first and several surplus p-n-p. transistors were tried in the circuit. All the transistors worked, so if you have a junk box, don’t be afraid to try different types.

Along the junk box line, if you have a defunct transistor radio — and they seem to be getting quite common — you can strip it down for parts, particularly for $T_1$ and the speaker. Practically any transistor output transformer can be used for $T_1$.

The cabinet used to house the monitor is a fairly new item, an LMB type W-2C, and it may be difficult to find locally. A letter to the address below should provide the name of the nearest distributor.

**Construction Information**

A piece of perforated Vectorboard, $2 \times 5\frac{1}{2}$ inches, was used to mount most of the com-

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This view shows the general arrangement of the internal parts of the monitor. Along the rear, from the left, are the two coax chassis jacks; next is the control for setting the operating voltage level, and to its right, the key terminals for code practice work. The battery is mounted on the Vector board at the right, in a battery holder. If desired, the battery holder could be eliminated and the battery wired directly into the circuit.
ponents. The Vectorboard is easy to use and consists of an insulated board that is liberally perforated with small holes. Terminals of the “push-in” type are easy to install in the Vectorboard holes, providing connection points in the circuit. The wired board is mounted on 1/2-inch high stand-off pillars inside the cabinet. However, before installing the circuit board, the speaker, \( R_1, R_2, TB_1, J_1, J_2, \) and \( J_3 \) should be installed in the cabinet. After the circuit board is mounted, the other components can be wired up. When soldering the transistor leads and the leads on \( CR_3, \) hold the lead being soldered with a pair of pliers in order to conduct any heat from the iron away from the body of the component. Too much heat can easily ruin the transistors or diode.

Layout of the components is not particularly critical. In our breadboard version a piece of wood was used for a chassis, and this unit, with laywire layout, worked just as well as the version shown in the photographs.

In the unit shown, a common ground bus was run around the back and sides of the board and all components mounted on the Vectorboard that required a ground connection were grounded to this bus. This ground bus must be connected to the cabinet in order to complete the ground circuit.

**Installation and Adjustments**

When the unit is wired, connect a key to the two terminals on \( TB_1 \) and plug a set of head-phones into \( J_3 \), or if you don’t want to use phones, turn on \( S_1 \) and turn up the audio gain and close the key. You should get a nice, clean, audio tone. If not, recheck your wiring carefully for any wiring errors or poor connections.

To use the unit as a monitor, connect a length of coax from your transmitter to \( J_1 \), and the antenna feed (which is normally connected to your rig) to \( J_2 \). Set \( R_1 \) so that the arm of the control is at the ground end. Connect a voltmeter between terminal 1 on \( TB_1 \) and chassis ground. Next, tune up your rig to normal input and then adjust the arm on \( R_1 \) so that the voltmeter reads about \(-7 \) or \(-8 \) volts. Under these conditions the monitor oscillator should be generating a tone, and if you have \( S_1 \) turned on and the audio gain control, \( R_3 \), turned up, you should hear a loud, clear note. The multivibrator oscillates with any voltage from about \(-5 \) to \(-10 \) volts, so set \( R_1 \) in that range.

For headphone use, plug your phones into \( J_3 \) and plug \( P_1 \) into the receiver headphone jack. When receiving, the audio from the receiver will be piped through the monitor. When going to transmit, you’ll hear the multivibrator oscillator tone in the phones, providing your monitoring note.

The battery drain for the amplifier is about 2 ma. While this amount is small, it is a good idea to leave \( S_1 \) switched off when the speaker setup isn’t used.

You don’t have to disconnect the monitor from the r.f. line in order to use the unit as a code practice oscillator. Just connect a key to terminals 1 and 2 of \( TB_1 \), turn on \( S_1 \), and the unit is ready for use.

Some of the “hot-shot” speed merchants of c.w. may wonder if the unit will follow a fast bug or automatic key. We tested the monitor with a bug and at 35 w.p.m., clean, crisp code was obtained from the unit.

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**Strays**

Who says that some batteries have a short shelf life? Maybe there’s some truth to the old saying, “They don’t make ‘em like they used to.” For here’s proof that after 42 years at least one dry-cell battery shown at the left was able to withstand the rigors of time.

Pictured here is an Eveready No. 771 C-type battery which was unearthed by Gordon Douglas, W8PMK, of Luther, Michigan, in 1967 while rummaging through an old deserted barn near his home. The battery was still connected to an old 2-tube t.r.t. radio which was somewhat weathered and whose cabinet was badly broken. This writer managed to talk W8PMK into parting with the battery so that it could be added to the ARRL museum.

Surprisingly, the battery was unfaded, had no bulges or leak marks, nor was it marred in any way. The stamp on the bottom reads, “For best results put in service before Aug. 1927.” When our museum curator, W1ANA, saw the prize he jokingly suggested that it be checked for d.c. potential. Lo and behold, its unloaded output proved to be 4.3 volts loaded by a 1-transistor oscillator which drew 10 ma., the output dropped to 4.1 volts and the oscillator “played.” It’s something to think about the next time you throw away a flashlight, or transistor radio that has been eaten up by leaky batteries. — W1CER

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**Stolen Equipment**

The following equipment was stolen on September 4 between 7:00 and 8:30 p.m.: Collins KWM-2 transceiver Serial No. 10185 and a Collins ANI-2 microphone Serial No. 4812. A reward is offered for information leading to the arrest and conviction of the thief and/or the return of the property. Jack D. Muff, WA5DGR, 5475 Jackwood, Houston, Texas 77035 (Tel. 713-668-5229).
The "Square-Rigger" Mast

64-Foot Unguyed Support for Large Antenna Areas

BY STANLEY C. SPAETH, WB6QFE

Anyone who has investigated the prices of free-standing towers capable of handling antenna areas of the order of 15 square feet, even for 30-lb./sq. ft. regions, need not be told that the cost runs high. In my case, this area is represented by a two-element 40-meter Yagi and a three-element tribander.

In considering a home-brew approach, a conventional lattice structure was ruled out, because I simply could not find the time that assembly would require, in my 25-hour-a-day schedule. The alternative arrived at is shown in the sketches and photographs. Construction involved only a little over 10 hours of labor, and the result is a clean-looking structure, less obtrusive than a lattice tower in a residential area, yet fully adequate to handle the required wind load.

In brief, the mast consists of approximately 30-foot lengths of 4-inch (5/16-inch wall)\(^1\) and 6-inch (3/8-inch wall)\(^2\) square steel tubing, plus a 14-foot rotatable extension shaft (drill pipe 2 inches o.d., 3/8-inch wall) which carries the antennas. See Fig. 1. The 4-inch column telescopes into the 6-inch column, and a winch-and-cable system permits lowering the rotator to a level of about 25 feet above ground.

The 4-inch column is maintained central in the 6-inch column by guides at the top of the 6-inch column, as shown in Fig. 2, and slides at the bottom of the 4-inch column, as shown in Fig. 3. The guides are made by welding two pieces of steel angle back to back, and are fastened to the column with 3/8-inch bolts tapped into the column. Felt padding is cemented over the inner faces of the guides to prevent scraping the paint off the 4-inch column when it is raised or lowered.

The slides (Fig. 3) are short pieces of 2-inch channel steel welded across the corners of the 4-inch column. The corners of the channel are rounded slightly with a file to make a loose fit inside the 6-inch column. Originally, large single-ball bearings were set in the faces of the channel pieces to bear against the inner corners of the 6-inch column, but this refinement was found to be unnecessary.

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* 221 East Hiilcrest Blvd., Monrovia, Calif. 91016.
1 14.52 lbs./ft.
2 18.82 lbs./ft.

Three plates are welded to the 4-inch column, as shown in Fig. 4, to provide mountings for the rotator and two shaft bearings. The top bearing is a self-aligning thrust bearing, which carries the weight of the antenna and extension shaft. A setscrew secures the shaft to the bearing coupling. The lower bearing is a sleeve made of a 2-inch pipe coupling with the threads reamed out. The sleeve is welded into a hole cut in the supporting plate. A collar made similar to the sleeve bearing is fastened to the shaft, above the bearing. This provides insurance, should the setscrew in the thrust bearing work loose. The two bearings remove any lateral strain from the rotator bearings, thus the only stresses imposed on the rotator are those of torque. The arrangement makes it possible to remove the rotator for servicing without having to dismount the antennas.

It is a good idea to weld on a pair of ears, one above the other, about 2 feet apart, near the top of the 4-inch column. The ears can be drilled for U bolts for temporarily fastening a gin pole to aid in mounting the antenna assembly.
A hole for a \(\frac{1}{2}\)-inch bolt should be drilled through the 6-inch column at a point 3 feet, 1 inches down from the top. A 7-inch bolt is inserted after the upper section has been raised to relieve the cable of any permanent strain. Another hole should be drilled and tapped for a short \(\frac{1}{2}\)-inch bolt which serves as a stop to prevent raising the mast inadvertently beyond the safe overlap limit. This hole should be placed 3 feet down from the top of the column, and in such a position that one of the slides on the 4-inch column will encounter it when the mast is raised to its safe limit.

A \(\frac{3}{16}\) X 2-inch strap should be welded across the bottom end of the 6-inch column to keep the 4-inch column from sliding out during the erection, and also to keep concrete from running up inside the column.

A mounting for the winch is welded onto the 6-inch column at a comfortable level above ground. The winch should be a good one. The one I use is rated at 1000 pounds, and has a 4-to-1 gear ratio. The cable (\(\frac{1}{4}\)-inch aircraft steel) runs from the winch, up along the 6-inch column, over the pulley, and back down inside the column to a hole drilled near the bottom of the 4-inch column. The end of the cable is passed through the hole, and then secured by attaching two cable clamps to the cable, as indicated in Fig. 3. Be sure to file the edge of the hole smooth so that it will not cut the cable.

A 2-inch pulley for cable is used, with a globe leather sheave. The sheave is made from a suitable forged-steel piece, and a \(\frac{3}{8}\)-inch steel plate is welded to the underside of the sheave to prevent damage to the cable. The 2-inch pulley is mounted on a \(\frac{3}{8}\)-inch angle plate, which in turn is welded to the main frame. The angle plate is placed on the column so that the holes in the column line up with the holes in the plate. Two \(\frac{3}{8}\)-inch bolts are used to secure the plate to the column, and two \(\frac{3}{8}\)-inch bolts are used to secure the pulley to the plate.

Fig. 3—This sketch shows how short pieces of channel iron, welded across the corners of the 4-inch column near its bottom end, keep the inner column central in the outer column. The corners of the channel pieces should be filed slightly round to make a loose fit.
All surfaces should be given a coat of Rustoleum primer before painting with a good enamel paint. I painted the 4-inch column sky blue, and the 6-inch column white to match the side of the house.

When it comes to putting the mast up, don't take any chances. If you do not have the proper equipment, and are not thoroughly familiar with the procedures and precautions necessary in handling heavy weights, have a professional do the job. A local sign contractor, using his crane, set this mast up with the greatest of ease, and at nominal cost. One important point to remember is that a professional carries insurance, in case of an accident.

The free-standing mast requires a concrete footing not less than 3 feet in diameter and 5 1/2 feet deep. If the mast is guyed at the top of the 6-inch column, the wall thickness of this column may be reduced to 0.2 inch, and the concrete foundation can be reduced to a 2-foot cube. If less antenna area is used, the wall thickness of the 4-inch column may also be reduced.

The design of the tower and footing was checked by a local registered engineer. However, if building codes are in effect in your area, don't undertake the construction of this mast, or any other mast or tower, without first making sure that its installation will be permitted. Requirements may vary considerably from one locality to another.

The cost of materials for the mast will vary in different parts of the country. Here in California, where Japanese-import steel is available, the cost ran slightly over $100.\footnote{14.41 lbs./ft.}
TVI And The Cable

(From X-MITTER, Penn. Wireless Assn., Inc.)

We've been rather anxiously awaiting a TVI case involving Lower Bucks Cablevision and off-cable reception, and the first one came in early July. The result was most encouraging.

The case involved both a thoroughly typical TVI problem and problems with the cable system, and so was ideal from the Committee's point of view; it provided an excellent demonstration of how amateur interference is affected by the switch to cable from rooftop antennas, and also gave us an intensive course of instruction on analysis of cable malfunction.

The complaint was of interference on the low channels from six meters.

Of course the initial step was the standard checkout of the amateur station. Here again the findings were absolutely typical: a rather high-power six-meter rig, the amateur's TV set in comparatively poor condition, but equipped with a Drake filter properly installed, and absolutely no sign of pickup on the amateur's TV set.

The complainant had a Sears color set, several years old. It was checked first on direct pickup from the rooftop antenna, and there showed medium overload (KYV, Channel 3) with distinct evidence of low front-end gain and intermittent poor contacts in the tuner. The Bristol Interference Committee recommendation was that a Drake filter be installed, and that at the time of the next service call the tuner be cleaned and checked for gain.

The interference condition was set up on the complainant's TV, and the local antenna removed and the cable connected. All signs of amateur pickup disappeared, though the six-meter signal could be detected when the set was tuned to Channel 2.

Since this particular case was the first involving the cable, we had invited John Zettick, LBCV's Chief Engineer, to witness and consult in the checkout. John, of course, was most interested in the signal quality from the cable, although all phases of the checkout were significant to him. In this particular instance, which was in Red Cedar, cable service had begun in the previous week, and final acceptance checks had not been made. John was not at all satisfied with the quality of signal being delivered, and he pointed to numerous flaws including crosstalk, adjacent channel interference, co-channel beat notes and poor linearity with loss of high frequencies.

None of the cable flaws were inherent in the system; they simply were what we considered normal adjustment problems in a rather complex system in its first days of use. Naturally, John did not enjoy seeing problems of any sort, but we welcomed the opportunity to witness the cable working, as it were, at its worst, in a typical home, with competent instruction regarding the several difficulties. We'd seen the cable working well in sections where it's been operative for a while, but we learn from fault conditions.

Cooperation between amateurs generally and the Interference Committee especially, and the Cable management will necessarily be close and continuous. Both have much to gain. We will likely uncover incipient cable troubles before they become serious, and thus simplify their maintenance problems.

The most important finding, however, is that the Cable reduces TVI by a tremendous factor. It's not a complete cure, but the severe cases become minor, and the minor cases are eliminated. — David L. Heller, W5NJP/K3HNP, 14 Darkleaf Lane, Levittown, Penna. 19055.

Break-in Key

This ingenious break-in key was designed and built by Harry Habig, K8ANV. When the key is closed, the receiver muting terminal is ungrounded (muting the receiver), the receiver input is shorted, the antenna is connected to the transmitter, and the transmitter is keyed, in that order. When the key is released, the keying contacts open, the antenna is connected to the receiver, the receiver input is unshorted, and the muting terminal is grounded, in that order. Since the receiver is muted before switching takes place, and is not unmuted until after switching takes place, change-over is silent. Also, since the antenna is connected to the transmitter before the keying contacts are closed, and disconnected from the transmitter after the keying contacts have opened, there is no r.f. voltage at the change-over contacts while the antenna is being switched. Proper sequencing is principally a matter of relative contact spacing. As the antenna switching is done at low impedance, the contact spacing can be quite small. The key works very well at all ordinary hand-keying speeds.

In the sketch, solid areas are metal; open areas are insulation. The two long metal strips are sections of hacksaw blade. In the photo, the lever at the right-hand end of the enclosure may be used to hold the key closed. [SST]
LOOP MEASUREMENTS

Technical Editor, QST:

Considerable interest was aroused on this side of the ocean by the article in Electronics of August 21, 1967, "Down-to-Earth Army Antenna."

The nonexistence of an overhead null in the vertical radiation pattern, as stated in the article, was of great importance to our firm, as we are interested in h.f. short-distance communication out of deep valleys, where ground-wave links are not possible.

The small dimensions, ease of setting up the self-supporting structure, and the simple matching network without coils were all very attractive features for our application.

Convinced of the low radiation resistance of the loop structure described in Electronics, we took the following measures to keep the losses as low as possible:

1) We increased the side length of the octagon from 5 feet to 2 meters (6.55 feet), thus increasing the radiation resistance three times.
2) We increased the tubing diameter from 1.5 inches to 50 mm (1.97 inches).
3) The junctions were made by heavy sleeve clamps making large-surface, high-pressure contacts between the antenna sections.

4) By using bent sections, only 4 clamps were needed.
5) The connection to the matching unit was made by gold-plated wing nuts, two for each antenna end.
6) The matching unit was built up with Jennings vacuum capacitors, known for low losses and high current capability.

The impedances measured at the antenna binding posts are shown in Fig. 1. The calculated radiation resistance at the lowest frequency to be used (2 MHz.) was 8.53 ohms, according to the equation indicated in Mr. Patterson's article. Considering the measured real part of the antenna impedance (14.8 ohms) the antenna efficiency at 2 MHz. should be:

\[ 8.53 \times 100 \text{ percent} = 57.6 \text{ percent}, \]

a not-too-bad figure at the first glance, although a half-wave dipole could be shortened considerably before dropping to this efficiency.

Measurements with the loop antenna were made by recording the field strength on a Hewlett Packard recorder, at a straight-line distance of about 20
The loop antenna used in the high-angle tests described in the letter from HB9AGK. The tuning/matching box at the right uses vacuum variables to reduce losses.

Miles from the transmitting location, using the loop as transmitting antenna and comparing the results with those of an inverted V half-wave dipole, supported at its center by a 40-foot mast. High-angle radiation was measured, the receiving site being enclosed by high hills.

Measurements were carried out by transmitting 5 minutes with the inverted V, then 5 minutes with the loop antenna, this cycle being repeated two or three times for elimination of errors due to changes in propagation conditions with time. Then QSY was made to the next measuring frequency. After this, measurements were repeated on three frequencies with the loop antenna turned 90 degrees with respect to its previous position to check for possible directional effects.

In the accompanying figures typical results of the loop antenna are marked RA (ring antenna), and those of the inverted V are marked RD (variable dipole).

The half-wave inverted-V dipole always gave a 15- to 20-dB better signal than the loop. — J. Wessendorp, HB9AGK, Sonnenbergstr. 47, 8010 Uster, Switzerland.

K9CPZ IC FREQUENCY COUNTER

Technical Editor, QST:

Mr. Staples’ (K9CPZ) article on an integrated-circuit frequency counter (July 1968) is excellent. Such projects and articles should be encouraged by QST, as they keep the amateur abreast of the rapidly changing technology in this field.

I would like to comment on the decade counter as shown in his Fig. 7. Mr. Staples states that when flip-flops 2 and 8 go on, to complete a count of 10, the reset pulse turns them off and the count starts over. If you follow the logic through the counter in Fig. 7, it appears that when flip-flop No. 2 is pulsed off, its carry would then turn on flip-flop No. 4. If so, the counter would count by 6 instead of 10s. However, this is prevented by the finite amount of time, as mentioned by Mr. Staples in his article, for the signal to pass through the gate, flip-flop, and the time difference between outputs 1 and 0. This time is called propagation delay ($T_{pd}$) and is measured in nanoseconds (nanosecond = ns. = millimicrosecond). $T_{pd}$ varies widely in flip-flops and can be as short as 2 ns. or more than 100 ns. This propagation delay is what limits the speed of a circuit. The delay is useful in many applications and the factor must be taken into consideration when selecting integrated circuits for specific applications.

The inherent characteristics of the 923 flip-flop are as follows (refer to Fig. 7): The 10th count toggles flip-flop No. 2 on. Outputs 1 and 0 complement, but the $T_{pd}$ of each is different. The specifications show maximum $T_{pd}$ as $t_2 = 50$ ns., and $t_2 = 80$ ns. This means output 0 can go low a maximum of 30 ns. before output 1 goes high.

Since the reset pulse is controlled by output 0, the pulse sequence is started before output 1 has time to reach sufficient high level. In effect, flip-flop No. 2 does not go on completely, nor does output 1 have sufficient pulse width or duration to toggle flip-flop No. 4. This delay does not affect the operation of flip-flop No. 8, as it was toggled on by 2 previous counts.

By using the J-K steering inputs (sometimes referred to as S and C inputs, respectively) a simple decade counter can be made without the use of extra gates, as shown in Fig. 4. — James R. Whitmore, W4JLI, c/o W9ZUU, 410 N.W. 117th St., Miami, Florida 33168.
Yaesu Musen
FL-2000 Linear
Amplifier

A recent arrival to the American market, the FL-2000 linear amplifier provides table-top r.f. power amplification from 3.5 to 29.7 Mc. Though the equipment appears to have been designed as a companion to one of the Yaesu transceivers, it is compatible with most American transceivers in the 50- to 100-watt power-output class. It is rated at 1200 watts p.e.p. input (600 watts d.c. input) and operates with four color-TV sweep tubes in grounded-grid, and in parallel.

Some interesting features of the equipment are forced-air cooling, a self-contained power supply, switch-through provisions for transceiving while the amplifier is in standby, a built-in s.w.r. bridge, a broadly-tuned input circuit for 28-Mc. operation; and a.i.c. takeoff for use with the exciter.

The manufacturer uses four 6KD6 sweep tubes in this circuit. These tubes are quite rugged and have a 33-watt plate-dissipation rating. Long-term operation in an experimental amplifier proved them to be reliable and long lasting. A small amount of fixed bias is applied to the control grids of the tubes to establish AB2 operating conditions. R.f. chokes are used in the filament leads and in the cathode circuit to keep those elements above r.f. ground. The control grids are bypassed for r.f., and the screen and suppressor grids are grounded directly. A series-parallel filament hook-up permits the use of a 12-volt filament supply.

A pi-network plate tank is used and works quite well on all bands although its Q is not as high on 3.5 Mc, as it would be if a higher CL ratio were employed. At the recommended p.e.p. plate current, 1 ampere, with the operating voltage, 1200, provided for the plates, the plate load impedance is on the order of 750 ohms. At this low value the tank capacitances provided are sufficient for an operating Q of about 5. The performance on 80 meters is slightly inferior to that of the higher bands as far as power output versus IMD (intermodulation distortion) is concerned.

A Monimatch-type s.w.r. bridge is connected to the output of the amplifier to aid in tune-up. It uses a printed-circuit carbon control as a terminating resistor in each pickup lead. These controls are used for nulling the bridge during initial adjustments at the factory. The indicating meter for the bridge is located on the front panel of the amplifier and doubles as a plate-current meter when the selector switch on the panel is moved to that position.

A full-wave bridge rectifier provides 1200 volts d.c. for the 6KD6 plates. Silicon diodes are used in the rectifier circuit, and the three series-connected output capacitors provide approximately 33 µf. of capacitance. The primary sides of the plate and filament transformers are arranged for use from either 115 or 230-volt mains.

The physical layout of the amplifier might well be termed "sanitary" in that everything appears to be arranged in a logical and orderly fashion. The quality of the components seems to be excel-

Looking into the bottom of the chassis, the tank coil is visible at the lower left, inside the chassis cutout. Directly behind it is the high-speed cooling fan. Behind the fan is the 10-meter tuned circuit which is between the input and the cathodes of the amplifier. The two filament chokes are wound on ferrite rods and are mounted at the center of the chassis.

The amplifier compartment is arranged for maximum cooling of the tubes according to the placement of the 6K7Ds and the high-speed fan. A solenoid-type r.f. choke is used in the plate circuit. It was checked on an L/C meter and proved to be quite suitable for the plate load impedance of the amplifier — 50,000 ohms on 30 through 15 meters, and 25,000 ohms at 30 Mc, offering assurance that the choke is not apt to burn out from series resonances.

An attractive heavy-duty cabinet houses the amplifier. The cabinet is dark gray and the panel is brushed aluminum. A protective layer of plastic covers the panel, but it can be removed if the operator wishes. Panel controls include plate tuning, band switching, amplifier loading, power on, standby, meter switching (s.w.r. and plate current), forward and reflected power, and meter sensitivity.

An instruction booklet accompanies the amplifier. It is well presented and is to the point as far as operating instructions are concerned. A complete and easy to read schematic diagram is included, as are top and bottom photos of the interior of the equipment. A parts list is given, and the part numbers are marked on the photos.

A spectrum analysis of the equipment showed that it was capable of delivering 350 watts of two-tone output (700 watts p.e.p.) on 80 meters while still having acceptable IMD — 25 db. below one tone (31 db. below p.e.p.). On the remaining bands a power output of 425 watts could be obtained under the same conditions. Considerably more power output was available, but the third- and fifth-order products became objectionable at the higher levels. The latter condition would of course cause a broad signal.

Like all sweep-tube amplifier stages, one must not hold the key down for more than a few seconds at a time for fear of overheating the tubes. If this precaution is observed, the operator should have no trouble tuning the amplifier and operating it — W1CER.

<table>
<thead>
<tr>
<th>Yaesu Musen FL-2000</th>
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<tbody>
<tr>
<td><strong>Height:</strong> 6 3/4 inches.</td>
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<tr>
<td><strong>Width:</strong> 11 1/2 inches.</td>
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<tr>
<td><strong>Depth:</strong> 11 3/4 inches.</td>
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<tr>
<td><strong>Weight:</strong> 15 pounds.</td>
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<tr>
<td><strong>Power Requirements:</strong> 115 volts a.c. or 230 volts a.c., 50/60 cycles.</td>
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<tr>
<td><strong>Price Class:</strong> $250.</td>
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<tr>
<td><strong>Distributor:</strong> Spectronics Co., Los Alamitos, California.</td>
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**NEW BOOKS**

*From Spark to Space. The Story of Amateur Radio in Canada,* published by the Saskatoon Amateur Radio Club, Box 751, Saskatoon, Sask. 150 pages, 6 by 9 inches, paper cover. $2.50.

This volume represents a monumental effort on the part of four dedicated radio amateurs. They are amateur authors as well, but you'd hardly suspect this. Of perhaps greater interest to Canadian amateurs than others, it is nevertheless a good documentary to have on hand.

After the idea was born, three years ago, came an enormous amount of research work, correspondence with old timers, etc. Some thirty clubs sent in their own contributions, together with many interesting and historical photos. Beginning with Macoun's coming to Newfoundland in 1901 and the first transatlantic radio reception, the story of the amateur's part in the development of private radio communication is well set forth. There apparently is little record of amateur experimentation prior to 1903; perhaps the old timers have not come forth with something earlier. With the American activity which was known to be relatively extensive in the 1900s, it is almost certain that some information drifted across the border at that time.

Congratulations to SARC for a nice job!

*Integrated Circuits: Fundamentals & Projects,* by Rufus P. Turner. Published by Allied Radio Corp., 100 N. Western Ave., Chicago, Illinois 60680. 90 pages, including index, 5 1/2 x 8 1/2 inches, paper cover. Price, 75 cents.

The primary purpose of this text is to provide the reader with a basic, nontechnical introduction to integrated circuits. Two introductory chapters quite adequately discuss such topics as the historical background of ICs, the nature of the IC, the types of ICs available, how ICs are used and their installation in actual circuits, and IC electrical ratings. In addition 20 quite helpful construction tips are listed. Six construction projects are described in the text, each project using only one IC. The large amount of detail provided with each project is just what the beginner needs. Each project is described with a brief text, a photograph of the actual project, pictorial wiring diagrams, a schematic diagram of the circuit as well as of the IC, construction tips, testing information, and a complete parts list. The projects described are: two n.f. preamplifiers, a 1/2-watt audio amplifier, a crystal frequency standard, an a.f./r.f. signal tracer, and a d.c. voltmeter.
SB-101 IMPROVEMENT

In their instruction manual for the SB-101 transceiver, Heath states that although the driver preselector control peaks at a slightly different position in transmit than in receive, for transceive operation the control should be peaked on transmit. However, this method of tuning doesn't work out well on 21 MHz, and above where the receiver input circuits must be carefully peaked for optimum receiver performance.

The reason for the different settings of the driver preselector control may be found by studying the transceiver schematic. The same coupling capacitor, $C_{wrm}$, that is used in the receiver r.f. amplifier grid circuit is used in the transmitter driver plate circuit, and the same coupling capacitor, $C_{wrm}$, that is used in the receiver r.f. amplifier plate circuit is used in the transmitter driver grid circuit. Because under dynamic conditions the input and output capacitances of the 6A2U6 r.f. amplifier are quite different from those of the 6CL6 driver, to compensate for these differences the driver preselector control, which tunes $C_{wrm}$ and $C_{wrm}$, has to be realigned when going from transmit to receive.

Fig. 1 shows a circuit modification which will result in maximum receiver sensitivity and optimized drive occurring at the same setting of the driver preselector control. By the application of B-plus from the receiver screen supply bus in only the receive mode, $CR_1$ and $CR_2$ are forward-biased to effectively switch trimmers $C_4$ and $C_5$ in parallel with $C_{wrm}$ and $C_{wrm}$.

The mechanical layout of the modification shown in Fig. 3 should be closely followed to secure correct operation. Directly solder ceramic trimmers $C_4$ and $C_5$ to the unused lugs on the left side of $C_{wrm}$ and $C_{wrm}$ as viewed from the front panel. As a precautionary measure, if the rubber drive bands off the capacitors so that the bands will not be in the vicinity of the soldering iron during the modification. Take care that the trimmers are vertical and that their mounting flanges are at the same height. Be sure the trimmers do not short to the adjacent sections of the tuning capacitors, but do not use any insulating material for this purpose.

Prepare the small fiber glass printed circuit board shown in Fig. 2 and slip it over the mounting collars of trimmers $C_4$ and $C_5$. At this point, mark the position of the hole for the ground soldier lug on the chassis apron, remove the board, and drill the ground lug hole from the outside of the chassis. Then replace the board, secure it to the trimmers with the nuts provided, and bolt the ground lug to the apron wall. Next run the B-plus wire down to the chassis, dress it in the gap between the

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Fig. 1—Circuit of the SB-101 modification. Components not listed below are original Heath parts.

- $C_7$, $C_8$—110-pf, piston trimmer.
- $C_{wrm}$—Disk ceramic.
- $R_{wrm}$, $R_4$—0.091 used; 1N36B, 1N55A, 1N70A, 1N98 and 1N270 suitable.
- $R_{wrm}$, $R_4$—1/2-watt composition.

Fig. 2—Bottom (A), top (B), and side (C) views of the circuit board used in the SB-101 modification.
DECAL SEALERS

Some method for sealing decals to the panel or chassis is usually required when decals are used to identify controls of radio equipment. Otherwise the decals dry up and crack, or fall off when brushed against.

