THE ONLY TUNABLE VHF CONVERTER,
MODEL VHF 126

VHF pioneers designed and built this versatile VHF Converter. It will extend the range of any communications receiver through the 6, 2 and 1½ meter bands. All bands are tuned with equal ease since the 50mc tuner does the tuning for the higher bands in the same way it tunes the 50mc band. Sensitivity 1/2 microvolt with very low noise figure. Built-in power supply. Simple to install and requires no circuit modification to select either VHF or standard communication to the requirements of costly astronomy receivers.

Experience the finest VHF reception, ever! . . . $239.00 Amateur Net.

CHECK ANY RECEIVER,
THEN CHECK THE RME 4350A.

It has everything you want and need. Study and compare these features usually found in only high-priced receivers. Efficiency concentrated for ham bands only. IF curve is 2.8 kc wide without crystal, down to 100 cycles with crystal. Sensitivity one microvolt with low noise figure. Dual conversion for image rejection of at least 54 DB. Six-pound cast panel with heavy gauge steel chassis and cabinet gives maximum stability. 100 kc crystal calibrator. Single dial speed dial for easy tuning. Engineered for maximum performance on SSB, CW and Phone. Ideal for contest and DX under all receiving conditions.

RFD Item R16, $249.00 . Amateur Net, Model 4302 Matching Speaker $17.50 Amateur Net.

RME DB23 PRESELECTOR...

improves the performance of any receiver. Three 6J6 twin triodes are used as neutralized push-pull stages in a unique combination of selective and wide band RF amplifiers. You get a minimum gain of 20 db throughout all ham bands from 3.5 to 30 mc, and signal-to-noise improvement can be as much as 7.5 db over that of the receiver alone. Input circuits are accurately matched to any standard type antenna. Operation is simple; merely set band selector and adjust peaking control for maximum signal . . . $49.50 Amateur Net.

Write Dept. QT-2 for free literature on RME equipment—built by hams, for hams.
the Big Signal...

does one puts out “rocking chair copy” without half trying!

HT-33A
linear amplifier

There’s more than one reason why the HT-33A was designed to be rated conservatively at the maximum legal input. Talk-
power was part of it—enough to provide output to the antenna that guarantees you one of the really big signals on the band. But way beyond that was a need for reserve-power . . . to insure the effortless operation that means so much to efficiency and component life. Your distributor is ready to give you a convincing demonstration.

Available with convenient terms from your radio parts distributor.

Make reservations now for annual SSB dinner, New York City, March 24th

FEATURES
- Maximum legal input.
- Certified for FCDA matching funds.
- Third and fifth order distortion products down in excess of 30 db.
- Passive grid circuit. 50 to 75 ohms input.
- Built-In r.f. output meter to simplify tune up.
- Complete coverage of 80 thru 10 meter amateur bands.
- Pi-network for maximum harmonic suppression.
- Variable output loading.
- All important circuits metered.
- Circuit breaker assures protection of power supply.
- Perfect match to HT-32 in size, appearance, and drive requirements.
- Tubes: (1) PL-172 high power pentode; (2) 3B28 rectifiers; (4) OA2 screen regulators.
- Front panel controls: Meter selector; Filament switch; High Voltage switch; Bias adjustment; Band switch; Plate tuning; Plate loading.
Circuits include new design low noise mixers for improved S/N ratio, RF crystal oscillator and low frequency VFO for maximum frequency stability, and Mechanical Filters for optimum selectivity.

Major components are arranged in an orderly manner with attention given to heat dissipation, a major requirement for high reliability. Note the pleasing appearance and simplified front panel arrangement.

Collins 75S-1 Receiver

Surpassing in Performance... Simplified in Operation

New criteria of performance, compactness and operational simplicity have been achieved in the new Collins S/Line Receiver — the 75S-1. The highly accurate linear dial, coupled with extremely stable circuits, provides maximum ease in tuning in the frequency you want for keeping a sked or checking into a net. A bonus feature of the S/Line enables the 75S-1 to control the frequency of its companion 32S-1 Transmitter, putting the transmitter right on the received signal frequency without zero beating.

Other new highlights of the 75S-1 design include AVC with a very flat characteristic for optimum SSB performance; 150 volts on vacuum tube plates for reduced heat dissipation and increased reliability; silicon power rectifiers; control of three degrees of selectivity — 2.1 or optional 0.5 kc with Mechanical Filters, or 4.0 kc conventional IF transformers for AM.

Time-proven features of its Collins predecessors incorporated in the new receiver include dual conversion with a crystal controlled first injection oscillator; bandpass first IF; RF amplifier with low cross modulation products; stable, permeability-tuned VFO, product detector for SSB, and diode detector for AM.

The 75S-1 offers reception of SSB, CW or AM signals on all amateur bands between 3.5 and 29.7 mc, with coverage of any frequency in the 3.5 to 30 mc range, except 5.0 to 6.5 mc, possible by substituting crystals.

See the 75S-1 and other units of the S/Line — 32S-1 Transmitter, 30S-1 1 kw (Average Plate Input) Linear Amplifier and accessories — on display by your Collins distributor.
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As in many amateur radio firsts, Eimac tubes played an important part. K6AXN/6 used an Eimac 4X150A to triple from 144 to 432 megacycles, and an Eimac 2C39A to triple from 432 to 1296 megacycles. Another Eimac 2C39A was used as a straight-through amplifier, with an input of 600 volts at 80 ma and an output power of 16 watts. W6MMU/6 also used an Eimac 2C39A tripler, without further amplification, delivering an output power of 6 watts.

Whether breaking records, exploring new bands, or just enjoying solid QSO's, there's a member of the Eimac transmitting tube family for the discriminating amateur radio operator. For information, write to our Amateur Service Department.

EITEL-McCULLOUGH, INC.

SAN CARLOS, CALIFORNIA
40, 80 and 160 Meters, PR Type Z-2
Rugged. Low drift, fundamental oscillators. High activity and power output. Stands up under maximum crystal currents. Stable, long-lasting, permanently sealed: ±500 cycles.................$2.95 Net

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Third overtone oscillator. Low drift. High activity. Can be keyed in most circuits. Fine for doubling to 10 and 11 meters or "straight through" 20 meter operation; ±500 cycles.................$3.95 Net

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Section Communications Managers of the ARRL Communications Department

Reports Invited. All amateurs, especially League members, are invited to report station activities on the first of each month. For preceding months, request information from your Section Leader. A summary of these reports is included in the QST reports for the month. Radio club reports are also desired by SCAMs for inclusion in QST. ARRL Field Organization station appointments are available in the areas shown to qualified League members holding Canadian or FCC amateur license, General or Conditional Class or above. These include ORS, OES, OPS, 00 and OBS. SCMs also desire applications for SEC, EC, RM and FAM where vacancies exist. OES appointment is available to Novices and Technicians.

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The TMC Transmitting Dissipators and Dummy Loads, Models TER are a new engineering approach to the problem of providing a flat, resistive termination capable of dissipating RF energy. Housed in reinforced fiberglass plastic cases for pole or frame mounting, the TER series provides for minimum insulation and maintenance expense with maximum protection from the elements. All units are teflon insulated and silicon sprayed. The assembly is completely free of ferrous materials, and all vents are screened for maximum protection.

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THE AMERICAN RADIO RELAY LEAGUE, INC.,

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

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

"Of, by and for the amateur," it numbers within its ranks practically every worth-while amateur in the nation and has a history of glorious achievement as the standard-bearer in amateur affairs. Inquiries regarding membership are solicited. A bona fide interest in amateur radio is the only essential qualification; owner-ship of a transmitting station and knowledge of the code are not prerequisite, although full voting membership is granted only to licensed amateurs.

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"It Seems to Us..."

Join 'Em Up!

In Geneva, Switzerland, there will convene this August — for the first time in twelve years — another international radio conference. At this meeting the nations of the world will revise the Atlantic City (1947) radio regulations, including the assignment of frequencies to various services. As in the case of every previous international radio conference dealing with our short-wave bands in the past thirty years, your League will have representatives present for the duration of the Conference, acting as advisers to the official U. S. Government delegation.

For some two years now, under the guidance of the Department of State, our domestic radio interests — government, military, and civilian — have periodically met in Washington to study and recommend what should be the official U. S. viewpoint toward possible changes in the regulations. Again, ARRL has had representatives present at every such group meeting dealing with amateur matters or possibly affecting the amateur service.

A spokesman for the amateur is essential in these matters. Obviously, it would be impractical for thousands of individual amateurs to appear, each with his own views. That is one of the reasons we have a League — to collect and record the accomplishments of the Amateur Radio Service in the public interest, convenience, and necessity — and to lay that record before regulatory authorities who have the power to decree the status of our future existence.

Such representation costs money — sizable hunks of money when it involves attendance at an international conference for a duration of perhaps several months. Again, this is one of the reasons we have a League — to finance activities necessary for the continued existence and health of our hobby. The job must be done — for amateur radio exists only so long as we can maintain our frequency bands — and the League is doing it on behalf of all amateurs, League members or not.

Several amateur organizations in other areas of the world, similarly aware of the need for international representations, have plans to send advisers with their government delegations to Geneva. For some of the smaller societies, this is quite a financial problem. European amateur societies have banded together and for several years now have been contributing to a fund to handle the expense of representation. The Wireless Institute of Australia has inaugurated a "war chest," soliciting a minimum of 1 pound (half of a year's dues) per VK ham — and are getting help also from ZLs — to cover anticipated expenses.

It seems to us that we here are fortunate; we do not have to assess members or solicit from amateurs generally. Our League structure contemplates and provides for such activities. But mark well one point: you members of the League are the active supporters of representation for the amateur service. Every amateur who is not a League member is getting a free ride. Mull this over — and next time you run across a ham pal who does not belong to ARRL, give him a sales pitch. For the moment, never mind the fact that he will receive a QST subscription with his membership. If League members received no more tangible return from their dues than organized representation before national and international regulatory authorities, we think it is still the best investment they can make. So, start a private membership campaign of your own — kick a few shins, discuss the subject at your club meetings, and let's see if we can't substantially broaden the portion of the amateur body which is actively supporting the carrying of our torch.
COMING A.R.R.L. CONVENTIONS

May 2-3 — Oregon State, Roseburg
June 19-21 — ARRL National Convention, Galveston, Texas
August 15-16 — Pacific Division, Honolulu, Hawaii
September 5-6 — New England Division, Hartford, Conn.

NOVICE ROUNDUP REMINDER

Event: Eighth Annual ARRL Novice Roundup! Starts: January 31, 1959, 6:00 p.m. Local Time. Ends: February 15, 1959, 9:00 p.m. Local Time.

Yes sir, this one we know will be an all-time record-breaker! Complete information, including a sample log form, may be found in the January issue of QST (p. 77). Don't miss this one, it'll be a real battle! Get off those cards, radiograms or letters for ARRL's convenient log forms. They're mighty handy and will save you much time in readying your final tabulation. Good luck!

Stolen from W0MMM was an Elmac transmitter model AF-67, serial number 5055. This unit was taken from his car on Dec. 8. Let him know if you see anything of this rig.

W2PS was recently (Sept. 17) interviewed on Jack Paar's "Tonight" show concerning his experiences as a radio and TV repairman, and wonders how many QST readers saw him.

K4LSI and K6ILS are mother and son!

The Boston section of IRE is sponsoring a transistor lecture series on six consecutive Wednesday evenings commencing April 1, to be held in John Hancock Hall. Registration is $10.00, or $7.00 for IRE members. Write to Boston Section, IRE, 73 Tremont St., Boston.

25th ARRL International DX Competition

Phone: Feb. 6-8, March 6-8

It won't be long now! Whatever your locale, you're urged to get your feet wet on both phone and c.w. Each of the four 48-hour contest periods starts on Friday at 7 p.m. EST and ends on Sunday at 7 p.m. EST on the dates shown.

Certificates will be issued to the highest-scoring c.w. and phone operator in each country and each continental U.S. and Canadian ARRL Section. And there will be special certificates for club leaders and multioperator stations and a cocobolo gavel to the top club entry.

The DX will be shooting to trade contest data with as many W K VE/VO stations as possible. U.S. and Canadian amateurs will transmit RS and RST reports plus states or provinces, while the returns from overseas will be five- and six-figure numerals indicating signal reports and powers input.

Free contest forms, though not required by the rules, are now available from the ARRL Communications Dept. When requesting them, please advise whether you expect to enter the c.w. section, the phone section, or both.

Be selective and go after only new countries for DXCC, if you wish. But if you expect to earn the award in your ARRL Section, you'd better chase all comers. Scan the rules in last month's QST. Don't miss the banner DX activity of the year!

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Be selective and go after only new countries for DXCC, if you wish. But if you expect to earn the award in your ARRL Section, you'd better chase all comers. Scan the rules in last month's QST. Don't miss the banner DX activity of the year!
Except for an antenna, this amateur-band receiver is complete as you see it—everything, including power supply, in one small cabinet. It makes no compromises with sensitivity or selectivity; both are what you would expect from a first-rate communications receiver using vacuum tubes.

All-Transistor Communications Receiver

High Performance in a Miniature Package

BY H. F. PRIEBE, JR.* W2TGP

This isn’t a “let’s see if it can be done” unit — transistors are no longer that experimental — but is a practical ham-band receiver capable of competing with the better tube sets. Single-sideband selectivity (thanks to including a mechanical filter in the low-frequency i.f.), double-conversion, a.c.e. and noise limiter. Seventeen transistors, plus a few semiconductor diodes, make it possible to house the whole works, including power supply and speaker, in a 5 × 6 × 9 box.

The ever-increasing popularity of the transistor has resulted in its utilization in a wide variety of electronic equipment. No doubt more and more electronic gear will make use of the transistor as time goes on. Continuing development has improved transistor performance to the point where transistorized equipment is actually easier to construct than its tube counterpart. Even the time saved in wiring is worth mentioning: No heaters, screen grids or suppressor grids to connect; for example, a pentode tube has seven leads that must be wired in the circuit while the transistor that replaces it has only three.

This “easier to construct” assertion certainly would not be true if it were necessary to neutralize the r.f. and i.f. stages. And up until a short while ago most of the available transistors used in r.f. circuits required neutralization. However, this is no longer the case, since transistors with very low collector capacitances are readily available.

Two types of transistors that are used in this receiver have been most gratifying to work with — the i.f. transistors, General Electric 2N169A N-P-N rate-grown junction types; and the r.f. transistors, RCA 2N384 P-N-P drift types. Circuit analysis shows that with transistors having collector capacitances of approximately 2 μf. or less, neutralization in typical receiver circuits is not necessary, and the transistors mentioned above were chosen for this reason. Surprising as it may be, these units are relatively inexpensive — approximately $2.00 each for the 2N169A, and a little more than $6.00 for the 2N384.

In the recent past, all sorts of worthwhile

* 192 Miller St., Morristown, N. J.

February 1959
In recent years, electronic devices have been constructed with various experimental transistors available to only a few individuals. But the receiver described here is not in that category, because all the components — transistors, transformers and the rest — are readily obtainable from good electronic parts distributors.

The availability of transistor circuit information has been quite complete. Therefore this article will only be concerned with application of transistors to this receiver. For information regarding transistor circuit properties, the ARRL Handbook and articles in previous issues of QST are suggested.1

If one reads just the characteristics and performance data listed in Table 1, it might be difficult to visualize that the entire receiver, with built-in speaker and self-contained batteries, is contained in a 5 X 6 X 9-inch cabinet.

Of course, the transistor has made this possible. However, one should not overlook the mechanical filter that plays an important part in the receiver's selectivity and its single-sideband operation. Miniature components also have made the task somewhat easier. But the principal credit still goes to the little semi-conductor devices.

**Over-All Circuit Features**

The block diagram of the receiver, shown in Fig. 1, does not differ greatly from block diagrams of tube receivers. However, the methods of interrelating the control functions have optimized performance and operating convenience.

Delayed a.v.c. is applied to the r.f. stage to insure the best signal-to-noise ratio on weak signals. The delayed action is also in operation when m.v.c. is used. (The word "delay" is used to mean a threshold in control voltage and not a time delay.) The signal-strength meter is operated from the same circuits as the a.v.c.-m.v.c.; consequently, for the same level of audio output the signal strength of c.w. stations can be read directly on the S meter. The same is true for single-sideband signals when a constant level of modulation is assumed.

---

**Table I**

<table>
<thead>
<tr>
<th>Band</th>
<th>Tuning Range</th>
<th>Sensitivity*</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>3.5 to 4 Mc.</td>
<td>0.2</td>
</tr>
<tr>
<td>40</td>
<td>7 to 7.3 Mc.</td>
<td>0.2</td>
</tr>
<tr>
<td>20</td>
<td>14 to 14.5 Mc.</td>
<td>0.3</td>
</tr>
<tr>
<td>15</td>
<td>21 to 21.5 Mc.</td>
<td>0.4</td>
</tr>
<tr>
<td>10</td>
<td>28 to 29.7 Mc.</td>
<td>0.5</td>
</tr>
</tbody>
</table>

* Microvolts r.f. input for 50 mw. a.f. output with 30 per cent modulated signal.

A.V.C.: Audio rise less than 3 db. for inputs from 1 to 100,000 μv.

Audio: Output 0.5 watt with a 3-μv. signal 30 per cent modulated.

---


A single-stage of 2000 kc. first-i.f. amplification is employed, not so much for the gain as to provide isolation between the first and second mixer-oscillators.

A total of four second-i.f. stages is operated at 455 kc. A little more gain than that provided by one i.f. stage is needed to offset the loss through the band-pass filter. The selectivity of the i.f. section, with the inexpensive i.f. coils used, is not adequate without the filter. However, for some applications other than single sideband the i.f. selectivity without the filter might be adequate.

A conventional diode detector and automatic noise limiter circuit is used. The detector is followed by three audio-frequency stages. The audio output stage uses a pair of 2N188As in push-pull with a peak output of 0.5 watt.

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The complete schematic diagram of the dual-conversion receiver is shown in Figs. 2, 3, and 4. Fig. 2 includes the r.f., mixer, h.f. oscillator and the first i.f. Fig. 3 is the circuit of the second mixer, conversion oscillator and 455-kc. i.f. stages. The third section, Fig. 4, includes the noise limiter, detector, a.v.c. amplifier, b.f.o. and carrier oscillator, and the audio frequency stages.

**R.F., Mixer and H.F. Oscillator**

The design of the "front end" or main tuning circuits was carried out with the object of keeping the number of adjustments and circuit elements to a minimum while covering the major amateur bands. A standard three-gang tuning capacitor having the required change in capacitance (12 μf.) was chosen and values for the various coils and shunt capacitors determined.

An earlier receiver of this type had used ceramic trimmers across the individual coils, which resulted in the front-end assembly's occupying approximately three-fourths of the entire receiver. Since the receiver covers only a relatively narrow band of frequencies and is hand calibrated, there is no need for precise control or adjustment of circuit capacitances, so good-quality fixed capacitors are used with a worthwhile saving in space. The r.f. chassis now occupies less than half of the total space and the components are not excessively crowded.

### Table II: Tuned-Circuit Data

<table>
<thead>
<tr>
<th>Band</th>
<th>L1, L2</th>
<th>C1, C2</th>
<th>L3</th>
<th>C5</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>40.3 mH</td>
<td>1500</td>
<td>0.25</td>
<td>3.00 mH</td>
</tr>
<tr>
<td>40</td>
<td>3.44 mH</td>
<td>11 turns No. 28</td>
<td>0.61</td>
<td>0.50 mH</td>
</tr>
<tr>
<td>20</td>
<td>0.61 mH</td>
<td>11 turns No. 28</td>
<td>1.00</td>
<td>0.39 mH</td>
</tr>
<tr>
<td>15</td>
<td>0.25 mH</td>
<td>5 turns No. 28</td>
<td>0.15</td>
<td>0.25 mH</td>
</tr>
<tr>
<td>10</td>
<td>0.30 mH</td>
<td>5 turns No. 28</td>
<td>0.24</td>
<td>0.30 mH</td>
</tr>
</tbody>
</table>

* L1 same as L2 except not tapped. Taps on L1 measured from ground end.

All coils wound with enameled wire on 1/4-inch diam. slug-tuned forms, spaced to occupy 5/8 inch. Ticklers on L3 wound over ground end with same wire size.
The $L$ and $C$ values for each tuned circuit were selected so the desired band would occupy most of the main tuning dial's 180 degrees. The resulting values are listed in Table II. The number of sections in the band switch has been kept to a minimum by employing a capacitor type of resonant-circuit tapping for impedance matching. This method of tuning results in a slight reduction in available gain from the r.f. circuits, but it is felt to be a worthwhile exchange for the easier construction and adjustment.

The h.f. oscillator is operated on the high-frequency side of the received signal. By keeping the oscillator on the same side of the received signal for all of the bands covered, the same position of the sideband switch will hold for all bands. If the oscillator were operated on the low-frequency side of the received signal on some of the higher frequency bands, the position of the sideband switch corresponding to the lower sideband on the lower bands would become the switch position for the upper sideband when the receiver was operated on the higher bands.

Since the h.f. oscillator is operated 2000 kc. above the received signal a corresponding first i.f. output frequency of 2090 kc. results.

**First I.F.**

The first i.f. stage (2090 kc.) separates the two oscillator-mixers. That is, it isolates the oscillator-mixer in the r.f. section from the one used to produce the 455-kc. intermediate frequency. An earlier design used a low-pass filter to provide this isolation, but its requirements were rather stringent and therefore not easily reproducible.

The gain of the 2000-kc. i.f. stage is relatively unimportant but the isolation is well worth while. In spite of the fact that the receiver can distinguish a signal of a tenth of a microvolt, the antenna can be disconnected and the receiver
tuned over its entire range with no trace of spurious signals. When the low-pass filter was used some weak spurious signals were heard but for many cases the filter could be considered adequate.

455-Kc. I.F.

The low-frequency i.f. is quite conventional. No particular attention was paid to the selectivity of the i.f. transformers since the Collins filter provides the desired selectivity characteristic. The output i.f. is link-coupled to the detector transformer. The link facilitates construction and testing and provides an easy way of matching impedances.

Second Detector and Audio System

The second detector is operated at a relatively high impedance for transistor circuits, but it was designed so it would work with the popular diode noise limiter. Audio amplification consists of two Class A stages followed by a stage of push-pull Class B output. The power output, 0.5 watt, is more than sufficient for the self-contained speaker. The 20-ohm resistor across the output transformer provides a load for the amplifier when headphones are used.

Automatic Gain Control

The normal range of received signals, so far as amplitude is concerned, is quite extensive. At one extreme the weak signals are limited only by noise conditions, and at the other the maximum amplitude in close proximity to a transmitter can exceed several volts. The most frequently encountered range of signals is from noise level to about a tenth of a volt (100,000 microvolts). To be effective, then, the a.v.c. should start operating at a few microvolts and remain in control of the receiver's r.f. gain at all signal levels up to 100,000 microvolts. The operating conditions of transistors in typical circuits make the a.v.c. problem more difficult than with tubes.

As shown in Fig. 4, a two-stage d.c. amplifier is used for a.v.c. and as a driver for the signal-strength meter. Delayed a.v.c. is applied to the r.f. stage in the form of a variable-voltage collector supply. This gives more effective operation on strong signals than would be possible with only emitter current variation as used on the other controlled stages.

Construction

The receiver is contained in a standard 5 X 6 X 9 inch metal cabinet. A framework of light-weight aluminum is made to accommodate three flat-sheet aluminum chasses. One chassis comprises the tuning unit or front end, and has the r.f., first mixer and oscillator stages. The second chassis accommodates the second mixer, oscillator, the 455-kc, i.f. and the mechanical filter. The third chassis includes the diode detector and audio circuits.

The speaker, main tuning dial, signal-strength meter, and various controls are mounted on the panel-frame assembly. The frame around the speaker grill was made from an old metal meter case.

The four units — the three chasses and panel-frame assembly — are wired individually for ease in construction. The arrangement of circuits and components is such that a minimum of wiring is used between units. During testing and alignment of the receiver the various units can be operated without completely assembling the receiver.

Front Panel Controls

The band-selector switch, $S_1$, is located below the main tuning control, the r.f. gain control, $R_1$, is just to its left, and the antenna trimmer, $C_1$, is to its right. The three switches at bottom center arc, from left to right, a.v.c.-m.v.c. ($S_2$), upper or lower sideband ($S_3$), and a.m.l. ($S_4$). The control beneath the speaker is the carrier insertion level, $R_2$, and its on-off switch, $S_5$. The control

The r.f. section is at the left, i.f. in center, and audio at the right in this view under the chassis. The small variable capacitor on the panel alongside the band switch is the antenna-circuit trimmer. The 28-Mc. coils are at the left, with the bands progressing to the right to 3.5 Mc.

In the i.f. section (middle chassis plate) the small bracket at the bottom in this view holds the 2090-kc. i.f. transistor, $L_9$ is concealed by the part of the bracket to the right of the transistor. $L_9$ is the coil just to the left of and below the 40-meter oscillator coil (third from the right in the h.f. oscillator row). The coil above the 2N247 i.f. is $L_9$, the 2545-kc. crystal oscillator tank.

A phenolic lug strip has most of the audio circuit components mounted on it, as shown at the right. This strip is mounted about an inch above the audio chassis and conceals the transistor sockets.

The two coaxial sockets at the left (antenna input) are wired in parallel. Only one is actually necessary. The connector at the right is for an external battery.
This plan view of the receiver shows the three flat-plate chasiss on which the various sections are constructed. The r.f. circuits are on the right-hand chasis, with the coils for the five bands arranged in rows adjacent to the capacitor sections which tune them. The r.f. amplifier is nearest the panel, the mixer is in the center, and the h.f. oscillator is toward the rear edge. The transistors, almost end-on in this picture, are mounted in miniature sockets.

The center section has the first i.f. amplifier, second mixer with its crystal-controlled oscillator, the 455-kc. i.f. string (including the mechanical filter), the a.v.c. amplifier and the b.f.o. The progression in this section is from the rear toward the panel. Audio circuits are on the narrow plate at the left, with the Class B output stage toward the rear.

Penlight cells for power supply are mounted in clips on supporting frame at the rear.

in the extreme right corner is the a.f. gain. The three-position toggle switch located directly under the signal-strength meter is the on-off switch. The center position is battery off. The right side connects the receiver to the internal 12-volt battery and the other position connects the receiver's power lead to a connector for external battery or power supply.

**Supply Voltage**

The normal no-signal current drain from a 12-volt supply is 30 ma. The 12-volt supply was chosen because most automobiles have 12-volt electrical systems. The receiver works well with as little as 6 volts and as high a voltage as the transistor's ratings will permit. However, there is no advantage to the higher voltage. The self-contained batteries (eight penlite cells) are mounted on the inside of the back cover.

**Circuit Adjustments**

Alignment of the receiver is straightforward. However, to obtain maximum performance from simple circuits some of the values of the circuit components might require adjustment. The gain of the two-stage a.v.c. amplifier depends on the beta of the transistors; therefore, resistor R4 should be adjusted by comparing the audio outputs from a given signal when S4 is switched back and forth. This adjustment is performed by first tuning in a station with S4 on a.v.c. and adjusting the r.f. gain for maximum undistorted audio output. Then, on throwing S4 to a.v.c. the S-meter reading should stay the same; if not, adjust R4 until it does.

The resistors in the S-meter circuit are chosen to give full meter deflection on the strongest signals likely to be encountered. However, by proper choice of R8 and R9, the circuit can accommodate different meter movements and different signal-strength indications.

Since a single oscillator stage is used for the two carrier frequencies (453.5 kc. and 456.5 kc.), differences in the activities of the two crystals will result in a different amplitude of carrier injection voltage being fed to the detector for a given setting of the injection control. If this occurs, the values of capacitors C6 and C7 can be changed to make the voltage outputs equal for the two conditions.

**Reception of A.M. Signals**

Adjustment of the receiver for regular a.m. reception is the same as with any receiver employing 3-kc. selectivity. The main tuning control can be positioned to tune in either sideband or it can be set with the carrier at the midpoint of the selectivity curve.

When the carrier is centered, the sideband frequencies are limited to less than 1500 cycles. The amplitude of the audio frequencies in this range (0 to 1500 cycles) at the detector output will vary as the receiver is tuned across a signal; if this audio voltage is represented as e when only one sideband is received, it becomes 2e when both sidebands fall in the pass band.

**Reception of Single-Sideband Signals**

Single-sideband signals are detected by inserting a carrier of proper frequency into the diode detector along with the received signal. A convenient method for tuning in s.s.b. signals is to tune for maximum exclusion in S-meter deflections and then increase the strength of the inserted carrier until the S meter wiggles only slightly on voice peaks. If signal is not intelligible, throw the sideband switch to the other position. Some slight retouching of the main tuning control may be necessary to bring the received signal into the natural voice range.

**Reception of C.W. Signals**

The controls used for single-sideband reception are also used for c.w. Several advantages are obtained by so doing. The carrier insertion control is used for beat-frequency insertion, which allows the level to be set at the optimum value for, for example, limiting action on c.w. signals. When the b.f.o. injection is set at the value that just gives maximum audio output the S meter reads signal strength. Since the a.v.c. amplifier remains in the circuit (if so desired) a certain degree of automatic adjustment of r.f. gain is achieved.
Interference to television reception by amateur transmitters may be divided into distinct categories, each one requiring a different treatment. This discussion of the causes and cures includes details of a simple low-pass filter.

Soon after getting into amateur radio, the newcomer will discover that a subject of general interest is something called "TVI." You won't find TVI defined in Webster's dictionary, but if it were, the definition might go something like this: "TVI — Garbling of received television signals by interference from undesired signals." These undesired signals have many different sources such as electrical devices with sparking contacts, industrial heating equipment, diathermy, short-wave stations, and many others. But there are only two types of TVI of direct concern to the amateur. First is the type of interference that is caused by spurious signals emanating from his transmitter at the same frequency as that of the television signal. The second type of interference is caused by the legitimate transmitter signal at the operating frequency.

The first is distinctly the amateur's responsibility, since regulations require that the radiated energy from a transmitter be confined to the authorized operating frequency. The second type of interference is a result of deficiencies in the television receiver itself. While it is therefore not a direct responsibility of the amateur, it is not a problem that he can entirely ignore.

Interference From Spurious Signals

Let's take a definition on spurious signals so you'll know what they are. Spurious signals resulting from operation of your transmitter are any signals other than your fundamental, the fundamental being the signal you are using for communication. Spurious signals fall into two general categories, harmonics and parasitics. Let's take harmonics first and see how they can cause trouble.

The generation of a signal at a desired operating frequency is invariably accompanied by the generation of other lesser signals at multiples of the fundamental frequency. These multiples are called "harmonics," and when they are radiated they are classed as "spurious" signals. If these spurious signals happen to fall in a TV channel, they may ruin the reception of an otherwise perfect picture. How bad the interference to the TV picture or sound may be will depend on the comparative strengths of the harmonic and the TV signals. If the TV signal is strong enough, it is possible to have a harmonic in the channel without causing TVI.

In the normal course of events, it would be unusual for a ham to cause TVI by harmonies from an 80-meter transmitter. As you go lower in frequency, the harmonies falling in the TV region decrease in strength. Thinking in terms of the Novice power limit of 75 watts input, it is unlikely that an 80-meter rig could cause TVI except in extremely weak TV-signal areas. On
the other hand, one must be on guard against harmonics from a 40-meter rig and definitely expect them in 15-meter operation.

Before discussing methods of eliminating harmonic interference, we must also consider the problem of parasitic signals that can be radiated and cause TVI. You can expect to have harmonics but parasitics are “odd-ball” signals that may be present when the transmitter is operated. They occur when some stage in a transmitter oscillates at some frequency which may be far removed from the operating frequency — often in the region assigned to television. Such signals are not harmonics of the operating frequency; they are usually generated directly at the interfering frequency. A point that should not be forgotten is that factory-built rigs and kits are just as likely to have parasitics (and harmonics) as homebuilt transmitters. Methods of detecting and eliminating parasitics are given in the Radio Amateur’s Handbook and won’t be treated in detail here. The important thing to remember is that parasites can cause TVI.

There is nothing very complicated about curing harmonic radiation. In fact, only a minimum amount of work and expense is required to insure a “clean” transmitter. The first step is to close up the transmitter so that any signals leaving the rig can escape via only one route. This route should be through a coax line to the antenna or antenna coupler.

By closing up the transmitter we are referring to a completely shielded enclosure. Although your transmitter may be housed in a metal cabinet, it doesn’t necessarily mean that it is shielded. Incomplete shielding is seldom better than no shielding at all, and even factory-assembled rigs may require additional work if they are to be considered r.f. “tight.” For example, some transmitters have panels with painted surfaces on the sides that fit into the cabinet, or the panel lip on the cabinet may be painted. In order to obtain good shielding, the paint must be removed so that the panel and cabinet are joined by clean metal-to-metal contacts. Screws holding the panel to the cabinet should be not more than three inches apart. Any spacing of screws greater than this may permit the harmonic energy to leak out. Harmonic energy will escape more easily through a slit-type opening than through a circular or square opening of equivalent area. If the transmitter has a hinged lid, the paint should be removed from around the edge where it joins the cabinet, and as with the panel, the lid should be screwed down. The same shielding techniques should be applied to the rear of the cabinet or any areas where there are large openings.

Ventilation holes in the cabinet should not exceed 1/2-inch in diameter. If they are larger than this the harmonic energy will tend to leak out. You can use perforated metal for covering large ventilation holes; the Reynolds “Do-it-Yourself” type of aluminum is excellent for the purpose. Once the rig is completely shielded you can be reasonably sure that the r.f. will be confined to escape routes provided by wires emerging from the enclosure. Techniques for filtering power and key leads are described in the BCI-TVI chapter of the Handbook.

Low-Pass Filters

This leaves us with only one more problem — that of preventing the harmonics from reaching the antenna through the feed line. The answer is to install a low-pass filter at the transmitter output. A low-pass filter is simply an “electrical gate” that permits your fundamental to reach the antenna but which stops harmonics. The filter is a coil-capacitor combination that is designed to attenuate any signal above a certain “cut-off” frequency. Any signals higher in frequency than the cut-off frequency are attenuated, while the signals below the cut-off frequency are permitted to pass through the filter.

The filter is a simple device and the one described here can be built in an hour or so. Details are shown in Fig. 1 and in the photograph. Parts for the filter should cost about one dollar or less. The cut-off frequency for this filter is slightly higher than the 21-Mc. band, permitting 3.5, 7.0, and 21-Mc. signals to reach the antenna but attenuating harmonics above 21 Mc.

For the filter to do a good job it must be shielded and properly installed on the transmitter. We want the r.f. to flow through the circuit, not around it. The customary method is to use a short length of coax line between the transmitter and the filter. The feedline terminals on the transmitter and filter must be of the coax type to maintain shielding and prevent harmonics from getting on the outside of the coax. If harmonics manage to get on the outside of the line they can bypass the filter and reach the antenna and be radiated. That is why the filter must be connected to the rig with coax line and coax fittings.

Fig. 2 shows how the filter should be used with antenna couplers or balun coils. In many instances amateurs use antennas fed directly with coax line, without benefit of a coupler. In this type of installation the filter should be installed close to the transmitter. The standing-wave ratio on the coax line should be low, say 2 to 1 or less, otherwise there is a danger of component break-
Fundamental Overloading

If you have followed the steps outlined above you should have a transmitter that is free of harmonic radiation. However, you may still cause interference on the neighbor’s TV set (or your own) due to “fundamental overloading.” This type of interference, though caused by your fundamental signal, is not your fault nor obligation. However, you should be in a position to know what it is, how it is caused, and the cure.

Briefly, here is what happens. Assuming you have a clean transmitter with no harmonics being radiated, you still have your fundamental signal going out. Receiver circuits that have sufficient selectivity to reject an adjacent-channel signal if it is of reasonable strength may not be selective enough to reject a very strong signal, even though its frequency may be far removed from the frequency to which the circuits are tuned. If the television antenna is close enough to your transmitting antenna, the signal from your transmitter picked up by the TV antenna may be so strong, even though you are operating on a frequency widely separated from the TV channel, that the input circuits of the TV receiver will not reject it. If the signal is strong enough, one or more tubes in the TV receiver may overload. This overloading is usually accompanied by the generation of spurious signals which are then fed to other stages in the receiver, and TVI results. If the TV set had better selectivity it could discriminate against your fundamental and prevent it from reaching the r.f. tube.

The way to improve the selectivity of the TV set so that it accepts only TV signals is by means of a high-pass filter. A high-pass filter is just the opposite of the low-pass unit described earlier. In this case we design a filter that will pass only signals higher than its cut-off frequency while attenuating lower-order signals. Usually the cut-off frequency is about 40 Mc, although there are special units available with a cut-off just below Channel 2. Any of the hams who operate on 50 Mc and have Channel 2 to deal with make good use of such filters. When high-pass filters are installed on the tuner of a TV set they usually clean up the fundamental-overload problem. The filters should be installed at the tuner and not on the back of the set. This is done to prevent any signal pickup on the lead from the TV antenna terminals to the tuner.

A good way of finding out when your own station is clean is to have a filter installed on your own TV set and be able to operate the rig without causing interference to your own set.

As we said earlier, cleaning up your neighbor’s TV set is not your obligation. However, it will usually help to maintain good relations if you explain the problem to your neighbor and invite him over to see your set and demonstrate that it is clean when operating your rig. You might also point out that a high-pass filter will help reduce other types of interference. Never be discourteous, even if the TV viewer is (and many of them can be quite difficult to deal with!). Don’t, under any circumstances, make remarks over the air about the neighbor or his set, he may be able to copy everything you say and you may find it difficult to keep things on a cooperative basis.

Many areas of the country have TVI committees—groups sponsored by local amateurs. These committees are equipped to handle TVI complaints and are trained to do the job. If you have complaints, contact your local committee and ask for help. If you don’t know of any local groups, write the nearest FCC office, since they maintain a list of committees in each area. If there is no committee nearby to service the complaint, then you will have to handle it yourself. This means that you must show the set owner how his set is at fault and why the installation of a high-pass filter is required. In many instances the set manufacturer will furnish a high-pass filter at no charge. The local service-man or distributor may not know about this policy, so you may have to persuade the set owner to write to the manufacturer.

As we mentioned earlier, study the BCI-TVI chapter of the Handbook. Also, your ARRL Headquarters has printed material available that is yours for the asking. This includes sample letters to TV set owners, explaining fundamental overloading and the use of a high-pass filter, sample publicity releases, information on forming TVI committees, and other information.

Maybe you’ll never have to worry about TVI, but if you do, don’t forget there is plenty of help available for the asking.

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A 500-Watt Package

Self-Contained Unit for Five Bands

BY DONALD MIX,* W1TS

By taking advantage of the short duty cycle of c.w. and s.s.b. operation, it has been possible to find space on a standard-size chassis for self-contained power supplies in a half-kw. rig. The safe limit on a.m. is about 250 watts. A differential keying system and remote-tuning v.f.o. are included.

The transmitter shown in the photographs is a 500-watt c.w. transmitter, completely self-contained except for an external remote v.f.o. tuning box. Provision is made for introducing s.s.b. input at the grid of the driver stage. While plate modulation can be applied to the final amplifier in the usual manner, ratings of the plate power supply limit the safe input to about 250 watts.

The circuit is shown in Fig. 1. Switch S3 permits either v.f.o. or crystal-controlled operation using a 6A16 oscillator. Either 80- or 40-meter crystals may be used. C5 is a crystal feedback control. The v.f.o. circuit is in the 80-meter band and S1 selects either of two frequency ranges — 3.5 to 4 Mc. for complete coverage of all bands, and 3.5 to 3.6 Mc. for greater bandwidths over the low-frequency ends of the wider bands. The plate circuit of the oscillator is on 80 meters for all output bands except 10 meters where it is non-resonant.

A 6CL6 buffer separates the oscillator and the first keyed stage. This stage doubles to 20 meters for 20- and 10-meter output and triples to 15 meters. The driver is a 2E26 which doubles to 10 meters and works straight through on all other bands. This stage is neutralized and a potentiometer in its screen circuit serves as an excitation control.

The final is a 7094, also neutralized, with a pi-network output circuit using a B & W 851 band-switching inductor unit. A differential break-in keying system using a 12AU7 is included. Both the final amplifier and driver are keyed by the grid-block method. Chirps are prevented by the keying system which automatically switches the oscillator on ahead of the amplifier and off after the amplifiers. The differential is adjusted by R1. Clicks are suppressed by envelope-shaping circuits which include C7, C11 and the associated grid-leak resistances.

Metering

A meter-switching system provides for monitoring 6CL6 plate current, driver grid or plate current, and final-amplifier grid, screen or plate current. The 1000-ohm resistor in series with the meter M1 makes it possible to use standard resistance values for the shunts $R_2$, $R_3$, $R_6$, $R_9$ and $R_4$. The 100-ohm shunts give a full-scale reading of 50 ma., the 51-ohm shunts a full-scale reading of 100 ma., and the 10-ohm resistor in the negative high-voltage lead provides a 500-ma. scale.

Power Supply

Space, restricted by the size of a standard...
Fig. 1—Circuit of the 500-watt self-contained transmitter. Except as indicated, capacitances less than 0.001 μf. are in μf. Fixed capacitors of capacitance greater than 100 μf. should be disk ceramic, except as noted below. Fixed capacitors of 100 μf. and 220 μf. should be mica. Capacitors marked with polarity are electrolytic. Resistors not otherwise marked are 1/4 watt.

Bi—Blower (Allied 72P715).
C1, C5—100-μf. air trimmer (Hammarlund APC-100-B).
C2—Midget dual variable, 25 μf. per section (Johnson 167-51 altered as described in the text).
C4, C6—0.001-μf. silver mica.
C7—30-μf. mica trimmer.
C8, C9—0.1-μf. paper (keyer shaping).
C11, C12—0.1-μf. mica trimmer variable (Johnson 160-130).
C13—0.1-μf. midget variable (Johnson 167-11).
C14—10-μf. mica.
C15—0.001-μf. 3000-volt disk ceramic.
C16—0.001-μf. 7500-volt ceramic (CRL 858S).
C17—244-μf. 2000-volt variable (Johnson 154-1).
C18—Triple-gang broadcast variable, 365 μf. or more per section, sections connected in parallel.
F1, F2—Type 3AG.
J1, J2—One-inch 115-volt panel lamp (Dialco C-432, C-431).
J5—Crystal socket (Millet 33102).
J6—Coaxial receptacle (SO-239).
J7—Key jack, open circuit.
J8—Chassis-mounting a.c. receptacle (Amphenol 61-1F1).
K1—S.p.s.t. 115-volt a.c. relay (Advance GHA/1C/-115VA or similar).
L1—35 μh.—32 turns No. 18, 2 inches diameter, 2 inches long (Airdux 1616).
L2—Approx. 10 μh.—65 turns No. 26 enam., on 3/4-inch iron-slug form (Waters CSA-1011-3).
L3—Approx. 2 μh.—16 turns No. 26 enam., close-wound at center of form similar to L2.
L4—Approx. 1 μh.—13 turns No. 26 enam., 1/4 inch long at center of form similar to L4.
L5—16 turns No. 20, 3/4 inch diameter, 1 inch long, tapped at 10 turns and 13 turns from L4 end (Airdux 616).
L6—40 turns No. 16, 1 1/4 inch diameter, 2 1/2 inches long, tapped at mid point (Airdux 1016).
L7—3 turns No. 14, 3/4 inch diameter, 3/4 inch long.
L8—4 turns 3/8 X 1/4-inch copper strip, 1 3/4 inches diameter, 2 1/2 inches long (part of B&W 851 coil unit).
chassis and cabinet, made it necessary to design the power supply primarily for the short duty cycle of c.w. or s.s.b. operation. The plate transformer in the high-voltage supply uses a transformer designed for a conventional full-wave rectifier circuit with an ICAS d.c. output rating of 300 ma. at 750 volts. A bridge rectifier is used with this transformer so that an output voltage...
of 1500 is obtained. The short duty cycle of c.w. or s.s.b. operation makes it possible to draw up to the rated maximum of the 7094 (330 mA) through a choke-input filter without a prohibitive rise in transformer temperature. For economy, electrolytic capacitors in series, with equalizing resistors, are used in the filter.

The low-voltage supply has two rectifiers. A full-wave rectifier with a capacitive-input filter provides 400 volts for the plate of the driver and the screen of the final amplifier. A tap on a voltage divider across 400 volts provides 300 volts for the plates of the oscillator, buffer and keyer tubes. Screen voltage for the 6AH6 and 6CL6 is regulated at 150 volts by an OA2. A half-wave rectifier with a choke-input filter supplies 250 volts of bias for the keyer and fixed bias for the 212A6 and 7094 when they are operating as Class AB1 linear amplifiers. The 6.3-volt filament winding on T1 supplies all filaments.

**Control Circuits**

S7 is the main power switch. It turns on the low-voltage, filament and bias supplies. Until it has been closed, the high-voltage supply cannot be turned on. In addition to turning on the high-voltage supply, S8 operates the relay K1 which applies screen voltage to the final amplifier. Thus, to protect the screen, screen voltage cannot be applied without applying plate voltage simultaneously. S8 is in parallel with S7 so that the high-voltage supply can be controlled remotely.
from an external switch. Also, in parallel with the primary of the high-voltage transformer is another jack, J7, which permits control of an antenna relay or other device by S6 if desired.

The "v.f.o. set" switch S5 simultaneously turns on the exciter and grounds the screen of the final amplifier. It is not necessary to turn off the high voltage while setting the v.f.o. to frequency.

S5 has three positions. One is for crystal control, the second for v.f.o. operation, and the third position is for operating the last two stages of the transmitter as linear amplifiers with an external s.s.b. exciter. In addition to shifting the input of the driver stage from the buffer amplifier to an s.s.b. input connector, fixed bias is provided for AB1 operation of both stages.

**Construction**

The transmitter is assembled on a 17 X 13 X 4-inch aluminum chassis with a 19 X 12½-inch panel. Except for the final amplifier, the top of the chassis is devoted to power-supply components. The exciter is built as a separate unit mounted underneath. The amplifier enclosure measures 8½ inches wide, 8⅛ inches deep and 7½ inches high. The three permanent sides shown in the rear view can be bent up from a single sheet of solid aluminum stock. The top and back (not shown) are made from a single piece of Reynolds perforated sheet aluminum. The box is centered on the chassis, flush with the front edge.

To provide ventilation for the final-amplifier tube, the tube socket is mounted on M-inch oak blocks so that its shaft is symmetric with the shaft of the oscillator tube. The five high-voltage filter capacitors are held in place in the front wall of the box. The ventilating fan is mounted against the right-hand wall of the chassis. The high-voltage bleeder resistors are also mounted at this end, supported on insulating strips. The five high-voltage filter capacitors are held in place in the right rear corner by a strap. In the opposite rear corner are the capacitors in the low-voltage and bias filters.

Along the rear wall of the chassis, from left to right as viewed from the front, are the s.s.b. input connector, the v.f.o. tuner connector, a.e. power connector, low-voltage fuse, bias potentiometer in the keyer circuit, key jack, coaxial output connector, high-voltage fuse, and receptacles for external high-voltage control and antenna relay. All power wiring is done with shielded wire. The 1000-muF heater bypass capacitors shown in Fig. 1 should be connected one at each ungrounded filament terminal of all tubes except the 6X5 rectifier.

On the panel, the meter switch is placed below the meter, symmetrical with the excitation control at the opposite end.

**The V.F.O. Tuner**

The v.f.o. tuner is assembled in a 5 X 6 X9-inch aluminum box (Premier AC-506). The dual tuning capacitor C2 has 7 plates, 4 rotor and 3 stationary, in each section. In the front section, which is used to cover the entire 80-meter band, the two rotor plates nearest the front should be removed. This leaves two rotor plates and two active stator plates, the front stator plate being inactive. In the rear section, the front stator plate and the last two rotor plates are removed. This leaves one rotor plate riding between two stators.

The capacitor is mounted on a bracket fastened against the bottom of the box, although it could be mounted from the front cover with spacers to clear the hub of the Millen 10035 dial. The shaft of the capacitor should be central on the front cover. The coil is suspended between a pair of
The remote v.f.o. tuning unit is housed in a standard metal cabinet. The cable at the right plugs into the main chassis.

