May 1965
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CQ

SPECIAL REPORT

OSCAR IN ACTION

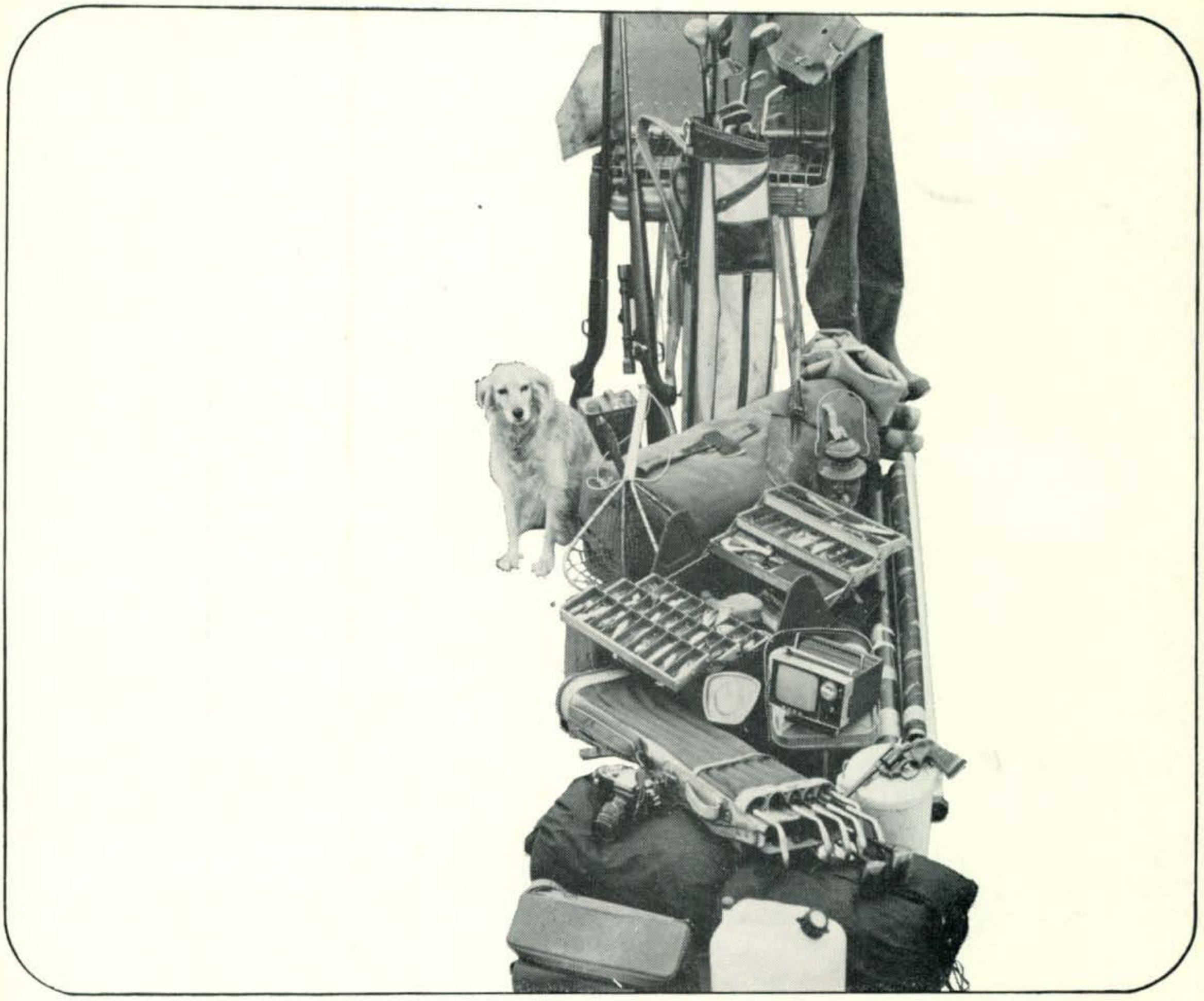
From the desk of: RICHARD A. ROSS, K2MGA editor

FCC Rules on RM-499!

see page 5

K2IEJ QSO's K9AAJ via OSCAR

The Radio Amateur's Journal



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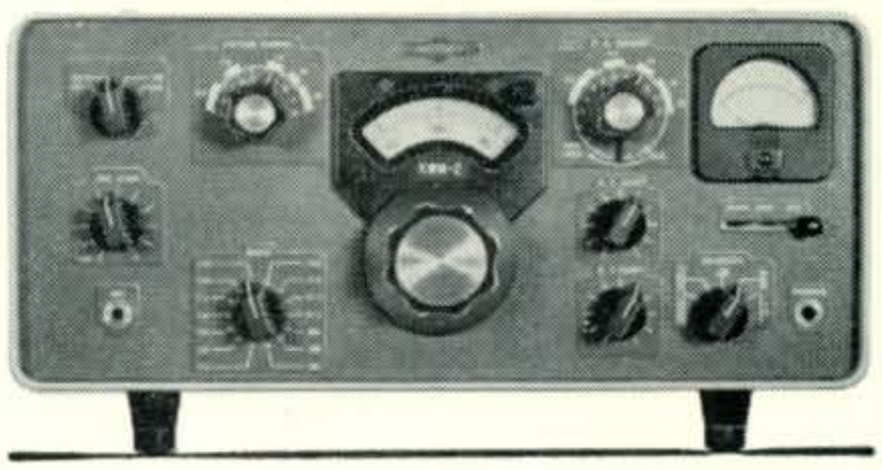

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CQ The Radio Amateur's Journal

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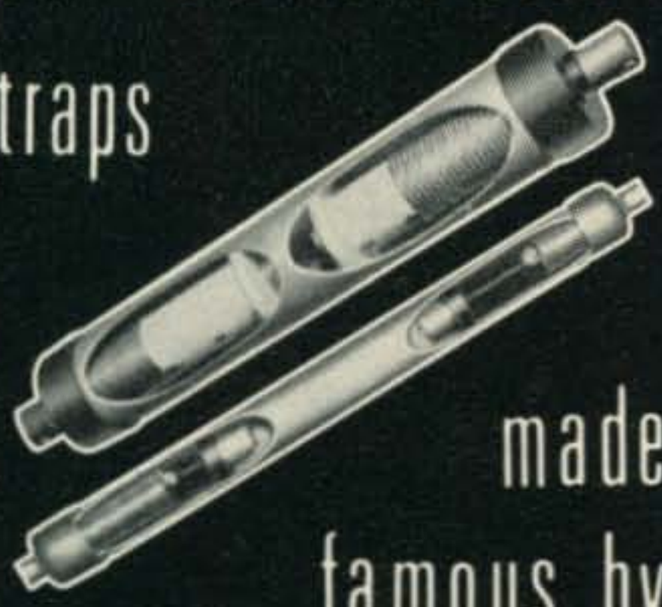

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For further information, check number 4, on page 110

ZERO BIAS

On March 31, the FCC reached a decision regarding the disposition of several incentive licensing proposals, including RM-499, ARRL's controversial "band a year" program. The FCC's decision was to deny all petitions and institute a new rule-making incorporating the most beneficial and workable portions of the proposals. The result is a more workable solution to the incentive licensing hassle than we have seen to date.

Just what is the problem causing the hassle? Simply stated, our current licensing structure is such that there is no substantial reason for an American amateur to improve his license status beyond that of General Class. Also, with the advent of readily available commercial equipment, there is little need for the modern amateur to acquire even the most elementary knowledge of radio communications. Therefore, it is widely felt by amateurs and FCC alike that amateur radio in the U.S. is not fulfilling its "reason for being" as outlined in Section 97.1 of the Communications Act. We agree that the need exists for a return to the progressive, inquisitive type of ham radio that existed prior to 1950.

The new FCC proposal seeks to regain some of that eagerness to learn and progress. Two main features having this effect are: 1—A limiting of prime operating frequencies to more experienced and knowledgable amateurs; and 2—Issuance of call signs which immediately identify the class of license held.

Realizing that too severe a curtailment of operating space might result in depopulation of the bands, FCC has wisely chosen to set aside (after two years) a maximum of one half the phone sub-bands on 80, 40, 20 and 15 meters for the more advanced amateur. What this means, of course, is that at no time will any amateur (General Class or higher) be completely deprived of his favorite band or mode. He may not be able to roam the width and breadth of the bands at will, but *no one* will wind up with a shack full of gear he can't use.

In order to gain full use of the phone bands, the amateur must now progress beyond the General license. But rather than force him to turn immediately to the Extra Class license, an intermediate license is proposed. This new license, called the Amateur First Class, will allow full phone privileges, but will still deny some c.w. privileges. After all these years with no exclusive privileges, the Extra Class license will now convey enough extra privileges to induce many fellows to attain it. The inducement is the bottom 50 kc of the 80, 40, 20 and 15 meter c.w. bands.

We can see, then, that the current General Class licensee has been given ample reason to improve his class of license, without having his interest stymied completely, meanwhile.

The attitude seems to have developed, recently, that to have to acquire a working knowledge of electronics is to be punished. How far this is from the truth. The world of electronics, particularly as applied to amateur radio, is one of the most satisfying and stimulating of all scientific studies, for here the fellow with the most modest budget can easily convert ideas and theories to actual working devices.

It will be argued that the proposal will not cause amateurs to return to the more technical side of the hobby simply because of more stringent license requirements. This is not entirely true, for the mere exposure of an amateur to a little "book learnin'" in order to pass an exam is a step in the right direction. How many currently active hams have ventured beyond their equipment's instruction manual recently? We'd guess not too many.

Therefore, we concur with ARRL and the FCC that an improvement in the technical level of US amateurs can be brought about by a more difficult license examination, but only if the examination is properly oriented. The present General and Extra examinations seem to lean too heavily towards random, spot information, instead of measuring the true understanding of any one subject. The Extra, for example, includes questions about microwave r.f. chokes and other equally obscure items. We feel that an examination probing a fellow's understanding of various basic elements of the modern communications system, such as balanced modulators, mixers or linear amplifiers, would be far more purposeful, and would put the student into intimate contact with systems and methods he must work with.

Getting back to the FCC's new proposed rule making, it is our opinion the exclusive phone segments are too large. Perhaps a more gradual transition to the FCC's "half the phone bands" goal would keep up interest in progressing, but alleviate some of the inevitable crowding into the upper half of the phone bands.

So far we have not commented on one point that is sure to create a storm: distinctive call signs. What do we think of it? We like the idea, but the proposed system is a horror. After listening for nearly a week to discussions on all bands from 80 on up through 2, we suggest the FCC reconsider the idea. It seems that nearly all old-timers resent the fact that they may lose their long-held calls, some going back to the 1920's. But they don't object too seriously to a change of prefix alone. We see no reason why a simple, uniform prefix system could not be adopted, such as: Extra-W6, First Class-WF6, General-WG6 and so on. In this way, a fellow could at least hold the same call letters, and change only his prefix as he progressed through the ranks.