Darling Technical Laboratories, Costa Mesa, California, not only manufactures decals (Teknicals), but sells a 1-ounce bottle of sealer (Teknisolv) for finishing purposes.

Recently, when temporarily out of Tekni-Solv solution, the need arose for a sealer to complete a construction job. It was discovered that standard Plastic Wood solvent, available at most hardware stores and lumber yards, worked extremely well as a substitute. It is very low in cost, and a can should last a long time.

Either sealer should be applied with a small artist’s brush after the decals are completely dry. Allow the fluid to completely cover each decal, making certain that some fluid flows under the decal as well. — W1CRI

IMPROVED SPOTTING FOR THE SB-400

The Heathkit SB-400 is a fine transmitter, but it is difficult to set on a desired frequency in a hurry. If you ever listen on 3990 kHz at about 5 p.m., you will hear a bunch of sharpshooters who will give you a going over if you are not on the exact frequency, and I mean EXACT.

Morris Hughes, W1PG1, sent me the following modification details, which enable the SB-400 to be put on the exact frequency quickly and easily. The normal operation of the transmitter is not affected in any way.

1) Pull the set out of the case just far enough to expose the mode switch.

2) Referring to Pictorial 13 in the SB-400 instruction manual, remove from switch contacts MS3-F6 and MS2-R4 the bare wire coming through contact MS1-F4 from the ground lug under the shaft assembly.

3) Connect a wire from MS3-F6 to the ground lug or MS1-F4.

4) Connect a 6200-ohm, ½-watt resistor between MS3-F6 and MS2-R4.

5) Connect one lead of a normally closed push-button micro-switch to MS3-F6, and connect the other lead to MS2-R4.

6) Locate a spot 5 ¼ inches from the right edge of the panel (not the case) and 1 ¾ inches from the bottom edge, and bore a hole for the switch.

7) Secure the switch to the panel.

8) Slide the transmitter back in the case.

To locate a frequency, turn the function switch to SPOT, and the mode switch to either USB or LSB, as needed. Push down the micro-switch button with your little finger and hold it down. This will unbalance the modulator, and make a note near the desired operating frequency. With your free fingers turn the dial to the exact null of the note, release the micro-switch, and you will be on the exact frequency. Finally turn the function switch back to TRAN.

— George W. Bailey, W1KH/W2KH

INSTABILITY IN THE DRAKE 2B

I have owned a Drake 2B receiver for about seven years. Until the last few weeks I have never experienced any difficulty with the unit. Then the receiver became plagued with a slow steady drift, and it also leap-frogged about two kilohertz every now and then.

Changing all the tubes did no good, and measuring the voltages and resistances throughout the set didn’t reveal the trouble. The drift persisted.

In desperation I began to search for a loose anything in the receiver. As luck would have it, I discovered that one of the two screws that secures the v.f.o. shield can to the variable capacitor had worked itself loose. I tightened the screw, and the excellent stability of the 2B was restored. — Carl Abrams, K1WIM

KEYING TIP

To solve the problem of tuning the transmitter when using an electronic keyer, I have always used a straight key in parallel with the keying line. This has been done either by installing a key jack in the back of the keyer itself or by utilizing a Y-type jack at the transmitter end. Not only has this provided a quick and easy means for transmitter tuning, it has also made it possible to quickly reduce the keying speed for working Novices and others who could only copy below the speed range of my keyer. — James R. Hadlock, K7JRE/W7BNV

November 1968
Results, 1968 Field Day

June 22-23, 1968

REPORTED BY BOB HILL, * W1ARR

"Clubs, 50-Mc. operators, all hams with licenses for portable stations, attention!!"

Thus did the clarion call go out from W1BDI in June 1933 QST, summoning one and all to participate in the first "International Field Day — June 10th-11th." Added F.E.I.A.: "Besides offering an opportunity to get out in the open in this fine spring weather, the real object of this contest is to test 'portables' wherever they may be available. If successful we want to make it an annual affair." Well, it was successful enough so that this year's festivities marked the 35th anniversary of Field Day. September 1933 QST reported FD activity by no less than fifty stations, and the writeup consumed a whole page of the magazine! This issue will chronicle the efforts of 3117 stations, manned by some 12,200 people, for a total of 1227 entries — and will require about ten or twelve pages to tell the story. Like nearly every other phase of ham radio, Field Day has grown incalculably since its beginning.

As a rule, there are certain similarities from year to year in FD: the cranky generator, the hordes of insects, the interference between setups, the delicious/abominable chow (pick whichever one applied to you), the shortage of decent c.w. ops, the indecipherable logs (K1ZND was Hq. logchecker this year and somehow even lived to tell about it), the bee-yewary feeling at 3 A.M. — and most of all, setting up and taking down all that junk!

Which brings us to a real bright spot: about 95 percent of comments were solidly in favor of the new rule that includes set-up time within the 27-hour limits of the contest. Many groups mentioned that, with only a limited time available in which to get everything ready, they were motivated to use their set-up time more efficiently than in past years, and were able to start operating without being completely pooped from the outset. A few regretted the end of those casual Friday-night setup-cum-social sessions of yore: a couple of participants felt that the new rules penalized smaller groups unfairly. But, as we say, we're basking in the unaccustomed warmth of overwhelming approval by a vast majority of the gang. (Wonder what we did wrong?)

On the minus side, we dropped the signal report from the exchange and (to put it as philosophically as possible) that didn't work out too well. Seems most of us are going to give and get reports on FD no matter what! There were lots of re-
quests to put RS(T) back in, even while the groups that liked its omission found they had to give reports or be scratched from the logs of their disgruntled contacts. Probably 90 percent of the QSOs included signal reports one or both ways.

Most popular entry class in 1968 was 2A, in which the Connecticut Wireless Assn. (W1TX/1) piled up a new record of 2016 QSOs for 15,174 points. In second-most-popular 3A, it was W52DDL-5 (Lafayette ARC) pacing the field by a goodly margin. All the leaders in the various categories are shown in a tabulation elsewhere in this writeup.

In brief, good weather and popular new rules (and let's not forget the new 10-watt battery multiplier, either) resulted in a thoroughly successful FD. We've come a long way since 1933!

Soapbox

"After a long and trying weekend one of the operators tottered home and sat down at the dinner table, whereupon he ended the customary grace with an inaudible "Dinner "W1CAE/6. "Our vote is thumbs up for the new rules. We used to start at 6 a.m. on Saturday; this time we got on the air (more or less) in two hours and weren't nearly so pooped."—W4VKV/4. "Good fast c.w. operators are hard to come by, but phone yappers are in abundance in any club."—W2Z\-PNU/2. "Boy, do I hate cold beans and leftover potato salad for Sunday breakfast."—K6ASU/6. "We were happy to meet the challenge of the new rules. We had a ball! If others think that they can profit by bending the rules to suit themselves, that's their problem."—W3OF/3. "The rain let up just long enough for us to get our antennas up and then we had to quit five hours early because of tropical storm Candy. Certainly surprised when W2XCSAL came back to CQ FD and gave us a 399 SOUTH LAOS."—W5SMS/5. "Our biggest problem was interference caused by the close proximity of our five stations. Next year we plan to spread out more and possibly employ wavetap filters for each of the receivers."—W52ST/6. "Good crew, beautiful weekend, fine equipment, efficient antennas, and the generator didn't start."—W8QYP/8. "Did we have the only air-conditioned tent and 60-watt stereo on FD?"—W4JNB/4. "Please go back to reporting signal report as part of exchange—it's useful sometimes."—K2AA/2. "Can you explain the report I go from several stations in the U.S.: 'Your signal's red strong, old man, but because of heavy QRM you're only 5/5. Perhaps there is a new SRT code replacing the RST one.'—W36CEI/3. "The new ham contest rules are so much easier."—K6HGL/K6H. "Why did everybody want a signal report? The rules didn't require it in the exchanges. We figured we hadn't to go along with the pack to keep reports for reports bahumminht the QSO."—K6QWM/6. "The neighbors gave us no trouble at all. We operated next to a cemetery."—W3EAN/3. "Everybody else must have done great."—W4N4XZ/4. "We will have to find a new location next year; everybody fell through the door at least once."—W58OM/9. "This was first FD in 16 years when I couldn't go into the field. Awaiting imminent childbirth. Both operations were successful."—W6OYJ. "Am. is dead for sure as far as contests go. I could not find another a.m. station in the contest on 60 meters. All my contacts were with s.w.b. stations."—W2ACKU. "Sunday morning 2 meters had as much QRM as 80 meters, with several mountain portables working extended ground wave."—W3AJTD. "Very sorry about the condition of the log sheets. The copying machine showed no mercy as it ripped one sheet after another."—W8NP/8. "Goal of the year: locating too close to the Illinois Central's main line. You could not only hear the ratchet, you could actually feel it."—K9AML/9. "Like I would register to vote to have the RST put back into the exchange. Even if all stations aren't honest, a large enough proportion will let you know how your signal is. This is especially necessary in FD, where one is using an untented setup."—K2BML/2. "As we closed down, everyone was saying that this was absolutely the last FD ever! (We also said that last year, the year before, etc. . . )"—K8WBL/8. "We had no trouble setting up this year, as we accomplished this in round time. The new rules provided an extra incentive."—K9BGL/9. "The nearest gas station was about 12 miles down the hill. The owner got to know us pretty well—we woke him up at 6:30 a.m. Sunday, one of the many times we bought gas for the goofy gruzzing generator."—W6HIV/6. "As a result of used "s07's," the antenna next year will be a homebrew beam ear-rant vertical."—W4AWWK/4. "No one could be bad from the generator until one member realized that the extension cord's three leads were connected to the same terminal."—W7DMC/7. "The only complaint about this FD was that so many people didn't read the blasted rules, about the fact that there was no signal report required. Actually got almost testy with a few guys who threatened to report us from their log if we didn't give them a signal report."—W3RQZ/3. "Congrats on the new rules; we thought they were great. It took us two hours to get on the air. In that time we accomplished what took us 7 hours last year."—W4NJB/3. "Like new 10-watt class; will be there next year."—W9WEUZ/6. "We had 185 contacts in the logs, but careful editing turned up 127 dupes."—K2CW/3. "Fifty Ws worked in 10
to set up. At least we were well."—K6JRR/6. "We took advantage of a 120-foot commercial tower on the site already existing for seven years. A 75-meter dipole at 100 feet increased our score tremendously."—VE3OE/3. "Best FD ever. Love those new rules."—W9CJE/6. "Glad to see the changes in the rules. The inclusion of setup time and the revised power-multiplier break points are good."—W3JSE/3. "New setup times rule very challenging and lots of fun."—VE2ARC/2. "We were quite happy with our results, considering that none of our operators had been on the air in over a year."—VE7FO/7. "Last year our generator quit and stayed quiet. This year it quit occasionally, burned a gallon of fuel in half of it, and messed up two towers when the sideband rig went on—but we stayed on the air about 20 hours and topped last year's score by four points!"—W4CUE/4. "The rules prohibiting construction were not a problem. We fired up the generator and got those stations on the air quickly with whip antennas. Permanent antenna installations were completed within 3 hours for all four stations."—W82RMW/2. "Would be nice to have a second Field Day in August, but suppose names at ARRL would be prohibitive."—W8WLO/6. [Arrrghhh!!!—Bill] "The new rules regarding setup time, in our opinion, added spice to the activity. Since we were inexperienced, this made things more interesting. Of course, we didn't say that at the time!"—W2BBDJ/2. "We've glad you left out HST—why didn't everybody?"—W8XIL/8. "Some provision should be made to encourage operation of transmitters in the Novice portion of the band. We had 2000 watts, but one position got its beams all installed and ready to operate and then found they had failed to connect the coax line to the radiator. In lowering the beam, they let it slip and broke an element. However, with all of this they were on the air by 2000 hours."—W2LJ/1. "Starting at 1000Z Saturday, it took our two-man operation nearly three hours to set up the antennas (including a tri-band quad and Yagi for 20, 40, and 80 meters) and get 30-foot wooden tilt-over towers, erect the tent, set up all the gear, and get the battery power and recharging systems going."—K6YNB/6. "Ever try to buy a gallon of gas at 5 a.m.?"—W9AWW/9. "Murphy manifested himself in the form of a goat and tried to butt our generator. Fast footwork and diversionary tactics by KC6D (who, incidentally, spent the next 15 minutes in a tree) saved the generator. A strong rope tugging would have generatoreds to further attacks."—KC6D/6. "Thanks for the fine contest, and keep that setup-time limit."—WASZEL/2. "Didn't expect to be on for FD, 'cause we're in the process of moving into our new house; however, I even got a chance to try out the 5-hour setup period as I frantically scrounged together a station and a 15-meter dipole."—W9BRAG. "Haven't had so much fun since the Orioles won the pennant!"—W3JCN.
**SCORES**

Class A stations are clubs and groups in the field with more than 2 operators. Scores are tabulated according to the number of transmitters operated simultaneously at each station. The figures on the following chart reflect the number of valid contacts, the d.c. power inputs used, the number of participants at each station and the final score. The "power classification" used in computing the score is indicated by the letters A, B, C or D after the number of transmitters. A indicates equal power to all transmitters (multiplier of 1); B indicates power over 10, up to and including 50 watts (multiplier of 3); C indicates over 50 watts, up to and including 200 watts (multiplier of 2); D indicates over 200 watts (multiplier of 1).

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**CLASS A**

**One Transmitter**

- K2QGL 20:00
- WH3D 25:00
- K49C 20:00
- K2M8I 20:00
- W4S59 20:00

**Two Transmitters**

- K42G 25:00
- K2M8I 25:00
- K2K8B 25:00
- W4AFL 25:00
- K46G 25:00

**Three Transmitters**

- K2K8B 30:00
- K2M8I 30:00
- K2K8B 30:00
- W4AFL 30:00
- K46G 30:00

**Four Transmitters**

- K2K8B 40:00
- K2M8I 40:00
- K2K8B 40:00
- W4AFL 40:00
- K46G 40:00

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**November 1968**
<table>
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<tr>
<td>K6LSR/G</td>
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* Did not conform to setup-time requirements

# QST for

56
November 1968

59
CLASS B

Grouped in this listing are the scores of portable stations manned by one or two operators. Where two persons participated, the call of the other operator (if known) is given below that of the amateur whose call was used. Figures following the calls indicate number of contacts, power and final score.

- VE6FOY 3 | 354 - R-3556 | W4HIZL/9 | 276-B-2584
- VE8FOY 3 | 564 - C-3814 | W4HIZZ/2 | 412 - C-2672
- K5EY/4 | 396 - C-2149 | K9QZ/9 | 402 - C-2512
- K5EY/6 | 396 - C-2149 | W4YOHQ/2 | 259-B-2503
- W4MALL | 512 - C-2438 | W4TF/8 | 359-B-2528
- W4MALL | 512 - C-2438 | W4NUZ/9 | 359-B-2528
- W4MALL | 512 - C-2438 | W4NBU/3 | 359-B-2528
- W4NBU/3 | 176 - A-2104 | W4QZ/9 | 359-B-2528
- W4NBU/3 | 176 - A-2104 | W4RZ/9 | 359-B-2528
- W4S3U/3 | 354 - AB-2398 | W4RU/4 | 359-B-2528
- W4S3U/3 | 354 - AB-2398 | W4RU/4 | 359-B-2528
- W4S3U/3 | 354 - AB-2398 | W4RU/4 | 359-B-2528
- W4S3U/3 | 354 - AB-2398 | W4RU/4 | 359-B-2528
- W4S3U/3 | 354 - AB-2398 | W4RU/4 | 359-B-2528
- W4S3U/3 | 354 - AB-2398 | W4RU/4 | 359-B-2528
- W4S3U/3 | 354 - AB-2398 | W4RU/4 | 359-B-2528
- W4S3U/3 | 354 - AB-2398 | W4RU/4 | 359-B-2528
- W4S3U/3 | 354 - AB-2398 | W4RU/4 | 359-B-2528
- W4S3U/3 | 354 - AB-2398 | W4RU/4 | 359-B-2528
- W4S3U/3 | 354 - AB-2398 | W4RU/4 | 359-B-2528
- W4S3U/3 | 354 - AB-2398 | W4RU/4 | 359-B-2528
- W4S3U/3 | 354 - AB-2398 | W4RU/4 | 359-B-2528
- W4S3U/3 | 354 - AB-2398 | W4RU/4 | 359-B-2528
- W4S3U/3 | 354 - AB-2398 | W4RU/4 | 359-B-2528
- W4S3U/3 | 354 - AB-2398 | W4RU/4 | 359-B-2528
- W4S3U/3 | 354 - AB-2398 | W4RU/4 | 359-B-2528
Happenings of the Month

Director Elections

ARRL Asks FCC Keep 6 M Open

New Chance For Novice

U.S. President Lauds Amateurs

Modulation Policy

ELECTION RESULTS...

In the current elections, two nominees were declared elected as directors and two as vice directors because they were the only eligible candidates for the office.

Robert York Chapman, W1QV, will start his third term (on January 1, 1969) as director from the New England Division. A second term as director from the Roanoke Division goes to Victor C. Clark, W4KFC.

In the Hudson Division, Stan Zak, K2SJO, has a third term as vice director. L. Phil Wicker, W4ACY vice director from the Roanoke Division since 1967, also was reelected without opposition.

... AND BALLOTING

The remainder of the offices in the current election were contested. Phil Haller, W9HPG, the current director and Robert C. Erwood, K9AAU, are on Central Division ballots for director. In the Hudson Division, incumbent director Harry J. Darnall, W2TUK, faces James Lawson, W2PV. A three-cornered race in Northwestern pits incumbent Robert B. Thurston, W7PGY against Raleigh A. Munkres, W7HZZ and William R. Watson, W7BQ. Director Carl L. Smith, W6BWJ and Bois R. Council, K6ATZ are on Rocky Mountain Division ballots. In the Southwestern Division, candidates are John R. Griggs, W6KW, the present director, and Ray E. Meyers, W6MLZ. Incumbent Ray K. Bryan, W5IQ, is pitted against Roy L. Albright, W5EYB, in the West Gulf Division race.

For Central Division vice director, the ballot offers Edmond A. Metzger, W9PRN, who is presently serving, and Sidonius M. Pokorny, W9NRP. Vice Director Bigelow Green, W1LAE, and Walter S. Rogers, W1DFS are candidates in the New England Division. In the Northwestern Division the ballot features incumbent R. Rex Roberts, W7CPY, David O. Bennett, W7QLE and Laverne W. Van Dyke, K7CFT. Rocky Mountain candidates are the current vice director, John H. Sampson, Jr., W70CX and Thomas G. Banks, Jr., W5HJ. The Southwestern Division vice director contest is between Arnold Dahman, W6UEI and Gary A. Stilwell, W6NJC. Favian M. Adair, W5FKK, Lester L. Harbin, W5BNG and Eric B. Hjerpe, W5FCD are candidates for vice director in the West Gulf Division.

During the second week in October, ballots were mailed to all those who were full members of the above divisions on September 15, 1968. The completed ballots must be received at headquarters by noon of November 20, 1968.

ARRL ASKS FCC TO KEEP 6 METERS OPEN

The League has filed a petition for reconsideration in RM-1287. The Federal Communications Commission in August denied a petition of K6EDX and K6RNP which would have set aside restrictions on six meters scheduled to become effective November 22, 1968 and November 22, 1969 (October QST, page 86). An earlier request of ARRL to the same end was also denied by FCC.

The League, although a strong supporter of incentive licensing, feels it is currently not applicable to v.h.f. It believes that the FCC action (reserving 50.0-50.1 MHz to Advanced

Governor Raymond P. Shafer proclaims amateur radio week in Pennsylvania September 1-7, 1968, coinciding with the ARRL Board's "Founder's Week" observance. Flanking the governor are W3YA, ARRL Atlantic Division Director and W3HK, section communications manager for Eastern Pennsylvania. Looking on, left to right: K3WEU, W3SMF, WA3CTP, WA3CFV, and W3AES, section emergency coordinator for Eastern Pennsylvania.
and Extra starting on the 22nd) will cut Technician Class licensees off from the opportunity of communicating with skilled amateurs in the Morse Code and thereby will hinder their progress to higher grade licensees rather than promote it.

Moreover, the six-meter band is unique in that in some areas a large portion is in reality a guard-band, protecting TV viewers from adjacent-channel interference. Amateur activity is, therefore, concentrated at the low edge. Technician, Conditional and General Class licensees will lose 62.5% of the more-useful portion of six meters by the end of 1969 if the language of Section 97.7 remains in effect in respect to the band.

Additional reasons why ARRL feels the six-meter band should be unrestricted appear in the actual petition, reproduced below.

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

**In the Matter of**
Amendment of Section 97.7(a) of the Amateur Radio Service rules relating to operation in the 50-50.25 MHz frequency band.

To: The Commission

**PETITION FOR RECONSIDERATION**

The American Radio Relay League, Incorporated, by its General Counsel, respectfully requests the Commission to reconsider and set aside its Order adopted August 9, 1968, and released on August 13, 1968 (Mimeo 20844), and to issue a notice of proposed rule making inviting comments upon a proposed looking toward amendment of Section 97.7(a) of the Commission’s Rules and Regulations to remove certain restrictions for the sub-band 50.0 to 50.25 Megahertz which become effective on November 22, 1968, and November 22, 1969. In the alternative, the Commission is respectfully requested to issue a simple order suspending the November 22, 1968, effective date pending further study in the light of this pleading.

In support whereof, the following is respectfully submitted:

**Introduction**

The notice of proposed rule making in the incentive license proposal of Docket No. 15928, released April 1, 1968, invited comments upon proposed major changes in the licensing structure of amateur radio, including proposals to reserve portions of various amateur frequency bands for use only by holders of the higher classes of amateur operator licenses. In comments filed July 15, 1968, the League expressed general concern that further study was needed before reservations be adopted for the amateur bands of 50 MHz and above. In its report and order, released August 29, 1967, 9 FCC 2d 14, 11 RR 2d 1563, the Commission amended Section 97.7(a) to provide, *inter alia*, that the sub-band of 50.0 to 50.1 MHz would be available for use only by holders of Amateur Extra and Advanced Class licenses on and after November 22, 1968, and that the restriction would be expanded to include the subband 50.0 to 50.25 MHz on and after November 22, 1969. Proposed restrictions in amateur bands above the 50 MHz band were not adopted.

The soon to become effective restrictions in the 50 MHz band have been the subject of continuing study by the League. At the annual meeting of the League’s Board of Directors in May 1968, the League’s earlier position was discussed at length in light of numerous comments by members to their Directors. The discussion reinforced the views expressed in the League’s earlier comments to the Commission and led to the unanimous conclusion that the Commission should be requested to hold in abeyance the effective date of the restrictions in the 50 MHz band. Knowing of the pendancy of a somewhat similar proposal in RM-1287 and that the minutes of the Board of Directors meeting were available to the Commission, the League has withheld its comments until this time.

The League reaffirms its often asserted position that the principles of incentives are in the long-term interest of amateur radio, and that the practical application of those principles as embodied now in the amateur rules are appropriate implementation as they apply below 30 MHz. However, there are several important reasons why incentives based upon subbands differ between the HF and VHF amateur bands.

**Band Occupancy**

The League for many years has advocated use of the VHF bands for regularly-scheduled communications over short distances so as to lighten the load on the crowded lower frequencies and increase regular occupancy of the VHF bands. Some progress has been made in this direction, and steady increases in activity in the amateur VHF bands have resulted.

The 50 MHz band, while interesting territory for all classes of amateurs, has been most widely

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**Cincinnati, too, observed Founder’s Week as amateur radio week in the city. Chief of Police W8DZ chats with Mayor Eugene P. Feighinn after the proclamation. Amateur radio was actively demonstrated by W8WC, Great Lakes Division director, who brought his equipment to City Hall. W8COA, K8WYJ and W8HQL also played important roles in marking the occasion.**

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*November 1968*
used by Technician Class licensees. Although some of these amateurs will be encouraged by the sub-band restrictions to try for higher license status, most are believed to be either unwilling or incapable of achieving Advanced or Extra Class status, largely because of the code requirements, or are unwilling to attempt it. The end result will be either an abandonment of the 50 MHz band, reversing the current trend toward more effective use of this assignment, or the shift of operations to portions of the band fraught with interference problems.

**Television Interference**

The 50 MHz band is unique in amateur radio allocations, in that it is the only band immediately adjacent to a television broadcast channel. The broadband nature of television transmission and reception makes difficult the design of television receivers capable of accepting the entire 6 MHz television channel from 54 to 60 MHz (Channel 2) and, at the same time, capable of rejecting amateur signals in the 50 to 54 MHz amateur band. From years of experience and innumerable instances of interference complaints, both to and from television in Channel 2, amateurs using the 50 MHz band have learned to live with this most difficult problem, if not entirely solving it.

The Commission recognizes the problems of adjacent-channel interference in other services by voluntarily controlling adjacent-channel assignments and by providing guard bands between services. No such controls or guard bands have been established with respect to the 50 MHz amateur band and television Channel 2, which, because it is the lowest frequency of all of the television channels, is the most widely used and received channel throughout the United States and Canada. The required protection to reception of Channel 2 has been provided voluntarily by the amateurs through a combination of well designed and operated transmitters, installation of filters on the inputs of television receivers, and confining operations to the lower frequencies of the 50 MHz band. Although the highest frequency which may be used without causing interference to the reception of Channel 2 depends upon many variables, including the relative strength of the signals and the characteristics of the television receivers, the most critical factor is the basic design of most television receivers. In recent years, practically every television receiver manufactured has been of the intercarrier type. Because of the separation between the channels of the visual and audio transmissions, amateur signals on 50.75 MHz are the most critical. Many thousands of actual experiences have shown that operations above 50.4 MHz are wise except under the most ideal conditions. The end effect has been to render virtually useless in many areas almost 90% of the 4 MHz of the band.

The restrictions of Section 97.7(a) will work great hardships upon the holders of Technician Conditional and General Class licenses, particularly after November 21, 1969. On November 22, 1969, they will have lost 250 kHz of the usable 400 kHz of the band, or 62.5%. Of that 250 kHz, 150 kHz now may be used for voice transmissions. Thus, on November 22, 1969, amateurs engaging only or primarily in voice transmissions will lose 50% of the usable voice frequencies. The result most certainly will be greatly increased and severe mutual interference between amateur stations, thereby destroying the unique usefulness of the band.

The band may be “open” for long distance communications only at the low edge, and “closed” at frequencies only 250 kHz higher. This problem will be aggravated by the greatly increased usage of frequencies just above 50.25 MHz, because weak distant-skywave signals will be buried under stronger ground wave signals. Thus, some of the basic objectives of the amateur radio service, to study propagation, may not be achieved.

**The Dilemma of the Newcomer**

The VHF bands are ideal territory for the newcomer to amateur radio. Normally, high power and the most sophisticated equipment are not necessary, and the beginner can start with relative simple low cost equipment and add to it as he progresses. Experimentation and construction of one’s own equipment and antennas, of particularly significance in training newcomers, are still widely practiced among VHF enthusiasts. The opening of the 50 MHz band to Technicians in 1955, with which the League approved, resulted in a very large influx of newcomers to the band. Their appearances on the 50 MHz scene made use of this band more interesting to all classes of licensees, and occupancy levels have been consistently higher each succeeding year.

The number of new calls heard at any time on the 50 MHz band shows that many amateurs are getting their first taste of interesting voice operation on this band. A good percentage of these amateurs are quite happy with what they have, and see little reason to try to obtain a higher class of license. This has been the main argument for some kind of incentive program for the VHF bands, but the program should be so devised as to give the newcomer as well as those licensed for more than two years the incentive and opportunity to progress. The Commission’s plan, as embodied in Section 97.7(a), makes it harder to upgrade, through experience on the 50 MHz band, than at the present time.

Improving one’s skill in use of the code is one of the problems confronting the VHF-oriented new amateur. Admittedly, the code is relatively little used in VHF communication by amateurs, but it could be used more than it now is, with proper band planning and incentives. Instead, the 50 MHz plan, as embodied in Section 97.7(a), will make it much more difficult for the amateur who needs practice in code work to obtain it on that band.

The segment of the band from 50.0 to 50.1 MHz is currently set aside for use of c.w. communication only. The reasons advanced in favor of this assignment are still valid, and the 100 kHz sub-band is used effectively during periods of unusual propagation. It is also used, to some extent, by operators who either like to communicate in code, or are interested in improving their skill in doing so. To restrict the use of this segment to the top grades of license will have the practical effect of cutting the Technician or General Class licensees off from the opportunity he now has of communicating with more skilled amateurs in code. The 100 kHz sub-band has a low enough level of occupancy ordinarily so that it provides an ideal spot for local communication with code. The high level of occupancy of lower frequency bands presents a constant interference problem to beginners, whereas in the 50 MHz band they can have interference-free communication a very high percentage of the time.

**Conclusions**

The foregoing discussion has not been a repetition of that contained in the petition for rule making,

66 QST for
WHO THE DEVIL IS WHO?

Seventh in a Series of Call Conversion Charts

Here are additional calls of amateurs taking advantage of new rules which allow Extra Class licensees licensed 25 years ago or longer to acquire two-letter calls. If you should be listed here, let us know by post card right away.

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RM-1287, which was denied by the Commission’s order released August 13, 1968, although some of the same facts have been cited. The League recognizes that at least some of the points raised in this and earlier pleadings were considered by the Commission when it adopted its Report and Order in Docket No. 15928. Nevertheless, the comments in that proceeding were submitted almost three years ago. It is respectfully submitted that the 50 MHz band is a special and unique case and requires further consideration.

Wherefore, the premises considered, the Commission is respectfully requested to reconsider and set aside its order denying the petition for rule making, RM-1287, to stay the November 22, 1968, effective date of that portion of Section 97.7(a) of its Rules which relates to the 50 MHz amateur band, and issue an appropriate notice of proposed rule making.

Respectfully submitted,

THE AMERICAN RADIO RELAY LEAGUE,
INCORPORATED
ROBERT M. BOOTH, JR.
Its General Counsel

September 13, 1968

NEW JERSEY LICENSE PLATES

Ed G. Raser, W2ZLI, ARRL section communications manager for southern New Jersey, reports the following procedures for the newly available call-letter license plates:

Applicant must submit photopy of his FCC license, of his driver license, and of his automobile registration. Only one set of plates will be issued, and only in the name of the amateur, whose driving and criminal records will be checked. A fee of $10 is charged, but the applicant should not send it until notified to do so. An application should be obtained from the Courtesy Plate Unit, New Jersey Motor Vehicle Department, 427 North Montgomery Street, Trenton, New Jersey.