2¼-inch ceramic pillars (Millen 31002). It is placed immediately to the rear of the tuning capacitor. The two air trimmers, \( C_1 \) and \( C_2 \), are mounted on the top side of the box with their shafts protruding so that they can be adjusted from the top. The bandspread switch is mounted in one end of the box and the cable connector at the other end.

The leads of the two bridging capacitors, \( C_4 \) and \( C_5 \), are soldered directly to the terminals of the connector and to a grounding lug.

The unit is housed in a standard cabinet (Bud C-1781) having an 8 × 10-inch panel. The dial should be fastened to the panel, making sure that the hub of the dial lines up accurately with the shaft of the tuning capacitor. Then the box is inserted in the cabinet through the front opening. The switch shaft goes out through a hole drilled in the side of the cabinet, and the cable goes through a hole in the opposite end to the cable connector. After the box is inside the cabinet, the dial hub can be fastened to the capacitor shaft and the panel moved into place. The dial should be set to read zero at maximum capacitance of the tuning capacitor. The box should be supported on spacers. Four 2-inch cone insulators were used in this case.

**Adjustment**

With all tubes except the rectifiers out of their sockets, the power supplies should be checked first to be sure that they are functioning properly. The voltage output of the low-voltage supply should be in excess of 400 volts, the biasing voltage 500 or more and the high voltage above 1500. The slider on the low-voltage bleeder should be set at approximately three quarters of the way from ground. The slider on the bias-supply bleeder should be set for a reading of -250 volts to ground.

Plug in the oscillator and buffer tubes and an 80-meter crystal if one is available; otherwise connect the v.f.o. tuner. With the low-voltage supply turned on, the OA2 should glow. When the key is closed, the OA2 should dim but stay ignited. If it does not, the value of the 10K VR resistor should be reduced.

The v.f.o. can now be adjusted to frequency. Set \( C_2 \) at maximum capacitance. Set \( S_1 \) to the 80-meter position. Adjust the 80-meter trimmer \( C_4 \) until a signal is heard at 3500 kc, on a calibrated receiver. Then set the receiver to 4000 kc, and tune the v.f.o. until the signal is heard. If the signal is not close to 100 on the dial, carefully bend the rear rotor plate of the 80-meter section of \( C_4 \) outward a little at a time to get the desired bandspread. Each time this adjustment is made, the trimmer should be reset to bring 3500 kc, at zero on the dial. When this adjustment is complete, the dial can be calibrated against the receiver at intermediate points.

The same procedure should be followed in adjusting for the other v.f.o. range, aiming for 3600 kc. (or above if desired) at 100 on the dial. The rear rotor plate can be bent for fine adjustment.

The 2E26 should now be plugged in and the excitation control \( R_4 \) set at the ground end (zero screen voltage). \( S_3 \) should be set in the v.f.o. position. With low voltage on and the key closed, a reading of grid current to the 5763 should be obtained with the band switch in the 80-meter position. With the switch in the 40-meter position, the slug of \( L_2 \) should be adjusted for maximum grid current to the 2E26. With the band switch in the 20-meter position, \( L_4 \) should be adjusted for maximum grid current, and then the slug of \( L_4 \) should be adjusted for maximum grid current with the band switch in the 15-meter position.

Now insert the 7091 in its socket. Turn the band switch to the 15-meter position. Advance the excitation control to about three-quarters of maximum. Tune the driver tank circuit to resonance as indicated by maximum grid current to the final amplifier. Switch the meter to read grid current. There will probably be a pronounced change in grid current as the plate tank circuit is tuned through resonance. Adjust the neutralizing capacitor \( C_8 \) using an insulated screwdriver. The neutralizing capacitor is adjusted, the change in grid current should become less. When the change has been reduced to a small percentage, tune the driver tank circuit accurately to resonance as indicated by minimum plate current. Now switch the meter back to grid current. Detune the plate circuit very slightly both above and below the exact resonant point, observing if the grid current increases with an increase or decrease in tank-circuit capacitance. If the grid-current increase occurs with an increase in capacitance, the capacitance of the neutralizing capacitor should be increased slightly. If the grid current increases with a decrease in tank capacitance, the neutralizing capacitance should be reduced. The neutralizing capacitor should be carefully adjusted to the point where there is no change in grid current at either side of resonance, or where the grid current decreases on both sides of resonance. This adjustment should be satisfactory for all other bands. After neutralization is completed, the driver tank circuit can be tuned for the other bands, always adjusting for maximum grid current to the final amplifier. Any excess of grid current can be re-
duced by adjustment of the excitation control.

Testing of the final amplifier requires a load applied to the output connector. Two 150-watt lamps connected in parallel should serve the purpose. Turning on the high voltage will also apply screen voltage through the relay \( K_1 \). With both band switches set to 10 meters, and \( C_{16} \) set at about half capacitance, quickly tune the output circuit to resonance as indicated by the plate-current dip. The load lamp should show an indication of output. Switch the meter to read grid current and reduce the fluctuation in grid current as \( C_{15} \) is tuned through resonance as described for the driver. Use an insulated screwdriver with extreme caution, since the neutralizing capacitor is at full supply voltage to ground. When the fluctuation in grid current has been reduced to a minimum, observe the plate current at resonance. If it is above the rated maximum value, increase \( C_{15} \) and return to resonance, or decrease \( C_{15} \) if the plate current at resonance is below the rated value. When the loading has been adjusted to normal, the last fine adjustment of neutralization, as described for the driver, should be made.

With the final adjusted and the entire transmitter operating, make a final check on the voltage at the tap on the low-voltage supply, adjusting the slider if necessary to bring the voltage to 300 with the key closed. Be sure to turn off all voltages each time an adjustment is made. Next, check the voltage from the arm of \( R_4 \) to ground with the control turned to maximum (toward the fixed resistor) and the key closed. If the voltage differs from 200 appreciably, adjust the value of the fixed resistor, decreasing the value if the voltage is too low, or increasing it if the voltage is too high.

The last adjustment is in the keyer. Adjust the potentiometer \( R_1 \) to the point where the oscillator cannot be heard between dots and dashes at normal keying speed.

Tuning the final amplifier with an antenna connected in place of the lamp load will be similar, although the settings of \( C_{15} \) and \( C_{16} \) may be different.

**A.R.R.L. QSL BUREAU**

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- **W4, K4** — Thomas M. Moss, WH1XY, Box 614, Municipal Airport Branch, Atlanta, Ga.
- **W5, K5** — Robert Stank, W5OLG, P.O. Box 261, Grapevine, Texas.
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- **W8, K8** — Walter E. Musgrave, W8NGW, 1245 E. 187th St., Cleveland 10, Ohio.
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- **VE7** — H. R. Hough, VE7LR, 1084 Freeman Rd., Victoria, B. C.
- **VE8** — W. L. Geary, VE8AW, Box 534, Whitehorse, Y. T.
- **VE9** — Ernest Ash, VO1AA, P.O. Box 8, St. John's, Newf.
- **VE10** — Douglas B. Ritey, Dep't. of Transport, Goose Bay, Labrador.
- **KP4** — E. W. Mayer, KP4KD, Box 1061, San Juan, P. R.
- **KH6** — Andy L. Fukushima, KH6BA, 2543 Nanuak Dr., Honolulu, T. H.
- **KL7** — KL7CP, 310-10th Ave., Anchorage, Alaska.
- **KZ5** — Catherine How, KZ5KA, Box 407, Balboa, C. Z.
New Thresholds in V.H.F. and U.H.F. Reception  
Circuit Theory and Diode Details

BY ROSS BATEMAN,* W4AO AND WALTER F. BAIN,** W4LTU

Before getting into the thick of this month's installation it might be well to briefly review what has gone before in order to be sure what we're about. December QST showed something of the potential of new devices for v.h.f. and u.h.f. réception. January QST discussed these devices with the emphasis on the reactance amplifier. It was shown that the important item in its operation is a voltage-tunable capacitor. It was also shown that under conditions of back-bias a semiconductor diode exhibits such a characteristic and should therefore be usable in this application. Now let us briefly rehash the basic circuitry in which this diode is to be used.

A Brief Refresher

Fig. 1 shows a simplified circuit which may be used for either frequency conversion or straight-through amplification. In this figure, tank 1 serves as an input tank to which a signal at a frequency \( f_s \) is applied. When used as a frequency converter, tank 2 is tuned to the output frequency \( f_o \) which may be either higher than (up-converter) or lower than (down-converter) the signal frequency. The pump tank has only the job of providing an efficient means for exciting the diode capacitor at a pump frequency \( f_p \). The diode capacitor is represented in Fig. 1 by the strange-looking symbol. Pump and pump-frequency are nothing more than new-fangled terms for a local oscillator and its output frequency. The pump performs a function similar to that of a high-frequency oscillator in an ordinary superheterodyne receiver.

When the circuit of Fig. 1 is employed as an up-converter, with the output frequency \( f_o \) higher than \( f_p \) (tank 2 tuned to \( f_o = f_p + f_s \)), a stable power gain equal to \( \frac{f_o}{f_s} \) may be realized with ideal diodes and lossless circuits. If the output tank

\[
\text{is tuned to } f_o - f_s, \text{ the gain relationship is } \frac{f_o}{f_s}.
\]

The negative sign implies that regeneration is involved and, depending on operating conditions, very high gains may be achieved.

When used as a down-converter, the output frequency is always lower than the signal frequency. For the case where the signal frequency is higher than the pump frequency, the gain is ideally \( \frac{f_o}{f_s} \) and since \( f_o \) is smaller than \( f_s \), we have a stable attenuator. Thus, if \( \frac{f_o}{f_s} \) is made small very high values of attenuation may be realized. Who knows, maybe someone can find a use for such a device. On the other hand, when \( f_o \) is lower than \( f_p \), the gain is ideally \( \frac{f_p}{f_s} \). Here also, \( f_o \) is smaller than \( f_s \), and the ratio \( \frac{f_o}{f_s} \) is less than unity. However, the actual gain for this arrangement, as in the case of the regenerative up-converter, may, in fact, be large if the device is adjusted to be highly regenerative.

It will be noted that for the regenerative arrangements \( f_o \) is always the highest frequency in the system and is equal to \( f_p + f_s \). In the regenerative condition the signal in tank 1 is amplified by the regenerative action and the device may be used as a straight-through amplifier merely by taking the output from tank 1 instead of from tank 2. The difference frequency \( f_p - f_s \) must, however, still appear in tank 2. The terms "idler" and "idler frequency" have become standard nomenclature for tank 2 and its frequency since they apparently have no purpose in life except that they must exist.

Two-Tank Amplifier

A mild skirmish with the noise figure equations for the two-tank amplifier will be helpful in illustrating what's involved in designing and adjusting the devices for low noise figure. Fig. 2 shows a block diagram of the device and illustrates a way in which it might be used. The electrical circuit showing the principal elements which determine noise figure performance is given in Figure 3.

\( R_i \) is the shunt resistance representing the losses directly associated with tank 1, including losses in the semiconductor capacitor (the shunt resistances representing the load and the antenna are not included).

\( R_s \) is the shunt resistance across tank 1 representing the antenna (or generator) resistance as

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transformed by the tuned circuit.

The theoretical noise figure of the two-tank amplifier has been developed in some detail by Heffner and Wade. For our purpose it may be represented to a good approximation by the relation:

$$F = 1 + \frac{R_a}{R_1} + \frac{R_a f_s}{R R_i}$$

The first term (unity) represents the thermal noise generated by an antenna (or signal generator) whose source resistance is at room temperature. The second term is the contribution added by the thermal noise associated with $R_1$. The third term represents the thermal noise generated at the idler frequency in tank 2. This noise appears in tank 1 which serves as both an input and an output tank for the device. In this last term, the factor $R$ is a shunt negative resistance determined by the operating conditions. If the device is giving a low noise figure with good gain, $R$ will have a value only slightly greater than $R_a$ and the ratio $\frac{R_a}{R}$ can be omitted without much loss in accuracy. The equation then simplifies further to:

$$F = 1 + \frac{R_a f_s}{R R_i}$$

What does the equation tell us, having in mind our goal of having $F$ as close to unity as possible? Since the first term represents noise which originates in the generator, we can't do anything about it. The remaining two terms when added together are a measure of the excess noise generated by the amplifier. Each of these terms should be kept as small as possible in order to keep their sum to a minimum. To minimize the second term we should couple the antenna tightly so that $R_a$ is much less than $R_1$. The third term may be made small by using an idler frequency much higher than the signal frequency. This means a still higher pump frequency, since $f_p = f_s + f_i$.

Fig. 4 shows how the noise figure varies with pump frequency and different values of the ratio $\frac{R_a}{R_1}$. The curve labeled $\frac{R_a}{R_1} = 0$ represents the best that can be accomplished. This is an idealized case in which $R_1$ is considered to be infinitely large. This curve illustrates the importance of having a high pump frequency. For example, if a pump frequency equal to five times the signal frequency is used, the contribution from idler noise will be 0.25. The noise figure will be 1.25 (approximately 1 db.). In any practical circuit, however, the contribution from $\frac{R_a}{R_1}$ will add to the 0.25 idler contribution with the result that the noise figure will be greater than 1.25. Thus, if you are straining for a one-db. noise figure ($F = 1.26$) it would be more practical to use a pump frequency in the range of 7 to 10 times the signal frequency. The contribution from idler noise will then be in the range of 0.11 to 0.17. This would allow some room to maneuver in with respect to the contribution from $\frac{R_a}{R_1}$, which can then be in the range of 0.09 to 0.15 depending on the ratio $\frac{f_s}{f_i}$ used.

Someone may be wondering about the noise associated with the load and whether it is amplified along with the signal by the regenerative action of the circuit. This matter is of some academic interest and is discussed in Appendix A.

Although the noise figure equation gives good directions on how to proceed, it does not tell the complete story. Nothing has been said so far as to how much capacitance variation is required from the diode capacitor and its pump. The required capacitance variation, $\Delta C$, may be
estimated from the relation

\[ \Delta C = \sqrt{\frac{C_1 C_2}{Q_1 Q_2}}. \]

Here, \( Q_1 \) and \( Q_2 \) are the loaded \( Q \)’s of tank 1 and tank 2 respectively. The loaded \( Q \) of tank 1 depends on \( R_s \) and \( R_i \), together with the effect of the actual load which for the two-tank amplifier will usually be a conventional v.h.f. or u.h.f. converter. In Fig. 3, \( R_1 \) and \( R_2 \) are shunt resistances representing the losses (excluding the effects of \( R_s \) and the load imposed on tank 1 by the converter) associated with tanks 1 and 2. For tank 1 the resistances \( R_1 \) may be considered to be the parallel combination of a shunt resistance \( R_{c1} \) resulting from the circuit losses of the tank itself and a shunt \( R_{c2} \) representing the losses in the semiconductor capacitor at the signal frequency. A corresponding situation exists for tank 2. Note that only \( R_1 \) enters directly into the noise figure equation but that both \( R_1 \) and \( R_2 \) are involved in \( Q_{r1} \) and \( Q_{r2} \).

The noise figure equation becomes complicated and somewhat sticky if the equation for the required capacitance variation is built directly into it. \( R_1, C_1, C_2, \Delta C \) and \( Q_{r2} \) are all interrelated in a complex fashion which will be left as an exercise for the mathematically inclined. The end result, however, indicates that in order to minimize the noise figure of a practical device the following conditions are desirable:

a. High idler and pump frequencies relative to the signal frequency, b. High-Q tanks, c. High \( Q \) in the semiconductor capacitor, d. A high available \( \Delta C \) in the diode capacitor, and e. Small \( C_1 \) and \( C_2 \).

Other means for minimizing noise figure of the two-tank amplifier are available in addition to the suggestions given by the simplified equation. These are discussed in Appendix B as their application to amateur practice will probably be somewhat restricted.

The Up-Converter

The theoretical noise figure of the up-converter has been developed by Leenov. The same general

\[ D. \text{Leenov, "Gain and Noise Figure of a Variable Capacitance Up-Converter," Bell System Technical Journal, Vol. 37, July, 1958.} \]

considerations such as high pump frequency and high-Q circuits and diodes that lead to low noise performance of the two-tank amplifier are also applicable to the up-converter. For this reason, the noise figure equation will not be given, although it is quite similar to that for the two-tank amplifier when translated into the same general form. The nonregenerative up-converter is attractive since it is stable and in practice will probably not require frequent retuning nearly as often as its regenerative cousins. Fig. 5 shows a practical configuration involving an up-converter and a crystal mixer in which the output appears at the signal frequency. This combination of up-converter and crystal mixer therefore performs the same function as a straight-through amplifier. It has the desirable feature of permitting a self-controlled oscillator to be used for the pump without introducing frequency instability in the output. The configuration has one disadvantage in that the overall noise figure will be somewhat greater than that which can be obtained from a two-tank amplifier using the same diode and pump frequency. Fig. 6 gives the minimum noise figure which can be obtained from an up-converter followed by a crystal mixer with a noise figure of 4.8 db. The value of 4.8 db. is about as good as one can do with a conventional crystal mixer using currently available diodes designed for this purpose. Fig. 6 is based on the assumption that the thermal noise generated in the signal tank (tank 1) has been made negligible by extremely heavy antenna loading and is there-

\[ \text{Fig. 6—Minimum noise figure of the up-converter/crystal mixer configuration.} \]
for an idealized case. The noise figure performance of the up-converter/crystal-mixer configuration as represented in Fig. 6 is therefore directly comparable with the idealized noise-figure performance of the two-tank amplifier as shown in the curve labeled $\frac{R_s}{R_1} = 0$ of Fig. 4.

**The Down Converter**

The regenerative down-converter arrangement illustrated in the block diagram of Fig. 7 is quite attractive from the point of view of the number of major components required for a complete receiving system. The noise figure equation is similar but not identical to that for the two-tank amplifier. In a simplified form it is given by the relation:

$$\tau = 1 + \frac{R_s}{R_1} + \frac{R_s f_o}{R_2 f_o}$$

In this equation $R_s$ represents the losses introduced at the output frequency $f_o$ by the load. Typically, the load will be a communications receiver, as in Fig. 7.

![Fig. 7—A receiving system employing a down-converter.](image)

Diode Considerations

It has been shown that a back-biased semiconductor diode can provide the voltage-tunable capacitance that is necessary for the operation of reactance devices. Is the capacitive component the only one existing in such a diode? Unfortunately, no. There is some leakage across the dielectric which appears as a high shunting resistance. There is also some resistance in the mass of the material outside the depletion region which appears as a low series resistance. This series or spreading resistance is not the d.c. resistance determined simply by $E/I$ in the forward direction. It is the dynamic or a.c. resistance in the forward direction, and is equal to the slope of the $E/I$ curve after it has straightened out to be nearly linear. $R_s$ is typically 0.25 to 2.5 ohms. Fig. 8 shows the equivalent circuit of the diode considering these three components, the small series resistance $R_s$, the large shunting or back resistance $R_p$, and the voltage sensitive capacitance, $C$. ($R_s$ should not be confused with the $R_1$ mentioned earlier. $R_1$ is the shunt equivalent of the actual diode loss. $R_p$ is of importance only at the lower frequencies.)

It is evident that resistive components are undesirable if the diode is to be used as the active element in a reactance amplifier. Resistance not only inhibits the gain of the device, but provides a source of noise. (Remember that a pure reactance cannot generate noise.) Therefore, in order to evaluate the usefulness of a diode for amplifier purposes, it is desirable to have a simple figure of merit based on these three characteristics. Such a factor turns out to be none other than "$Q$," the same as used for evaluating ordinary coils and capacitors which have reactive and resistive components.

Fig. 9 shows qualitative curves of the behavior of diode $Q$ versus frequency for both germanium and silicon types. It will be noted that at the lower frequencies $Q$ is dropping as it is limited by shunt resistance, hence the poor showing there by germanium, well known to be inferior to silicon in back resistance.

At the higher frequencies, $Q$ is largely limited by series, or forward resistance, and germanium does not make such a poor showing. For all practical amateur applications at the higher frequencies, the limiting factor will be series resistance and the quantitative expression for $Q$ takes on quite a simple form:

$$Q = \frac{X}{R_s} \text{ or } Q = \frac{1}{2\pi f R_s C}$$

From this, it can be seen why $Q$ drops off linearly...
with frequency in the higher frequency region of Fig. 9. This leads one to expect poorer performance from a given diode as the frequency increases. (Shades of tubes and transit-time!) This is indeed the case and it is possible to define a cutoff frequency for a given diode as that frequency at which $Q$ has dropped to unity, i.e., the resistive component is equal to the reactive. These cutoff frequencies typically fall high in the microwave region.

**Maximizing Diode Q**

In order to maximize $Q$ in a given diode, it is necessary to operate with as high a reactance as possible. This implies a low capacitance which in turn requires a high back bias. The limit to the amount of back bias that may be used is the peak inverse voltage (p.i.v.) of the diode. Beyond this value, avalanche breakdown may take place, the diode will begin conducting in the reverse direction, and a new shunting resistance will appear across the diode, deteriorating the $Q$. The behavior of the $Q$-versus-frequency curve for various levels of back bias is shown in Fig. 10 for a diode of 100-volt p.i.v. Note that in the high frequency region the $Q$ increases with bias until the p.i.v. is reached and breakdown occurs. The $Q$ then rapidly deteriorates, beginning at the low frequency end, due to the above-mentioned shunting resistance. It would appear then that for high-frequency operation we desire to operate as close to the p.i.v. as possible.

In what manner does the capacitance vary with the applied back-bias voltage? This is dependent on the junction structure employed. Where there is a sharp boundary between the p-type and the n-type material, the step or alloy junction shown in Fig. 11, the capacitance varies inversely as the square root of the bias. For what is known as a diffuse junction, see also Fig. 11,

there is no sharp boundary between the materials, and capacitance is found to vary more nearly as the inverse cube root of the bias. Fig. 12 shows the variation of capacitance with bias voltage for a typical step-junction diode with a 50-volt p.i.v. The curve follows the expected $1^{-3/2}$ law quite closely except in the region below 1 volt. The cause of the flattening of the curve in this region is the presence of a small constant “built-in” voltage in addition to the applied bias. This is the contact potential existing between the two dissimilar substances, the p-type and n-type material. Its magnitude is about 0.7 v. and it sets the practical upper limit on the diode capacitance. The $1^{-3/2}$ law proves to be quite accurate when this effect is included. Another effect that may be observed in practical cases is an apparent flattening of the curve at the low capacitance end. This is due simply to the fixed static capacitance of the diode cartridge and may be considered to
set the lower limit of available capacitance for cases not limited by p.i.v. Its value ranges from 0.1 μf for sub-miniature glass diodes to 0.1 μf for the microwave ceramic structure.

It has been seen that Q represents a rough figure of merit by which diodes may be evaluated. It has also been seen that diodes may be classed in four different groups, germanium or silicon, each in either a step-junction or a diffused-junction configuration. Let us briefly consider the comparison of these four types on the basis of their theoretical Q's. An excellent discussion of diode Q is given by Spector, which indicates that in general silicon should prove superior to germanium, and that diffused structures should have an edge over step junctions. It is also indicated as a result of this theory that low p.i.v. diodes should be preferable. Experimental results concerning these considerations will be discussed shortly. It might be mentioned at this time that no improvement in overall Q is to be expected by either series or parallel operation of diodes.

Practical Diode Results

Evaluating presently available diodes for use in reactance devices is a fertile field indeed. The latest tabulation shows a total of over 2500 different semiconductor diode types. It has of course not been possible to test even a significant portion of this total and a certain amount of educated (7) guessing has been involved in selecting types to measure. For this reason the data contained here are not intended to be all inclusive but rather to serve as an indication of what directions might prove fruitful for future work.

A word or two might be in order about the methods of measurement involved in the determination of Q. Two methods have been used. The first is to use the diode in question to resonate a tuned circuit whose resonant impedance may be determined. This resonant impedance is then compared with that observed when an air capacitor of known Q is used in the same circuit. The second method is by use of a standard Q-meter, with the diode resonating a tuned circuit of known Q. When using this method, care must be taken to see that the r.f. voltage developed by the Q-meter is not sufficient to swing the operating point of the diode. Frequencies at which Q measurements have been made include 30, 50, 100, and 200 Mc., with the majority being made at 50 and 200 Mc.

Results of Q measurements of most interest are summarized in Table I. Values of Q_max, p.i.v. and C are given for those diodes which appear satisfactory for low-noise v.h.f. and u.h.f. use. The Q given is for the maximum bias condition, with the spread in Q being given where available. The value of diode capacitance is a typical value that might be expected at ½ p.i.v. (½ p.i.v. might be considered the nominal operating bias if the maximum pump voltage is to be used to swing from zero volts to full p.i.v. The manufacturer of each diode type is also given. The retail price of these diodes is $6.00 or less, with the exception of the MA-100 series, which currently sells for about $50.00. The 1N603 and 1N606 are available from supply houses such as Allied Radio. It might be noted that the MA-100 series, designed specifically for voltage-tunable reactance use, should soon be available in improved versions such as the MA-160E with Q's of 300 at 200 Mc.

Appendix C gives a list of marginal and submarginal diode types tested. The 1N21 and 1N23 series are conspicuous by their absence from any of the lists. Small but measurable Q's could be determined for these diodes but with no tunability. Point-contact silicon diodes do not appear suitable for reactance use.

Theory and Results

Now let us consider briefly the overall results of the measurement program in the light of what was predicted theoretically. The diffused structures have indeed shown a superiority over the step junctions as to Q. However, it is possible that the greater tuning ratio of the step junction may partially offset this in practical use. The superiority of silicon over germanium has not been clearcut. The usefulness of silicon over germanium has not yet been fully resolved because of the measurement difficulties resulting from the extremely small junction capacitances.

The theoretical prediction that low p.i.v. diodes would prove superior has not been verified. In fact, the indication has been that the high p.i.v. units have a slight advantage. This may

---


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Table I

<table>
<thead>
<tr>
<th>Type</th>
<th>Q_max</th>
<th>C at ½ p.i.v.</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1N603...</td>
<td>40-63</td>
<td>100v. 2.0 μf</td>
<td>Pacific Semicond.</td>
</tr>
<tr>
<td>1N252...</td>
<td>51</td>
<td>200v. 0.5 μf</td>
<td>Transition</td>
</tr>
<tr>
<td>8206G...</td>
<td>55</td>
<td>8v. 0.5 μf</td>
<td>Transition</td>
</tr>
<tr>
<td>DR301...</td>
<td>112-124</td>
<td>500v. 0.25 μf</td>
<td>Radio Receptor</td>
</tr>
<tr>
<td>1N606...</td>
<td>31-59</td>
<td>100v. 2.0 μf</td>
<td>Texas Instr.</td>
</tr>
<tr>
<td>PS705...</td>
<td>34-56</td>
<td>200v. 1.4 μf</td>
<td>Pacific Semicond.</td>
</tr>
<tr>
<td>MA-100A...</td>
<td>115</td>
<td>9v. 2.0 μf</td>
<td>Microwave Assoc.</td>
</tr>
<tr>
<td>1N308...</td>
<td>82</td>
<td>8v. 0.3 μf</td>
<td>Raytheon</td>
</tr>
</tbody>
</table>

February 1959
result from the fact that the theoretical predictions assume comparison of a low p.i.v. diode designed to be a low p.i.v. diode, with a high p.i.v. unit designed to be high p.i.v. In the practical case of mass-produced diodes, junction design may well be aimed toward optimizing high p.i.v. characteristics, with those units failing to meet the spec being marketed as low p.i.v. That is, the low p.i.v. diodes are imperfect high p.i.v. design rather than optimum low p.i.v. design.

It is of interest to compare the measured values of Q with those computed on the basis of measured spreading resistance and reactance. The realized Q has been found to fall considerably short of the calculated values particularly for germanium and alloyed-silicon units. Diffused silicon junction units designed for fast recovery time show somewhat better agreement but still indicate that existing theory is not complete.

In outlining in general the diode characteristics that appear to correlate with high Q for use in reactance devices, it appears that the fast-recovery silicon diffused computer diodes, and extremely high forward conductances diodes of all types, hold the most promise. The higher p.i.v. units appear somewhat preferable. One precaution in considering high conductance units: rectifier types, even diffused, seem to have poor Q even though their forward conductance may be phenomenal. Their forward characteristic is due principally to a large junction area, a process equivalent to paralleling diodes, which is known not to increase the Q.

**Diode Q and Noise Figure**

It might be of interest at this time to attempt to determine what noise figures may be expected using a diode of given Q. Noise figure, however, is indirectly dependent on the ratio of tunable to fixed capacitance \( \Delta C \) as well as being directly dependent on diode Q. Thus a fully rigorous figure of merit for diodes should include the effects of both Q and \( \Delta C \).

Fortunately the range of variation in \( \frac{\Delta C}{C} \) between diodes is not nearly so large as the range of Q's encountered: in fact, for diodes of interest it differs by not more than 2:1. Therefore, it appears that we may solve the noise figure equations using a mean value of \( \frac{\Delta C}{C} \) to determine a required Q, and state that practical Q's will vary about this value over a 2:1 range. This allows us to include the effects of \( \frac{\Delta C}{C} \) without having to solve for each individual diode.

Table II, then, gives the range of Q, as measured at 200 Mc., that appears necessary on the above basis to obtain the noise figure given. Note that the required Q ranges given are at 200 Mc, so they may be compared directly with the measured values given in Table I. In considering the values in Table II it might be noted that the low p.i.v. diodes and the germanium units would tend to require Q values at the high end of the range. For the high p.i.v. diodes the lower values of Q would be expected to be satisfactory.

The noise figures of Table II are theoretical and are based on certain assumptions, such as equal noise contribution from the idler tank and the diode, zero signal-tank loss, and a specified ratio of pump to signal frequency. Hams have been in this business long enough to know that theory is good only so long as it agrees with the results. How well these numbers agree will be determined in the next year or so as these devices are put to use. With the best available diodes noise figures of 1 db. appear attainable up to 432 Mc., and 2 db. at 1300 Mc.

A discussion of experimental results and hardware details is planned for a future article. In the meantime there are no good reasons why a stock of the hotter diodes should not be laid in and experimental work begun.

**Appendix A**

Thermal and excess noise generated by the load affects the overall noise performance in a rather tricky way. Although the noise figure equation is correct, it tells us only how to minimize the noise figure of the two-tank amplifier. It says nothing about the coupling between the two-tank amplifier and the converter. As an indication of the difficulties which may arise, the noise figure of the receiving system will be greater than that of the converter alone, if the converter is matched to the generator impedance and connected in parallel with the noise figure of the receiving system will be obtained when the load is tightly coupled to the two-tank amplifier. This, however, results in a higher gain requirement, narrower bandwidth and poorer gain stability of the device.

These problems can be avoided by using an electronic device called a circulator. Circulators have a unique property of permitting power to flow in only one direction between certain pairs of terminals. By properly connecting a circulator in a receiving system, the noise generated by the load can be made harmless by dissipating it in a resistive termination. Unfortunately, these devices are available only for frequencies above 1000 Mc, and have not yet appeared on the surplus market.

Another approach involves the use of two of the two-tank amplifiers connected in a receiving system in such a way that the load noise is cancelled out. If the reader is interested in pursuing this matter further, the technique is described by S. H. Autler, in connection with a similar problem involving masers, in the Correspondence Section of the Proceedings of the I. R. E., for November, 1958.

**Appendix B**

Thermal noise generated in the tanks and in the diode is directly proportional to their absolute temperature in degrees Kelvin. Noise figure might be reduced by immersing and keeping these components in a bath of liquid air or liquid...
nitrogen. This technique could be quite effective, but how you do this is your problem.

A second way to reduce noise figure is to terminate the idler tank in a separate directive antenna pointing at a cold spot in the sky. The region in the general direction of Polaris (the North Pole Star) is relatively quiet, permits a fixed antenna, and appears suitable for the purpose. This method is not without its drawbacks. Idler frequency signals received by the idler antenna will be converted to signal frequency and appear in the output as interference. Also, the FCC has not yet seen fit to allocate "idler dumping" frequencies in which no transmissions may be made!

Appendix C

Measurements indicate that the following diode types are either not useful or of marginal value for use in v.h.f. resistance devices. They are listed so that further testing or experimentation will not be required to establish their merits for this application. All of these types did, however, exhibit variable reactance and might be useful at lower frequencies.

<table>
<thead>
<tr>
<th>Not Useful at V.H.F.</th>
<th>Unable but Marginal</th>
</tr>
</thead>
<tbody>
<tr>
<td>S10C</td>
<td>1N645</td>
</tr>
<tr>
<td>1N482B</td>
<td>1N91</td>
</tr>
<tr>
<td>1N484A</td>
<td>1N674</td>
</tr>
<tr>
<td>10213</td>
<td>1N609</td>
</tr>
<tr>
<td>1N461A</td>
<td>1N601</td>
</tr>
<tr>
<td>HC7901</td>
<td>1N604</td>
</tr>
<tr>
<td>V27</td>
<td>1N109</td>
</tr>
<tr>
<td>1N1225</td>
<td>1N145</td>
</tr>
<tr>
<td>CK6551</td>
<td>1N34</td>
</tr>
<tr>
<td>RDQ</td>
<td>1N700</td>
</tr>
</tbody>
</table>

Strays

The annual radio contest for Boy Scouts sponsored by Boys’ Life and ARRL will be held during the last two weeks in February. There will be a Hamboree for on-the-air contacts between hams who are in scouting, and there will be a short-wave listening contest for those scouts who are not yet licensed. The list of 200 prizes runs the gamut from receivers to QSL cards. Only those who are in scouting and who have not reached their 17th birthday by March 1, 1959, are eligible. For further details and complete rules, see the December issue of Boys’ Life.

W3HPO says that when working with antenna problems he often gets his ohms, impedance and resistance mixed up. Therefore, he suggests two new terms — Zohms and Rohms. (Sometimes life gets so complicated.)

QUIST QUIZ CORRESPONDENCE

Transportation Problem Resolved?

I have gazed long and fondly into my single crystal (yttrium-iron-garnet) sphere hoping to find solace there. Alas, to my everlasting sorrow I am led to believe that you are about to publish an incorrect answer to the December Quist Quiz, submitted by friend Sam Goldish. My crystal sphere tells me that Sam wanted his 6-meter man to construct a cubic container one yard on each edge and place the 1.7 yard antenna therein, as a body diagonal.

The trouble here is in the wording of the ban by the baggage man. He said, "... whose greatest dimension does not exceed one yard." Now on some railroads the 1-yard cube would be accepted. But don’t try this one out on the Milltown and Tranquility R.R. on which I am chief baggage master. We would consider the body diagonal of the cube as the greatest dimension in one direction. Then, when the traffic gets pretty bad, as at Christmas time, we may even take the circumference (4 yards) or a circumference including two face diagonals (about 4.8+ yards) or even revert to a ruling similar to that of the U.S. Post Office and measure length and girth. Then we would find Sam’s convenient package measured about 6.55 yards. So the 1-yard cube is definitely out.

There remain two solutions: one practical and one depending on the sensibilities of the railroad officials. The latter, place the confounded antenna in a coffin (the 6-meter man can even ride with it, if he is quiet and does not start the baggage men ghost-dancing) and apply for special permission to send this long-departed relative in the baggage car. Even the M & T R.R. would make this exception. The other and perhaps more practical solution, especially for tall men, is to place a curved wooden top on the antenna and claim that it is the latest model in crutches. (And thank your lucky stars it wasn’t a 10-meter or lower-frequency vertical.)

Now it is your problem; which solution would you use? I will stay tuned in to find out.

— Robert D. Hatcher, W8RIL
A Simple Electronic Key

Better Code With Less Effort

BY ROY G. FOSTER,* K0HLC

In these progressive times we have a.m., s.s.b., r.f., r.f.y, TV and other great improvements in radio communications, but we still have c.w., thank goodness! Although in just tuning across one of the crowded amateur bands, one would wonder if the art of radiotelegraphy has not, in many instances, been lost.

What can one do to improve his fist? Well, he might obtain a tape perforator and use tape in all his QSOs. But there is a much simpler and more economical means for the average ham to obtain tape-like perfection of his code — the automatic, self-completing electronic key. Many readers will no doubt stop here. However, if you will go a bit farther and look at the diagram in Fig. 1, you will find that a good electronic key does not have to be extremely expensive or complicated.

It is true that a good many of the electronic keys proposed for amateur construction are quite complicated, while others that are relatively simple leave much to be desired in the way of operating ease and flexibility.

Just what are the fundamental requirements of a good electronic key?

1) Dots and dashes must be self-completing and the key lever must be necessary only to start a dot or dash — the electronic key should then complete the character and make the required space as well.

2) It should be impossible to make a dot following a dash (or a dash following a dot) without first completing the dot (or dash) and the correct space between. Releasing the key lever in the middle of a dot or dash should not affect the length of that character.

3) The speed control should be continuously variable from about 5 to 50 words per minute.

4) The key switch circuit should be adaptable for use with a slightly modified semi-automatic bug or a simple home-made key lever.

5) Provisions should be made for an adjustable dot-to-dash ratio. Slight deviations from the accepted ratio of one to three sometimes allows easier sending.

6) Weight of keying (dot-to-space ratio) should also be variable to meet the requirements of different transmitters and keying techniques. Here again, the accepted ratio of one to one may not suit the requirements of all operators.

7) The circuit should be mechanically and electrically stable. Ordinary variations in line voltage should have little or no effect on the performance of the circuit. Adjustments should not require critical attention.

8) There should be no interaction between the three controls: speed, dot-dash ratio and weight of keying. Changing any one of these should not affect any other.

9) And last, but by far not the least, the circuit should be simple, using the minimum of easily obtained standard components.

I would like to present an electronic key that will meet all of these requirements. The only one of these requirements that leaves anything to be desired is number 8. When the speed is changed there is a slight change in the dot-to-dash ratio. However, this change is quite small and is entirely unnoticeable unless an extremely wide change of speed is made. Within the usual limits of 10 to 25 w.p.m., there will be no difficulty.

The Circuit

As shown in the schematic, Fig. 1, the circuit requires only one tube, a triode-connected 6AQ5. This tube is normally biased beyond cutoff by the drop across the 5000-ohm cathode potentiometer. Relays $K_1$ and $K_2$ are not energized in this condition.

Upon application of the supply voltage, both $C_1$ and $C_5$ charge to its value, about 150 volts. When the key lever is pushed to the dot position, $C_1$ discharges very quickly through the 470-ohm resistor. At the same time the grid of the 6AQ5 is driven positive by the current flow through $R_1$, $R_4$ and $R_5$. This causes the tube to conduct heavily and energizes both $K_1$ and $K_2$. When $K_1$ is energized, the discharge path for $C_1$ is open and it is permitted to charge to the supply voltage again. This charging current flowing through $R_4$ and $R_5$ keeps the grid positive and the relays energized after $K_1$ has opened and $B^+$ has been removed from the resistors in the grid circuit. When $C_1$ becomes recharged, the grid is no longer positive and $K_1$ is de-energized and the discharge path for $C_1$ is again closed. If the key lever is still in the dot position when $K_1$ is de-energized, the cycle will repeat. When the key lever is in the dash position the operation is similar except it takes longer for $C_2$ to charge because of its higher capacitance. Now both dots and dashes are automatic with the key lever locked out until the character and space have been completed.

$R_5$ and $R_6$ provide adequate isolation between $C_1$ and $C_5$. Complete isolation would require another tube and is quite unnecessary. $R_6$ varies the charging time for both $C_1$ and $C_5$ and thus controls the sending speed of the key. Relay $K_2$ is shunted with an adjustable resistor. This allows $K_2$ to become de-energized at a higher plate current than $K_1$. By adjustment of the 500K weight control, $K_2$ can be made to

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* 9 Rambler Road, Hutchinson, Kansas.

Fig. 1 — Circuit diagram of the electronic key. All capacitances are in μF, all resistances are in ohms, all resistors are ½ watt unless otherwise indicated.

CR1—65-ma. selenium rectifier (Federal 1002A or equiv.).
K1, K2—9000-ohm plate-circuit relay (Sigma 11F-9000-G/SIL or equivalent).
Ti—125-volt 15-ma. ½-wave secondary and 6.3-volt 0.6-amp heater winding (Stancor PS-8415).

open at any time during the charging time of C1. This controls the weight of keying.
S3 is a normally open switch or push button; when operated it causes K2 to close so that the transmitter can be tuned.

Adjustment

After the key is wired and B+ applied, the following procedure should be used for initial tune up. A code oscillator connected to the contacts of K2 will be very helpful at this stage. If everything is working properly, both relays should operate when the key lever is pushed to either the dot or dash position. Adjust R6 for a speed of about 8 to 10 words per minute. The weight control should be turned so that all its resistance is out of the circuit. Now, while listening to the key through the audio oscillator, adjust R5 for the proper ratio. This should be a one-to-three ratio, and a little patience will give just the right sound. Now advance the weight control for proper weight of keying. Its final adjustment should be made while keying the actual transmitter under normal load and listening to the signal on the station receiver. The keying circuits in some transmitters tend to change the weight of keying. The 5000-ohm cathode potentiometer should be adjusted for about +35 volts or so on the cathode of the 6AQ5. Then while listening very closely to the dots (keying the code oscillator) make very small adjustments of the cathode control in the direction that tends to slow down the speed of the key, until all the dots at any specific speed are the same length. If this adjustment is not correct, the first dot of a series of dots may be shorter than the following. There is some interaction between controls during tune-up, so all adjustments should be touched up again.

The author's model was built into the case of a Mon-Key. The entire circuit, along with the power supply, was included on the chassis, thus making a very compact arrangement. The only controls that need to be accessible are S1, S2 and R6, the speed control. All the others may be under cover and made screwdriver-adjustable.

Relays

An ordinary semiautomatic bug may be easily modified for the key lever. Remove the weights from the bug lever, adjust the dot contacts for positive closure without vibration, and remove the jumper between the dot and dash posts. The modified bug is then connected to the proper points on the electronic key with a three-conductor cable.2

(Continued on page 158)

2 If you don't have a bug key to convert for the lever, ideas on lever construction can be found on page 36 of February, 1955, QST; page 35 of April, 1955, QST; and on page 18 of February, 1957, QST. — Ed.
Smooth c.w. break-in operation with a single antenna requires the use of a good keying system, an electronic transmit-receive antenna switch, and an adjustable receiver muting system. In this article W3OFU describes a combination that works well for him and should be applicable to any station with blocked-grid keying. And he also proves that good old "cut-n-try" isn't dead!

For several years the Handbook has included a differential keying system using a VR tube and a 6J5. However, neither the Handbook nor the original article mentions anything about receiver muting or protection when using this keying circuit. The Handbook shows a receiver protection and muting circuit using a relay, but I asked myself, "Why not do it electronically without relays?"

The system I've worked out does just that. Used along with the t.r. switch described by W3LYP, my muter gives me full c.w. break-in without clicks or thumps. I monitor my sending on the receiver with a comfortable signal, adjustable downward from S9+ to a meek S5 or less. If I choose, I can set my own signal level so it is weaker than the station I'm working.

I could make this short and merely describe the circuit of the final product, but QST editorialized recently about the need for more do-it-yourself cut-and-try spirit. That's exactly what was involved here, since my technical electronic education was a correspondence course in radio and TV that I took just for the fun of it. Perhaps you will find my efforts at design of some interest, so let's start at the beginning...

Desiring a versatile rig, last year I built the two-control job described by W3KMA, using the handbox multiplier of WITS. I substituted a 6146 for the 2E26 output tube so I could have reasonable power until I could afford a good amplifier. Next, I added a remote-tuned v.f.o., also described in QST and the Handbook. Not satisfied with cathode keying, I installed the VR system with the variations mentioned by W5DXW. These variations permit me to use a 6C4 instead of the 6J5 and to ground the plate directly. The system works fine, and I get many compliments on the quality of my keying.

One Monimatch and a t.r. switch later, I decided I wanted to install a good method of receiver silencing. Not caring for noisy relays, I spent many hours poring through available literature. Stumped! There was nothing on electronic receiver muting geared to the VR-tube keying idea. Plenty of other ideas, but to adopt them I'd have to scrap the keying system I liked so well.

Analyzing the set-up, I had a negative voltage that was being used to good advantage to grid block my oscillator and amplifier. Why couldn't it be used also to grid block another tube employed to develop a negative voltage for muting purposes? Seemed elementary enough, but how to do it?

The problem resolved itself into two parts:

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**Fig. 1** — Circuit diagram of the VR-tube differential keying circuit and the receiver muter (V1V2). Resistances are 1/2 watt unless otherwise indicated.

- R1 — Oscillator grid leak.
- R2 — Keyed stage grid leak.
- R3 — Key-down receiver gain control.
- R4 — Part of grid-block keying circuit; value may differ with value of Rs.
- RFC1 — R.f. choke, 40 µh. to 2.5 mh.
- S1 — V.f.o. spotting switch.

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(1) how to develop the required biasing voltage, and (2) how to trigger it properly. The answer to (1) was basic enough: use the voltage drop developed across a plate resistor with one end grounded. The whole thing could be accomplished with a tube, a small power supply, and a few resistors — except that I didn’t know what values to use for the resistors.

Here’s where cut-and-try took over. With the aid of a few potentiometers in an experimental layout, I was able to develop the proper relationship between the resistance values. Using a 150-volt source, I had no trouble juggling the values to develop a voltage drop of up to 50 volts across the plate resistor. By using a potentiometer instead of a fixed resistor, I could vary this voltage drop at will. A higher voltage could be developed by changing values or increasing the source voltage, but I saw no need to do so. I had all I needed.

Next, I had to figure out how to employ the negative voltage already available in the VR keying system, use it to grid block the bias tube, and key it along with the transmitter. I tried it the hard way first, by digging into the rig and running out some experimental leads. Here’s where I ran into trouble. The v.f.o. wouldn’t oscillate when I took the grid blocking voltage from between the oscillator and the VR keyer tube. Taking it from the power supply side of the VR tube worked after a fashion, but gave me an uncomfortable “tail” on break. No amount of juggling circuit constants relieved this condition much.

Almost ready to give up, I decided to make one more attempt, using a simple approach. I took my cut-off voltage direct from across the key, which is in the grid circuit of the keyer tube instead of the cathode. It worked! Perfect keying, with no connections inside the rig! (At least it’s perfect as far as my ears are concerned, and that’s what counts.)

Operation of the muter is simple. With key up, the VR tube (V1) conducts, biasing off V2. With key down, the VR tube stops conducting and permits V2 to draw current, developing a voltage drop across the plate potentiometer. The muting voltage is varied by increasing or decreasing the resistance of the plate resistor.

How to apply the muting voltage may vary somewhat with different receivers. Mine is an RME 4350A, and the modification is simple. I merely opened up the connection to the ground ends of the a.v.c. (grid) resistors for the r.f. and first i.f. tubes and applied the negative voltage to the grids of these tubes through these resistors. The shield on the coax between receiver and muter completes the circuit to chassis. I use RCA phono plugs and jacks for my connections. To run the muting voltage in to the receiver, temporarily I am using one of the jacks provided at the back of the receiver for the s.s.b. adapter, by removing the original connection. Since this method necessitates inactivating the a.v.c. system (which isn’t in use on c.w. anyway), I intend eventually to install a regular closed-circuit phone jack.

My transmitter at present runs only 50 watts input. Perhaps with higher power it might be necessary to mute an audio stage also. If so, this should be easy to accomplish. Or it may be necessary to shield and bypass the receiver to reduce direct pick-up, along the lines described recently for the HQ-129X.7 Incidentally, I use a conventional r.f. choke and capacitor spark filter at the key; that could make a difference in how smoothly and click-free the muter works. The r.f. choke in series with the muting lead to the receiver helps in this respect. I used an Ohmite Z-14 which I had on hand. A regular 2.5-mh. should do as well.

My silencer is built on the back part of a 5 X 9½ X 3-inch chassis, the front half being used for the t.r. switch. Parts layout is not critical. For convenience, I mounted Rs on a small panel in front above the t.r. tuning control, and to avoid r.f. pick-up ran the connection to the potentiometer through a length of shielded wire. I didn’t have space in this small chassis for the muter power supply, so I used a separate 150-volt supply I had on hand with a 4TK-10K voltage divider as shown in Fig. 2.