It seems that discussion of the proposal could go on for pages, but we have presented here only a few of our more obvious feelings. We strongly suggest a thorough reading of Docket 15928 beginning on page 8. Your comments are solicited.

73, Dick, K2MGA

For further information, check number 6, on page 110

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For further information, check number 7, on page 110

Text of FCC's Decision on Incentive Licensing

BELOW is the full text of FCC Docket 15928 regarding incentive licensing. Although rather lengthy, it is interesting reading. We strongly suggest that you take the time to carefully study the comments (Section 4) offered in support of an incentive licensing system, and then carefully consider the logic (generally speaking) of the FCC's proposal (Section 6). A brief statement of *CQ*'s attitudes towards the proposal appears in ZERO BIAS on page 5.

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

In the Matter of Amendment of the Amateur Radio Service Rules to provide for Incentive licensing and Distinctive Call Signs	DOCKET NO. 15928 RM-378, 455, 470, 474, 480, 481, 499, 516, 517, 538, 577

NOTICE OF PROPOSED RULE MAKING

By the Commission: Commissioner Loevinger absent.

1. The Commission has under consideration nine petitions proposing, to varying degrees, that special privileges be given to the holders of Amateur Extra Class licenses as an incentive for licensees to obtain this highest class of Amateur operator authorization. Many of the petitioners additionally propose that, as a stepping-stone to the Amateur Extra license, another higher class of operator license be created which would also carry special privileges as an inducement to its attainment. A number of the petitioners recommend changes in the procedure for assignment of station call signs to correspond to a new license structure.

Since we shall consider the call sign problem in this connection, we will also consider RM-470 and RM-474, petitions which are solely concerned with the call sign assignment procedures. The attached appendix lists the petitioners.

2. To support their proposals, the petitioners essentially contend that there is a need for a general improvement and "up-grading" of operations in the Amateur Radio Service which can best be fulfilled by establishing an "incentive licensing" program. They maintain that amateur operators will thereby be encouraged to self-improvement by qualifying for higher classes of licenses. The chief proponent of these views is the American Radio Relay League (ARRL), a national Amateur radio organization with approximately 85,000 members. In its petition, RM-499, the ARRL states:

"A most significant trend has developed in the last few years which has caused increasing concern to the League as to whether the basic purposes and objectives of the amateur radio service, particularly those relating to technical qualifications and proficiency, as set forth in subparagraphs (b), (c) and (d) of Section 12.0 [97.1] are being and may continue to be adequately achieved.

"This trend has arisen from two developments, . . .

"In 1951, the Commission after an extensive rule making proceeding in Docket No. 9295, adopted major changes in the amateur license structure. Both lower-level (Novice and Technician) and higher-level (Amateur Extra) classes were established with commensurate examination requirements. All frequency bands and all modes of operation were made available equally to the Amateur Extra, Advanced, General and Conditional Class. Although special privileges were contemplated by the Commission for the new Amateur Extra Class, none has yet been adopted. Thus, once an amateur has obtained his General or Conditional Class license he no longer has any practical or meaningful incentive to increase his technical knowledge and proficiency and earn a higher grade of license.

"The second development contributing to the trend is the development and availability of highly complex and efficient manufactured equipment, particularly single sideband suppressed carrier (SSB) radiotelephone transmitters, receivers and transceivers. The design and construction of many equipments are so excellent and the operation is so simple that it no longer is necessary for an amateur using such equipment to have practical knowledge sufficient to construct his own equipment or to even fully understand the circuitry and theory of operation of the manufactured equipment. As a result, there has been little incentive for many amateurs, once licensed, to increase their technical knowledge and proficiency as contemplated by subsections (b), (c) and (d) of Section 12.0 [97.1] of the Commission's Rules."

3. A summary of the specific pertinent proposals in the petitions under consideration is as follows:

a. Six petitions (RM-455, 480, 499, 516, 517, 538) propose that the Advanced Class license, which has not been issued to new applicants since 1952, be again made available but as a new higher class of authorization with special privileges. Some of the petitioners would "grandfather-in" the present holders of the old Advanced Class license (about 40,000). While the suggestions vary as to the type of examination which would be required for this new Advanced Class license, they generally contemplate a difficulty level somewhere between that of the examinations for the General and Amateur Extra Class licenses.

b. RM-577 advocates that there be both an "Extra Phone" and "Extra CW" license, both licenses to be issued to present holders of the Amateur Extra Class license. Other persons could then apply for either or both licenses depending upon the type of operation desired.

c. With regard to the nature of the privileges for these higher classes of licenses, six petitions (RM-455, 480, 481, 499, 516, 517) propose the reservation of portions of high frequency (HF) telephone bands between 3.5 and 29.7 Mc/s. RM-455 would additionally reserve HF telegraphy segments for the Amateur Extra Class. RM-538 and 577 recommend reserved telephony and telegraphy sub-bands in all, or most, of the bands below 148 Mc/s for the Amateur Extra Class. Three petitions (RM-455, 499 and 516) would leave the width of the present HF telephony sub-bands unchanged but available only to Advanced and Extra-Class operators while three others (RM-481, 517, 577) would expand the width of the telephony bands but reserve only portions thereof to the Advanced and Extra Class. Two petitions (RM-481 and RM-577) recommend that the reserved telephony segments be restricted to single side band or suppressed carrier emissions. RM-499 and RM-516 propose a staggered timetable for implementation of the reservation of the telephony bands.

d. RM-378 proposes that two-letter station call signs (call signs with a single letter prefix and a double letter suffix) be issued to holders of the Amateur Extra Class license. A number of the other petitions also recommend new call sign assignment procedures which relate to the "incentive licensing" program.

4. The proposals for an "incentive licensing" program have generated the largest number of comments and the greatest controversy in an amateur rule-making matter in many years. Nearly all of these comments are in response to RM-499, the ARRL petition. A large number of persons, about equally divided, merely approved or opposed RM-499. Of those who gave reasons for their opposition, only a very few apparently felt that an "incentive licensing" program was not desirable or was unnecessary. These persons either thought that amateur radio operations were presently satisfactory or that methods other than "incentive licensing," such as requiring an examination for license renewal, would cure any ills. Many objectors to the ARRL proposal stated that the reservation of frequency bands to higher class licensees to the extent advocated by the League would unduly encroach upon the operating privileges of the lower classes of licensees. They maintained that loss of these most desirable frequency bands would force licensees to acquire higher classes of licenses in order either to utilize their equipment or to enjoy the most rewarding aspects of amateur radio operation.

No Letters This Month

IN order to be able to bring you the full text of FCC Docket 15928 concerning incentive licensing, we have deleted our usual "Letters to the Editor" section this month. We'll be back to normal next month, though, with the usual reader comments and observations.

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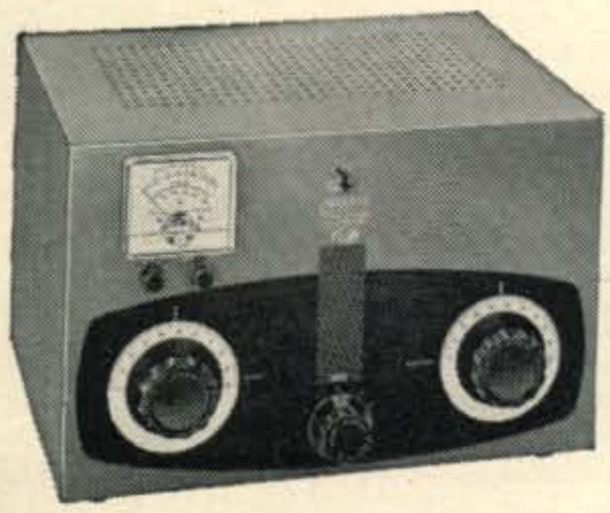

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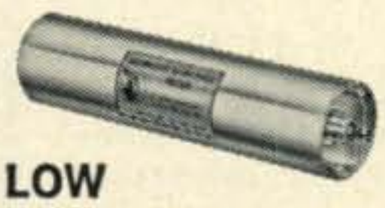

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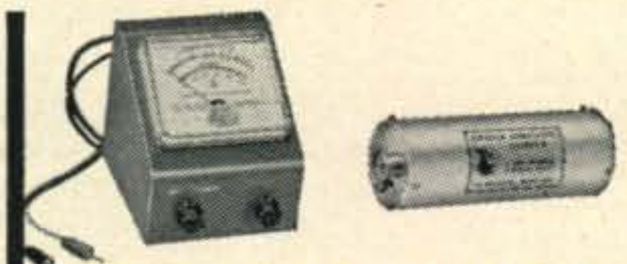

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For further information, check number 9, on page 110

Endorsement of the ARRL position was received from many persons of widely diversified interest in the Amateur Radio Service.

a. From a retired former Chief Signal Officer of the Army:

"During the early years of my military career (the 1930's) whenever an individual who possessed a radio amateur license came to my attention I did my utmost to have the individual assigned to communications work. His license spoke well of his technical understanding and intense interest. During the latter part of my career (the last decade or so) such has not been my feeling. The license has generally meant 'Here is another hobbyist—maybe he has it and maybe he doesn't.' The license has lost its stature; it appears to be anybody's, just for the asking. . . ."

b. From the Bar Association Librarian of a large city:

"It does not disturb me that for a time I may be precluded from operating in certain bands until I have demonstrated that I am able to understand and therefore successfully negotiate more advanced requirements. May I say here that I do not believe the reliability of commercially produced equipment to be any excuse for ignorance in its operators.

"I see every reason to believe that the amateur service would flourish under an incentive program. In this era of continuously pressed demands for increased competence in every area of activity, I cannot see how amateur radio can prosper if it adheres to the comfortable ways of yesterday."

c. From the president of a leading electronics manufacturing company:

"A decade ago when a licensed radio amateur applied to the company for employment, mere possession of a 'ham ticket' was sufficient guarantee that the holder was technically competent, could read a schematic, had the capability to learn, and was capable of mature growth in the industry. Many of today's leaders in the electronics field advanced along this very path. Now, although the electronics industry is in chronic shortage of trained technicians and engineers, by and large, applicants for these jobs are not coming from the ranks of the radio amateur. Possession of a radio amateur license does not now mean that the holder is technically qualified in any sense. On the contrary, the Personnel Department of this Company has been continuously disappointed with the quality, calibre and technical ability of holders of radio amateur licenses to such an extent that such individuals are subject to careful screening before they are considered for employment."

d. From a college engineering and technology educator:

"As a college instructor, we automatically assumed (and with good basis) that an engineering student who was also a radio amateur, would be a highly capable student willing and able to accept the loads and responsibilities of an engineering program. This idea to an even higher degree was present when the new student possessed a license of one of the more advanced classes. . . .