Incidentally, Ed credits Northern New Jersey SCM W2ZZ and the NNJ clubs for much of the success of the current drive for the plates, after years of failure. New Jersey is the 49th state to grant call letter license plates; the lone hold-out is Kentucky, where the State Constitution forbids special privileges to groups except in direct relationship to services furnished.

ARRL SUPPORTS "RETREAD"

The Executive Committee, in accordance with Minute 44 of the 1968 ARRL Board Meeting, at its meeting September 28 directed the filing of comments with FCC in Docket 18266 supporting eligibility of ex-amateurs for Novice Class licenses after one year out of amateur radio. However, based on further comments of members relayed through directors, the League also asks that present holders of the Technician Class license who have not held the Novice license in twelve months be made eligible, too. (The FCC version would end dual Novice-Technician license-holding; see page 33-34, September QST.)

GIGAHERTZ BAND CHANGE OKAY

The League has expressed willingness to go along with a possible rearrangement of frequency allocations above 17.7 GigaHertz. As part of United States preparation for the World Administrative Conference on Space, scheduled for 1970 or 1971 by the International Telecommunications Union, FCC issued a Notice of Inquiry, Docket 18294, in which it asked for discussion of several allocations changes. One would move the amateur band presently at 21-22 GHz, to 23-25 GHz, shared with radiolocation. Since commercial relationships are not involved up here, and the present number of amateur experimenters involved in work on the band is limited, ARRL sees no objection to the shift.

This is a working document only, not yet a formal proposal for change, and in any case is still a long way off. Neither the agenda nor the date of the conference has yet been established except in the broadest terms.

November 1968
second, shall not exceed 1 kilowatt nor shall the peak envelope input power exceed 2 kilowatts.
2. For single and double sideband transmitters employing 'full' carrier, the unmodulated carrier input shall not exceed 1 kilowatt, and with modulation, the average carrier power input shall not exceed 1 kilowatt and the peak envelope power input shall not exceed 4 kilowatts.
3. For type A1 and the FM emissions the carrier input power shall not exceed one kilowatt under any condition (keyed, key down, modulated, unmodulated).
—James E. Barr,
Chief, Safety and Special
Radio Services Bureau
Federal Communications Commission

MINUTES OF EXECUTIVE COMMITTEE MEETING
No. 323
September 28, 1968

Pursuant to due notice, the Executive Committee of The American Radio Relay League, Inc., met at the Statler-Hilton Inn, Greensboro, N. C., at 10:45 a.m. September 28, 1968. Present: President Robert W. Dennison, WBDX, in the Chair; First Vice President W. M. Groves, W5NW; Directors Charles G. Compton, W5BGU, Harry J. Dannals, W7TUK, Noel B. Eaton, VE3CJ and Carl L. Smith, W9BWJ; and General Manager John Huttoon, WILVQ. Also present were General Counsel Robert M. Booth, Jr., W3PS, Atlantic Division Director Gilbert L. Crossley, W3YA, and Central Division Vice Director Edmond A. Metzger, W3PRN.


68 QST for
On motion of Mr. Dannals, approval was unanimously GRANTED for the holding of a Southwestern Division Convention in Miami, Fla., January 18-19, 1969; a Michigan State Convention in Grand Rapids on May 9-10, 1969; and a West Gulf Division Convention in Amarillo, Texas, on August 17-18, 1969.

On motion of Mr. Eaton, unanimously VOTED to confer Life Membership upon the following:

Art Bates, W1RY; Joseph G. Charet, W1RGG; Richard W. Ehthorn, W1ETO; Stanley A. Fierston, KX6FJ/W1BIS; James J. Freeman, WB2NHP; Ervin G. Havas, WB2MOG; Ronald J. Hasler, VE1S; John D. Holmes, WA7BJL; Fred G. Holzhausen, W2VKR; Frank E. Hope, Jr., KS5CEF; William D. Hudgins, W2JS; Dr. Perry L. Klein, K3JTB; O. Lewis Levitt, WB2NDI; William Magoon, W8OEE; David U. Maier, K8BGZ/-W1BAT; Alfred G. Roach, W6JUK; Charles B. Smaek, Jr., W3NB; Walter C. Snyder, W5IPH/-W2DV; Raymond John Thill, WA9EXP; Warren R. Torell, W8TJD; James L. Vase, III, W2GSF; William R. Watson, W7BQ.

The Committee was in recess from 11:35 a.m. to 12:35 p.m., during the course of which Roanoke Division Director Victor C. Clark, W4KFC, joined the meeting.

The Committee proceeded to examine nominations in the director elections, with careful attention to the application of the eligibility rules concerning membership and freedom from commercial radio connections. The Committee made findings and ordered actions as detailed below, all by unanimous action.

CENTRAL DIVISION

For Director:

Donald A. Miller, W0WNV, was found lawfully nominated but ineligible due to lack of the required membership continuity. Robert C. Erwood, K9AAU, and Philip E. Haller, W9HPG, were found lawfully nominated and eligible and their names ordered listed on ballots to be sent to Full Members of the Division.

For Vice Director:

Edmond A. Metzger, W9PRN, and Sidonius M. Pokorny, W9NRP, were found lawfully nominated and eligible and their names ordered listed on ballots to be sent to Full Members of the Division.

HUDSON DIVISION

For Director:

Harry J. Dannals, W2TUK, and James L. Lawson, W2PY, were found lawfully nominated and eligible and their names ordered listed on ballots to be sent to Full Members of the Division.

For Vice Director:

Stan Zek, K2SJQ, was found lawfully nominated and eligible. Being the only eligible nominee, he was thereupon declared, pursuant to the By-Laws, to be duly reelected as Vice Director from the Hudson Division for the 1969-1970 term without membership balloting.

NEW ENGLAND DIVISION

For Director:

Gerald A. Cohen, WA1CYT, was found lawfully nominated but ineligible because of failure to meet the age requirement. Robert York Chapman, W1QV, was found lawfully nominated and eligible. Being the only eligible nominee, he was thereupon declared, pursuant to the By-Laws, to be duly reelected as Director from the New England Division for the 1969-1970 term without membership balloting.

For Vice Director:

Bigelow Green, W1EAE, and Walter S. Rogers, W1DFS, were found lawfully nominated and eligible and their names ordered listed on ballots to be sent to Full Members of the Division.

NORTHWESTERN DIVISION

For Director:

Raleigh A. Munkres, W7HAZ, Robert B. Thurlow, W7PGY, and William R. Watson, W7BQ, were found lawfully nominated and eligible and their names ordered listed on ballots to be sent to Full Members of the Division.

For Vice Director:

David O. Benetti, W7QLE, R. Rex Roberts, W7CPR, and Laverne W. Van Dyke, K7CTP, were found lawfully nominated and eligible and their names ordered listed on ballots to be sent to Full Members of the Division.

ROANOKE DIVISION

For Director:

Victor C. Clark, W4KFC, was found lawfully nominated and eligible. Being the only eligible nominee, he was thereupon declared, pursuant to the By-Laws, to be duly re-elected as Director from the Roanoke Division for the 1969-1970 term without membership balloting.

For Vice Director:

L. Phil Wicker, W4ACY, was found lawfully nominated and eligible. Being the only eligible nominee, he was thereupon declared, pursuant to the By-Laws, to be duly re-elected as Vice Director from the Roanoke Division for the 1969-1970 term without membership balloting.

ROCKY MOUNTAIN DIVISION

For Director:

Bois K. Council, K9ATZ, and Carl L. Smith, W9BWJ, were found lawfully nominated and eligible and their names ordered listed on ballots to be sent to Full Members of the Division.

(Continued on page 148)

U.S. PRESIDENT LAUDS AMATEURS

The ARRL Southwestern Division Convention at Phoenix, Arizona, August 30-September 1, 1968 was in receipt of the following telegram:

"MY CONGRATULATIONS TO THE AMATEUR RADIO OPERATORS WHO INDIVIDUALLY AND AS MEMBERS OF THE MILITARY AFFILIATE RADIO SYSTEM ARE PROVIDING A RADIO-PHONE AND RADIO-TELEGRAPH MESSAGE SERVICE BETWEEN OUR MILITARY PERSONNEL OVERSEAS AND THEIR FAMILIES HERE AT HOME. I HAVE LEARNED THAT YOU ARE NOW HANDLING OVER 30,000 PER MONTH. YOU MAY BE PROUD OF THIS FINE EXAMPLE OF VOLUNTARY PUBLIC SERVICE WHICH HAS PROVIDED A SIGNIFICANT BOOST TO THE MORALE OF OUR MILITARY SERVICES, ESPECIALLY THE MEN IN VIETNAM. MAY YOUR SIGNALS NEVER FAIL!"

—LYNDON B. JOHNSON

November 1968 69
Advisory Committees:

A Pilot Project

What is needed in our League, many have pointed out, is greater opportunity for direct participation in League affairs by more members, more organized ways for members to register their ideas and their opinions, particularly in the various specialty areas of interest and activity.

There is an increasing tendency on the part of amateurs today to concentrate our interests in such diverse fields as v.h.f. repeaters, contests, DX, nets, emergency communications and many more. As this trend toward specialization has grown, so has the need to develop additional formal channels to reflect and represent those interests.

ARRL Board action in May initiated several months of effort and planning by a working group for a project intended to add a whole new dimension to the League's program, to stimulate membership communications and participation. This is the creation, on a trial basis, of two pilot Advisory Committees — one on VHF Repeaters and the second on Contests — composed of qualified amateurs nominated from the membership at large. These groups will function as a further bond among the League's membership and its management (Board and staff) on matters pertaining to their particular areas of interest.

Except for minor editorial revisions, the rules and regulations governing the establishment of national advisory committees are the same as published on pages 72-73 of July QST. In essence, advisory committees may be proposed by any director on any subject, along with supporting data on the purpose and scope of activities. Assuming Board approval, the President will appoint up to ten members active and experienced in the specific field. One director and one Hq. employee are appointed by the President to provide liaison with the Board and staff, respectively. Both Board and staff may refer current questions, proposals, inquiries, etc., from the general membership to the advisory committee for study and recommendation. The Committee may also initiate proposals and recommendations based on its own expertise and grass-roots direct membership contact in its field.

Nominations Requested

Guidelines have been developed by the planning group (Directors W4KFC, W3YA, W2TUK) covering qualifications for Advisory Committee membership: a League member for two years and an amateur (Technician or higher class) for three years prior to nomination, currently and consistently active and qualified in the specialty area of the field served by the Advisory Committee. Nominations may be submitted by three or more members having personal knowledge of the candidates qualifications.

The Contest and VHF Repeater Advisory Committees are soon to be established; nominating forms for membership may be obtained from your director, SCM or Hq. Or a letter to Hq. will suffice if it is signed by three current members and has complete data — name and call of nominee, license class, date first licensed, length of League membership, and a detailed statement of qualifying activities in the specialty area; it should also be affirmed that the nominee has been contacted and is willing to serve. In order to establish the two pilot committees with the least delay, only nominations received by December 2 can be considered for the initial committee membership.

To a considerable extent, of course, membership participation in League affairs has had expression via many channels: direct correspondence with headquarters, field trips and conventions, the field and net organizations, the affiliated club program, and, importantly, through the directors themselves, their club visits, their correspondence, their vice- and assistant directors.

An Invitation

Now we are to have an opportunity to broaden the channels of communication and membership involvement substantially, especially in the areas of individual members' particular interests. There are a number of problems, of course, to be resolved in the process of developing truly effective advisory committees (for which reason only two are being initiated at this time), and your director would welcome any comments which you may have now or later concerning the project.

A lot of time, effort and careful thought have gone into the preliminary planning. The results will now depend on the capabilities and enthusiasm of the pilot committee members, and especially on the response from the membership as a whole.

QST
How I Learned
To Love A Contest

BY E. B. REDINGTON,* W4ZM

You know, this bit of acrimony that is manifesting itself within our ranks would be amusing if it didn't have serious potential. Anyway, it must be pretty serious because "they" write letters to the Editor and seem to be all upset because these contest phobes are showing up on their own special frequencies, upsetting a phone patch to Aunt Minnie who probably requires five minutes of explanation as to her relationship with the other end. From what I see in foreign amateur journals, this is getting to be a sort of international disease. Right now, it seems to be the current fad to belittle the contest and to be in favor of only one thing — yak, yak, yak. Some of us like to yak and some like to contest and some others like to do both. Well, I happen to be one who likes to do both. For a long time, it was the former until I discovered how much fun you can have in a contest. And you meet the nicest people.

I guess that the first real contest was organized by the League about 1930 when the ARRL DX Tests began. Since then we've had the ORS Parties (which became the CD Parties) and the Sweepstakes, and so on. You've got to admit they caught on. I was never very active in any of them but they didn't make me see red. I just assumed in my na'ive way that they had as much right to use the frequencies as I did, especially if they got there first.

And you know how contests took up with a bang right after we got back on the air after WW II. Lots of guys found them to be a real shot in the arm in contrast to everyday, run-of-the-mill operating. Besides, a lot of DX only shows up at contest times. Anyway, they were popular and each one was bigger than the one before. I still couldn't get interested. Contests seemed like harmless fun and, Lord knows, there were lots of other things I could find to do. Even with the bands full of "CQ Contest" and right where I wanted to operate, I could always shut off the rig. There would be other week-ends. They didn't bother me; I could take 'em or leave 'em.

Once in a while, though, I'd go in a contest very casually. I went in the Sweepstakes in 1953 and decided that I'd amuse myself by knocking off the 73 sections, one by one, and call it quits. Me with a Ranger and an 80-meter antenna 20 feet off the ground. Just like that, what an idle dream! Another time, I took a crack at Field Day and what did I get? — Sunburned, a lot of lost sleep and mosquito bitten. But I'll have to admit, I also had some fun. Contests are OK, I said but . . .

I didn't know it but just about that time I was going to have my eyes opened and what an awakening. In 1955, the Commandant of the U.S. Coast Guard decided that I was needed at Headquarters in Washington, D.C. I decided to renew my old friendship with W4CC. I didn't realize then what an effect this would have on my attitude toward contests. Jack insisted that I attend a meeting of his radio club with him, at which time he proposed me for membership. Now, I've been involved with quite a few radio clubs in my time but never with a club like his. It was different. In fact, after the first few meetings, I began to wonder what I had done to get mixed up with a gang like this. I began to suspect that the old saying about "You don't have to be crazy, etc." was true. But I must say, in all fairness, that it only seemed that way; they all turned out to be amateurs in the real tradition of amateur radio. You have probably guessed by now that I'm talking about the Potomac Valley Radio Club.

The author, now a contest convert, at K4CG/4 during a recent Field-Day Contest.

Such meetings they have! It was an eye opener. Never an argument about money or Robert's Rules of Order and so on, they just talked about amateur radio — how to beat Frankford R.C. in the SS or what sly tricks to use in a DX contest. Just amateur radio. What heritage!

This was the summer of 1955 with the Sweepstakes a few short months away. So it was inevitable that the major topic was the annual fall madness. I'm sure you recall reading about that radio club the OM used to tell about, the one with Final Authority and Radical in it. Well, (Continued on page 144)

November 1968
November 1943

. . . Editorially, K. B. Warner, W15IU, is already contemplating amateur amateur operations in the post-war period. He invites correspondence with amateurs on the matters such as: should we stress technical excellence, operating ability or what? He points out that in most other countries, experimental work is a must to retain a license. Many countries and services will demand part or all of our precious frequencies, claiming we do nothing to advance the art, even though admitting that amateurs have in the past contributed mightily to the art and supplied a vast number of highly trained operators and technicians.

. . . Frederick A. Long, ex-W8NE, ex-WbSSL, describes a 1944-style CO-WERS mobile transmitter and receiver. It is entirely self-contained and needs nothing but a source of power and an antenna. It is designed to be permanently installed in a car but may also be operated on 110 v.a.c. if near such a power source. It is not a transceiver but may be operated push-to-talk. Uses a modified "J" antenna.

. . . Hollis M. French, W1JLK, Assistant Technical Editor, has an interesting piece on Astronomy and Amateur Radio, discussing sun-spots, the various reflecting layers, etc. and their influence on radio transmission in general. He gives many references on several aspects of the phenomena.

. . . A pack-set walkie-talkie for WERS is described by Frederick M. Burkle. This enables the operator to go just about anywhere be on the spot. It uses three 1Q5ST tubes, one voltans, of course. He puts 165 volts on the plates. The photo shows the constructor with one on his back. He is leaning just a little bit forward!

. . . in HAMDOM, we have a short radio biography of Fred Schnell, W0UZ, now a Captain in the Navy, and William J. Lee, ex-41X, also a Captain. Schnell is Base Communications Officer at an unnamed Naval Base and Lee is Assistant Director of Naval Communications for the Administration in Washington. Both have, of course, very notable careers in radio. Fred is currently (1968) operating W4CF in Bradenton, Fla.

. . . There are four pages of pictures showing the Signal Corps Exhibit at the Army War Show in Washington. The show is put on in connection with the Third War Loan drive.

. . . An Interpolation Oscillator described by Frank H. Mills, W9HQH, uses a 100-kc. bar and a 10-ke. multivibrator, as a valuable aid in frequency measurement. This rig would still be plenty useful today. The author claims an accuracy of part in a million. — W7ANV

COMING A.R.R.L. CONVENTIONS

January 18-19, 1969 — Southeastern Division, Miami, Florida.
June 20-22, 1969 — NATIONAL, Des Moines, Iowa.

Note: Sponsors of large ham gatherings should check with League headquarters for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at A.R.R.L. for up to two years in advance.

Hamfest Calendar

New York—The Fulton ARC Annual Birthday Party and Hamfest will be held Saturday, November 16 at Fulton Town Hall, 3 miles east of Fulton on Route 3, Starting at 1500 on the Flea Market, there will be contests and other activities. At 1800 there will be a roast beef dinner. Only 100 tickets to be sold, $3.00 per person. Write Hamfest Tickets, Fulton ARC, P.O. Box 26, Fulton, N.Y. 13069.

Oklahoma—The Annual Tecumseh Radio Amateurs Hamarunna will be held on the 15, 16 and 17 of November at Lake Tecumseh Lodge on Lake Tecumseh in Oklahoma near Kingston. There will be the customary program of technical discussions, a swap and shop, mobile hunt and an auction. All of the programs except for the mobile hunt will be indoors so that weather will not be a factor. For more information write Charles Vanderpool, WSNT.

The Naval Ship Engineering Center, Great Lakes Division, Great Lakes, Ill., employs six electronics engineer hams, including L. to r.: Leonard Eckman, W9AKO; Paul Schmidt, W9IDP; Robert "Rip" Powell, W9KPO; George Hale, WA9UUL; Bill Randall, W9IPS and, absent, Bill Fullerton, WA9SBO. These NA9SEC hams operate c.w., a.m., f.m., and s.s.b. from 2 meters through 160, including MARS frequencies, and form an emergency communications team. Now in planning is a tie-in with the area tornado alert monitoring system. (Official Navy Photograph)
The Ruptured Rhombic

BY JAMES W. VOORHEES, * W8EGR

This will not be a technical article complete with graphs and technical information rather, a loose coupled story of one ham and his antenna. The project was initiated more by chance than with the arrival of the fourth sixty-foot pole, surplus to a local utility. Three of these poles had been in use supporting a dipole and a 600 foot long-wire antenna.

The fourth pole lay in the snow until some use could be figured for it — but you can’t say “no” to free poles! To a ham with any tenure at all, four poles can mean only one thing: a rhombic. W8EGR radiates from the middle of twenty acres and space is no problem. Thus, shortly after the first of the year, the plot began to thicken. I have a long file of O3Ts and reread the November 1936 1 article on the subject — a dogeared memory of the high-school radio club. I can assert that this article is correct and makes no claim which is not true thirty-three years later.

Research led to a design which measured 600 feet long, 225 feet wide and occupied the better part of five acres. This yielded 360 foot legs or six wavelengths per leg at twenty meters. The pole at the end of the long wire was in fine position for the southwest end of a rhombic aimed at fifty degrees which is a good DX heading for this location. A transit was borrowed and at ten above zero in a snow storm, the poles were staked out. A week later, the utility company moved the remaining poles, and the die was cast.

Seven-hundred feet plus of uninterrupted wire — Copperweld of course — is not easy to come by in this area and I needed two pieces. This created a two-week delay until a patient volunteered that the several small telephone companies in this area were no longer using Copperweld wire for phone lines. This proved a good tip and I found several mile-long rolls waiting in an unattended warehouse. If you intend to purloin wire in that length, help will be needed, for I had trouble liberating a roll which held some 2000 feet. The telephone boys provided some fittings and their crimper for holding the ends of the wire in the insulators. You’ve got to scrounge and I am sure that there must be miles of such wire unused in rural telephone warehouses.

Two CBers helped measure and erect the wire on the poles in the middle of a snow storm, but, when it was up it was a thing to behold! Even when the far end could not be seen in the blizzard! The feed line was the usual 600 ohm deal with six-inch ceramic spacers donated by WA8FLL and wrapped for shipment by his wife in you-can-guess-what paper, individually wrapped, too. By chance, the feed line measures one-hundred-thirty feet from coupler to antenna. The array timed fine on seventy-five meters, but the results were anything but exciting. W9BDG in Fort Wayne reported that the dipole was ten db. louder. After considerable checking, this holds true over a radius of three-hundred miles. However, one night during a meeting of the Wolverine Net, another net was giving us trouble and I switched to the rhombic. Several annoyed lives called in to see what was going on. Clare, K8HGA, eavesdropping on vacation in New York State, told me later that I was louder than the locals in that area. This has been checked out over a two-month period. At six-hundred miles, the rhombic will run rings around a good dipole on 75.

The antenna first demonstrated its gain one afternoon when on 21,300 kc, VR6TC was heard in QSO with a W5 who was MCing the frequency. With the barefoot TR-4, Tom was called while the W5 was transmitting. Tom came back at the start of his transmission with a “please stand by W8EGR.” Oh boy! It works. Tom is off the Southwest end of the affair and will verify that he hears me barefoot or no. Off the other end on 15, GD3RFK verified that I was as loud as any W he was hearing — barefoot again. Doug wanted to hear it with the amplifier (4-1000A) going, so I fired it up and the signal became head and shoulders over anything else he was hearing. This has been the case on 15 meters and the amplifier has not been used on that band.

In its present unterminated condition, the antenna is very directional and you don’t hear or work stations other than in the proper directions.

*97 S. Broad St., Hillsdale, Mich. 49242

(Continued on page 148)
Armed Forces Day 1968

Communication Test Results

This year's annual Armed Forces Day communication tests sponsored by the Departments of the Army, Navy, and Air Force once again proved to be a highly successful event.

Four military radio stations — WAR (Army), NSS (Navy), and AIR (Air Force), located in the Washington, D.C. area and NPG (Navy) in San Francisco — conducted the communication tests on 18 May 1968. The tests included military-to-amateur crossband operations and receiving contests for both continuous wave (c.w.) and radio teletypewriter (RTTY) modes of operation.

Crossband Results

WAR, NSS, NPG, and AIR had a combined total of 6948 QSOs during the twelve hours and forty-five minutes devoted to the military-to-amateur crossband portion of the communication tests. Commemorative QSL cards have been mailed to all contacts that could be identified in the Spring 1968 issue of the Radio Amateur Callbook Magazine. Any amateur who has not received a QSL card confirming his contact should address a request for clarification to the Armed Forces Day Contest, Room 5B900, the Pentagon, Washington, D.C. 20315. This request must include the amateur's call sign, the station worked, time of contact, and the frequency utilized by the military station.

C.W. Receiving Contest Results

There were 457 perfect entries for the 25 w.p.m. c.w. Broadcast Message originated by the Secretary of Defense. The complete text of the 25-word-per-minute c.w. message is printed below followed by the call signs or names of individuals who received a Certificate of Merit for submitting a perfect contest entry:

— n — 182200Z MAY 68
— FM WASHINGTON DC
— TO ALL ARMED FORCES DAY PARTICIPANTS

Each year on this day the communications services of the military departments join in conducting a special radio communications program for radio amateurs. This annual program CMS which features the awarding of special acknowledgement cards and certificates of merit CMS also symbolizes the appreciation and gratitude of the military departments for the technical and public service contributions of radio amateurs to the military communications services for more than a half century. Through their participation in the military sponsored military affiliate radio system DASH MARS DASH program, CMS several thousand radio amateurs are now voluntarily assisting in providing an expanded voice and message service between our service-men in southeast Asia and their loved ones at home. This service CMS which is of inestimable value to the morale and welfare of our fighting men CMS is a notable public service contribution in the history of military dash amateur radio association PD as secretary of defense CMS I am pleased to convey to radio amateurs everywhere the appreciation of the military departments and my own personal thanks for your many valuable part and present contributions SD. CLARK M. CLIFFORD

C.M. Secretary of Defense to QAR

C.W. Certificate Winners:

RTTY Receiving Contest Results

There were 567 perfect entries for the 00 w.p.m. RTTY Broadcast Message originated by the Secretary of Defense. The complete text of the 60-word-per-minute radioteletypewriter message is printed below followed by the call signs or names of the successful participants who received a Certificate of Merit for submitting a perfect contest entry:

RTTY Receiving Contest Results

A coffee break during the Armed Forces Day military to amateur radio activities. (r. to l.) Edward Schafer, W8BE; Ralph Rickett, W8BTW; Joseph H. Ziglinski, W4DIN; Jack Shepard, W8OMY; Edward S. Liscombe, K4NJV.

November 1968
A familiar fist on the DX bands, Leonard Chertok, W3GFR mans the c.w. position.
A light tropical breeze billowed out the curtain at his right and gently cooled his face and arms as Father Tim O’Neal, ZP3YY, tuned up the transceiver on the c.w. portion of the twenty-meter band. It had been another hot day in Santa Marguerita and Tim was certain that even five more years in that Paraguayan town would not bring him any closer to being reconciled with its tropical weather.

Once more he checked the meter; the s.w.r. was nearly 1 to 1. He chuckled to himself as he thought of the antenna raising party he had held to get tower and beam up on the tile roof of the priests’ residence. Tim, and the three parishioners he’d ask to help, were soon joined by nearly 40 villagers who quickly gathered for the biggest event in Santa Marguerita since the mayor’s daughter’s wedding. All together, the antenna raising had cost him three cases of beer and several promises to give instruction in Morse. It had also cost him the good will of the aged Najero sisters who thought that the young Padre Tim could put a Saturday morning to better use than to be climbing all over the rector’s roof playing with metal rods. Tim’s image hadn’t been improved, either, by all his arm waving to make up for his lack of technical Spanish. But somehow his helpers had understood his directions.

Six hours of work and festivities had at last given Tim the sort of antenna he needed for this year’s big DX contest. Now, the twenty-four hour clock just above his desk showed 0010 GMT. In twenty minutes he’d really be sweating to handle the pile-ups trying to work him. A good prefix like ZP3 was no small consolation for being a missionary in South America. Of course, Tim hadn’t used the ZP prefix much; as the only priest in a parish larger than 6000 square miles he’d only found time for an occasional QSO with friends back home and a weekly schedule with Father Henry in Concepcion. But now that Father Henry was here to take his place while Tim spent three months back in the States, Tim could devote this whole week-end to the contest! It was sure to give him a WAS, WAC, and maybe DXCC.

Another quick glance at the clock; 0055 GMT. Father Tim tapped out a series of Vs and a “de ZP3YY.”

Just then, light from the hallway filled Tim’s room. He turned to the doorway behind him. A boy of about twelve years hesitated in the hallway.

“Padre Tim?” he asked.

“Eduardo!” Tim exclaimed at the sight of his altar boy from the village of San Phillipe. “What is it, boy?” he asked, hoping Eduardo did not hear the irritation in his voice.

Of all the altar boys who served Tim at Mass, Eduardo was the most faithful and it was Eduardo’s mother who always insisted that Tim have dinner with them on his weekly visit to San Phillipe. “What is it, Eduardo?” Tim repeated. The boy’s dark eyes seemed to be burning with fear and his frail form quivered with anxiety and exhaustion from his long trip to Santa Marguerita. “Padre Tim! It is Mama. She is sick and she say Padre Tim is to come at once.”

“Did you see Padre Henry? Padre Henry is taking the sick calls tonight, Eduardo. Really, he is very good and perhaps he can help your mother to get better and...”

“But Padre,” the boy interrupted, “Mama, she say ‘Only Padre Tim.’ She would not like if Padre Henry were to come.”

Tim knew he’d said the wrong thing and he tried to find words to repair the damage. “I’m sorry, Eduardo,” he offered softly.

The chatter of c.w. signals coming in over the speaker told Father Tim that the contest had begun. He felt somehow drained into emptiness as his mind looked back on the ten years he’d been a ham. There had been the night of the Novice contest when the long-wire antenna broke in the winter cold; the chirpy forty-watter and S-38 receiver he had set up in the recreation room of the seminary; the grumpy student advisor who had made them dismantle the station because it was too “worldly,” and the new sideband rig that a young instructor had set up for them some time later. He remembered, too, his station in an African mission. That station had never been put on the air! The government there was still considering his application for a license when he was reassigned to South America.

(Continued on page 148)
CONDUCTED BY GEORGE HART,* WINIM

Count Your Traffic Right

ALTHOUGH it may seem a minor matter to some, the "traffic count" is an important concept to many of our traffic-handling amateurs. It can be a basis for controversy as well as a means of gaining recognition for individual or net performance, and often has been both.

Some recent correspondence has led to the suspicion that quite a large segment of traffic handling amateurs are not counting traffic correctly, some through ignorance of the correct method, others because they don't agree that the ARRL standards are logical. Well, we can't do a great deal about the latter, and assume they will not submit (for BPL) traffic totals based on other than standard ARRL counting methods. Regarding the former, however, all that is needed is information.

Where do you find it? In the booklet Operating an Amateur Radio Station, which has been available for years free of charge to League members, a thin quarter to others (which barely covers the cost of publication). This booklet has received widespread circulation and is often passed out at hamfests, conventions, even club meetings when an ARRL official attends. Its treatment of message handling by individual amateurs is comprehensive, including how to count.