In some instances where VR-tube differential keying is already in use, the addition of V1 and V2 for receiver muting may have a slight effect on the shaping of the keying. It should only be necessary to juggle the values of C1 and Rs to restore the shaping to the desired characteristic.

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February 1959 39
Who burns the midnight oil?
What source those nervous
clicks and clacks
that punctuate the evening air?
All’s revealed! The dreadful sight’s
disclosed!
And who’s the wretch our shuddering
eyes behold?
A c.w. man! A binary booh!
And worst of all
This article’s meant for him. — thp

The C. W. Man’s Friend

An All-Purpose Keying Unit

BY T. H. PUCKETT, W5JXM

This is a description of a precision general-purpose keying and control device to provide flexible break-in control of a complete station. It uses small, standard, inexpensive relays as the actual control elements, since no other arrangement allows as much flexibility with equivalent electrical performance.

What It Is

The input is the usual telegraph key. The outputs are two sets of relay contacts, arranged to operate in a controlled sequence. One circuit, which will be referred to as the oscillator circuit (\(V_1\) and \(V_2\) in Fig. 1), controls the transmitter oscillator, the receiver break-in gain control, the antenna switch or relay, the final amplifier bias (for noise suppression purposes), etc., as used in any particular station. The other circuit, which will be referred to as the amplifier circuit (\(V_{2A}\)), controls the keyed amplifier, the monitoring oscillator, etc., as used. The actual outputs are sets of relay contacts to be used as desired in performing the operations listed above. Up to three single-pole-double-throw contacts may be used in the oscillator circuit, and either one or two \(S.P.D.T.\) contacts may be used in the amplifier circuit, one relay being required for each \(S.P.D.T.\) contact.

The sequential operation is as follows: on “make” (when the key is closed) \(K_1\) picks up immediately, but \(K_2\) pickup is delayed for a time proportional to the value of \(C_2\). This allows the oscillator clicks and chirps to get over with, the receiver to get turned off, etc., all before the keyed amplifier controlled by \(K_2\) passes any signal. On “break” (when the key is opened) \(K_2\) drops out almost immediately, but \(K_1\) is held up for a time proportional to the value of \(C_1\) to allow the keyed amplifier to cut off cleanly the transmitter output before the oscillator is turned off and the receiver turned back on.

Necessary Adjustments

Because a range of negative voltage, \(E_v\), and component variations were allowed for, there are three adjustments that must be made when the keyer is initially put into operation. For best performance these adjustments should be checked occasionally to allow for gradual drift in component values as the unit ages.

The first adjustment to be made is the 250,000-ohm potentiometer, \(R_4\), that adjusts the level of the input control signal. It should be set to give the two voltage levels indicated in Fig. 2. A high-input-impedance voltmeter should be used for this measurement, preferably a v.t.v.m. or 20,000-ohms-per-volt multimeter. If things are working normally there will be a little extra voltage swing available. Adjust the pot so that the excess swing is about the same in each direction.

The next adjustment is the relay resistors \(R_2\) and \(R_3\). Adjust each so that 12 volts, or a little over, appears across the relay coils when the key is closed. Typical values for these resistors are: one relay, 8200 ohms; two relays, 2200 ohms; three relays, 1000 ohms.
The final adjustments are the delays controlled by $c_2$ and $c_1$. The amplifier keying should first be adjusted as desired, with the keyer functioning only to drive $K_2$. This may be done conveniently by grounding pin 2 of $V_{2A}$ to hold the oscillator on, and temporarily removing $c_2$ from the circuit so there is no delay. After the keying circuit connected to the contacts of $K_2$ has been adjusted satisfactorily, restore the keyer to its original condition. Now gradually increase the value of $c_2$ until the output signal of the transmitter on makes just as it did when the keyer was not functioning. Because of the inherent time delays in the relays, it may be found that $c_2$ can be omitted entirely.

After $c_2$ has been adjusted, adjust $C_1$ to the minimum possible value that does not clip the transmitter output signal on break. For most transmitters both $c_2$ and $C_1$ will probably end up within a factor of ten of 0.01 $\mu F$. The use of decade capacitors is very convenient in making these adjustments.

![Fig. 2—Voltages to chassis at point "A" (Fig. 1) for proper operation of the keying unit.]

Technical Discussion

The keyer may be operated with any negative voltage supply, $E_k$, from 60 to 150 volts. The current required will range from 2.5 ma. at 60 volts to 6 ma. at 150 volts. The 150 volt positive supply current can be calculated from the following equation: $5 + 9N$ (N = number of relays) ma. Thus if two relays are used at $K_1$ and one relay is used at $K_2$, the total positive current will be about 32 ma. These supplies should be reasonably well regulated, preferably by VR tubes. If this is a problem, $V_2$ may be supplied by a source of somewhat poorer regulation, leaving only 5 ma. at +150 volts that must be well regulated.

The decision to use relays as the primary control elements was due to their flexibility. Practically any kind of control circuit can be made to work from relay contacts, so their use allowed the keyer to be designed with practically no thought as to the circuits to be controlled and their voltage and current requirements. Anyone who has tried to replace a relay with a vacuum tube, particularly when the final use of the circuit is unknown, will appreciate the convenience involved. The relays are all 12-volt s.p.d.t. Potter and Brumfield type RS51D, with 1350-ohm d.c. coils; they cost $2.70 each. They are quite adequate at speeds up to about 30 w.p.m., allowing a breaking station to be heard through a string of 25 w.p.m. dits. For higher speeds it is suggested that Stevens-Arnold Millicene relays be used, which cost around three times as much.

The $K_3$ circuit is practically a straight relay control circuit. The 1-megohm resistor limits the grid current of $V_{2B}$ and in conjunction with $c_2$ creates the delay in the pickup of $K_2$ on make. There is also a slight delay in the drop out of $K_2$, but it is not long enough to be significant.

The $K_1$ control circuitry is a little more subtle. $V_{IA}$ is used as a driver for the break storage capacitor $C_1$ and $V_{IA}$ as a cathode-follower driver for $V_{2A}$. The capacitor charges through $V_{IA}$ in less than a millisecond after the key is closed, but when the key is opened $V_{IA}$ is cut off and the capacitor must discharge through the 1.7-megohm resistor, giving an appreciable delay before $V_{IA}$ is cut off and $K_2$ opens. There may be a little delay on make as a result of the closure time of $K_1$, but probably not more than 10 milliseconds, and it is automatically allowed for in the adjustment of $c_2$.

If the key spark causes an objectionable amount of r.f. noise in the form of clicks when the key is opened or closed, correction measures should be limited to placing an r.f. choke in series with the key as close to the key contacts as possible. The shunt capacitors of the usual click suppression circuit might slow up the waveforms too much.

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1CQX, John W. Singleton, Portsmouth, N. H.
W2LAD, Clinton C. Brown, Needham, Mass.
W1PWO, Benjamin H. Biays, Yarmouth Port, Mass.
W3HBU, John J. Oskay, New Brunswick, N. J.
W2FAY, Francis J. Hinz, Beach Haven Crest, N. J.
W3KNU, John McGlash, Bayonne, N. J.
W2SFQ, Philip A. Sasseff, Port Huron, N. Y.
W3GBL, Charles L. McGee, Norfolk, Va.
W4QMM, Raymond L. Norman, Birmingham, Ala.
W4KCN, Joseph G. Rhode, Washington, D.C.
W4LTE, Graves Taylor, Tryon, N. C.
W5GLQ, John L. Robison, Altus, Okla.
W5PCO, Dale F. McTiren, El Paso, Texas.
W6AY, James F. Brown, Los Alisos, Calif.
W6KDL, Elliott Lasky, Los Angeles, Calif.
KN1KMP, John B. Hunter, Newport Beach, Calif.
W4KGO, Alfred W. Boller, Mountain View, Calif.
W7SF, George H. Johnson, Aurora, Ore.
W3GCU, George R. McCutcher, Lawrence, Mich.
W8AY, Alfred C. Breth, Chillicothe, Ohio.
W8QJO, Dale R. Hetman, Lima, Ohio.
W9BY, Fred J. Hoffman, Chicago, Ill.
K9OKU, Lawrence A. Schmidt, Salem, Wis.
W8THY, Alfred A. Breth, Chillicothe, Ohio.
W8WGO, Dale R. Hetman, Lima, Ohio.
W9WJE, Walter P. Hardin, Liberty, Ill.
W9WJH, E. F. Graball, Zearing, Ill.
W0CRT, William C. Caldwell, Humboldt, Iowa.
W8KTH, George A. Bell, Bethany, Mo.
W8PJO, Arthur O. Flankey, St. Vincent, Minn.
HB8S, Adolph Anderegg, Gretenach, Switzerland.
V65GD, Gordon C. Drake, Rennia, Saska.
VP9Y, Jim A. Amos, Pembroke, Bermuda.
ZS6UT, H. J. Buckley, Maguire, Union of S. Africa.

February 1959
At first glance the HQ-170 appears to be the HQ-110 receiver with a built-in HC-10 converter. It isn't exactly, but if it were it would point up the fact that a lot of hams missed the HC-10 to their older receivers. Making a single package out of the two brings home the fact that here is a new philosophy in ham-band reception, something that has been staring us in the face for some time without being spelled out.

It has been mentioned many times that a slow tuning rate is desirable in a receiver that is very selective or is being used to tune in a single-sideband signal. However, it has always seemed advantageous to be able to get to any given part of a band in a hurry, and these two opposed objectives have been a stumbling block for designers. One recent approach has been the two-speed dial drive.

The HQ-170 uses another approach, one of those "Why-didn't-I-think-of-that?"-type inventions. The normal two-knob receiver is well known to all; one knob is used to set to the general frequency area (band set) and the other knob tunes the amateur band in that area (bandspread). In a typical receiver the bandspread dial may just cover the amateur band or a little more.

The HQ-170 receiver is a ham-bands only receiver, 160 through 6 meters. In the past this would have been a one-knob receiver. The HQ-170 is a two-knob job. The main tuning knob drives the directly-calibrated scales, and most operators sitting down to the receiver will use just this knob, because it controls the receiver in the traditional manner. However, another knob, marked "Vernier Tuning" tunes just 3 kc. either side of the frequency determined by the main tuning! This we consider the bandspread dial of the HQ-170, and band spread it is. The tuning rate is 2 kc. per revolution, and you don't hardly ever find tuning much slower than that! It means that a sideband signal can be handled with ease and dispatch by even the most impatient operator.

Before we get into the details of the receiver, we might mention that the 6-meter band on the 170 is no mere manufacturer's gesture, designed to let the operator listen to an occasional loud local signal. The 6-meter range in our sample HQ-170 dug down and brought up the weak ones in a manner that even had perfectionist W1HDQ nodding his head in approbation.

![Block diagram of the HQ-170 receiver](image-url)
Heterodyne reception on 6 meters yielded d.c. signals and made the reception of c.w. and s.s.b. on 50 Mc. a cinch.

Referring to the block diagram in Fig. 1, the HQ-170 is a triple-conversion receiver with a tunable front end. The f.f. out of the 6BE6 mixer is 3035 kc., except on the 100- and 80-meter ranges where it is 455 kc. and the 6B66 converter following becomes an amplifier at 455 kc. The signal is given a boost in a 6BA6 i.f. amplifier and then, if desired, an undesired carrier or heterodyne can be nulled out by means of a "bifilar T trap" or slot filter. This handles like the rejection notch of a Q multiplier; the circuit was described earlier. Following the 455-ke. f.f., the signal is heterodyned to 60 kc. in a 6B66 converter with a tunable oscillator. This tunable oscillator has a panel control marked "Vernier Tuning," and its range is limited to 6 kc. This is the control referred to earlier, the one we consider the band-tunable oscillator. The panel control turns a variable capacitor through a planetary reduction drive.

Following the conversion to 60 kc., the signal is passed through a couple of 6BA6 i.f. amplifier stages where quite a bit of selectivity is applied, and this portion will be discussed in more detail a little later. The triode portion of a 6BVI8 then feeds the signal to a diode detector when a panel switch is on "a.m." and to a 12AUG product detector when the panel switch is on "c.w.-s.s.b."

Whether another panel switch has the a.v.e. on or off, an a.v.e. rectifier is always operative and the 8-meter works. We have been told that one user of the HQ-170 didn't like the fact that there is no way to turn off the 8-meter, but we found it interesting to have a meter kicking on all signals, even with the a.v.e. off.

Following the detector a double diode noise limiter is available for reducing the effects of ignition noise during both a.m. and heterodyne reception; this circuit has a panel control for setting the threshold of clipping. Two stages of audio amplification follow the limiter, and the Hammarlund "auto-respons-o-circuit" is again used to restrict the audio frequency range on weak signals and extend it on strong ones.

A 100-ke. crystal oscillator, using a 6BI6 tube and a printed circuit, is included for checking the dial, and a panel control sets the hairline index on the dials. Since the receiver cannot tune to WWV for checking the 100-ke. oscillator, one has to rely on the factory adjustment or an auxiliary receiver. A 5U4-GB rectifier and a 0B2 regulator round out the tube complement; regulated voltage is used on the screen grids of the r.f. amplifier, mixer, 455-ke. i.f. amplifier and first converter and on the high-frequency oscillator and the 8-meter amplifier.

One thing you notice when you tune the HQ-170 is that backing off on the r.f. gain control doesn't make the set go dead as quickly as it does on many receivers. In other words, with the gain control backed off some you can twist the antenna trimmer and still get it to peak up the noise. (Try that on some highly-touted receivers!) This can be attributed to the (long-overdue!) first commercial use of multiple controls of different characteristics. In the 170 the gain control knob actually turns two controls. One of these is in the cathode circuit of the 6BZ6 r.f. stage and its taper is such that for the first 20 per cent or so of rotation it changes the bias very slightly on the r.f. stage. In other words, the r.f. stage runs "wide open" in this region. The other control is in the cathode circuit of the 455-ke. i.f. amplifier, and it changes the bias "faster" on this stage. The net result is a desirable type of operation in which the r.f. stage is the noise-determining factor over a wide range of gain-control setting. Other applications of this general principle (the HBR-14 of W6TC, and the Heath Mohawk) involved separate controls.

The a.v.e. in the 170 is applied to the r.f. amplifier, the 455-ke. amplifier, the second converter and the first 60-ke. amplifier. A panel switch selects one of three time constants (slow, medium, fast) or turns off the a.v.e. Incidentally, some operators will perhaps wonder what is happening to the receiver when it occasionally goes dead (or nearly so) in the slow or medium condition. This will happen when a sudden noise peak of high amplitude loads up the a.v.e. system momentarily. It is the cross all-time-constant a.v.e. systems must bear (at least all those we have seen). The a.v.e. in the 170 will work with the b.f.c. on or off, and you will probably find yourself experimenting with the longer time constants on a.v.e. and sideband, reserving the fast time constant a.v.e. for a.m. reception. The diode portion of the 6AV6 (audio amplifier) is used as a clamp that prevents the application of a.v.e. voltage to the r.f. and 455-ke. i.f. stages until a sizable a.v.e. voltage has developed. As a consequence, the same effect is obtained with a.v.e. as with manual gain, in that the front end gain of the receiver is maintained until the signals are fairly strong. Fig. 2 shows a simplified version of the a.v.e. clamp circuit.


All of the inductors for the front-end tuning are mounted above the chassis except those for the 6-meter range, which are mounted on the band switch. The many switch sections at the left are used in the 60-ke. circuitry.
While a "wise guy" can twist the controls of the HQ-170 and bring in signals, a little time spent in learning the significance of some of the controls and where they should be set will really pay off. The selectivity switch, the sideband selector switch and the b.f.o. pitch control are all tied together in a sense, and we will resort to a sketch or two to demonstrate this interrelation. Incidentally, the selectivity switch is marked "5, 1, 2 and 3," indicating the nominal bandwidth in kc. The sideband selector switch is marked "Upper, Lower, and Both," and now we get to the tricky part. Forgetting the .5-ke. position for the moment, switching the sideband selector switch to Both doubles the indicated bandwidth of the receiver. In other words, if the selectivity switch is set at 3 kc., you have a 6-ke. bandwidth when the sideband selector switch is at Upper or Lower, and a 6-ke. bandwidth when it is switched to Both. Confused? Well, don't be, because it is a very neat trick and something you should understand thoroughly if you are going to get the most out of your 170. The principle is illustrated in Fig. 3.

In Fig. 3 the frequency marked "0" is, of course, the nominal i.f. of 60 kc. It should be obvious that for single sideband reception the b.f.o. should be set to this frequency if the sideband-selector switch is to do its job properly. The receiver is set up at the factory so that this b.f.o. setting is obtained when the pitch control pointer is vertical, a real convenience for the operator who is always wondering how to set the b.f.o. for s.s.b. reception.

When the selectivity switch is in the "5" position (too sharp for anything but c.w.), the mid frequency of the i.f. is 60 kc., and the b.f.o. has to be set off to one side for single-signal c.w. reception.

The various degrees of selectivity are obtained by switching in capacitors that change the coupling and tuning of the six tuned circuits used in the 60-ke. i.f.

**Mechanical**

Physically the HQ-170 resembles the other receivers in the line in many respects, with the familiar styling right down to the perforated metal case. It has two dial windows and at a distance one might think these scales were independent, but such is not the case. One dial, fastened to the capacitor shaft, turns 180 degrees for 5³/₄ revolutions of the tuning knob. This dial scale carries the calibrations for the 3.5-4.0, 14.0-14.4, 7.0-7.3 and 1.8-2.0-Mc. ranges. The other dial scale turns 270 degrees at the same time, and it carries the 50-54, 28-30, 21.0-21.6-Mc. bands and a 0-100 arbitrary scale for logging. The time-tested rim drive is used, with a heavy flywheel on the tuning knob shaft.

Much of the clean look above and below the chassis of the 170 can be attributed to the use of separate shield cans for the front-end inductances and the use of preformed cables and printed circuits. — B. G.

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**Transcon TNS**

The transcon TNS is a noise limiter and squeal system designed to be used with the car broadcast receiver. In Fig. 1 when there is only noise at the second detector, the voltage at Y will be low and the voltages on the grids of V₁ and V₄ will be close to ground potential. If R₂ is set to a value lower than R₁, the voltage at the plate of V₄ will be more positive than the voltage...
at the plate of $V_1$. As a result, no current can flow around the loop from the plate of $V_1$ through $R_2$ and $V_2$ and $V_3$. With $V_2$ nonconductive, any slight noise amplified by $V_4$ can not be passed on through to the receiver audio.

When a carrier is rectified by the receiver detector, the voltage at $Y$ becomes negative, and the grid of $V_1$ is always more negative than the grid of $V_4$. Consequently, $V_4$ passes more current than $V_1$ and the plate of $V_4$ is less positive than the plate of $V_1$. Under these circumstances $V_2$ conducts and audio amplified by $V_3$ passes through to the receiver audio.

Noise peaks are transmitted via $C_1$ as negative-going pulses to the plate of $V_5$. During their existence the condition of transmission through $V_2$ ($V_5$ plate more positive than $V_2$ cathode) no longer exists and no signal is transmitted to the receiver audio.

When using the unit, the squelch control $R_3$ is advanced until all normal background noise just disappears. When a carrier appears at the detector, the squelch will automatically trigger, and the audio component of the signal will be heard. When the carrier disappears the circuit will function to cut off the audio.

Both the noise limiter and squelch circuit are turned on when heater and plate voltage are applied to the unit through the power cable. There is no switch on the TNS and, therefore, provision for turning the unit on and off has to be made outside the unit.

Instructions included with the unit show methods of connecting it to most of the detector circuits commonly used in automobile radios.

The TNS is available in both factory-wired and kit form. Creative Electronics Corp., Stamford, Conn., manufactures it. — E. L. C.
Hula-Hoop Helical Halo

BY E. LAIRD CAMPBELL,* W1CUT

The recent hula-hoop fad produced quite a few discarded "hoops" along with quite a few comments such as, "There must be something else they can be used for!" Naturally the ham instinct made me try to think of an application for these plastic rings in amateur radio. The result, a ten-meter antenna, is shown in the photograph.

The hoop is about 3 feet in diameter; the tubing is 3/4 inch in diameter. The pitch of the helix is about 3/4 inch and about 16 feet of wire are used in each leg. A diagram of the hoop is shown in Fig. 1.

The hoop antenna was constructed in about 15 minutes. I didn't measure the wire—just rolled a spool of No. 24 cotton-covered copper wire around the plastic tube, feeding the wire out as needed. After the entire loop was wound the wire was cut so as to produce two equal helical legs. I grid-dipped the antenna and found several good dips; one fell in the ten-meter band so I decided to try this band first. A series capacitor was connected at the feed point, the transmitter hooked up and the capacitor tuned until my s.w.r. bridge indicated a decent match.

Mounting the antenna seemed to be a bit of a problem at first but was solved by merely tying four strings at equal distances around the hoop and suspending the strings from the top of a wooden pole. The coax transmission line was taped to the pole and helped to steady the hoop.

After this preliminary test in the workshop, I mounted the antenna up about 50 feet, found that the match was still satisfactory, and tried my luck on 10 meters. Besides working the local gang, I also made several out-of-state contacts, W9PHI and W9IQU both reported the signal S9 plus, I carried on a 15-minute ragchew with both stations without any difficulty.

This antenna won't out-perform a beam but it will clear out those old used hoops in the back yard. Who knows, maybe we'll soon see a stacked hula hoop helical halo!

Fig. 1—Diagram of the hoop antenna. Details are given in the text.
C₁—35 μfd. variable capacitor (once the optimum value is found a fixed mica capacitor may be substituted).

Strays

Here are the various MARS technical net schedules for February.

First Army MARS
(Wednesday evenings 2100 EST, 4030 kc. upper sideband)
Feb. 4 — Observation of Radio Signals Transmitted From Earth Satellites.
Feb. 11 — Vehicular Noise Problems in Mobile Communications Systems.
Feb. 18 — Experience With Video Tape Recording.
Feb. 25 — Mobile SSB Communications.

AF-MARS Eastern
(Sundays 1400 EST, 3295, 7832.5 and 143,400 kc.)
Feb. 1 — Electronics in Medicine.
Feb. 8 — Future Atomic Powered Generator Stations.
Feb. 15 — Electronic Seeing With Low Level Illumination.
Feb. 22 — Modern Quality Control Principles.

AF-MARS Western
(Sundays 1400 PST, 3295, 7832.5 and 143,400 kc.)
Feb. 1 — Technical Writing in the Electronic Field — Part I.
Feb. 8 — Technical Writing in the Electronic Field — Part II.
Feb. 15 — Weapons Systems Electronics.
Feb. 22 — Space Flight Problems.

IIBAF, up on a 9500-foot mountain for a v.h.f. contest, discovered that he had forgotten loudspeaker and earphones. Not being one to give up easily, he connected the receiver output to his automobile horn, and says it worked fine. He does admit, however, that the result wasn't exactly hi-fi!
Two-Band Conversion for 10-Meter Beams

Simple Alteration for 15 Meters

BY L. E. BUMP,* W0ANY/VOI

An easy and inexpensive method of extending the usefulness of a 10-meter beam to the 15-meter band.

If you have a 2- or 3-element 10-meter beam, the chances are good that you can convert it to a 2-band affair for 10 and 15 meters very easily and at small cost. If your present antenna has a 12-foot boom or longer, all you need is to add traps and short extensions to the ends of each element, and shorten the elements a little.

The traps, sketched in Fig. 1, are easily constructed in one evening from scrap aluminum tubing that you may have lying in your junk box. The polystyrene tubing is available from Allied Radio in Chicago and probably from most other radio supply houses. The sizes of tubing you will need will depend on the size of tubing at the ends of your present elements. If it is 1/8 inch o.d., the dimensions shown in the sketch will fit. In any event, the same principle will apply.

First cut to a length of 6 inches 6 pieces of aluminum tubing that will fit over the ends of your elements. Then cut to 3-inch lengths 6 pieces of polystyrene tubing that will fit inside the aluminum pieces. Next, cut to 6-inch lengths 6 pieces of aluminum tubing that will fit inside the polystyrene tubing. These pieces of tubing will form the trap capacitor.

Before assembling them, cut a 1-inch saw slot in one end of each of the aluminum pieces, and near the opposite end of each piece, drill small holes approximately as shown in the sketch. Do not drill the polystyrene tubing.

Insert the polystyrene tubing into the larger aluminum tubing to a depth of 2 1/2 inches, and then insert the smaller aluminum tubing into the polystyrene tubing to a depth of 2 3/4 inches. This will give you a capacitance of about 35 µfd.

Now hold the assembly over a low flame until the polystyrene bubbles out of the holes in the aluminum tubing. When the poly has cooled, this will lock the pieces together so the capacitor won't fall apart.

The coils have 5 turns of No. 8 or No. 10 copper wire, 1 1/2 inches inside diameter. The coil is fastened across the capacitor by means of clamps. Using a grid-dip meter, the length of the coil should be adjusted so that the trap resonates at 28.8 Mc. Be sure to do the job on a wood bench because any metal left within a foot or so of the trap will alter its resonance point.

It will be necessary to shorten your original 10-meter elements when the traps are added. The length of the driven element between outer ends of the trap coils should be 14 ft. 2 inches, and the over-all length, including the 21-Mc. extensions (of 1 1/2-inch aluminum tubing) should be 19 ft. 6 inches. Similar lengths for the reflector should be 14 ft. 10 inches and 20 ft. 10 inches, while those for the director should be 13 ft. 2 inches and 18 ft. 10 inches.

I have been feeding the beam with RG-8/U. As a measure toward keeping r.f. off the outside of the coax, the coax line is wound into a coil of 12 turns 8 inches in diameter, close to the feed point. The coil is taped to the boom. My measurements show an s.w.r. of 1.8 on 10 meters and 1.5 on 10 meters, with little change over the entire range of either band. I run 100 watts and have worked 10 states and the Canal Zone on RTTY on 21,000 kc. from Newfoundland, with 89 reports from California. In the CQ DX contest for 1956, I had the second highest score for Canada on 10 meters, although the beam was only 35 feet off the ground.

I also found that, with the length of coax I happened to be using, I could load the transmitter on 20 meters. Several East Coast stations gave me 89 reports. I didn't measure the s.w.r.!

![Fig. 1 — Sketch showing construction of trap capacitor and method of mounting coil.](image)

**FEEDBACK**

In the Novice 50-Watter described in December QST the 0–200-ma. milliammeter was omitted from the circuit diagram. The lead between the bottom of RTFC2 and J1 should be opened and the meter inserted at this point. This makes it possible to read the cathode current of the 6146.
MODIFYING THE HEATH VX-1 FOR C.W. BREAK-IN

After obtaining a Heath VX-1 voice-controlled break-in unit, I looked about for a way to modify the unit for c.w. break-in. I studied the circuit, tried various methods, and finally arrived at the following changes.

The only additional components needed are an s.p.s.t. toggle switch and a 0.1-μf capacitor. Remove the ground end of the 100,000-ohm grid resistor on Pin 7 of the 12AX7 speech amplifier tube and connect it to one side of the toggle switch. Ground the other side of the switch as shown in Fig. 1. Now connect the 0.1-μf capacitor in parallel with the 0.1-μf capacitor that is already connected to the 7.5-megohm time-delay control. See Fig. 2. Consult pictorial diagram No. 4 on page 16 of the instruction manual for aid in finding the above components.

If more time delay is wanted, add more capacity in parallel with the capacitor across the 7.5-megohm time-delay control.

The above change will work on a transmitter using grid-block keying or on one that makes use of a blocking bias for keying. The bias can be obtained from a battery that is keyed by a relay. My transmitter uses —55 volts bias to key the oscillator. With the toggle switch open and the function switch on vox, it is ready for c.w. break-in. With a little practice, the most pleasant setting can be found. When keying begins, the relay in the vox will close and stay closed until keying is discontinued, then the relay will open after a short delay.

The unit’s function can easily be switched to phone operation, of course, by throwing the toggle switch to the other position.

— Paul G. Marsh, K4AVU

HOMEMADE TERMINAL STRIP

Every constructor is familiar with the terminal strip, and has probably used the masonite/machine screw variety for mounting components and small subassemblies. Although machine screws are satisfactory for solder terminals, terminals made of medium-gauge copper wire are economical, quickly soldered, and easily trimmed to size. Lugs of this type can be easily fabricated with long-nose pliers as shown in Fig. 3. The terminal should fit snugly into its hole with the lead soldered flush with the board. If the lug is loose after this connection has been made, its legs can be spread by pressure with pliers at the top and under side.

— Joe A. Rolf, K5J0K

5-BAND MOBILE ANTENNA

Here is a center-loaded mobile antenna that will work on 5 bands and there’s no need to get out of the car for switching or adjustment when changing bands. I used a Master All Band Coil, but any type with the correct number of turns may be used. The antenna could be called a multiple-loaded antenna since the proper LC sections resonate the antenna for whatever band is being used.

The diagram of the antenna is shown in Fig. 4. The capacitors should be mica or ceramic and must have a voltage rating high enough for whatever power is being run. Solder the four capacitors in series and connect the 40-μf. capacitor to the bottom end of the coil, using a lead of about 6 inches. Now tune the mobile receiver to 10 me-
Fig. 4—Circuit of the multiple-loaded mobile antenna. The capacitors are in \( \mu \text{f.} \)

Fig. 5—Circuit of the b.f.o. Transformer \( T_1 \) is a 455 kc. i.f. transformer.

Fig. 6—Diagram showing the v.f.o. zero addition to the Viking Ranger.

**VIKING RANGER V.F.O. ZERO BUTTON**

The circuit shown in Fig. 6 was developed to permit zeroing the Viking Ranger v.f.o. without operating any switches after the transmitter is tuned up. Normally, in order to zero beat a received station, the operate switch has to be turned from C.W. to STANDBY and the key pressed. This requires two switch operations each time the v.f.o. is tuned to the frequency of the received station. During a contest this might require hundreds of switch operations.

The zero button \( S_1 \) keys the v.f.o. independently of the rest of the transmitter. The level of the “v.f.o. only” signal in the receiver is adequate on 80 and 40 meters and reduced somewhat on 20 meters but still usable.

Unused pins on the existing octal socket \( J_1 \) (the one provided for plugging in crystals) are used to bring out the oscillator grid connections without the need for drilling any holes and destroying the resale value of the transmitter. An Amphenol octal type plug, \( P_1 \), is connected to the push button zero switch by a short length of cable and is mounted at the operating position. To restore the transmitter to its original circuitry, merely connect pins 4 and 0 of the crystal socket together.

**OUTBOARD B.F.O.**

The circuit shown in Fig. 5 is a simple 455 kc. b.f.o. which is easy to build and adjust. Most of the parts can be found in the junk box but if components do have to be purchased they can be obtained with no great damage to the billfold.

**IMPROVISED R.F. SNIFFER**

Conventional vacuum tube voltmeters can be used for antenna coupling and tuning adjustments simply by switching to the a.c. voltage range and plugging a loop of wire into the a.c. input jacks. The loop acts as an r.f. pick-up and the induced r.f. is rectified by the diode in the a.c. circuit.

**TAPPING CLOSE-WOUND COILS**

Putting a tap on a Miniductor coil whose turns are spaced rather closely together can pose somewhat of a problem. For example, a No. 20 wire will not pass between the turns of a coil of No. 24 wire wound 32 turns per inch. A solution is to flatten the end of the wire used for making the tap. This can be done by putting the wire on a hard flat surface and pounding it flat with a hammer. The wire can easily be flattened to a thickness of a few thousandths of an inch so that it can be wrapped around a coil without shorting.
adjacent turns. The wire can be annealed to its original pliability by momentarily heating it red hot over a flame and allowing it to cool slowly. After cleaning the wire with steel wool it can be soldered in place easily; small strips of aluminum foil alongside the tap will keep the solder from running to adjacent turns.

— Leo B. Weiner, W3LOS

HANDY ADJUSTMENT TOOL

Those who have transmitters built in a one-piece cabinet know that internal adjustments sometimes can be made only by pulling the transmitter completely out of the cabinet. My Johnson Valiant transmitter has a control on the time-sequence circuit and in order to adjust this control the transmitter must be removed from its cabinet.

To overcome the above problem, I use a length of wire bent into a small right angle as shown in Fig. 7. The wire is small enough to go through the perforated holes in the cabinet and fits into the slot on the end of the control. The wire is used to adjust the control to the desired position. One caution: be sure the high voltage is turned off whenever the adjustment is being made!

— Paul G. Marsh, K4AVU

STATION CONTROL CIRCUIT

A novel method of switching line and plate voltages is shown in Fig. 8. Two momentary contact switches, S1 S2, are used, one being of the normally open type, the other a normally closed type. The relay is of the d.p.s.t. variety. One pair of contacts is used as holding contacts, while the other pair is used to break the circuit. This method is often used in commercial broadcast equipment, and is especially useful for remote control applications. The switches can be color coded to show their functions; red and green seem to be appropriate colors for start-stop and on-off.

— Earl A. Carr, Jr., W1WRW

ACCURATE ZERO BEATING

Because the audio frequency response of most receivers drops rapidly below a few hundred cycles per second, it is not possible to zero beat two signals exactly by listening to their audio beat note on a receiver's speaker or earphones. A more accurate indication of zero beat can be obtained by measuring either the receiver's a.c. voltage or its second detector output voltage with a vacuum tube voltmeter. When the difference in frequency between the two signals is only a few cycles per second, the voltmeter needle will fluctuate with the beat signal. The fluctuations become slower as the frequency difference becomes smaller and a large dip is obtained when the frequencies are exactly equal. However, this dip is extremely sharp and it sometimes requires a steady hand to zero beat the two signals exactly.

— D. F. Zawada, K8EMS

EMERGENCY MODULATOR

After many enjoyable hours using my 80- and 40-meter c.w. rig I decided to try my luck on phone. I didn't have a modulator so I tried to think of an inexpensive way to convert to phone operation. I had an old television power transformer and an old phonograph audio amplifier with a microphone preamplifier stage. These parts connected as shown in Fig. 9 made up my new modulator.

Fig. 9—Circuit showing a modulator using a power transformer modulation transformer.

T1—Power transformer.

Only a few connections are required for the modification and it is an easy job to shift back to c.w. Reports on the voice quality are excellent and many successful phone contacts have been made.

— David T. Saukser, jr., W3MLE

HINT CONCERNING THE KWM-1

Users of the KWM-1 may sometimes have some difficulty when tuning the receiver due to an apparent electrical instability in the tuning (Continued on page 148)
It was 3 a.m. The XYL was beside me in the shack, as always, pouring me another cup of coffee, and setting out a freshly toasted sandwich. We were taking a break from another night of frenzied DX activity. The receiver gain was turned down but I could hear three strong signals on the frequency.

“W9QQU, W9QQU de ZK1AK pse”
“W9QQU de AC4NC bk”
“W9QQU de HE8LAC ar”

I stretched back in the chair with my feet on the operating table, took another puff on my post coffee cigarette and mused “Some of these guys are awfully persistent, aren’t they, honey?”

“Whaddaya say, shall we work ’em or turn off the rig and go to bed?”

“If you work ’em they’ll be expecting QSL cards and I’ve already made out 265 tonight.”

It had been a good night. I had racked up that many stations toward my WAC, which, as any fool knows, means Worked All Countries. I had a comfortable score of 29,252 with only another thousand to go. That WAC certificate would look good on the wall of the shack with all the others and right behind the WAS (Worked All Satellites).

I cast an appraising glance at the XYL. In her new sack dress, she looked more and more like Brigitte Bardot. She had made the dress herself from a sack. After all, giving me half of her household allowance each week toward the new transmitter and directional antenna farm hadn’t been easy. But she had insisted on it and was happy now that we had a first class installation. After all, it isn’t every amateur that has a rotatable stacked rhombic on each band.

She interrupted my reverie. “The post office delivered five more sacks of QSL cards from the Bureau, today, while you were at work. You know, we’ve almost completely covered two of the walls already.” It had been her idea to rent the abandoned Eagle’s Ballroom just for a place to post our QSL’s.

Suddenly a weak but persistent signal could be heard under the other 20-meter c.w. stations. My wife made it out as FB8ARL. That was the one we had heard about on TV news earlier in the evening. A cruise ship had gone aground on an uninhabited island halfway between the Antarctic Circle and the Kerguelen islands. Among the passengers were the members of the ARRL DX committee. While waiting for rescue, they had authorized amateur equipment to be set up on shore with the call FB8ARL—a new country, the island Shavnlotion. Evidently they had just completed the installation and were ready for their first contact. They were calling W9QQU, naturally.

It had been that way for three years now—ever since the QST article on “Hidden Meanings of Awkward Calls” had pointed out that “9QQU” in Gaelic pig latin means “Good DX”.

I snapped on the plate switch and rapped out on the bug “Pse QRX, CM, you’re QRMing a W6.”

“Don! Don!—wake up! It’s three o’clock in the morning!”

I raised one eyelid and, through bloodshot eyes, saw the curler clad head of the XYL leaning over me, not looking much like BB.

“If you’re going to sleep, then for Heaven’s sake come on to bed—a grown man, sitting up all night listening to a lot of mouse squeaks.”

It was a cruel, cold dawning.

25 Years Ago this month

... George Grammer, W1DF, modernized a three-tube transmitter, putting in a meter panel, a 47 crystal oscillator, and a new tank circuit with a split-stator capacitor.
... Arthur Collins, W9CXX (now W0CXX), described a universal antenna coupling system for modern transmitters.
... Fred Schnell, W9U7Z (now W4CF), presented some notes on the adjustment of bugs and the improvement of sending.
... The Sixth International DX Competition was announced, to take place during the nine days of March 10–18.
... H. A. Robinson, W3LW, commenced a two-part series on the operation of r.f. power amplifiers.
... Temple V. Ehmsen, W77VS, gave some dope on tampering a phone transmitter.
... G. F. Lampkin, W8ALK (now W4DRB), presented constructional details on an oscillator-multivibrator band-setter.

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I suppose that this Saturday night was the
same as most Saturday nights round 1730
GMT. W4YIE and 9G1CF were on 21,410.
The only difference was that the ragchew turned
to DXpeditions. One of the only ZS countries
which had not shown up on sideband was ZS9.
It was now my turn to matter. I did. Bechuana-
land Protectorate was not far from my QTH and
I would organise an expedition. When? Well, the
first public holiday was three weeks away. . . .
Francistown is the chief town of Bechuanaland.
Of this fact I was certain. Nothing else! For the
rest of it was remote as Timbuktu is to most
of the chaps reading this story. There are two
operators in this territory that I knew. Jock,
ZS9A and his son Norman, ZS9P. I had worked
them with great excitement in the distant past

Portable ZS9

BY ARTHUR LEWIN,* ZS6AQO

when everything beyond a twenty-mile radius
was rare DX. A little research through some
tavel magazines showed that there was a.c.
power in this town, and that this was the only
town with a.c. in the Protectorate. The road
map showed that the nearest border was 120
miles away on a beautifully cemented road. Then
we looked for Francistown. One way to get there
was via the latter road plus some four hundred
miles thru the sandy bush, or you could travel
well on the way to the Game Reserves on the
northern borders of the Union and then swing
west towards Serowe, the domain of the Seretse
Khamu, and then on to Francistown. A good deal
more civilization was thrown in on this route and
the likelihood of having to drag a petrol tanker
with you was a lot more remote.
The next day I phoned the Automobile Asso-

*32 Latium Road, Irene Park, Bloemsdrorp, Tvl. South
Africa

QST for

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till this choke fizzed like a faulty firecracker. Another one did the trick. The following night we had a QSO with W4IYC. At the start things were not too good but once the audio levels had been determined 5-8's and 5-9's began to appear. We were all set for 15 and 20. Least, so we thought!

Then we drove out to see the portable power. It had now been completed. What a magnificent sight awaited us. The world’s largest hydroelectric scheme had nothing on this baby. It weighed just short of a ton. Francistown had triumphed. It was ordained that we visit OM Jock and Norman. But instead of 100 miles of cement road we were to have 1100 miles of everything both natural and manmade.

A cablegram to ZS9. A QSO. They would be overjoyed to have us. But watch for elephants between Serowe and Francistown. They were in the town the week before.

With three days to go we were about to start work on a ground plane for twenty and a two-element beam for fifteen when Norm, ZS6ATA, came in and offered us his Mosley Trapmaster. There are only about five or six of these in the country and Norm had not yet got his atop his tower. If you were aware of the transportational hazards associated with trip you would no doubt appreciate the magnanimity of this offer. Not too reluctantly we accepted. The beam was brought over, assembled, tested out at twenty feet. It gave my home-constructed Christmas tree such a go that one of the elements is still drooping!

On Thursday night we packed the car. The equipment was strapped down to the back seat on foam rubber. When completed the car looked more like an ice sleigh than the Jet it was called. ZS6ATA was running the station inside telling the world about the expedition while we sweated with ropes and dural tubing. We finished packing at midnight. We needed sleep and there was still a morning’s work ahead before we could get cracking.

We left Klerksdorp at 3 p.m. on Friday and made our way to Potgietersrust. Passing through the various towns must have evoked some terrific thoughts in the minds of pedestrians judging by their physiognomic stuper. In P-prust we filled a four-gallon drum with the juice of transportation while we filled the petrol tank to capacity. Unless you want to suffer the headaches that we did on the upward trip then I suggest that you check to see that the garage attendants seal the petrol drums properly. We were almost anaesthetised before realising what the cause was. From this town we made our way northwest on the last piece of tarmac. Darkness was upon us when some forty miles later we took off from the tarmac and landed on the gravel with a soul-shattering jolt. The surface of the road for the next hundred miles was as corrugated as a turbulent sea. A high speed was essential if the equipment was not to be subjected to the treatment received by many a character in the days of the old fashioned dental drill.

Martinsdrift lies on the border of the Union and the Bechuanaaland Protectorate. It is at this point that we crossed the mighty Limpopo River (dry as a bone) and came into contact with the soft velvety sand roads. The roads are made by dragging a branchy tree behind a tractor so that the sand can be displaced to the sides of the road where it forms an ominous embankment. Ben had been this far once before and he was sure that there was a hotel and petrol some three miles away across the border. Sure enough we saw the sign indicating petrol ahead and then the hotel loomed up. It was in darkness. We stopped and got out. The silence and eeriness of that place was frightening. I doubt if ever I have experienced anything so quiet and still. We walked down to the main buildings and found the place absolutely deserted. The rooms were devoid of any furniture and all signs of habitation were gone. There was only one thing to do and we did it fast!

We drove on into the night, becoming more and more aware of the falling needle on the petrol gauge. Then at about midnight a light suddenly loomed up in the distance. The roads are straight as a die for miles on end. We deduced that this must be an oncoming car. But then the light vanished. What now? We drove on and on becoming more and more perturbed. At last the most welcome sign in the wilderness. Your Last Chance for Petrol. There was the car we had seen having the spirit of motion pumped into its veins. We filled up and were told that we were on the right road and that we were about 100 miles from Palapye. Again we were warned of the sand banks.

We forged on a lot happier and Ben found the necessity for Scotch a little less pressing. We found Palapye. It was like a native kraal with dozens of little paths leading in and out of it. Very disconcerting, until we managed to wake a native who was asleep by his tire and find out which path to take. Soon we were bypassing Serowe and well on the way to Francistown. There was to be a sign ‘Welcome to Francistown’ which jokingly we had been told to ignore! We were under the impression that the distance from Serowe to Francistown was 35 miles. In fact it was 105 miles! What a long and tiring stretch that turned out to be. We were on the lookout for the elephants but the Scotch and digestine made us a little less worried than we would have been. The trees along side the road were broken and rather large droppings were to be seen but...
the world’s largest beast had decided to leave us in peace. Maybe they were as tired as we were! At 3:15 a.m. we almost passed through Francistown without knowing it.

Jock and Norman were on the veranda waiting for us as we climbed from the dust wagon. They gave us hot coffee and then some hot coffee. We set about unpacking the gear which was almost lost in the dust and got cracking on the installation. Jock had just cleaned up his whole shack to make room for us and it did not take us long before the s.s.b. equipment was functioning. We went outside at 5:30 to help Ben and Norm pull up the beam which they had assembled by torchlight. With a jimpole, sweat and blood we pulled the antenna up to 28 feet. Not very high, but at that time of the morning quite a formidable feat.

After more coffee we switched on and allowed the rig to heat up. At 6:35 a.m. we called W4IYC and pronto W6BAC replied giving us 5-9. Then W4IYC broke in. We were 15 minutes earlier than pre-arranged. By the time the band packed up we had logged some 15 contacts.

We hit the hay at 0700 GMT. The beds were soft and downy. Sleep came easily.

At 1000 GMT we started again and made a few contacts before the screen current went berserk. We could not load. Immediately we reasoned that something had gone wrong with the antenna so we set about pulling it down for examination. Two hours later we had it back, convinced that there was nothing wrong with it in the first place. Still no loading. Still no QSO. A few hours later after more brilliant deduction we decided that there must be a short in the feedline. But there was no short. But the feedline did not start at the coax connector. There lay the trouble. The coax connecting the link to the coax connector had melted. The temperature in the shack was 102°! The 4-125 was not the coolest of birds and so I cannot blame the coax for melting. We replaced it with a piece of open wire and the screen resistor exploded. This happens when the screen draws too heavily in the G2MA circuit. We had anticipated it. The next one did the same thing after a few minutes. The only resistor of the correct value was a ten wattter. We needed at least fifty watts. What now? The plate voltage was decreased to 600 volts and the ten wattter placed. We left the amplifier out of the case, mounted the chasis on match boxes and placed the fan into its belly. Everything would be cool now. We had a few more cans of beer to cool us down. We tuned 15. We tuned 20. The band was motherless dead! The time — midnight. Up again at 6 a.m. A few calls between then and 8:30 a.m. Then the band packed up again. To hell with expeditions!

After the tour of the ‘city’ we had tea with another ham who was minus a.e. since the area had not yet been supplied although the house was fully wired and the cables connected to the mains. Frustrating was the word used by Peter Broome!

Before lunch we again tuned the band and only Empty, ZS6KD, was on talking to a local. I want it to go on record that on this occasion Empty responded to ‘break-break’!

After lunch on Sunday we called CQ. Pandemonium broke loose. We never let up for one minute until 2015. We were now aware what had happened to Jimmy when he was VQ9. That would not happen here. We refused to go back to stations on our own frequency and informed that we were listening 3 kc. up or 3 kc. down. A few of the boys were accurate enough to be three up or down, but the majority were not. Some were up ten, others down seven. So it went and we logged some 200 contacts in under two hours. It was a glorious experience.

At 2005 we started to pack up. By midnight we had hidden our wonderful hosts and hostess a fond farewell. We hit the trail for home. 35 miles from Francistown we also hit a boulder in the road at 60 m.p.h. Where that rock came from in the sandy wastes of Bechuanaland still remains a mystery to me. (Meteorie shower, Ben said.) After that the slightest dip caused a machine-gun like rattle on the floor of the car. We had to stop and look, even if it was in the elephant country. We loaded the Brownie revolver (a lot of use it would have been anyway!), got out and inspected. Ben reported that one of the body cross members had been bent and that the universal was rat-tat-tatting against the overloaded body whenever the springs gave a bit. What was needed was a stout piece of fencing wire, said Ben. We had spare plugs, points, condensers, coils, tubes and tires, but a stout piece of wire? Who would have thought of that. All the cables, feedlines and so on that we had with us were as useful as the blown screen resistors. Miserable as blazes we got in and drove at a snail’s pace. There were no fences, no farmers, no nothing. Only sand and bush. The half jack of Scotch was out and another dexedrine was down the hatch. (Ben has a weak heart . . . and that’s true, too!)

(Continued on page 146)
Pictured above is the father and son team of W3CWW and W3CXY. Their station is completely home-built and consists of a 20-tube, double-conversion superhet and a phone/c.w. transmitter with a 6146 in the final.

The U. S. Navy recently authorized operation of a ham station on board the USS Ranger (CVA-61) while she was on detached duty on a goodwill cruise from Atlantic to Pacific around the Horn. Above, in an order not disclosed by the Navy, are six of the hams on the Ranger at the time: KH6BWX, W8PBX, W1WSM, K4GHY, W4HLX, and W9UJI. Not present when the photo was taken were W1YUT and W4IDN.