"In contrast, today we in education almost prefer not to have our students come to us with amateur radio licenses. Typically, today's ham is concerned wtih contests and chatter and knows little or nothing of theory and construction. His approach to study and lab is hit-or-miss or the try-this-or-that approach. He appears never to have tried to understand the basis of electronics to say nothing of his equipment itself. He has probably never wired anything more complex than a cable or two and would not consider the modification or service of even his personal receiver. He simply wouldn't know how and is not really interested in it beyond its function of reception."

e. From the Communications director of a state Civil Defense department:

"The . . . Division of Civil Defense values very highly the service rendered to our organization by amateur radio operators through the Radio Amateur Civil Emergency Service. Without this Service our emergency communications would be severely handicapped. The reservoir of trained technicians, available within the amateur radio service, is of immeasurable value to the success of our civil defense program in (the State).

"With this thought in mind, it is felt that any attempt to up-grade the amateur service will ultimately result in a higher grade of trained personnel which may be called upon in time of national emergency. . . . Therefore, I would like to recommend immediate adoption of the suggestions contained in their proposal, and further recommend a complete revision of the examination material with the view of increasing the scope of the examination as well as the degree of difficulty of the questions contained therein."

5. The Commission has carefully considered each of the subject petitions and the documents in response thereto in the light of its responsibilities under the Com-

◀ For further information, check number 10 on Page 110

When you head for the wide open spaces . . .

take SB-34 with you

Vacation, at last! Now time to head for the wide open spaces. You'll be busy during the day—hunting, fishing, tennis, golf, swimming, boating—trying to crowd in all those activities you've planned during the year. But at night, pleasantly tired—relax—turn on the **SB-34.**

Here's where you will begin to appreciate how good your judgment was when you selected **SB-34** as the SSB transceiver that offered you the most for your money.

Operate **SB-34** from hotel, motel, station wagon, camper—your boat or plane. And of course from the family car. Built-in supply for 12V DC **and** 117V AC makes this varied operation possible. Change from AC to DC is easy. Just use the AC or DC patch cable. (Both are provided).

Very low drain (500ma) on receiver standby is important for portable operation. Almost complete transistorization, (just 3 tubes are used in RF output and driver stages) makes this low drain possible.

The SBE concept . . . "a complete station in an exceptionally small and lightweight package" proves its worth convincingly on vacation or—for that matter—at **any** other time when you have occasion to take SB-34 with you.

Please send data on **SB-34** transceiver

Name

Address

City State

SBE

317 Roebling Road, So. San Francisco, Calif.

$395 including built-in power supply.

Power input: 135W P.E.P. input. (slightly lower on 15). **Frequency range:** 3775-4025 kc, 7050-7300 kc, 14.1-14.35 mc, 21.2-21.45 mc. 23 transistors, 18 diodes, 1-zener, 1-Varactor, 2-6GB5's PA, 1-12DQ7 driver. **Speaker built-in.** Prewired receptacles on rear accept VOX and Calibrator—both units optionally available. **Size:** 5"H, 11¼"W, 10"D.

RAYTHEON

Export sales: Raytheon International Sales & Services, Lexington 73, Mass. U.S.A.

For further information, check number 11, on page 110

munications Act to regulate the use of the radio frequency spectrum in the public interest, convenience, and necessity. It is altogether clear that justification for the continued allocation to the Amateur Radio Service of a substantial portion of the spectrum in the face of incessant and important demands by other radio services can not be founded on anything other than a continuing movement of the Amateur Service toward the goals specified in Section 97.1* of the Amateur Rules. It is the Commission's opinion that revision of the present license operating privilege structure is an appropriate and desirable step to take at this time to insure such progress and place a proper emphasis upon the quality of the service as well as upon its mere numerical growth and activity Accordingly, we propose to revise our rules to provide for higher classes of licenses with special privileges as an incentive to the general "up-grading" of licensees. We propose, additionally, to revise the privileges and term of the Novice Class license, to modify a basis of eligibility for the Conditional Class license, and to provide for distinctive station call signs. These latter proposals are all considered to be consistent with, and necessary to, an incentive licensing program.

It has been suggested in some of the comments that, although there is a need for improvement of licensee knowledge and proficiency in the Amateur Radio Service, rule changes are not appropriate since the licensees should adopt their own program for improvement. While, of course, self-initiative by licensees is vital, we can not agree that Commission action is inappropriate. Section 97.1(c) of the rules clearly contemplates the improvement of the Amateur Radio Service through rules which provide for the advancement of skills in both the communication and technical phases of the radio art.

6. In consideration of the foregoing, the Commission proposes amendment of its Amateur Radio Service Rules as follows:

A—A new higher class of license to be designated the Amateur First Class license shall be created. Eligibility for this license shall be limited to an Advanced, General or Conditional Class licensee who has held such license for at least one year. Examinations for this license will be conducted at Commission Field Offices or examination points. Applicants will be required to pass a 16 word per minute code test and a written examination of a difficulty level between the General and Amateur Extra Class examinations.

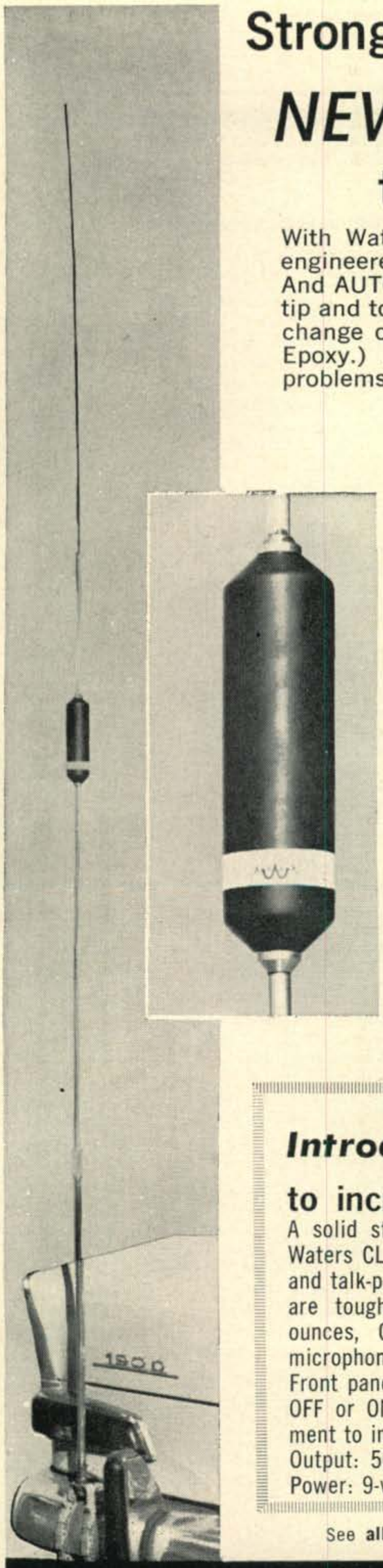
B—Holders of either the Amateur Extra Class or the Amateur First Class license shall be exclusively entitled to utilize the frequency segments 3800-3850 kc/s, 7200-7225 kc/s, 14200-14235 kc/s. 21250-21300 kc/s, 50-50.1 Mc/s, and 144-144.5 Mc/s effective one year after adoption of these rule changes, and, 3800-3900 kc/s, 7200-7250 kc/s, 14200-14275 kc/s, 21250-21350 kc/s, 50-50.25 Mc/s, and 144-145 Mc/s effective two years after adoption of these rule changes.

C—Holders of the Amateur Extra Class license shall be exclusively entitled to utilize the frequency segments 3500-3525 kc/s, 7000-7025 kc/s, 14000-14025 kc/s, and 21-21.025 Mc/s effective one year after adoption of these rule changes, and 3500-3550 kc/s, 7000-7050 kc/s, 14000-14050 kc/s, and 21-21.050 Mc/s effective two years after the adoption of these rules changes.

D—The Advanced Class license shall no longer be renewed. Present holders of this license shall be issued the General Class license upon renewal. The basis for this proposal is that there no longer exists any valid distinction between the Advanced and General Class licenses as to the difficulty of the examination. Therefore, continued issuance of the Advanced Class license has become an unnecessary administrative burden and, under an incentive licensing program, would merely lead to confusion.

*"§97.1 Basis and purpose. The rules and regulations in this part are designed to provide an amateur radio service having a fundamental purpose as expressed in the following principles: (a) Recognition and *enhancement* of the value of the amateur service to the public as a voluntary non-commercial communications service, particularly with respect to providing emergency communications. (b) Continuation and *extension* of the amateur's proven ability to contribute to the advancement of the radio art. (c) Encouragement and *improvement* of the amateur radio service through rules which provide for advancing skills in both the communication and technical phases of the art. (d) *Expansion* of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts. (e) Continuation and *extension* of the amateur's unique ability to enhance international good will." (Underlining supplied).

[*Continued on page 96*]



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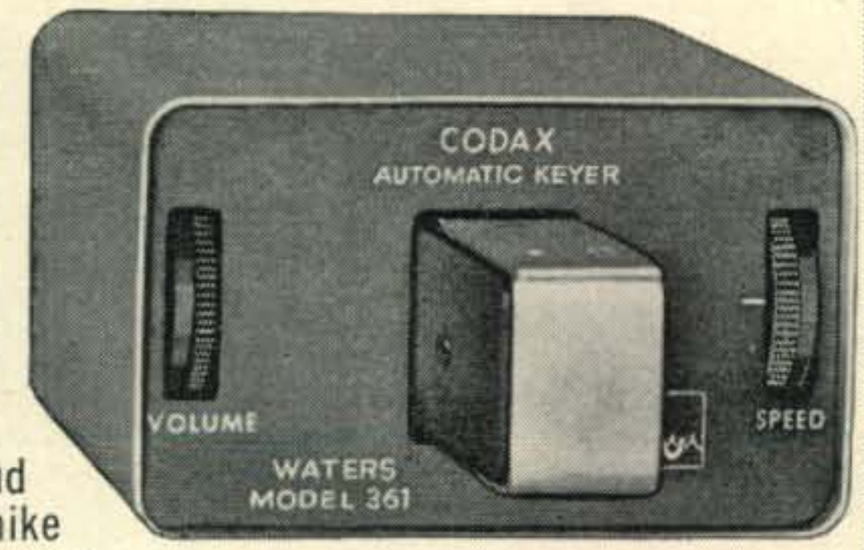
With Waters new AUTO-MATCH, you'll get the signal strength **out** that's engineered **into** your modern, compact transceiver. Every precious DB of it! And AUTO-MATCH is built to endure with its stainless steel tapered radiator tip and tough aircraft aluminum mast. It operates on any band with a simple change of top-center loading coils. (Coils are sealed in protective, low-loss Epoxy.) AUTO-MATCH—the permanent solution to your mobile antenna problems!