One thing about message counting needs to be emphasized: Unless your traffic is handled (a) on amateur frequencies, (b) in standard ARRL form and (c) is duly reported and published in QST, it is not eligible for BPL recognition. Also, if it is not counted in full accordance with the ARRL rules for counting, it should not be reported for QST publication at all. There has been suspicion voiced by many in the past that some of the high-ranking BPLers play "fast and loose" with the counting rules — to their own advantage, of course.

We would hate to think this is true and sincerely hope it is not. However, just to get on record, a few things about traffic count by individual stations should be pointed out and emphasized:

1. Traffic that is not handled in full and complete ARRL form may not be counted in the ARRL traffic total submitted to your SCM. An occasional slip through ignorance by a beginner can be forgiven, but consistent handling of traffic in sloppy, abbreviated, incomplete form is ground for eliminating the count from the total. Such as what? Well, short cuts such as using the word "same" in place of a message part, repeated omission of some part of a message, counting of "book" messages incorrectly, handling of illegal traffic, etc.

2. Every traffic-handling function, to be counted as a traffic-handling point, must be an on-the-air function except the act of delivery. You don't get a "received" or "relayed" point for receiving or relaying a message by mail, telephone, telegram or MARS. Only if the reception or relay is by amateur radio, on amateur frequencies, using standard ARRL procedure do you get such a point.

3. You get a "delivered" point when you put the message in the hands of the addressee by non-amateur-radio means—that is, you can telephone it, mail it or hand it to him in person, but if you send it to him over the air, by amateur radio, it's a "relay," not a "delivery," as far as you are concerned. If you are on the receiving end of such a message (i.e., one addressed to you), it is a "received" point, not a delivery. So, the only "delivery" must be to someone other than the receiving operator and must entail some effort on his part to effect delivery.

4. On examining the counting method, one would assume that the "received" total must be equal to the "delivered" and "relayed" totals. Not so, for reasons apparent in the above. A message may be received for relay by non-amateur-radio means, in which case it gets no "received" count but does get a "relayed" count if sent onward by amateur means. Or, a message may be received for the operator, in which case it will get a "received" count but no "delivered" count.

5. It should be obvious from the above that "informal" traffic is not countable at all. This includes direct communications between two

*Communications Manager, ARRL.
third parties, either present in the stations or through telephone connection. As meritorious as some of this is, there is no present mechanism for crediting it numerically.

Counting Net Traffic

The procedure for counting net traffic has never been formalized, but is standard on NTS nets. Basically, it is absurdly simple, but different in principle from individual traffic count. When Station A hands a message to Station B during a net, Station A gets one “relayed” count (or one “originated” if it’s in that category), and Station B gets one “received” count. The net gets a count of one handled. This is the only category of net traffic — the “handling.” It is not referred to in this manner ordinarily, but it’s simply logical that when a station in a net passes a message to another station in the net, the net gets a traffic count of one. The net’s total for a particular session is the total number of times such a procedure is completed. A “session” is the time between the NCS call-up (QND on c.w.) and the time the NCS declares the net closed or secured (QNF). The net’s traffic total for the month is the number of times the process was completed in session during the month.

Simple? Sure it is, but all kinds of complications seem to arise. In the past, some nets have counted all traffic reported, never mind whether it was handled or not. This hardly seems kosher to us. Others have inquired whether traffic handled after the net but by net members can be included. In our view, no. Another question has been, how do you count traffic that is dispatched to another frequency during the net session but handling not completed until after the net session is over? Answer: NCS has to estimate how much of it could be cleared: either that or go find the off-frequency netters to tell them the net is secured and find out how much they cleared — then let them go ahead and clear the rest.

Another question: Suppose a message has to be relayed in the net by a third station, do you count it twice, or only once? Answer: twice if it was relayed in toto, otherwise only once. Then, supposing nets start to make a practice of relaying messages from one station to another to pad their traffic totals? Well, we hope nets won’t do this; padding isn’t very nice, and only gives a distorted view of the net’s capability and efficiency.

So, fellows and gals, count your traffic right — but count it and report it to your SCM, so it can be credited to the public service record of the amateur. — WINJM.

National Traffic System

Handling much Vietnam traffic? Quite a bit of it appears on NTS. If you will forgive a personal note, the writer originated several such messages to his son in Vietnam and has since heard that some of them were received, but about a month later. We’re sure this isn’t typical, but it does raise the question: what happens to this kind of traffic when it gets on NTS? Where does it go and who handles it and how does it get to Vietnam?

As you all know, NTS is a system and tries to behave as such; and because it is a system, handling of Vietnam traffic is on a systematic basis just as handling of all traffic on NTS. Since the system does not purport to handle traffic outside the League’s field organization, Vietnam traffic is APO/FPO-San Francisco. San Francisco is in the Sixth Region, so this is where such traffic has been sent — via RN6. In the same manner, APO/FPO-NY traffic goes via 2RN and APO/FPO-Seattle traffic via RN7.

So what happens when the traffic gets through the system and lands in RN6? We understand it is transferred into MARS at that point, but this is RN6’s problem. Assuming it goes MARS from RN6, what does MARS do with it? That, we have always assumed, is MARS’s problem. We would have guessed that it is relayed directly across the broad Pacific on military frequencies to a MARS installation at some army, air force or naval base in Vietnam, and ultimately delivered. But this was just guessing, because once we had taken it as far as we could via NTS, it was out of our hands.

Not so long ago we were told unofficially, but by a high official, that Vietnam traffic is all centralized at the Pentagon before being sent to Vietnam via Hawaii, presumably on a direct RTTY link. Does this mean, we wondered, that Vietnam traffic originated on the east coast goes all the way to the west coast whence it is transferred to MARS and comes back to the east coast before being sent on its way to Vietnam? Astonishingly enough, this appears to be precisely what has been happening. Those effecting the transfer at the west coast end must have been aware of this all along, but no mention has been made of it.

The obvious thing to do is change the transfer point — that is, assume we do want to handle as much of this traffic as we can get our hands on. On the other hand, the same aforementioned high official advised that the best, if not the only, way to handle the problem is simply to put the traffic in the hands of a MARS station (any MARS station) as soon as possible after its origin, and let MARS take it from there. This would be, in effect, admission of our incapability of handling it and leaving its handling up to the originating station. Or, to put it another way, we would simply adopt a NTS policy of “no outlet” for this traffic and originators would be on their own.

The shack of K3DSM where the Lower Merion, Pa. CD radio unit spent the FD night after being struck out by Murphy.

November 1968
Members of the Redwood City Disaster Communications Net who participated in the Fourth of July Parade Communications. Back row, left to right: WB6MED, WA6YGR, K5UKF, K5MPN, W6DEF, K5ANH, W6VQQ, W6FIT, K5DRN. Front: W6BIX, W6BVS, two helpers, K5GKH and W6UKO. W4CTH took the picture.

Much to be preferred is a systematic entry from NTS into MARs at some regular entry point, such as 3RN or NTS section nets in the Md.-D.C. section. Perhaps we could consider an ad hoc "corps" of stations to take on this responsibility via 3RN — stations active in both NTS and MARs.

While further negotiations on these points are continuing, the procedure remains the same — APO/FPO-SF traffic to RN5, APO/FPO-Seattle traffic to RN7, APO/FPO-NY traffic to 2RN. If any definite change is called for, the word will get down the nets as soon as possible. — W1YNM.

August reports:

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August Summary:

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Diary of the AREC and RACES

At 2330 GMT on July 22, W6BRRM at YMCA Camp Lundein in Nevada called WA6BWO, NCS for WCAIRS, reporting that a youth at the camp had been seriously cut and that transportation and medical aid were needed.

No stations in the immediate area were available, but WA6GQF called the U.S. Forest Service at Inyo National Forest. U.F.S.F. then used their own radio link to Tahoe. Aid was on the way by 2338 and serious incident was avoided. — W6GQF, EC Inyo County, Calif.

W9CNV, Colorado State Radio Officer, answered a call for assistance to aid a search and rescue operation, about August 6. A boy was lost on the rugged Rockies five miles above Minturn. As no telephone service was available, amateurs were called on to help.

Operations on 75 and 40 meters were continued for a full week with numerous messages passed and a total of more than thirty amateurs participating. However, the boy was not found until several days after the search was called off. He had been taking food and supplies from one party to another and thus had the means to survive at the extremest altitude. — W9CNV, SEC Colorado.

The report of the East Tennessee VIII Net was inadvertently omitted from the SET report in Aug. QST. The group operated six and two meters with K1FO, WA4JIT and WB4IAD acting as net controllers. — KA4VI, EC Knox County, Tenn.

VE2AFT and VE2DGH manned a checkpoint, June 5, for the Shell 4000 car rally. Although none developed, the checkpoint was available for emergency and general traffic. — VE2AFT, SEC Quebec.

On June 6, members of the Glen Falls Area AREC held a drill to test the feasibility of operating amateur equipment aboard USCG Auxiliary boats during emergencies.
Aboard the boat in “distress” was WB2ZTP with a six-meter walkie-talkie. WB2z KBQ and RPL, aboard another craft, took the initial call for assistance. W2FEM and WB21MY were NCS from a station set up at the marina. K2s BHM PBE and WB2BJ operated K2AYQ aboard an observation craft. — K2AYQ, EC Glen Falls, N.Y.

The Bucks County (Pa.) AREC, on June 8, used ten meters to provide marshalling and general communications for the Croyden Fire Company 50th anniversary parade. Six mobiles and two walkie-talkies were manned by fifteen amateurs, with the call W3SEK used as NCS at the reviewing stand. — W3TCC, EC Bucks County, Pa.

The Redwood City, Calif., RACES provided communications for the annual Fourth of July Parade of the Peninsula Celebration Association. Under the direction of RO K6ANN and EC W6DEF, twelve amateurs manned eight portable and mobile stations along the staging area and route. — W6DEF, EC Redwood City, Calif.

The Gem State Amateur Radio Club provided communications for a boat race held in Boise July 6 and 7. Two and ten meters were used with nine amateurs active in the exercise. — W7ZNN, SCM Idaho.

Seven members of the Suffolk County CD, operating under the call W2TFJ, used two-meter f.m. to coordinate communications for the calamar races held at Mattituck, N.Y., on July 20 and 21. — W1ASKBB.

On July 20, seven amateurs under EC VE2ANH provided communication for canoe races held at Cartierville, Quebec. Two-meter f.m. was used aboard the starting boat where VE2ZA had a handheld unit. VE2BSQ, also with a portable unit, was on a follow-up boat, acting as a relay for messages between the judges and other officials. — VE2ALE.

A drill simulating a storm with ensuing power blackout was held throughout the South Dakota section on July 27. Only four ECs failed to check into the net operating on 3055 kc. Twelve amateurs had emergency power capabilities and another twenty had mobile equipment. — W10CPX, SEC South Dakota.

Thirteen members of the Muskegon Area Amateur Radio Council provided a fast means of relaying election results from outlying communities whose polling places have no telephone service, August 6. Six and two meter a.m. were used in relaying to the Civil Defense Communications Center. — W1AGYVK, EC Muskegon County, Mich.

On the morning of August 20, weather conditions in the Montreal area were bad when VE2BU, on the Trans-Canada Highway, came on the aftermath of a serious accident. Using the VE2RM repeater, VE2ALE was notified. VE2AKM, who was called through the VE2MT repeater, reported the accident to a local broadcast station, which made announcements of the traffic jam to the public. — VE2ALE.

The Tri-County Net provided communications for a Veterans of Foreign Wars parade in Detroit, Michigan, August 20. Three fixed stations and six mobiles were active on ten, six and two meters. The mobiles assisted aid stations and hospitals by transporting medical personnel, supplies and persons stricken by the extreme heat. Controlling the net from WS8HS were WS1DJ and K8IYZ under the direction of EC W8BEZ. — W8BEZ, EC Wayne County, Mich.

At 0105 GMT September 8, WA6JPS was operating on twenty meters when he received a call from VP8WJ with an expedition in the Antarctic. One of the expedition’s sled dogs had been seriously injured and the medical officer was trying to obtain information for an operation and blood transfusion for the canine. WA6JPS called a local veterinarian and instructions were relayed to the medical officer by phone patch. — W10JPS.


Miscellaneous Net Reports

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Bill Smith, WA3JHB, sent us this photograph of his unique Ohio call-letter plates. Since taking the picture, Bill has moved to Pennsylvania and had to give up the plate, but fortunately it was picked up by another ham, WA8AWD. Bill notes that Ohio CQ 88 belongs to a CBer and a CQ 40 belongs to another ham.

November 1968
I PASSED!

I passed my General amateur radio license test on August 20, 1968. This was accomplished by copying W1AW every evening. Thanks for the help.

I will be 81 years of age on December 6, 1968. — George W. MacCool, W1J3Z1, Philadelphia, Pa.

Now that I can insert “Amateur Extra” in the blank space on the renewal card, let me offer a few words of sincere appreciation to the ARRL for providing the stimulus that led to the upgrading of my license.

Frankly, my reactions were strongly adverse when you first came out with your proposal for incentive licensing, since at the time it seemed an almost hopeless goal for this aging professor of Greek and Latin to pack into his noggin sufficient up-to-date electronic knowledge to pass the Extra Class exam. But with the constant encouragement (I might almost say badgering) offered in the pages of QST ever since the proposal was first made, and with the helpful material contained in the recent editions of the License Manual, especially the current ARRL Handbook; the task was somehow accomplished. Believe it or not, I really enjoyed the work of preparation which proved to be much less formidable in reality than it had appeared in prospect back in 1963.

I’ve told my friends on the c.w. subbands that my main motivation in taking the Extra Class exam was my reluctance to get down to work and build a 25-ke frequency divider for my crystal calibrator; but just between us, it was ARRL’s hectoring that did the trick. For that, my sincere gratitude to you. Keep up the good work with the good! — Edward W. Burke, K8YWN, Cincinnati, Ohio.

WB2NOD’s Ham-ad in September QST shows results of “National Incentive Licensing Poll” (639 against, 178 for). There must have been hundreds, maybe thousands, of amateurs like myself who were too busy studying, practicing and passing amateur Advanced and Extra exams to take time to vote in this poll. Now that the poll is finished, I suggest WB2NOD and his “SCCARO”; whatever that is, get on the ball too. — W. E. Horner, Jr., W4QO, Sanford, N.C.

I passed my Extra Class exam today. In all fairness, I must admit that it took some effort on my part, but I cannot overlook the effort that you expended in order that I pass it. First, of course, I could not have made it without the W1AW code practice sessions and the license examination. But I wish to express special gratitude for the excellent six-part (March-August) series on higher-class license examinations. What I most appreciated was the series of multiple choice questions that followed each article. — Frank E. Fisher, W44UXQ, Arlington, Va.

I want to thank you for the wonderful job in QST’s Questions and Answers for higher-class license examinations coupled with the study-guide reference to the Handbook.

No doubt, QST’s study outline has made it possible for me to pass (on the first try) my Extra Class exam today without any trouble. The added time at 20 and 25 w.p.m. sent by W1AW is an excellent idea.

All in all, incentive licensing has re-awakened my interest in ham radio and believe me, it was worth the effort! — Edgar Laddera, W1B0KN, Brooklyn, N.Y.

After having obtained the Extra Class license, I would like to express my appreciation to the ARRL for the excellent study guide furnished to us in the new License Manual and the QST series of Questions and Answers guide. This material was so well prepared and presented that it seems almost impossible for one to fail the FCC exams after having studied this guide. I feel sure that I am not alone in saluting the ARRL for this fine service. — P. Q. Partee, W4ABI, Miami, Fla.

DOCKET 18268

During my many escapades this month I also took on the reading of the Electronic Industries Association’s proposal of a change in the rules governing the Novice License. Though I am a Novice I find myself in favor of the FCC’s decision. I find that the reduction in code speed, 10-meter band privilege and a 5-year term, renewable license, totally unnecessary. A Novice Class license is meant for a Novice; not an Extra. It is a license that requires study, patience and a mastery of the code from which amateur radio became what it is today. This I might add will not help my QSL reply but then again the minority often has the good of the majority in mind. — John D. Kelley, WN3JSVY, Annapolis, Md.

[Editor’s Note: Docket 18260 appeared on page 83, September, QST.]

Originally, the Technician Class was instituted to encourage electronic technicians to experiment on the v.h.f. and microwave bands. Today, this license has become a glorified CB license. My own observations show more “appliance operators” and less builders among the Technicians than in any other class . . .

I make the following alternate suggestions to improve the status of Technicians:
1) Abolish the Technician license completely and give the present Technicians the option of taking the new two year Novice license, or
2) Give the Technician who has never held a Novice license the opportunity to resign his license and take a Novice license, or
3) Make the Technician Class open only to real Technicians; that is, make the test much more
difficult either with questions specifically on v.h.f. or from the Advanced and Extra Class licenses. Give the holders of the present Technician license the option of taking the new test and remaining Technicians or taking a Novice license, or
4) Establish two classes of Technicians. The lower class would require the same test as is in use today. This class would be limited to 220 Mc. and up. The Advanced Technician class would require the more difficult theory test as in 3 above plus one year of experience and offer full privileges on 50-54 Mc., 145-147 Mc. and possibly 29.4-29.6 Mc. or a segment of 160 meters. This would give better use of 220 Mc. and 432 Mc. and should also encourage the manufacturers to bring out more and better ready made gear for these bands. This would also give the man with no c.w. interest an incentive to work for and encourage a higher technical knowledge among these amateurs, or
5) Encourage the use of c.w. by Technicians with several methods through League action:
a. Encourage v.h.f. c.w. nets.
b. Encourage local code practice sessions on v.h.f., perhaps through radio clubs.
c. Hold v.h.f. c.w. contests with special recognition for high scoring technicians.
d. Do everything possible to encourage manufacturers of v.h.f. gear to include c.w. capability in all ready made gear.

I am offering these suggestions in hope that they will stimulate discussion and lead to changes that will improve the quality of amateur operation on the v.h.f. bands, and pull Technicians out of their blind alley. — Harry F. Hillman, W7DYZ, Oracle, Ariz.

TWO YEAR NOVICES

Issuing of two-year Novice licenses was a mistake. All the Novices I have talked to who have a two year license (which I had also up to a couple of weeks ago) plan to just sit on their licenses until time for expiration before trying for a higher class. Therefore, you have a kid who is going to be stuck with the horrible class of Novice for two years, rather than just one, with twice as long to become discouraged and quit. As for those who advocate that the two year license is often necessary to give the kid time to assemble a station, I say it's all a lot of baloney. It took me less than a year to build my transmitter, antenna system, and a half to receiver, plus appear before the FCC twice, and I am very slow at learning the code. As for the argument that it takes time to gather up the money, I say that if a person takes a year to get up enough money to be a Novice, he'll never get enough to assemble a satisfactory station, and will quit anyway. There are many widely varying privileges granted by passing this exam; probably 75% of them aren't even touched on by the exam. — Steve Hurder, W3WFP, Champaign, Ill.

THANKS

The Beginner and Novice section article of July, 1968 QST posed the question, "Where Did The Signal Go?"

After reading September 1968 QST I say, "Where did Lew McCoy go?"

Whatever happened I am sure was unavoidable. I just wanted to let you know that I am always looking forward to issues of W1HCP. — Wendell Adler, Jr., WN2EQL, Saddle Brook, N.J.

[Editor's Note: Mac was temporarily laid low by illness some weeks ago; he's now back in full swing.]

In reference to your comments on the additional code practice runs at 20 and 25 w.p.m.; by all means make this a permanent part of the late session of W1AW code practice. I feel that I owe my Extra mostly to that additional practice. Many others either do or will soon find that these extra few minutes help learning to copy higher speeds. — George Garaline, Jr., WB3GWR, Blackshear, Black, Va.

I would like to thank your technical staff on the fine job it has done on writing the book, Understanding Amateur Radio. I read through that book for a few weeks and then started studying the License Manual. I could not believe how easy it was to get the answers and diagrams into my head. Keep up the good work, guys. — David Anderson, WN1JXD, East Greenwich, R.I.

Please pass my thanks on to Mr. Burke, K2ENU, for his very down to earth eye opener, "Beware the Scrap Box," in September QST. His practical article has turned my junk box into a treasure chest. — Dr. Robert L. Morgenstern, WN2BAX, Kew Gardens Hills, N.Y.

Thanks for the photo and write-up about [General Manager] Huntoon in the September issue. Photos, etc., about the Staff sure make us out here in the boondocks feel closer to our League. How about photos of the secretaries, lab men, etc.; even the janitor? We're interested in all of our staff. — E. Kemper Fitch, W4DPR, Charlottesville, Virginia.

[Editor's Note: If our members enjoy "Behind the Diamond," we'll certainly keep it coming — roughly on a seniority basis.]

WHY THE RADIO CLUB?

Why belong to a club? Of course, K6YA (September QST) is right about needing collective strength. He is right when he talks about the need to protect our frequencies. He is right when he talks about the need for friendly cooperation, but I joined the club for far more personal reasons.

First, the club has given me a new field of knowledge! Every clergyman should have knowledge in as many fields as possible. I can't tell you how enjoyable it is to sit with a group of men and talk electrical theory. It is a privilege simply to hear their world views. Ham radio has opened a whole new realm of information to me. "Paradis," "reactance," "L/C ratio" were as foreign to me two years ago as a clergyman talking about "the eschatological significance of the Incarnation" is to the average layman.

My mind has been expanded by the club. It has given me those simple explanations that I could neither find nor understand in a book.

Secondly, the quality of men we have found in the ham ranks, especially those belonging to the club, is outstanding. There is comradeship and friendship. My son, who incidentally is now a General while the old man remains a Tech. (someday I'll learn the code), has met the type of men I want him to meet. When he or I ask questions, even though they are probably on the kindergarten level, club members take their time and effort to explain a full answer. Club members are the kind of persons that I could leave my eleven year old son with on Field Day and never have a second thought to his safety or treatment. The men that we have met are from all realms of life, but they have one thing in common. They live the Amateur's Code of being gentlemen and friendly. All kinds of men, polished and rough, of great intelligence and lesser intelligence, of money and of
The last and main reason for my enjoying the club is that I am accepted not as "the Rev." or "Father" but just plain "WAIHXX." Daily at meetings I attend, the group looks for my direction; in church groups, the final decision is often left to the rector. The buck stops with me. It is so good simply to be one of the gang; one who will be voted against when he is wrong; straightened out when he is off the track. For the first few months I even managed to keep my identity a secret. It is good to be treated as one of the boys. (Only at the last Field Day was I granted a special privilege. The boys allowed me to climb to the top of the tower to put up the two meter rotor and antenna on the basis that as a sky pilot I should know how to work near heaven!)

Yes, K6YA, we all need a radio club. We need it for obvious reasons, but I need it because of the knowledge I have received, the men I have met, and the wonderful feeling of being treated as just "WA".

— Rev. Gordon J. Slone, WAIHXX, South Portsmouth, R.I.

INPUT ESCALATION RACE

■ That the League has had the forbearance to finally implement, and see through the FCC, a workable upgrading program for our game is appreciated by most thinking amateurs. This is despite the inconvenience it may have caused some of us personally. But it was the maturing thing to do. Now, have we, through the League, the necessary guts to take the next step? Can we squash the "Input-escalation race"?

Most radio amateurs need a transmitter power of one kw. (or 2 kw. p.e.p.) as much as they need a hole in the head. Amateur radio is, I hope, still a sporting activity; a hobby. Save for an expedition or two, or some activities of MARS, we are neither expected nor requested to provide instant world communication upon request. Most amateurs, I believe, who suffer such delusions, possibly have more ego-trouble or even that modern American disease, "status-itis". . . .

The disadvantages of greater-than-necessary radiated power are too well known to reiterate here, and are not rationally disputable at the engineering level. Why do not we, the thoughtful amateurs, think about the FCC upon this matter? I leave the details to the League's wisdom, but suggest a power magnitude curtailment of ten, across the board, except for well-recognized special cases.

We are told that the power consumption of the human brain approximates ten watts. What does any amateur brain have to communicate so important as to require a hundred times this power for its dissemination? — C.F. Boecky, WOSCH, Deerfield, Ill.

SENIOR CITIZEN LICENSE—continued

■ In the August QST, the "Senior Citizen License?" letter from OM W9MC makes a lot of sense.

Ham radio activity bulks large in my own plans for the future, and I know that it has contributed mightily to the peace of mind and well-being of numerous members in my retirement age. Matter of fact, in several cases, being an active amateur has opened the door to a continuance of business activity after the boom has been lowered by the existing (and somewhat arbitrary) retirement requirements of many employers.

However, I do not agree with W9MC's discounting of technical and code requirements. I have assisted numerous chaps over 60 to obtain General tickets — and one has gone on to Extra. So for the "Senior License", I would think an examination requirement somewhere between Novice and General would be appropriate. Perhaps a code requirement of 8 or 10 w.p.m., and a technical exam tight enough to insure adequate comprehension of "who goes on in the gear used, if for no other reason than to keep probing fingers off the power transformer terminals. A license term of five years would be appropriate, as I doubt that the FCC would go for an indefinite term.

Altogether, seems like a grand idea. It would bring some useful maturity into ham ranks. Why not put ARRL behind such a recommendation to the FCC? — Al Smith, K5ZMS, Doylestown, Pa.

■ I would like to heartily endorse the suggestion regarding senior citizens licenses. This may sound selfish coming from one who is going on 67, but I doubt that I would benefit by such a generous and thoughtful change in licensing as it is usually a lengthy period from the time a suggestion is made and the time it becomes a matter of record.

However from my own experience I can say it was quite a struggle learning the code and passing the exam at 6 a.m. and after months of study I can only copy solid at the rate of 8 w.p.m.

With all the necessary data readily available in ARRL books the problem of becoming a good operator is negligible. Memorizing this data in order to take an exam, is another thing for one whose agility and retentiveness is not quite what it was a few years back. — Ralph C. Bishop, WN7JKK, Grants Pass, Ore.

■ I operated from 1911-1925. I'm nearly seventy years old now and find I am unable to secure any form of license due to inability to learn all the things even a Novice ticket requires — technically — although I can copy at least 13 words per minute. I can't even be anything but an associate member, but I have been since my retirement. I have all of the ARRL books but even they give little consideration to us old timers due to terms there seems to be no explanations for, in so many articles. I might say that I feel sure there are many more like me that would really appreciate ARRL if ARRL took sufficient interest in us oldsters who have been left out in the cold. Many of our health is such we cannot attend classes and many of us won't live long enough to learn all that is needed known. — Jas. "Art" Wilson, Vero Beach, Fla.

TECHNICIAN PROGRAMS?

■ The development of a large number of permanent Technician operators interested only in phone operation would seem to justify some study of their problems and spectrum allocation . . .

The League could help the Technician by promoting development of rejecting TV boosters and requirements for such by the FCC.

Additional c.w. operation period on Novice frequencies might well appeal to Technician but their minimal use of it on v.h.f. would appear to reduce to significance.

I notice that selection of directors is approaching. How about them suggesting some programs for improving the Technicians' lot and recognizing his permanent status and large representation through meager privileges. — Fred Humphrey, KB2ESF, New Paltz, N. Y.
MONACO BECOMES MEMBER

With a unanimous vote, the Association des Radio-Amateurs de Monaco became the seventy-eighth member society of the International Amateur Radio Union. ARM is the official national society for Monaco. Its membership numbers twenty-one, and includes all sixteen of Monaco's licensed amateurs. In a message to ARM, IARU president W0DX said, "We are pleased to have your society as a Union member, and look forward to working with you in the interest of amateur radio."

RECIPROCAL OPERATING

Kenya recently rejected a U.S. inquiry about reciprocal operating but indicated, however, that Kenya, Uganda, and Tanzania will continue the past practice of issuing special amateur operating permits to aliens on an individual basis. Amateurs seeking further information should write the Radio Society of East Africa, P.O. Box 5681, Nairobi, Kenya.

The reciprocal operating agreement between the United States and the Netherlands (including the Netherlands Antilles) has been extended to include Suriname (PZ). U.S. amateurs seeking to operate from PZ may obtain the necessary information from Vrienden van Radioamateurs in Suriname, P.O. Box 566, Paramaribo: Suriname amateurs wishing to operate in U.S. may obtain forms from ARRL headquarters.

As this issue goes to press, we learn that a reciprocal operating agreement between Barbados and the United States was signed and became effective September 12, 1968.

NEW KOREAN CALLS

The Ministry of Communications, Republic of Korea has authorized the United States Forces, Korea, the use of the HL9KA-KZ, HL9TA-TZ, HL9UA-UZ, HL9VA-VZ, and HL9WA-WZ series of amateur station calls. Some of the HL9U series are already assigned and will be on the bands shortly. (Info via Richard W. DeWeil, Director of Amateur Operations, United States Forces, Korea.)

MAURITIUS ISSUES AMATEUR LICENSES

For the first time since its recent independence, the government of Mauritius has conducted examinations for amateur licenses. Despite the formidable problem of no common language (Mauritians speak French, English, Hindi, Tamil, Urdu, Creole, or Chinese.), four candidates passed the English language examination. RSGB and ARRL had supplied the Mauritius Amateur Radio Society with English language textbooks for their licensing program.

Canadian Division Director, VE3CJ received as a Christmas gift, one of the devices described in the above photo. Noel says that he hears enough of TVI without having a commercial outfit promoting it!
Meteors at 432 MHz.

**Meteors** scatter (m.s.) at 144 MHz, has been well exploited in the past dozen years, and random m.s. has received much attention in the last two years. We have found 1000-mile m.s. contacts possible almost any night we keep a schedule. There are still non-believers, but midwestern 2-meter men are changing that. Few amateurs have tried m.s. above 144 MHz, but as reported last month, four stations have been successful at 220 MHz. A handful of operators are now exploring 432 m.s. possibilities. Is an m.s. contact at 432 likely?

Some schedules have been kept, but without positive results. Pings have been heard. Whether or not they were of meteor origin is questionable. Lightning-originated pings would more likely be the case. I would be amiss to say that m.s. is not possible on our lowest u.h.f. band, but let us examine the results of a 440-MHz. radio-echo study at the Massachusetts Institute of Technology.

Their transmitter ran 2 megawatts, the antenna was an 84-foot paraboloid with 37.5 db. gain over isotropic. The receiver had a 3-db. noise figure and 200-cycle bandwidth. MIT observed some three thousand meteors, 90 percent had durations of less than one-half second! They concluded that (a) the detected meteor height at 440 MHz. is substantially the same as at a lower frequency, so path distance would be the same; (b) the effective scattering length of the trail is short, due to an almost immediate expansion of the ionized trail, the required ionization is therefore rapidly dissipated.