The USCG Spar recently returned from a 4-month stay in the Arctic during the course of which W1WIN (shown above) operated his ham station on board to help the crew keep in touch with the home front.

W2ZC has a sure cure for inquisitive sight-seers and picnickers who turn the controls in his remote antenna-tuning doghouse. It's a sign that reads, "Danger — 110,000 Millivolts. Trespassers Subject to Ohm's Law."

W2TPV says he has been getting out good with only a Heathkit v.f.o. tied to the antenna.

One of the Navy's icebreakers in the Antarctic, the USS Staten Island, has been authorized to have an amateur station aboard, using the call of Electronics Technician W9HJM. Shown above is W9HJM himself, trying out the gear furnished through the courtesy of Hallicrafters and C&G Radio Supply of Tacoma, Wash. Four other men on board the icebreaker have taken their ham exams, so look for plenty of activity from W9HJM in the Antarctic.
Cherchez la Femme...

In September the Montreal Radio Amateur Club ran its annual hamfest, during the course of which they pulled off one of the neatest hidden transmitter hunts that we’ve heard about in a long time. Here’s the way it went.

Registration of mobiles for the hunt was made in the usual way, with no hint of what was to transpire later. VE2AUU/mobile was the “hidden transmitter,” and the fact that he was poorly hidden was intentional. He was instructed to stay “hidden” until four mobiles had found him, at which time all the other mobiles were told by radio that the hunt was over and that they were to return to the hamfest site. Upon their return they and everyone else (except the four who had “found” VE2AUU) were told that the real hunt would now get underway, with the hunters being the first four that had arrived at VE2AUU’s site.

The gimmick was that VE2NR (a real and very pretty YL) and Eric Lloyd were to stroll up and down the street in the vicinity of the hamfest headquarters. Eric was dressed up as a girl, and so all any casual observer spotted was a couple of good-looking blondes strolling aimlessly around. However, the hunters heard a masculine voice transmitting, because Eric carried a 14-watt battery-powered transmitter in the handbag with an antenna wire sewed in the hem of his skirt and the mike taped to his wrist.

The hunters soon arrived in the area, but spent an hour looking behind bushes, in houses, under benches, and so on and so on before VE3UY with a portable field strength meter finally had the courage to walk right up to the blonde and ask “her” to speak to him. The discrepancy between the voice and the costume had the boys going for quite a while!

... Just Strollin’ Along

But all the ingenuity isn’t in Montreal. Down in Santa Barbara the AREC was kept guessing for a while because K6DXW hid his transmitter in a baby stroller. Battery-powered, with about three watts input to a 6AQ5 final modulated by another 6AQ5, and with a Gonset G-66 receiver and a ground-plane antenna, he kept the hunters confused for quite a spell. K6UEC finally was successful in running down this unusual mobile.

Left, K6DXW and his “mobile.” For the transmitter hunt he had the equipment a bit better disguised than this!
**Danger — Blasting — Turn Off Two-Way Radios!**

Ever been driving along the highway and noticed a sign like this one? The reason for the warning is that radio frequency energy from an operating transmitter is strong enough in some cases to induce current in electric blasting caps and cause them to explode. The danger of accidental firing increases as the leads in the electrical circuit of the caps approach a half wavelength or longer at the transmitted frequency. Since a current as small as 150 mA is sufficient to fire an average cap, complete safety requires that the transmitter be turned off when near a blasting site. The table shown in Fig. 1 shows the minimum safe distance that should be maintained between electric blasting caps and an operating radio transmitter.

It is relatively safe to carry caps in vehicles containing an operating radio transmitter so long as the caps are in their original containers: the metal car body is a good shield against the r.f. energy. However, as an extra precaution it would be a good idea to carry the caps in a closed felt-lined metal box.

It might be well to note that there is no danger that radio frequency energy will fire primers such as those used in the primer pocket of cartridge cases. Those primers are quite insensitive to anything except a direct blow or extremely high temperatures. — E. L. C.

<table>
<thead>
<tr>
<th>Transmitter power</th>
<th>Minimum distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>watts</td>
<td>feet</td>
</tr>
<tr>
<td>5 – 25</td>
<td>100</td>
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<td>25 – 50</td>
<td>150</td>
</tr>
<tr>
<td>50 – 100</td>
<td>230</td>
</tr>
<tr>
<td>100 – 250</td>
<td>350</td>
</tr>
<tr>
<td>500 – 1000</td>
<td>650</td>
</tr>
</tbody>
</table>

**Fig. 1 — Table showing the minimum distance that should be maintained between an electric blasting cap and a radio transmitter.**

When you hear a ROAR on the bands these days, don’t be frightened — it’s a Rotarian of Amateur Radio. W9JKC is compiling a list of Rotarians who are also amateurs and is trying to establish a phone net for Rotarians. He suggests noon CST, Saturdays and Sundays, on the following frequencies: 3060, 7235, 11,270, 21,100 and 28,000 kc., either a.m. or s.s.b.

From the School of Medicine at the University of Washington, Seattle (via W7USO), comes a warning on the hazards of microwave radiation. Microwaves produce localized heating in matter, and this effect can cause damage to certain human organs where normal heat control is poor and blood circulation is low. The organs most likely to be affected are the eyes. Wavelengths of 10 cm. or longer are more likely to cause damage than those of less than 10 cm., because they penetrate more deeply. It is particularly important not to expose appreciable portions of the body (100 sq. cm. or more) to microwaves in the range 30 cm. (1000 Mc.) to 10 cm. (3000 Mc.). Do not make detailed visual examination of any microwave radiator, reflector, waveguide opening, waveguide horn, or magnetron during a period of transmission.

Congratulations to QST author G. Franklin Montgomery, W3RQB, who has been appointed chief of the electronic instrumentation section at the National Bureau of Standards. At the Bureau he has been associated with research programs on ionospheric forward scatter and meteor-burst communication. In recent months he has been investigating the application of transistors to electrical measuring instruments. One of his better-known QST articles was “Corkey — a Tubeless Automatic Key.”

We have a rather interesting letter from a fellow who says that because he is past the half-century mark his days are probably numbered. However, the only thing that bothers him about the future is that after he is gone from this vale of tears his name and call will be listed under “Silent Keys.” And this bothers him because he is strictly a phone man.
Field Day
on the Green

An Unusual Activity
in Rugged Country

BY CECIL L. HEBREW, JR.,* WØQEL

It wasn't exactly a "Field Day" in the ARRL sense; but it was an outdoor communications experience that had all the aspects of FD except the score, plus a few others — and those are what we want to tell you about.

During February, the Chambers of Commerce of Green River and Moab, Utah, contacted our club — the Western Slope Radio Club of Grand Junction, Colo. — to request that we provide communications for the Canyon Country River Marathon, an annual speed boat race held the third Sunday in June on the Green and Colorado Rivers. The objectives were two-fold: (1) to provide spectators along the route with a running account of the boats as they progressed, and (2) to dispatch aid quickly in the event of a mishap or emergency. The race, down the Green from Green River to the Colorado and then up the Colorado to Moab, covered a total distance of 196 miles, much of it through sheer canyon walls, although the distance from Green River to Moab by road is only fifty miles. It was a challenge, and we accepted it.

Problems

First, the long distance involved would require many stations in order to provide adequate coverage. Second, the two river banks are inaccessible, except at a few points, to automobiles. Third, the canyon walls would make radio coverage difficult if the operator was to be close enough to read the boat numbers. Fourth, since the area is mostly uninhabited, power would have to be supplied by generators or batteries. So a Field Day it was, but unlike the average FD we couldn't pick any location we wanted, and we had to maintain communication with specific points.

Preparations

Preparation was under the supervision of two committees, the Activities Committee and the Communications Committee. The former, chairmanned by WØFKY, planned the location of stations, ways and means of getting the

* 1630 Hall Ave., Grand Junction, Colo.
equipment and operators to the locations, and the method of operation. The latter, under W0IQV, set to work modifying some surplus equipment, purchased by the civil defense agency.

The plan was to set up nine stations along the race route (see map). Four of these were to be in pick-up boats and one in an aircraft. Dependence on mobile stations was ruled out because of the length of time of the operation (supposedly all day); fixed stations with portable generators were to be set up, although most were to be backed up with mobile rigs. The pick-up boats would be stationed along the river in various areas to aid any racers in distress, and the aircraft would circle the area for spotting purposes. All stations were to be put on location Saturday, June 14, and operators would camp out overnight so they would be ready to roll early the next morning.

The net control was to be located at Green River and operate as W0RRZ, the club call. Frequency picked for the operation was 3800 kc.

Since there was no road into Anderson Bottom, W0IQV and W0UVY were flown in, along with their equipment, on Saturday afternoon, landing on an old Forestry Department landing strip. W0VCB had his equipment in a jeep with four-wheel drive, which is what it took to get to the slide area, along with a full day’s travel time.

Many stations, set up Saturday as planned, were checked in that evening. Everybody (well, almost everybody) went to bed early in order to be ready to go at 0500 the next morning.

Great Day for the Race

At 0430 Sunday, after a session of trying to get relays to operate on 90 volts (that’s all we had!), contacts with some of the other stations were started. Most of the operators were up and around, except those who had been carried away by the mosquitoes. W0IQV asked for a new spark plug and a quart of oil, which were flown in to him. W0ZJO, at the finish point in Moab, reported generator trouble and general confusion. But our problems were only beginning.

The race started right on time, at 0030, and W0DGA, who had one of the strongest signals in pre-race tests, could not be contacted. This required relaying of boat numbers by outside stations, but there were plenty available for this. (Isn’t this ham fraternity the greatest?) Then two of the boat transmitters refused to work. The station in the aircraft worked fine on the ground, but in the air W0GSF said it was so bouncy that he couldn’t tune it up, so contact could be made only when the aircraft was directly overhead.

Two other transmitters went out because of voltage variations from the small generators (from 120 to 180 volts), and mobile operation was required. W0ZJO finally got set up with a generator that would conk out every so often; this, along with a noise level of 7 db., made it very difficult to contact him at the finish line.

But all was not lost, despite this operation of “Murphy’s Law.” A total of 57 boats entered the race, but naturally not all finished. They were started in ten heats, with as many as 18 boats in one heat. All types, sanctioned and not sanctioned, participated. Some had engine trouble, some ran aground on sand bars, some ran out of gas. The amateurs had their hands full with messages concerning these mishaps, in addition to regular spotting functions. Several boats were spotted by the aircraft, beached along the bank, and help was sent to them. A typical message read: “Will drift to Mineral Point. Send someone to pick me up there.”

The winning boat made it in four hours and thirty-five minutes, but some of the slower boats were still coming across the finish line at 1600. Many problems were met and some solved on the spot. However, there is room for a lot of improvement, so “wait until next year.”

This account wouldn’t be complete without a list of the amateurs who took part in this venture. Here they are: W0s PXZ VCX GS F VCB QEL DGA PCB FKY GNK UVY QWW GDC IQV ZJO, K0s JTE JMG, KN0QTV.

Right: W0IQV and W0UVY set up this station at “Anderson Bottom.” Since there is no road, they had to be flown into (and out of) this location.

Below: W0QEL/m is drawn up alongside the control station, in case the latter should break down. After the start, most cars and boat trailers repaired to the finish line.
The Art and Practice of Delivering Messages

Some Hints on the End Object of All Message Handling

BY DAVID B. FELL,* W3TN

W hoever has made final delivery of radio messages will remember the joy and satisfaction he derived from this phase of traffic work. Have you known these pleasures? Have you ever notified a mother that her son is homeward-bound from Korea? A grandmother that she has first grandson, born early this morning? A young lady that her sweetheart sends reassurance of his love from his military outpost in Greenland?

If you have enjoyed these satisfactions you may even have had letters, just as I have, from especially grateful recipients. Now the surprising thing is that they thank you or me, when usually all we did was to bring in the message by short relay from forty or a hundred miles away. Still we are lavished with thanks. So let us in all humility accept those thanks on behalf of the whole chain of hams who carried the message through rough conditions, a chain in which you or I were but the short end-link. And let us accept those thanks on behalf of the whole network of sections, regions, areas and transcontinental nets that make these deliveries possible.

When we contemplate the amount of work on the part of a number of stations that has already gone into bringing a message to your station and mine for delivery, it is only fair to expect that we will finish the job as effectively as we are able.

The suggestions that follow are aimed at just that: more perfect deliveries. Just as when a housewife has painstakingly prepared an excellent dinner it is an outrage to serve it in a tin dish, mixed like a cold, unappetizing stew; so when the rest of the chain — originator and relayers alike — have all done their parts well it is an outrage to spoil the delivery with a drab, lukewarm performance.

So then, to make more perfect deliveries, how shall we proceed? There are, I suggest, three distinct steps: (1) pre-delivery checking, i.e., preparation for the delivery; (2) the telephone delivery; (3) the written delivery or confirmation.

First, the pre-delivery checking. You read over the message you are about to deliver and make note of any passages possibly garbled. You consult your telephone directory either to find the phone number or to verify the correctness of the number given in the message. If no listing is found and none is given in the message address, here is a chance to enlist the help of the phone company's Information operator. Simply by telling Information my mission I have found her most helpful. She tells you there is no such street address; she tells you there is no such town as South Pleasant, Pa., with a Kimmel exchange, but there is a Mount Pleasant, Pa., with a Kimball exchange. From her you learn the number to be called is a university dormitory, a hospital, a rooming house, or an apartment hotel with a private branch exchange, thus pressuring more trouble getting through to our party.

There is an immense amount of help we can get from Information just for the asking. We may also check our Call Books, in case of doubt, to verify that the town and call letters of the station of origin match. To those of you whose copying skill is much better than mine, such checking may be wasted time. But I find it worthwhile. The more I know in advance what I'm likely to encounter when I place the phone call, the better delivery I can make.

Second, and most important, is the phone delivery itself. Here and now is our great moment. Remember, we are going to make an impression, either favorable or unfavorable. There is no happy medium. We are about to telephone an utter stranger; we are about to intrude upon the privacy of the home of someone who has, perhaps, too often suffered the annoyance of tele-

Deliver Messages As Soon As Received
phone solicitations of fund-raisers, canvassers, TV-viewer survey pollsters. We are about to deliver a "telegram," a thing which raises the image of nothing but dreadful tidings to folks of earlier generations.

What our recipient cannot yet know is that we are about to bring her good news—greetings, safe arrivals and so forth. She doesn't yet know the wonder of all this ARRL traffic system; that we didn't just happen to pick up this message directly from Maine or California, wonderful though that would be, but it was relayed in; that hundreds of us banded together and engaged in this work for the sheer love of it. We are indeed amateurs, i.e., lovers of our craft. So let us launch into this cheerfully, enthusiastically, and, at the same time, with all the considerateness and good manners that we can muster. The text itself (its urgency or routineness), the addressee (his or her probable youth or maturity), and whatever else our pre-checking has told us will guide us.

Very well, then, how to proceed? There is no single best way and you will develop your own. This way works for me. I speak slowly:

"Mrs. Smith? My name is David Fell, I am an amateur radio operator in Bethesda and I have a radio message for you from Hawaii, signed Moose." Note that in these brief words we get directly to our business; and, by announcing Who, What and Where From, we do our best to put our recipient at ease and to dispell the cautious reserve which it is normal to expect.

Right here I keep the recipient in suspense long enough to do some "post-checking" before I deliver the text. Thus: "Do I have the name correctly, Mrs. John P. Smith at 1807 Wishful Vista? The signature, Moose, do I have that correct?" Yes, we learn, that is the nickname of a favorite nephew. All right then, "This message was originated in Honolulu on March 22, and here is the text," and we read it to her, accepting from her fill-ins or corrections for any parts that appear garbled to you, but which are quite intelligible to her. Thus, by careful inquiry from Mrs. Smith, we correct our file copy and are enabled to confirm to her a "smooth" message, freed from the simple mistakes that have cropped up during transmission and reception. One purpose of these verifications is for possible use in our third step: confirmations.

Third, the written message or confirmation. When shall we make mail deliveries? Here are four kinds of occasions: (1) obviously, when there is no phone listing in the local directory; (2) for delivery to outlying towns where the cost to telephone would be excessive; (3) to other towns in our ARRL Section when the text of the message indicates that to hold it hoping to find a radio outlet within the next 24 or 48 hours would defeat the purpose of the message and render it useless; (4) for confirming telephone deliveries.

Our first task is to complete the delivery. Shall we quit just because telephone Information tells us there is no phone listing and no such address? Not yet. There is further checking we can do; road maps, atlases, street and city directories, inquiries to the post office and fire department. Let us make every reasonable effort to get the message through. I have on occasion enclosed the message with its own stamped envelope in a letter to the postmaster in an outlying town requesting his help to complete or correct the address. It worked. Remember, a service message back to the originating station regarding undeliverability is at best a poor substitute for actual delivery, when, by a little more effort, we could have finished the job.

Now deliveries in writing require, if anything, more exactness than phone deliveries. For here, written mistakes and omissions reveal more glaringly the errors that have accumulated along the way. We must not tamper with the text of a message but we can query parts not clear. And we ought, I think, make every correction we can in our written confirmation delivery. Thus, a message to Mr. Scotfield from his friend Bill should be addressed to Mr. Scotfield, not to a Mr. Suffield even though that is certainly what we copied. Likewise, when the recipient has a newer street address, new telephone number, new and higher rank or title, use the correct information and show the older, incorrect stuff parenthetically, if at all.

For written messages I use the ARRL message blank and I type the message as neatly as I can. Postcards or plain paper written in longhand will do. But a little glamor or "gift wrapping," will help make a more pleasing impression.

Contrary to the practice of most traffic men, I regularly mail written confirmations of telephone deliveries.

Here are some benefits and values of all written deliveries and confirmations:

1. The written message or confirmation gives station of origin, town of origin and date of filing; name, station, address and telephone of the delivering station. How often have you received a commercial telegram delivered by telephone and then wondered afterward exactly when or where it originated? How often has another member of your household accepted a message for you and failed to grasp certain vital information? You, the delivering station, are not even sure they got your name and phone number to be able to call back for verifications!

(Continued on page 144)
C.W. BANDS ON 6 AND 2

At press time last month we received word that the FCC had acted on Docket 12485, which grew out of an ARRL proposal that 100 kc. be set aside at the low end of the 50 and 144 Mc. bands for c.w. only. In its Report and Order, the Commission established c.w.-only segments, effective January 10, but placed them at 50.9-51.0 and 147.9-148 Mc. We present the text of the FCC action at the end of this department.

Flash! At ARRL request, FCC (on Jan. 9) delayed the effective date of the above order and set March 10 as a final date for the League’s (or others’) possible filing of petitions for rehearing.

W1DF ELECTED FELLOW, IRE

We know that George Grammer, Technical Director of the League and Technical Editor of QST, needs no introduction to our readers. Therefore, and contrary to established policy among public speakers, we’re not going to give him one. We just want you all to know that George has been elected a Fellow of the Institute of Radio Engineers, an honor we feel he thoroughly deserves. The citation mentions his details of procedures for issuance of the plates, effective in 1960. The Governor also had some nice things to say about amateurs in general and New York hams in particular:

“My purpose in speaking to you today is to express, on behalf of the people of the State of New York, our deep appreciation for the human and often heroic services you have performed in the past and to tell you how very much we are dependent on you to be on the job at anytime, and particularly if a civil defense emergency should ever occur.”

WITS 25th

At the risk of making the old timers feel still older, we want to report that the Sleepless Wonder of ITS, the man behind the key at 19'2a's WNP, the operator who had your call in the “Calls Heard” column of QST if you so much as sent a one-by-one on the air, has now been on the League staff for a quarter-century. Donald H. Mix, who still etches the call WITS on the Kennelly-Heaviside layer “regular and frequent”, first came to the League in 1933 to operate the Technical Information Service. The shine was hardly off his nameplate when he began turning out the copy on transmitters which has made his name a household word among hams.

CALL PLATES FOR N.Y.

After several futile efforts, hams in New York, led by W2AAO and the Albany Amateur Radio Association, apparently have won their battle for automobile license plates bearing their amateur call signs. New York is thus the 41st state to grant this special recognition.

Governor Harriman made the announcement himself by ham radio through the facilities of W2APF. He told the members of the New York State Emergency Net that Commissioner Kelly would meet soon with amateurs to work out the
fitting out the Bowdoin for his 1923 Arctic Expedition to Greenland, he made provision to take ham radio along—perhaps the first DX-expedition. Zenith contributed the equipment, and the ARRL Board of Directors was asked to furnish an operator: Don was its choice. During the long winter, when the schooner was frozen in the ice at Etah Harbor, WNP kept the Bowdoin in touch with civilization. After the expedition, Don spent the next ten years in the research laboratories of a number of outstanding organizations including Burgess and Press Wireless. A ham continuously since 1920, Don's current interest is in chasing DX, with 250 watts available on 80 through 10 meters; at press time the score is 199/192.

MORE RACES FREQUENCIES PROPOSED

Responsive to a petition by the U. S. Civil Defense Amateur Radio Alliance, the Federal Communications Commission has proposed to make certain additional frequencies within the amateur bands available for the use of the Radio Amateur Civil Emergency Service. As will be seen from the list of frequencies in the notice published at the end of this department, most of the proposed channels are centered around ARRL national calling and emergency frequencies. Additionally, two frequencies are to be designated for liaison with military units.

FCC EXPANDS MARITIME MOBILE PRIVILEGES

FCC has now made final its proposals in Docket 12307 (see QST for March, 1958, page 60) to permit maritime mobile amateur stations to operate on any band from 7 to 148 Mc. when on the high seas in Region II (roughly, North and South America and adjoining waters; see footnote 2 for an exact description). The new rules become effective January 30, 1959. The text of the Commission's Report and Order is published below:

In the Matter of

Amendment of Section 12.91 of Part 12, Amateur Radio Service, to make additional amateur frequency bands available for amateur operations outside the continental limits of the United States, its territories, or possessions.

REPORT AND ORDER

By the Commission:

1. The Commission issued a Notice of Proposed Rule Making in the above-captioned proceeding on February 3, 1958, wherein it was proposed to amend Section 12.91 of the Commission's rules so as to make available all amateur frequency bands between 7 Mc. and 148 Mc. for use by amateurs operating within Region 2, except when within the jurisdiction of a foreign government. All interested persons were afforded ample opportunity to file original and reply comments in support of or in opposition to the proposal.

2. The purpose of the proposed amendments is to place (Continued on page 148)

George K. Rollins, W3GA

It is with great regret that we report the passing of George K. Rollins, W3GA, on December 17, 1958. "Red," as he was universally known, had served as Chief, Public Safety and Amateur Division of the Federal Communications Commission, since that post was established in July, 1950. For the two years previous he had been Chief of the Radio Operator and Amateur Division of the Commission's Engineering Department.

Born February 2, 1905, in Minneapolis, and raised in Springfield, Mass., Red Rollins became interested in amateur radio at age fourteen. His first station license was issued in 1922 with the call 1CHO. This was followed with 8HW, W8JO, W9GR, W4EJP and W3GA as he went off to school at Michigan State College, and then to work for the Radio Division of the Department of Commerce at Grand Island, Nebraska, in 1929. The next stop was at Atlanta, Georgia, where Red was responsible for the operation and maintenance of the Marietta Monitoring Station.

W3GA

In 1937 Red left Government service, and went into business for himself as a partner in the firm of Holey and Rollins, consulting engineers to broadcasters. He returned to the FCC in the Hearing Section of the Broadcasting Division in 1939, and left these duties a year later to supervise the construction and installation of the Laurel, Md., monitoring station. Not long after, Red became Chief, Aviation Section of the Safety and Special Services Division. Toward the end of 1942, he went into Naval aviation, reaching the rank of Lieutenant Commander by the time he was discharged in 1946. He returned to the Aviation Section of FCC, and served there until moving to the Radio Operator and Amateur Division.

Red was active on the bands 80 through 10 meters, and on v.h.f. as a member of the Montgomery County RACES net. His other hobbies include bass fishing and photography.

W3GA will be deeply missed, both on the air and in his official capacity.

February 1959 63
YLRL ANNIVERSARY PARTY RESULTS

Another YLRL Anniversary Party record broken! In nineteen years of YLRL contesting a new participation record has been set each year. Last November 550 YLs participated in the AP phone contest (166 logs submitted) and 161 YLs participated in the c.w. section (70 logs submitted) — making the total turnout of YLs the largest ever for the popular annual Party. All forty-nine states plus three Canadian districts and fifteen different countries were represented.

Varying opinions of the revised rules for the contest were received by Vice President Kay Anderson, W4BLR. Here are Kay's summarising remarks:

"Comments were about equally divided for and against the new 24-hour time limit. Suggestions ranged from one who wanted a week-long contest with a limit of 36 hours operating time out of the week, to one who would like a 12-hour blitz contest, with no resting time.

"Some would like the c.w. section first and the phone section second. Many, many YLs wondered about California being divided into sections. Others would like the contest on a weekend. A few say 'Let's keep the rules somewhat permanent, so winners will be competing under the same rules and conditions as previous winners. Only in that way will the awards have any meaning'.

"It takes more than one letter or one complaint from a group to get a particular feature changed or ruled out. It takes lots of pressure from all the sections. The vice president has to know that it is the will of the majority before the rules can be changed. If you have not voiced an opinion and would like to, then by all means write to our new vice president, Gladys Eastman, W6DPI. She will be writing the rules for the Twentieth Party and will want to please the majority.

"Thanks to all who sent in logs, comments, and helpful suggestions. Congratulations to the winners!"

Highest scoring phone contestant in the AP was Katherine Johnson, W4SGD, who gathered her 11,180 points on 10, 15, 20, 40, and 75 meters. Although Katherine has been a high scorer in other YLRL contests, winning this one was a surprise, for she says that she just relaxed and operated for the fun of it all. Katherine is custodian of the popular YL Century Certificate.

Top phone scorer Katherine Johnson, W4SGD, and top c.w. scorer Mary Schultz, K6GOWQ, each received a gold cup. Certificates were awarded to second and third place phone winners Harriett Wochst, K5BJU and Doris Anderson, K5BNQ, and second and third place c.w. winners Joyce...
Polley, K0IKL, and Illian Byrne, K2FYZ. A novelty certificate was given to KN5PD, the only one of fifteen participating novices who submitted a log. A gavel was awarded to the Floridora YLs for the highest club score of seven competing clubs.

**SCORES**

Only the station and the total score is listed below. Complete score information, including number of contacts made, various worked, and power multiplier, if used, will appear in the YLRL publication YL Harmonies.

**C. W.**

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<tr>
<th>Club</th>
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<td>Portland Rose</td>
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<td>Gulf Area YLRCs</td>
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<td>Los Angeles YLRC</td>
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In Houston, Texas, K5BIU, Harriett Woehst, persevered hard and long enough to capture second place AP phone honors. Harriett was first president of the new Gulf Area YL Klub organized early in 1958.

**Phone**

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**TENTH ANNUAL YL-OM CONTEST**

Last year some 1500 OMs and 300 YIs participated in this YLRL sponsored contest. Interest in YL certificates of all kinds is soaring, and the YL-OM contest offers the year's golden opportunity to contact literally hundreds of YIs in two gay week ends. And the attraction is mutual, to be sure, for what gal wouldn't be interested in talking personally to a few hundred men herself? So, gals, and guys, observe the rules and get set!

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ELAW Exercise

Elaw, a YL net that meets at 0600 GMT, offers a certificate to any YL or OM who works ten of some thirty-six members in off-net contacts. Confirming QSLs should be sent to K6GYZ, Lucille Miller, 215 East Frazier, Roswell, New Mexico. Include return postage. Contacts valid beginning Jan. 1, 1959. (No question about it — clever gals are they who can load both their clothes lines and their rigs by nine on blue Monday mornings!)

Six Meter Certificate

Twelve YLs in the Pittsburgh, Pa., area who get together every Tuesday at 9:00 p.m. EST on 50.4 Mc., offer a certificate to amateurs who contact QSL any seven of the group. Known as the Petticoat Operators of Six, the net officers are president K3AZZ, secretary W3UTIT, treasurer K3DYQ, and manager W3BRK. The goal of the group, according to W3BRK, is to get more women interested and active in amateur radio and "to be able to help if and when the time comes that we are needed. Most of the YLs are available 24 hours a day, and in our small group we have three mobile units that can be manned at a moment's notice by efficient operators."

Keeping Up With The Girls

Clubs:

TYLRUN — Custodian of the net's YL-OM Certificate, (Continued on page 140)

XYLs all and proud enough to wear placards advertising the fact. Occasion for the mass declaration was a "Ham Fiesta" at W4UNU, Harold Peterson's QTH in Coronado, California. Members of the G.G. Breakfast Club net, which meets at 6:00 A.M. daily on 3940 kc., brought their XYLs to the gathering, which paralleled a similar get-together ten years ago. The XYLs are the wives of W6s CID, DQN, GBP, GUG, GVT, HQL, IZ, LI, MJB, PQT, QNK, SQC, T2C, UNU, VJ, and K6s AZW and BWS.

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Whereas:

It's that time of the year again, mates — the 25th ARRL International DX Competition's general sessions are only a log page or two away. The full announcement in last month's QST states the case for the prosecution. If necessary, subpoena the XYL with that proclamation to secure the needed mittimus for cellar, attic or closet, wherever the shack may be. Gather your own evidence — Exhibits A4, BV1, CR9, etc. — remembering, of course, that DX hogs will be in contempt. The ultimate verdict is invariably favorable.

Old Sol, as usual, will hand down appellate decisions while CRPL, our chief counsel, attempts to gauge the temper of the court. That won't be easy. There still are things 'twixt heaven and earth as yet undreamed of, or at least unfathomed by, our philosophy. How's that? Well, scan this testimony sworn to by witness W1BIH, a conservative DX scholar from Connecticut:

Last September 6th, a Saturday evening, I acted on a hunch, turned on my receiver at 0245 GMT, and immediately heard CE6AC calling CQ on 14,095 kc. I called him but he came back to a K2. After he signed I called him again. This time he came back to "W2BIV?". I called once more and he again promptly answered W2BIV?, asking for a repeat of the call. Finally he gave up and answered a W9. I decided something must be wrong, so I checked the transmitter tuning and found I had been operating the final of a receiver beam switched in by mistake. I tuned up properly with the twenty-meter beam pointed 30 degrees west of south. After hearing the CE6 now coming in about three Ss stronger I found he was going QRT.

Along with others I called him for a while and then heard W5LBW working him a few kc. higher, the CE6 on phone. Then he disappeared again; but I kept at it, together with other hopefuls. In five minutes the rest apparently gave up chase. But, in hopes of coaxing him back on, I kept calling CE6AC off and on for another fifteen minutes or so, carefully tuning between calls. Then I concluded that the project was hopeless, checked my clock, and wrote in the log, "QRT at 0340."

However, I kept listening around the general area of 14,095 kc., presently noting a weak signal calling CE6AC. Curious, I put the crystal of my NO-300 at its sharpest and peaked this calling station to perfect readability. I then clearly heard: "CE6AC CE6AC DE W1BIH W1BXH W1BIH K." The clock read exactly 0345. Without touching the receiver dial I turned on my v.f.o. and found it peaking perfectly at that receiver setting. I briefly called CE6AC again but heard no more.

If my own signals came back to me five minutes later — maybe more — where did they come from? At a speed of 186,000 m.p.s., the traveled distance figures to approximately 56,000,000 miles.

Teasy, eh? Clean-cut observations of such singular echo phenomena are rare enough, particularly where the interval is a matter of minutes. Even amicus curiae E. E. Terman swings somewhat speculative on this subject with a brief filed in his Radio Engineers' Handbook:

... Echo signals having a time delay of several seconds have been reported a number of times, and there are authentic cases of echoes having a time lag of several minutes. The cause of such echoes has not definitely been established, but theoretical work indicates that retardation up to ten seconds could be accounted for by low group-velocity propagation in the upper part of the ionosphere. Signals of greater retardation could be accounted for only by waves that have traveled great distances in the empty space outside the earth's atmosphere, and that then by a fortuitous combination of circumstances are finally reflected back to earth by ionized regions either within the influences of the earth's magnetic field or in the vicinity of the sun.

What unusual propagation incidents will you encounter in the 1959 ARRL DX Test? Probably nothing to match W1BIH's adventure, but there's not much cut and dried about the long-haul game. You're in for some signal surprises or we'll be mighty surprised.

What:

This year's ARRL DX classic promises to be a truly multiband affair. Our 3.5-Mc. range has surged to long-W1.TAI points out that WTDX (then VE1PE) recorded similar "creepy, spooky-sounding" retardations in "How's DX?" all of twenty years ago (p. 52, January 1938 QST). This recounted a 10- or 15-second job on 28 Me. with W6DUC transmitting and W6ADP observing.

W1NJM points out that W1DX (then W1JPE) recorded similar "creepy, spooky-sounding" retardations in "How's DX?" all of twenty years ago (p. 52, January 1938 QST). This recounted a 10- or 15-second job on 28 Me. with W6DUC transmitting and W6ADP observing.

February 1959
These USAF lads normally are scattered throughout the Ryukyus, so the camera recorded a red-letter occasion when (L. to r.) KR6s HP, GI, LP, DO and BP assembled for a trans offense round table at the latter's station in 1958.

Got'em all worked!
c.w. suffered several sinking spells as the new year dawned but the band certainly is entitled to a vacation now and then, as the timetable of events could be harrowing.

 Weather. — The month was predominantly mild, and only a few cold spells occurred. The tempestuous conditions which prevailed in October and November continued throughout much of December. The autumn months were characterized by a succession of cold fronts and low pressure systems, resulting in frequent showers and periods of high winds. The temperatures were generally below average, with the coldest days occurring near the end of the month.}

Where: —

Oceanian — "I will be operating from Mackaquero Island as K4XJZO from about January to December, 1960. 5 cw, s.s.b., a.m. and a.b.," informs K4XJZO, "VY4PF has been kind enough to offer his services as my QSL manager; hence prompt QSL is ensured. Cards received via the bureaus will be replied to via bureaus, cards accompanied by IRCs will be answered by direct mail, all QSLs will be issued on 10, 15, and 20 meters, and the call was reissued to me without sufficient time to QSL them directly."

African — From CN183 via W0VQB comes word of a new bureau address for Yanks in Eire: "I am sorry to announce that my African QSLs will now be handled by W0VQB."

Asia — "I am surprised by the number of QSLs received from your overseas friends," writes VE7VZ, "I am happy to report that my QSLs are being handled by W0VQB."

Europe — "We have missed only one morning in the past six weeks," writes K6XQX, "Each morning we keep schedules which supply me with QSLs."

North America — "I have received several reports of QSLs sent direct to your overseas address," writes K6XQX, "I have received several reports of QSLs sent direct to your overseas address."

South America — "I have received several reports of QSLs sent direct to your overseas address," writes K6XQX, "I have received several reports of QSLs sent direct to your overseas address."

February 1959
should let me know via either address. I might mention a Capital must cope with a.c. mains which swing unpredictably.

"A lot of people seek TE5WDW QSLs and they may easily for them at my K1QME address. I departed land found unexpected QSLs in my mailbox and I went back on the air from Rikoxi, Alja, in the near future."

"Will be live on DX bands almost every day and I'll certainly QSL 100 percent," replies the new VP2LI (K7C7X). Take care not to confuse Bill with one N. Dunkel, former holder of the call. Form these map reassessments.

Keeping track of Swedish QSL-hunters is a cinch because there is no suffix duplication in the seven SM calls currently observed, ex-SM14BPJ easily became SM0BPJ. By the same token, the address of any legitimate shipboard or portable SM is easily established by seeking out the homestead suffix — there is only one — among said Sweden call areas.

"A self-addressed stamped envelope is desirable be-cause there is no suffix duplication in the seven SM call areas," observes ex-SM14BPJ.

The requests I receive for QSLs would stagger you. Some 200 per month is not an uncommon number for me to send out.

Wisai B. H. Sapau in the back yard of Princess Grace. "All QSLs with 324AF since 1951 and prior to November, 1953, are invalid. It seems that 324 continues as a favorite pirate prefix."

Hereabouts — W3CTN now handles world-wide QSL disbursements for W3RAT, W3BIA, WK6GU, OK13H, W1Vaddy, 1FH V3CZ, WB0GU, W8PZ, ZL1JWP, and others. The requests I receive for QSRs would stagger you. Some 200 per month is not an uncommon number for me to send out."

WOSAI B. H. Sapau in the back yard of Princess Grace. "All QSLs with 324AF since 1951 and prior to November, 1953, are invalid. It seems that 324 continues as a favorite pirate prefix."

ex-CN8EE, L. Bruce, Lann-Bihoue, Loront (Moribihan) France

ex-CN8EE-5A5TF (see WE1QV X K17)

ex-CN8IU, T. St. A. Pittman (K1Z0), 60th AC&W

ex-CN8IU (see EP2TV and preceding text)

CR4AD, H. da S. Sousa Brito, P.O. Box 16, Prisau. Cape Verde Islands

CR4AV (via CR1A1)

CR5AR, Ramalho, V. PTT, Box 21, Sao Thome Island, Portuguese Guinea

ex-CR9AF (to CT1ID)

DL2YN, W. Hill, Deidon, No. 3 Higher Education Centre, P.O. Box 20, United Kingdom

DL4FL, W. Briston (K7C7X), C. C. 104th Ord. Bn., APO 89, New York, N. Y.

DL4FL, H. Lilienthal, Birkenfeld/Nahle, Mainh, USAF

EAA09S, C. Urdetam, Transmission, Cuesta, Sp. Morocco

E2W (via K4A5)

E7TTO, H. T. Orr, 172 N.E. Logan Pkwy., Minneapolis

E9FGR, L. H. All, Annandale, N. J., Minn.


F7BAI, D. Hendor, Avo. d'Affortatevery, 41, Chlois-le-Roi

(ex-SM14BPJ)

ex-F4NA5D (to AC1AX)

FORAU (via W3GYU)

FY7YC, R. Martineau, Rue Bolland St, Paris 18, France

FY7YP (via W2FZAX)

HASKDO, Radio Club of Budapest, Kokoexy Ter No. 2, Budapest, Hungary

HIC1VA, A. Vazquez, Box 2278, Quito, Ecuador

H4C2LYJ, C. Willett, Central Romon, D.R.


K4USW (to W2ZV7E)

K51EG, U. S. Coast Guard Loran Sta., APO 351, San Francisco, Calif.

ex-K66MJ, J. Jones, K2RTX/1, 155 Farm Ln., Portsmouth, N. H.

KW6GU (via W2CTN)

LUS4MT, O. Feliel, Rovadibia, Mendoza, Argentina

OYV5JY, Pioezoampheta No. 5, Torshavn, Faroe Islands


PY3BOM, M. Jarinto, Box 22, Sao Paulo, Brazil

PY3APJ, H. T. L. de Medeiros, Box 67, Canau, Brazil ex-58MAQOF, L. P (to 58MAQOF)

SBVWAD, U. S. Consulte General, Solonika, Greece

TF5WDD, APO 81, New York, N. Y.

ex-TF5WDW (to KQ8EE)

TGYTS, P. Silbon, 19 J. 19, S. Embassy, Guatemala City, Guatemala

USKAB, P.O. Box 27, Starloz, Ukrainian S.S.R.

VESMG, P.O. Box 2630, Edmonton, Alta., Canada

VK5CC (via VK12P)

VPIRA, P.O. Box 2311, Belize, British Honduras ex-VP2IU (see VP2IU)

VP2SL, B. Dellimore, P.O. Box 80, Kinington, St. Vincent (via K5X85)

VP4RL, 75 Broadway, San Fernando, Trinidad

VP5ERG, M. Chet, P.O. Box 118, New York, N. Y.

VP6FM (via WP7ES)

VP5MG (via W4NB)

VP5ERG (via WIEQ)
Seventh "DXCC" and No. 1 claim from our seventh case area is filed by W7ENW (see p. 59, April 1959 QST) on the heels of last month's HB9J and W5KC endorsement. This announcement comes courtesy G2CJN, GRS secretary, who has been signing W5QV, and is the Swedish DXCC officer for the Grafton Radio Society (GSAFT), an RSGB controlled group that has been providing QSLs from ARRL Century Club members.

Seven "DXCC" and No. 1 claim from our seventh case area is filed by W7ENW (see p. 59, April 1959 QST) on the heels of last month's HB9J and W5KC endorsement. This announcement comes courtesy G2CJN, GRS secretary, who has been signing W5QV, and is the Swedish DXCC officer for the Grafton Radio Society (GSAFT), an RSGB controlled group that has been providing QSLs from ARRL Century Club members.
HSIJN’s homespun 40-watt sender and S-40 receiver function faithfully on 20 c.w. in Bangkok where the OM is an officer in the Royal Thai Navy’s research lab. After warming up on a fast WAC, HSJIN practices for WAS and DXCC honors. (Photo via W1TUW)

We KG finds W1L0Q enjoying the DX end as KE3AS. Lloyd also hears that WA2YB comes home from KHC4SK next month. — — W6KG has word that HSDC, an ex-wartime e.w. protagonist, lost both arms in a commercial high-voltage mishap some months ago.

In India — Z82ZV writes W9DOS: “I started using s.s.b. last November first and have been working an average of sixty stations per day on a.m. and s.s.b. I could work more if there were less QRM from airports, shops, and small villages. I do my listening on the frequency of each station with whom I have just completed QSOs. Quite unnecessary trouble results, too, from improper phonetics. For instance, ‘be one’ sounds a poor choice for the letter ‘N because two other months end in ‘ember’. And there is little logic in using phonetic words likely to be unknown at the other end and audible on 14, 21 and 28 Mc., depending on conditions. When on a contest front, I can change to a.m. if needed. But I am active daily between 1330 and 1730 GMT – additional Sunday periods at 0100–0300 and my usual frequencies are (a.m.) 1721, 2130, 28,600, and 28,020 kc. — — K7F7P has XW7AI in his band for operations elsewhere. The grapevine also reports W3ZA from 1751XWA3 confirming the latter call may be used by other ops — W9DOS identifies KIP1BCN as our old rover friend, Lee Grant (see p. 07). W6KG finds W9TZR from JA6I on the mark. VA7UK is about due for a four-month leave according to the Indian Ocean near Socotra. QSL via CAV. The ODAX/Expand claims that ET2US/ET3 s.s.b. and c.w. outburst next month after a few weeks of activities in Asmara next month after a few weeks of activities. BA3U looks forward to resuming activity in Georgia, Ky., Ont., N.J., S.Ca., Vt. and NH. Range YQ2RB, in range VY60 on 20, claims 28,100 and 28,500 kc., receiving in the 28,500–28,800-kc. range. — — ZL2JB finds home from KE4USK next month.) ..

Africa — Local Libyan color is supplied by 5A1FF (KGTZ): “I am located 350 miles south of Tripoli in the Sahara and operating conditions are at present fairly good with portable generator, etc. I use 10, 15 and 20 phone from 1730–2100 GMT daily, also 20 and 15 sideband when my v.f.w. is in control. Clear in Africa is a top, NC-18317 and a four-band trap vertical. I’m engaged in geophysical and observations and my high temperature for the summer of ’58 was 110°F, with the wind ‘and sand all at times.’ — — V5Q5EK, in line to W6X5K, lists his neighbor V5Q5 AD G62 CF as the most active v.f.w. in the area. We are planning to work the States on 20 Mc. when conditions allow. V5Q5E uses a homemade c.f.o.–807–2130–130 watt arrangement modulated by receiver and transmitter using heave antenna. He’s hearing W. Ka on 7-Mc. phone and broadcast QRM required serious low band.”

W1A1 out on the air in Northern Ireland, ET2TO looks forward to resuming DX activities in January next month after a few weeks of SNJIE work. — — W3Q1R finds CS5CA in hot pursuit of Del. St. Mont., Neva., S. Dak., Colo., Utah, and Wyo. From 1700 to 2000 GMT, transmitting phone 28,100 and 28,500 kc., receiving in the 28,500–28,800-kc. range. — — V5Q5RB, in QSO with W8NOI, claims employment at one of the world’s largest rubber manufacturers. Stacked rhomboids, anyone? — — CS2JJ tells W8YN he’s heading for a Voice of America assignment in Germany, probably Munich. From a sizeable 2000 kc. sideband V5Q5H confirm a DX2US staffer for the time being.”

South America — Activities by CE3A ZF and ZC were announced by the Juan Femandez subject prior to RCC’s DX-penultimate. Jean RPIRZ claims CE3A DQ CH DS and DL as CE3A and includes 4300 km GJ and IL as CH2G2Z. W9QG reports CE2GC workable around 2310 GMT near 28,400 kc. — — VPS recently raised by W9YJH, mostly on phone include CC CQ QR DR D1 HT DL DT and DN in Antarctica. AQ DS and DW in the Falklands, UT on some Orkney and BJ of South Georgia.

(Continued on page 148)
If our news coverage is a bit thin this month, blame it on a three-week trip through the southeastern part of the country during December. Though such junkets may make it hard to compile a balanced column of news for a month or so, they give us opportunities to gain perspective that is helpful in many other ways.

This round included visits with radio clubs in Virginia, the Carolinas, Georgia, Florida, Alabama and Tennessee. Some of the areas covered were new to us, and our most recent previous visits to any of them were made more than 2½ years ago. It was mighty revealing to see what has happened in v.h.f. circles in the interim. Even as recently as the spring of 1955, v.h.f. activity was not easy to locate anywhere in the South.

There was a local state of 6-meter interest everywhere, and nowhere was it lower than below the Mason-Dixon Line. The 144-Mc. band was picking up converts gradually; there were a few really good stations scattered around the South, but widespread general activity was unknown.

This time around we found at least a few stations on 6 and 2 in just about every community we visited. In North Carolina they were talking in terms of statewide coverage for c.d. and other emergency purposes on 144 Mc. South Carolina, once a v.h.f. hotbed, now has good representation on both 6 and 2, as have all other southern states. In southern Florida we reported into the Gold Coast 6-Meter Net and found ourselves in the midst of a lively session with several stations participating. Their roster of active 50-Mc. stations in and around Miami lists close to 100 calls.

Florida v.h.f. men were convinced, not so long ago, that their major population centers were too far apart for good inter-city v.h.f. coverage, but no more. Following the Gold Coast Net session, at the station of K4GKL and K4GKM, better known to v.h.f. operators as WSFBQ and WSWJC, we did a bit of visiting. While at W4EHV we had a nice QSO with W4GJO, Sarasota. This 175-mile hop, we learned, is not restricted to the Sunshine State.

In city after city we were able to raise 50-Mc. stations with our low-powered mobile, even in the daytime, something all but unheard of a few years ago. Usually this meant a string of QSOs; obviously, there were lots of 6-meter stations in most southern cities. Miami, St. Petersburg, Birmingham, Atlanta, Chattanooga—all along the line we found the same heartening response.

This growth in v.h.f. interest, which we believe to be fairly typical of the country as a whole, is compounded of many factors. The Novice and Technician classes of license have helped, cer-

*V.H.F. Editor, QST.
By W6BZ.
Without much interference.

Some interesting 144-Mc. DX is being provided for New England by W5YI, operating from a 9450-foot elevation at Sunspot, about 17 miles below Alamogordo and Cloudcroft. This is a 175-mile hop to the Albuquerque area, but W6FPB reports that most of the stations in and near Albuquerque, and even some in low power, W8PAM has been keeping schedules with Alamogordo and El Paso stations, 100 and 220 miles, respectively. With his high power on 220, he has been getting through, and has heard W5EDP, but no two-way work had been done at the time of W5FPB's report.

What are the chances of a beginner having fun on 67 3KCPA, Washington, D. C., thinks they're good, and he views this report with interest. Ed first went on the air Nov. 15, with a 50-watt rig. As of Dec. 10 he had worked 106 stations, of which 17 were in his own call area. W5s spotted 30, California stations head this list with 30. He also worked 17 sevenes and 4 zeros. This was done within the framework of an average working schedule, so his contacts were made during evenings, weekends, and an occasional lunch hour.

W8WRT, Omaha, has been dividing his time between 50 and 144 Mc. He reports that there is somewhat more doing on 50 Mc., due to the current DX interest, but there are about 10 stations active on 144 Mc. in and around the city. He and W8EIM8 wonder why they never hear anything from the Dakotas on 144 Mc. They'd be glad to cooperate with interested parties to the north in bringing about more two-way activity.