PRICES

Mast 370-1	$12.95	Coil 370-20	$13.45
Radiator Tip 370-2	$ 9.95	Coil 370-15	$12.75
Coil 370-75	$15.95	Coil 370-11	$11.95
Coil 370-40	$14.95	Coil 370-10	$11.95

Waters NEW CODAX™ Automatic Keyer

COADAX—new rhythm-smooth automatic keyer by Waters—never anything like it! Feather-touch double paddle is factory-adjusted for precise gap and tension. Spacing and timing from 5 to 50 WPM is fully automatic. Battery powered all-solid state digital circuitry with sealed Reed Relay output for block grid keying. Also operates into mike jack to work VOX CW on upper or lower sideband. Unique audio circuit provides for monitoring and mixing incoming signals.



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See **all** our new goodies at the Sideband Show—Statler-Hilton, New York, March 23rd.

WATERS
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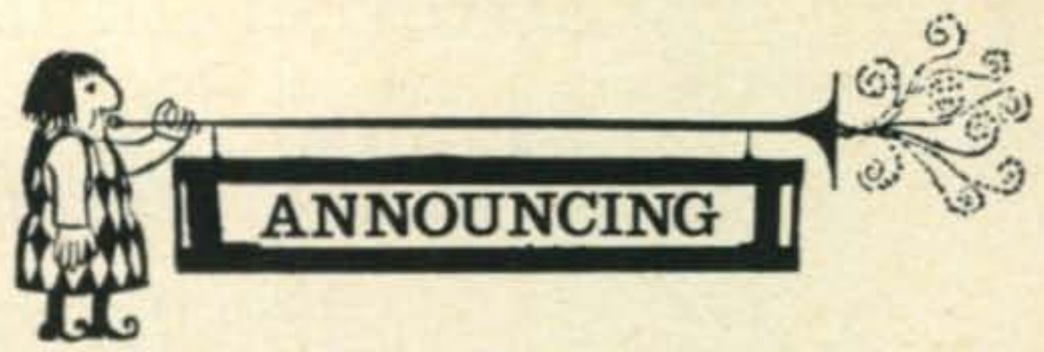


Washington, D.C.

The Foundation for Amateur Radio, Inc., with headquarters in Wash. D.C., announces its intent to make the fourth award of the John Gore Memorial Scholarship for either graduate or undergraduate study, full or part time. The scholarship pays $250 for the academic year, and is subject to renewal. Licensed radio amateurs who intend making a career in electronics or related sciences may now apply for the academic year 1965-1966. To be eligible, applicants must have completed one year in an accredited college or university and must be enrolled in a course of studies leading to a degree. They must also be radio amateurs holding a valid FCC license of at least a General class rating. Preference will be given to applicants from the area served by the Foundation, the District of Columbia, Maryland and Virginia, although those living elsewhere are not excluded. Requests for application should be made not later than May 20, 1965, and should be addressed to: Chairman of Scholarship Award Committee, FAR, Inc., 10224 Farnham Drive, Bethesda, Maryland 20014. The Foundation for Amateur Radio, Inc., is a non-profit organization devoted to the advancement of amateur radio. It is composed of trustees representing radio clubs in the Washington-Baltimore area. John W. Gore, W3PRL, in whose honor the scholarship was named, was until his death in 1960 the president of the Foundation. A prominent radio amateur in Baltimore for many years, he was a vice president of the Bethlehem Shipbuilding Corporation there.

Jefferson City, Missouri

The Mid-Mo Amateur Radio Club will host the Missouri Net picnic/hamfest for 1965. The date this year will be June 6, and the place, Memorial Park in Jefferson City. For further details write to Roy Lilley, KØJJS, 1204 Edgewood Drive, Jefferson City, Missouri.

Seattle, Washington

The Northwest Chapter of the Quarter Century Wireless Association will hold their annual summer meeting in Seattle this year on June 12 and 13 at the Lakeshore Inn Motel. All old timers as well as members are welcome. For more information and advance reservations, contact W. P. Gilbert, W7QA, 4060 S. Myrtle St., Seattle, Wash., 98118.

Mobile, Illinois

The 12th annual Mississippi Valley Hamfest will again be sponsored by the Quad City Amateur Radio Club. The hamfest will be on May 23rd at Indian Bluff Forest Preserve near Milan, Illinois. A wide variety of activities are planned including: picnic, trunk sales, auctions, displays of new equipment, and games for the children. For tickets and information write to Wm. Cooper, Jr., K9CHZ, 911-23rd Avenue, Moline, Illinois.

Rockaway, New York

The Rockaway Amateur Radio Club Spring Auction will take place Friday evening May 28, 1965 at 8:00 P.M. The event will be held at the Daniel M. O'Connell Post 272, American Legion Hall at 301 Beach 92nd Street, Rockaway Beach, N.Y. Doors will open at 6:00 P.M. to accept items to be sold. One dollar donation accepted at the door.

Columbus, Indiana

The Columbus Hamfest will be held Sunday, May 23rd, at the Bartholomew County 4-H Fairgrounds located 2½ miles south of Columbus at the junction of US 31-A and State Road 58. Registration is $1.50. Activities for the ladies and children, door prizes and awards as usual. For additional information write to the Columbus Amateur Radio Club, P.O. Box 544, Columbus, Indiana.

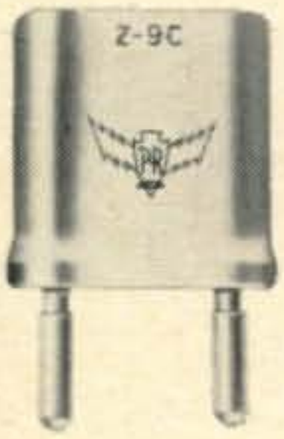
El Paso, Texas

The El Paso Amateur Radio Club will hold its

Preferred for VHF since 1934

For more than 30 years, VHF experts have been enthusiastic about the performance of PR Crystals . . . their activity, dependability, low drift, and hair-line accuracy. These qualities are built-in by precision workmanship at every stage of manufacture. And EVERY PR CRYSTAL IS UNCONDITIONALLY GUARANTEED.

FUNDAMENTAL, PR TYPE Z-9C



Frequency Ranges in Kcs.: 1,750 to 2,000 (160M); 3,500 to 4,000 (80M); 7,000 to 7,425 (40M); 8,000 to 8,222 (2M); 8,334 to 9,000 (6M) ± 500 Cycles. $2.95 Net.

(All Z-9C Crystals calibrated with a load capacity of 32 mmfd.)

THIRD OVERTONE, PR TYPE Z-9A

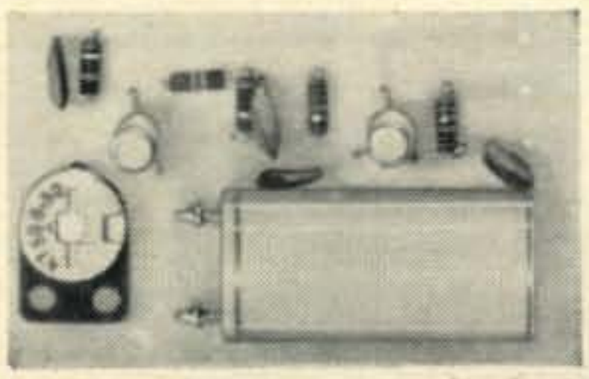
Third Overtone, PR Type Z-9A, 24,000 to 24,666, 25,000 to 27,000 Kc. ± 3 Kc., 28,000 to 29,700 Kc. ± 5 Kc. . . . . $3.95 Net

6 Meters, Fifth Overtone, PR Type Z-9A, 50 to 54 Mc., ± 15 Kc. $4.95 Net.

Radio Control, PR Type Z-9R
Calibrated .005% . . . . $2.95 Net
Calibrated .002% . . . . $3.95 Net

PR-100 TRANSISTORIZED OSCILLATOR

With PR-100 you can check harmonics at 100 Kc. intervals through 54 Mc. A precision oscillator, fully wired, ready to install. Includes a Z-6A Crystal. Power requirements: 12V DC @ 14 Ma. Oscillator output connects to receiver antenna, high side. Base is 1-7/8 x 2-13/16 inches. Weighs 2 ounces. . . . **$12.95 Net**



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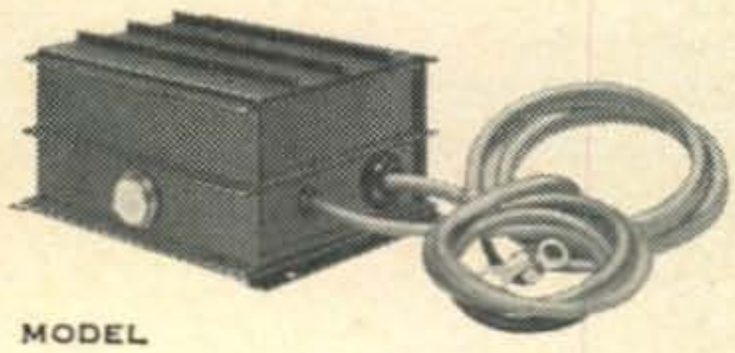
CENTURY*

MOBILE POWER SUPPLIES



MODEL 350-12

QUALITY COMPONENTS
EXPERT WORKMANSHIP
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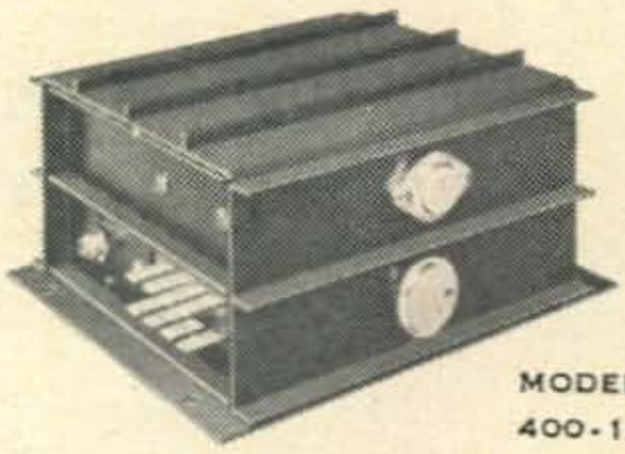

MODEL 400-12

There is a CENTURY model converter made for your power requirements. No other converter on the market today can give you the many outstanding features assembled in these compact, solid-state CENTURY supplies. Backed by years of experience in the power supply field, engineers at Linear Systems designed the CENTURY series to provide the finest unit possible for powering commercial and amateur radio communications equipment in mobile service.

CENTURY MODEL No.	CONT. OUTPUT (WATTS)	PEAK OUTPUT (WATTS)	VOLTAGES	APPLICATION	PRICE
350-12	300	350	800 275/325 0 to 125	Most Mobile Transceivers 12 Volt	$114.50
400-12	350	400	850/750/650 250/285/325 0 to 125	All Mobile Transceivers 12 Volt	$145.00
500-12	400	500	1150 285/325 0 to 125	Hi-Power Mobile Transceivers Linear Amplifiers	$165.00
1000-12	750	1000	2200 285/325 0 to 125	Mobile Linear Amplifiers	$275.00

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CABLES NOW SUPPLIED WITH ALL CONVERTERS

LINEAR SYSTEMS INC.
605 UNIVERSITY AVENUE
LOS GATOS, CALIFORNIA

For further information, check number 24, on page 110

second annual Swap Fiesta at Bassett Center in El Paso on May 15 and 16. Grand prize for the event will be a Collins KWM-2. A $2.00 donation may be paid to any member of the EPARC, or by writing the club at 1501 Golden Hill Terrace, El Paso, Texas, 79902. For more information contact the Swap Fiesta Chairman, Hurley O. Saxon, K5VQH.