The power difference between 2 megawatts and 1 kilowatt is about 32 db. You'll have to measure your own antenna gain, but converting the figures to the best the amateur is likely to produce, we should expect no more than one ping every six to eight hours on random meteors at 432 MHz. Of course, the number of echo returns would be greater during a meteor shower. MIT concludes, however, at this frequency echoes are returned only from a small region close to the meteoroid head. At 144 MHz, the return also comes from the ionized trail, which, at 432 is almost non-existent. The slow-velocity Quadrantid and Geminid meteors appear to be the only ones worthy of exploration with amateur power levels.

The possibility of a 432-MHz. m.s. contact is remote, but it does, indeed, present a challenge to the serious worker. Aurora at 432 was thought impossible until two years ago. Will a 432 m.s. contact be made?

The full MIT report may be found in the *Journal of Geophysical Research*, Volume 70, Number 21, November 1, 1965.

**Pulsars — Signals from Stars?**

The pulsar radio signals discovered last summer by radio astronomers at England's Cambridge University Mullard Radio Astronomy Observatory have stirred interest among amateurs. The extremely regular signals are emitted from four different locations in space. Three pulsars radiate r.f. energy at precisely 1.33 seconds, the fourth known pulsar has a 0.25-second rate. Their origin is believed to be within our galaxy, but at a distance of several hundred light-years. There has been speculation that the signals are being transmitted by an intelligent being, but the amount of electrical energy needed to produce the signals tends to make this explanation unlikely. Rather, growing conviction among radio astronomers is that the signals originate in white dwarf stars. White dwarfs are thought to be dying stars collapsed to a density thousands of times greater than water. Kitt Peak National Observatory has visually located a star believed associated with one of the pulsars. Further visual studies are underway.

The British scientists announced their discovery several months after detecting the first of the signals. Alan Parish, K1KKP/2, Ithaca, New York was apparently the first amateur to receive the signals. He did so on the 2-meter band with a pair of 10-element Yagis and an intensity-modulated oscil-
loscope described in his January, 1968 QST article. It is worthy of close inspection for this and other weak-signal detection applications. Parrish says the pulsars may also be heard on a large array and a receiver with filtered input can have a speaker having good base response.

What frequency? The signals have been detected higher than 1400 MHz, and in fact, begin above that frequency, swishing down the spectrum at a rate of 30 MHz per second at 144 MHz. K1KKP says the signals have an apparent instantaneous bandwidth of about 1 MHz.

There is only limited material published on these signals. The interested reader is referred to Sky and Telescope, July, 1968. Position information is available there, or I can furnish that information to the serious worker, allowing at least two weeks for processing.

Most of us will not be able to detect the pulsar signals, or hear meteor pings at 432 MHz, but this month's material is intended for those who believe they have good systems to prove it.

K6MYC — SM7BAE QSO

Mike Stahl, K6MYC, and Kjell Rasmusson, SM7BAE, in Sweden, exchanged signal reports September 9th on 144 MHz moonbounce. The distance is approximately 5800 miles. The contact was SM7BAE's first on e.m.e., coming about four months after schedules with K6MYC were begun. The contact lasted 32 minutes, ending at 0724 GMT, when the moon set for SM7BAE. The Swedish station was operating at an authorized input of 1500 watts, with sixteen 10-element Yagis stacked four wide and four high. K6MYC, who now has e.m.e. contacts with Australia and Europe on 144, was running his kw. and 160-eleven collinear.

League Petitions FCC

We were disappointed the K6EDX/K6RNQ 50-MHz petition was denied by FCC; see the October column. On September 13, however, ARRL petitioned FCC to suspend that portion of the so-called incentive licensing Docket 15928 pertaining to 50 MHz. The League's petition, RM-1287, asks FCC to review the 50 MHz inclusion as a unique situation. (See "Haps" this issue.)

There was no FCC reply to RM-1287 at the time of this writing. Listen to WIAW bulletins for further details.

Central States V.h.f. Conference

The second annual Central States V.h.f. Conference was held at Missouri's Lake-of-the-Ozarks in late August. Some 130 of the outstanding v.h.f. men

K6JYO displays his 32-element extended collinear which measured 15.0 db. at the 1968 Fresno V.h.f. Conference. W6MMU won the 432 honors by two-tenths of a db. with a similar antenna. That is moonbounce K6MYC with folded arms. (W6SUR photo)

from all U.S. call areas except the sixth attended. Canada and England were also represented.

Highlights of the conference were technical sessions by Bill McCua, Jr., K0RZJ, Al Burson, K5WXZ, and Pat Arnold, W0IPB. League Headquarters representative was V.h.f. Editor, Edward P. Tilton, W1HBD.

The conference has been renamed the Central States V.h.f. Society. Next year's meeting is scheduled for Boulder, Colorado. In 1970 the event will be held in a more easterly city.

OVS and Operating News

50-MHz DX got off to an early start when KV4FU, Virgin Islands, caught transequatorial scatter (TE) the evening of September 4th, from CE3QQ, Chile. The Chilean signal was soon joined by that of OA4C in Peru. This initial opening of the 1968-69 season lasted 21/2 hours. And on the 5th, CE3QQ was again copied at KV4FU. The 6th was apparently quiet, but on the 7th KV4FU worked CX7AG (Uruguay), CE3QQ, OA4BR, OA4C, LU3DCA (Argentina), and had a partial contact with Y4VE, Venezuela. A solar disturbance on the 7th produced widespread aurora on six and two meters in the northern United States and Canada, but disrupted TE until the 10th. That night TE finally reached state side as CE3QQ and OA4C worked stations in Arizona, including WA7FJQ, and New Mexico for two hours. KV4FU began at 8400 GMT, by working OA4C, followed by CE3QQ. OA4C again worked into Arizona and New Mexico. KV4FU found similar South American openings the next five nights.

But the 16th was the day! The band opened for P between North and South America from 2230 to 2255 GMT, and then remained open via TE until 0400 GMT, the 17th. This was the first P-layer opening of the season observed in the southeastern

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states. CE3QG's code wheel was heard at WB4HIP, Miami, 0630 GMT. The automatic transmission peaked S9 for an hour or two by 0730. Quick report was exchanged. Then a quick blackout in Santiago halted CE3QG for another 1½ hours. LU8DCA was worked by W4GDS, WB4BNBD, WB4HIP and WB4KUN. OA4C made a big circuit by working several stations in California, the first reported two-ways on 50-MHz TE between W6 and Peru. None of those working the contact was W6HXX, who also worked XE1PY, LU5DCA, OX6BX, and CE3QG. The opening extended as far north in California as Fresno, where K6MIO and WB6UHG worked CE3QG. WB6UHG also worked LI3EX. Stan says the signal was S9 with slow, shallow fades and no flutter. This opening was one of the best ever observed between North and South America on TE.

The evening of the 17th was similar. KV4FU worked PY5GK, Brazil, who runs 150 watts of a.s.b. to a 6-element Yagi. CE3QG, who has one kw and 8 elements on a 53-foot boom, was heard in Miami and worked Arkansas, Texas and California. OA4C was also working stateside. South American activity appears good, with a half-dozen stations reported active in Uruguay and three or four in Chile and Argentina. All told, we can expect signals from six or eight countries on that continent, and there may well be some rare ones not already heard. Elsewhere, possibilities include ZS2BG and BO on Gibraltar; ZS1JD, South Africa; 5W1AR, Samo; DJ1FI, Philippines; numerous Japanese stations, and several Australians above 52 MHz. W5GZ is scheduling the Vks with a rhombic.

With the earlier-than-usual September openings, 50-MHz DXers are encouraged to work DXs this month and next spring. TE openings undoubtedly will be numerous. We hope all 50-MHz DXers in the United States and elsewhere will forward Cycle-20 observations, so an accurate report may be published.

ES suffered the expected late summer and fall doldrums, but the minor December ES peak is just a few weeks away. KS8BN/KL7, Sitka, Alaska, now signing KL7GLL, worked more than 40 Washington and Oregon stations July 31 and August 12, 14 and 16 openings. Gene's best DX was W7EGN, Montana. Excellent ES was observed September 10th over the southeastern quarter of the country. Thanks to WA2PMW, W60DD, K7ZOK, WA7GFP, W8NNOH, and VE1ACJ for their August reports.

September v.h.f. contest scores will reflect much contrast. An excellent aurora the evening of September 7th fattened scores of VE9s and W1s, 3s, 8s, 9s, and 8s, while other areas went begging for contacts and multipliers.

1.44-MHz tropo hasn't been spotty, but meteor scatter addicts continue adding to their states totals as you see in this month's standings. Last month we listed early Perseids results. Here is a final tally. W1JSM: W4WER, F1a; W9DLR
K2HHA: W9DRL
W2NTD: W0EBS
K1GL: K1WIS, K1WIT, K1UGQ, WA2CJ, W9EYE
K3QIF: W4CKB (twice), W5RCE, W9DOT, W9DRL (twice), W9NXT
W4WZQ: K1UGQ
W5MCC: W4DOW, W9DRL, K0MOS
W3RRI: K1HVT, K1WIS, K1WIT, K1UGO, K4QIF
K0QY: W5OH, W7UBL (Idaho), VE7BQH
K7ZCW: W5HFV
W9DQ: W4TVT, K4QIF, W4FJ, W5GVE, W5MCC, K7TVT (Wyoming)
W9DRL: K1ABR, K1HVT, K1WIS, K1WHT, W2AZL, K2HHA, K2RTH, W3KWN, K4GL, K4QIF, W4MCC, WA5MFZ, K7NII, W8NDU, W9EYE and VE3ZC.
W9ENC: W3KWN, W9DUP (twice), VE3ZC
W9LQN: K1UGQ, K2RTT
W9LE: K1ABR, W1AJR, K1HVT, K1UGQ, W1VTV, WA2CJ
W9NXX: K7TVT
VE3EHC: W5GVE, W9DRL, W9ENC, W9NXX
VE3BZT: W5HFV, W9RL
VE7BQG: WB6VYM
VE7BQH: K5JYO, K7NII

Eleven members of Japan's Sekisen Amateur Radio Club recently climbed Mt. Fuji with 435 MHz TV equipment. The 5-watt TV picture of JA1AKA was received at JA8YNW, 144 miles, and a two-way TV contact made!
These contacts were made between July 25 and August 15, during the Aquarids and Perseids showers. This year and in 1967 the Aquarids shower (July 26-Aug. 4) received more attention than previously, and proved worthy of it.

The Perseids show a W2/LMI initial effort from Massachusetts before moving to New Hampshire. Don leaves his Boston location holding top honors in the first call area, 35 states, 8 call areas and 1400 miles. Now he begins anew and wants schedules. His address is Don Brown, 638 Post Road, Greenwood, New Hampshire 03840. K4GL and W5FYE scored the first South Carolina to Colorado 2-meter contact August 12 on a 2-minute burst! And K4GL needed out the rest of his KHI until Dec. 15 in New Mexico. September 6th K4GL worked his state number 30, when he exchanged reports with W9UNN, Illinois, on random meteor showers, help, but you don’t really need them, eh Jay? In Virginia, K4QF heard W6BFB, Iowa, on tropo August 11, 950 miles. W5GFV says the Perseids came and went without his accomplishing much, but he had long-haul schedules with WA4KRA and K2HML. Bill did manage five ‘routine’ contacts, however, and some of the Aquarids produced numerous S2-S8 bursts separated by 5 to 15 seconds of silence. K6JFO found long-haul schedules with W6DRL and W6EINC disappointing. W6CQN comments on 2 meters and m., “...the stations have got to spread out. On August 11th and 12th I identified five stations using 144.0501.” Clair is not the first to make the comment. And as activity increases, he won’t be the last. There is no reason for not using more than the bottom 100 KHz. Could we encourage more Technicians to explore the long-distance possibilities of 144 MHz by better band usage? K5BDQ, Victoria, Texas, says he is exhausted from calling CQ on 145.08 and hearing contacts in only the lower 200 KHz.

How about that W6DRL? Al has done an exceptional job representing Kansas on 2 meters during 1968. And m. fans welcome Wyoming’s new meteor-ping artist K7VTM. A reliable Wyoming signal has been long-sought on all v.h.f. bands. K7VM also operates 50 MHz.

K6MQS and K6MYC continue their moonbounce schedules. K6MQS hears his own echo from a rhombic array similar to that at VK3ATN. Dick has added four elements that he mounted to the original stack of four. The top of the eight-rhombic array is at 50 feet. Here is another E, report. W4WVF/N, New Mexico, heard Florida and Louisiana f.m. broadcast stations at 2115 GMT, August 16. Any two meter contacts?

W8D1T, Chicago, wants 144- and 220-MHz schedules. He has 100 watts on both bands. There were no 220 reports this past month, except from W8FYE, saying he was scheduling K4GL during the October Orionids meteor shower.

420-MHz popularity continues to grow. W4PJ has tied states-worked leader W5RCI at sixteen states. Ted’s sixteenth was W1QVF in Connecticut, worked September 8th. W4PJ worked K2CBA near Albany, the same evening, as a large high-pressure area drifted across the mid-Atlantic and New England states. W1QVF runs a 4X150A and stacked 13-element Yagis. W5UKQ, Louisiana, worked his sixth state—Louisiana—on September 8th. They’re all difficult until you work ‘em, even your own! John has a pair of 4CX250B’s and a 10-10-10 J-beam up 100 feet. W4HUV and W9WCD worked W5RCI in late August, a new one for each of the Illinois stations, W4HUV now ranks second in the 422 standings; 15 states, 7 call areas and 3750 miles. Norm is scheduling W5ORH hoping to equal W4PJ and W5RCI. The competition is getting tough on 432!

September 16th, W5RCI in Mississippi and W6DRL, Kansas, made what is apparently the first 432 lightning contact. Both stations pointed their antennas at a very intense thunder.

(Continued on page 160)
Whodunnit, and Why?

Legend has a weedlike habit of growing all over our amateur radio tradition. So much of that tradition has its source in the very early days of communications history that the original idea is often mislaid and fancy, rather than fact, becomes accepted because it is limited only by the imagination. Fancy seems so much more exciting than the actual facts. There are, however, times when the real story is far more interesting than the legend that obscures it.

November marks the birthday of YLRL. In the growth of this oldest of women radio operators organizations, tradition that is exclusively feminine has developed into the symbols of the club. We are all aware of this symbolism of YLRL, but not all of us know the “WHY” of the blue and silver diamond with the scroll, the gal on the globe of Harmonics, QRV as a motto, or that baffling, most questioned “33” with which we sign? Before these identification marks that are YLRL become obscured by some flight of fanciful theory it might be worth while to find out just who was responsible for each one, and her reasons for suggesting them. The best sources for this “whodunnit” search are the gals who thought them up.

That frothy, feminine “YL on the Globe,” familiar to every member of YLRL as the design on the cover of Harmonics, the official publication of this organization, was the result of a contest sponsored by YLRL for an official cover design. Viola Grossman, W2JZX, submitted this winning sketch which was based on love of DX hunting, and as Viola explains it, “Any YL with her license and her equipment is literally sitting on top of the world.” Formerly very active in traffic nets, a member of YLRL, ARRL, QCWA, and RSGB, Viola is now a commercial artist.

*YL Editor, QST. Please send all news notes to WB6BBO’s home address: 1086 East Boston St., Altadena, Calif. 91001.

The diamond shaped emblem has become the basic symbol of many amateur radio organizations; ARRL, RSGB, and IARU all employ this design. The dark blue diamond with the silver scroll was the idea of YLRL’s founder and first president, Ethel Smith, K4LMB, then W7FWB. Ethel says: “The diamond was intended to indicate our support of ARRL, and the scroll seemed to lend itself to inscribing the abbreviation for Young Ladies Radio League.” The

Martie Wessel, K1BPE, 1969 YLRL President
Clara, Anita, Ethel and Viola are responsible for the feminine touch in the tradition of amateur radio, and are the gals we should thank for giving us our lasting symbolism.

Results YLRL Election, 1968

The election results are in despite the Canadian Postal Workers' strike, and here are the new officers for the year 1969.

President
Martha Wessel, K0EPE

Vice President
Ethna Kristjanson, VE5DZ

Secretary
Ivy Smythe, VE3EZI

Receiving Treasurer
Tony Chapman, K8PXX

Disbursing Treasurer
Janice Fontana, WB2JCE

District Chairmen:

1st District
Carolyn Thompson, K1BJZ

2nd District
Gretta Longware, WA2WHI

3rd District
Harriet Creighton, WA3ATQ

4th District
Shirley Hill, W1WPW

5th District
Annie Smith, KE5JKV

6th District
Deborah Willisson, WA6EVU

7th District
Jane Reichman, W7LXQ

8th District
Marge Parnet, KE3TF

9th District
Dori Leiser, W9VNG

10th District
Martha Shirley, W0ZWL

KL7 District
Elaine Mitchell, KL7FNM

K8H District
No Candidate

VE District
Mildred Graham, VE3GTI

Congratulations and best wishes to each of the successful candidates for a most successful term of office in this the oldest of all the women's amateur radio clubs.

The Trillium Memorial Week

The Albert Theodore Jensen Memorial Trophy was donated to the Trilliums by Dot and Jack Abel in memory of a truly great amateur. In 1967 the
Trilliums instituted the Memorial Week to perpetuate his memory by on the air operating with the Memorial Trophy as an award for the highest total contacts.

The rules are simple:
Dates: November 23 to November 25, 1958.
The Trilliums, being the host club, will call "CQ TMW." All others will call "CQ TOT." Exchange signal reports, name, and QTH. Trilliums will give their club numbers.

Scoring: c.w. contacts count 2 (two) points.
Phone contacts count 1 (one) point. Low power multiplier 1.25 for all transmitters running 150 watts c.w., 150 watts a.m., 300 watts p.e.p. or under.

Each Trillium station may be contacted once only regardless of band or mode. Logs must show date, time in GMT, RS or RST, band, mode of emission, TOT number, name and address, and claimed score and must be signed by the operator.

Send logs to: Bubbles Timlick, VE4ST, 1317 Magnus Avenue, Winnipeg 14, Manitoba, Canada.
A contest to perpetuate the memory of an amateur radio operator is the nicest tribute anyone could give. In this case there is an added lure for those of us who are interested in certificates, for what better way can we acquire that WAVE? In this case with exclusively feminine contest this could be a WAVE/YL because of the wide coverage of this Canadian YL club.

*It Isn’t Too Late*

If you missed the first half of YLAP, there is still time to get into the contest for the final weekend. It is as easy as calling “CQ YL,” and the results are well worth the effort of firing up the rig for this “for women only!” contest to celebrate the birthday of YLRL. See October QST, YL News and Views for details.

*Plan Ahead*

Before the holiday season knocks everything else off the “must do” list, and as soon as the new calendars appear in the shops, remember, when you are marking the birthdays and the anniversaries and contest dates, the Mid-West YL Convention in Toronto, May 16-18, 1959. The Ontario Trilliums will be our hosts this time with Doris, VE3BBB as the list checking chairman. It will be an affair well worth attending so start planning.

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Helen Harris, W1HOY/KP4

To badly paraphrase a worn cliché, in the lexicon of the Harris family there is no such word as acrophobia, for the higher the frequency, the happier they are. There are few in amateur radio, and no one in the 50 MHz-and-up fraternity who are more familiar to all of us than Helen and Sam Harris, W1HOY, and W1FZ, formerly co-editors of The World Above 50 MHz, in QST.

Helen Harris, W1HOY/KP4

Helen’s amateur radio license arrived on her birthday in 1955, and to nobody’s surprise her activity has remained way up near the top of the spectrum. To begin, she chose 50 MHz. as the spot where she wanted to work, and operated all a.m. emission while she was in New England. When she and Sam added the /KP4 to their call signs, she switched to s.b. Helen holds sixty two certificates including WAS #55, which she received in 1958, and the 500 County Award #88. (Remember, all her operation is v.h.f.) She holds the Cup awarded to the winner of the YL VHFR Contest in 1964, and YLCC plus 3 stickers. All of her awards are from this country except one; the WGSF certificate from Sweden for working two amateurs in Gothenburg on 50 MHz.

She has been a member of YLRL since 1956, ARRL, Charter Member of W1RONE, and the Rhododendron Swamp VHFR Society. Also was DC for the YLRL First District in 1961, and in 1964, 1965 was YLRL Eastern Membership Chairman. A certificate of appreciation was issued to Helen for her work as Publicity Chairman for YLRL.

There are few of us who treasure a letter from FCC, but the one addressed to W1HOY was a little different. This was a request for information as to band and exact frequency she was operating on a certain date and time during the last sun-spot cycle. The FCC had received a TVI inquiry (not complaint) from England where W1HOY was reported to have caused a great deal of interference during a very popular TV program! The English TV frequency is in our 50 MHz. band. How’s that for getting out of the back yard? During that same sun spot cycle Helen managed to work twenty two countries on 6 Meters. One of her more amusing moments is when Sam is working the low frequencies and talks to someone in Europe who tells him that he worked Helen on 50 MHz. years ago.

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

EBBASTIOUSON, VE5DZ, 1969 YLRL Vice President enjoys DX and contest operation and works only c.w. Of Swedish descent, Ebbas enjoys QSOs with SM-land in Swedish.
W-VK AFSK RTTY Tests on 28 MHz.

To facilitate communication between the Australian and U.S. Oscar groups (the Oscar satellite next in line for launching is being assembled in VK-land) an experimental program using autostart A.F.S.K. RTTY was begun on October 1, with W6HDO at the U.S. end of the circuit. Under Special Temporary Authorization from FCC, the authorized frequency is 28,890 kHz., with amplitude modulation using audio tones of 2125 Hz. (mark) and 2975 Hz. (space). Autostart is triggered by a 30-second 2125-Hz. tone before message transmission commences. Australian stations will use the same frequency and modulation.

As this is being written the tests are just getting under way and there are no firm schedules, but the usable period probably will be 2000 to 0400 GMT, with peak conditions expected around 0200. The most intensive activity is expected to be on Sundays from 2200 to 0400 GMT. Teletype standards will be used in those cases by W7 stations — 5-element code, 60 w.p.m.

ARRL QSL Bureau

The function of the ARRL QSL Bureau System is to facilitate delivery of mail to amateurs in the United States, its possessions and Canada of those QSL cards which arrive from amateur stations in other parts of the world. All you have to do is send your QSL manager (see list below) a stamp-wrapping addressed 4½ by 9½ inches in size, with your name and address which is the usual place on the front of the envelope and your call printed in capital letters in the upper left-hand corner.

Cards for stations in the United States and Canada should be sent to the proper call area bureau listed below:

W1, K1, WA1, WN1— Hampden County Radio Association, Box 216 Forest Park Station, Springfield, Massachusetts 01108.

W2, K2, WA2, WH2, WN2— North Jersey DX Assn., P.O. Box 565 Ridgewood, New Jersey 07451.


W4, K4— H. L. Parrish, KH1XF, RFD 5, Box 304, Hekton, North Carolina 28601.

WAA, WBB, WN4— J. R. Baker, W1LR, 1402 Orange St., Melbourne Beach, Florida 32951.

W5, K5, WA5, WN5— Hurley O. Saxon, K5QVH, P.O. Box 9015, El Paso, Texas 79909.

W6, KG, W6A, W6B, WN6— San Diego DX Club, Box 6029, San Diego, California 92106.

W7, K7, WA7, WN7— Williamette Valley DX Club, Inc., P.O. Box 555, Portland, Oregon 97207.

W8, K8, WA8, WN8— Paul R. Hubbell, W8CXY, 921 Market St., Zanesville, Ohio 43701.

W9, K9, WA9, WN9— Ray P. Biren, W9MSG, Box 519, Elmhurst, Illinois 60120.

W0, K0, WA0, WN0— Alva Smith, W6DMA, 238 East Main St., Caledonia, Minnesota, 55921.

VE1— L. J. Fader, VE1FQ, P.O. Box 663, Halifax, N. S.

VE2— John Ravenscroft, VE2NV, 353 Thorncrest Ave., Dorval, Quebec.

VE3— R. H. Buckley, VE3UW, 20 Almont Road, Downview, Ontario.

VE4— D. E. McVittie, VE4OX, 647 Academy Road, Winnipeg, Manitoba.

VE5— Fred Ward, VE5OP, 899 Connaught Ave., Moose Jaw, Saskatchewan.


VE7— H. R. Iroudi, VE7HR, 1291 Simon Road, Victoria, British Columbia.

VE8— George T. Kondo, VE8 ARRL QSL Bureau of Department of Transport, Norman Wells, N.W.T.

VO1— Ernest Ash, VO1AA, N. O. Box 5, St. John's, Newf.

VO2— Goose Bay Amateur Radio Club, P.O. Box 232, Goose Bay, Labrador.

KH6, W1H6— John H. Oka, KH6DQ, P.O. Box 101, Aleo, Oahu, Hawaii 96701.

KL7, W1L7— Alaska QSL Bureau, Star Route C, Wasilla, Alaska 99687.

SWL— Leroy White, 39 Hannum St., Ballston Spa, New York 12020.

These bureaus prefer 5X8 inch or #50 manila envelopes.

Recently members of the Wireless Spaghetti Network Club got together at the home of W1LOZ to welcome 110VL. Shown from left, are WA1CTZ, W1LOZ, 110VL, W1SUQ, K1OVT, and W1KVP. WSNF with headquarters in Rome, has an international membership of 99.

SWITCH TO SAFETY!
How’s DX?

CONDUCTED BY ROD NEWKIRK,* W9BRD

When:

Some of the unusual activities of our ham pal Grommethead Schultz are almost believable. Others flop somewhat short of the credibility gap. November will always bring to mind, for example, the time he invited us over for Thanksgiving goose. His secondary hobby then, we recall, was taxidermy. Stuffed birds perched all over the place.

Grom showed off the new shack while his auto-range expertly roasted our dinner, a most aromatically appetizing procedure. Plenty of fresh rare QSLs on Schultz’s walls, stuff we’d been stalking unsuccessfully for some time. This turned our chitchat to antennas, particularly since Grommethead’s skyhook was nowhere in sight on the premises.

“No outside antennas allowed in this subdivision,” explained Schultz, “but we make out okay.”

“Oh, good old No. 40 wire in an invisible beam,” we surmised.

“No chance,” said Schultz. “The super comes through twice a week dragging heavy chains.”

“Ahh, an underground antenna,” we concluded.

“Not exactly. Tried a deep one but QRM from Chinese commercials was rough. Here’s what I’m using now, a sort of Marconi with zip. Stand back!”

Grom turned on the rig, counted to ten, listened on frequency briefly, and sent some Vs.

You wouldn’t believe it. Every time he pressed the key a shiny lance-like object shot up through a tiny hole in the floor and popped out through a similar hole in the ceiling. Every time he let up on the key the darned thing whizzed back and disappeared somewhere below. Two VU’s appeared on frequency and complained about QRM.

“I call it The Piston,” said Grommethead, leading us down to the cellar. “Simple but effective.”

Simple for Grommethead Schultz, maybe. In the basement we saw two huge flywheels whirling in opposite directions. With a test key Grom showed us how the flexible whip was flipped out by one wheel, retracted by the other.

BV2A represents Taiwan almost singlehandedly, mainly on 20-meter c.w. Chin signed 3YW, C3YW and XU6A in a DX career that goes back to 1930. (Photo via W1ARR)

*7862-B West Lawrence Ave., Chicago, Ill 60656.
other, almost instantaneously. "Nice e.w. shaping when properly adjusted," he added.

Upstairs once more, the savory fowl with trimmings appeared before us on a table-setting conveyer unit. Delicious! We chomped thoughtfully.

"Say, Grom, isn't that thing kind of dangerous?"

"Yup," munched Schultz, passing the gravy. "But this roof is unclimbable. Haven't been able to do anything about the birds, though. Especially on 160. Messy." Our drumstick began to taste funny. Then somebody pounded furiously on the front door.

A large weatherbeaten rustic wearing a bright brass star dashed in, grabbed Schultz in one huge paw and the goose in the other. "I was watchin' that flock pass over last night when another bird disappeared, out of season. Dunno how you do it, fella, but I'm runnin' you in!"

We bailed him out later and settled for an anchovy pizza. Grommethead Schultz stays on anchovies 6 and 10 meters now, snaring only an occasional sparrow.

**What:**

Snow lingers season already—that time of year our lowest amateur frequencies return to the DX list anew. We can, of course, DX 160 meters where another double DX feature spurs up the coming months. Firstly, there are the always flustered annual 1.8-MHz Transatlantic and World-Wide DX Tests, a series of activities promulgated by W1BB and associates since way back in 1922. Register for 160-meter Transatlantic crossings by Delyo, Schnell, Reinharz, Godley and others in 1921. The Tests will be held this 1966-67 season on these marmalade-Lexan days. Join us beginning January 2nd, January 2nd and 10th, 0500-0730 GMT. W1BB expects you to call CQ DX TEST for the first five minutes of the hour. Then the next five minutes, call again during the third five-minute period, etc., until contacts are made. W1BB emphasizes, "Set your clocks accurately! General operating procedures will be similar."

Many 160-meter veterans think it's a fine idea to give newcomers to this band a DX break. It is therefore recommended at 0700-0730 GMT, January 5th and March 2nd, that huc-signal W1EJ regulars quiet down and clear the ether for "first-timers." European and African stations are given the same privilege at their ends on December 15th and February 2nd."

Meanwhile, sparked by the interest of the JA-CA gang, the second annual 160-meter Transatlantic Tests will commence at 1330-1600 GMT on November 30th, December 14th, and 29th, January 11th, February 1st and 14th, and March 19th. JAs HSSG ICQ9, NPL9, NPL1, CST 3A, 3M, 1973, KH51J, VSV9, KJ2L1, other top-band irregulars and plenty of fresh Asia/Oceania DX talent will be on band for the tests. Special JA-CA-sponsored tests are also recommended at 0700-1000 GMT, same dates. W1BB, as usual, offers his good offices as clearing-house for 160-meter stations. DX Tests are also recommended at 0700-1000 GMT, same dates. W1BB, as usual, offers his good offices as clearing-house for 160-meter stations. DX Tests are also recommended at 0700-1000 GMT, same dates.


**AFRICA**—"I'm QSL manager for SMEF's 3VSAB operations beginning August 16, 1968," affirms K7QKB.

In the DX press of Holland's VEREN we note that W4DQ has signed for confirmation of EOMH QSLs made in January, 1968: no others.