"How does the range on 220 Mc. compare with that on 144?" This question was asked during almost every meeting we had on our recent swing through the Southeast. One thing is sure: none of these people are drinking and talking 220 these days. W4RMU, Jacksonville, W4GJO, Sarasota, W4TKE, Gainesville, W4LNG and W4FPH, Atlanta, W3HK, Chattanooga. These are just a few of the well-known w.h.f. men of the South whose getting set to work on 220.

We have to admit that we have no sure answer to their question, but we feel sure that just about anything (except snow) that is currently being done on 144 can be done on 220 about as well. The higher band may even be the better under favorable tropospheric conditions. Too few regular schedules have been kept on 220 to permit much in the way of comparisons, but the record of W5EQC, Aurora, Ill., and others looks encouraging.

Dick has been keeping nightly schedules with W8SVI, Fairborn, Ohio, for many months. Many of these contacts have been on voice, and c.w. work is always possible, despite the 500-mile distance. W8GHLX, Top City, has also been working many times under normal conditions. W9EQC's schedules include WSPT, Benton Harbor, Mich., at 1900 CST and W8SVI at 2000. Dick runs 125 watts. His beam is 28 half-wave whip in reception of DX, and is better for DX work than hals of various kinds. hales give much-improved DX range in local work, however, which matching polarization is important. Principal feature of the 30-inch whip is that it is well-nigh invisible, being made of piano wire.

W1UE, Windsor Locks, Conn. — Many tests with 5-over-5 220 Mc. have been made in parallel with the 144-Mc. on the latter array alone. The 5-over-5 is fixed NE, and was constructed as a possible aid in working European DX. It is the higher of the two, but is only 3/4-wave spaced, whereas the 4-over-4 is 1 1/2....

W1URC, N. Tierton, R. I. — Experimenting with parametric amplifier on 432 Mc. Results thus far, using 1N21C (Continued on page 140)

2-METER STANDINGS

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<td>2100</td>
<td>1175</td>
<td>150</td>
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</table>

OES Notes

W1IZZ, Danville, Ill. — Using direct frequency control on 50 Mc., with Kalitron oscillator. Info on oscillator found in RNSG Bulletin for September, 1958. Recently had 5-way QSO with K1CXX, Auburn, K1GPT, Lewiston, W1GQG, Buffalo, W1GEC, Old Orchard. Both stations are in Maine, 100 miles or more distant and on opposite side of the White Mountains of northern New Hampshire.

W1QDQ, Canton, Conn. — Presently using 30-inch base-loaded whip for 50-Mc. mobile. Seems as good as full-quar-
USE THAT MARKER!

Editor, QST:

Recently, a DX QSO of mine was ruined by a W4sman (may all his fuses blow), who was operating outside of the American phone band. But, is not a lone in enjoying this QCQ-free bonus? There are throngs of other W stations whose religious trust in their VFOs damn is exceeded only by their psueonde lack of common sense.

Since so many Ws can meet themselves, undisturbed, in the DX bands, I am forced to conclude that the FCC is undisturbed, so long as the ham's frequency is not lower than d.c. nor higher than ultraviolet.

Should someone, somewhere become concerned about this problem, I would suggest a firm regulation, that none be permitted to use VFOs unless his station is equipped with either a 10kc. axial marker, or, at least, a single band-edge unit for each band of operation.

Mark Holzman, W6YJ

HELP A LID

Editor, QST:

When will some hams wake up to the fact that the FCC makes rules to be obeyed, and not to be ignored? We must all realize that the vast majority of the regulations are for our own benefit. The violation that most agitates me is the flagrant out-of-the-band operation that some persist in. These fellows must possess the mentality to realize that the edge of the band means that operation is not permitted beyond that point by an amateur radio station. The band limits for all types of emissions are certainly available to every amateur, so ignorance can never be claimed.

Apparently our out-of-the-band operators never consider the harm they do by breaking this regulation. They subtly undermine the reputation of amateur radio in general, and themselves in particular.

It is clearly time for the amateurs at large to wake to this problem. Take the initiative and stop pampering those hams known to habituate the other outside of the legal limits. Let's stop listening to their snickerings about our "fun." If they find themselves unliked and unwanted by the amateur fraternity, they will likely take the hint and obey the law. Let's do something about this problem, and do it quickly!

Art Samuelson, K2PLM

A PROPHECY

Editor, QST:

The other day I had just finished a contract and decided to go down to 75 meters to do a little snooping. Man, those fellows should complain about the novices. There was a W2 calling "CQ CQ non-phonetic. Class A operators, no Texas Rangers." I asked a fellow to come back to him and the "Class A operator" who was calling the CQ turned him down when the guy used phonetics in his call. I almost chased the receiver off the table! The worst part of it was that the "CQ Class A operator" told him to call a Class B operator instead of him. Boy, does that make me mad! The next time I hear that guy on I am going to see that he gets a pretty sour letter. A guy like this shouldn't have the privilege of being on the air.

Guy B. Young, K8DGO

FROM OUTER SPACE?

Editor, QST:

I was rummaging through some old QST magazines and came across an interesting prophecy on page 31 of the June, 1940 QST: "Some day, we imagine, someone amateur will build a station with a control panel having one switch to select the band he wants and one dial to tune the band—for both transmitter and receiver." Ham radio has certainly come a long way since this prediction, I am wondering what prediction you would venture at this time for the next fifteen years of ham radio?

Robert R. Renfro, Jr., K14AMU

QST for
about this subject and to suggest a new, revised system of reporting and states instances of a.e. signal that was reported by many hams as T9 and he wanted to call the DX station to report that his signal was 575. Good for him!

For many years now I have considered writing ye Ed. about this very subject and to suggest a new, revised system of reporting signals. I hesitated because I know it is against human nature to want to change a thing such as our beloved RST system. However, it seems like the time has come, and I submit the following:

R-1 Unreadable
R-2 Readable with considerable difficulty
R-3 Perfectly readable
S-1 Faint, barely perceptible
S-2 Fair signals
S-3 Strong signals
T-1 Extremely rough or a.e. note; suggest you close down and investigate (or, you have an illegal note).
T-2 Fair note, some a.e. or chirp
T-3 Pure a.e. note.

Regarding the R — after all, what else is there to tell him? Either you can read him or you can’t (with difficulty) and I think he’d be glad to know. As far as S goes, why should there be other figures (for example a figure for extremely strong signals)? As far as T-1 goes, if someone heard my signal in such a condition I should be most happy to have him tell me so.

Do you think we could cut this around a bit before letting it die? At the present time, an RST 599 X is a standard signal, even though it may actually be 347! However, who among us would ever expect to get a 347 signal these days (I’ll bet it would lead to suicide!).

Comments, anyone? — Don Miller, W2MJB

WASTED QSLs

Davenport, Iowa

Editor, QST

This card, mailed from Idaho, is “the most.” Since we have quite a few YL chasers and numerous chit artists in our fraternity, can any one of you perhaps give me the answer? No wonder I am aged prematurely! Seriously, fellows, please develop the habit of addressing your cards with a complete address. Most of this trouble is in the fact that you “roger” or deposit your QSL in the sewer, boys.

That last name is the most important item in the address. All cards showing last names have been successfully delivered. There are times when the mountainous task becomes extremely frustrating. I now have cards from 37 states (including Delaware) in my undeliverable collection.

I therefore respectfully suggest that all clubs place the following placard in their clubrooms:

Example

Call of station (Amateur Radio Station K0AGJ)
Operator (David Davis, opr)
Address (3322 W. 17th St.)

That last name is the most important item in the address. All cards showing last names must be successfully delivered. Last but not least, QSL Booklets are never up to date, in a roving population such as ours. Please remember post cards are never forwarded unless the address is guaranteed by a forwarding post office, and never returned, unless the mailer guarantees return postage. The next time you don’t receive an answer to your card, don’t blame the contact; how can I reply if I never received your card?

— David Davis, K0AGJ

MEMBERSHIP CHANGES OF ADDRESS

Four week’s notice is required to effect change of address. When notifying, please give old as well as new address. Advise promptly so that you will receive every issue of QST without interruption.
Worked-All-States Certifications. Alaska’s statehood, accomplished by Presidential proclamation, became effective January 3, 1959. Submissions for worked all states now require inclusion of an Alaskan confirmation, this representing a QSO accomplished on or after that date. See September QST, page 78, for a detailed discussion concerning Alaska and WAS. (If you made a 48-state WAS before January 3 you have until July 4 to get your WAS cards in to ARRL.)

Novice Roundup. Dedicated to the interest of the Novice in testing his station on the air and building his coverage and operating ability, the annual ARRL operating activity known as the Roundup calls for a list of your QSOs made between January 31 and February 15. The “NR” starts at six p.m. local time. One and all are invited. See the full announcement of the activity on page 77, January QST. Here’s an activity that calls for you to put in just a little time each day. The general call is OQ NR. It’s a chance for all amateurs to welcome newcomers into ARRL activities. The “NR” always finds some interested old-timers working near, but outside, the Novice sub-bands to give them contacts, in addition to those made by Novices with each other.

Novice participants and others merely make a list of your QSOs and ARRL sections with which were made. Let’s look at recurrent scheduled contacts. Where stations have a schedule, which one will call first likewise may be made a definite procedure: otherwise a period of poor conditions can result in both operators wasting considerable time in calling each other simultaneously to no avail. Two OUs who worked out this problem over the air reasoned that the station customarily heard best should call first for a predetermined number of minutes. The operators then alternate, calling each other in a known time sequence. This permits the operator whose turn is second to zero his frequency exactly to that of the calling station so there is maximum chance of his being heard. It is incumbent on the station making the first call to look over the band carefully to pick the spot most free of QRM. Advance indication of the order of frequencies he is likely to use is necessary so everything goes off smoothly, of course.

Slow-Speed Nets. Slow code speed or modest code and procedure ability should not keep you out of traffic work. Every outstanding operator had to build up his prestige and proficiency by actual on the air work. Such net operation can be most enjoyable. The know-how and pleasure in exchanging intelligence through messages with amateurs beyond those we normally work directly is the heritage of every American amateur. You never know when a flood or hurricane or other type of disaster will challenge your ability to be an accomplished communicator. Since you will want to be able to rise to such a challenge in the field of possible public service work, we think that by all means you will want to review sections II-VI-VII of our Operating an Amateur Radio Station booklet (sent ARRL members...
on request) and join in some group traffic activity.

The foremost section leaders across the country are ready to organize low-speed nets, where these are not already functioning, if enough of their individual active amateurs will drop a line, indicating interest in such section nets. We're pleased to mention at this point quite a number of slow-speed traffic nets that are now working in different sections. All amateurs in those parts of the nation who would like to get into traffic work are invited to report into these nets (QNL). The registration of nets was not quite complete for the new season as this list was made up. Be sure to drop a line to your SCM for slow-speed net information or to express your interest if a group can be organized, if your area is not covered herein.

| County Training Net | Sun | 0900 | W1RFJ |
| Emporium Slow Speed Net | Daily | 0800 | EST | K2QJL |
| Georgia Novice Net | Tu-Th-Sat | 1730 | CST | K4HMS |
| Lakeland (NY) Slow Speed Net | Daily | 1200 | EST | K2UTV |
| Net, Slow Speed Net | Daily | 1730 | CST | W8MAO |
| Net (NSN) | M thru Fri | 1830 | EST | K2ZHJ |
| NW Slow Speed Net (NSN) | M thru Sat | 2100 | EST | W7IEU |
| Novice Emergency Net (NEW) | Sun | 1615 | CST | W4SBB |
| Novice Hurricanes Net (NEN) | Sun | 0730 | CST | W4HUF |
| Ohio Slow Speed Net | M thru Sat | 1830 | EST | K5DDC |
| Okla. Slow Speed Net (NSN) | Sun | 0730 | CST | W4XRM |
| Sundown Novice Net | Sat-Sun | 1800 | CST | K6KMN |
| Virginia Slow Speed Net (VSN) | M thru Fri | 1830 | EST | W1LW |
| Wise, Slow Speed Net (W3SN) | M thru Fri | 1830 | EST | W8SAU |
| Ky. Slow Speed Net (KEN) | M thru Sat | 1700 | CST | W4QJ |
| W. Mass. Novice Net (WMN) | Tu-Th-Sat | 1830 | EST | W4XRM |

What any net lacks in speed it can make up for by high efficiency and good procedure. Accuracy and reliability are the prime aims in accepting and handling any message at any time. The rate of sending on either a phone or a c.w. net must always be adjusted to the capability for writing-down words accurately. Good speed and a steady speed, avoiding the necessity for asking for fills, and reasonable rate of sending, never fails to accomplish the greatest amount of transferred intelligence between operators in the very minimum of time. Good net procedure and order make for net efficiency; operator judgment is even more important than intrinsic code speed. We shall welcome all reports on the organization of slow-speed traffic nets, and will be happy to furnish forms for Net Registration of such groups.

ARRL's 25th Annual DX Competition. Among many tasks completed in December was the annual mailing of promotional invitations to other national societies and some of the rare DX, to get into the 25th ARRL DX Competition. DXers everywhere will follow the contest dates and timetables for this annual high-light. Two-way international amateur work is concentrated on those designated February-March dates. There are really two separate contests. Full rules appear in January QST. The phone section scores include all contacts in the February 8-8 and March 8-8 periods; the c.w. section similarly may include all successful DX exchanges February 20-22 and March 20-22. Many overseas amateurs will be looking for new states in the contest to advance their WAS standings. Luck and DXI.

--- P.E.H.

**BRASS POUNDERS LEAGUE**

Winners of BPL Certificates for November traffic:

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**More-Than-One-Operator Stations**

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**More-Than-One-Operator Stations**

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**February 1959**
One thing that seems to be missing from the issues of QST and literature made available to ECs and AREC members, judging from the tenor of correspondence we have received sporadically over the past few months, is some specific information on how to keep up interest in the local AREC organization and some suggestions for activities which might accomplish this. We can read something of this some years ago (May 84, p. 78). Since then as before then we have been making suggestions by implication right along in QST.

In May '54 we suggested a number of activities, including picnics, banquets, dances, regular net drills, the Field Day, the simulated Emergency Test, in-person meetings with speakers, participation in civic functions, prizes or other inducements to attend drills, a “production line” for equipment needed, hidden-transmitter hunts, press and radio-TV publicity, and intra-member competitions. In addition to all that, we suggested you read the rest of this column with open eyes and open mind each month. Why? Because it contains innumerable other ideas for you to ponder and possibly apply to your own group.

For example, in December QST one AREC group provided communication for a boat race, another for a trout-fishing derby, another assisted police with Labor Day traffic. Each year a number of AREC groups offer their services to police departments to prevent vandalism on Halloween, also in December QST are accounts of RACES activities under the RACES subhead. Similar activities are described each month in whatever space is left over after account of actual emergency operation.

So read, brother! Read! Don’t gloss over these items as being about someone else’s activities and therefore of no interest to you. They aren’t printed just for the glorification of the group that wrote them. They are printed for you, and you and you! In many cases, the circumstances may not apply to you, but in some of them you will find that you, too, can take part in such an activity. Sure, we can suggest that you help your police department with Halloween patrols, that you investigate upcoming public events for possible use of your facilities, that you organize RACES and tie in closely with your c.d. — and, from time to time, we have done so. But all this other material we put into this column is intended to be suggestive as well. Read it, digest it, ponder it — then act on it!

On November 18 and November 25 the North Dakota Emergency net was called into session to handle telephone and railroad company traffic during severe blizzards and snow storms. An emergency station was set up at Car-
These four young fellows put on an amateur radio display at the Bloomsburg (Pa.) Fair in September, operating the rig ten hours per day on 160 thru 6 meters. The equipment, consisting of 412 feet of antennas, 300 feet of lead-in and $2,000 worth of gear, was all furnished and installed by the boys. Left to right are WS3EPL (EC), GZC, EPJ and ATB.

while mobiles scattered to strategic locations to be able to pick up phoned-in pledges quickly. Control station used a ground plane antenna on 147.3 Mc. 20 feet above the top of the newspaper office building.

Cuyahoga County (Ohio) AEC's "Project 45" was participation in the 1958 fund drive for Muscular Dystrophy. Twelve mobiles took part, a control station was established at dystrophy headquarters and a c.e. station was activated at central police headquarters. Many communities were handled, dispatching the mobiles and otherwise handling fund drive activities. The National Guard rode "shot gun" for the group, since large amounts of money were often picked up and delivered. Eighteen AEC members took part. — W8LBU, EC Cuyahoga County, Ohio.


RACES News

OCMD has announced that 14,000 copies of the USCDARA's RACES Operators Manual (SOP) have been distributed and that requests for 3000 more are now on hand. Since they are completely out of copies at this writing, a new, slightly revised printing is being made, and by the time you read this it should be available. It will come down to OCMD regional offices and thence to state civil defense offices, from which it can be obtained for RACES groups. The best way to have your local radio officer or c.o. director request copies from the state office, in whatever quantity is required.

This procedural manual, although devised by the United States Civil Defense Amateur Radio Alliance for use by its member states, has the official OCMD stamp of approval and is printed by the Government Printing Office. It is used extensively throughout the United States and possessions.

In a successful c.e. evacuation in Georgia, 510 pupils were evacuated from Peach County school to reception centers in Douglas County. Six RACES mobiles and 3 fixed stations were on the job to provide communications. The operation was directed by the Unadilla c.o. director and was monitored by Region 3 OCMD headquarters.

Dixon, Calif., conducted an unusual c.e. evacuation on Dec. 6-7 which received national publicity. The evacuation started in Esparto and wound up in Chico. Amateurs maintained communications during the convoying of hundreds of vehicles over the route. Radio contact commenced at 0800 when the first section left Esparto and was secured at 1435 after the last section arrived at Chico. Stations were manned at c.e. headquarters at Chico, at the first dispersal point in Chico, at the starting point in Esparto and at Dixon. Two stations, one at Stockton and one at Sacramento, served as reays when evacuees could not make contact direct to Chico. In addition, there were fourteen 75-meter mobiles traveling with the various evacuees, and an undisclosed number of 2 and 6 meter mobiles. Eighty-meter c.e. was also used in the operation. This was a big operation in which 500 people took part and 104 ears were involved. — W0CJU, ECM Bear Boat Station.

The Seneca Radio Club of Tiffin, Ohio, was active during the December 5-7 week end during a c.e. alert. Setting up operations about noon on Friday in the hall room in Hall basement, everything was in smooth operation when sealed orders were opened at 1900. W8WAB operated club station W8ID handling messages to W8JCL in Tiffin on two meters; these were then relayed to Cleveland and Akron on 27 meter s.s.b. and telephoned to Chagrin Falls state c.e. Area 5 station, with which radio contact could not be made. Three mobiles also assisted in the Tiffin alert. W8ID was again on the air the following day at 1000 when direct contact was made with W8JCL at Chagrin Falls on 160 meters. On Sunday two mobiles did convey duty from Fostoria to Tiffin, with W8ID again acting as home station.

North Carolina RACES operators and operators received a fine tribute from Governor Hodges on December 7. The governor pointed out that preparations for emergency communication in the state have been particularly offenee, director of the state c.e. headquarters the survival plan could not be carried out without RACES. "No group of people," he said, "is more important to the survival of this state." Fifty counties in North Carolina are now covered by the RACES network.

Maine News: Acting SCM W9QJA reports that state c.e. headquarters has a mobile unit equipped for communications on all state RACES frequencies plus a link to state police headquarters. York County and Casco also have mobile units and Penobscot County is installing equipment for all frequencies and will be ready soon. The City of Gardiner now has a Collins transmitter and IRO receiver with supplementary high frequency gear.

TRAFFIC TOPICS

The other day we were called upon to go through our file of Traffic Net Bulletins — purpose, to reduce the file to a reasonable size to save much-needed filing space in the ARRL-CD filing cabinets. It took us longer than it should have, because we kept stopping to read the various bulletins. Of course we had already read them when they came in, but it's a subject we never tire of.

We think the average amateur — even the average traffic handler — would be surprised to see the number of such bulletins that are received here and the extensiveness of some of them. Some of them are on a subscription basis, but none of them is commercial — that is, the subscription price is to cover (some of) the cost of producing them. Most of them are supported by net members or by the owner himself. We think it is appropriate to mention a few of the more notable traffic bulletins that cross our desk and to suggest to all concerned that in order to get the full amateur traffic picture you ought to have access to one or another of the traffic bulletins which covers activities in your neck of the woods, to supplement the traffic reading we are able to give you in QST.

Probably the most outstanding (of course, it's a matter of opinion) is Vic Gish's (W7FTX) Pacific Area Net News. Vic has been publishing this for a number of years, and it is easy to see that an enormous amount of work goes into it. The October issue, for example, contains 20 printed pages on 17 subjects, including a well-written and well-edited net reports, comments from individuals and a supplement which contains rosters of four nets, a TCC flow chart, a summary of Sixth Army MARS Nets, a picture of W6PLG at his operating position, and copies of recent MARS and ARRL bulletins. Besides covering the Pacific area, PAC also
includes reports and comments from amateur traffic men and nets all over the country.

Another outstanding traffic bulletin is W8UOUL's Midwest Relay. This is an outgrowth of Mert Meade's W8KXI-NYT, deceased) Midwest Cita, and deals mostly with traffic matters in the midwestern area. The September issue of this effort contained 15 pages on 8 sheets and makes good reading for any traffic man.

There is no eastern counterpart to these two fine bulletins. There is a very closest thing in radio is W2GYN's Watch Words, which handles the bulletins of the Traffic Hounds Morning Watch, a net of savvy operators that hangs out on 40 meters in the early morning. This is an outgrowth of W1A's Morning Watch Bulletin, which Err himself edited until government duty called him to foreign climes. But there are many more bulletins in our files. Just in browsing through them we come across surprisingly sumptuous bulletins of local and regional nets such as the Mission Traffic Net (next month), the Virginia Traffic Net, (W4KXJ), Eastern Penna. News and Views (W3PJD), W4QYU's UTL Bulletin, The Virginia Ham (W4KX), the KYV/KPN Bulletin (Ky., W9QGB's IFN News and The Oregon Netter, etc. Remember, one day our hams may be offered you, one day, no doubt, and we'll bear about it. Many SCMUs, RMs and PAMS, not to mention SECs and ECs, get out bulletins to their participants to enhance net participation and performance. Some, like Florida Strip, are not entirely devoted to nets, but take other amateur activities into account as well. Others are on a more specialized theme. Well, we don't intend to slight anyone. The point we are trying to make is that putting out a bulletin is the thing to do. It isn't easy, and you have to find someone willing to do most of the work, but it cannot fail to bind more closely together the members of a net that is already successful, or to bring added participation and success to a net whose fortunes are ailing. The biggest secret is to find an editor who can grout an interesting line of patter. Such amateurs aren't available just everywhere, and so some of the bulletins are just dry statistics of interest only to those who are statistical-minded. Even this is better than no bulletin at all. We are for more, bigger and more interesting net bulletins. If your net doesn't already have one, give some consideration to getting one started. It makes a good supplement to net information in this column and in your SCM's monthly report. It frees you from some of the editorial shibboleths we have to observe in QBT. And in your own net bulletin we have to observe in QBT. And in your own net bulletin you can rant and rave all you want about FCC, ARRL, QST, or anything else. Your net bulletin is your castle. We frequently use them for ideas to be developed in QST, sometime quote from them directly, and we are always interested, even if we don't often get around to saying so.

Net Reports. Early Bird Transcon net reports 30 sessions, 813 messages. Hudson Traffic Net reports 26 sessions, 219 check-ins, 253 messages. Transcontinental Phone Net reports: 1st Call Area, 1130; 2nd Call Area, 1440; 4th, 5th, 9th, 10th Call Areas, 376; total, 3275. Northwest Oklahoma Net reports 30 sessions, 971 check-ins, 291 messages. Interstate Side Band net reports 30 sessions, 1860 check-ins, 912 messages. The 1200 traffic net reports 38 sessions, 496 messages, 1296 check-ins. National Traffic System. The net directory that just came out has 114 nets registered as being a part of NTS. Of these, 39 meet daily, 31 meet six days per week, 19 meet five days per week and 22 meet less than five days per week. Of the latter, a majority can be discounted as being one-day-per-week nets which do not really add to the system's daily coverage. There are still some sections that are not represented on NTS by a participating net, while some sections have several nets which make the connection. Those which appear to have no NTS net are Miss. La., South Texas, New Mexico, Arizona, Montana, Idaho, Nevada, Utah, Alberta, Saskatchewan, Manitoba, Hawaii, Alaska, West Indies, Canal Zone and, of course, Yukon.

Of the 39 nets which meet daily, 30 are section nets. This is a surprisingly large percentage. Although it is not perhaps a majority, we note that eight of the nets at regional and area level consist of a clear majority of such nets. Therefore, we have suggested that NTS be put officially on a daily basis starting as early in 1959 as this is feasible. This does not mean that all nets will henceforth be required (we just don't use that word) to meet every day, but that daily operation will become the rule rather than the exception and that those which do not do so will be considered substandard rather than standard NTS nets. Actually, there is no reason why nets should not be able to meet on Saturdays and Sundays. This will allay any doubts that may be present in the minds of those operating clubs who can manage only those times. And that's one of the things NTS is for—to bring in the traffic man who cannot be active more than once or twice per week.

November reports:

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<tr>
<th>Net</th>
<th>Sessions</th>
<th>Traffic: Rate</th>
<th>Average</th>
<th>Representation (%)</th>
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<td>72.2</td>
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ECN 19 62 .106 3.2 75.7
TWN 20 239 .256 12.0 64.0
Sections* 973 3037 .... 8.3 ....
TCC Eastern 92 275
TCC Central 101 1039
TCC Pacific 100 1148

Summary 1573 21396 EAN 12.0 CAN/PAN
Record 1430 15027 .... 12.0 100.0

Regional net representation based on one session per day. Others are based to two or more daily sessions.

2 Section nets reporting: LIL (LIL), CN & CPN (Conn.);
TLCN (Iowa); SCN (Colift); BNIN (Md.); S. Dak. 40 phone, S. Dak. 70 phone & S. Dak. CW; WSSN & WN (Wla.);
WWRF (Florida); GNB & MN (Ga.); KY & KY (Ky.); SCN (S. C.); NNJ (N. J.); QKS (Kans.); KSN, KPN, MKNP & KYN (Ky.); GN, FAITN & FN (Fla.); N. W. Fl.; WVN (W. Va.); VN (Va.); MJN, MISP, Noon, MISP Evening & MSN (Mich.); CWXN, LNN & CED, General. Phone (Conn.).

3 TCC Functions reported, not counted as net sessions.

We are pleased to be able to report that effective Dec. 1, the recently-organized Twelfth Regional Net went on a daily basis. This makes nine of our fifteen regional-area nets operating daily. No doubt others will be coming up to full schedule as time goes on. For TWN in particular it is quite an accomplishment after its two-year start. Our compliments to the gang in this new mountain-state region, and may their accomplishments be permanent ones to show others in areas of much greater population density what can be done with a little determination.

T3UE is still having troubles getting Pennsylvania into the 3RN act, but the net is being bolstered by activities of a new RM in E. Pa. and return of W3PZW to MDD. A 4RN net has been awarded to K4TBR. K8HRL sends us a copy of the December RNN Bulletin and also suggestion for a NCS-ing form for regional nets. Not many comments this month. The net managers seldom say anything unless it is to complain, so this, we think, is good.

Transcontinental Corps. Things are going well, generally speaking. We have some holes developing in the Eastern Area as one former "talwart finds it necessary to drop his activities. We have some holes developing in the Eastern Area as one former "talwart finds it necessary to drop his activities. We are very much interested in finding anybody to take over the Central Area TA, and may need volunteers in others in areas of much greater population density what can their accomplishments be permanent ones to show others in areas of much greater population density what can be done with a little determination.

Valid petitions nominating a single candidate as Section Manager were filed by members in the following sections, completing their election in accordance with regular League policy, each term of office starting on the date given.

ELECTION RESULTS
Valid petitions nominating a single candidate as Section Manager were filed by members in the following sections, completing their election in accordance with regular League policy, each term of office starting on the date given.

WIAW OPERATING NOTE
The full WIAW operating schedule appeared on page 89 of November 1958 QST and on page 94 of last month's issue. Refer to those for details if you wish to work or visit the Headquarters station or copy the bulletins.

CODE PROFICIENCY PROGRAM
Twice each month special transmissions are made to examine you to qualify for the ARRL Code Proficiency Certificate. The next qualifying run from WIAW will be made on Feb. 19 at 2130 Eastern Standard Time. Idents using WIAW will be broadcast simultaneously by automatic transmitters on 3555, 7060, 14,100, 21,075, 28,080, 50,900 and 145,600 kc.

The next qualifying run from W3ZOW will only be transmitted on Feb. 4 at 2100 PST on 3555 and 7125 kc.

Any person can apply. Neither ARRL membership nor 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 receive at least one of the six speed transmitted, 10 through 35 w.p.m., you will receive a certificate.
ARRL invites every amateur to try his hand at frequency measuring when W1AW transmits signals for this purpose starting at 9:30 p.m. EST (6:30 p.m. PST) Friday, February 13. The signals will consist of dashes interspersed with station identification. These will follow a general message sent to help listeners locate the signals before the preamble-exchanges and claimed score should be mailed to Merrill L. Swan, W6AEE, 372 Warren Way, Arcadia, California. For March 13 through 15, W6BP gives an advance word of the 3rd Annual Narrow-Shift RTTY Party. Purpose is to advance RTTY technique by a peaceful operating session of those who can "tinker." If you work RTTY get in this test without any special arrangements or ending time. Name your own hours starting Friday afternoon. A QSO-list of those contacts you made abandoned 500-cycle f.s.k. shift and using n.f.s.k. of 200 cycles or less should be sent to the organizers, so results can be reported. In the event one a shift of 170 cycles is preferred. Receiving a regular RT converter to "straddle" the center of the usual tuning range is possible. However, for maximum benefits using the narrow shift, you should build or adjust your receiving setup to work in this narrower frequency range, putting the improved selectivity to work for you. Less bandwidth should mean less interference, and closer to the same fades on mark and space; the test is dedicated to the ability to minimize interference successfully in our shared bands.

HIGH CLAIMED SCORES 1958 A.R.R.L. SWEETSTAKES

While you SSers breathlessly await the official results of last November's contest, we present an assortment of the highest tallies which includes all valid c.w. entries above 100,000 and phones over 100,000 points. Figures after each call are claimed score, number of QSOs, and different sections worked in that order. The power level is indicated by letters; A is 150 watts or less, B higher.

C.W.


K5EVR.... 229,314-1012-73-A K7EDM.... 115,815-550-70-A W0IOW.... 188,595-900-66-A W0ML.... 131,715-546-70-A KM6D.... 179,905-821-73-A W0VGA.... 122,692-584-64-A W5YAL.... 174,625-809-72-A W1JTL.... 121,248-722-74-A WDQK.... 170,642-779-73-A W3ML.... 108,216-503-73-A W7BSS.... 143,145-695-73-A W3CRW.... 107,867-803-73-A K9ALP.... 142,350-690-73-A W0FRH.... 107,529-738-73-B W7ZCA.... 138,900-660-70-A W2HRH.... 106,122-516-69-A K5KHO.... 106,940-740-73-A W7TWT.... 105,810-784-B W0AYW/8.... 105,735-506-70-A W3VXO/3.... 122,057-603-73-A K5ERY.... 105,570-521-68-A K5RZS.... 122,931-625-67-A W0KVW.... 103,835-535-65-A W5MYL.... 121,736-809-72-A W1BHH.... 103,248-722-74-A WA5JR.... 121,416-625-72-A W1TKE.... 103,194-545-63-A W3CYY.... 121,057-603-73-A K9CH.... 102,000-492-70-A K5ADDO.... 122,480-588-70-A KEKIL.... 102,108-473-72-A K5EXO.... 120,048-874-72-A K5QI.... 100,020-610-72-A W0FHM.... 120,360-550-88-A W7WIT.... 99,262-718-67-B K9ATZ.... 116,670-573-73-A

1 Multiple-operator station. 2 W1WP, opr. QST will carry a full report on the 25th Sweepstakes when the checking is completed. Patience, please.
TRAINING AIDS NOTE

Only affiliated clubs are eligible to obtain ARRL Training Aids. We certainly wish we could grant all requests, but for the present there is too wide a field to embrace. At this writing there are over 1,000 active clubs affiliated with the League and they're really keeping the TA desk humming! If your group is a bona fide amateur radio club desiring to use the material mentioned here, there is but one course of action open to you: apply for affiliation! It is a simple matter to accomplish. Complete information is available on request from the Communications Department.

Summary of Available Material: At this time to time we have listed additions to available material in QST. We will continue to do this. However, a complete and up-to-date copy of available aids in mimeo form is yours for the asking. Meanwhile, let's summarize what is available:

- 38 film titles (16 mm. only)
- 14 film strips (35 mm.)
- 2 slide collections
- 2 tape talks on v.h.f.
- 1 tape-talk by Dr. Lee De Forest
- 12 quizzes with answers and discussion

List of up-to-date material, some with reviews

The above material, of course, has to be scheduled in turn to take care of the current heavy demand.

DX CENTURY CLUB AWARDS

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Charges? The club pays only for handling and shipping of the material. Rules for use of Training Aids are available upon request, and must be carefully read and adhered to by all affiliated clubs.

* Dr. De Forest recounts many of his early experiences in radio and thanks amateurs for their thoughtfulness on remembering his birthday (p. 10, last December QST).

CONTEST CORRIGENDUM: 1958 DX Competition (last October QST). From K2DQ's call, 23.97 points. N.J. c.w., was mistakenly shown as K2DQ. The Georgia section heading was dropped from the c.w. tabulation; W4BFR, 64.170, should have been indicated as Georgia winner and the nine K4/W4 calls that follow are also Georgia, not Florida c.w. entries. (2) June V.H.F. Party Summary (last October QST) — The nine-operator entry of K6GJ/A9, 840 points, 10 multiplier, 84 QSOs on 50 Mc. should have appeared in the Wisconsin listing. (3) 1958 Field Day Results (December, 1958, QST) — Score data on W5LVD/V of Amateur Radio Association was correct but should have appeared in the one rather than the seven-transmitter Class A tabulation. Omitted was the Class 1A score of W0FEN/8, nonclub group, 218 contacts, B power, 8 participants, 1458 points.

February 1959
• All operating amateurs are invited to report to the SCM on the first of each month, covering station activities for the preceding month. Radio Club news is also desired by SCMs for inclusion in these columns. The addresses of all SCMs will be found on page 6.

ATLANTIC DIVISION

EASTERN PENNSYLVANIA—SCM, Richard B. Metzler, W3JNQ—The SCM has been laboring under optimal difficulties; expected improvement in conditions should permit your reports to be combined for full activities information in QST next month.


FOURTH DELAWARE QSO PARTY February 14 and 15

The Delaware Amateur Radio Club of Wilmington announces its 4th 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-DEL certificate. Here are the details:

(1) Time: 30-hour period from 6 P.M. EST Saturday February 14 to midnight EST Sunday, February 15

(2) No time limit and no power restrictions.

(3) Scoring: Delaware stations: 1 point per contact and double total by the number of states, Canadian provinces and foreign countries worked during the contest period. Outside stations: 5 points for each Delaware station worked and double total by the number of counties in Delaware worked during the contest period.

(4) Credit for contests with the same station on another band will be given.

(5) A certificate will be awarded to the highest-scoring station in each state, U. S. Possession, Canadian Province and foreign country (with 3 or more contacts) and to the highest-scoring station in each Delaware county. In addition, a W-DEL certificate will be sent to any station working all 3 Delaware counties. Party logs showing required data will be accepted in lieu of QSLs.

(6) Watch 3530, 3700, 5095, 7430, 7750, 11,000, 14,250, 21,100, 21,400, 28,100 and 50,000 Mc. for contest stations.

(7) General Call: "CQ DEL." Delaware c.w. stations should identify themselves by signing de DEL (call) K. Phones say, "Delaware calling."

(8) Contact information required: Delaware c.w. stations should identify themselves by signing de DEL (call) K. Phones say, "Delaware calling."

(9) Logs and scores must be postmarked not later than March 1, 1959 and should be sent to the Delaware Amateur Radio Club, c/o Gordon R. Rugg, W3TXY, 611 W. 27th St., Wilmington 2, Delaware.
The first issue of this series, published in the February, 1955, issue of QST, was devoted to a statement of our aims in publishing this series. Perhaps it is time to restate these policies.

1. *This is your page.* It is our goal to publish articles of general interest, technical information, and other news of general interest to hams.

2. *We will* welcome articles which fall into this category, from amateurs outside the Hallicrafters organization. If you have a topic on some specific aspect of amateur radio which you feel needs airing, why not submit your article to us? You can be sure that it will receive serious consideration.

3. *Perhaps* there are subjects which you would like to see discussed in this space. If you will advise us of your wishes in this respect, an attempt will be made to provide material which follows your suggestions.

4. *If you know* of an individual, or an organization, which you feel deserves recognition because of a signal contribution to the advancement of amateur radio, such recognition is available here . . . just give us the details.

*Bear in mind — we have no way of knowing what you want — unless you tell us. So, from here on out think of this as your page, with the facilities of our entire company at your disposal.*

Bebelinger Jr.  W. J. Haslag  W9AC  for hallicrafters
Yes, dollar-for-dollar and feature-for-feature you'll get more of everything in a Viking transmitter... that's why Viking transmitters outsell all others! Write for your free Viking Amateur Catalog and you'll soon see why your best transmitter buy is a Viking!

"RANGER" TRANSMITTER/EXCITER
This popular, superbly engineered transmitter also serves as an RF/audio exciter for high power equipment. 75 watts CW or 65 watts phone input. Built-in VFO or crystal control—instant bandswitching 160 through 10. 6146 final amplifier—wide range pi-network output. Timed sequence keying. TVI suppressed. With tubes, less crystals.

Cat. No. Amateur Net
240-161-1. Kit $229.50
240-161-2. Wired and tested $329.50

"VALIANT" TRANSMITTER
Here's effective power, wide flexibility, and many unique operating features combined in a compact desk-top transmitter! 275 watts input CW and SSB (P.E.P. with auxiliary SSB exciter) and 200 watts phone. Bandswitching 160 through 10. Built-in VFO or crystal control. Final amplifier utilizes three 6146 tubes in parallel—wide range pi-network output. With tubes, less crystals.

Cat. No. Amateur Net
240-104-1. Kit $349.50
240-104-2. Wired and tested $439.50

"FIVE HUNDRED" TRANSMITTER
More than one-half kilowatt of power and operating convenience! 600 watts CW input... 500 watts phone and SSB (P.E.P. with auxiliary SSB exciter)—instant bandswitching 80 through 10 meters! All exciter stages ganged to VFO tuning. High gain push-to-talk audio system. Highly stable, built-in VFO or crystal control. Wide range pi-network output. Low level audio clipping—effectively TVI suppressed. With tubes, less crystals.

Cat. No. Amateur Net
240-500-1. Kit $749.50
240-500-2. Wired $949.50

E. F. JOHNSON COMPANY
2802 SECOND AVENUE S.W.
This power-packed Class B linear amplifier is rated 500 watts P.E.P. input with aux. SSB exciter—500 watts CW and 200 watts AM! Continuous coverage 3.5 to 30 mc. May be driven by the Viking “Ranger”, “Pacemaker” or other unit of comparable output. Drive requirements: 5 to 35 watts. Employs two 811A triodes in parallel—wide range pi-network. TVI suppressed. With tubes.

Cat. No. Amateur Net
240-352-1...Kit $244.50
240-352-2...Wired $289.50

Here’s real power and peak performance in a compact desk-top amplifier. Rated 2000 watts P.E.P.* input SSB; 1000 watts CW; 800 watts AM linear! Continuous coverage 3.5 to 30 mc.—instant band-switching. May be driven by the “Ranger”, “Pacemaker” or other unit of comparable output. Two 4-400A tetrodes in parallel, bridge neutralized. Wide range pi-network output. With tubes.

Cat. No. Amateur Net
240-353-1...Kit $524.50
240-353-2...Wired $589.50

Here’s the most exciting unit you’ve ever seen… the unit that puts the whole world at your fingertips! Brilliantly designed and engineered, the Viking “Kilowatt” is the only power amplifier available which will deliver full 2000 watts SSB* input and 1000 watts CW and AM! Continuous coverage 3.5 to 30 mc. Excitation requirements: 30 watts RF and 10 watts audio for AM; 10 watts peak for SSB.

Cat. No. 240-1000...Wired and tested $1595.00 Amateur Net
Cat. No. 251-101-1...Matching top, back and pedestal...FOB Corry, Pa. $132.00 Amateur Net

*The FCC permits a maximum of one kilowatt average power input for the amateur service, in SSB operation under normal conditions this results in peak envelope power inputs of 2000 watts or more depending upon individual voice characteristics.

An outstanding power bargain when used as a transmitter or exciter! 90 watts SSB P.E.P. and CW input…35 watts AM. Highly stable built-in VFO. Instant band-switching 80, 40, 20, 15 and 10 meters. VOX and anti-trip circuits. Wide range pi-network output. Effectively TVI suppressed. With tubes and crystals.

Cat. No. 240-301-2...Wired $495.00 Amateur Net

WASECA, MINNESOTA

Viking

FIRST CHOICE AMONG THE NATION’S AMATEURS
All of these licensed radio amateurs make important contributions to the Heath line of fine ham kits. In a sense, they are your personal representatives within the company, because their design ideas and performance preferences reflect not only their own "on-the-air" experiences, but those of the amateur fraternity with which they are in constant contact. With this kind of representation in Benton Harbor, you can continue to rely on high-performance Heathkit amateur radio equipment designed by hams, for hams!

HEATH hams work to bring you

HEATHKIT 50-WATT CW TRANSMITTER KIT

MODEL DX-20
$35.95

If high efficiency at low cost in a CW transmitter interests you, you should be using a DX-20! It employs a single 6DQ5A tube in the final Amplifier stage for plate power input of 50 watts. The oscillator stage is a 6CL6, and the rectifier is a 5U4GB. Single-knob band-switching is featured to cover 80, 40, 20, 15, 11 and 10 meters, and a pi network output circuit matches antenna impedances between 50 and 1000 ohms to reduce harmonic output. Designed for the novice as well as the advanced class CW operator. The transmitter is actually fun to build, even for a beginner, with complete step-by-step instructions and pictorial diagrams. All the parts are top-quality and well rated for their application. "Potted" transformers, copper-plated chassis, and ceramic switch insulation are typical. Mechanical and electrical construction is such that TVI problems are minimized. If you desire a good clean CW signal, this is the transmitter for you! Shpg. Wt. 19 lbs.
HEATHKIT "APACHE" HAM TRANSMITTER KIT

• Newly Designed VFO—Provision For S.S.B. Adapter
• Modern Styling—Rotating Slide Rule Dial

MODEL
TX-1 $229.50

Shipped motor freight unless otherwise specified. $50.00 deposit required on C.O.D. orders.

Fresh out of the Heath Company laboratories, the brand-new "Apache" model TX-1 Ham Transmitter features modern styling and is designed as a handsome companion to the also-new Heathkit "Mohawk" receiver. The "Apache" is a high quality transmitter operating with 150 watt phone input and 180 watt CW input. In addition to CW and phone operation, the "Apache" features built-in switch-selected circuitry providing for single-sideband transmission through the use of a plug-in single-sideband adapter. These Heathkit adapters will be available in the near future. A compact, stable and completely redesigned VFO provides low drift frequency control necessary for single-sideband transmission. An easy-to-read slide rule type illuminated rotating VFO dial with vernier tuning provides ample bandspread and precise frequency setting. Simple band-switching control allows flip-of-the-wrist selection of the amateur bands on 80, 40, 20, 15 and 10 meters (11 M with crystal control). The "Apache" features adjustable low level speech clipping and a low distortion modulator stage employing two of the new 6CA7/EL-34 tubes in push-pull class AB operation. Time sequence keying is provided for "chirpless" break-in CW operation.

The final amplifier is completely enclosed in a perforated aluminum shielding for greater TVI protection and transmitter stability. Cabinet comes completely preassembled with top hatch for convenient access without taking chassis out of cabinet. Die-cast aluminum knobs and front panel escutcheons add to the attractive styling of the transmitter. Pi network output coupling matches antenna impedances between 50 and 72 ohms. Incorporates all the refinements necessary with many "plus" features for effective and dependable communications. Shpg. Wt. 115 lbs.

HEATHKIT "MOHAWK" HAM RECEIVER KIT

• All Critical Circuits Prewired and Aligned
• Crystal Controlled Oscillators for Drift-Free Reception

MODEL
RX-1 $274.95

Shipped motor freight unless otherwise specified. $50.00 deposit required on C.O.D. orders.

Outstanding results can be expected with the new "Mohawk" receiver which is designed to combine all the necessary functions required in a high quality communications receiver. A perfect companion for the Heathkit "Apache" transmitter, the "Mohawk" features the same wide-band slide rule type vernier tuning and covers all of the amateur bands from 160 through 10 meters on seven bands with an extra band calibrated to cover 6 and 2 meters using a converter. External receiver powered, accommodations are available for these converters which will be available in Heathkits soon. The "Mohawk" is specially designed for single-sideband reception with crystal controlled oscillators for upper and lower sideband selection. A completely preassembled, wired and aligned front end assures ease of assembly. All critical wiring is done for you insuring top performance. This 15-tube receiver features double conversion with IF's at 1662 kc and 50 kc. Five selectivity positions from 5 kc to 500 CPS. A bridged T-notch filter is employed for maximum heterodyne rejection. Complete accuracy is obtained with the use of a built-in 100 kc crystal calibrator and the set features 10 db signal-to-noise ratio at less than 1 microvolt input. S-meter and many other fine features built-in for top-notch signal reception. Shpg. Wt. 90 lbs.
HEATHKIT PHONE & CW TRANSMITTER KIT

The DX-40 incorporates the same high quality and stability as the DX-100, but is a lower powered rig for crystal operation, or for use with an external VFO. Plate power input is 75 watts on CW, permitting the novice to utilize maximum power. An efficient, control-carrier modulator for phone operation peaks up to 60-watts, so that the rig has tremendous appeal to the general class operator also. Single-knob switching covers 80, 40, 20, 15, 11 and 10 meters. Pi network output coupling makes for easy antenna loading, and pi network interstage coupling between the buffer and final amplifier improves stability and attenuates harmonics. A line filter is incorporated for power line isolation. The efficient oscillator and buffer circuits provide adequate drive to the 6L46 final amplifier from 80 to 10 meters, even with an 80-meter crystal. A drive control adjustment is provided, and the function switch incorporates an extra "tune" position so that the buffer stage can be pretuned before the final is switched on. An electroselects any of three crystals, or a jack for external VFO. High quality D’Arsonval meter for tuning. Shpg. Wt. 26 lbs.

HEATHKIT DX-100 PHONE & CW TRANSMITTER KIT

MODEL DX-100

$189.50

Shipped motor freight unless otherwise specified. $50.00 deposit required on C.O.D. orders.

You get more for your transmitter dollar when you decide on a DX-100 for your ham shack! Recognized as a leader in its power class, the DX-100 offers such features as a built-in VFO, built-in modulator, TVI suppression, pi network output coupling to match a variety of antenna impedances from 50 to 600 ohms, pi network interstage coupling, and high quality materials throughout. Copper plated 16-gauge steel chassis, ceramic switch contacts, etc., are typical of the kind of parts you get, in assembling this fine rig. The DX-100 covers 160, 80, 40, 20, 15, 11 and 10 meters with a single band-switch, and with VFO or crystal operation on all bands. RF output is in excess of 100 watts on phone and 120 watts on CW, with a pair of 6L46 tubes in parallel for the final amplifier, modulated by a pair of 1625 tubes in parallel. VFO tuning dial and panel meter are both illuminated for easy reading, even under subdued lighting conditions. Attractive front panel and case styling is completely functional, for operating convenience. Designed exclusively for easy step-by-step assembly. No other transmitter in this power class combines high quality and real economy so effectively. Here is a transmitter that you will be proud to own. Time payments are available! Shpg. Wt. 107 lbs.

more fine ham gear from the pioneer

HEATHKIT GRID DIP METER KIT

A Grid Dip Meter is basically an RF Oscillator used to determine the frequency of other Oscillators, or tuned circuits. Numerous other applications such as pretuning, neutralization, locating parasitics, correcting TVI, adjusting antennas, designing new coils, etc. Features continuous frequency coverage from 2 MC to 250 MC, with a complete set of prewound coils, and a 500 ua panel meter. Has sensitivity control and a phone jack for listening to the "Zero-Beat". It will also double as an absorption-type wave meter.