Roanoke, Virginia

The Roanoke Valley Amateur Radio Club will hold its annual Hamfest May 29 and 30th at the Vinton War Memorial, Vinton, Virginia. A dinner Saturday evening with a dance afterwards is planned. There are many activities planned for Sunday including phone and c.w. meetings and discussions on traffic. For advance registration and further information write to: Roanoke Valley Amateur Radio Club, P.O. Box 2002, Roanoke, Virginia.

St. Petersburg, Florida

The St. Petersburg Amateur Radio Club Hamfest will be at Phillippe Park, near Safety Harbor, Florida. Prizes, swap shop and fun for all, rain or shine, from 9 AM on May 16th. For additional information write to the club at P.O. Box 4026, St. Petersburg, Fla.

Cornell University, New York

The Cornell Amateur Radio Club will sponsor a gala swapfest and auction on Saturday, May 1, 1965 in Barton Hall on the Cornell University Campus in Ithaca, N.Y. Refreshments will be served. Admission is free.

Boston, Massachusetts

The Milton Radio Club is reactivating their Net every Monday evening 8 PM local time on 28.6 mc. Net control is K1JLV.

Topeka, Kansas

The Kaw Valley Radio Club of Topeka, Kansas, will have their annual picnic on May 16. The location will be at Garfield Park, and the time will be from 9:00 AM to 5:00 PM. For more information write to L. M. Johnson, KØAER, 2400 James St., Topeka, Kansas.

Ursina, Pennsylvania

The 10th annual Grave Yard Net picnic and Hamfest, sponsored by the Somerset County Amateur Radio Club, Inc., will be held at Lake Stonycreek, in the beautiful Allegheny Mountains, near Somerset, Pa. on July 10th, and 11th. W3GGN, club station, will be on 3.885 kc and 50.4 mc to direct mobiles to the site. Prizes and surprises. Registrations in advance—$1.50—at the door—$2.00. For further information and advance tickets contact Blaine, K3BGI, 510 Broadway, Rockwood, Pa.

Mother's Day Certificate

The Grafton Amateur Radio Club, Grafton, West Virginia, the birth place of Anna Jarvis founder of Mother's Day, will issue a certificate for working club members on Mother's Day, May 9, 1965 from 12:01 AM to 12:00 PM EST. Club Call W8EP and member stations are W8NTV, WA8KAN, K8MRX, K2OEK, K8HUX, K8MYU, K8KRU, K8HHU and K8ZWN. The certificate shows the Andrew's Methodist Church of Grafton in which the first Mother's Day Services were held on May 10, 1908. The above stations will be calling "CQ from the home of Mother's Day" or CQMD on c.w.

Air Force Academy, Colo.

To mark both Armed Forces Day and the 11th anniversary of the founding of the nation's newest service school, the Air Force Academy MARS station KØWWD will operate from the top of Pikes Peak May 14 through 16. Academy personnel will begin station operation at 1900 GMT May 14 and continue until 1900 GMT on the 16th. The station will operate on three frequencies: 20 meters (14.320 kcs.) from 1900 GMT to 0300 GMT and 1300 GMT to 0300 GMT; 40 meters (7.220 kcs.), continuous; and 80 meters (3.940 kcs.), 0300 GMT to 1300 GMT. A QSL certificate will be awarded to each station contacted during the operation.

Correction

In the "R.F. Filtered Lamps" article, *CQ*, March, 1965, p. 54, if either capacitor C_3 or C_4

(shown in fig. 1) should short with the lamp ungrounded, a dangerous shock hazard would exist. For this reason Underwriters Laboratories Inc. has specifically instituted tests of ceramic capacitors to be used for this application. The disc capacitors used are slightly more costly (25¢ list) since they have to withstand severe a.c. overvoltage tests. Units that are suitable for this application are Sprague, 1500 mmf, #125-L-D15 or equivalent types rated at 125 v.a.c.

DeKalb, Illinois

The Kishwaukee Radio Club of DeKalb, Illinois is again holding its annual equipment Swapfest on Sunday, May 2, 1965. Last year over 600 hams attended. For further details write to: Alton L. Brand, 415 E. Sycamore St., Sycamore, Illinois.

Geneva, Switzerland

On Sunday and Monday, 16 and 17 May 1965 the International Amateur Radio Club (IARC) station will be operating in all Amateur bands in commemoration of the Centenary of the International Telecommunication Union (ITU). On the 17th of May 1965, the I.T.U. will be a hundred years old! The Club will contact many amateur stations around the World, including you, we hope! At the I.T.U. Headquarters there will be six stations in operation around the clock in all the amateur bands. For the occasion, the special calls in addition to 4U1ITU: 4U2ITU, 4U3ITU, 4U4ITU, 4U5ITU, and 4U6ITU will be used by the six stations in rotation. (Commemoration Operator Certificates and QSL cards will be issued.)

Williamsport, Penna.

The West Branch Amateur Radio Association will hold its yearly Hamfest on May 2, 1965 at the Firemens' Social Hall in Montoursville, Pa. For more details write to: H. J. Lamade, Jr., K3MKW, President, WBARA, c/o Grit Publishing Co., Williamsport, Penna. 17704.

Fresno, California

The Fresno Amateur Radio Club, Inc., will have their 23rd annual Fresno Hamfest, Saturday, May 15 at the Towne and Country Lodge, Fresno, Calif. Events planned are: Smorgasbord dinner, grand award banquet, prizes, transmitter hunts and a mobile judging contest. For more information write to Howard Craven, W6DUD, Registration Chairman, Fresno Amateur Radio Club, Inc., P.O. Box 783, Fresno, California.

Lansing, Michigan

The 12th annual Michigan Week celebration will be from May 16th through the 22nd. Hams from Michigan and throughout the nation and world will be eligible for achievement award certificates, signed by Michigan Governor George Romney, for contacts made relaying information about Michigan. For complete rules write to the Greater Michigan Foundation, 520 Cherry St., Lansing, Michigan.

Dearborn, Michigan

The Henry Ford Museum in cooperation with Detroit Amateur Radio Association and Council of Amateur Radio Clubs of Southeastern Michigan will sponsor an Old Timer's Night on Saturday, May 8, 1965. There will be a lunch sponsored by the QCWA, a dinner and a meeting at which George Bailey, W2KH, will discuss Ham Radio past, present and future. The activities throughout the day will be recorded by the University of Michigan as part of their plan to record oral history. For reservations and information, write to Dept. of Communications, Henry Ford Museum, Dearborn, Michigan.

Please . . .

When writing to *CQ* for any reason, be sure to include your **ZIP code.** It will soon be a postal regulation and may effect delivery of *CQ* to your door each month.

The Amateur Radio

Club Forum

BY AL SMITH, WA2TAQ

WE have previously mentioned that newspaper publicity is perhaps our best form of public relations. We brought to your attention that the local broadcast station, as a means of promoting the good word of our avocation, is yet another great means. Another method comes to mind, this one will give us a chance to get our message "directly" to the public. For this you have to get on what could be termed the "free lunch circuit." There are many service clubs in our communities. These groups meet weekly, semi monthly or monthly. It is the policy of most clubs to have a guest speaker at their meetings.

A service club that meets weekly (usually a daytime luncheon meeting) will be on the lookout for speakers on any subject. The mention of your availability to one of the members, will no doubt have the clubs "speaker seeker" chairman on your door step in no time.

Just to mention a few of these service clubs we have Rotary, Kiwanis, Lions, Elks, Exchange and Chamber of Commerce groups. You'll find that the members of these clubs are usually civic minded individuals; businessman, public officials and other people of importance in the community.

They of course will be the leaders of any community and the type of people we want to get the true facts of amateur radio to.

Many of these groups do much for a community, mostly in a financial manner. Don't overlook the possibility that your pet goal may be given a shot in the army by a donation. Club programs such as supplying emergency communications for your community, hospitals, Red Cross, or similar agencies may be just the thing the service club is looking for as a project. Keep in mind that many things we do, such as Field Day, are public services. Let these clubs know what your amateur radio club is doing in the old home town. Tell them of the many good things we can do for them and their neighbors.

Service clubs of course are not the only groups that could be interested in having speakers on amateur radio. We have literally hundreds of veteran, religious, and fraternal organizations that would welcome a change of pace from their normal meeting routines.

As we mentioned in newspaper publicity "sock-em" in the first paragraph. We could do likewise in a talk to local clubs. One way, is to find out ahead of time if the organization has had any connection what-so-ever with amateur radio. Perhaps you know of a chapter, Post, Council, or Branch that donated some amateur radio equipment, or allows an amateur radio club to use their meeting facilities, or as is the case in many organizations, an amateur radio group exists within the organization. Whatever you can dig up, use. It will particularly attract attention when they know they have some tie to amateur radio. This paid off for me when speaking to a Rotary Club luncheon. I made mention of a group within Rotary known as ROAR (Rotarians of Amateur Radio), this made all ears perk up, and from then on I had a very attentive audience.

About your talk, try to make it interesting, don't worry if you haven't had experience in public speaking; if you know what you're talking about that's ninety percent of the problem licked right there. Dig up stories of happenings in amateur radio both humorous and serious. Start by filling your audience in on the difficulties of the spark days and progress to present day operating. Add some highlights from public service activities, particularly recent events such as the Alaskan earthquake, with at least one human interest sidelight, preferrably something local. Perhaps the story of a nearby resident receiving a message telling of the well being of a loved one in Alaska would be good. Of course any local work carried on by AREC and/or RACES will be appropriate.

FULLY PREPARE YOUR TALK, read it many times. If possible, put it on tape, and keep playing it back. By the time you get sick of hearing yourself, you'll pretty well know your speech. To be on the safe side prepare notes, you'll find them very useful particularly if you mention long lists of names such as famous radio amateurs, which by the way always seems to hold an audience spellbound.

This writer notes with pleasure the receipt of many club publications. I hope that the clubs that can, will send along a copy of their club paper each month. This will enable the FORUM to pick up interesting ideas put to use by various clubs, and allow others to know about them.

Out of the *Microvolt* (published by the Utah Amateur Radio Club of Salt Lake City), we read of a FB public service venture. This group came to the aid of the "March of Dimes Telerama," staged for some thirty one hours on a local Salt Lake City TV Channel. As pledges for donations were telephoned to the station, the club teletyped the information to the State Disaster Center. The Center had a number of two meter mobile units standing by, ready to be dispatched to pick up the pledged donations.