**ASIA**—"I've received large numbers of QSLs from W/R stations for contacts I made earlier this year," acknowledges APR7, "due to illness and other reasons I could not answer all of them. I assure all those who await my cards that I hope to send them out within the next few months." W/3ZRA, now back in Canada, are held ready by VE2AHF.

In the DX press of Holland's VEREN we note that W4DQ has signed for confirmation of EOMH QSLs made in January, 1968: no others.

**EUROPE**—CTISO is often operated by visiting CRISGO, learns WIDCQ, George, proprietor of WGRD.

**HEREABOUTS**—W4A1HF, QSL, via K9HPX, K7WZ 50 QA, P21DC, VQ9HJ, ZD8 GA and 9V8L, replies to requests via bureau unless the customary s.a.s.e., or s.a.s.e. plus IRCs, are supplied. "I've taken over as QSL manager for Z9PA starting September 1, 1968," announces K7HDO, W9KQZ's only.

**W4BD** of DX Magazine informs WICW of the ARRL DXCC Desk that W4CQ takes over QSL chores for his past DXpeditions. "I'm trying to catch up on QSLs still arriving via WICW. If I go on another DXpedition it is possible that W4CQ may handle a portion of the cards."

"Only PJ9CC contacts between November 16 and 30, 1968, should be QSLs to W4CQ or PJ9CC next month. "PJ9CC has some new material for his mailing list, and QSLs are coming in rapidly."

**GYS**—"I have been instructed not to respond to QSL requests that had to include self-addressed stamped envelopes," warns K9SMQ, QSL manager for K9SMQ, for K9SB and CC.

"My liaison as QSL manager for W2BIP commences August 1, 1968," states K4LIPZ. "Only cards accompanied by s.a.s.e., or s.a.s.e. plus IRCs, will be answered.

"IA1QK tells me that most of the A1RQ/1T7 QSLs he sent to the U.S., first call area have been lost," reports W1DYJ. He requests anyone still awaiting cards to write in care of NIDA, Frankfort, Indiana. Yudiant says he can use more postage or IRCs from any country."

**AR**—"DX/MG of Germany's PARC has it that Y7UBD may be of assistance toward A1EFT QSLs for August 1968 QSLs."

**ARKANSAS**—Arkansas DX Association's responsibility for K6RBU QSLs starts with contacts after August 30, 1968.

"Pass the word around that the 1968 ARRL QSL is now on the press," requests W3CTN, QSL manager for N3STJ.

K8LPI reports that DL1KPS intends to fulfill ZB2FV QSL commitments this month, also that G8CET, possessing 100 percent of QSLs, vows to catch up on his backlog shortly.

Not a good idea E4A4N about weirdos JW2AP and JX9J. Stein ought to know: he's QSL chief for Norway's NRRL.

An all too pictorial visit to sunny Spain introduces us to (top, left and right) E4A 2CR and 3NA, (lower) 4DO and 3K1 who hail from Pamplona, Tarragona, Madrid and Barcelona respectively. EA4DO stands while his father, the station's official second operator, checks the bands. (Photos via W1A 1YW, W2BQO)
November 1968

November 1968
9Y4LA is a familiar call in DX tests. Some of Gordon’s skycasts may be discernable in the interesting Tobago landscape at right. (Photo via W1ARR)

W8ZCA — 9M2LN, according to W8VAV, seeks Me, Vt. and Wyo, to sew up WAS, 14.000 kHz, around 1600 GMT, and W6RXX says 9M2UB (KJ4JG) is hungry for east coast QSOs on 2100-2800 kHz, c.w. at 1500-1700 GMT with a KW4-2 and dipole. Ed teaches English, etc., with the Peace Corps. SK2GC (W9J0) tells K8CM he’s been with Qatar, K8K and Y1 possibilities. W3HHD finds that EP2KB, with a 30-MHz N on 16, 15 and 20, barely missed out on two recent earthquake disaster areas. K9PIII highly recommends JARL’s WA5JF 120 kHz challenge. WA5 also pursues JCC, a sleep-exam answer for QSOing 100 or more Japanese calls, etc. Long Island DX Association’s DX Bulletin finds APRS AR and HB residing for sideband sport, the former recently married, and states that ex-CE4F0H will settle in British Columbia.

AFRICA—Via the clubs press: ZD8GA is hot for 40 code and phone this season with his new 14-14AV vertical. K7RREG intends to rip up r.f. output from the Sudan if possible. ZV5AT’s NCX3 replaces ZV2RQ in Togo, the latter repatriating to Canada. YL CR4GI is actually popular near 14200 kHz at 0600 GMT. VQ0HE, 21243 kHz, at 1800 GMT or so, may visit Des Roches if properly encouraged. FR9RZ may spell ZF8LZ on the Tromso meteorological station this month. 8R1R, bidding adieu to Guyana, may become a 6H8R ear.

EUROPE—Statistical recap of last year’s Scandinavian activity Contest, SIRAL (Finland) sponsor: C.w. entries 1031, phone 634,360, c.w. limits per reporting call area are W2FFU, Ws IB0GZ/2 8RYX 4Z4X/KC, KH8, KZ8U, W8KE, W8OEM, K8HJ, K8LE. Phone leaders are W8TCP, W8X9Y 4Z88, W8A 500D T8SO, Ks 8H2Z 9ECE, W8OEM and K8HJ. Up Canada way it went (c.w.) Via IAE 8N5 50X, (phone) SC14NT. In order of score our side finished (c.w.) Ws IB0GZ/2 8MEZ 42X1X, W8OEM, 8WYX, K8B11, W8OEM, K8HJ, W8OEI, KANUM, (phone) W8RYX, K8ECE, W8OEM. Ws 84XK OHLB 4HOS, K8HJ, W8HUI, W8DDP and W8ASL. The ten top Scandinavian single-opers are (c.w.) O9USE, SM4 7E3Z 8C9U, O9URK, O9LQ, SM4MD, O9R 6VP, 8Z8K, OZ4CF, OH7IN; (phone) S9M7TE, O8E 2TH 7PL, SM7TRW, OH1V, SM4CZT, OHONI, LA7VE, SM5API and OH4MO, listed in order of scores. World single-op e.w. QSOs were turned in by OL8CL, LA0BBY, DA0BC, EA1KT, EL2ZD, EP8Q, E52PF, 331AR, GM4AHS, HAJD, H9RRGH, H14XPl, H4V, J4AB, K8HJ, KL2AF, K8L6A, O8AS, OH4WC, OK1XG, OK80, PY1TS, SP4ARN, Ua 83X 2DP 9WS, U8ME8, UC1NE, U8DA, U8HSO, U8QD, U8KAA, U8LCH, U8OWU, U8YES, U8RAS, U8RC2, VE1NY, V8A4XR, YOSAP, V83EY, ZS2D, ZL2CD, 4X4Y, 5HSKJ and U81AG. Phone country kingspins are OL8DD, CT7IM, OL8HB, DZ1J, Ks OL8B 8HH, EL8H, EP8Q, 3F1E, 3G1AR, GM4AHS, GW50CD, HB5QG, HB110A, H8PA, H9P5N, IB2CK, J92KZ, KL8X, LX1B, Z24B, O8H4S, Z8K, Z8K1G, K8JQ, PA5OG, PY1TS, 3P8AJK, TG8F, Ua 83K 9BE, U8SDW, U8CBF, U8OSW, U8HIB, U8IB, U8QD, U8QAND, U8HIB, SC14NT, VG16X, V86RR, U8K2G and U8LDP. There are 42 US, c.w. logs, 14 phone, all single-operator entries. The U81AR, outdistanced us in this category by 12 to 50. WAFUH 48DX5's all-transmitter 25-watt rig comes across nicely on 20 c.w., a ground-plane radiating.

HEREABOUTS—"DXCC-squared" No. 57, the first from Brazil, arrives from PY9AEJ, a photo of QSLs confirming QSOs with ARLR DX Century Club members in 100 or more countries (see p. 138, August '68 QST). 100.2 kHz: "When a DX station calls CQ WHO, has as many kind ones do, please let WNs answer him," reasonably requests WQ7TVG. K4TWJ reports a plague of QRM on s.s.b. DX frequencies apparently caused by W7K Lida running open, someone sick or something? WATFAM, with a fresh Advanced ticket, is all ready for Ws IC's impending phone sublists shipment. Are you? The International YL Sideband System net frequency remains at 14,332 kHz, where much choice voice DX checks in. North Eastern DX Association DX Bulletin editor K1M8PM drew a six-month call to duty from the military. Top DX and contest talent from Connecticut Wireless Association and Potomac Valley Radio Club will man Curacao's PJ3CC on November 23rd-24th, multipop and multimode from 20 through 150 meters. They'll display the first PJ3D tag of record. WJT 

KH6BFZ, ARLR’s Hawaii Section Communications Manager, turned in an astronomical phone score in the 1968 ARRL DX classic. You may also occasionally catch Lee on operational visits to rarer Pacific points. (Photo via W1ARR)
New 40,000-MHz. Record

A new distance record for the unassigned region above 40,000 MHz was set by Arizona amateurs during the recent ARRL Southwestern Division Convention. Two-way communication on 40,100 MHz over a distance of 3720 feet was carried out Sept. 1, by Lorraine Cripps, WA7EDI/7, operating atop the First Federal Savings Building, and Gary Hamman, W7CAF/7, set up on the sidewalk in front of the Townehouse Hotel in Phoenix.

Laboratory test equipment from the Motorola Aerospace Center was adapted by Ray Cripps, WA7EDH, and W7CAF. The transmitters were H-P 628A signal generators, driving 940A frequency doublers, with power output of about one milliwatt at 40,100 MHz. Receivers used H-P R922A crystal detectors, working into narrowbandpass amplifiers and speakers. Each generator was externally modulated with a 1000-cycle tone and a hand key. Break-in A2 operation was possible, using a 10-db. directional coupler, as shown in the block diagram.

The antennas were 3-foot parabolas fed from WR-28 waveguide. Beamwidth was measured 0.7 degree at the half-power points, and gain was calculated to be 48 db. over isotropic.

Block diagram of the 40,100-MHz stations used in the microwave record work in Phoenix, Sept. 1.

Arizona SCM, Gary Hamman, W7CAF, operates in front of the Townehouse Hotel in Phoenix, site of the ARRL Southwestern Division Convention, Sept. 1. Looking on are John Hunton, W1LVQ, ARRL General Manager, and John Griggs, W6KW, Southwestern Division Director. Signals were exchanged on 40,000 MHz over a 3720-foot path with WA7EDI/7. At the right, Lorraine Cripps, WA7EDI, operates atop the First Federal Savings Building, as Ray Cripps, WA7EDH, codesigner of the installations, supervises the record attempt.

November 1968
Operating News

GEORGE HART, WINM, Communications Manager
ELLEN WHITE, WITYM, Deputy Comms. Mgr.
Administration: LILLIAN M. SMIKTER, WIZIE
Contests: ROBERT HILL, WIAE
DXCC: ROBERT L. WHITE, WICW
Training Aide: GERALD PINARD

It's About That Time. On Nov. 22, the first phase of the new band segments for extra and advanced class licensees go into effect, and many changes will have to be made in some of our operating habits. The exact limits of the segments have been covered previously and elsewhere, so we won't go into detail at this time. This, however, may serve as a reminder and help some

once uttered by Robert Benchley, by applying the seat of one's pants to the seat of the chair. In other words, by intense study of the very excellent study material provided (through many sources, not the least of which has run in QST) and by nightly practice of the code.

Regarding the latter, which is really the only part of the incentive program which is a CD function, W1AW transmits nightly code practice at speeds which include sessions at or near both the 13 and 20 w.p.m. required by the General and Extra Class tests respectively. The code proficiency program has recently been expanded to include a session at 0030 GMT, and to include sessions at 20 and 25 w.p.m. every night of the week.

If you can qualify for a code proficiency certificate at 15 w.p.m., you should certainly have little difficulty passing FCC's 13 w.p.m. General Class test. After all, W1AW is an amateur station operating in the QRMed amateur bands, and copying the signal, especially in the far

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OPERATING EVENTS (Dates in GMT)
ARRL-IARU-SCM-Affiliated Club Operating Events

<table>
<thead>
<tr>
<th>November</th>
<th>December</th>
<th>January</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-3 KRG DX Contest (p. 103, last issue).</td>
<td>4 Qualifying Run, W6OWP</td>
<td>2 Qualifying Run, W6OWP</td>
</tr>
<tr>
<td>6-7 YL/AP, phone (p. 106, last issue).</td>
<td>13 Qualifying Run, WIAW</td>
<td>4-5 VHF SS</td>
</tr>
<tr>
<td>7 Qualifying Run, W6OWP</td>
<td>9 Frequency Measuring Test. 11 Qualifying Run, WIAW</td>
<td>11-13 GD Party (o.w.)*</td>
</tr>
<tr>
<td>10 International OK DX Contest (p. 103, last issue).</td>
<td>14 Qualifying Run, WIAW</td>
<td>18-19 Louisiana QSO Party</td>
</tr>
<tr>
<td>16-18 SS, c.w. (p. 54, last issue).</td>
<td>Delaware QSO Party (p. 105, this issue).</td>
<td>25-26 Simulated Emergency Test</td>
</tr>
</tbody>
</table>

League Officials and Communications Dept. Appointees only.
west, can be tough. As for the 20 w.p.m.
11 test, qualifying for an ARRL certification at
20 w.p.m. is a good indication that you’re close
to if not at, the goal line. To be on the safe side,
however, many amateurs make sure they can get
it at 25 w.p.m.

Code proficiency has to start somewhere. The
ARRL program is not restricted to licensed
amateurs or League members, and the 10 w.p.m.
11 certificate has been issued to many SWLS working
11 toward an amateur license, not to mention
Novices and Technicians in hot pursuit of that
General Class ticket. It is the first milestone in
the progression from Novice to Technician to
General. The second milestone is the 15 w.p.m.
sticker, and then you can pass the General Class
11 test. After that comes 20 w.p.m., the first mile-
stone on the way to Extra class. Then 25 w.p.m.,
and you’ve got the Extrum.

After that, what? What can you do with 30
and 35 w.p.m.? What does it buy you? Well, noth-
ing, really, except a very satisfying sense of
achievement. As often as not, once you have
reached the 25 w.p.m. heights and have that
Extra Class ticket tucked away, you start seeking
new worlds to conquer. The 30 and 35 w.p.m.
stickers are available, so why not have a crack at
them? You’ll be surprised to find that once you
can copy 25 w.p.m., 30 and 35 require only a little
more practice.

New W1AW Frequencies. Now that the new
reg's are about to go into effect seems a propitious
time to move the W1AW bulletin and code prac-
11tice frequencies into the restricted segments.
The purpose of this move is twofold: first, to get
W1AW out of what will probably be (for a while,
anyway) the most crowded portion of the band;
and secondly, to avoid W1AW’s adding to the
din at the same time that the “big signal”
helps the occupancy of the new segments. A corollary
reason for the change is to standardize the W1AW
frequencies, so they can be found readily by any-
one looking for the headquarters station and so
that the frequency in each band can be remem-
bered as being just 20 kc. inside the low end.

That’s right, 20 kc., inside the low end of each
amateur band, from 160 through 2 meters is
where you will find W1AW, starting at the
changeover from “daylight saving” to “standard”
time on Oct. 27. In other words, for most of you,
this is probably where you’ll find the bulletins
and code practice right now -- 1820, 3520, 3820,
7020, 7220, 14020, 14220, 21020, 21270, 50020,
50120 and 144020.

Please note that these changes apply only to
bulletins and code practice (i.e., one-way trans-
missions) and those general contact periods which
immediately follow these transmissions. Other
general contact periods will remain on the former
W1AW frequencies, so contact with all classes of
amateur licensees can be maintained as before.

W1AW bulletin frequencies are crystal con-
trolled, but no temperature-controlled oven are
in use and the exact frequencies will be subject to
the normal amount of variation. Thus, do not try
to use W1AW as though it were WWV. We ex-
pect that these new frequencies will be perma-
nent, but we wouldn’t want to guarantee this un-
til we see how they work out.

The Net Directory. Those operators who have
asked that they be sent one of the new net direc-
tories when they are ready are in for a surprise —
a pleasant one, we hope. The new directory is
cross-indexed by name of net, state and fre-
quency, as before, contains a few minor items of
information not included in previous directories,
but is just as readable (in fact, somewhat more so),
and yet includes everything in slightly over half
the number of pages as the previous net directory.

— W1JMJ.

BRASS POUNDERS LEAGUE
Winners of BPL Certificate for August Traffic

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More-Than-One-Operator-Station

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BRP for 109 or more originations-plus deliveries

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November 1968
CODE PROFICIENCY PROGRAM

Twice each month special transmissions are made to enable you to qualify for the ARRL Code Proficiency Certificate. The next qualifying run from W1AW will be made Nov. 14 at 0230 GMT. Identical tests will be sent simultaneously by transmitters on listed c.w. frequencies. The next qualifying run from W6OP will only be transmitted Nov. 7 at 0500 Greenwich Mean Time on 3600 and 7125 kHZ. CAUTION: Note that since the dates are given per Greenwich Mean Time, Code Proficiency Qualifying Runs in the United States and Canada actually fall on the evening previous to the date given. Example: In converting, 0230 GMT Nov. 14 becomes 2150 EST Nov. 13. Each month the ARRL Activities Calendar notes the qualifying run dates for W1AW and W6OP for the coming 3-month period.

Any person can apply. Neither ARRL membership for an amateur license is required. Send copies of all qualifying runs to ARRL for grading, stating the call of the station you copied. If you qualify at one of the six speed-transmits, 10 through 3 w.p.m., you will receive a certificate. If your initial qualification is for a speed below 3 w.p.m. you may try later for endorsement stickers.

Code practice is sent daily by W1AW at 0030 and 0230 GMT, simultaneously on all listed c.w. frequencies. At

**DX CENTURY CLUB AWARDS**

From August 1, 1983, through August 31, 1988, DXCC certificates based on contacts with 100 or more countries have been issued by the ARRL Communications Department to the Amateurs Listed below

### New Members

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### Radiotelephone

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<td>LA848</td>
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<td>W8KB</td>
<td>LA891</td>
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### Endorsements

Endorsements issued for confirmations credited from August 1, 1983 through August 31, 1988, are listed below. Endorsements listing through the 999 level are given in increments of 20, above the 999 level they are given in increments of 5. The total shown do not necessarily represent the exact endorsement given but that the partitions have reached the endorsement group indicated.

<table>
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<td>LA884</td>
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<td>LA885</td>
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### Radiotelephone

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<td>W1BQ</td>
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<td>LA892</td>
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<tr>
<td>W8EF</td>
<td>LA893</td>
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<tr>
<td>W8ET</td>
<td>LA894</td>
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</table>

102 QST for
0230 GMT Tuesday, Thursday and Saturday, speeds are 10 20-25 or 30-35 w.p.m. on Monday, Wednesday, Friday and Sundays, speeds are 5 7 14 10 13 20 and 25 w.p.m.

CAUTION: 0230 GMT Tuesday corresponds to 9:30 p.m. (EST) and 6:30 p.m. (PST) Monday evening. For practice purposes, the order of words in each line may be reversed during the 5 through 13 w.p.m. tests. At 0230 GMT daily, speeds are 10 13 and 15 w.p.m. The 0230-0230 GMT runs are omitted four times each year, on designated nights when Frequency Measuring Tests are made in this period. To permit improving your skill by sending in step with W7AW (but not on the air) and to allow checking strict accuracy of your copy on certain tapes note 5.

W1AW FALL-WINTER SCHEDULE, EFFECTIVE OCTOBER 27, 1968

The ARRL Maxim Memorial Station welcomes visitors. Operating-visiting hours are Monday through Friday 3 p.m.-5 p.m. EST, Saturday 7 p.m.-9:30 p.m. EST and Sunday 3 p.m.-10:30 p.m. EST. The station address is 225 Main Street, Newington, Conn., about 7 miles south of Hartford. A map showing local street detail will be sent upon request. If you wish to operate, you must have your original operator's license with you. The station will be closed November 25, Thanksgiving Day.

**NEW W1AW**

**C.P. & BULLETIN FREQUENCIES**

**Strays**

Feedback

Although Cs, a 0.005-uf. disk ceramic capacitor, is not shown in Fig. 1 of the "Connecticut Bond Box" (QST, August 1968, p. 11), it should be included as shown on the circuit-board template. The equipment will work without it, but it should be used to assure bypassing for the B-plus end of L7.

The coil table for the "General-Purpose V.F.O." (QST, September 1968, p. 40), lists the correct J. W. Miller coils for each band. However, the inductance range for the 42A225CM should read 12.9 to 27.5 au. The 42A155CM has a range of 9.40 to 18.7 au., and the 42A470CB1 tunes from 2.4 to 5.8 au.

The dates in the footnotes to Simmons' "Digital Counter with Teletype Print-Out," August 1968, should have been: Grigg, July 1965; Skees, January, 1965; Brasen, December 1966.

WB2VIA says that his call was incorrectly listed as WB2VIA (NYC-LI) in the September 1968 QST report of the 1967 VE/W Contest.

November 1968
**Strays**

**WEFAX**

Latest development in satellite-relayed weather information is the broadcasting of maps compiled from the small-scale pictures received from ESSA satellites. The accompanying pictures were recorded by Aubrey Burton, W4TNT, with home-built equipment of the type described by Wendell Anderson, K2RNF, in November 1965 QST, during the experimental program. The transmissions originated at the NASA ATS ground station at Mojave, California, and were retransmitted by the ATS-3 satellite hovering 19,000 miles above the Equator over Brazil—not bad DX for picture transmission on approximately 2 meters! (The Mojave frequency was 149.22 MHz, and the ATS-3 retransmission was on 135.6 MHz.)

The picture at the right is a test pattern and the one at the left is a weather map of the type that will be sent out periodically as the information is accumulated from satellite pictures. The reproductions here don’t really do justice to the 8 X 10 original photographs; the majority of the print can easily be read on the latter while it gets lost in the half-tone screen in these reproductions.

**WAS**

The ARRL Communications Department recently completed processing WAS #19,228—unique by any standards! W5AQF of Okay, Arkansas submitted proof of contact with the same station (W5EGY) on W5EGY’s trek about these 50 states. That’s W5AQF below with the ubiquitous Gene W5EGY on the left. Gene’s trailer-touring started in summer of 1965 with a short jaunt to Idaho, Washington, Montana, Nebraska, Kansas and Oklahoma. The east coast swing this past summer wound it up with W5AQF’s 50th state, Alabama.
All operating amateurs are invited to report to the SCM on the first of each month, covering station activities for the preceding month. Radio news items are also desired by SCMS for inclusion in these columns. The addresses of all SCMS will be found on page 16.

ATLANTIC DIVISION

DELAWARE—SCM, John L. Poread, KEN 52G—SEC/PAM; WADUMX, RMJ—WEZB. Endorsement forms: K3KJ8, WADUMX, WADUMD, WADUEER, K3KJ8 and WADUMF are Asst. EC for Sussex County, WADUMG and WADUMH are off for college for the year. W3TYG is continuing in the Intruder net and W3WHC has joined the ranks of retirees. W3E0D reports doing 2-meter work, W3EEB spent his vacation in Vermont. W3CZS and W3AFU upgraded their License to Advanced Class. WN3FF is new General, WN3KFF is the grandson of W3WR. W3CDY is 8-meter mobile, WABAO has his 2-meter setup on the air. WN3M7 has a new 80-ft. tower, including a beacon light on the top. All stations are urged to check over their emergency gear in preparation for the annual SET coming up in Jan.

DELAWARE QSO PARTY

November 23-25

The Delaware Amateur Radio Club of Wilmington (W3SL) announces its 13th Delaware QSO Party and invites all amateurs to participate. Delaware hams are urged to work as many out-of-state stations as possible, so that those interested can earn credit toward WAS and the W-DL certificate. Here are the details:

(1) Time: 30-hour period from 2300 GMT Nov 22 to 0700 GMT Nov 25
(2) No time limit and no power restrictions.
(3) Scoring: Delaware stations: 1 point per contact, multiply total by the number of states worked, including Delaware. Out of state stations: 1 point per contact, multiply total by the number of counties in Delaware worked during the contest period.
(4) Credit will be given for contacts with the same station on more than one band.
(5) A certificate will be awarded to the highest-scoring station in each state, Canadian Province and foreign country (with 3 or more contacts) and to the highest-scoring station in each Delaware county. Additionally, a W-DL certificate will be sent to any station working all 3 Delaware counties. Party logs showing required data will be accepted in lieu of QSLs.

Special thanks to W3SS for helping out.

EASTERN PENNSYLVANIA—SCM, George S. Van Deusen, Jr., W3KJ—SEC; W3AES, RMJ; W3EML, KMVQ, W3KDJY, W3FPX, K3KJ8, VHF, PAM; W3FQG, OBS reports were received from W3KWS, K3KJ8, W3HXX, W3DJN, W3AHR, W3AFC, W3AES, W3KDJY, W3DJN, K3KJ8 and W3RZE; from K3KJS, W3EUR, W3AES, W3KWS.

Net reports: DEPN, QNI 61, QCQ 91; DTMN, QNI 23, QCQ 17; Traffic: WADUMG 44, W3EAB 59, K3KJ8 26, WADUMX 26, W3DWAH 17, WADUMH 1, W3E0D 4.

W3CUL reports that the back-to-school rush is building up traffic, W3DJN is having some problems with the new antenna receiver on his rig. W3AJC passed the Advanced Class exam. W3XCSB, W3NH and W3JEM moved up to General Class. W3AKF reports that the quad is now working. W3HSS is performing major surgery on his rig but will be back on the bands soon. W3CDU has been globe-trotting again. W3CPR is designing an all-transistor s.s.b. rig. W3AFM is starting a new daily "Net:" column, primarily for Novice, W3KJ8 is W3CLC when he is in Pontiac, Mich. W3AES is active in the "Newcomers' Shack Alive Net. W3AFP was a link between the 2-meter nets and the 7-MHz Net.

MARYLAND-DISTRICT OF COLUMBIA—SCM, Carl E. Anderson, K3JYZ-SEC; W3LDD.

New reports: Time Days Seen QCQ QCQ MC.

MDM 3643 00002 Daily 31 95 22.8 W3AFQ, RM
MDS 3643 01367 Daily 29 44 12.2 W3AFQ, RM
MDCN 3620 23002 SST-TS 18 60 13.9 K3KJ8, PAM
MENZ 3202 23002 W3DJN 23 54 14.9 K3KJ8
MTM1 148.500 00202 19 59 14.9 W3AFQ
K3GZK is the new PAM for the MDB h.f. net in lieu of W3RQC who will pursue a heavy study course in evening college. New operating position for K3GZK as PAM. Endorsed appointments: W3EOR as 00 Class IV, W3KJ8 as 00 Class III, W3MC as 00 Class III. K3GZK as OBS and OPS. New ARRC members: W3DJN, W3AFQ and W3DWAH. W3DJN again earned BPL on origination and delivery of K3GZK's logs.

November 1968

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ARIZONA—Acting SCM, Robert D. Schauer, WA-811B; Acting NET, WAIQQN. As your Acting SCM, I hope to follow the good example set by WSDTR, WSPBZ, our new SEC, is well qualified and should make an excellent leader for us. The EC appointment of WA1QSI has been endorsed. WA1QSI is now the new OPS, W4LKD. W4LKD reports they are working a new ARC and using new equipment. The new ARC in Russellville, WA1QY, has been issued an OZK certificate No. 54. Welcome to the new Novices W5QVR in Monticello and W5QVQ in the little town of HIWASSEE, Tenn. WA5NBN has been working good DX on 20 with his new X-beam. I received a nice bulletin from the ARRL, American Radio Relay League, announcing a W5KQJ back to Fort Smith. Net reports for Aug.: Net Freq. Days Time Zones: QTH QTC Mgr. TSSB 3580 Tues-Sun. 0200Z 27 4755 151 WA4BYT TPN 3590 M-Sat. 1315 10 1405 161 W4LPF ETPN 3590 M-F 11 51 57 WA4BWW TUN 3590 Thurs. 0200 4 35 Wed. W4TYW CST 3590 Mon. 3000 4 53 54 WA4AS TPO 3590 Daily 0100 31 222 213 WA4XEM TPN 3590 Daily 1200 31 111 211 WA4CT EHAYW 50.1 Tues-Thur-Sat. 0000 WA4TJJ FYHF 145.2 Wed. & F. 0000 K4FPO Appointments: WA4BWT as PAM; KA4EC as EC; WA4IFC, WA4BQQ as OSEs: WA4WYV, WA4B55 as OPS; WA4VM as OBS; WA4YON as OBS. On Aug. 13 WHIDQ, V.I.F., Editor of QST, spoke to the Delta ARC (Whitehaven). The Knoxville ARC, WA4BB/4, operated portable at the To, Valley Air Force Post. The following attended the Central States V.I.F., Conference at Lake of the Ozarks, Minn.: W9HVR, WA4QW, WA4IFC. K4AXI. WA4IQI has built a parametric amplifier and is building a crystal-controlled transmitter for 3300 Mc. EC V4BEH riles reports the Johnson City ARC had a booth at the Appalachian District Fair. W4BE4ICR is attending Southern U. Memphis, The Kingsport ARC, W3JJA/4, operate a message center in the "Fate Five" program of the Amer. Red Cross and the Kingsport Safety Council over the Labor Day weekend end. K4UWI made the MPC. OCF, 1st. 2 W5QV, Gen. Mgr. and Secty., of ARRL and editor of QST, spoke to the Alto ARA in Alcorn, plus. Other honored guests were W5LDD, WAIQQN and WA4AS. I regret to report that our Air SCM, W4QYDT, is now a student at Tulsa Tech. 144. K4UWH 229, WA4YVM 328, W4OOG 293, WA4UAT 217, W4POQ 151, W4ZRC 137, K4VY 125, WA4WY 74, WA4NX 70, WA4RRC 63, WA4QH 58, W4FEC 33, K4NQI 31, WA4EBK 30, WA4WYV 30, W4PQ 29, WA4MNX 29, WA4VYV 22, WA4TQI 21, K4LTA 20, WA4LQ 16, W4LQ 16, WA4CT 12, W4YT 11, K4UW 11, WA4CT 10, WA4EW 7, WA4BE4 4, WA4TJJ 3, WA4GNN 2. TENNESSEE QSO PARTY December 22 1968 All amateurs are invited to participate in the Fifth Annual Tennessee QSO Party, sponsored by the Radio Amateur Transmitting Society. Rules: (1) Contacts may be made during the 24 hour period beginning at 0000 GMT December 22, 2400 GMT December 22. 2) No power or time limitations. 3) The same station may be worked on different bands and modes. 4) The call is CO Tern. All modes to be combined as one entry. 5) Exchange QSO points by county (Tennessee stations) or state, province or country (non-Tennessee stations). 6) Tennessee stations cannot count one point for each contact, multiplied by the number of states, provinces, counties and Tennessee counties worked for final score. 7) OQSO points by the number of different Tennessee counties worked. 7) Certificate awards for the first three places per state, province or country and for the first five places within Tennessee. A suitable engraved loving cup will be awarded to the grand aggregate score outside of Tennessee and also to the winner in America. All amateurs contacting 10 separate Tennessee stations during the contest will receive the certificate of Achievement.” 8) Suggested frequencies: 3550 7000 7250 14070 14275 21050 21255 28500 28600. 9) Any station disrupting a Tennessee traffic net for the purpose of contest contacts will be automatically disqualified from any award. Logs showing date, time, stations contacted, band, modes, location and computed final scores must be mailed to the Contest Manager no later than January 23. Send logs to the club station, WA4PQ, c/o American Red Cross Building, 22nd and Patterson, Nashville, Tennessee 37203. GREAT LAKES DIVISION KENTUCKY—Acting SCM, George Wilson, WPOV—Appointments: W4YVS as OBS, W4AAH as OSE, W4AEEH as OBS. Endorsements: W4AAH as OBS, OBS, OQ; W4ABZ

Net
Freq. Time Days OQI OTC SSK. Mgr.
QMN 3683 2200 Dy 464 507 31 W6FWQ
W8B 3935 2200 Dy 799 157 29 W8GQW
UP 4785 1200 Dy 928 132 18 W8KZM
PON-DAY 3935 1600 M-Sat. 128 184 27 W8QQW
B-H-MEN 3090 2100 M-Fri. 917 81 26 W8GQW

All clubs again are urged to appoint a representative to the Michigan Council of Clubs, W8AET is doing fine after a bad operation, W8JHR had heart surgery in Michigan. W8AET had surgery last week and while on vacation, W8SQZ is recovering from a leg amputation in Allegan. W8DQW is now in surgery in Detroit. W8DQT and W8JHR had heart surgery and while on vacation, W8JHR had surgery last week and while on vacation, W8SQZ is recovering from a leg amputation in Allegan. W8DQW is now in surgery in Detroit. W8DQT and W8JHR had heart surgery and while on vacation, W8SQZ is recovering from a leg amputation in Allegan. W8DQW is now in surgery in Detroit. W8DQT and W8JHR had heart surgery and while on vacation, W8SQZ is recovering from a leg amputation in Allegan.