MODEL GD-1B
Low frequency coil kit: two extra plug-in coils extend frequency coverage down to 350 KC.

Shpg. Wt. 4 lbs. Low frequency coil kit: two extra plug-in coils extend frequency coverage down to 350 KC. Shpg. Wt. 1 lb. No. 341-A $3.00

HEATHCOMPANY
A Subsidiary of Daystrom, Inc.
BENTON HARBOR 9, MICHIGAN

92
HEATHKIT ALL-BAND COMMUNICATIONS-
TYPE RECEIVER KIT

Ideal for the short wave listener or beginning amateur, this Receiver covers 550 KC through 30 MC in four bands. It provides good sensitivity and selectivity, combined with fine image rejection. Amateur bands are clearly marked on the illuminated dial scale. Features transformer type—power supply—electrical band spread—antenna trimmer—separate RF and AF gain controls—noise limiter—internal 5/8" speaker—head phone jack and AGC. Has built-in BFO for CW reception. An accessory power socket is also provided for connecting the Heathkit model QF-1 Q Multiplier, Will supply 250 VDC at 15 ma and 12.6 VAC at 300 ma. Shpg. Wt. 12 lbs. Cabinet: Fabric covered cabinet with aluminum panel as shown part 91-15A. Shpg. Wt. 5 lbs. MODEL AR-3 $29.95

HEATHKIT ELECTRONIC VOICE
CONTROL KIT

Here is a new and exciting kit that will add greatly to your enjoyment in the ham shack. Allows you to switch from Receiver to Transmitter merely by talking into your microphone. Lets you operate "break-in" with an ordinary AM transmitter. A terminal strip is provided for Receiver and speaker connections and also for a 117 volt antenna relay. Unit is adjustable to all conditions by sensitivity and gain controls provided. Easy to build with complete instructions provided. Requires no transmitter or Receiver alterations to operate. Shpg. Wt. 5 lbs. MODEL VX-1 $23.95

HEATHKIT "Q" MULTIPLIER KIT

This fine Q Multiplier is a worthwhile addition to any communications, or Broadcast Receiver. It provides additional selectivity for separating signals, or will reject one signal and eliminate a heterodyne. Functions with any AM Receiver having an IF frequency between 450 and 460 KC that is not AC-DC type. Operates from your Receiver power supply, and requires only 6.3 VAC at 300 ma (or 12.6 VAC at 150 ma), and 150 to 250 VDC at 2 ma. Simple to connect with cable and plugs supplied. Effective Q of approximately 4000 for sharp "peak" or "null". A tremendous help on crowded phone or CW bands. Shpg. Wt. 3 lbs. MODEL QF-1 $9.95

NOTE: $10.65 WHEN ORDERED WITH AR-3 BECAUSE OF EXCISE TAX.

...in do-it-yourself electronics!

HEATHKIT "AUTOMATIC" CONELRAD
ALARM KIT

Designed to give instant warning whenever a monitored station goes off the air, the CA-1 automatically cuts the AC power to your transmitter, and lights a red indicator. Works with any radio receiver; AC-DC—transformer operated—battery powered, so long as the receiver has AVC. A manual "reset" button is provided to reactivate the transmitter. Incorporates a heavy-duty 6-ampere relay, a thyatron tube, and its own built-in power supply. A neon lamp shows that the alarm is working. Simple to install and connect with complete instructions provided for assembly and operation. Shpg. Wt. 4 lbs. MODEL CA-1 $13.95
HEATHKIT VARIABLE FREQUENCY OSCILLATOR KIT

Enjoy the convenience and flexibility of VFO operation by obtaining this fine variable frequency oscillator. It covers 160-80-40-20-15-11 and 10 meters with three basic oscillator frequencies. Better than 10 volt average RF output on fundamentals. Requires 250 volts DC at 15 to 20 ma, and 6.3 VAC at 0.45 a, available on most transmitters. It features voltage regulation for frequency stability, and has illuminated frequency dial. VFO operation allows you to move out from under interference and select the portion of the band you want to use without having to be tied down to only 2 or 3 frequencies through the use of crystals. "Zero in" on the other fellow's signal and return his CQ on his own frequency! Shpg. Wt. 7 lbs. $19.50

HEATHKIT REFLECTED POWER METER KIT

A necessity in every well equipped ham shack, the model AM-2 lets you check the match of the antenna transmission system, by measuring the forward and reflected power or standing wave ratio. Handles up to one kilowatt of energy on all bands from 160 to 2 meters, and may be left in the antenna system feed line at all times. Input and output impedances for 50 or 75 ohm lines. No external power required for operation. Meter indicates percentage forward and reflected power, and standing wave ratio from 1:1 to 6:1. Shpg. Wt. 3 lbs. $15.95

HEATHKIT BALUN COIL KIT

This convenient transmitter accessory has the capability of matching unbalanced coax lines, used on most modern transmitters, to balanced lines of either 75 or 300 ohms impedance. Design of the bifilar wound Balun Coils will enable transmitters with unbalanced output to operate into balanced transmission line, such as used with dipoles, folded dipoles or any balanced antenna system. Can be used with transmitters and Receivers without adjustment over the frequency range of 80 through 10 meters. Will handle power inputs up to 200 watts. Shpg. Wt. 4 lbs. $8.95

save 1/2 or more... with HEATHKITS

HEATH COMPANY
BENTON HARBOR 9, MICH. a subsidiary of Daystrom, Inc.

name
address
city & state

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<tr>
<th>QUAN.</th>
<th>ITEM</th>
<th>MODEL NO.</th>
<th>PRICE</th>
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$—. enclosed. Parcel post, include postage—express orders are sent shipping charges collect. All prices quoted are Net F.O.B. Benton Harbor, Mich. and apply to Continental U.S. and Possessions only. All prices and specifications subject to change without notice.
**"HAM-M" BY CDR**

America's most popular ham antenna rotor

Preferred because:

**EXTRA HEAVY-DUTY**

Holds heaviest commercial arrays—ice-proof, wind-proof, moisture-proof!

**WON'T DRIFT**

Provides 3500 in.-lb. resistance to lateral thrust.

**EASIEST TO INSTALL**

It's complete! Mounts on shaft or flat on plate in 30-minutes.

**CONTROL CABINET:** Pin-point calibrated in 5° units. Needle operates without activating rotor. Built for 8-wire cable.

**ROTOR MECHANISM** streamlined to resist moisture, "ice-lock." Actually stronger than your antenna itself. 98 ball bearings for smooth action. Positive brake ends drift.

**YOU CAN'T AFFORD LESS! WHY PAY MORE?** In only a few months the new CDR "Ham-M" Rotor has become the "pet" of hams from Coast to Coast. Costs less than rotors that won't give you any better performance, won't hold heavier antennae, won't give you any more resistance to the elements. It's the complete rotational system—no extras to buy. At your distributor's: only $119.50!

**EXCLUSIVE OFFER:**

**CDR "CALL-LETTERS" JEWELRY FREE!** Handsome rhodium-finish tie-bar and key chain, both with your call-letters engraved FREE with your purchase of the "HAM-M." Both bear amateur radio emblem. Just examine the "HAM-M" and get both for only $8.60 (tax included) a $7.20 value for half price. See your CDR distributor for details.

---

**CDR**

**HAM ANTENNA ROTOR**

Cornell-Dubilier Electric Corp.,

South Plainfield, N. J.

The Radiart Corporation,

Indianapolis, Ind.
GOTHAM ON ANTENNAS

As one of the oldest antenna manufacturers consistently advertising in "73," we think it is a good idea to sum up our activities, comment on the antenna industry, and answer questions that arise year after year.

We have seen scores of antenna Manufacturers come along with new designs, run an ad or two, perhaps linger longer, then disappear. Almost always the pattern runs: A new super antenna is advertised at fantastically high prices, accompanied by fantastic blurbs for its performance. A few antennas would be sold, and the manufacturer would sadly discover that only antennas that had stood the test of time could sell in sufficient quantities to cover all costs. As a result of these scores of failures, 'orphan' antennas still pop up plaintively in "Used Equipment" bargain columns.

From the moment Gotham made its first antenna, there has always been continued acceptance of Gotham antennas as the standard of the amateur radio field. We are very proud of the fact that every one of our beams is a full half-wave in element size, justifying the hams' faith in our basic design.

To sum up our present plans, Gotham will continue to manufacture fifty ham antennas at low, low prices. Our only new venture for the foreseeable future is a new low-cost marine radio-telephone antenna, which will bring an added measure of safety to mariners, due to a new efficient design. Literature is available.

And now to answer some questions: Why is the Gotham price so very low? Doesn't the low price mean a lack of quality? Answer: The Gotham price is low because we sell in quantities and make only a fair profit on each antenna. We do not add on a tremendous overhead and engineering charge. As for quality, we have always used the best materials, and every antenna is doubly inspected before shipment. Thousands of Gotham antennas are in use the world over.

Why are all Gotham beams of the Yagi type, all metal, and grounded at the center? Answer: To get the maximum strength for the minimum weight, to get maximum efficiency, and to avoid the use of wood, tuning struts, traps, or other substitute devices, all of which are undesirable and unnecessary. In addition, grounded beams are lightning-proof and protect your home.

How do Gotham beams gain compare with higher-priced antennas? Answer: No beam, regardless of price, can give more gain, for a given boom size, than a Gotham beam. Obviously, the more elements, the more gain. Our gain figures are published in our literature, and are available, free, on request.

What matching systems are available in Gotham beams? Answer: We use both the Gamma match for 52 and 72 ohm coaxial feed, and the T match for 300 ohm feed. These are tried and true matching systems, proven by thousands of hams, and extremely simple. No electronic equipment or measuring devices are needed. Everything is furnished.

How difficult is it to put a Gotham beam together? Answer: It's easy, and it takes only a few moments. No special tools are required for assembly and installation. Full, simple instructions are given, and all machining and cutting take place at the factory. Thousands of novices have successfully assembled and installed our antennas.

What is the difference between the Standard and the DeLuxe beams? Answer: The Standard beams in the 6, 10, and 15 meter bands used 5" and 5½" tubing elements; the DeLuxe models for these bands use 5½" and 1" tubing.

In the 20 meter beams, the Standard beams have a single boom, while the DeLuxe beams use twin booms. All 20 meter beams use full 12 foot booms. In the 20 meter beams in the Twobanders and Tribanders, only 5½" and 1" tubing are used.

Is the Gotham aluminum tubing corrosion-proof? Is it strong? Answer: Yes, our aluminum has an 'aluminized' finish, both on the inside and outside surfaces, and is corrosion-proof. As for strength, our 6061TA832 alloy has a yield strength of 30,000 lbs sq. in.

Is it advantageous to use a Gotham Twobander or Tribander beam? Answer: Hundreds of these beams are in daily use. They are compromise beams, but by having each element a full half-wave, their gain figures are more than reasonably good. Of course a single three element beam on a single band will outperform a Tribander on the same band, but the Tribander permits beam operation on three bands.

Are Gotham beams complete? Answer: Yes, we furnish everything—al tubing, fittings, castings where required, instructions—nothing extra to buy. We do not price an antenna piecemeal.

Do any Gotham antennas require guying? Answer: No. Our antennas have been designed to be self-supporting, due to the combination of tremendous strength and light weight. Whereas thin-walled or traped verticals must be guied, our 23 foot vertical antenna has come through hurricane winds without damage.

Do the Gotham verticals perform well on all bands? Answer: Yes, thousands of ham users attest to their efficiency on all bands from 6 to 160 meters. Reports of tremendous DX on low power are common.

Are mounts supplied with the vertical antenna? Answer: Yes, four mounting straps for side mounting are furnished with each vertical.

Are radials needed with a Gotham vertical? Answer: No, except in a few rare locations. 99% of the installations are done without radials.

Must a vertical antenna be mounted at any particular height? Answer: No, any convenient height will do. The higher, the better.

How do you change bands on a Gotham vertical? Answer: For 20, 15, 10, and 6 meters, the loading coil is not used. For 40, 80, and 160 meters, the proper portion of the loading coil is used.

Do you need a separate loading coil for each band? Answer: No, a V60 loading coil will cover 60, 40, 20, 15, 10 and 6; a V80 loading coil will cover 80, 40, 20, 15, 10, and 6; and a V40 loading coil will cover 40, 20, 15, 10, and 6 meters.

How much power can be used with a Gotham vertical? Answer: Anything up to the legal limit.

Is much space required for installing a vertical? Answer: No, only a few square inches are needed.

Can you give details on the loading coil used in the Gotham verticals? Answer: Yes, it is made for us by Barker and Williamson. It is 4" in diameter and exceptionally rugged. No other loading coil in the antenna industry has a higher Q.

Which do you recommend buying, a vertical or a beam? Answer: A beam is always preferable for use on any particular band. The beam cuts down QRM and amplifies the transmitted and received signal. The vertical has the advantages of small space, low cost, no rotator required, and multi-band coverage.

Why does Gotham make so many different antennas? Answer: To meet the needs of hams everywhere for a wide variety of antennas, on all bands.

What antennas are best for a novice? Answer: The V8Q vertical and the USN beam are the most popular choices.

Why should a ham buy a Gotham antenna? Answer: The tremendous progress of the amateur radio art makes it imperative that hams graduate from the antiquated antennas of years past to a modern antenna system. We will be glad to send, free of charge, our technical literature on our 50 antennas, or you can order for immediate shipment.

73,

GOTHAM
IN APPRECIATION • • • •

10% PRICE SLASH!
TAKE 10% OFF WHEN ORDERING

Airmail Order Today — We Ship Tomorrow

GOTHAM Dept. GST
1805 PURDY AVE., MIAMI BEACH, FLA.

Enclosed find check or money-order for
TWO BANDER BEAMS

A full half-wave element is used on each band. No coils, traps, baluns, or stubs are used. No calculations or machining required. Everything comes ready for easy assembly and use. Proven Gotham! Value!

<table>
<thead>
<tr>
<th>Band Range</th>
<th>Price</th>
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<tbody>
<tr>
<td>6-10</td>
<td>$29.95</td>
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<tr>
<td>10-15</td>
<td>$34.95</td>
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<tr>
<td>10-20</td>
<td>$36.95</td>
</tr>
<tr>
<td>15-20</td>
<td>$38.95</td>
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</tbody>
</table>

TRIBANDER

Do not confuse these full-size Tribander beams with so-called midgets. The Tribander has individually fed (52 or 72 ohm coax) elements and is not frequency sensitive, nor does it have baluns, coils, traps, or other devices intended to take the place of aluminum tubing. The way to work multi-band and get gain is to use a Gotham Tribander Beam.

<table>
<thead>
<tr>
<th>Band Range</th>
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<tbody>
<tr>
<td>6-10-15</td>
<td>$39.95</td>
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<tr>
<td>10-15-20</td>
<td>$49.95</td>
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2 METER BEAMS

Gotham makes only two different two meter beams, a six-element job and a twelve-element job. They are both Yagi beams, with all the elements in line on a twelve foot boom.

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
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<tbody>
<tr>
<td>Deluxe 6-Element</td>
<td>$9.95</td>
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<tr>
<td>12-El</td>
<td>$16.95</td>
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6 METER BEAMS

New records are being made every day with Gotham six-meter beams. Give your rig a chance to show what it can do, with a Gotham six-meter beam.

<table>
<thead>
<tr>
<th>Type</th>
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</thead>
<tbody>
<tr>
<td>Std. 3-El Gamma match</td>
<td>$12.95</td>
</tr>
<tr>
<td>Deluxe 3-El Gamma match</td>
<td>$21.95</td>
</tr>
<tr>
<td>Std. 4-El Gamma match</td>
<td>$16.95</td>
</tr>
<tr>
<td>Deluxe 4-El Gamma match</td>
<td>$25.95</td>
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</tbody>
</table>

10 METER BEAMS

Ten meter addicts claim that ten meters can’t be beaten for all-around performance. Plenty of DX and skip contacts when the band is open, and 30-50 miles consistent ground wave when the band is shut down. Thousands of Gotham ten meter beams have been pinging for years, working wonders for their owners, and attesting to the superior design and value of a Gotham beam.

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
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<tbody>
<tr>
<td>Std. 2-El Gamma match</td>
<td>$11.95</td>
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<tr>
<td>Deluxe 2-El Gamma match</td>
<td>$18.95</td>
</tr>
<tr>
<td>Std. 3-El Gamma match</td>
<td>$14.95</td>
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<tr>
<td>Deluxe 3-El Gamma match</td>
<td>$22.95</td>
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<tr>
<td>Std. 4-El Gamma match</td>
<td>$21.95</td>
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<tr>
<td>Deluxe 4-El Gamma match</td>
<td>$27.95</td>
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15 METER BEAMS

Fifteen meters is the “sleeper” band. Don’t be surprised if you put out a quick, quiet CQ and get a contact half-way around the world. Working the world with low power is a common occurrence on fifteen meters when you have a Gotham beam.

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
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<tbody>
<tr>
<td>Std. 2-El Gamma match</td>
<td>$19.95</td>
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<tr>
<td>Deluxe 2-El Gamma match</td>
<td>$29.95</td>
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<tr>
<td>Std. 3-El Gamma match</td>
<td>$26.95</td>
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<tr>
<td>Deluxe 3-El Gamma match</td>
<td>$36.95</td>
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</tbody>
</table>

20 METER BEAMS

A beam is a necessity on twenty meters, to battle the QRM and to give your signal the added punch it needs to over-ride the high power boys. Hundreds and hundreds of twenty meter beams, working year after year, prove that there is no better value than a Gotham twenty meter beam.

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
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<tbody>
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<tr>
<td>Deluxe 2-El Gamma match</td>
<td>$31.95</td>
</tr>
<tr>
<td>Std. 3-El Gamma match</td>
<td>$34.95</td>
</tr>
<tr>
<td>Deluxe 3-El Gamma match</td>
<td>$46.95</td>
</tr>
</tbody>
</table>

(Notes: Gamma-match beams use 52 or 72 ohm coax. T-match beams use 300 ohm line.)

ALL-BAND VERTICAL ANTENNAS

You could work the whole world, and get fantastic reports, with a Gotham vertical and only 55 watts, like VP1SD.

You could work tremendous skip and DX, and be surprised at the way your Gotham vertical brings them in, as R. E. C. of Washington, D. C., found out.

You could have a simple, easy-to-install-and-operate vertical antenna, and switch from band to band, as thousands of Gotham customers have done.

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>V40 vertical for 40, 20, 15, 10, 6 meters</td>
<td>$14.95</td>
</tr>
<tr>
<td>V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters</td>
<td>$16.95</td>
</tr>
<tr>
<td>V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters</td>
<td>$18.95</td>
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HOW TO ORDER. Send check or money order directly to Gotham or visit your local distributor. Immediate shipment by Railway Express, charges collect. Foreign orders accepted.

WORK THE WORLD

Name
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City Zone State
was elected as officers for the coming year of the Chicago Amateur Radio Club in honor of Pittsburgh's bicentennial anniversary.

All are eligible to take part in a contest sponsored by the Western Triangle Amateur Radio Club in honor of Pittsburgh's bicentennial anniversary.

PITTSBURGH QSO PARTY

February 1-16

All amateurs are eligible to take part in a contest sponsored by the Western Triangle Amateur Radio Club in honor of Pittsburgh's bicentennial anniversary.

PITTSBURGH QSO PARTY

February 1-16

All amateurs are eligible to take part in a contest sponsored by the Western Triangle Amateur Radio Club in honor of Pittsburgh's bicentennial anniversary.
For once—everyone agrees, experts, amateurs, dealers—there is no amateur receiver that approaches the Hammarlund HQ-170 in performance and features. Even receivers costing much more, cannot offer everything the HQ-170 offers....

- Dual and triple conversion—17-tube superheterodyne.
- Full dial coverage of 6, 10, 15, 20, 40, 80 and 160 meter amateur bands.
- Razor-sharp slot filter, adjustable ± 5 KCS over passband with up to 60 db attenuation.
- Separate vernier tuning ± 3 KCS for easy SSB tuning.
- Separate linear detector for CW and SSB reception.
- Tuned IF amplifier with seven selectivity positions for skirt selectivity.
- Selectable sideband, upper, lower or both.
- 100 KCS crystal calibrator.

$359.00
Telchron clock-timer, $10 extra.

ADD SSB /CW AND AM /MCW
TO YOUR PRESENT RECEIVER
HC-10

The biggest box of tuning tricks ever offered! Provides all modes of tuning for perfect SSB reception. Takes seconds to connect to any receiver having an IF from 450 kcs to 500 kcs. Has own audio system and power supply. You must try it to believe it...

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Hammarlund Manufacturing Company, Inc., 460 W. 34th St., N. Y. 1, N. Y.
Export: Rocke International, 13 E. 40th St., N. Y. 16, N. Y.

See you at the SSB Dinner and Hamfest—March 24, Hotel Statler Hilton, New York
tower which supports 10-15-meter beams. The West
Suburban YMCA Amateur Radio Club is now affiliated
with the League. IOU, UNR and KD8YD were elected
as the new officers of the Peoria Amateur Radio Asso-
sation. IBI is the latest convert to use an SWR brid-
ge. Joe B. W. and IBI worked 80-meter DX from Sandus-
ky, OH, EU purchased an HT-32 for s.s.b. and used it in
the recent sweeps. The Starved Rock Radio Club cele-
brated its 10th year anniversary, and KQJX received
a DX award from the NTS nets. The "talk Wisconsin."
Get details from the SCM. Traffic for the month was 121.
SK8JG has been keeping fairly regular calls twice a week with his brother in lower
towens on 10-meter dial. We wish to thank all those
who took part in the emergency nets during the No-
umber of traffic nets. W9QVI 24, K9EEK 18, W90CC 8.
K9GLU 4, NBK 4, K9CFG 5, W9MHP 5, OK 5, WAU 5,
WC 4, K9DWK 4, KUKBW 7, W9NTR 7, K9EDG 6.
GFQ 6, W9HUF 6, BNL 10, PPB 9, W9DGA 8, QR 8,
BDJ 83, EHZ 80, K9GBB 79, W9ETM 69, K9IXD 68,
W9IBQ 67, K9GLL reports that the IMO Six-Meter Net, handled a
sessions, K0LXD 18, W9QVI 17, YYX 17, IMU 13, DOK 11, K9-}
QKJ 22, W9VNY 22, WRK 21, GFA 20, QWI 20, K9-
K9N 19, QF 18, K9R 16, K9YD 16, K9YY 15, DIA 15, \n-10, low 0, average 3.875; informals 57, high 6, low 1,
Sessions, K0BHF 2. W9HUF 4, K9SHU 4, K9LKW 4,
48, W9AYL 40, VY0DVB 40, FJZ 29, K0LXF 22, W0NNX 20,
K0OMP 15, K9NEC 15, K9GGL 10, K9KPK 9, JEU 9,
K0BHF 2, GQD 2, a.}

Dakota division

North Dakota—SCM: Harold Wenzel, W0LVA—
SEC: K0LXW, PAM: YCL. The North Dakota 75-Meter
Net, reports 23 sessions with a total number of
check-ins as 604. The highest number per session was 34
lowest, 8, average 24.16. The North Dakota C.W. Net
more sessions at 1100 CST every Mon., Wed., and Fri., on 3670 kc.
K9ATK has been keeping fairly
regular calls twice a week with his brother in lower
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K0OMP 15, K9NEC 15, K9GGL 10, K9KPK 9, JEU 9,
K0BHF 2, GQD 2, a.}
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The popular G-77A/G-66B Holiday offer has been extended into the winter season!

The "Twin sparklers", G-66B and G-77A put a modern powerful, 5-band station at your fingertips. Compact—rigid—smooth handling, the same operating conveniences as the finest fixed station. This handsome equipment is an excellent example of Gonset "compactness without compromise".

G-77A TRANSMITTER—80-40-20-15-10 meters. Excellent, stable, calibrated VFO or optional crystal control. Full bandswitching...pi network output. Power input 50-60 watts...provisions for C.W. Universal power input and modulator separate unit for convenient rear trunk mounting.


G-77A transmisser only. Model 3118. 164.50
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Total regular price 558.00

"WINTER SPECIAL" PRICE 499.00

Send for name of your nearest Gonset dealer.

Middletown, R. 1, K6MYW and K6OW have dropped the "N" from their calls, K6DHY has completed installing a new Heathkit Mohawk receiver, KR41L has worked 80 meters on 10 meters, K4DHY got these awards this month: W.A.S., CP-25 and Traffice Club 250. K6HST made his goal of 100,000 points in the Sweepstakes. As of this month K4P has had a 54 point for 20 years! W4IAx's lineup now includes a Collins 758-E receiver and 3525-1 transmitter. K6KLY and TDF have new beams, BBY and PBY have installed Lapager modules in their ears. Newly-appointed echos include GRT for Marshall, Pennington, Polk and Red Lake Counties; K6JLY for Hasen County; K6ZJZ for Nobles County; and K6Y for Fillmore County. Traffic: K6DHY 669, W6KGT 325, K6IV 175, K6RS 198, W6VPT 67, KLQ 62, UMYX 90, K6HL 59, HID 51, CQCM 41, W6IOC 53, K6KFP 29, W6OOG 27, K6KMT 21, W6CNP 21, CQCM 39, CEZ 19, K6Q 18, W6KIN 16, K6ZJZ 16, TCF 16, K6V 15, K6IQA 13, W6XPO 11, K6KNY 14, W6YQR 14, 8XT 13, K6JLYC 10, W6KLY 9, W6OAB 8, W6QY 7, HEN 5, VBD 5, K6JFCG 3, W6YAC 2.

DELTA DIVISION

ARKANSAS—SCM, Elmon M. Gunter, W3MZY—SEC: K6CIR, PAM: DYL, RM: SJF, KALNN has up a new quad antenna on 20 meters and operated in the Sweepstakes with a score of 45,000 points. He recently received his WAC and WAS certificates. VQD and EPH have gone RTTY and have installed 2-meter modules. Model 3229.

LOUISIANA—SCM, Thomas J. Moragni, W5FWO—The Baton Rouge ARC has a project of the installation of a compact transmitter and receiver. Ambrose, W4CQ, and W4JW have installed a complete hearing aid for the club house. The club has installed a new transmitter and receiver. K6JLY is in the process of building 1333. K6KFP is Ham of the Year. W6KGT is in the process of building a new 5-Band station.

MISISSSIPPI—SCM, J. Adrien Houston, sr., W5HE—The Cleveland Amateur Radio Club elected K6FSC, pres.; K6DLN, vice-pres.; K6YTO, secy.; and K6FRC, act. secy. K6ELD and K6CIR head the TVI Committee. The Cleveland Club has made application for a club call. The Jackson Amateur Radio Club members recently elected officers for 50 as follows: K6ELD, pres.; K6CIR, act. secy.; K6FSC, vice-pres.; K6YTO, secy.; K6KFP, act. secy.; K6Q, k.d.t.; and K6R, 1st vice-pres. The club has installed 2-meter mobiles in their cars. The club heard 1BBF, Communications Manager, address the group via long distance speakerphone. NUIII is sparkplugging the Bird Early Bird 725 on 35, 50, 100, 200. The club has been a ham for 20 years. W4IAx is doing well.

Send for name of your nearest Gonset dealer.

GONSET BURBANK, CALIF.
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Citizens’ Communicator

a complete 2-way radio station for use in the new Class “D” service on 11 meters

WHY? Now... F.C.C. assigns 22 channels in 27 mc range... virtually without restriction as to legitimate usage... can be business or pleasure. Any U.S. Citizen is eligible for license. No difficulty. Merely complete Form 505-D, (packed with equipment) and submit to F.C.C. No tests... no special skills... no examination.

27 mc range offers better, more reliable 2-way communications possibilities than existing 450 mc Citizens Band...latter is essentially for “line of sight” operation.

G-11 equipment is precision, rugged, foolproof, dependable! Gonset G-11 meets every field and F.C.C. requirement, is a member of famed Gonset 2 and 6 meter Communicator family.

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POWER INPUT: Transmitter rated at 5 watts input, (maximum for Class “D” service) AM modulated.

OPERATING POWER: Two models available, 12 volts DC only and 115 volts AC only. Power supplies are built in.

COMPACT: 6¾” wide, 5¼” high, 6¾” deep.

G-11 CITIZENS COMMUNICATOR. Complete with press-to-talk microphone and transmitter/receiver crystals for one channel. Less antenna. 115 volts AC operation. ...... Model 3303 ............... 149.50

Same as above except 12 volts DC....... Model 3304 ............... 149.50

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BEAM ANTENNA FOR POINT-TO-POINT OPERATION Model 3302 .... 39.95 3-element beam, forward gain 8 db. Front to back ratio 20 db.

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Single Sideband at Its Very Best!
Triple conversion HQ-170 • 20 monthly payments $17.77. $35.90 down. CASH PRICE $359.00. Radio amateur's ideal for modern SSB reception in performance, tuning techniques, dependability. Clock timer $10 extra.

HENRY HAS THESE HAMMARLUND ITEMS IN STOCK FOR IMMEDIATE SHIPMENT

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
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<tbody>
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<td>HQ-110 RECEIVER</td>
<td>$249.00</td>
</tr>
<tr>
<td>HQ-160 RECEIVER</td>
<td>$379.00</td>
</tr>
<tr>
<td>HQ-100 RECEIVER</td>
<td>$189.00</td>
</tr>
<tr>
<td>MATCHING SPEAKER</td>
<td>$14.95</td>
</tr>
<tr>
<td>CLOCK TIMER</td>
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Complete stock of all transmitters, receivers, antennas, rotators, towers, parts, accessories, equipment. Henry has ALL the new equipment first.

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516F-2 AC Power Supply ......................................... 105.00
516E-1 12V DC Power Supply .................................. 262.00
75G-1 Receiver ..................................................... 495.00
312B-3 Speaker .................................................... 27.50
312B-4 Speaker Console ......................................... 185.00
75A-1 Receiver ..................................................... 695.00
KWM-1 Transceiver ................................................ 830.00
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EXCELLENT VOICE OPERATED CONTROL SYSTEM (VON). Biasing voltage available for cutoff of external linear amplifier when receiving.

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DRIVING POWER REQUIRED: 70 to 80 watts, readily supplied by GSB-100 or similar SSB transmitter in 100 watt class.

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FULL BANDSWITCHING OPERATION.

PI NETWORK OUTPUT. Flexible, easily loaded.

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Same size cabinet and general appearance as GSB-100 transmitter.

Model #3262... 439.50

* In s.s.b. operation under normal conditions the peak envelope power input is approximately twice the average d.c. power input as measured by the plate milliammeter and voltmeter.

GSB-100 Transmitter

GSB-101 Linear Amplifier

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* Self-supporting up to 40 ft. above ground with any full-size 3-element Tribander. May be extended to 120 ft. with proper guys.

* Commercial Grade Construction.

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- New factory-to-consumer sales plan (direct sales only) includes trade-ins, time payments, money back guarantee.

Although designed to commercial specifications, the Elenco Commander operates with excellent efficiency at the legal amateur power limit of 1 kw average d.c. input. Working well within its rating, the amplifier gives superior performance on five amateur bands, 10 through 80 meters.

A post card will bring a detailed 8 page brochure.

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Both LER and PNM made accurate frequency measurements in the last tests. From GPy comes a recommendation that stations with traffic going out of the State take it to the Pine Tree Net, which will tend to give the G2 Gulf Net more time to catch up. WFTQ and KIDQ are now WITQ and KIHZ in Hancock. KIQD is a new ham in Ellsworth Falls. All appointees are urged to please send in monthly reports at the end of the month. Let’s start the New Year off by retraining from calling into the nets until a call-up occurs. Thereby helping VYA, your PAM, and the New Year’s resolutions. We all regret the passing of John Singleton, a faithful member of the Barn Yard Net and ham fraternity. KBU has no signal for the present, according to some reports, but the 2-meter addicts report excellent coverage. A call to note the observance of FCC regulations by stations calling into our nets. Many of the fellows are working DX with the frequent openings of the 6-meter bands. See the 2-meter addicts report excellent coverage. Hope all the gang reads “Operating News” in QST. There has been some very informative and convincing dope in this and other articles in the “fine print” sections. Traffic, W1JA3 200, GYP 142, CEY 117, Elf 55, BY 34, UDD 34, QTH 23, WX 25, HDQ 19, BAY 9, BIB 9, KIDQ 6, AIF 2, EBG 2.

EASTERN MASSACHUSETTS—SCM, Frank L, Baker, jr., W1ALP—New appointments: WNC and K1CRP as OOSs, UOP and P3s as OOs, K1BYL as ORs, K1HAI as OSs. Appointments renewed: TK, SW, NS, IPA for Boston Red Cross, ZNG Wakefield, YZ Randolph, ADR Winchester, BB Walthrop, EGZ Harwood, N. X. Bourne, IBO Wellesley, LNF Waltham, UNI Dedham, as Ecs: EMG, DWO, K1UF and MEF as ORs; W4, BB and JNY as Os; EPL and AMT as ORs; ALF, LUMU and KIN as OOs; CTW and CTX as OEs; UE as RM for 80-meter e.e. The Eastern Mass. 2-Meter Net meets Mon., through Fri., on 146.5 Mhz. at 1435, in the library of the 2nd floor of LAD, ALP attended a c.d. meeting at BBA’s LBP on 46 meters. IDX and ZGW are on 46 meters. (Continued on page 116)
The radiation resistance as measured at the center of the driven element of a 3-element array can vary over a fairly wide range since it is a function of the spacing and tuning of the parasitic elements. There are, however, certain fairly well-defined trends. (1) The resistance tends to reach a minimum at the parasitic tuning condition that gives maximum gain, becoming larger as the element is detuned in either direction — that is, made longer or shorter. (2) The resistance tends to be lower the closer the spacing between the parasitic and driven elements. Values of the order of 10 ohms are typical with a 3-element beam having 0.1 wave length director spacing, when the director length is adjusted for maximum gain. This can be raised considerably — to 50 ohms or more — by sufficient change in director length, at a sacrifice of increased director spacing, and is of the order of 30 ohms at a spacing of 0.25 wave length.

We at Hy-Gain feel that it is the function of an antenna system to develop gain and front to back ratio. Its ability to do so should not be compromised to facilitate matching. It is for this reason that Hy-Gain's engineers developed the commercial version of the very popular Gamma Match System for use on both the monobander and full sized tribander series of Hy-Gain antennas. In the Gamma Matching System the driven element is grounded at the center directly to the boom. This eliminates splitting and insulating the dipole which usually weakens it mechanically. The Gamma Match is a shunt feeding device whose impedance transforming abilities are a function of the point at which it is attached along the dipole, and the ratio of the diameters and spacing between the driven element and the gamma rod. (See Figure A). By adjusting the tap position along the dipole the radiation resistance of any three element array can be transformed easily into 50 ohms for maximum energy transfer into the commonly used RG8U 50 ohm coaxial cable. In addition to transforming the impedance, the Gamma Rod introduces a small amount of inductive reactance due to its length. This reactance can be tuned out by inserting, in series, a capacitor as shown in figure A.

Carrying the application of the Gamma Match one step further, Hy-Gain's engineers designed the triaxial Gamma Match system shown in figure 13 as used on the full sized Hy-Gain trap tribander antennas. In this instance, three Gamma Rods, with their associated reactance cancelling, coaxially formed, capacitors are fed in parallel by a single 50 ohm transmission line. Each gamma rod is set at a point along a dipole which makes possible the proper transformation of impedances and matches the coaxial transmission line on each band. Each capacitor is tuned so as to cancel the inductive reactance of the individual 10, 15 and 20 meter gamma rods. There is very little interaction since each gamma rod and capacitor combination is effectively a series resonant circuit. Series resonant circuits are very low impedance at their resonant frequency (thus allowing RF energy on that frequency to pass). They offer a very high impedance, however, to the passage of RF energy of all other frequencies.

Both the single band and three band Hy-Gain Gamma Match Systems are factory pre-tuned with exact dimensions which will result in a very low SWR. Although factory pre-tuned, they are also adjustable to compensate for variations which may be encountered at each installation site. This is a very important feature since height above ground and the proximity of various objects often change the characteristics of an antenna.

Andrew A. Andros, W0LTE
President
Hy-Gain Antenna Products Co.

Andrew A. Andros
Mass, C.W. Net meets on 3500 kc. at 1900 EST Mon. through Sat. The Mass. Phone Net meets daily on 3570 kc. at 1900 EST, attention West Mass. Novices; The West Mass. Novice and Slow-Speed Net meets Tue., Thurs., and Sat. on 2047 kc. at 0600 EST. Net appoint- ments go to KGJ as Asst. SCM, BYH as SEC, ZPH as ORS, and QKC as OPS. Congratulations, fellows, to those who are now or who will soon be members of the Mass. C.W. Net. The Fitchburg and KPJC Net (144 kc.) has been established and is working well.

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Better Strength
Because our Plytubular Construction, a process of fabricating multi-ply aluminum beams and elements, permits smaller diameters for less ice loading, wind loading, vibration and torque. No struts or braces.

Better Match
Because our Tuneable RG and Coax-O-matic RGX gamma systems are constant, rain or shine. No coils, traps or baluns.

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Because we design for many years of service and guarantee against defective parts for a period of five years. The cost per year of a Tennalab Plytubular Beam is lower than any other, regardless of price.

Catalog No. | Bands | Elements | Amateur Net
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2L-20RG | 20 | 2 | 67.50
3L-20RG | 20 | 3 | 107.50
20L-20RG | 20 | 5 | 225.00
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15L-15RG | 15 | 3 | 157.50
1L-10RG | 10 | 3 | 55.00
5L-12RG | 12 | 5 | 107.50
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TENNALAB
QUINCY, ILLINOIS

NEW HAMPSHIRE—SCM, Robert H. Wright, W1MHI—SEC: HXU, RMS; K1BCS, PAM: HQ, V.H.F./PAAM: TA. The GSPN meets at 1900 EST, through Fri. and at 0000 Sun. on 3842 kc. The NHN meets nightly at 1845 on 30 kc. for technical discussions and reports the passing of CDX, of Portsmouth. John was very active in amateur affairs and his contributions to net activity in the State will not be forgotten. The NHN will find more stations to check in for traffic. Welcome to KNJICO the XYZ of MDP. MDP is working at Evans Radio. All reports FB results on 15 meters using a 40-meter dipole, BVS says the new G-77A mobile transmitter is doing a nice job. Dana worked CKNHU from downtown Concord. Congratulations to CHN on his reelection as ARRL New England Division Director. The new office of the Turkey River Amateur Radio Club. W1QAR, pres.; TTV, V.H.F./PAM: KL1D, sec.-treas. Appointments: IQ as PAM. Endorsements: HAA and K1BCS as ORSes. Anyone interested in ARRL appointments, please contact the club.

RHODE ISLAND—SCM, Mrs. June R. Burlett, W1UXC—SEC: PAZ, PAM: KCS and YRC, HM: BBN and BTV. Appointments endorsed: URI as OES and CM01 as OHS. WTR and KIAFJ are now alternate NCSe for the Johnson Lake Net. On Nov. 14 the HVARC elected AUT, pres.; IHI, vice-pres.; KJRH, sec.-treas. KJRH, sec.-treas. KIEM, sec.-treas.; KJRH, corr. sec.-treas.; ZEZ, trans.; KNIHDNC, act. mgr. MNC is instructor of the new code and theory classes. The Antennas Club has been installed on the roof of the club headquarters. We're glad to welcome #15, who is living in Middletown while stationed in R. I. with the Navy. He is active on 10 meters and "hails" from St. Paul, Alton. YRC reports that the Providence Area stations finally have found the RISP and that the representation is good! Thank you, UHE is building a new 220-Mc. amplifier. Many of the reports coming in contain very little information about current activities, etc. Your traffic and appointee reports are greatly appreciated each month, but lack of a little bit of information makes them more effective. DGT is working on an interpolation frequency meter. ZPB recently modified his rig and is working on two ARC-4s for breaks in. BVR and DWV did a fine job in putting out an explanatory bulletin for the Novice Net. The BCRN continues to put out its fine collection. Random Scatter. New Novices are KN1JKD and ILP from Fitchburg and KNIHIS from Fiskdale. BKG gives a fine talk on TVI again at the BCRA. Our SEC, BYH, is now active on 6 meters with 40 watts. AFN, one of the nation's outstanding authorities on RTTY, demonstrated RTTY to the Montachusett Club of Fitchburg. A vote of thanks goes to HVR for his fine service to the section as SCM. Your new SCM looks forward eagerly to a term of continued progress, Traffic: W1UEQ 623, KGJ 173, K1CAU 149, WIDZV 143, BYH 93, DGL 87, ZU 83, AGM 20, ZPH 19, MNG 18, BYH 1.

NORTHWESTERN DIVISION

ALASKA—SCM, Eugene N. Berato, KL7DZ — The

(Continued on page 118)
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ANCHORAGE--SMC, Robert B. Thurston, WTPG

The Anchorage Amateur Radio Club elected AUV, pres.; PJ, vice-pres.; MCM, secy.; RES, treas.; MF, three-year trustee. MF is the proud recipient of A-1 Operator, WFX-C.W. and FOC certificates. AZU's new QTH is now in Juneau. CBO is on the air again and an SX-101 on 20 and 80 meters. Some bodging is going on with BVC's call. TL's new QTH is now C.A.A. Seminat. BVC reports all TVI problems in the Anchorage Area have been cleaned up, AUA is vacationing in W-O Land. The QTH of CUP is desired. Anyone knowing it please drop your BCM a card. CRE will be mobile down the Alaska Highway during March. Traflle: K7GDI 88, KL7BZM 91, MF 17, CRE 3.

IDAHO—SMC, Rev. Francis A. Peterson, WYRI—RACES and ARRL members are increasivng and keeping up the good work. Idaho is getting even more coverage, too, on the C.D. Net. The police are appreciating the helpfulness of the amateurs in communications. JHY reports that the FARM Net handled 91 pieces of traffic in November. The E.C.s report much new activity and organization. 1960 should be a big year for the Idaho hams—with your help. Applications for various annointments or suggestions should go to the SMC. KTDUX gave a talk to the Pocatello Club about microwaves. New high school hams are sprouting up all over. The high school station, ZP1 at St. Anthony, is being restored, too. The holiday traffic was quite heavy, especially in the ORS, OES and OOS spots. Your service to the public will help keep them favorable to the hams. How about each one getting a new ARRL member in 1960? Traflle: WTYQG 45.

MONTANA—SMC, Vernon L. Phillips, W7NPY/WX1

SEC: KUB, WAPM; KOI, RM: KQJ. The Montana Phone Net meets AI-W-F at 1730 on 2-meter c.w. or 800 M.H. over for quick, easy maintenance and adjustment. In tilt position, less space is required than on many smaller 2-section models!

Sturdy, heavy-duty construction throughout. Models to fit any requirements.

Get set for real DX results - because with E-Z Way, You Put Your Beara Where You Want It!

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Sold by Top Flight Distributors Everywhere!

WASHINGTON—BCVF, Robert B. Thurston, WTPG

The present lineup of appointments in this section is as follows: SEC: TQI, HV: AJN, PAMs: NJS, VPE and RGS, EQC: IHLI, DAX, AIH, RCL, RQY, OPs: GJN, ECL, GOY, ATQ, TVI, LT, VNC, HCL, BLN, NP: JNC, JZ: MF, treas.; DEM, UU, RHX, TVE, NWU, AUTO, UH: ORS: ONO, TFD, LT, VUB, AJN, ZBI, YKT, GAC, ZB: BDU, ORB: BY: WQ, AJN and KQY, ORS: ZBI, KQY, and KQAV, OOs: PQI, WNV and KQAV. This is a small lineup of the gang but we can always use a few more, especially in the ORS, OES and OOS spots. The SMC is always ready to send out application forms to anyone expressing an interest in any appointment. ZB really is making a record for himself and is filling the shoes of APP in traffic totals. PQI got on record with a perfect score in the last Frequency Measuring Test. Fine work, Fred. We sure regret to announce the death of George Johnson, SP, the old-timer of Aurora, Ore. He was always an active voice in and on OEN and surely will be greatly missed by all his friends. Traflle: WTZB 578.

OREGON—SMC, Hubert R. McNelly, W7FXD—The present lineup of appointments in this section is as follows: SEC: TQI, HV: AJN, PAMs: NJS, VPE and RGS, EQC: IHLI, DAX, AIH, RCL, RQY, OPs: GJN, ECL, GOY, ATQ, TVI, LT, VNC, HCL, BLN, NP: JNC, JZ: MF, treas.; DEM, UU, RHX, TVE, NWU, AUTO, UH: ORS: ONO, TFD, LT, VUB, AJN, ZBI, YKT, GAC, ZB: BDU, ORB: BY: WQ, AJN and KQY, ORS: ZBI, KQY, and KQAV, OOs: PQI, WNV and KQAV. This is a small lineup of the gang but we can always use a few more, especially in the ORS, OES and OOS spots. The SMC is always ready to send out application forms to anyone expressing an interest in any appointment. ZB really is making a record for himself and is filling the shoes of APP in traffic totals. PQI got on record with a perfect score in the last Frequency Measuring Test. Fine work, Fred. We sure regret to announce the death of George Johnson, SP, the old-timer of Aurora, Ore. He was always an active voice in and on OEN and surely will be greatly missed by all his friends. Traflle: WTZB 578.

Continued on page 120)
ANNOUNCEMENT!

We are pleased to advise that Central Electronics, Inc. has become a wholly-owned subsidiary of Zenith Radio Corporation.

The acquisition by Zenith materially strengthens Central Electronics' position in its field of amateur, commercial and military electronics, and will enable it to expand its operations substantially.

Wesley R. Schum who founded Central Electronics in 1950 will continue as Vice-President and the balance of the personnel will remain as before.

In the future you can expect the same satisfaction, service and leadership in creative engineering that we have delivered in the past.

Central Electronics' fine quality equipment is a natural addition to the Zenith family of high quality products.

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NEW 100V EXCITER-TRANSMITTER
SUPERIOR SSB GEAR

NO TUNING (except VFO), uses famous CE BROADBAND system, PRECISION LINEAR VFO—1KC Calibration. Single Knob Bandswitch 80 thru 10, SSB—DSB—AM—PM—CW and FSK. RF Output adjustable 10 to 100 Watts PEP. Meter reads Watts Input, Amps Output and Carrier Suppression, 2" RF Scope. Speech Level and Load Mismatch Indicators. Audio Filter — Inverse Feedback — 50 db Carrier and Sideband Suppression.
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NO TUNING CONTROLS — CE BROADBAND Couplers in HIGH EFFICIENCY CLASS AB2 using single 813. Easily driven to 600 Watts PEP input 160 thru 10 by a 20A or 100V. Built-In HEAVY DUTY POWER SUPPLY — 45 MFD PAPER Capacitor. Meter reads WATTS INPUT, GRID DRIVE, RF AMPS, and SWR. Completely shielded — TVI suppressed — parasitic free. REMEMBER there is LESS than ONE S UNIT difference between the 600L and a 2 KW PEP [ob. ..................................PRICE $495.00.]

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THESE MULTIPHASE EXCITERS PIONEERED AMATEUR SSB

Wired............$179.50 Kit.............$139.50
MODEL 20A — 20 watts PEP. Bandswitched 160 thru 10 meters, SSB—DSB—AM—PM and CW. Magic eye monitors carrier null and peak modulation. Ideal for driving AB1, AB2, and most Class B linears.
Wired............$279.50 Kit.............$219.50

Central Electronics, Inc.
1247 W. Belmont Ave. Chicago 13, Illinois

119
ALAMEDA COUNTY F. M. NETS—Meetings are held at 2100 on 3900 kc. VBDIX, WBTVQ and WBBIL, made his WACC certificate, off to Reno. Las Vegas, Winnemucca, and Elko boys' VUH, has a new Flecker-Thunderbolt combination. Traffic: WTVIU 103.