Despite an extremely heavy fog, nearly everyone in the area with a two meter mobile unit, joined in the effort. This was a chance to do a terrific public service job while in the public eye. It makes doing this type of work worthwhile, when someone knows about it. To quote a paragraph from the *Microvolt*, "Participation in affairs such as this, is good communications practice and also gives amateur radio reason to continue to exist." nuff said. 73, Al, WA2TAQ

---

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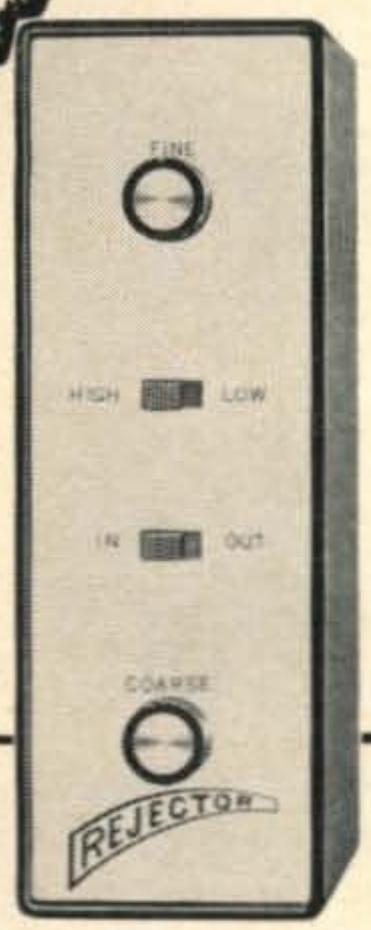

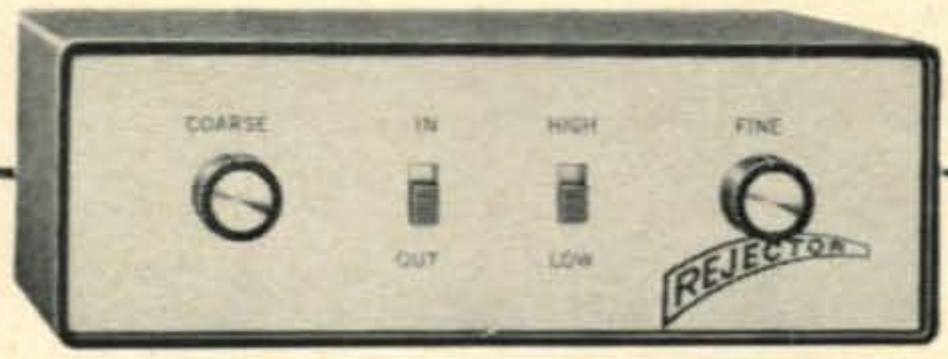

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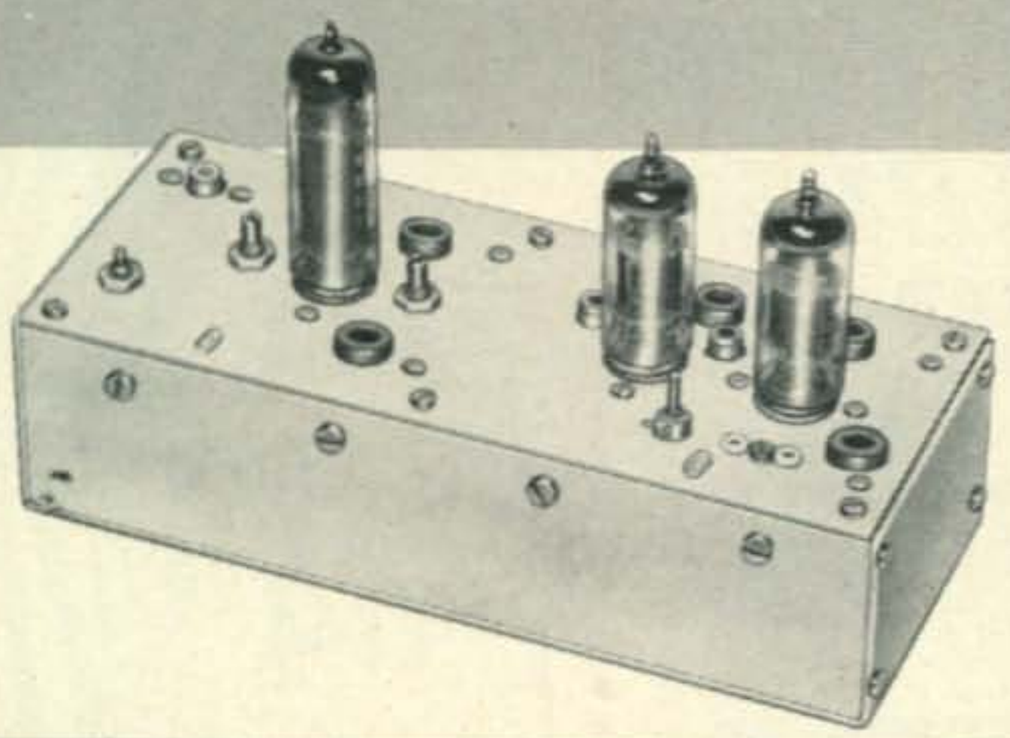
For further information, check number 19, on page 110

NEW FROM

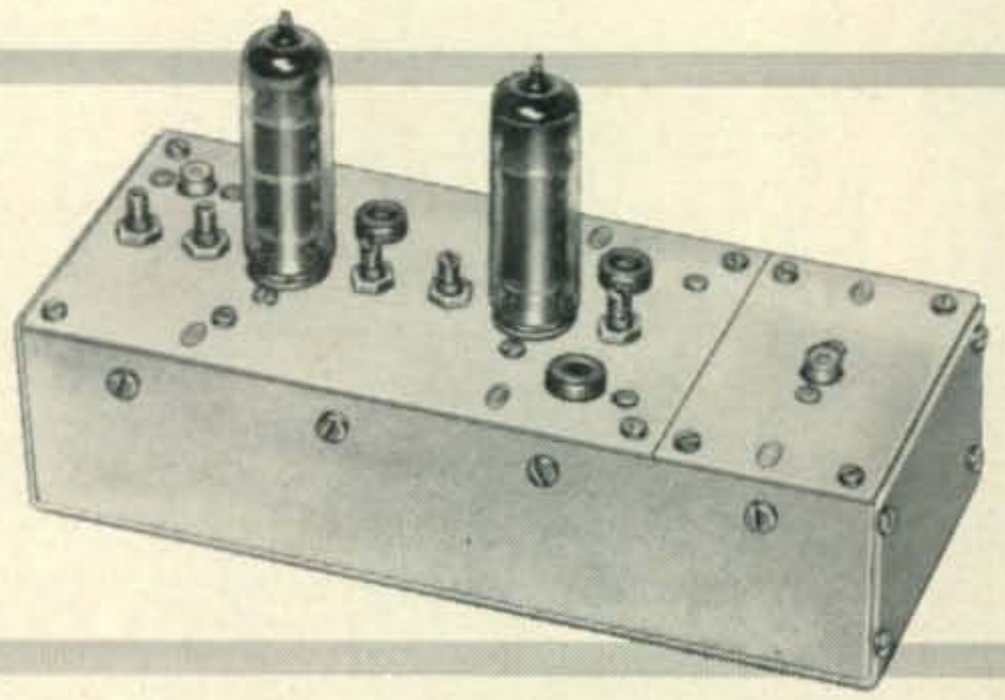
VHF/UHF UNITIZED TRANSMITTERS
50 mc — 420 mc



AOD - 57
DRIVER/TRANSMITTER FOR 50 OR 70 mc

The AOD-57 completely wired with one 6360 tube, two 12BY7 tubes and crystal (specify frequency). Heater power: 6.3 volts @ 1.2 amps. Plate power: 250 vdc @ 50 ma.

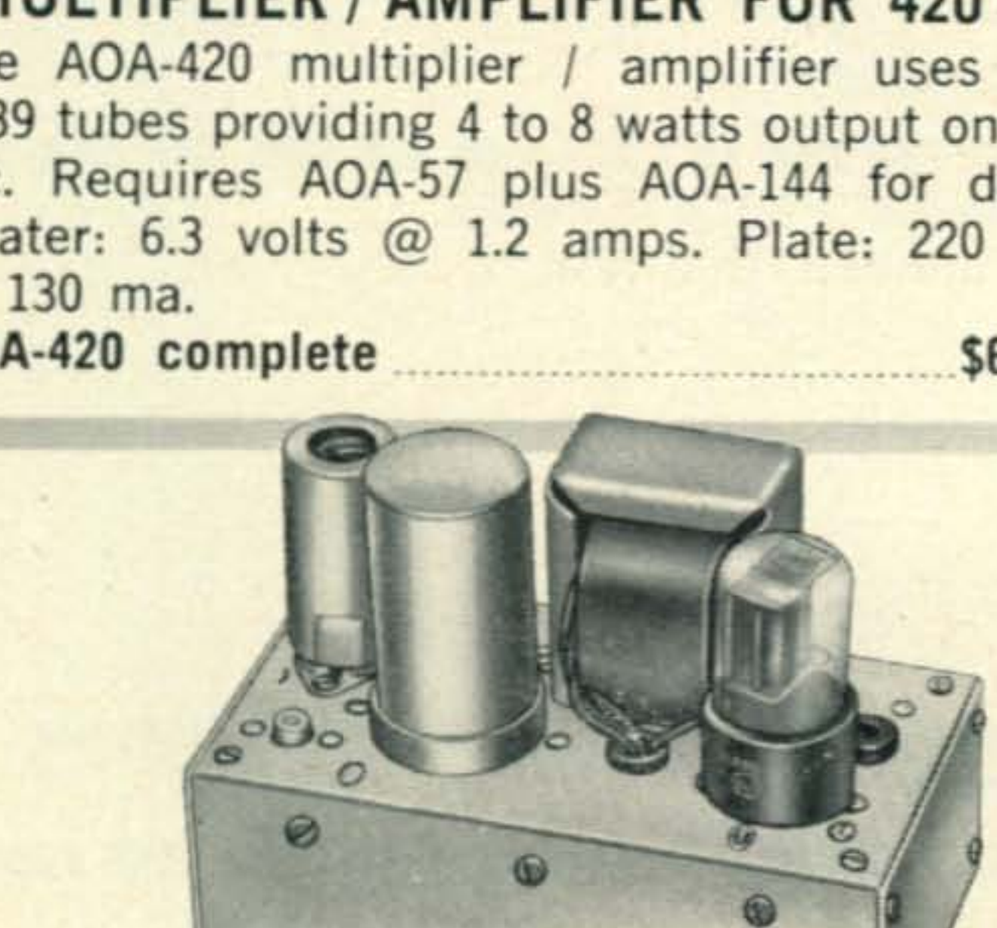
AOD-57 complete $69.50



AOA - 144
MULTIPLIER / AMPLIFIER FOR 144 mc

The AOA-144 uses two 6360 tubes providing 6 to 10 watts output. Requires AOD-57 for driver. Heater power: 6.3 volts @ 1.64 amps. Plate power: 250 vdc @ 180 ma.