Hudson Division

EASTERN NEW YORK—SCM, Graham G. Berry, K8JSN—Ass. SCM and RMI: Ruth Blase, W2VYS: SEC: W2RKC: PAMS: W2YVJH; Section nets: NYS at 2600 on 40 meters, WGR at 2200 on 80, NYSS at 3200 on 40. Krull, W2YVJH, W2RKC: appointments and renewals: W2RKC, W2YVJH, W2RHC as OPs. W2RKC, W2YVJH, W2RHC as OPs. W2RKC, K2DNR, W2ZPPD, W2DQM, W2QGG and CTA as QSOs. We're looking for applicants for EC in eastern county. Get in touch with W2RKC and help organize the AEC for the EC. W2RKC reports a different certificate awarded to the boss, K2ONF, and recommendations to all net managers seeking up to $150 or better drill participation. Albany County now has a new DR active on the 6-meter RACES Net. Hudson County Council PAMS: K2JKS and View-Director: W2ZPPD among the group running classes for the Explorer SC, W2RKC. The new Rochester Club station K2YJC supplied communications for the local school's science fair. W2YVJH is running, with K2QJB, W2TEQ, W2RHC on the operating board. W2FUE is working on the 6-meter RACES Net. Hudson County Council PAMS: K2JKS and View-Director: W2ZPPD.
The R. L. Drake L-4B linear amplifier shown here uses two of EIMAC’s new 3-500Z zero-bias triodes in grounded grid circuitry to achieve 2-kW PEP SSB input and 1-kW dc input on CW, AM, and RTTY. Drive power is 100 watts PEP and 75 watts CW, AM, and RTTY.

Drake chose EIMAC 3-500Z’s because these rugged, compact, high-mu power triodes are ideal for grounded grid operation. They can provide up to 20 times power gain in a cathode driven circuit. And the two tubes have a total plate dissipation rating of 1000 watts.

For more information on EIMAC’s line of power tubes for advanced transmitters, write Amateur Services Department, or contact your nearest EIMAC distributor.

3-500Z TYPICAL OPERATION*

<table>
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<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>DC Plate Voltage</td>
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<tr>
<td>Zero-Sig DC Plate Current**</td>
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<td>Single-Tone DC Plate Current</td>
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<tr>
<td>Single-Tone DC Grid Current</td>
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<tr>
<td>Two-Tone DC Plate Current</td>
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<tr>
<td>Two-Tone DC Grid Current</td>
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<tr>
<td>Peak Envelope Useful Output Power</td>
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<tr>
<td>Resonant Load Impedance</td>
<td>3450 ohms</td>
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<tr>
<td>Intermodulation Distortion Products</td>
<td>-33 dB</td>
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*Measured data from a single tube
**Approximate

EIMAC
Division of Varian
San Carlos, California 94070
3-400Z’s used in prototype 6-meter linear amplifier for 2 kW PEP at 50 MHz

The prototype Swan linear amplifier shown here uses two EIMAC 3-400Z triodes in grounded grid circuitry to achieve two kilowatts PEP input at 50 MHz. Drive power is less than 100 watts PEP. The prototype amplifier features a tuned cathode circuit for low intermodulation distortion, and uses a pi-network plate tank circuit. The new linear may be driven with modern six-meter SSB transceivers, and offers real operational economy at 50 MHz.

Swan chose EIMAC 3-400Z’s because these compact, high-mu power triodes are ideal for grounded grid operation. They can provide a power gain as high as 20 in a cathode-driven circuit.

For more information on EIMAC’s line of power tubes for advanced transmitters, write Amateur Services Department, or contact your nearest EIMAC distributor.

<table>
<thead>
<tr>
<th>3-400Z TYPICAL OPERATION</th>
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<tr>
<td>(Minimum IM Distortion Products at 1 kW PEP Input)</td>
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<tr>
<td>DC-DC Plate Voltage ............... 2500 V</td>
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<tr>
<td>Zero-Sig DC Plate Current* ........ 73 mA</td>
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<tr>
<td>Single Tone DC Plate Current .... 400 mA</td>
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<td>Single Tone DC Grid Current .... 142 mA</td>
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<td>Two Tone DC Plate Current .... 274 mA</td>
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<td>Two Tone DC Grid Current .... 82 mA</td>
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<td>Peak Envelope Useful Output Power .... 560 W</td>
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<tr>
<td>Resonant Load Impedance ........ 3450 ohms</td>
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<tr>
<td>IM Distortion Products ........ -35 db**</td>
</tr>
</tbody>
</table>

* Approximate
** -35 db or more below one tone of a two tone test signal.

We have a new brochure entitled “Linear Amplifier and Single Sideband Service.” Write for your copy.

EIMAC
Division of Varian
San Carlos, California 94070
The World's Largest

THE FAMOUS HEATHKIT® SB-SERIES...

SB-301 Amateur Band Receiver ... SSB, AM, CW, and RTTY reception on 80 through 10 meters plus 15 MHz WWV reception. Tunes 6 & 2 meters with SBA-300-3 and SBA-300-4 plug-in converters. (less speaker)
Kit SB-301, 20 lbs., no money down, $24 mo. .... $260.00

SB-401 Amateur Band SSB Transmitter ... 180 watts PEP SSB, 170 watts CW on 80 through 10 meters. Operates "Transceive" with SB-301 — requires SBA-401-1 crystal pack for independent operation.
Kit SB-401, 35 lbs., no money down, $27 mo. .... $285.00
SBA-401-1, crystal pack, 1 lb., no money down, 95 mo. .... $29.95

SB-610 Signal Monitor Scope ... operates with transmitters on 160 through 6 meters at power levels from 15 watts through 1 kw. Shows transmitted envelope. Operates with receiver IF's up to 6 MHz. Spots signal distortion, over-modulation, etc.
Kit SB-610, 14 lbs., no money down, 48 mo. .... $74.95

SB-630 Amateur Station Console ... including 24-hour clock, SWR meter, 10 minute timer with audio-visual signaling, and more. Styled to match your SB-Series station.
Kit SB-630, 10 lbs., no money down, 95 mo. .... $74.95

SB-610 6-Meter SSB Transceiver ... puts the famous Heath SB-Series on "6". 180 watts PEP input SSB ... 150 watts CW — with single-knob linear tuning, 1 kHz dial calibration, and the ultimate in stability (less speaker).
SB-110, 23 lbs., no money down, $28 mo. .... $299.00

SB-110-6 Meter SSB Transceiver ...  puts the famous Heath SB-Series on "6". 180 watts PEP input SSB ... 150 watts CW — with single-knob linear tuning, 1 kHz dial calibration, and the ultimate in stability (less speaker).

6 & 2 Meter Plug-In Converters For SB-301,... 10 meter output — operate from front panel switch on SB-301. Better than 0.2 uv sensitivity for 6 db signal-plus-noise to noise ratio.
SBA-300-3 (6 meter), 2 lbs. .... $19.95
SBA-300-4 (2 meter), 2 lbs. .... $19.95

HM-15 Relative Power SWR Meter ... indicates forward and reflected power and SWR. Band coverage is 160 through 6 meters. Handle peak power well over 1 kw.
Wiring options permit operation with either 50 or 75 ohm transmission lines.
Kit HM-15, 2 lbs. .... $14.95

SBA-100-1 SB-Series Mobile Mounting Bracket ... cantilever mounting for SB-110 and SB-101. Allows quick-change from fixed to mobile installation.
Kit SBA-100-1, 6 lbs. .... $14.95
Kit HP-13, 7 lbs., no money down, 67 mo. .... $64.95
Kit HP-23A, 19 lbs., no money down, 96 mo. .... $49.95

No-Money-Down Credit ... Write for Application Blank
Selection of Amateur Radio Kits
FINE EQUIPMENT AT LOWER COST

SB-200 KW SSB Linear Amplifier...1200 watts PEP input SSB, 1000 watts CW on 80 through 10 meters. Built-in antenna relay, SWR meter, and power supply. Drives most popular SSB transmitters & transceivers.
Kit SB-200, 41 lbs., no money dn., $21 mo. .......$220.00

SB-101 80 Through 10 Meter SSB/CW Transceiver...180 watts PEP input SSB, 170 watts CW. Front panel selection of SSB filter or optional CW filter makes the SB-101 an exceptional CW rig. Unmatched in engineering and performance.
Kit SB-101, 23 lbs., $37 dn., $35 mo. ............$370.00

SB-620 Amateur Radio Spectrum Monitor...displays all received signals up to 250 kHz either side of receiver tuned frequency. New narrow sweep function shows 10 kHz for accurate signal analysis.
Kit SB-620, 15 lbs., no money dn., $11 mo. .......$119.95

SB-640 External LMO...provides an additional LMO (Linear Master Oscillator) for independent control of SB-101 transmitter and receiver frequency.
Kit SB-640, 9 lbs., no money dn., $10 mo. .......$98.00

SB-310 Shortwave Listener/Amateur Band Receiver...covers 40, 41, 43, 20, 19, & 16 meter bands plus amateur bands 80, 40 & 20 and 11 meter CB, SB-Series performance and quality (less speaker).
Kit SB-310, 24 lbs., no money dn., $23 mo. .......$249.00

SB-600 Communications Speaker...matches the Heathkit SB-Series line and includes space for HP-23 fixed-station power supply. Features an 8 ohm 6" x 9" speaker with 300 to 3000 Hz response.
Kit SB-600, 6 lbs. ........................................$18.95

Communications Microphones & Solid-State Electronic Keyer...Heathkit recommended microphones for optimum voice communications. Electronic keyer features built-in sidetone to provide audio monitor, no relays to stick or chatter, speed ranges 10 to 20 wpm and 15 to 60 wpm. Grid block keying transmitter only.
HDP-21A Desk-top microphone, 4 lbs., no money dn., $5 mo. ........................................$29.40
GH-12A, Hand Held PTT Mike, 2 lbs. ..............$8.50
HD-10 Electronic Keyer, 6 lbs., no money dn., $5 mo. $39.95

A Complete Line Of Test Instruments...to provide the ham with professional instrumentation at a price he can afford. Features New Heathkit Instrumentation Series...solid-state Volt-Ohm meters, power supplies, and more! See the "new look" new performance instruments in the 1969 Heathkit catalog.

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115
The World’s Largest
OPEN YOUR HEATH ACCOUNT...NO MONEY DOWN

The New HW-100 5-Band SSB-CW Transceiver... 180 watts PEP SSB input, 170 watts input CW on 80 thru 10 meters. Switch select USB/LSB or CW. Solid-state (FET) VFO, Crystal filter, TALC, VOX, PTT, S-meter. Run fixed or mobile with the HP-23A or HP-13 power supplies.
Kit HW-100, 22 lbs., no money down, $22 mo., $240.00

The New HW-17 Solid-State 2-Meter AM Transceiver... 25-30 watts input... covers 143.2 to 148.2 MHz. Switch select 4 crystal frequencies or external VFO (the HG-108 is perfect). PTT, ANL, Squelch, S-meter.
Kit HW-17, 17 lbs., no money down, $12 mo., $129.00

The HW-18 Series... CAP, MARS & 160 M Transceivers, 200 watts PEP SSB input. 25 watts input with carrier for AM station compatibility. Crystal filter, TALC, PTT, S-meter.
Kit HW-18-1, CAP xcvr, 16 lbs., no money down, $11 mo., $119.95
Kit HW-18-2, MARS xcvr, 16 lbs., no money down, $11 mo., $109.95
Kit HW-18-3, 160 M xcvr, 16 lbs., no money down, $11 mo., $109.95

The Single-Bander Transceivers... provide 200 watts PEP SSB input on the band of your choice. Now with LSB or USB on 80, 40, or 20. New styling, plus AVC, TALC, S-meter, PTT, and VOX.
Kit HW-12A, 80-mtr., 15 lbs., no money down, $10 mo., $99.95
Kit HW-22A, 40-mtr., 15 lbs., no money down, $11 mo., $104.95
Kit HW-32A, 20-mtr., 15 lbs., no money down, $11 mo., $104.95

Amateur Station Accessories... PM-2 RF Power Meter indicates transmitter relative power. Covers 100 kHz to 250 MHz. No power connections or battery required. HD-20 100 kHz Crystal Calibrator provides accurate calibrating signals every 100 kHz up to and beyond 54 MHz. Uses 9 volt battery (not included).
Kit PM-2, 2 lbs., $12.95
Kit HD-20, 1 lb., $14.95

Tools For The Amateur Station... HM-31 “Cantenna” Transmitter Dummy Load... provides a non reactive 50 ohm load to transmitters up to 1 kw... better than 1.5:1 SWR for frequencies 160 to 2 meters. Oil coolant not included. Soldering iron, needlenose pliers, nut drivers, and more are included in the new 1968 Heathkit catalog.
Kit HM-31, 3 lbs., $9.95

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Benton Harbor Lunch Boxes — Complete Transceivers... for 6 and 2 meters. Feature crystal-controlled transmitters with 5-watt input and tunable super-regenerative receivers with RF stage. Built-in 115 VAC power supply and speaker. Mike included. Less crystal.
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Kit GP-11, Mobile Vibrator Power Supply, 6 lbs., $17.95
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Kit HR-10B, 20 lbs., no money down, 60 mo., $79.95
Kit HRA-10-1, 100 kHz crystal calibrator, 1 lb. $9.95

DX-60B Phone & CW Transmitter...with new wrinkle finish matching HR-10B and the new "Single-Banders". Here’s 90 watts on 80 through 10 meters...operates at reduced power for novice class.

Kit DX-60B, 24 lbs., no money down, 60 mo., $79.95

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Kit HW-16, 25 lbs., no money down, 11 mo., $109.95

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Kit HD-16, 3 lbs., $9.95
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8 El 12.................. $18
12 El 2........ $25
20" boom

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"All band vertical?" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: V83FAZ, T12FGS, W5KY3, W1WOZ, W2ODH, W3ADJT, W2BFCB, W2YHII, V83FOB, W8CZE, KS6YB, K2RDJ, K1MVV, K8IYGY, K3ULT, W8OJC, W42JVE, Y8I-MAM, W38ATS, K2PQS, W2OJP, W4JWJ, K2PSK, W8CGA, W2BKWY, W2JWJ, VE8KT. Moral: It's the antenna that counts!

FLASH!: Switched to VU-E.W. and worked KZ31KN, KZ60WN, K8I-LC, PY5A5N, FG7X7T, XE2J, KP4-AQL, SM5BGC, G2AOB, YV5CLO, OZ3HI, and over a thousand other stations!

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NEVADA—SCM. Leonard M. Norman, WTPBY-SEC: WATEB4. The new QTH of K7AJO and K7O-L is Tucopa. It is to be well represented at the NV A in a few days. W7LY needs more amateurs interested in a statewide RACES program. N. Emergency Net. 190625, ke, continues to be well represented at 400. local time Mon. and Thurs. K7DQ has a 450-Mc. repeater under construction, K7ZOK has been in Washington, D.C., for TEN on business. W7LY will continue to anyone needing Nevada DX or state wide. WTPBY is starting his fourth term as Nevada's State Director. W7JEZ has a 144-Mc. repeater at 144.94 out, continues to be active with mobile in the state. K7CCW has assumed the duties of H & D director, WATEB is in Phoenix. W7HFJ has been active in the area of the SNARC. W7ST has a new antenna tower and beam, W7JRE has gone to NV to assist the SNARC. W7SVF has for outstanding public service in handling the WCARs bulletin and WCARs has been transferred to NV, K7UZ has been inactive in his area under construction! K7LBO is a home from summer college. Traffic: (Aug.) K7SH- GKL 476, K7GNY/K7Gri 54, WATEB/K7H 4, K7GLOU 1, K7HIOZ 20, WATEB/K7H 8, K7HIOZ 1.

SACRAMENTO VALLEY—SCM. John F. Mill, 8TH, WACDEJ-ECs: W6HNL, K7QHD, W6DSY, W6MU, W6OFT, RA: W6LZN, W6TJ, Your SCM decided the Sierra Hamfest at Brewer's Mansion near Carson City and was interested in the many to many interest. K6HE's QST reports he passed the Extra Class exam! Incidentally, follow amateurs, that 20 w.m. in San Francisco is a good time to listen and see what you think. For those who are participating in the California QSO Party, set those logs in, RM W6XBY reports to W6N2J4W, set those logs in, RM W6XBY reports to W6N2J4W, W6XBY and W6AS2E are on 7 crystal for a long absence. W6OFT is the only S.Y. member in the ARRL. Intruder Watch. If any of you are interested and feel qualified, let me know. Please note that Intruder Watch is not connected with the QO program or amateurs of another country. Any of you who want to be included in this column, please send it to WACDEJ, Traffic: W6LZN 127, W6DAD WA, W6TX 60, W6TA 27, W6QZ 26, W6YUS 3.
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WEST VIRGINIA—SCM, Donald B. Morris, W4JIM-SEC: W4EY, RXA, K8MIY, W3TPF, PAMs: W4TYD, K8CHW, WVN Phone Net Aigr; W4VOYF, West Va. C.W. and Phone Nts operated nightly on 2870 and 3890 at 0000 and 2300, Greenbrier ACR operated club station W4KARR at the West Va. State Fair, West Va. C.W. Not in 20 meter band. Westerns: 3890, 2870 and 6090 ke. The Phone Net with 31 sessions and 708 stations reports 205 messages, The West Va. Tech Club station, W4ABE, with trustee W4APOS, is active in c.w. and phone nets, W4ABEY and W4XCBK hold regular ARPSAC-RACES drills in Upshur County, K8MIY secured OBS appointment. W4BKW is the first to get good DX with their quad, W4LIC is editor of the Opercom Radio Society bulletin, W4THS is a new amateur of Marion County. At the Dinner Meeting, Charleston, were W4HIZA, W4DJP, W4EY and W4CLC, W4CLC is the call of the W.V.U., BARC and W4MIU, also is located in Morgantown. The MARA set up a novice position during the V.H.F. Field Day, W4JYV and W4CLC made contact on 28.90, W4CVR worked 77, K8MIY 71, W4ON 70, W4XCK 69, W4ASYE 52, K4STP 51, W4SHL 20, W4CGV 17, W4N5B 16, W4R3H 15, W4AYB 14, W4XEL 13, W4AFI 9, W4SUI 4, L4L 4, W4KMMZ 3, W4ARLY 2, W4AWTR 2, K4SAS 2, K4LTP 2, W4AYF 1, W4BFA 1, W4WQC 1, W4ZWX 1.

ROCKY MOUNTAIN DIVISION
NEW MEXICO—SCM, Kenneth D. Mills, W5E2B—New EMC include W5EBJ, W5MOYV, W5GFLG and W5ASL. We still have new no’s up in the northwest, southwest and southeast parts of the state. We can be found to fill all areas this system will keep going. Interested? Write W5EB, W5IM, or W5AE, W5M, W5OM, W5IOH or W5BAM, W5IPI, 1021 40th St., Los Alamos, NM 87544, W5FPSF reports few 50 Mc.-and-above band openings this month. K5MAT is new on 40 meters in Los Alamos. He did move K5LA from 80-, 40-, 20- and 15-meter c.w. he moved from Santa Fe. Infrader Watchers are needed. W5HV, W5J, full-fledged, W5AFL was W5ZER’s guide for the Ennie Plants tour in California recently. The Port Arthur ARC was...
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not by the Albuquerque ARC and the Albuquerque Chamber of Commerce when they arrived the IPD. Albuquerque has shown the Texas what the Albuquerque has to offer. A great time was had by all.


UTAH—SCM, Thomas H. Miller, W7QWJ—SEC: W7WRF, K7RMA has been appointed ORS. All section appointments are being reviewed for mutiny. Activity and monthly reports to the SCM and SEC are the criteria for maintaining your appointment. W7AWA copies W7BTSFJU 6, who was in Northern California, on 146.35 Mc. The Utah AREC—SECs NET now has 41 members with good state coverage. W7DVTY is NCS, with W7DIA and K7- KQYD as ANCS. BUN now has 25 regular members. W7OCX, W7AGM and W7AGUS are NCS and alternating as ANCSs. Stations are needed for these positions as well as liaison to TWN. This should be helped by the following items: W7OCX is the only one. Traffic: W7OCX 59, K7OTG 18.

WYOMING—SCM, Wayne M. Moore, W7GCI—SEC: K7QNX, RM; W7SSLF, PAMs; W7TKZK, K7SLM, OHA; W7AGM, W7SLDA, W7AGUS, W7TAQX, Pony Express, Sun, at 0800 on 3029; XQ, daily at 0350 GMT on 3610; Jackalope, Mon. through Sat. at 1215 on 7120; Wx Net, Ws 0630 Mon. through Sat. on 2200. Traffic: W7S5A and K7QTAQ as OBSs, W7TEGK and W7TTVB as OBSs. W7TVU is experimenting on 454 Mc. and may go with a repeater with K7KAB. S7 atlantic in a tragic accident in Aug.—K7DLE of Cokeville died in a car accident. K75DD was married in Aug. W7TCB has moved to Boulder, Colo., and K7QYG has moved to Rock Springs. W7QCP has moved to Ordan. W7VWJU has moved to Cedar City, Utah. K7TWS assisted by radioing Highway 491 and found an accident that K7QNX came upon his way to Casper. The ten-nagers won the Field Day trophy for 1968. Traffic: K7TVH 144, W7CQV 16, W7SLDA 13, W7AGUS 12, W7QDZ 12, W7KYG 9, K7SLM 1, K7KRA 1, K7TWA 24, W7- GOV 13, K7YPT 17, W7WYV 7, K7AHO 10, K7QW 8, W7TFU 5, W7BFS 4, W7AEF 2, K7ofi 2.

SOUTHEASTERN DIVISION

ALABAMA—SCM, Edward L. Stone, K4BH—SEC: W4BFP, PAM; W4WLC, RM; K4BKS. Another excellent North Alabama Manifest is now history, but will be long remembered by many. The Huntsville ARC was host this year and everything seemed to progress almost like a dream. K4AII was the proud recipient of the transceiver. W4BEJK has been appointed net manager of AEEN, W4VIV has Extra, DXCO and his rotator fused, and a good traffic count for the section. W4GRG now has worked 101 Hungarian stations. We still lack stations from quite a few areas of the state. Many pieces of traffic have to be relaid, and a good traffic count for the section. The AENM S.S.B. Net meets daily on 3965 kc. at 1508 CST; AENBT on 3570 at 1650 CST; call nets, AENM and AEEN at 3573 kc, at 1000 and 2000 CST daily. Make your plans now for the SS Contest, please note Nov. 18-19. Traffic: K4BK 115, W4FVY 104, W4AAM 19, W4BIEJ 19, K4AOZ 15, W4AEV 10, W4BMI 48, W4BIW 48, W4AEFC 41, W5ARO 40, K7KJ 29, W4GDD 23, K4CWW 22, W4MTQ 24, K4CWW 24, W4DGJ 16, W4AAM 16, W4AAM 15, W4AMQ 15, W4BFMQ 10, W4MMLN 6, W4KQ 2, K4DMD 4.

CANAL ZONE—SCM, Russell E. Oberholtzer, KZS- OU—Local civil defense nodes took place in the Canal Zone during Oct. W3ADE and his xyl visited with K3ZMB and K3ZEP. Ted operated as K3STD during his vock. Most of the K3s diverted from their usual daytime vacation. K3ZIF, K3ZILM, K3ZMA and K3ZOB arrived on the same ship, K3ZOA and K3ZOB attended the usual conventions of the IARRA (Inte- national Amateur Radio Association) in Atkinson, Kansas, and had a wonderful time. The LIRA does much good in helping the missionaries via station, supplying equipment, etc. Anyone interested in securing more information about this worthwhile organization may call W4VIV, 1804 Concourse. Antenna: K7Q- JC 55, K7ZPA 39, K7ZSA 39, K7ZET 12.

EASTERN FLORIDA—SCM, Jesse H. Morris, W4- MVB—Asst, SCM: Wm. G. Hissinger, W4NQV; SEC: W4HYT. Asst, SEC: W4FP, RM C.W.: W4CE, H, K7TYF, W4WLC; PAM: W4AAM 40M; W4SEFR, V.H.F. PAM; W4AAMC, August and the National Conventions (political) have come and
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goes. A group in Miami operated a station in Miami Beach near the convention site using the call K4GOF. This is the first time for such an operation and from the traffic reports was very successful. WA1LMA reports that he has received his Extra Class ticket. Also daughter Regina is now W4KTR. WB4FLW recently was appointed Amt. EC for Howard County. W4KTD soon will be leaving for school. He will relinquish QFN net user, duties and turn them over to W4GQZ. I understand that WB2KO operated from A.A.A. quarters in Orlando over Labor Day week-end participating once again in BEBA, better known as Bring Em Back Alive. This is a joint project of A.A.A. Jaycees and the amateur radio operators of Florida. Weather conditions, road conditions, traffic jams and other items of interest are gathered for motorists are gathered for the amateurs and reported to Orlando. There is much information is turned over to A.A.A. and they seem to have it all broadcast over 35 radio stations throughout the state, in an attempt to reduce the holiday traffic fatalities. Trufiie: (Aug.) WA1ECK 74, K4GOP 471, W4IP5X 130, WA6VWZ 247, W4FBZ 215, W4QUF 249, W4YTH 249, W4BFMSL 187, W4AWT 162, W4DGR 50, W4ILE 88, W4FIP 75, W4KGCX 72, W4HJL 70, W4FJA 69, W4MEM 57, W4DLY 52, W4GQZ 51, W4KLC 50, W4RNG 45, W4DQSP 38, W4HJL 32, W4A8K 25, W4SAK 20, W4HAD 20, W4HLS 20, W4KAC 17, W4AEYU 15, W4YX 16, W4SAEM 10, W4VQF 7, W4JEM 5, W4RBE 3, (July) W4BFMSL 64, W4HJL 32, W4QIOJ 45, W4HLS 32, W4SOM 6.

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Pensacola: W4MWAR is the new IC for Escambia County. WA4AYX assists WB4BNR as WEPFN QST. WA4HJ, WA4ECY and WB4DVM were active in Operation BEA. K1PKQ/4 is a new OPS. W7BNR/4 renewed as EAM and OPS. K4M2Z works 2 meters on W8M14 scatter, WA4IE, WB4DHL, WA4IZN, W4ZRE, W4UF and WB4DVM are operating on 2-meter FM, gear, W4UF and K4M2Z meet the Tri-State 2-meter S.S.B. Net on 144.1 Mc. each Sat. at 10 A.M., W4QY, K4VQD and WA4IZN are operating on RTTY gear, New Novices are WA4HJQ and WA4GQU, W4BHJ is now General. Anyone interested in forming a DX Club, contact K4BSS. WA4MB joined the Silent Key Roll. W4NFFY received his General Class license. Fort Walton Beach; WB4CQK is OBS for local v.h.f. nets. The N.W. Florida Field Day was a big success because of the efforts of W4QED, chairman, and his committee. A new DX record for 400.0 Mc. and above was set at the convention by W4EUI and W4RQ. W4WFE won the TR-4 and K4WATJQ has his SH-500 in mobile operation now. K7SWX was married last Aug. and Tom and his family are attending school at the U. of A. WA4DUB worked 65 countries with a dipole and HW-100 during the summer and also earned the Advance Class license and constructed an integrated circuit keyer. WA4IFD worked 110 countries last summer and received an OBS appointment. K4THL, running a key to 47 states, ran 100 QSOs, continues to hold weekly sessions with New Mexico and California on 2 meters. He also has 500 watts and 22 elements on 432 Mc. The Arizona Automobile Association expressed its gratitude for the excellent job the hams did during their “Bring-em-Back Alive” campaign over the Fourth of July. K7GQF and K7UGA continued to telephone relay traffic: K7HNL 31H, W7F 23, W7DUB 22, W3CD 14.