SANTA CLARA VALLEY—SCM, W. Conner Smith, K6JWY—SEC; W6VNO, PAM; W6ZLO, RJL; W6PELG, John Reimundt, K6BJ, gave his first club talk after an extended illness to the Monterey Bay RC in October, K6GGK is back on the air after an illness of several months. The West Valley RC reports a show of new members and an operating contest with amusing wrinkles. WATUM gave a talk on Celectronic Flood Waves (S6) before the SARO. The San Mateo RC enjoyed its annual Christmas Dinner at the El Runcio. The Santa Cruz Co. RC election results: W6JLD, pres.; W6VEV, vice-pres.; K6HJA, secretary. The dinner meeting of the Northern Cali. Net (NCN) was held in San Bruno Dec. 14. W6QNO, NO, manager, reports a new station layout a little closer to the ultimate. K6HGV is joining with W6HBO in VTY work, W6TN/8 is busy lining up a new beam, K6ZK is back after a few weeks QRT because of a license lapse. W6CGL, ex-W6HGC, ex-W6102N, is active on 40, 20, 15 and 6 meters. W6BRE is experimenting with the s.s.b. rig, W6WNI, made 502 QSOs in 65 sessions in the October 30th party and then blew a filament transformer in the third hour of the ssb. K6MA is eager to start a chapter of Veteran Wireless Ops. Asm., in the Bay Area. W6NO now reports a new mobile receiver, W6PBC, is building a revised u.h.f. transmitter, W6XYS, has a new vertical on 40 through 10 meters. W6XMS is working a vertical. Search work is curtailting traffic work for W6RF, W6MIG, active on 6 meters, reminds us the NPEC Net is on 50.5 kc, Mon. at 8 p.m. W6LGA was in the Sept. F.M.T. Traffic: (Nov.): K6DLY 341, K6E7Z 388, W6H9T 261, W6WPG 67, W6YBY 89, W6EFT 47, W6H9Y 47, W6QMO 40, K6YKG 32, W6S3 26, W6YH 26, W6DEB 10, K6R8X 10, (Oct.): K6E7Z 441, W6AC 110, W6AC 163, W6WPG 75, W6PUP 59, K6YKG 47, W6MIG 5.

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THE BIG-SIGNAL ANTENNA

Here's the full-size beam with full-size performance, for the ham who demands the best!

100% rust-proof ... aluminum elements and boom ... stainless steel hardware ... high impact poly-styrene insulators ... all the finest ... all built to last!

Each POWERMASTER is designed for a single band ... 10, 15 or 20 meters ... with low SWR over entire bandwidth.

For U.S.A. only
A-310 — 3 elements, 10M, rated 1KW ........ $37.50
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A-320 — 3 elements, 20M, rated 1KW ........ $77.25

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NEW UNIVERSAL MODULATOR-DRIVER... #730
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SUPERB, truly versatile modulator at low cost. Can deliver 50W of undistorted audio signal for power operation, more than twice linear output @ 90% EICO #270 CW Transmitter or any xmitter whose RF amplifier has plate input power of at least 5W. Multi-switch circuit makes easy loads between 500-10,000 ohms. Unique over-modulation indicator permits use as an overmodulation detector for all types of stationary and mobile equipment. Excellent as exciters for a power amplifier stage to max. allowable phone modulation with 65W input. Excellent deluxe driver for high-power class B modulation, ECC83 /12AX7

NEW GRID DIP METER... ... #710
KIT $29.95 WIRED $49.95 including complete set of coils for full band and coverage.

Exceptionally versatile, this 800W with micro-ohmmeter in grid determines...
MOBILE BASE MOUNTS

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FOR 10, 11, 12, 15, 20, 40, 80 METERS

SIZE
1¼" X 15"

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Positive action, just slide whip in or out to readjust glass and lock nut into position.

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NEW MULTI-BAND ANTENNA COILS

New Plug-In type coils for the Ham, designed to operate with a standard 3' base section and standard 5' whip.

No. 999
10-15-20 METERS
YOUR CHOICE
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New easy-to-install, single band, top-loaded plastic covered mobile antenna provides maximum performance at the most useful radiation frequencies.

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10 Met-5 Ft.L $12.95
15 Met-5 Ft.L $12.95
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NEW CITIZENS BAND
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SUPER HY-GAIN CITIZEN BAND
Citizen band mobile stacked coaxial antenna provides 5 to 6 DB gain, 42" high from ground plane. Furn. with 12" extension for bumper mount.

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1.0» Mr. M: mm jéd w m. : î B* 1 V 1 * mm O mm £ K« Jf i o » z .* ^ S . • 0 * 225x56 DKA 3, IUO 2, YVG 2. (Oct.) W4PFC 728, BZE 51. KX 113, K4MEV 75. W4Qr)Y 57, K4SGQ 55. W4EMH 50 313. ASU 233. EIG 230. QIX 171, QER 169. W4SN'H 151 W4AAD 16. OOL 15. CXQ 8, JMB 8. CVO 6, K4JRE Ù SHJ 43, BGP 34. K4DSD 28, W4BYZ 27. KAITP «5 (Nov.) K4QES 831, JKK 557, EZL 470. KNP 447 VET “beaut.” If you’re not on the mailing list, vou’re miss-

new vertical. .K4JKK s first issue of Viroinin Ilfim was

 vn and sporting a new 75A-1 recëiver. IF is aweating

New beams are in service at BGP, TJIO and K4AET.

Newly-tormed Grcenwood Club. AKC is the new Vice-

Director of the Moanoke Division and editor of Scarctb. We wish him succès» in lus new duties. K4PFC, at last

fell, is heading to Winston for his General Class

license. HDQ, from Headquarters gave a taîk to the

Aiken MC on Dec. 2. K4RLX completed an elaborate.

articale must-head for Scarab of which we are all proud


SOUTH CAROLINA—SCM, Dr. J. O. Dunlap. W4GQY--SEC: K4JPE. KM: AKC. PAM: YOS. The

D. A. C. of Camden ratified its constitution on Dec. 8

with DX ss, appropriately, its first president. K4GGP as vice-president and K4STMI as secretary. Greetings to the

Southern Coffee Club on B316 kc, which meets every

0700 EST Mon. through Fri. WHOU and BHR are regular participants, CNZ, ex-K4HTG/4, is net secretar. K4FW has completed his mobile set. New officers of the Dreher ARA are K4AXV, K40VE, KN4TRX and KN4PEO. K4JFYV is president of the newly-formed Greenwood Club. AKC is the new

Director of the Roanoke Division and editor of Scarab.

We wish him success in his new duties, K4PEC, at last

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Aiken RC on Dec. 2. K4RLX completed an elaborate.

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WASHINGTON, D. C.—SCM, John Carroll Morgan. W4X—Vir-

ginians continue to be well represented in the BPL col-

umn. Both halves of the KAQM/QES family made it in

November, while KAELZ eked out an even dozen. OOL is

the new VSM manager, succeeding LW who resigned

because of Navy business. Dick reports visiting several

European points. VSN is thriving, thanks mainly to his

procédure is being taught by RRH on 5850 kc. at

HKB, RRG and TLA also are on MARS RTTY. A cîass

is proving to be excellent. BLV has received a

model 15 Teletype from MARS: LOV has a model 14

from MARS. Both of these machines will be on the air

before too long. This makes RTTY increased.


SOUTH CAROLINA—SCM, Dr. J. O. Dunlap. W4GQY--SEC: K4JPE. KM: AKC. PAM: YOS. The

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articiale must-head for Scarab of which we are all proud

there are more
hy-gain trap tribanders in use
than all other
three-band beams
combined!

because the SMART BUYERS

Compare!

Compare the Hy-Gain Full Size Trap Tribander with any other trap
tribander in the industry. You will find it is the only one that has both full
element spacing (.25 wave length boom on 20 meters) and full sized ele-
ments (longest element 32'). This amounts to almost a third more metal
than smaller tribanders selling for the same price. If you have a space
problem, buy the Hy-Gain Miniature Tribander at a saving of $30.

Compare Construction

Hot dipped galvanized steel boom 1 1/4" in diameter for maximum strength
with lowest possible wind loading. Boom braces form rigid angular boom
to mast assembly. Heavily plated 10 gauge steel channels attach all ele-
ments to boom and boom to mast with positive grip. Elements are 6061 T6
high strength aluminum alloy; 1 1/8", 1", 1 1/4" and 1 1/2" in diameter. All
hardware is galvanized and irrigid treated offering weather resistance
superior to that of any other known material. Hy-Gain's streamlined traps
(only 2 x 3") together with steel boom construction result in the smallest
wind loading area possible in a full sized tribander.

Compare Matching

Exclusive Hy-Gain Triaxial Gamma Match System with coaxially formed
reactance cancelling capacitor built in makes possible for the first time a
perfect 1:1 SWR on a three band antenna. Although factory precalibrated,
it is also adjustable to compensate for variations which may be encountered
at each installation site. Exceptional bandwidth maintains low SWR over the
entire band. The use of this matching system permits tuning the array
for maximum gain with no compromise to facilitate matching.

Compare Traps

The Streamline Hy-Gain Traps are small (8" in diameter)and light
weight. They actually have less wind surface area than any other trap
manufactured. Capacitor, dielectric and coil form moulded high impact styron. They are designed to take 1 KW AM, 2000 watts PEP. Individu-
ally factory resonated for maximum frequency accuracy and completely
factory weather sealed, water proof and air tight (do not breathe) for
years of stable operation. Carbon activated polyethylene covers. High Q
coils well removed from any metal mean highest efficiency of isolation
action.

Compare Performance

Hy-Gain’s High Q Traps result in minimum element loading and true full
sized performance. The longest element of approx. 32' together with full
size 18' boom spacing results in a triband beam with full 8 db gain and
25 db front-to-back ratio. No smaller 3-band beams can develop this gain.
In addition, Hy-Gain does not compromise by detuning parasitic reflector
and director to raise feed point impedance of array so that it can be fed
split dipole with a 52 ohm line. Instead, the Hy-Gain Tribander is tuned
for maximum forward gain and the matching is accomplished by the Tri-
axial Gamma Match System.

Compare Price

Hy-Gain's tremendous Ham Acceptance and large volume production makes
possible the lowest price in the industry for a full-sized three element
tribander: $99.75.

"World's Largest Manufacturer of Amateur Communication Antennas!"
GUARANTEED CRYSTALS!

HERMETICALLY SEALED CRYSTALS
2%, Spec.

Amateur & Novice Fund. — .01% tol. ea. $2.50
Marine & Aircraft Fund. — .005 tol. ea. 4.10
10 to 30 Meg. tol. .005% ea. $3.75
Overtones: 30 to 54 Meg. tol. .005% ea. 4.10
54 to 75 Meg. tol. .005% ea. 4.25
75 to 90 Meg. tol. .005% ea. 5.40

Special! FT-243 Prec. Calibr. to 1st Decimal
2 Meters | Exam: *8010.6 x 10=144.190
Note — 10 KC difference between the above
6 Meters | Exam: *8340.6 x 6=5004.6
Note — 3.6 KC difference between the above
Calibrated FT-243 as exam. above spec. $1.19
Thin-Line FT-243—6 Meters,
50 meg. to 52.44 meg. .... $1.79
52.44 meg. to 54 meg. ... $2.39
2 Meters, 144 meg. to 148 meg. .... $1.79
Hermetically Sealed Fund., .01 Tol. .... $2.50

NOVICE BAND FT-243 Fund. or DC-34 Freq. $1.29
80 Met. | 3701-3748—Steps of 1 KC, FT-243 or DC-34
40 Met. | 7150-7198—Steps of 1 KC, FT-243 or DC-34 only
Dbl. to 40 Met., 3576-3599, Steps of 1 KC, FT-243 or DC-34
15 Met. | 5276-5312—Steps of 1 KC, FT-243

1000 KC—DC9-LM-BC 221 Std. ........................................ $6.25
FT-243—From 1005-2999. Steps of 5 KC ea. .................. $2.39

SPECIAL ITEMS
FT-241 200 KC or 500 KC ea. $1.00
FT-243 Single Band low frequency Crystals — .307 KC to .540 KC—ea. 59c
AN/TRC-1 FT-241 holders from 729 to 1040 KC— 75c
1000 KC—excluded
DC-34 or 35—1690 to 4440 KC. Steps of 10 KC ea. 79c

Marine & C.A.P.—All Freq. Available
2009—2182—2637 etc. Tol. .005% ea. $2.99

U.S. CRYSTALS, INC.
1342 So. La Brea Ave., Los Angeles 19, Calif.

ROCKY MOUNTAIN DIVISION
COLORADO—SCC, B. Eugene Snoponoreno, WBDBL—SEC: NIT, PAM; JR and CXW, O0: OTR and HRV, OBS: HTU, TX has been hard up with jeg trouble, but is getting along all right. He has participated in the September Frequency Measuring Tests and all made good scores. According to Splitter Cluster K9IST, in progress, is K90H and K9RQ, see, of the Larimer County Amateur Radio Club. We understand that UFB has been rebuilding according to "Arrl" instructions. The Denver University Auxiliary radio operation with QVJ, K5QN, K5JNJ, K5JBY, K5DIO, PAB, Rad and VPQ, has been working DX and one Conditional Class exam during the holidays. Send your reports to your local KC, SEC or SCC, AMR and LNJ spent the holidays with their son George, who is attending George Tech. Our sympathies to CXW on the loss of his equipment during a cabin fire. Congratulations to IC on his reselection as Rocky Mountain Division Director. K5Q 575, KB9Y 159, K90K 94. RF9 92. W69MA 60, DQ 55, K5BDH 53, WTV 54, OQT 51, K5BDH 53, WA6A 29. NIT 29, FYD 14. LJJ.

UTAH—SCC, Thomas H. Miller, W5QW—Asst. SCC; John H. Sampson, 70CC, SEC; FSC, PAC; HAM, WJF, PAC; Lf, reexamination for DXCC award, the second to be issued to a Utah ham. BAJ, DTF, WQI, H9D, QJI and K9ZBE were active in the 20th Century, K9H, K9J and K5Q were selected for the 25th Century, K7L and K9ZSH are active and are looking, of the Davis High School Amateur Radio Club. BUE put up a Tri-band and now have a 40-meter beam up soon. K9B has been working DX with his kw. on 10 meters. JWV has received a TNW certificate. All Novice interested in checking into a Novice net for Utah, please contact K5U. We understand the quality, the times and frequency you would like to meet. K7s CTO and CLES are both working on 813 numbers. CTO worked on 144 with a new 25-watt amplifier. Traffic: W7KBY 216. O05 108. OQW 15. K5CS 8, W7E 7, K5CO 5, W7BAM 4, FSC 2.

NEW MEXICO—SCC, B. Eugene Snoponoreno, WBDBL—SEC: CIN, PAC; ZU, VIF, PAC; FPR, O0: Lf, GHH and GHH, RFB, O0: WNN, RFU, DFB and K9RQ; 0PS: YC, K5BS1; GHH, O0s: YG, K5WSP, K5MDAB, K5JBE and K5IE8. The New Mexico Emergency Phone Network meets each Sun. at 1000 MST on 3800 kc. K5JBE, K5CS and K5QBE, The Breakfast Club meets Mon. through Sat., on 3858 kc. at 7000 MST. The TUNN meets Mon., through Fri. at 1900 MST on 3800 kc. The TUNN meets Sun. at 1000 MST on 3850 kc. There were four v.h.f. nets this month with a total of 29 check-ins. LFJ has worked all "49" states and two continents on 6 meters. The Aldebaran V.H.F., Net operates on 146.802 Mc. NTV now is a member of the Quarter Century Wireless Association. The Colorado Club had its...
NEW! FOR FIXED STATION OR MOBILE USE
Globe's Completely Re-Designed — PRINTED CIRCUIT

Globe Meter CONVERTER

NIWIRED & TESTED: $29.95
IN KIT FORM: $21.95

Before You Buy
LOOK AT THESE TOP FEATURES!

★ New improved circuit provides higher gain, better signal-to-noise ratio.
★ Completely shielded to minimize feed-through of unwanted signals.
★ Printed circuit for simplifying kit assembly.
★ Works with most receivers on the market today, including home broadcast receivers and car radios using proper converter.
★ Highly stable, crystal controlled oscillator.
★ Measures only 3x5½x4½"; complete with tubes, crystal and connecting cables.
★ B plus requirements 150-250V at 15-18 Ma. Provisions for changing filaments for 6 or 12V operation.
★ Models available for output ranges of 550-1600 Kc, or 10-14 Mc, covering most ham receivers and car radios.

SEE YOUR FAVORITE DISTRIBUTOR
FOR THESE TOP FLIGHT GLOBE ELECTRONICS PRODUCTS
Globe King, Globe Champion, Globe Scout, Globe Chief, Sidebander, Hi-Bander, VOX and QT-10, Power Booster, Globe Linear, Power Attenuator, 6-Meter Converter, Universal Plate Modulator, Screen Modulator Kit, Globe Matcher, Sr. and Jr., Speech Booster, VFO Models 755A, 8-2, and 656, many in kit as well as wired and tested form.

This new and improved model of the popular Globe 6-Meter Converter now offers better signal-to-noise ratio through improved circuitry. Has highly stable, crystal converter with Cascode RF Stage and band pass coupling, made with two output frequencies, enabling converter to be used with many types of communications receivers plus 6 or 12V auto radios for mobile use. Kit extremely simple to assemble with printed circuit. Complete with 6U8 and 6BQ7 tubes, crystal, receiver input cable and power cable. Size: 3x5½x4½.
A NEW CONCEPT—Hi-Power VHF LINEARS for 6 or 2 meters

**Watts DC Input:** 600 on SSB-CW-FM; 250 on AM-PM

- New BROADBAND untuned input circuit uses 6-watt drive for 600-watt input; for 50-70 ohms. • New output circuit gives approximately 20 db more harmonic suppression than any other in common use while matching antenna impedances between 25 and 300 ohms.
- New built-in TR switch uses gain and selectivity of output tuned circuit; has approximately 10 db gain, with one 128H7A tube.

Excellent stability; No parasitics; TVI suppressed. By-pass RF final in shielded compartment. Designed to work with 600A, 200A, Gonset Communicators, etc.
- Built-in heavy-duty power supply furnishes 700 watts; work with 600A, 200A, Gonset Communicators, etc.

Six Meter Transmitting Converter

A new heterodeodyne unit ideal for any low powered 14 to 18mc transmitter or exciter such as 20A, 10X, DX20, DX35, etc. Uses a 6UB operating as 63mc crystal controlled oscillator amplifier and has an 0A2 voltage regulator. A 6360 linear mixer amplifier in the output is tunable between 49 and 55 mc. Low impedance input of approximately 60 ohms delivers up to 10 watts RMS output into a low impedance load between 25 and 100 ohms. Powered by separate power supply or in some cases by transmitter or exciter such as 20A or 10B. Requires 300 volts at 100 ma dc, 150 volts negative bias and 6.3 volts at 1.5 amp filament. Size only 5x7x7 inches.

Model 600A Complete, less Power Supply ........................ $49.95
Model PR 600A Power Supply for above .................................. 39.95
Model 600A-PR Complete with Power Supply ........................ 87.50

**LA-400 Series Linears—75 thru 10 meters**

LA-400-C Kit, complete for assembly only .......................... $149.95
LA-400-8, same unit wired and tested .................................. 199.95

**V-F-O-MATIC Frequency Control**

6020 for 75A-2, 3, 4 Collins receivers .......................... $129.95
8010 for KWS-7 thru 15 ........................................... 179.95

**High Power RF Choke—Model 160-6**

Max. rating of 5000 volts direct current .......................... 162 oh at 1 kc. Operates on all amateur bands, 160 thru 6 meters. Each ........................................... $3.50

Also choke custom designed to your requirements.

See your distributor or write:

**P & H ELECTRONICS, INC.**

424 Columbia, Lafayette, Ind.
**Transistor Power Supplies* and Components**

**D SERIES (Standard)**
Continuous operation at 30 watts. Selective taps at 200, 250 and 300 volts; intermediate voltage at 1/3 selective taps. Both voltages can be drawn simultaneously if total power does not exceed continuous ratings. Positive or negative ground operation. Input and output filtering included except for intermediate tap.

Size: 43/4" x 3/4" x 1 1/4"  Wt.: 10 oz  6- or 12-V Input: $39.95  24-V Input: $61.95

**DA SERIES**
Continuous operation at 45 watts. 450 volts and 225 volts simultaneous if total power does not exceed continuous ratings. Intermittent duty to 90 watts, 450 volts at 150 MA; 225 volts at 100 MA (5 min. on, 20 min. off). Positive or negative ground operation. Input (primary voltage) filtering; partial high voltage filtering provided.

Size: 43/4" x 3/4" x 1 1/4"  Wt.: 14 oz  12-V Input: $57.50  24-V Input: $79.50

---

**Toroid Transformers for Transistor Power Supply Application**

**H SERIES**

<table>
<thead>
<tr>
<th>Model</th>
<th>Input</th>
<th>Output</th>
<th>Transformer Configuration</th>
<th>Secondary Tap</th>
<th>DC Output</th>
<th>Power Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-6-450-1</td>
<td>6-VDC</td>
<td>450-VAC</td>
<td>Voltage doubler, Center Tapped</td>
<td>450 and 225 VDC from bridge rectifier</td>
<td>45 watts</td>
<td></td>
</tr>
<tr>
<td>H-14-450-12</td>
<td>12-VDC</td>
<td>450-VAC</td>
<td>Voltage doubler, Center Tapped</td>
<td>450 and 225 VDC from bridge rectifier</td>
<td>55 watts</td>
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**HD SERIES — 2000 CPS**

<table>
<thead>
<tr>
<th>Model</th>
<th>Input</th>
<th>Output</th>
<th>Transformer Configuration</th>
<th>Secondary Tap</th>
<th>DC Output</th>
<th>Power Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD-14-225-300-3-D</td>
<td>12-VDC</td>
<td>225-VAC</td>
<td>Voltage doubler, Center Tapped</td>
<td>225 or 300 VAC</td>
<td>225-600 V at 200 MA</td>
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</table>

**HDS SERIES — 5000 CPS**

<table>
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<tr>
<th>Model</th>
<th>Input</th>
<th>Output</th>
<th>Transformer Configuration</th>
<th>Secondary Tap</th>
<th>DC Output</th>
<th>Power Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDS-14-225-300-3-D</td>
<td>12-VDC</td>
<td>225-VAC</td>
<td>Voltage doubler, Center Tapped</td>
<td>225 or 300 VAC</td>
<td>450-600 V at 300 MA</td>
<td></td>
</tr>
</tbody>
</table>

**400 CYCLE SERIES**

<table>
<thead>
<tr>
<th>Model</th>
<th>Input</th>
<th>Output</th>
<th>Transformer Configuration</th>
<th>Power Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>14-115-1.5-400</td>
<td>12-VDC</td>
<td>115-V at 1.5 amp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-115-1.5-400</td>
<td>24-VDC</td>
<td>115-V at 1.5 amp</td>
<td></td>
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**OEM Prices on Request**
All fully performance tested, 100% guaranteed. Manufactured by makers of world-famous SUNAIR H.F. Aviation Transceivers.

**SUNAIR ELECTRONICS, INC.**
Broward County International Airport
Fort Lauderdale, Florida, U.S.A.
is temporarily QRT awaiting a modified license. Hams
assembled police with traffic in the Christmas Parade
under the direction of BPJ. The EQ, a three-year-old, 75-2
Mz, has been picked for the 2-meter net. Those active
include CSS, MTQ, MTZ, K4VE, K4KX, KGZ, and
K4ZU. Among the new operators is a new Heathkit receiver for the
Motor Radio Society. JUA volunteered to be instructor for the
booth and theory class which started last November. Participating
December, Part St. Joe: K4ZM organized an 8DXpedition to Galveston,
Texas, to help the boys in the World All Florida Counties Contest to get this rare county. A lot of inter-
est is being shown in this contest, sponsored by the
SC and the Dade Radio Club, Pensacola: AXP is
active in the SS and IU Parties. PTJ, TVJ, QRT and
others are getting much DX on 6 meters. The PARC
sponsored a 10-meter transmitter hunt, with hunts from
Mobile and PT: Wallen taking part. At its last meeting the
PARC made a tour of Gulf Power Co. facilities,
arranged by K4KBQ. A new TTV committee has been
inaugurated with JT, chairman, K3PO, K3QK, SOU and
K4PTQ. Traffic: (Nov.) K4URB 301, W4BVE 109, K4OD
54, K4SH 30, K2M 8. (Oct.) W4SR 859, K4URB 616,
GOD-SCM, W4SHG, W4SK, W4SPI, WACF.
SEC: K4AAM, PAM: LIHE and AOH, RM: PIM.
OCEN meets on 3925 kc. at 1830 EST Tue. and Thurs.,
8925 kc. at 1830 EST THU. 7100 kc. 1800 EST Mon."

These fine relays, manufactured by Jennings Radio,
world's foremost producer of vacuum relays and vac-
um variables, were obtained by a fortunate purchase
of stock made available by cancellation of a current
contract. Relays direct from a production run
... are not surplus.

RE2 Vacuum Relays are precision built... designed for
high-power applications in resistive circuits. Vacuum
dielectric insures high power switching without the
danger of anti-alias relay problem! Extremely
fast action... no arcing. Ideal for SSB voice-operated
or CW break-in circuits... none of the frequently
present difficulties of the TR switch. Also usable in
many other high voltage applications. The required
operating voltage of 24 volts DC at 500 ma is easily
obtained from simple transistor/silicon rectifier com-
bination. Data sheet available upon request.

SPECIFICATIONS

JENNINGS TYPE: RE2
CONTACT ARRANGEMENT: SPOT
RATED OPERATING VOLTAGE: 24 VDC
TEST VOLTAGE BETWEEN TERMINALS: 15 KV
TEST VOLTAGE TERMINALS TO GROUND: 15 KV
CONTINUOUS CURRENT—RMS AMPS: 150 MS
CONTACT RESISTANCE: 0.02 OHMS
CONTACT CAPACITANCE: 0.25 pH
OPERATE TIMES: 50 MS
DC ACTUATING COIL: POWER: 12 WATTS
VOLTAGE: 24 VDC

Save more than 70% on regular price of 147.00.

Low Elmar price 39.50

SOUTHWESTERN DIVISION

LOS ANGELES—SCM, Albert F. Hill, Jr., W4IQD—
(Continued on page 138)
PARDON US FOR BLOWING OUR OWN HORN, BUT...

We are sure proud of the Frequency Stability vs. Time tests on a few typical COSMOPHONE "35"s. Here are curves of a few typical units to better acquaint new owners with the Frequency Stability of the new COSMOPHONE "35"

THE FIRST DUAL CHANNEL BILATERAL TRANSCEIVER

- Operates on 10, 11, 15, 20, 40 and 80 meter bands.
- Transmits or receives SSB (upper or lower), single sideband with carrier (AM) or C.W.
- Peak-Null "Q" Multiplier.
- Receiver Sensitivity. 1 Micro-volt @ 6 db S/N ratio.
- Single 6146 output.
- Built-in VOX and QT.
- 40 db suppression.

- Meter Indication for R.F. output, final Grid or Plate current and receiver signal strength.
- Dimensions 17" wide x 12" high x 15" deep.
- 3.1 kc mechanical filter for transmission and reception.
- Dual speed tuning knobs with ratios of 20:1 and 100:1 over a 600 kc band spread.

Amateur Net Price $799.50 $139.50

IMMEDIATE DELIVERY AT YOUR DEALER

FOR ADDITIONAL INFORMATION AND DEALER NEAREST YOU, WRITE DEPT. QST-2

COSMOS INDUSTRIES, INC.
31-28 QUEENS BOULEVARD, LONG ISLAND CITY, N.Y.

FOREIGN REPRESENTATIVES: MINTHORNE INTERNATIONAL CO., INC., CABLE ADDRESS: MINTHORNE, N.Y.
I DA Club was held at the home of V6BZE. K0AOF conducted a raffle to benefit the San Luis Obispo newspaper. DA Poly harnessed FB on the job of the collection of revenue. V7UUVT handled an antenna-raising party to put up his new Gouset Tribander. Those present were AV6KSW, W6ESH, AV6NXT, AV6BVT, AV6MGB, and K6PBY. They also entertained with a Spirex game.


ARIZONA—SCM, Cameron A. Allen, W70IF—SEC; TWF, PAM Copper State Net; FAIZ, CBN, now is operating on 3890 kc. K6KCR participated in the 1L Anniversary Party. A combination Red Cross and c.d., drill with display of the new mobile van was held in December at Tucson. W6TVL and W70IF made a successful contact with San Diego DX Club. W6RLU was on the air on 7 meters.

SAN DIEGO—SCM, Don Stansifer, W6LSW—NEW, and W6LSW—NEW. The annual installation of officers was held at a dinner meeting held on Jan. 16. W6KCR participated in the 1L Anniversary Party. A combination Red Cross and c.d., drill with display of the new mobile van was held in December at Tucson. W6TVL and W70IF made a successful contact with San Diego DX Club. W6RLU was on the air on 7 meters.
The Finest in Single Sideband

NOW—Morrow research and creative engineering make possible the finest performance in single sideband transmission—superior for both home and mobile use. The compact design has been achieved with no sacrifice in the famous Morrow standard of quality, yet this set can be yours at an amazingly low price. You can be the first in your area to get on the air with the new SBT, clean, crystal-clear signal.

Complete coverage: 3.8-4.0, 7.1-7.3, 14.1-14.3, 21.25-21.45, 28.5-28.7 MC. VFO calibrated 0-200 KC (add to frequency shown on band switch). Other 200 KC segments of the bands can be selected when desired by inserting the proper heterodyning crystal.

Mechanical filter for long term maximum suppression (50db) of carrier and unwanted sideband.

Emission—upper or lower sideband, CW-AM (SSB with carrier added). Change bands in 30 seconds with semi-automatic antenna loading designed for 50-75 ohms. Excellent voice operated control system (VOX) as well as push-to-talk. Anti-trip of new improved design. Built-in antenna (VOX) relay. Controls grouped for operating ease. PEP input 90 watts. Matching power supply has “half power” switch for using the SBT as a lower power exciter.

Same cabinet dimensions as MB6 and MB565: 4½” x 11½” x 7¼”. Plug-in connections for easy removal from car.

Amateur Net Price ........................................ $349.50

12-Volt DC, 115-Volt AC, Universal Power Supply Unit designed especially for the SBT Transmitter. Includes complete set of power cables for either home or mobile use.

Amateur Net Price ........................................ $124.50

MORROW radio mfg. co. • P. O. Box 1627 • Salem, Oregon
NOW — an efficient distributed-load antenna built into a Shakespeare Wonderord! You can mount this shortened antenna on trunk or fender . . . where radiation pattern is best. Superior Shakespeare fiberglass construction, using high grade dielectric materials to reduce power loss.

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<tbody>
<tr>
<td>Band</td>
<td>30-35</td>
<td>35-40</td>
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<td>4&quot;</td>
<td>5&quot;</td>
<td>6&quot;</td>
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<tr>
<td>Price</td>
<td>$15.90</td>
<td>$18.75</td>
<td>$21</td>
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Special 40 & 80 meter bumper mount antennas in 8" lengths — $21.

*marked for intermediate frequencies.

Amateur net reports 41,069 points were made in the 1938 Sweepstakes. W0OQ was active on 40-meter s.s.b. KGIC is now active on 2 meters. K5RC has ZL, now on 15 meters. Power? 5 watts. Traffic: W6FCD 7, W6DTY 3, W6FYW 3.

WEST GULF DIVISION

NORTHERN TEXAS — SCGM L. L. Hubbard, W0BNG — Asst. SCGM: M. C. Pool, 5NFO, SEC: K5ALEX, PAMs: BUO and K5QG. K5AJ: ACK. With the ending of activities of the Ground Observer Corps it seems this will be an opportunity for Emergency Coordinators to reorganize their local emergency set-up. Amateurs who have been giving their time to that operation may be induced to give their time and experience to ARRL activities. K5LUG is the new net control for NTEX. The Corpus Christi Rock Club has organized a RACES group and is looking for a building to be used for the base station, seeking the 6-meter group to have greyhounds and have mounted Halo antennas on their UV. UVW goes one better by pulling a 16-Ft sailboat behind his F1R, and FON are proud owners of new Traband beams. JFN put up his on a 30-ft. tower at midnight. K5AEX can be heard on s.s.b. with a new 20-A. K5DNG reports working 7 counties with a two-element horizontal-15 meter beam. JML, B7R, RR, JAJ, FIQ, K5Q, PQM, K5DG, K6JHG and ARD took part in the Statewide Frequency Monitoring Test. Most of them qualified as Class I Operators. Congratulations. We are in need of more OQs. Because of handover interference K6QG now works on his antenna system at night; the odd thing about this is that she seems to pick up the night with the highest wind. Traffic: W5SMK 341, B4R 120, K5PKY 99, W5UPO 70, K5JP6 39, W5THI 37, LR 12, QY 11, K5YM 10, K5S2G 4, DOW 3, W5WEE 3.

OKLAHOMA — SCGM, Richard L. Hawkins, W5FEC — SEC: K5KPS, RM: JXN, PAMs: DZH and MFX. The following stations qualified for OQV/SO5 Net certificates: K5FYW, ERL, FEC, K5K, K5NC, KY, K5GW, K5MB, K5MFX, PNG, K5BDK, VWL and VWV. New Noxes in Copan are K5STEX and KNSTEB. NS was transferred to Tulsa, TR5Q. New call in the future is K5GJ and K5QKQ. ZZG installed a telephone pole for his beam support. HIC QSOed CTICO on 20-Ale. e.w. K5KTV confirmed both W38 and WAC certificates. K5GJS placed No. 15 in the recent S.S.B. WAS contest. K5MSA came one of the top scores in the Field Day. XZD is trying 7 meters after a tour years. He says some of us characters don't discourage him. K5MBK now has a Viking 500. QOL is up and around after surgery. K5MCK made DXCC. The Sooner-Nooner Net reports 21 sessions with 904 stations checking in and 140 messages being handled. Oklahoma's Ham of the Month: DRZ for his work as PAM and his excellent net and NCS on the Sooner-Nooner Net. Traffic: (Nov.) KG5CL 138, J2X 130, MKB 119, W5DZB 111, V5QV 103, JXN 88, DXR 79, RX 71, PNG 33, K5KFS 15, FEC 29, MKG 27, VWL 19, K5DJJ 17, K5KMU 15, CVU 14, W5SWE 13, K5BYP 12, CBA 12, W5WAF 8, ZZG 7, LER 2. (Oct.) K4MKR 138.

SOUTHERN TEXAS — SCM, Roy E. Englestone, WQ58M — SEC: QRF, PAM: ZIN, RM: C5K5BZ, K5K8S is the new EC at Rockdale. This is the first time in the history of the town that there has been an emergency communication plan. K5GKC has a new Traband beam. K5KBS is working break-in. K5JZB has a new Viking 11. K5QG and RPH attended the Dental Convention in Dallas. We welcome K5LXX to Sinton. WXT and TTH are the proud parents of a baby girl. Congratulations to ETA for his election for another term as Director of the West Gulf Division. The 7200 Net has had 38 sessions. 1268 sweeps and sweep-up messages handled. All the 6-meter operators have been having a field day with the good DX that has been coming in. The following districts have been working K5K8S, LAM, LAB, VO2, VET, and JAI. The only problem in 6-meter DX is the popularity of the low end of the band for ragchewing. I wonder, when the present sun-spot cycle is over, how many of the guys can look back with pride on the contacts they QRMed with their low-end ragchewing. K5QON has a new Giome Hillebrandt. He is now "Yankee Jack" since becoming a member of the Comanche Signal Corp. Another good converted Yankee. Listen for FCX on module e.w. KN9TOP is a new Rockport. K5EKM 292, W5LYC 173, EGD 16, K5CC 119, W5LYC 87, ZIN 70, HEK 63, K5HYS 51, W5FEC 14, KB5VWT 10.

CANADIAN DIVISION

MARITIME — SCM, D. K. Weeks, VE1WE — Asst. SCM: A. D. Solomon, 10C; and H. C. Hillyard, VOICZ. SEC: 2L. We take pleasure in announcing two new appointments this month. VOICZ as Asst. SCM for the VO (Continued on page 137).
Coax connector not included.

Two coils required.

LADDER LINE®

IDEAL FOR TELEVISION LEAD-IN, COMMUNITY T.V., TRANSMITTER FEED LINES OR ANTENNA ELEMENTS.

<table>
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<th>Cat. #</th>
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30’, 35’, 40’, 50’, 60’, 75’, 100’, S = Copper Wire, Silver Plated, C = Copper Wire Formvar Covered, Formvar Covered, CW = Steel Core Copper sheathed

250’ self reeling cartons.

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Unbalanced coax lines used on most transmitters can be matched to balanced lines of either 75 or 300 ohms impedance by using the B2009 air dux coils. May be used with transmitters and receivers without adjustment over the frequency range of 80 through 10 meters, and will handle power inputs up to 200 watts.

NO. DESCRIPTION NET EA.
B2009 Coil with hardware 3.36
MB2009 Mounting plate 1.95

indented pi dux®

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vari-pitch pi dux®

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The 500 and 1000 watt pi dux assemblies are compact yet conservatively rated. The high frequency coil sections are silver plated for high tank circuit efficiency. A complete technical sheet is included with each assembly.

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PL-6569—250-watts plate dissipation, hi mu (45). With a power gain of 10 or more, this tube gives you more than 800 watts output with only 75 watts drive. Low plate-to-filament capacitance (0.10 uuf) gives you high stability.

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EXTRA-RUGGED PLATE CAP—Penta has designed both these tubes with a one-piece low-loss copper plate cap and seal. It can't break off. And there are no set screws or separate pieces to come loose.

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BRAND NEW HALLICRAFTERS
S-107 RECEIVER

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Among new equipment and top values, this handsome new Hallicrafters S-107 receiver is a best buy for you... Broadcast plus 4 short-wave bands, including 6 meters, cover 540 KC-54.5 MC. Plug-in jack for your record player! Separate electrical bandspread with 0-100 logging scale plus calibration for the 6 meter band. Also boasts Receive-Standy switch; AM/CW sensitivity control; noise limiter switch; 2 position tone switch; 5-position band selector switch; 5" PM speaker; jack for earphones; speaker-phones switch; terminals for doublet or single wire antenna. Audio output one watt. UL approved. Seven tubes plus rectifier: 6C4, 6BA6, 2-6BA6, 6H6, 6SC7, 6K6GT, 5Y3GT. Modern, streamlined gray hammer tone steel cabinet with brushed chrome trim. 13¾" wide, 7" high, 8½" deep. Shpg. Wt. approx. 18½ Ibs.

Talk to Terminal. Talk to Terminal about the S-107 and entire Hallicrafters line. Talk to Terminal about our usual buys for all your Ham equipment. "You can always depend on Terminal for your best deal"...73.

Communications Receiver

The receiver will operate as described above with either setting of the sideband switch. However, by proper choice of b.f.o. frequency a selectivity advantage can be obtained from the 3-ke. filter. If an interfering signal is present, the sideband switch can be thrown to the other sideband position, putting the interfering signal out of the receiver's pass band.

Main Tuning

In general, main tuning controls have left a lot to be desired on all but a few of the most expensive receivers. The case is not much different in this application. The MCN dial is one of the few available that is anywhere close to meeting the requirements of this receiver. However, a more elaborate tuning mechanism would be justifiable in view of the selectivity employed. A higher gear ratio and a reduction in parallax are two features that would be helpful.

Electronic Key

Automatic too! It is almost impossible to send poor code with this key. Characters cannot be cut short nor can they be run together. As an example, let's make the letter "N." Push the key lever to the left (dash position). Just as soon as the dash has started, move the lever to right (dot position). The automatic key will finish the dash, make the proper space and begin the dot. Just as soon as the dot has started, move the lever to neutral. The key will finish the dot and stop. Try this at a very slow speed to realize just how automatic it is. So if you really want to sound like W1 A/V, put this gadget together. It will take only a few hours and will repay you many times in ease of operation and almost perfect c.w.
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YL News and Views
(Continued from page 94)

Helen Dougla, W5LGY, reports that 35 certificates have been issued to date. OH1 W2QHI and YL W45GD were the first WS-hams to earn the award. The 101 members of TLRLR are listed in a new directory which is available for 25 cents.

KI6 YL Club — Pres. KI6CRO, Kay, writes that the club is beginning to grow, and that the membership is "out to let everyone know we’re here" (See separate item on new KI6 YL Certificate.)

LARK — New officers: Pres. K1TVG, V. P. W9TDC, Secy. KOBWJ, Trens. KOBCH, Pub. Chmn. and Editor of Pinfeather W9MYC, Novice Rep. K19LR. Some 66 LARK certificates have been issued to amateurs who contact 10 members and send a list of contacts to Custodian Gladys Jones, W19MYC, 11351 Hampton Ave., Weston Springs, Ill. Newcomers are invited to join the LARK Nest, which meets Friday at 10:00 P.M. CST on 29 Mc, and the e.w. net Monday at 1:00 P.M. on 3750 kc.

R. I. YLRC — New officers: Pres. W1OTT, V. P. W1CFT, Secy. W1ZOK, Trens. W1WEED,


Los Angeles YLRC — Ruby Word, W6WRT, 2140 N. Valley, Burbank, Calif., replaces W6KER as custodian of the Lark N. Lassies Certificate.


Miscellany
Very active sidebander K5GME, Dorothy, lists the YLs she has contacted most often on sideband in the past two years: W12XT, W2EO, H1K, K2TEX, W3s GEN, VCB/4, K2HIL, K2ZWW, K6s IKB, M1H, W6NAZ, K8HJR, W8SPU, W8KJR, W8JMH, and Q5ME. Dottie has worked 116 countries on s.s.b., with 109 confirmed (photo in Oct. '58 column). . . . Thanks to K4JMB, Ethel, and OMs K3AXX, K3CHN, and W3CN who raised an antenna for her, W3JTR, Meg now puts out a potent signal on several bands. . . . W7TDK graduated third among members of her code class. Naomi has been instructing radio beginners for years. . . . Back in the U. S. again after a two-year stay in Lebanon at the U. S. (Continued on page 144)
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Rush New Catalog

For...

(Continued on page 144)

How's DX?

(Continued from page 72)

the form of a certification will be given to any amateur radio operator in any part of the world who successfully establishes contact with 70 North Atlantic Islands. Decision to present these certificates was made at a recent meeting of the Amateur Radio Club... Two contacts must be made with amateur radio operators in Aruba, five in Curacao, one in Bonaire and one in the Windward Islands. This from Hank Moyer Associates, 557 Morgan Rd., Miami Beach, Fla. Others can be... one representatives of possible Caribbean DXpeditionary work... and the year... valuable and... by fining their 15-meter uniform signals back at them via tape recorder... W3NEI 5, writing from League City, Texas, a natural QRM for an ARRL booster... and then there's Philadelphia's League Island and the Redheaded League of Sherlock Holmes. Any others? Stayed at "How's" operation for new service with a 132 70 DX record... V2PD's DA and DM utilized the ham gear of V2PA 1 and DN in opening the first airport in Leominster's history last September. The... gives next month as our Half-Century Novice certification (p. 154 and 155), a few inquiries arrived concerning the "How's" publicity for V2PA 1, V2PA 2 and W2PA 3, arrives... One contacts from OX3IGY were several confabs with our own... and W6CAE of San Diego. Hostess YL elub was the San Diego YLRC, with Betty, is operating portable on 10 w., from a new WOTF's tight little island W6CAE of San Diego DX Club's Clipperon conquerors gives next month as

(Continued on page 144)
You are needed for this year of progress

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POLICE • C.A.P. • C.D. • MARS

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<td>100 KC Marker Crystal in 3 Prong</td>
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(NOVICE BAND

80 meters within 1 KC of specified frequency, 3701 to 3749 in FT 243 or DC-34 holders (specify holder wanted). each 99c

40 METERS

From 71.52 to 7198 KC within 1 KC of specified frequency in FT 243 holders only. each 99c

STOCK CRYSTALS

From 4005 to 8550 KC in FT 243 Holders—Pin Spacing—

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<tr>
<td>2000 KC to 6500 KC</td>
<td>.01%</td>
<td>$1.25</td>
</tr>
</tbody>
</table>

(Pin Spacing .01"

SPECIAL CUT CRYSTALS

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency Range</th>
<th>Tolerance</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very thin Crystals</td>
<td>$1.65</td>
<td></td>
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</tr>
<tr>
<td>FT 243 or FT 171 Holders</td>
<td>$1.65</td>
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<tr>
<td>FT 243 or FT 171 or DC-34 Holders</td>
<td>$1.65</td>
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<tr>
<td>CRI or CRI/AR Holders</td>
<td>$2.00</td>
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<tr>
<td>MC-7 Holders</td>
<td>$2.00</td>
<td></td>
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</tbody>
</table>

SEND FOR FREE CATALOG

A well qualified staff of crystal engineers and technicians and the use of electronic frequency counters make possible the quality crystals listed in this ad, 24 hr. service.

JET CRYSTAL COMPANY

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TERMS: Include 5c per crystal for postage and handling charge. Prices subject to change without notice. All crystal orders must be accompanied by check, cash or M.O. WITH PAYMENT IN FULL. NO C.O.D.'S. Postpaid shipments made in U.S., and possessions only.

target date for the club's coming Socorro sortie —— R2T3HJ is seriously inclined toward Tortola operation before the winter wanes—— VP2VB of Ynese II managed thousands of multipliers from Montserrat (VP2HIX) and Anuilla (VP2KFA) in late 1958. Among difficulties encountered by Daniel in these doings was a painfully silent car —— W8HIN maintains his mastery of the OURIRA Ether Waves hand-band-counties soundex, Jim's 1938 total is followed by W8BFX GWX 8SD and W2 with 992, 774 and 600 band-counties respectively.

Ten Years Ago in "How's DX?" —— Acknowledging DXing as just about the most competitive angle in day-to-day hamming, your February 1949 column calls attention to new ARRL Operating Aid No. 5, a DX operating code prepared by ARRL's Communications Department to help minimize fraternal frictions —— Eighty is warming up with W7KPA, VP2 and ZC8PM as standouts, PY4ZT and others.

SPECIAL FREQUENCIES

Very thin crystals.

SPECIAL CUT CRYSTALS

From 4005 to 8550 KC in FT 243 Holders—Pin Spacing—

Delivering Messages

(Continued from page 51)

2. The written message is a renewed invitation for the recipient to use amateur radio to acknowledge or reply. Often the recipient is not immediately ready to answer or she may be timid about a reply. Written deliveries have proved to be for me a fruitful source of new traffic to originate. In that connection, even though the message blank carries the printed statement: "Your reply to this message will be handled without charge by the receiving station," I often add, below the typewritten text, "We shall be pleased to handle any reply or acknowledgement you wish to send."

3. The written delivery is a tangible evidence of how excellent our amateur traffic system can be; not your private traffic system nor mine, but our nationwide one. Sometimes the message gets mailed back to its originator and, in turn, is passed to the originating station, for others to share in the glory of the thing. When you yourself have been the originating station, you have perhaps been disappointed to learn from the originator that she had a letter from Mrs. Smith and Mrs. Smith never even mentioned the message. If it was delivered by phone, was this a case of "in one ear and out the other"? A written delivery will help Mrs. Smith to remember that she got it! And it may help the originating station to get some repeat traffic.

4. Finally, for messages of greeting: seasonal, birthday and anniversary — a written delivery will help her to remember that she got it! And it may help the originating station to get some repeat traffic.

In summary: we can improve the art and practice...
SALE! POWER PLANTS for field, farm, home!

3000 watt Generator with Gas Engine!

$279.95 Model 208

$28 Down, $17 Monthly

• 5 1/4 HP Briggs and Stratton Ball Bearing Engine
• Generator Directly Connected to Engine (Drip-Proof)
• Extra Large Capacity Fuel Tank — 6 Quarts

Order No. Model Starting Choke Down Monthly Setup
RMF208 208 Manual Manual $28 $17 $279.95
RMF288 288 Push Button Manual 32 19 319.95
RMF298 298 Push Button Automatic 34 21 339.95

Model 298 shown

2000 Watt 4 hp

Models 108 and 88
115 V.A.C., 60 Cycle
With built-in mechanical governors

1000 Watt 2 1/4 hp

• Briggs and Stratton 2 1/4 HP Engine #6B
• 1000 Watt Generator
• Pulley-Belt-Steel Base

Reg Value $225

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Save Money! Write for used equipment list!