AOA-144 complete $39.50



AOA - 220
MULTIPLIER / AMPLIFIER FOR 220 mc

The AOA multiplier / amplifier uses two 6360 tubes providing 6 to 8 watts output on 220 mc. Requires AOD-57 for driver. Heater power: 6.3 volts @ 1.64 amps. Plate: 250 vdc @ 150 ma.

AOA-220 complete $39.50

AOA - 420
MULTIPLIER / AMPLIFIER FOR 420 mc

The AOA-420 multiplier / amplifier uses two 6939 tubes providing 4 to 8 watts output on 420 mc. Requires AOA-57 plus AOA-144 for drive. Heater: 6.3 volts @ 1.2 amps. Plate: 220 vdc @ 130 ma.

AOA-420 complete $69.50

AMD - 10 MODULATOR:

The AMD-10 modulator is designed as a companion unit to the AOA series of transmitters. Uses 6AN8 speech amplifier and driver, 1635 modulator. Output: 10 watts. Input: crystal microphone (High Impedance). Requires 300 vdc 20 ma, no signal, 70 ma peak: 6.3 vac @ 1.05 amps.

AMD-10 Modulator complete $24.50

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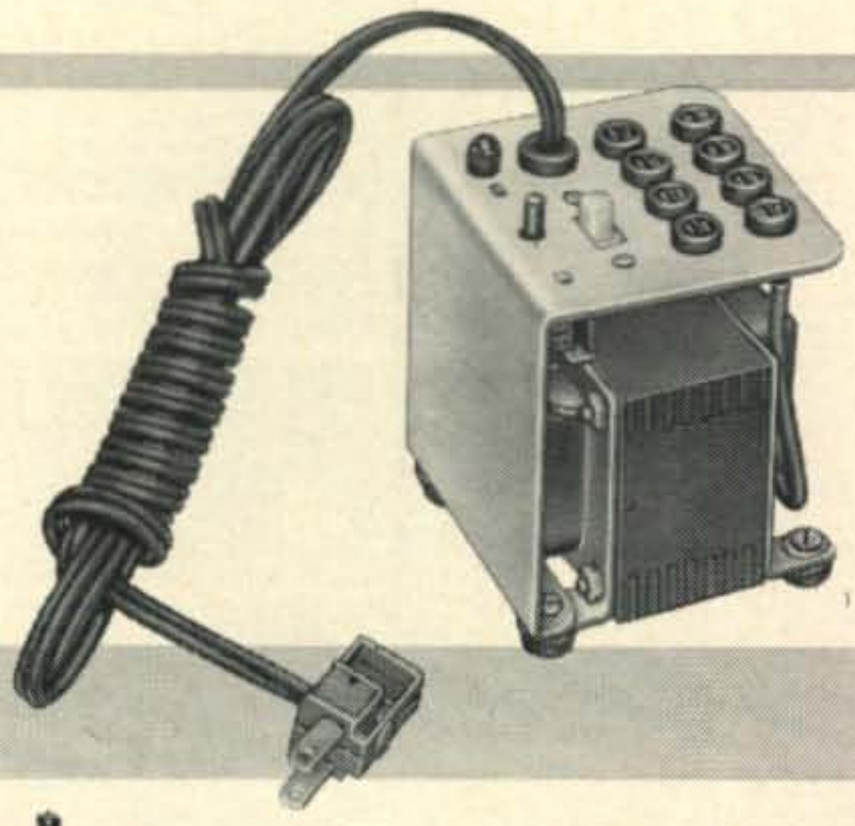
International's new unitized VHF/UHF transmitters make it extremely easy to get on the air in the 50-420 mc range with a solid signal. Start with the basic 50 or 70 mc driver. For higher frequencies add a multiplier-amplifier. All units are completely wired. Plug-in cables are used to interconnect the driver and amplifier.

ARY-4
RELAY BOX

Four circuit double throw. Includes coil rectifier for 6.3 vac operation.

ARY-4 Relay Box complete.....$12.50

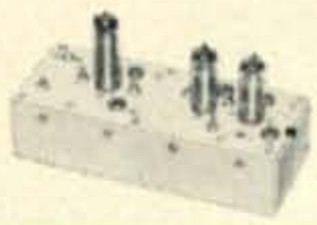
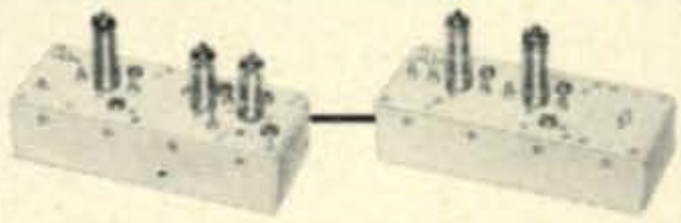
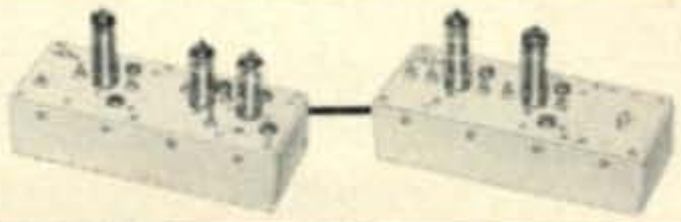
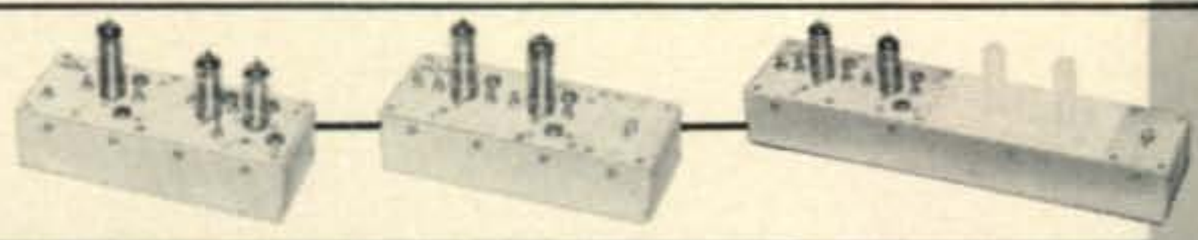


APD-610
FILAMENT SUPPLY

The APD-610 provides 6.3 vac @ 10 amperes.

APD-610 complete $9.50

COMPLETE TRANSMITTER

6 METERS	50 mc	AOD-57	
2 METERS	144 mc	AOD-57 PLUS AOA-144	
	220 mc	AOD-57 PLUS AOA-220	
	420 mc	AOD-57 PLUS AOA-144 PLUS AQA-420	

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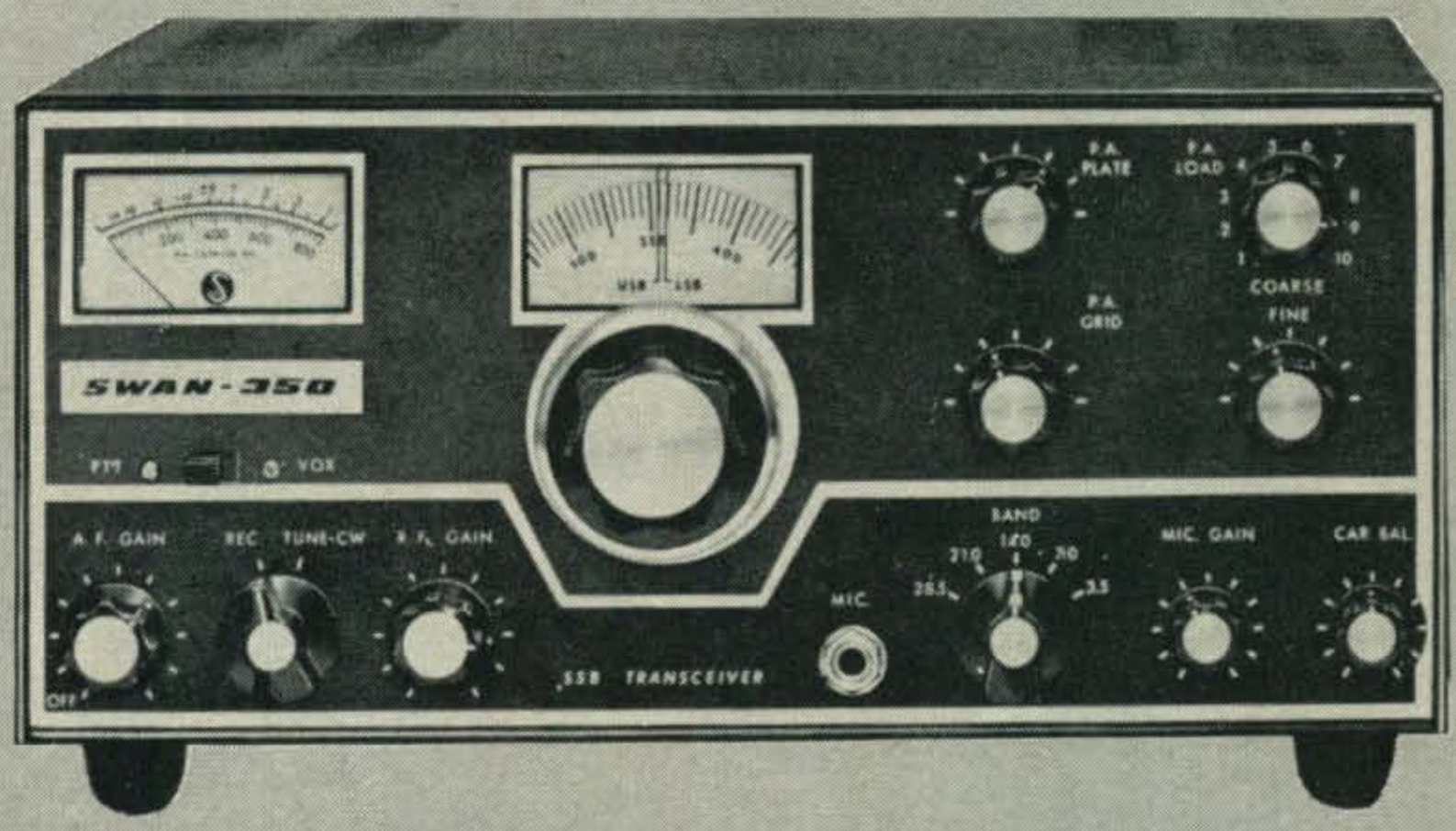
SWAN 350

Built-in VFO, optional crystal calibrator and sideband selector.