SOUTHWESTERN DIVISION

ARIZONA—SCM. Gary M. Hannan, W7CAF—PM: W7UXZ, RM: K7NLH. OBS: WA7QGO on 440.16 Mc. ATX 24 hours a day. The new FAMS manager of the Copper State Net is W7UXZ. CSN meets Mon. through Fri. at 1900 MST on 3.878 Mc. The Annual Convention in Phoenix will be a big event, due to the efforts of W7G7D, chairman, and his committee. A new DX record for 400.0 Mc. and above was set at the convention by W4EUI and W4RQ. W4WFE won the TR-4 and W4WATJQ has his SH-500 in mobile operation now. K7SWX was married last Aug. and Tom and his family are attending school at the U. of A. WA4DUB worked 65 countries with a dipole and HW-100 during the summer and also earned the Advance Class license and constructed an integrated circuit keyer. WA4IFD worked 110 countries last summer and received an OBS appointment. K4THL, running a key to 47 states, ran 100 QSOs, continues to hold weekly sessions with New Mexico and California on 2 meters. He also has 500 watts and 22 elements on 432 Mc. The Arizona Automobile Association expressed its gratitude for the excellent job the hams did during their “Bring-em-Back Alive” campaign over the Fourth of July. K7GQF and K7UGA continued to telephone relay traffic: K7HNL 31H, W7F 23, W7DUB 22, W3CD 14.

LOS ANGELES—SCM, Donald R. Etheredge, K13CUM—Asst. SCM: Harvey D.D. Helland, W4K3X. A Section Net certificate recently was earned by W6BWS. W6K3W and W6N1L were competing for the Vice-Director position in the Southwestern Division. W6HPE and W6BMM are new Extra Class holders, as are K6DQX. W6E1VY now is repeating new 2-meter e.s.b. gear. W6VEA and W6DWPX have acquired some RTTY gear of late and are working with W6HUI on the possible SQRVC net of RTTYers. The W6JW group in Neahpi reports having an excellent annual picnic. K6CL is, or rather was, touring VE-Land and operating on the WACS Net regularly, while K6VY got back to ARRL Headquarters for his vacation. W6JVB is making a new Drake line installed and W6V6YD has TV1-operated his rig after much work. While W6USY of SCM went to K6-Land, W6QAE was registering voters for the election this month, included the SQRVC, LERC, SFLRVC and LBARC. An auction is set for K6NPC in November. V.h.f. circuits, K6NA has a new final amplifier on the air, W6E50Q had hearing bells! A v.h.f. traffic net recently was established on 40.70 Mc. for Army MARS members, a new So. Cal. V.H.F. RC member is W6S9YJ. W6B2ZC is now operating on the 28-Mc. band. Club bulletins are appreciated and solicited via add-on on page 6. Traffic: (Arr.) WB4BBB 729, W6MLP 468, W5QAE 299, WB4TQ 297, K6CDD 227, W6CAZ 111, W6F 85, W6BMM 63, W6WDS 87, WB4K 89, W6HKO 82, W6ZMV 11, W6BZQ 17, W6SLQ 15, W6DQX 12, W6SSY 10, W5AM 8, K6ARZ 8, W6HUI 8, K6BQD 8, W6CAJ 7, W7W 63, W6D2F 2, W6DHE 2, W6GGL 40, W6AM 4 (June) W6AM 2 (Apr.) W6AX 6.

ORANGE—SCM, Roy R. Maxson, W6D5Y—W6BY, Automobiles Radios, Inc., contract DX Long John antenna which is performing nicely. Handling 401 Vietnam telephone relays, per S. H. King, vice-pres. WAIJIZ now is at Westover AFB.

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THE FT dx 400 "FULL HOUSE"

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with a DX-35 and a 75-A2 on WAIN. EC WBVRM says the 2K is working FB. KKMCA handled 597 telegrams in August. EC WGGJ has had an umpire report on emergency traffic under ARPS. OC WWORF advises that the Mission Trail Net now is on 3900. WB4K visited Mammoth Lakes and kept in touch on 40 and 80 meters. He is getting a Drake R4B receiver. OC WOBAM has a new 10-meter beam. WOBF has a new QTH in the same area. WB4TW has a new 230/226. Fred has been an ARRL member continuously for 47 years and says his grandson, Steve, is interested and there may be another ham in the family yet. If you want to get your code speed up or practice check the net on 712 at 2000 to 2300 Q5TS, 25 wpm. minimum speed. Traffic: (Aug.) WBRX 119, WA4Q 231, K9MC 233, W4KOP 238, W4JIC 226, WA8BUCK 232, W4WJR 27, WBVRM 53, X0GME 35, WOBG 7, WB4QA 8(July) W4GGJ 30.

SAN DIEGO—SCM, James F. Emerson, Jr., WB6- QMAI—K8AIV, North County EC, has been appointed Asst. SEC to replace W6VNM, who recently moved to a new QTH. Ralph is a sparkplug up north and has started a 2-meter net besides his efforts with the 9-meter group. WADJER is putting the finishing touches to an i.f. circuit and expects it to be on RTTY very soon. The ARC of El Cajon announces K8F0M! is coming. Also members who recently passed the Advanced Class exam are W6B0OE, W6DJR and W6- WRA. North Shores ARC has joined the ranks of clubs putting out a monthly paper. Many section members attended the Southern California Division Convention in Phoenix Labor Day weekend and had a grand time. Those who were there know that we were constantly reminded that next year's convention will be held here in San Diego. Our convention committee would like to know what you would like to see as a part of the general program or as a special extra curricular event? Are there any features you would like to see in other conventions that you would like to see here? Please address your comments to WATF1, general chairman, WOBG, of K6HN. County Civil Defense reports via W6BKA, that it is looking for about 20 operators to man 2-meter stations throughout the county. Aon, nights and in emergencies. Are you doing anything for public service and amateur radio? Traffic: K6BI, K6UW, W6VQG, W6YNO, W6FY, W6CQ, W6FRM, W6SE 118, W6DEI 61, K8AVH 59, W6BMM 26, W4KIL 12, W6GAY 11, W6YKF 3.

SANTA BARBARA—SCM, Cecil D. Hinke, W6G- OK—SEC: K6GV, RM: W6UJ, W6YK reported on his w.h.d. activities. Bill has an 80-element beam and has heard 34AM on the E-M-E path. He will use the 12-ft. dish at K6KV soon for the 1200 Oscar activity. A new linear in Thousand Oaks is WAGWGC, W6BINHE, in Newbury Park, is building a 400 kw linear. W6DR is the newly-appointed EC for the Simi Valley and is the leader of the emergency group for that area. K6TOE sends a nice report from the Morro Bay group. The Estero Radio Club is especially proud of W6FBRW who, with only three months on-the-air experience, has 32 states to his credit. W6ZER devoted 33 hours of his station activity to the Powder Puff Roundup. The San Luis ARC handled communications for the Labor Day Parade in Morro Bay as they have for the past 5 years. I ran into K6VRL in Phoenix and he remanded me that the Mike and Key ARC meets the 2nd Thurs of each month at the Security Bank in Camarillo. Traffic: W6ORW 13, W6UP 12.

WEST GULF DIVISION

NORTHERN TEXAS—SCM, L. E. "Gene" Harrison, W5LW—May I remind you this report leaves my desk "come high water" the 7th of each month. Net managers are reminded that reports should be in Dallas via some form of reliable communication by this date. Your SCM appeared before LTV Garland recently and a good crowd was on hand. The club has considerable equipment including a Swen 290, 290B, 1500, 40 and associated equipment and is attempting to contact LTV people on 75 meters. W5H1Q augmenting the group is the leader of this group. Supported by A. C. Robinson and K3AVN, the Dallas Amateur Radio Club has enjoyed a considerable "tour" of LTV Continental Electromor, the "VLF" experts, with 2 amateurs attending. A review of existing ARRRL records shows 155 appointments in our West Gulf Division. The Torrent County Emergency Net is very active on Sunday, 2200 to 1 p.m., local time. The Texas C.W. Net is very active at 7 p.m. and 12 p.m., local time on 2770 ke and W6ZYY would like more participants. Incidentally, certificates are available upon request. Please let me know your needs. TexTron reports 1475 check-ins, 461 messages, 24 collisions. All amateurs are reminded of the Texas Tron Net meetings on 3961 ke, daily at 8:30 local time; also the 7200
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CANADIAN DIVISION

ALBERTA—SCM, Harry Harold, VE5THQ—SEQ: VE5THQ, P.O. BOX 250, EDMONTON, AB.

ONTARIO—SCM, Jerry Osgood, VE3FRI—SEQ: VE3FRI, 1152 JERVIS ST., MONTREAL, PQ.

QUEbec—SCM, Wyanne, VE3NF—SEQ: VE3NF, 3850 DE LA RUE, MONTREAL, PQ.

NEW BRUNswick—SCM, John Brown, VE3KZ—SEQ: VE3KZ, 105 KING ST., FREDERICTON, NB.

NOVA ScOTIA—SCM, John Brown, VE3KZ—SEQ: VE3KZ, 105 KING ST., FREDERICTON, NB.

SOUTHERN OHIO—SCM, Jim Kline, W3HPL—SEQ: W3HPL, 206 E. WHITTON ST., CINCINNATI, OH.

SOUTHERN PENNSYLVANIA—SCM, Jim Kline, W3HPL—SEQ: W3HPL, 206 E. WHITTON ST., CINCINNATI, OH.

WEST VIRGINIA—SCM, John Brown, VE3KZ—SEQ: VE3KZ, 105 KING ST., FREDERICTON, NB.

SOUTHERN TEXAS—SCM, Jerry Searls, W5KVL—SEQ: W5KVL, P.O. BOX 250, BEAUMONT, TX.

SOUTHERN MASSACHUSETTS—SCM, Bob O'Flaherty, W1BFX—SEQ: W1BFX, P.O. BOX 250, CLINTON, MA.

SOUTHERN CALIFORNIA—SCM, Bob O'Flaherty, W1BFX—SEQ: W1BFX, P.O. BOX 250, CLINTON, MA.

MIDWEST—SCM, Bill Long, W9EDT—SEQ: W9EDT, 305 W. 1ST ST., CHICAGO, IL.

SOUTH COAST—SCM, Bill Long, W9EDT—SEQ: W9EDT, 305 W. 1ST ST., CHICAGO, IL.

MID-ATLANTIC—SCM, Bill Long, W9EDT—SEQ: W9EDT, 305 W. 1ST ST., CHICAGO, IL.

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MIDWEST—SCM, Bill Long, W9EDT—SEQ: W9EDT, 305 W. 1ST ST., CHICAGO, IL.

SOUTHERN CALIFORNIA—SCM, Bob O'Flaherty, W1BFX—SEQ: W1BFX, P.O. BOX 250, CLINTON, MA.

MIDWEST—SCM, Bill Long, W9EDT—SEQ: W9EDT, 305 W. 1ST ST., CHICAGO, IL.

ALBERTA—SCM, Harry Harold, VE5THQ—SEQ: VE5THQ, P.O. BOX 250, EDMONTON, AB.

ONTARIO—SCM, Jerry Osgood, VE3FRI—SEQ: VE3FRI, 1152 JERVIS ST., MONTREAL, PQ.

QUEbec—SCM, Wyanne, VE3NF—SEQ: VE3NF, 3850 DE LA RUE, MONTREAL, PQ.

NEW BRUNswick—SCM, John Brown, VE3KZ—SEQ: VE3KZ, 105 KING ST., FREDERICTON, NB.

NOVA ScOTIA—SCM, John Brown, VE3KZ—SEQ: VE3KZ, 105 KING ST., FREDERICTON, NB.

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immediately to set up some activity which will give a job to each of the other AEC members and especially the AEC, EOs. Why doesn't the SCM receive club activity reports? Each club has a secretary. Let's know what you are doing for amateur radio. VE3QX held the AEC gang together on many occasions during the summer. See our VE288 has a new harmonic. VE3DAX is a newcomer on the Three Rivers 2-meter repeater and in the same location as VE2DAE with a 24-element beam. VE3BFQ and VE2FW continue to do well on 2200 kc with great results on CW. Operates a 22-mile path. VE2DFX now is VE3MIQ and his XYL is VE3DFX! VE2WV reports great activities in the lower Saint Lawrence region. VE2DHO has a fine 80-meter s.s.b. signal from that region from the college in Matane. Le Radio Club de Quebec presented a major session in French and had all amateurs present by the end. The Province offers another 2400 kc each to the members of the Radio Club that send in the required forms. The station is V2OU. 62, V2AO 24, VE2CP 22, V2EALE 20, VE3EC 18, VE2FP 17, VE2FWM 8.

NEW BOOKS


This book is a useful reference guide to three widely used pieces of test equipment. Each test instrument is described with sections on how the instrument works, the uses of the instrument, and servicing techniques to be used in conjunction with the test equipment. No new or particularly enlightening testing techniques are presented, but the text does contain many standard techniques for three instruments under a single cover. Having such information available in one book should be especially helpful to a newcomer to electronic test equipment.


Although a basic knowledge of electronics is helpful for this book to be fully appreciated, the beginner should have little difficulty understanding the majority of the text material because of the large number of sketches, photographs, and schematic diagrams which are included to complement the text. The book is set up as a completely self-taught course on the theory and operation of the oscilloscope. Five lessons, covering 20 pages of text, discuss such topics as the oscillographic patterns, time base oscillators and generators, and vertical deflection amplifiers. The majority of the text consists of 29 projects using the oscilloscope. These projects start with the simple procedures for setting the scope up, voltage and current measurements, calibrating the time base, and Lissajous diagrams, and proceed to more elaborate techniques such as used in color TV servicing. In addition, a handy section is provided describing the various test uses of waveform analysis. One important point made by the author bears mention: the oscilloscope can be used to diagnose its own ailments when they do occur.

Electronic Hobbyist's IC Project Handbook (No. 464), by Bob Brown and Tom Kneitel. Published by Tab Books, Blue Ridge Summit, Penna. 17214. 160 pages, 50 projects, 160 illus-
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This text is geared primarily for the experimenter who wants to learn about ICs by building projects. This book is a handy compilation of many typical IC applications. In a brief, general-type introduction, the authors discuss why ICs were developed and some of the possible uses of ICs without resorting to the discussion of any theory. Fifty rather simple projects are described, many using a single IC, and some using both ICs and bipolar transistors. Each project is described with a brief text, a schematic diagram, and a parts list. There are no pictorials or photographs of the actual projects. Some of the projects which might be of interest to amateurs include: a two IC receiver, a three IC 90-meter preamplifier, a 40-meter f.r.o. transmitter, three electronic keyers, several audio circuits, two crystal calibrators, two c.p.o.s. an IC tester, and three power supplies. Following the project section of the text is an index of IC schematic diagrams showing just what’s inside the 26 integrated circuits used in the projects that are described.

How I Learned To Love A Contest

(Continued from page 71)

PVRC has them too and they also have a guy named Computer. He goes over the PVRC potential for each contest we decide to go in for as a club. He weighs all the variables, determines who should do this and who should do that and then sets up a point quota of minimum contribution per man. You’d better make your minimum and then some, otherwise, what you’ll get makes the old Chinese water drop treatment seem like fun. It’s scientific and I’d never seen anything like it. Imagine a radio club that is 100% concerned with amateur matters and not with the treasury and how much extra dividend could be declared that year.

Well, to get on with my story. Computer and a guy named Helper were going over the list of potential output. When they came to me, I could see they were puzzled, no doubt about it. After a short, whispered conversation, Computer asked me if I’d ever been in a contest. Well, not seriously,” I responded, “I’ve been in a couple. I worked W4KFC once.” I could see right away that this wasn’t getting me anywhere because Helper came out with “So what’s new? So has everybody else.” Well, anyway, Computer looked me over in his best, very superior manner with just the suggestion of a sneer on his face and told Helper to put me down for 25,000 points. Now, it wasn’t the 25K (and me still operating with the Ranger and the 80-meter dipole), it was the way he had of saying it to show me where I stood. I’d make that 25K and then some or kill myself. I did it, too, and darned near did kill myself in the trying but in the process, I had found it—the magic ingredient that had been missing. Competition. Yes, that was it and what fun it was, pure, unadulterated pleasure. I’ve enjoyed contests ever since.

I live in the Virginia Section of the Roanoke ARRL Division. So does W4KFC and W4GF and
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Happenings of The Month
(Continued from page 66)

For Vice Director:
Thomas G. Banks, W5HH, and John H. Sampson, jr., W7OCX, were found lawfully nominated and eligible and their names ordered listed on ballots to be sent to Full Members of the Division.

SOUTHWESTERN DIVISION

For Director:
John R. Griggs, W5KW, and Ray E. Meyers, W5MLZ, were found lawfully nominated and eligible and their names ordered listed on ballots to be sent to Full Members of the Division.

For Vice Director:
Thomas J. Cunningham, W5UF, was found lawfully nominated and eligible; but the Committee was in receipt of a letter from Mr. Cunningham withdrawing his name as a candidate. Arnold Dahlman, W6UEI, and Gary A. Stilwell, W6NJU, were found lawfully nominated and eligible and their names ordered listed on ballots to be sent to Full Members of the Division.

WEST GULF DIVISION

For Director:
Lester L. Harbin, W5BNG, and George F. Munach, W5VPQ, were found lawfully nominated: but the Committee was in receipt of letters from both nominees; each withdrawing his name as a candidate. Roy L. Albritt, W5EXB, and Ray K. Bryan, were found lawfully nominated and eligible and their names ordered listed on ballots to be sent to Full Members of the Division.

For Vice Director:
Favian M. Adair, W5FKE, Lester L. Harbin, W5BNG, and Eric B. Hjerpe, W5FCD, were found lawfully nominated and eligible and their names ordered listed on ballots to be sent to Full Members of the Division.

During the course of the above actions, Vice President P. Lanier Anderson, W4WII, joined the meeting.

On motion of Mr. Dannals, unanimously VOTED that Noel B. Eaton, Gilbert L. Crossley and David W4HM and K4MXF and W4JQ and W4NW and a lot more highly skilled contest types with antenna farms and youth. So what do I do to add zest to these contests? I have my own little private competitions with other club members who are about my speed. They don't know it, but it adds zing. Then, too, there is the desire to stand well up in the club competition and the section.

Yes, I have discovered that contests are fun. Sometimes, as I look back over my 55 or so years in the game, I think of all the fun I've missed. The first 40 years are down the drain but I figure that, in addition to the 13 years I've put in so far, I ought to have 30 years or so left, figuring conservatively, of course.

Contests are fun. In my opinion, they separate the men from the boys. I hope the status remains "status quo." If it doesn't, so help me, I'll spearhead an organization called "Contests, Unlimited" and that's all we'll do. You don't think it would fly? Well, don't bet that it wouldn't. Have fun.

See you in the Sweepstakes. 73.
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H. Houghton, with F. E. Handy and George Hart as alternates, are appointed a Committee of Tellers to count the ballots in the current elections.
The Committee then examined the FCC proposal in Docket 18260, concerning expanded eligibility for the Novice Class license. After discussion, on motion of Mr. Dannals, unanimously VOTED to file comments in support of the proposal to make eligible for the Novice examination anyone who has not held an amateur license for at least 12 months; but to request the addition of present Technician Class licensees to the list of those eligible.
The matter of formation of Advisory Committees was discussed at length, after reports from the special working group of Messrs. Clark, Crossley and Dannals. On motion of Mr. Smith, unanimously VOTED to approve the petition of Director Griggs for the formation of an Advisory Committee on VHF Repeaters. On motion of Mr. Groves, unanimously VOTED to approve the petition of Mr. Dannals for the formation of an Advisory Committee on Contestas.
During the course of its meeting the Committee discussed, without formal action, aircraft emergency communication, “homebrew” equipment, “phone patches,” BPL, and the 1969 Board meeting location.
There being no further business, the Committee adjourned, at 6:20 P.M.
JOHN HUNTONT Secretary

CQ Contest, de Padre Tim
(Continued from page 77)
The reassignment had brought him to Santa Marguerita. A ZP ticket and a modern s.s.b. rig were soon acquired with the help of a local amateur. Contests and serious DXing had been out of the question, though, because of the little spare time he had.
Tim turned back to Eduardo. The boy hadn’t understood that he didn’t want to go, but only stared intently at Tim.
“Please, Padre, we go now?” he pleaded.
Picking up his medical kit and case of holy oils used in the last rites of the Church, Tim threw the main switch on the rig.
“OK, pal,” he said. “Meet you at the Jeep as soon as I get the Eucharist from the chapel.”
Bumping down the road toward San Phillippe, Tim smiled at his reluctance to give up the contest. Then he glanced up into the starry night and muttered half-aloud, “CQ, CQ, CQ, heaven. This is Father Tim. Please, God, let me work the next contest.”

The Ruptured Rhombic
(Continued from page 78)
It is dead off the sides. Two Sundays ago on ten, I had a long and pleasant rag chew with Jack, ZL3KA, the only ZL I was hearing. Conversely, I was the only eight he was hearing—barefoot again—and this has occurred several times which verifies the 1936 article in QST. You hear them sooner and longer. On twenty, the rhombic competes with the twenty-meter medium-spaced beam, but you cannot rotate the rhombic—vet
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4. Note the commercial duty 25 ampere mercury power relay.
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anyway, although I recall reading an article where some guy rotated the hill along with it. On forty, the directional effects of the antenna begin to show and on the low end of this and the eighty-meter band, the exciter works well into Europe.

In conclusion, if you desire to work only short-haul contacts this is not the antenna for you. For an all-band array with fantastic gain and directivity in a predetermined bidirectional area, you can't beat it — if you've got five acres, four poles, friends, and are not above a little larceny. I have decided against terminating this antenna which would require very long feed lines and two double-pole-double-throw switches to change direction. It works well enough as it is, for my purposes. Oh yes, the title of the article? Well, during the transit work in the bitter cold, my glasses iced over and the pole on the Northwest corner ended up a little out of position. Thus, the Ruptured Rhombic!

The World Above 50 Mc.

(Continued from page 89)
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FS-1 Secondary Frequency Standard

(Continued from page 30)

body has needed less than 5 pf.

If, on the other hand, you had to turn the trimmer counterclockwise, you had to remove capacitance, which means that the oscillator went lower with heat, and was not temperature-compensated enough. In this case, add, say, 5 pf. N750 and make the necessary adjustment in the fixed parallel value so the total again is the same as originally. So far, nobody has needed over 15 pf. N750, and only one person needed that much.

In Conclusion

The total cost of all components, including the chassis and printed circuit board but less power supply, is $83 when purchased separately (see footnote 5). Of the principal components, the Motorola ICs run $8.00 each and the Texas Instruments SN7490N decade dividers are $11.10 each. Thus the total cost of all the logic is around $95. The HA-1 crystal is $0.80.

Like many other good-quality items, once you have determined that the advantages outweigh the disadvantages (such as cost) you will soon wonder how you could have done without something of this nature for so long. You can set up schedules you can meet with ease. You can work closer to the edge of the band than any but the foolhardy, and you can rapidly spot net frequencies on any band. It is ideal for frequency-measuring work, contests, and similar activities.

The main thing that will happen, probably, is that you will become aware of just how much receivers and transmitters really do drift with use or temperature changes. You can tell whether it is your own equipment doing it or that of the other station. You may find that the receiver you always thought had superb stability isn’t nearly as stable as you thought, even when allowed to run 24 hours a day.

The idea for this circuit was originally advanced by Vic Poor, K3NIO, when both of us gave up trying to get decent stability from a 100-kHz crystal. Jon Schmidt, WA3DZK (ex-W8BZB), supplied many suggestions for the circuit. W4ZAG, W7AHW/A, W2QFR, and K8JUG have all built prepublished units to assure uniform results. K8JUG has also been instrumental in setting up facilities to fabricate the printed-circuit board designed by the author, and also to procure the crystals and all other parts needed, for those interested in obtaining all parts at one time.

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A Tranceiving Converter for "160"

(Continued from page 14)

drive at $J_1$. Switch $S_1$ to read r.f. voltage, then tune $C_5$, $C_6$, and $C_8$ for maximum meter reading. Next, $L_1$ can be peaked for maximum oscillator output, while still observing the meter. After the foregoing adjustments are made monitor the plate current and tune for a dip the p.a. plate current by adjusting $C_4$, $C_5$ is the loading control, and it should be adjusted so that the dip in plate current is rather broad to assure tight coupling to the antenna — necessary if a good-quality signal is to be had. When the p.a. is properly adjusted the plate current should be approximately 100 ma.

If the 6146B stage is stable there will be no changes in plate current, other than the normal dip, as $C_4$ is tuned through its range. If additional peaks or dips occur, adjust the spacing between the neutralizing wire and the tube's anode until no instability is noted. With the drive disconnected from $J_1$, tune $C_4$ through its range and observe the plate current. Only the resting plate current should be registered if the amplifier is stable. By coupling a sensitive wavemeter to $L_4$ during the latter test, self-oscillation will be apparent as r.f. output when $C_4$ is tuned. Fine adjustments to $C_4$ can then be made until no spurious output is noted.

When operating c.w., insert sufficient carrier to bring the p.a. plate current up to 100 ma at dip. The key can be plugged into the exciter's key jack, or into $J_4$. Since $K_1$ is not designed for high-speed keying, it might be best to use $J_4$ as the keying terminal.

Final Comments

It should go without saying that the true measure of any ham station's performance can be taken from its antenna system. This is as true for 160-meter operation as it is for any other band. A random-length wire will usually give random results: a good antenna will give good results when used with good equipment. A quarter-wavelength vertical antenna, worked against a good ground system (even if the vertical element is physically short and uses lumped inductance to achieve resonance) will give good results. If space permits, a half-wave dipole, as high in the air as possible, will do an excellent job. Good results can sometimes be obtained by using an end-fed horizontal quarter-wavelength wire, as high in the air as possible. The latter should be worked against a good earth ground, and the more of the wire that is vertically oriented (current end) the better. Most end-fed quarter-wavelength wires for 1.8 MHz, are shaped like an inverted L, hence the previous statement.

This transceiving converter has sufficient power output for making plenty of DX contacts. If more power is desired, it can be used to excite a linear amplifier. (Thanks are given to Gus Wilson, W1NPQ, ARRL lab technician, for his work in building and testing this equipment.)

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Direct Conversion — A Neglected Technique

(Continued from page 17)

stations were logged with this receiver in the 1968 ARRL DX Test. The cross-modulation performance is at least equivalent to that of a medium-priced superhet and certainly much better than that of a regenerative receiver.

Additional Thoughts

The receiver is easily adapted to other bands by changing the input tuned circuit and the local-oscillator frequency. Oscillator coil data for 7-MHz operation is included in Fig. 1. The more experienced experimenter may build the receiver for other bands by using the oscillator from the HBR-TR \(^6\), with changes in the inductance values. Alternatively, it would be possible to make a stable master oscillator on 3.5 MHz and construct a multiplier chain to derive local-oscillator injection for the higher bands. The product detector performs adequately with a local-oscillator injection level of 0.6 volt peak to peak. Measurements have shown the receiver's usable sensitivity to be constant at less than a microvolt over the range of 3.5 to 50 MHz, the limit of the test equipment used for the measurements. The manufacturer's data for the hot-carrier diodes suggests that the principles are easily adaptable to the 144-MHz band, and perhaps even higher in frequency.

One disadvantage of the direct conversion approach is the ever-present audio image. While phasing techniques could be applied, the complexity of such a receiver would make a superhet more practical.

Since the local oscillator of a direct conversion receiver operates at essentially the same frequency as the received signal, the addition of an r.f. power amplifier would yield a very simple transceiver. Careful buffering of the v.f.o. is of course required. A unit in frequent use at W7WKR is such a transceiver. The rig operates on the 3.5-MHz, c.w. band, and is completely contained in a 3 × 4 × 5-inch box. With an output power of a tenth of a watt, hundreds of contacts have been made.

Clearly, the addition of switching at the input and output of the product detector would allow it to function as a balanced modulator for the generation of a double-sideband, suppressed-carrier signal. This could be the basis for a very simple phone transceiver for modern "hill topping."

While certainly not providing the ultimate in performance, the unit described represents perhaps the simplest approach to the construction of a truly usable receiver.

The authors gratefully acknowledge the ideas and comments of W7ZHA and W7DRA. Special thanks go to Chuck Wilcox, K6DMW, who contributed to many of the earlier experiments.

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These kits are used to mount our SCR's, zeners, & rectifiers etc.

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INVITATION: New York Radio Club invites New York area hams to Friday Night Silver at the Radio Club, 46th St. and 7th Ave., New York, N.Y. on Friday evenings, 8:30 P.M. to midnight, for a chance to hear world famous personalities from radio and television. Details will be announced in radio and television magazines.

OCWA—Quarter Century Wireless Association is a non-profit organization founded in 1947. Any amateur radio operator holding a General or Advanced Class license for any time is eligible for membership. Write for information to: J. I. Grifonda, W2IE, 1417 Stonebrook Ave., Mamaroneck, N.Y., 10543.


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WANTED: 375A, etc. coax, vernier knob, 2 filters, org.

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WANTED: Tuner for Heathkit 138B amplifier. W7MSY.

WANTED: Junk or very cheap Q-meter, stanol generator and decade capacitor. Please call if you have any. W6WOS.

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92200 TRANSMATCH handles a kw.
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TUBES AND SEMICONDUCTORS: 19 tubes, 7 bipolar and 3 field effect transistors, 12 diodes.

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SELECTIVITY: 6 dB bandwidth 2.4 kHz with USB filter provided. Accessory filters available for LSB, AM (6 kHz) and CW (3 kHz).
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INPUT: 50 ohms unbalanced.
OUTPUT: 4 Ohms to speaker or headphones.
AUDIO OUTPUT POWER: 3 watts at 10% HD.
AVC: Output variation less than 1 dB for 60 dB input change. Fast attack. Release time selectable.
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POWER INPUT: 300 W PEP on SSB, 300 W PEP on AM, 300 W CW (50% maximum duty cycle).
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VOX AND PTT: VOX and Anti-VOX built-in.
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DISTORTION PRODUCTS: Down 30 dB minimum from PEP level.
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14 MHz OUTPUT: 13.5 to 14.5 MHz output for Drake TC-2 and other transmitters.

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