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Please send me:

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RMF288 288 3000 187 lbs. 319.95
RMF298 298 3000 185 lbs. 339.95
RMF108 108 2000 135 lbs. 199.95
RMF88 88 1000 105 lbs. 119.95

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Each—$3.00
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AMERICAN RADIO RELAY LEAGUE
West Hartford 7, Conn.

Practice of message deliveries by careful pre-checking, by considerate handling of telephone deliveries and by use of neat, accurate written deliveries. More perfect deliveries will bring rewarding satisfactions to us all.

Portable ZS9

(Continued from page 54)

I want to express my appreciation to the South African and Rhodesian Railways for deciding to bring the railroad so that it crossed the motor path. There we found what once must have been a motor gate. On the rusting gate were tangled masses of "a stout piece of wire." If you were home you would go out and buy some new stuff but out there the wire looked so good you could eat it. I doubt if ever I have felt such passion for anything so inanimate. In California I could easily have started a wire worship cult! Out came the Brownie ... the jacks ... the side-cutters and torches. Ben was soon sweating sub-chassis. He "bopped" (when translated from the ancient Aramaic means "twisted the hell out of") the cross member to the universal mounting. We were on our way again.

Uneventfully we crossed the Limpopo, found petrol, and at 1:30 P.M. on Monday we were back in Klerksdorp. We had ten hours sleep in eight-five, 1150 miles chalked up on the speedometer, 305 contacts, 35 countries, and a lovely weekend. Oh, brother!

A personal tribute must be paid to the Richmond Amateur Radio club in general and Myron Steffy, W4TYC and Joe Galeski, W4IMP, in particular for advice, help and above all for handling the tedious business of QSL cards. These were handled expertly and I doubt if any guy who has sent in his QSL has not received the cherished ZS9.

Strays

Five brothers who are all hams and Franciscan Padres: W9NHO, W8MUR, W9NEP, W9VRT, K0MFT.

Another multi-ham family is that of W0NIT, whose XYL is W0VLS. Their three junior ops are W0NCB, W0SKB, and K0JYJ. A sixth ham member of the family is Grandma K0JJJ. Our records aren't complete, but KGUDM says there is another brother ham on the west coast.

Overseas readers who don't readily hear WWV in the States can get time signal and standard frequency transmissions from ZUO at the Union Observatory in South Africa. The carrier frequencies are 5 and 10 Mc, interrupted from 15 to 25 minutes past each hour. Morse code announcements are made each 15 minutes, giving the call sign ZUO and the Universal Time of the next minute.
Hammarlund Model HQ-170

All the best features of the finest SSB converters, plus the best features of the finest amateur receivers wrapped up in a single, outstanding receiver. Covers the 6, 10, 15, 20, 40, 80 and 160 meter amateur bands. Separate vernier tuning. Dual and triple conversion 17-tube superheterodyne. Adjustable 60 db notch filter. IF passband tuning. Adjustable AVC.

Amateur Net: $399.00
Amateur Net (With Clock): $369.00

Central Electronics 100V Exciter-Transmitter

NO TUNING (except VFO), uses famous CE BROADBAND system. PRECISION LINEAR VFO - 1 kc calibration. Single knob bandswitch 80 thru 10. SSB - DSB - AM - PM - CW and FSK. RF output adjustable 10 to 100 watts PEP. Meter reads Watts Input, Amps Output and Carrier Suppression. 2" RF scope. Speech level & load mismatch indicators. Audio filter - inverse feedback - built-in Carrier and Sideband Suppression.

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Hy-Gain Rotobrake

Complete rotating assembly including motor, brake and wall-map indicator. Built to rotate and hold like the "iron fist" without damage to beam.

Amateur Net: $149.95

Global Linear LA-1

Complete with well-filtered power supply, 300w input AM Class B, 300w DC or 420 PEP input Class B linear SSB or DSB. 300w Class C for CW, Pi-Net 80-10 meters. 52 ohm Pi-Link coupled on 6 meters. Extensively TVI protected.

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With the broad CAMBION line to choose from, you can finish many a do-it-yourself job on your ham equipment with speed, satisfaction and economy.

CAMBION Coil Form Kits, as shown, hold 3 each of 5 ceramic coil form types. Coil Kits contain 10 forms in overlapping inductance ranges; 2 mh to 800 mh. Choke Kits have 14 RF chokes; fixed inductances 6.8 mh to 1,000 mh. Designers' Terminal Kits hold 100 each of 10 different solder terminal types, with mounting tools.

CAMBION packaged items include phenolic and ceramic coil forms, separate coils in standard inductance ranges and 65 types of solder terminal, 100 terminals of single types in single packages. CAMBION standard and miniature all-set terminal boards are sealed individually in protective plastic bags.

CAMBION distributors are in key locations, coast to coast. Contact yours for prompt service.

Hints and Kinks
(Continued from page 50)

mechanism. The trouble usually shows up as an intermittent bubbling sound and requires a rapid back-and-forth movement of the kilocycles control to reduce the trouble.

A small spring contact makes a mechanical connection between the kilocycles control tuning shaft and ground. When this contact becomes dirty or corroded, the above tuning difficulty becomes apparent and seems to be more prevalent when the KWM-1 is used mobile. It is only necessary to clean the contact to cure the trouble. Apply some contact cleaner and lubricant solution such as the General-Cement DE-OX-ID on the connection with an eye dropper or hypodermic needle injector. —John Hunt, WQYBE

Happenings of the Month
(Continued from page 63)

Commission licensed amateurs operating beyond continental limits of the United States, its territories or possessions on a more equal footing with amateurs operating within these areas.

The first step toward accomplishing this goal was taken in Docket Number 10501. The rule changes enacted in that proceeding added the frequency band 21.0-21.45 Mc. to the frequencies which amateurs operating outside the jurisdiction of the United States were previously allowed to utilize. Thus, the present proposal may be regarded as an effort to further implement a previously established principle.

The majority of comments filed support adoption of the proposed amendments and no party expressed opposition to the principle which the proposal sought to implement. However, the comment filed by the American Radio Relay League objected to the proposed amendments on the following basis:

The Commission's proposal to expand amateur maritime-mobile operating privileges was carefully examined at the annual meeting of the Board of Directors of the League on May 9, 1958.

It was the unanimous decision of the Board to oppose at this time, expansion of amateur maritime-mobile privileges beyond areas substantially within the jurisdiction of the United States, on the basis that on the eve of an international conference it is undesirable for the United States to take an action on behalf of its amateur service which may be viewed as having international implications, even if only in Region II. The League is otherwise sympathetic with the needs and desires of amateurs who

(Continued on page 150)

1 At the time the Notice of Proposed Rule Making in this proceeding was issued, the involved rule provisions were encompassed in Section 12.91 but subsequently were placed in Section 12.90. Therefore, amendment ordered herein is of Section 12.90.

2 Region 2 is defined as follows: On the east, a line (B) extending from the North Pole along meridian 10° west of Greenwich to its intersection with parallel 72° north; thence by Great Circle Arc to the intersection of meridian 50° west and parallel 40° north; thence by Great Circle Arc to the intersection of meridian 20° west and parallel 10° south; thence along meridian 20° west to the South Pole.

3 At present amateurs operating beyond the continental United States, its territories, or possessions may utilize only these frequencies in the bands 21.0-21.45 Mc. and 28.0-28.7 Mc.

4 A total of fifty-six original comments were filed and of this total fifty-five advocated adoption of the proposed rule changes.

5 Herein referred to as the League.
from CARTON to CONTACT in 47 minutes!

WITH THESE POWERFUL "HY-GAIN" TRAP VERTICALS

**MODEL 14-AV**

The Model 14-AV is only 21 feet high and weighs just 13 pounds. It incorporates the exclusive Hy-Gain capacity hat assembly which increases the electrical length of the maintaining high efficiency on 40 meters.

Model LC-80 loading coil adds 80 meter operation to the 14-AV Vertical. Only $3.00 Ham Net.

Combination mast and radial roof mounting kit complete with hardware, $39.95 Ham Net.

**INSU-TRAP**

Acting as an insulator at resonant frequencies but allowing radio energy of other frequencies to pass freely the Hy-Gain Insu-Trap becomes an automatic electronic switch which isolates various sections of the vertical to make it the proper length for each band. Hy-Gain Traps use exclusive adjustable capacitor plates and are individually factory resonated maintaining a high degree of efficiency. Each Trap is completely weatherproof and air tight. No water or condensation can ever enter. Enclosed in ebonite activated polyethylene cover and cap assembly the Hy-Gain Insu-Trap is rated to take the full maximum legal input power. Traps are only 2 x 3", weighing just 4 oz. each.

**MULTI-BAND OPERATION**

Completely factory pre-set, with no further adjustments necessary these Hy-Gain Multiband Trap Verticals maintain an SWR of 2 to 1 or less across the entire of each band for which they are designed. (52 ohm coaxial feed line). True 1/2 wave narrow resonance on each band makes possible low angle DX radiation patterns.

**NYLON BASE MOUNT**

Thick Glass Impregnated nylon base assembly makes possible self support. Heavy cast aluminum mounting bracket is adjustable for various sizes of mast. Weatherproof internal coaxial feeding supplied.

Available as an accessory, the specially designed decoupling stub adds 6 meter operation with low SWR to Models 12 or 11-AV.

Order Model 6MK, $4.95 Ham Net.

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The Model 12-AV is only 13.5 feet high and weighs just 12 pounds.

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**...another RED HOT SESCO special**

**MORROW MB6 RECEIVER WITH AC POWER SUPPLY AND DUAL SPEAKERS**

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<thead>
<tr>
<th>Regular</th>
<th>$281.00</th>
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<tr>
<td>Special SESCO</td>
<td>$218.00</td>
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<td>New Low Price</td>
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**$21.80 DOWN • $10.00 PER MO.**

**MB-6 RECEIVER. 13 tubes, covers 80-40-20-15 and 10-meter bands. (Companion unit to MB-565 Transmitter.) Sensitivity 1 microvolt or better on all bands. Signal to noise plus signal is better than 20 db. Crystal-controlled second mixer. Bandpass, 4 kc. at 6 db down. Integral, 100 kc crystal calibrator. Illuminated "S" meter converts to field strength meter for transmitter tune-up. RF and audio gain controls. Antenna trimmer. Noise limiter. Noise balanced squelch circuit eliminates inter-station noise but opens on extremely weak signals. 4 3/4"x11 3/8"x7 3/4". Weight, 12 lbs.**

**RAP 2505 POWER SUPPLY. Tilt-base with built-in AC power supply and dual speakers. Size: 3 1/2"x6 1/2"x10 1/4". Ship. weight, 15 lbs.**

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Interest lie in maritime-mobile operation but it is unwilling to risk—however small the risk may be, the possibility of the development of attitudes at the conference unfavorable to amateur radio because of the now-proposed U.S. action set forth in Docket 12307.

The Maritime-Mobile Amateur Radio Club in reply to the League stated:

The position taken by the League in this docket is exactly the same as that which prompted their objection to the Commission's proposal in Docket 10501, to extend maritime-mobile operating privileges to the 21 MHz world-wide amateur band. In that proceeding, the League objected on the grounds that the current international radio situation is such as to make such action highly undesirable.

In the present proceeding, as in Docket 10501, the League again offers an opinion without supporting evidence that harm may result from the Commission's proposed action. The League, in effect, is saying that the Commission acted unwisely in Docket 10501, and is again proposing to place amateur radio in further jeopardy.

MMARC considers the League to be unpresumptuous in making such representations to the Commission without substantial documentary form to a situation which, in the slightest degree, gives evidence of any animosity toward, or "development of attitudes" unfavorable to United States' amateurs engaging in maritime-mobile operation on the high seas. On the contrary, MMARC points to an increased interest in this mode of amateur operation throughout the world. In Docket 10501, MMARC produced a record of foreign amateurs engaging in maritime-mobile operation on a world-wide all-band basis. Evidence was submitted to the Commission, at that time, concerning the rules and regulations for maritime-mobile operation of foreign administrations, including that of Great Britain, which was one of the countries specifically pointed to by the League, as unalterably opposed to maritime-mobile operation in any form. Records in MMARC's files show continued maritime-mobile operation with additional countries participating since 1954. For example, Canada recently formalized maritime-mobile operation for Canadian amateurs and, for this purpose, has assigned the special prefix VE0. Further, since Region 2 is particularly involved in this proceeding, MMARC calls attention to the fact that Argentina, Panama, Ecuador and Colombia have amateurs operating maritime-mobile. Attention is called to the fact that our own Navy and Coast Guard permit maritime-mobile operation in the United States.

Another RED HOT SESCO special

**ALL THE WAY • IT'S EZ WAY**

See Page 118

**TOWERS**

ADIRONDACK RADIO SUPPLY

AMSTERDAM, N. Y.
ANNOUNCING 5 NEW RIDER BOOKS

FUNDAMENTALS OF RADIO TELEMETRY by Marvin Topper. Telemetry is closely related to missile and aircraft development for the exploration of outer space, because it makes possible the collection of data on which the improvement of existing rockets, missiles and aircraft is based. This exciting book covers the field of radio telemetry, the

BUILDING THE AMATEUR RADIO STATION by Julius Berens, W2PIK. If you intend to buy the equipment for an amateur radio station, or build one, you will find this volume indispensable. This book is the next step for the amateur radio enthusiast who has earned his operating license. In his sequel to GETTING STARTED IN AMATEUR RADIO, the author, W2PIK, has written an all-inclusive guide for construction of the novice and general ham stations. Every tool and its use is mentioned. Chassis layouts are provided and text instructions are reinforced with diagrams and illustrations. Also includes instructions for receiver and transmitter on-the-air operation.

VIDEO AMPLIFIERS (Electronics Technology Series) edited by Alexander A. Schure, Ph.D. Provides a thorough understanding of the design and application of video amplifiers. It tells how design problems are solved. It utilizes examples that are easily applied to radar, television, and pulse amplification where many video amplifiers are used.

FUNDAMENTALS OF NUCLEAR ENERGY AND POWER REACTORS by Henry Jacobowitz. This exciting book, with its remarkably understandable illustrations supported by up-to-the-minute crystal clear text, makes it possible for anyone to comprehend the fast-moving developments in this exciting field. After lucidly presenting the fundamental concepts in atomic and nuclear physics essential to understanding the operation of nuclear reactors, the book discusses the construction, principles of operation, cost and power output of specific plants. Experimental reactor and the forerunners of the units now under construction are covered. Numerous pictures and carefully selected illustrations make the theoretical material understandable and show what the various installations actually look like.

VIDEO AMPLIFIERS edited by Alexander A. Schure, Ph.D. Provides a thorough understanding of the design and application of video amplifiers. It tells how design problems are solved. It utilizes examples that are easily applied to radar, television, and pulse amplification where many video amplifiers are used.

FUNDAMENTALS OF HIGH FIDELITY by Herman Hurst. To how to select the best hi-fi equipment for the money you have to spend—and how to achieve the best performance and realize the most pleasure from your equipment—are the purposes of this book. The emphasis is not so much on what an amplifier is, rather than on what an amplifier (and the rest of your high fidelity system) should provide, and how you can choose the best equipment to fit your pocketbook. The book also deals with aspects of high fidelity and with technical terms with which the hi-fi enthusiast must be familiar.

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OBTAINING & INTERPRETING TEST SCOPE TRACES by John F. Rider. Shows how to connect and operate the scope. It utilizes examples that are easily applied to radar, television, and pulse amplification where many video amplifiers are used.

HOW TO SERVICE TAPE RECORDERS by G. A. Tuthill. Discusses the tape recorder and its operation explaining the types of circuits, drive mechanisms, trouble shooting and repair.

HOW TO USE METERS by John F. Rider. Starting with the construction and operation of all types of electrical meters, it gives special emphasis to the details of what kind of meters to use for making different kinds of measurements in electronic and electrical equipment. Explains how to make the measurement — namely, where to connect the meter.

HOW TO USE TEST PROBES, by A. Ghirardi and R. Middleton. Complete step-by-step explanations with practical examples of all types of test probes used with test scopes, VTVM’s, and VOM’s.

There's a world of electronic know-how in these easy to understand low cost RIDER books. At your jobber or book store, or order direct. Dept. Q-2

Don't Forget the 8th ANNUAL SINGLE SIDEBAND DINNER, STATLER-HILTON HOTEL, N.Y.C., MARCH 24, 1959

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1200 watt (A712) Shop, wt. 90 lbs. 175.50
2300 watt (A2312) Shop, wt. 225 lbs. 325.50

Sizes to 3500 watts. F.O.B. factory
Dual voltage models, automatic controls, etc. available.

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40-20-15-10 METERS

Hi-power design. 4 bands in 60 ft. over all. Will handle 2 KW of well over-modulated AM carrier.
40A-C 4 band KW coils $14.95
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All antennas have
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5. The Commission believes that differences in privileges accorded amateurs, dependent solely on geographic location, are in the public interest only when clearly justified by compelling reasons. No party to this proceeding has demonstrated "compelling reasons" for continuing that portion of the present differences in privileges which the proceeding would eliminate. In addition, the Commission is aware of no other information which would lead it to conclude that continuation of such differences in privileges is justified. Accordingly, the Commission finds that adoption of the rule changes proposed in the Notice of Proposed Rule Making issued in this proceeding would be in the public interest.

6. The petition of the Maritime-Mobile Amateur Radio Club which engendered this proceeding sought, in addition to the rule changes proposed by the Commission, amendments which would allow amateurs aboard vessels "operating between" certain United States ports to utilize frequencies in the 3500-4000 kc. band. The Commission, in the Notice of Proposed Rule Making issued herein, stated that this plea was not granted because "if adopted it would provide no specific boundaries within which such operations would be permitted." The comment filed by the Maritime-Mobile Amateur Club "now requests that the Commission give consideration, prior to its final Report and Order, to the addition of the following:

Operation may be conducted in the band 3500-4000 kc. when the ship is sailing directly between ports on the coast; directly between ports of the Gulf Coast, or directly between ports of the Pacific coast; and the Hawaiian coast and Aleutian coast."

This "new proposal merely substitutes "directly between" specified ports for "between" specified ports as set forth in the original petition and fails, as did the original proposal, to provide specific boundaries within which amateur operation on frequencies in the 3500-4000 kc. band would be permitted.

The League, while objecting to the Commission's proposal as set forth in the Proposed Rule Making, advocates "that all authorized amateur bands and modes of emission be made available to amateur operations on vessels voyaging between United States ports "while under enrollment.""

This proposal, like that of the Maritime-Mobile Amateur Radio Club, also fails to provide specific boundaries within which amateur operation may be conducted.

7. IT IS ORDERED, pursuant to authority contained in Sections 4(i) and 303 of the Communications Act of 1934, as amended, that the rules set forth in the attached appendix be and are hereby adopted, effective January 30, 1959.

FEDERAL COMMUNICATIONS COMMISSION
Mary Jane Morris
Secretary

Released: December 19, 1958

Part 12, Amateur Radio Service, is amended as follows:

Section 12.901(b) is amended to read as follows:

(b) When outside the continental limits of the United States, its territories, or possessions, an amateur radio station may be operated as portable or mobile only under the following conditions:

(1) Operation may not be conducted within the jurisdiction of a foreign government except pursuant to, and in accordance with express authority granted to the licensee by such foreign government. When a foreign government permits Commission licensees to operate within its territory, the amateur frequency bands which such station may be operated on within that country shall be as prescribed or limited by that government. (See Appendix 4 of this Part for the text of treaties or agreements between the United States and foreign governments relative to reciprocal amateur radio operation.)

(2) When outside the jurisdiction of a foreign government: operation may be conducted within Region 2 on any amateur frequency band between 70 Mc. and 148 Mc., inclusive, except that operation within Region 2 operation may be conducted only on the amateur frequency bands 21.00-21.45 Mc. and 28.0-28.7 Mc. (Region 2 is defined as follows: On the east, a line (a) extending from the North Pole along meridian 90° west of Greenwich to the intersection with parallel 20° north; thence by Great Circle Arc to the intersection of meridian 72° west and parallel 40° north; thence by Great Circle Arc to the intersection of meridian 20° west and parallel 10° south; thence along
This is the month for honesty. Taking a leaf from George Washington and Abraham Lincoln, Uncledave says, honestly, “Whatever you need, we’ve got. Write us. We love to open mail. Honest!”

**SHELL**

**Field Strength • Modulation Meter**

Tests power-output, frequency, audio level, modulation, distortion, hum, percent modulation and harmonic content of transmitter.

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- Self-powered; standard batteries
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- Retractable antenna extends to full 36”
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meridian 20° west to the South Pole. On the west, a line (C) extending from the North Pole by Great Circle Arc to the intersection of parallels 65° 30’ north with the international boundary in Bering Strait; thence by Great Circle Arc to the intersection of meridian 165° east of Greenwich and parallel 30° north; thence by Great Circle Arc to the intersection of meridian 170° west and parallel 10° north; thence along parallel 10° north to its intersection with meridian 120° west; thence along meridian 120° west to the South Pole.

(3) Notice of such operation, in accordance with the provisions of §12.91, shall be given to the Engineer in Charge of the district having jurisdiction of the authorized fixed transmitter location.

FEDERAL COMMUNICATIONS COMMISSION

In the Matter of

Amendment of Section 12.111 of the Commission's Rules, Amateur Radio Service, to provide that only A1 emission may be used in the lower 100 kc. of the 90 and 144 Mc. amateur bands.

REPORT AND ORDER

By the Commission: Commissioners Deoerfer, Chairman; and Lee absent.

1. A Notice of Proposed Rule Making was issued in the above-captioned proceeding on June 11, 1958. Ample opportunity was afforded all interested parties to file comments in support of and opposition to the proposal which, if adopted, would allow only those amateurs utilizing type A1 emission to operate in the frequency ranges 50.0-50.1 and 144.0-144.1 Mc., whereas various other types of emission, principally A3, presently may be utilized in such frequency ranges.

2. Rule changes proposed in this proceeding were engendered by a petition filed by the American Radio Relay League, Inc, and have elicited an extremely large number of comments from individual amateurs and organizations representing groups of amateurs. These comments range all the way from those devoid of reason and which merely state "I request you vote yes (or no) on this matter" to well-reasoned, thoughtful comments both in support of and in opposition to the proposal.

3. The principal arguments advanced by comments supporting adoption of the proposed rule changes may be summarized as follows:

(1) Adoption of the proposed amendments will afford "the many experimentally inclined amateurs now operating in the 50 and 144 Mc. bands the means of further adding to the knowledge of propagation characteristics of the very high frequency portion of the radio spectrum."

(2) The provision of sub-allocated bands in the 50-54 and 144-148 Mc. amateur bands restricted to the use of type A1 emission would encourage "a great deal more useful serious work of amateurs thereby contributing to the development of the radio art."

(3) The proposed amendment, if adopted, would "tend to increase c.w. (A1) activity in the 6 meter band and as a result one could raise his code speed with little difficulty."

(4) "The government is spending large sums to promote research into scatter propagation. The amendments that are proposed will make available to the government, through the ARRL 1GY project, coordinated reports from hundreds of amateurs who will use these frequencies. Much of the unusual signal reception will be obliterated if the weak c.w. signals are forced to compete against phone stations occupying the same frequencies."

(5) Adoption of the proposals will enable amateurs to "uphold our tradition of leading the way in experimental work."

(6) Adoption of the proposals "will make it much easier for United States amateurs operating on voice to work for" (Continued on page 156)

1 Telegraphy without the use of modulating audio frequency.
2 Telephony.
3 Hereinafter referred to as the League.

154
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Adjustable speed control, maintains constant speed at any setting. Complete with ten rolls of double perforated tape. A wide variety of other practice tapes available or 50c per roll.

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(Continued on page 158)

SIGN voice stations because foreign voice stations will be able to get away from United States phone QRM by transmitting in our c.w. band."

(7) "The allocation of AI emission sub-bands in the high frequency amateur bands has been necessary and proved successful through the years. 50 and 144 Mc. bands should not be an exception."

(8) Although the 50 Mc. amateur band extends from 50 to 54 Mc. "frequencies above 52 Mc. in this band are seldom used" and adoption of the proposal will encourage utilization of the band above 52 Mc.

(9) A sub-band allocation in the 50.0-51.0 and 144.0-148.0 Mc. bands would "insure an increase in positive results through decreased A3 interference during years of peak activity by operators not inclined toward propagation experimentation. The value of the results achieved by relatively minor number of dedicated amateurs should more than offset any inconvenience suffered by those not engaged in scientific aspects of the HF communication."

(10) Many serious experimenters employ the bands involved in the subject docket and, because of signal-to-noise ratio advantages, these experimenters most frequently employ AI emission whereas the general amateur employs A3 or other modes of emission. The "serious experimenters" have in the past suffered extreme difficulties caused by interference from general activity in the band. The proposed rule making would eliminate a great majority of this interference.

(11) At the present time "many operators refrain from trying to use c.w. solely because of phone interference" and adoption of the proposal will encourage such amateurs to enter the "c.w." field.

(12) Restriction of portions of amateur bands below 50 Mc. for type AI emission has contributed much to the development of the "low frequency amateur bands" and similar restriction of a portion of the VHF bands is "essential for their development."

(13) "An exclusive AI sub-band within the 50 Mc. amateur band would do much to 'prod' the Technician Class amateur in upgrading himself by becoming more proficient in code transmission and thereby obtaining a higher type license."

(14) Adoption of the proposed amendments will "permit better coordination with foreign amateur stations specifically licensed for the IGY year. Experience in the fall, winter and spring of the 1957-1958 season shows that considerable harm has already been done by the intolerable local and U. S. A. A3 interference to the frequencies occupied by foreign amateur stations specifically licensed by their respective governments for the IGY year."

(15) Adoption of the proposed amendment would "in no way interfere with the established emergency or civil defense networks, all of which remain considerably higher in frequency than these bands."

(16) "Adoption of the Commission's amendment will promote vital and basic studies in scatter propagation, aurora communications, and space communication technique."

(17) Adoption of the proposals will encourage use of c.w. and "will benefit national defense and security by providing a wider range of skilled and national manpower."

(18) Adoption of the proposals will aid in carrying out the President's desire to encourage scientific progress wherever possible."

4. The principal arguments advanced by those opposed to adoption of the proposed rules are:

(1) "Surispots will only be with us a few months more and then the c.w. operators will, as in the past, move to greener pastures leaving their 100 kc. segment completely unused. The few contacts made by these operators of far less value to IGY than the thousands of reports they get from regular operators on that band. C.w. men can easily
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move above 50.5 Mc. for their work when the lower channels are full.

(2) "When conditions favor c.w., there is seldom any problem of interference from anything but other c.w. signals" in the 144 Mc. band.

(3) Adoption of the proposed amendments would be inconsistent with the Commission's prior refusal to "allocate separate frequencies for single sideband on the lower frequency amateur bands. S.t. and a.m. are as incompatible as are c.w. and a.m."

(4) Adoption of this proposal will not eliminate the problem of A1 operation being interfered with by A3 operation because such interference would still be present by virtue of foreign amateurs, such as Canadian, operating with type A3 emission.

(5) "There has been little evidence of interference to A1 by A3 generated by amateurs." To the contrary "commercial harmonics have caused more trouble."

(6) "Unlike the lower frequencies practically all of the early work in the development of the 50 and 144 Mc. bands has been done by amateurs using A3 emission. Therefore, adoption of the proposal would give the c.w. operator a better and unwarranted opportunity for contact over the phone operator."

(7) Amateur stations using A3 emission, located in areas served by television channel 2, "cause much less television interference, due to fundamental overloadings, when said stations operate in the 50.0-50.35 Mc. portion of the 6 meter band. Amateur stations using type A1 emission, on the other hand, can operate in any portion of the 6 meter band with negligible television interference."

(8) Most amateurs utilizing type A3 emission work at the lower portion of the band in order to keep down the TVI complaints, as many TV set owners will not install the proper filters. Adoption of the proposal would cause more television interference than has ever been experienced previously and in particular will cause "more interference to the cities that have channel 2 — to say nothing of the fringe areas around them." It is imperative that the phone operation be allocated the lower sections of the 50-54 Mc. band so as to minimize television interference.

(9) "There are many occasions when the first 50-100 kc. are the only points at which there are signals except for the ground wave signals, and the use of this portion for c.w. only would seem to limit operation on this band." Therefore, since the 50-54 Mc. amateur band is primarily a phone band, the proposal is alleged to be both discriminatory and "intended for the benefit of a very small minority of those presently operating the band."

(10) The first 100 kilocycles of the 50 Mc. amateur band is "the most desirable for DX work" and those amateurs who desire to use type A3 emission resent "being pushed out of this section of the band."

(11) "There are presently "hundreds of kilocycles given over to c.w. which are hardly used at all, yet phone is squeezed into a small spectrum of these amateur bands against all good judgment as to the proper use of our frequencies" and any extension intensifies this inequitable situation.

(12) "There is presently underway serious work on long distance phone communications in the first 100 kilocycles of the 50-54 Mc. band which would be disrupted by the adoption of the proposal."

(13) "The 50-54 Mc. and the 144-148 Mc. amateur bands are essentially local-contact bands." C.w. and phone have been operating simultaneously on the first 400 kilocycles of the 50-54 Mc. band with concentration on the first 100 kilocycles with a minimum of dissension. "There is no necessity for specific allocation of frequencies for exclusive c.w. operation on these bands."

(14) "Limiting the first 100 kilocycles (of the 50-54 Mc. band) to c.w. would not result in effective full time use of these desirable frequencies."

(15) A substantial number of amateurs operate transmit-
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Cat. No. 207-509 antenna employs a folded radiating element plus an additional element creating a 2x gain cardioid pattern. The radiating element and director as well as all ground plane elements are permanently grounded providing excellent lightning protection.

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5. The Commission has carefully considered every comment filed and evaluated each as to the position expressed and the reasons or arguments offered in support of such position with particular emphasis upon the soundness of such reasons or arguments. As a result of such consideration and evaluation together with consideration of other information available to it, the Commission finds:

1. The lower portions of the involved frequency bands are presently utilized to a much greater extent than are the upper portions of these bands.

2. Operation in upper portions of the 50-54 Me. band has been voluntarily avoided by amateurs using type A3 emission in numerous areas so as to reduce complaints of interference to television receivers. As a consequence of this fact and the recognized tendency of amateurs to "group" operation on upper portions of the band has also been avoided in areas where interference to television is not a factor.

3. Operation in the upper portions of the 50-54 Me. band, when it has occurred, has resulted in reception by the Commission of a number of complaints from television viewers even though such interference often resulted from faulty television receivers or other factors unrelated to amateur operation per se.

4. The 50-54 Me. and 144-148 Me. bands are normally better suited for local than for long distance communications.

5. Much more operation on frequencies in the involved bands is conducted by use of type A3 emission than is conducted by use of type A1 emission.

6. Restricting operation in the lower 100 kc. of the 50-54 Me. band to the use of type A1 emission will result in more operation in the upper portion of this band.

7. Increased operation in the upper portion of the 50-54 Me. band will result in an increase in the number of interference complaints received from television viewers.

8. Establishment of segments of the involved bands wherein operation may be conducted only by use of type A1 emission will encourage amateur experimentation along "over the horizon" communications in the 50-54 Me. and 144-148 Me. bands.

9. Establishment of segments of the 50-54 Me. and 144-148 Me. bands for use of A1 emission only will minimize interference between those amateurs using type A1 emission and those using type A3 emission.

10. Establishment of segments of the involved bands for use of A1 emission only will benefit those amateurs seeking to "work" foreign amateur stations.

11. There is no significant difference in propagation characteristics of frequencies in the ranges 50.0-51.0 Me. and 144.0-144.1 Me. and 147.0-148.0 Me. ranges.

6. The Commission recognizes that some members of the League have indicated a position contrary to that taken by the organization but the Commission must conclude that the League represents the view of the majority of its membership.

The Commission concludes that the public interest will be served by establishment, as segments of 100 kc., segments of the 50-54 Me. and 144-148 Me. amateur frequency bands wherein operation may be conducted only if type A1 emission is used. However, the Commission is also led to conclude that the public interest will not be served by utilizing the lower 100 kc. of the 50-54 Me. and 144-148 Me. bands, as proposed for establishment of such segments for the following reasons:

Those amateurs who have been primarily responsible for the present stage of development of operations in the involved frequency bands would be required to relinquish the preferable portions of such bands for the use of a lesser number of amateurs who have contributed little to such development: complaints alleging interference to television reception as a result of amateur operation would be increased; and other portions of the 50-54 Me. and 144-148 Me. bands have only insignificantly different propagation characteristics and, therefore, are suitable for establishment of the desired "out" bands.

7. In view of all factors involved, it is concluded that restriction of the frequency ranges 50.0-51.0 Me. and 147.0-148.0 Me. so as to permit operation therein only when type A1 emission is used will be in the public interest.

(Continued on page 164)
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Ancoringly, it is ordered, pursuant to the authority contained in sections 4(i) and 303 of the Communications Act of 1934, as amended, that Part 12 of the Commission's Rules be and is amended, effective January 10, 1959, as set forth in the Appendix attached hereto.

FEDERAL COMMUNICATIONS COMMISSION
Mary Jane Morris
Secretary
Adopted: December 3, 1958
Released: December 5, 1958

APPENDIX

PART 12 IS AMENDED AS FOLLOWS:

1. Section 12.111(b) is amended to read:
   (b) 50.0 to 51.0 Mc. using type A1 emission, 50.9 to 50.9 Mc. using types A2, A3, A4 and narrow band F3 emissions, 51.0 to 51.0 Mc. using types A9, A2, A3, A4 and narrow band F3 emissions, and on frequencies 52.5 to 53.0 Mc. using types F0, F1, F2 and F3 emission.

2. Section 12.111(i) is amended to read:
   (i) 144.0 to 148.0 Mc. using type A1 emission, and 144.0 to 147.9 Mc. using types A0, A2, A3, A4, F0, F1, F2 and F3 emission.

Before the FEDERAL COMMUNICATIONS COMMISSION
Washington 25, D. C.

In the Matter of
Amendment of Section 12.231(a) of Part 12, Amateur Radio Service, to Docket No. 12719

1. Notice is hereby given of proposed rule making in the above-entitled matter.
2. The Commission has before it for consideration a petition filed by the United States Civil Defense Amateur Radio Alliance which seeks amendment of Section 12.231(a)(1) of the Commission's Rules so as to make additional portions of the amateur frequency bands available for use by amateur stations authorized to operate in the Radio Amateur Civil Emergency Service (RACES).
3. The petitioner proposes that Section 12.231(a)(1) be amended to provide:
   (1) For use only by authorized stations or units of such stations which are operated under the direct supervision of duly designated and responsible officials of the civil defense organization;

   Frequency Band: Authorized Emission:

   1800–1825 kc. 0.1A1, 6A3, 1.1F1
   1875–1900 kc. 0.1A1, 6A3, 1.1F1
   1900–1925 kc. 0.1A1, 6A3, 1.1F1
   1975–2000 kc. 0.1A1, 6A3, 1.1F1
   2050–2550 kc. 0.1A1, 1.1F1
   2550–4000 kc. 0.1A1, 1.1F1, 6A3, 6F3
   7000–7050 kc. 0.1A1, 1.1F1
   7350–7300 kc. 0.1A1, 1.1F1, 6A3, 6F3
   14000–14025 kc. 0.1A1, 1.1F1
   14175–14300 kc. 0.1A1, 1.1F1, 6A3, 6F3

4. Use of frequencies in the band 1800–2000 kc. is subject to the priority of the Loran system of radio navigation in this band and to the geographical, frequency, emission, and power limitations contained in §12.111 of the rules governing amateur radio stations and operators (Subpart A of this part). The use of these frequencies by stations authorized to be operated in the Radio Amateur Civil Emergency Service shall not be a bar to expansion of the radio-navigation (Loran) service, and such use shall be considered temporary in the sense that it shall remain subject to cancellation or to revision, in whole or in part, without hearing, whenever the Commission shall deem such cancellation or (Continued on page 166)

5. This band was deleted by Commission Order of April 9, 1958, effective May 10, 1958, (FCC 58–345) published in the Federal Register April 15, 1958 (23FR2425).

8. Accordingly, it is ordered, pursuant to the authority contained in sections 4(ii) and 303 of the Communications Act of 1934, as amended, that Part 12 of the Commission’s Rules be and is amended, effective January 10, 1959, as set forth in the Appendix attached hereto.
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Revision to be necessary or desirable in the light of the priority within this band of the Loran system of radio-navigation.

4. Statements in support of the proposal include:
   (a) “Four years of endeavoring to operate Radio Amateur Civil Emergency Service networks on channels in the 3500-3510- and 3900-4000-kilicycle frequency bands, confirms the fact that propagation characteristics of signals at the 3.5- and 4-megacycle frequencies do not permit communications over many of the distances required.
   (b) “There have been occasions on which RACES operations were scheduled but could not be conducted because it was impossible to maintain communications over certain paths of 400 miles or more with the limited RACES frequencies now available. Had RACES channels in the 7- and 14-megacycle region been available, communications could have been maintained.
   (c) “... the interference problem plaguing RACES communications efforts, in addition to preventing execution of RACES responsibilities, also constitutes a very real and serious threat to the interest of the radio amateur. If the radio amateur is to be asked to accept responsibility, the necessary frequencies must be furnished to him. Physically, equipment can, in most cases, be made available, but it is all too frequently made ineffective for lack of spectrum space in which to use it. On the basis of the RACES growth trend, ... further aggravation of the long-range communications problem must be anticipated.”
   (d) “The Commission believes that some expansion of frequency space for the RACES is justified. Accordingly, have consulted with interested government agencies in the matter, the Commission proposes to effectuate the purpose of the petitioner’s proposals as far as possible by means of the rules set forth in the attached appendix.

5. The proposed additions are issued pursuant to the authority contained in Sections 4(i) and 303 of the Communications Act of 1934, (47 USC 154, 303).

6. Any interested person who is of the opinion that the proposed amendments may also be filed on or before the same date. Comments in reply to the original comments may be filed within ten days from the last date for filing said original data, views or briefs. The Commission will consider all such comments prior to taking final action in this matter.

APPENDIX

IT IS PROPOSED TO AMEND PART 12, AMATEUR RADIO SERVICE, AS FOLLOWS:

Section 12.231(a) is amended to read as follows:

§ 12.231 Frequencies available. (a) The following tabulation indicates the frequencies and frequency bands, within the regularly allocated amateur frequency bands, which are available for use by stations in the Radio Amateur Civil (Continued on page 168)
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Emergency Service. These frequencies and frequency
bands may be used, on a non-exclusive basis, by the classes
of radio amateur civil emergency stations or units of such
stations indicated, and only with the types of emission
shown in the right-hand column.

(1) For use only by authorized stations or units of such
stations which are operated under the direct supervision of
only designated and responsible officials of the civil defense
organization:

<table>
<thead>
<tr>
<th>Frequency band</th>
<th>Authorized emission</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900-1825 kc.</td>
<td>0.1A1, 1.1F1, 6A3</td>
</tr>
<tr>
<td>1975-2000 kc.</td>
<td>0.1A1, 1.1F1, 6A3</td>
</tr>
<tr>
<td>3950-3510 kc.</td>
<td>0.1A1, 1.1F1</td>
</tr>
<tr>
<td>3990-4000 kc.</td>
<td>0.1A1, 1.1F1, 6A3, 6F3</td>
</tr>
</tbody>
</table>

1 Use of frequencies in the band 1800-2000 kc. is subject
to the priority of the Loran system of radionavigation in
this band and to the geographical, frequency, emission,
and power limitations contained in §12.111 of the rules
governing amateur radio stations and operators (Subpart A
of this part). The use of these frequencies by stations au-
thorized to be operated in the Radio Amateur Civil Emer-
gency Service shall not be a bar to expansion of the radio-
avigation (Loran) service, and such use shall be considered
temporary in the sense that it shall remain subject to can-
cellation or to revision, in whole or in part, without hearing,
whenever the Commission shall deem such cancellation or
revision to be necessary or desirable in the light of the prior-
ity within this band of the Loran system of radionavigation.

(2) For use by all authorized stations in the continental
United States only:

<table>
<thead>
<tr>
<th>Frequency band</th>
<th>Authorized emission</th>
</tr>
</thead>
<tbody>
<tr>
<td>3510-3516 kc.</td>
<td>0.1A1, 1.1F1</td>
</tr>
<tr>
<td>3516-3550 kc.</td>
<td>0.1A1, 1.1F1</td>
</tr>
<tr>
<td>7097-7103 kc.</td>
<td>0.1A1, 1.1F1</td>
</tr>
<tr>
<td>7103-7125 kc.</td>
<td>0.1A1, 1.1F1</td>
</tr>
<tr>
<td>7245-7255 kc.</td>
<td>0.1A1, 1.1F1, 6A3, 6F3</td>
</tr>
<tr>
<td>14037-14053 kc.</td>
<td>0.1A1, 1.1F1</td>
</tr>
<tr>
<td>20147-20153 kc.</td>
<td>0.1A1, 1.1F1</td>
</tr>
</tbody>
</table>

1 The availability of the frequency bands 3516-3550 kc.,
7103-7125 kc., 7245-7255 kc., 14220-14222
kc. and 14228-14230 kc. for use during per iod of actual
civil defense emergency is limited to the initial 30 days cf
such emergency, unless otherwise ordered by the Com-
mission.

(3) For use by all authorized stations:

<table>
<thead>
<tr>
<th>Frequency band</th>
<th>Authorized emission</th>
</tr>
</thead>
<tbody>
<tr>
<td>3997 kc.</td>
<td>0.1A1, 6A3</td>
</tr>
<tr>
<td>28.55-28.75 Mc.</td>
<td>0.1A1, 6A3, 6A4, 6F3</td>
</tr>
<tr>
<td>50.35-50.75 Mc.</td>
<td>0.1A1, 6A2, 6A3, 6A4, 40F3</td>
</tr>
<tr>
<td>53.30 Mc.</td>
<td>40F3</td>
</tr>
<tr>
<td>145.17-145.71 Mc.</td>
<td>0.1A1, 6A3, 6A4, 6F3</td>
</tr>
<tr>
<td>146.79-147.33 Mc.</td>
<td>0.1A1, 6A2, 6A3, 6A4, 6F3</td>
</tr>
</tbody>
</table>

1 For use in emergency areas when required to make
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with military stations on matters requiring coordination.

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The “bug” is about 3 1/4 inches long and averages 3/4 inch in diameter. The photograph shows two of the three gap screws which project into the center of the fitting. Earth-ground connection is made to the large round-head screw. The gap screws do not need adjustment: when screwed in tightly, they are automatically in the correct relationship with the center conductor.

The fitting is designed to mate with type 83 RF series coax connectors. The Blitz Bug is manufactured by CushCraft, Manchester, New Hampshire.

— E. L. C.

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<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>32S-1 Transmitter</td>
<td>$590.00</td>
</tr>
<tr>
<td>75S-1 Receiver</td>
<td>$495.00</td>
</tr>
<tr>
<td>30S-1 Linear Amplifier</td>
<td>$1470.00</td>
</tr>
<tr>
<td>56F-2 Power Supply</td>
<td>$105.00</td>
</tr>
<tr>
<td>312B-4 Speaker Console</td>
<td>$185.00</td>
</tr>
<tr>
<td>312B-3 Speaker</td>
<td>$27.50</td>
</tr>
</tbody>
</table>

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220 Mc. NF 5-6 DB
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5320 Nebraska Tampa 3, Florida

W4TWW, who handled a considerable amount of traffic for some of the Navy men in the Antarctic, received this stuffed penguin as a token of appreciation. The bird, incidentally, was brought back from the Antarctic in the freezer of a Navy ship, and wasn't stuffed until it arrived here in the States.

W4OHJ recently put up a brand-new beam antenna, and soon received reports from his neighbors that his king-size TV antenna was "sucking up" all the picture from the area.

If you will just tap staring at the attractive Miss W6OSD, you will note that she is holding a rather odd license plate — whoever heard of a W6 call on an Ohio plate? This is to let W6YHE know that every year the Ohio plate manufacturers run off his call on a set of plates just for sample purposes. Obviously a W8 call was to be avoided for the sample, and so W6YHE was selected. Photo by K8BYT.
THE NEIL ALPHA 6 Six Meter Phone Transmitter

NOW AVAILABLE IN KIT FORM . . . $58.50

MOST PARTS PRE-MOUNTED!

AVAILABLE FOR 6 OR 12 VOLTS!

- Only 3 inches high, all enclosed, ideal for mobile or fixed station.
- Two tuning meters eliminate meter switching, ideal when operating mobile, or to give rapid performance checks when you QSY.
- Built-in crystal switching for rapid QSY, socket for 3 crystals.
- Uses 8mc crystals, no expensive high frequency crystals needed.
- No frequency multiplication in final amplifier for highest efficiency.
- Low distortion, push-pull modulator.

TRANSMITTER KIT - with all tubes, crystal, and step by step construction manual ........................................... $58.50

TRANSMITTER - completely wired and tested ........................................ 78.50

POWER SUPPLY FOR FIXED STATION (300v @ 200ma - 6.3v @ 3.65a) ................................. 39.95

This power supply is completely wired, with tubes, connecting cable, separate ON-OFF switch and SEND-RECEIVE switch, 2 indicator lamps, and a switched 110 volt outlet for connection to antenna relay.

Order From: THE NEIL CO. • Box 5001 (River Campus Station) ROCHESTER 20, N. Y.

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TAPE CODED

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Item 24

600 Watt Plant - 415 v. 60 eye

$143.50

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1200 Watt Plant (item 45) same as item 24 but with larger generator and engine - 50% greater output.

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3% tax. Dual Track 7” 1200’ tape. Recorded at 3 1/2 IPS.

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A MOBILE OR FIXED STATION ANTENNA FOR AMATEUR, CAP, CD, OR ANY USERS WITHIN THE 144 TO 148 MEGACYCLE RANGE

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173
ALUMINUM CRANK-UP TOWERS

“GUY AS YOU GO”

Strong, lightweight aluminum construction features exclusive design... outer tower sections crank-up first permitting safe, ‘GUY-AS-YOU-GO’ procedure.

Raise or lower the tower as needed... protect against sudden adverse weather... also adjust antenna without climbing tower. Each section has automatic ‘lock-up’... can’t get out of control.

Rustproof... corrosion-resistant... stands winds over 100 mph... tower loading to 100 pounds.

1—Secure guys on lowest section, crank-up section.

2—Progressively crank-up succeeding sections until tower is at full height.

3—Stand back and say, "GEE THAT WAS EASY!"

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AFC-1 complete, less power supply... introductory price $29.95

AFC-2 as above, with 3 pos. audio filter, switch compression level control and power supply; size 5" x 7" x 6"... introductory price $49.95

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... No Tuning—No Adjustments. Just goes between Antenna and your receiver input.

... Watch for 10 meter version shortly.

... Requires 6.3V. @ .6 Amp., 105V. D.C. @ 15 mils.

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Postpaid in U.S.A.
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Complete with Brake Rotator and Indicator

$179.95

High carbon machine steel gear and rack, heavy shoulder bolts and lock nuts, oil-sealed bronze bearings for positive braking action. High starting torque capacity motor develops 750 in. lbs. rotation torque. Gear reduction unit factory sealed.

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Beautifully colored Great Circle wall map indicator, calibrated at each degree, makes your shack into a show-room. Moving pointer indicates beam direction. Countries outlined, call areas labeled. Available centered on East or West Coast, or Central USA. Compass rose available for foreign use. Designed for any location in the world, to cover any place in the world. Control box mounts under operating table.

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JONES Micromatch coupler plus indicator, $18; WY6YM, 75 N. Marin Dr., Mount Holly, N. J.

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Described in detail in QST November 1958, W6MDI's Modulator offers a practical way to get high audio power at reasonable cost. W6MDI uses popular priced RCA-813's to do the job. Says W6MDI:

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