$395



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- AC power supply, matching cabinet with speaker. Model 117-C..... **$85**
- 12 Volt DC Power supply. Model 412 **$130**
- Plug-in VOX. Model VX-1..... **$35**

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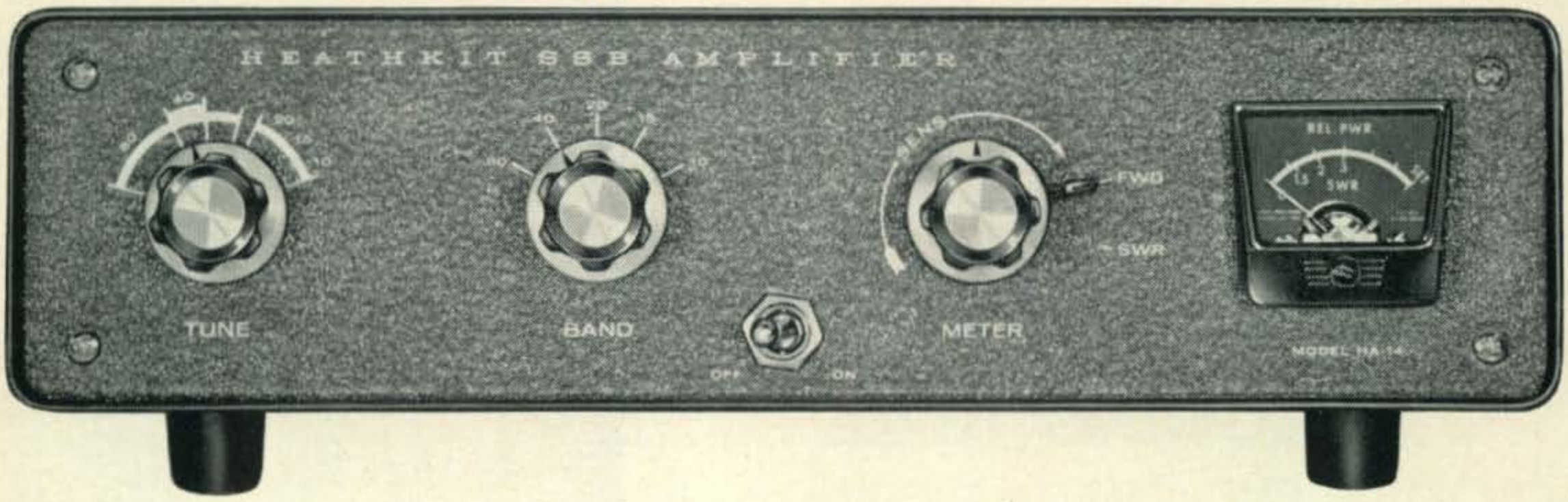
For further information, check number 23, on page 110

THE WORLD'S SMALLEST KILOWATT LINEAR



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• Provides 1000 watts P.E.P. input power • Tunes 80 through 10 meters • ALC output to exciter • Built-in antenna changeover relay • Built-in SWR meter aids antenna adjustments on the road & monitors for maximum efficiency • Pretuned broad-band input circuit requires no tuning • Engineered with a pair of rugged tubes ideally suited to mobile operation (572-B's or T160L's) • Full provision for control of "remotely" located AC or DC power supply

Here's A Kilowatt SSB Linear Amplifier That Sets New Standards For Size And Price! It can be installed under the dash of nearly every model of car with your exciter, providing a complete under-the-dash mobile station. This full KW SSB linear measures just 3 3/16" H x 12 3/16" W x 10" D. What's more, the *KW Kompact* goes for only $99.95!

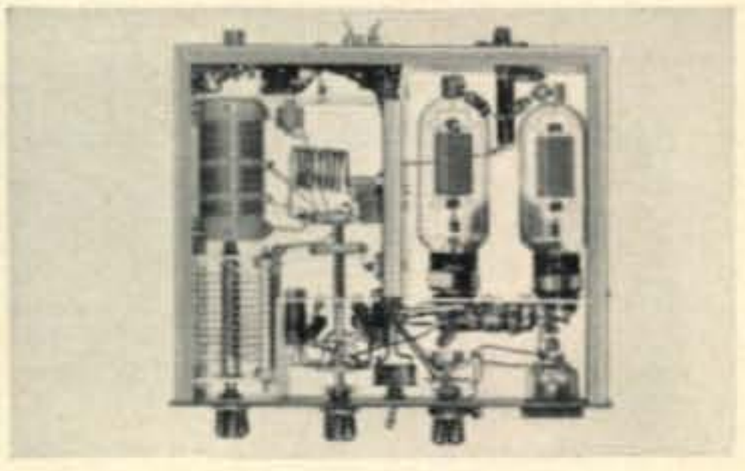
Heath Engineered To Set The Pace For Both Mobile And Fixed Amateur Stations . . . A kilowatt in a car means real sock for mobile and emergency communications—where antenna efficiencies are normally low. In fact, we've included a panel-mounted SWR meter, enabling on-the-spot antenna checks and adjustments . . . a real convenience feature! But the *KW Kompact* is not just a mobile rig . . . Picture it on the top of your operating desk. Nice? Then order yours today. Priced less power supply options below.

Kit HA-14, 9 lbs.....$99.95

HA-14 SPECIFICATIONS—Band coverage: 80, 40, 20, 15, and 10 meters. **Maximum power input:** SSB, 1000 watts P.E.P. **Driving power required:** 100 watts P.E.P. **Duty cycle:** 50% (SSB voice modulation). **Third order distortion:** —30 db or better at 1000 watts P.E.P. **Output impedance:** Fixed at 50 to 75 ohms unbalanced. SWR not to exceed 2:1. **Input impedance:** 52 ohms unbalanced; broad-band pretuned input circuit. **Meter functions:** 0-6 relative power & 1:1 to 3:1 SWR. **Front panel controls:** Tuning, band switch, relative power sensitivity control, meter switch (FWD & SWR), power switch (off, on). **Tube complement:** Two 572-B (or two T160-L) in parallel. **Power requirements:** 2000 VDC at 500 ma SSB peak, —110 VDC at 60 ma, and 12.6 VDC at 4 amperes. **Cabinet size:** 12-3/16" W x 3-3/16" H x 10" D. **Net weight:** 7 lbs.

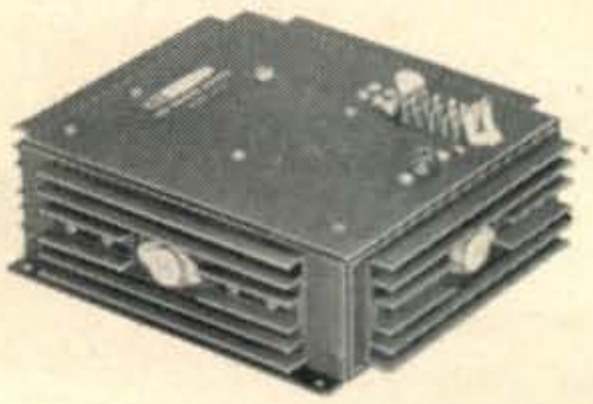
Picture a "*KW Kompact*" on your operating desk. Handsome design, small size. Ideal for portable operation, too!

A kilowatt in a car? The "*KW Kompact*" leaves room to spare.



Inside, a neat layout that makes assembly easy . . . quality components for dependable operation.

A Choice Of Power Supplies For Fixed Or Mobile Operation



Heathkit HP-14 Mobile Power Supply

The HP-14 Mobile power supply uses all solid-state circuitry. Switching frequency is 1500 cps. A toroidal core transformer for efficiency and regulation. Recommended for operation only with 12 V alternator equipped cars. Circuit breaker protected. The HP-14 provides all necessary operating voltages for mobile operation of the HA-14. Input voltage 12 to 14.5 VDC, negative ground, 25 amps average, 50 amps peak. 8 3/8" W x 2 5/8" H x 7 3/4" D.

Kit HP-14, 10 lbs.....$89.95

Heathkit HP-24 AC Power Supply

The Heathkit Model HP-24 AC power supply is controlled from the HA-14 SSB Amplifier, permitting it to be conveniently placed in any location. Provides all necessary operating voltages for the HA-14. Features complete circuit breaker protection. All solid state. 120 or 240 VAC, 50-60 cps operation. 9" W x 6 3/4" H x 4 3/4" D.

Kit HP-24, 21 lbs.....$49.95

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For further information, check number 25, on page 110

A Six Meter S.S.B. Transmitter

CLIFFORD JOHNSON,* WØURQ

The front panel of the six meter s.s.b. transmitter is painted in two tone grey. Below the center of the dial is the final tank tuning control and to the lower right of the dial is the v.f.o. tuning knob. On the shaded portion of the panel at the left is the sideband selecting switch and below it, the carrier control. The unmarked knob to the right of the switch is the audio gain control with the mike jack below it. The three center knobs tune the mixer, amplifier, and final grid. The a.c. switch is at the extreme right of the panel and the MODE switch is adjacent to it with the key jack below the

The common approach to getting on six meter sideband has been to use a low frequency s.s.b. transmitter with the addition of a transverter to reach 50 megacycles. However, this method ties up a lot of equipment and is bulky to say nothing of being an expensive way of doing it. A complete rig just for six meter s.s.b. doesn't cost much more than some transverters and since the rig is for one band only, with no bandswitching, construction is not difficult.

THIS 6 meter s.s.b. rig is a combination of circuits that have appeared in the handbooks and magazines, leaving out added frills like v.o.x. circuitry, but lacking nothing in the way of performance, ease of operation and stability. The block diagram is shown in fig. 1, the circuit in fig. 2. A 9 mc commercial filter (McCoy) in combination with a 7360 balanced modulator tube is used for sideband generation. The same tube works as the crystal oscillator using the crystals furnished with the filter for upper and lower sideband. A 12AX7 constitutes the entire audio system with a push to talk switch on the microphone for simplicity of operation. This is an old and reliable method called f.o.x.—finger operated transmit. The filter output is fed to a 6BA6 9 mc amplifier and mixed at low level in another 7360 tube used as a balanced mixer with the 5 to 5.5 mc output of the v.f.o. to get a 14 mc range that is broadbanded into a second low level mixer, a 12BY7A. Here the sideband signal combines with the 36 mc output of a crystal multiplier (6U8) to obtain the desired 50 mc.

A 6CL6 neutralized amplifier drives push-pull 6146's for the final output. Series feed to the final amplifier and isolation of grid and plate circuits together with neutralization make this circuit very stable. The output is coupled to the antenna with a swinging link arrangement.

Particular attention has been paid to the v.f.o. to obtain the stability needed for six meter sideband operation. In addition to using silver mica capacitors, ceramic tube socket, an air wound coil, and heavy rigid wiring, the location of the v.f.o. on the chassis has been chosen for the coolest operation and least chassis flexing. The coil and components are enclosed in a shield of heavy aluminum and placed off to one side underneath the chassis away from any sources of heat. Heat generating bleeders are located on the top side of the chassis to minimize heat underneath. Only a small temperature compensating capacitor is used, C_{11}, a 10 mmf, N750 type. The wide spaced variable tuning capacitor

*1258 Van Buren, St. Paul, Minn. 55104.

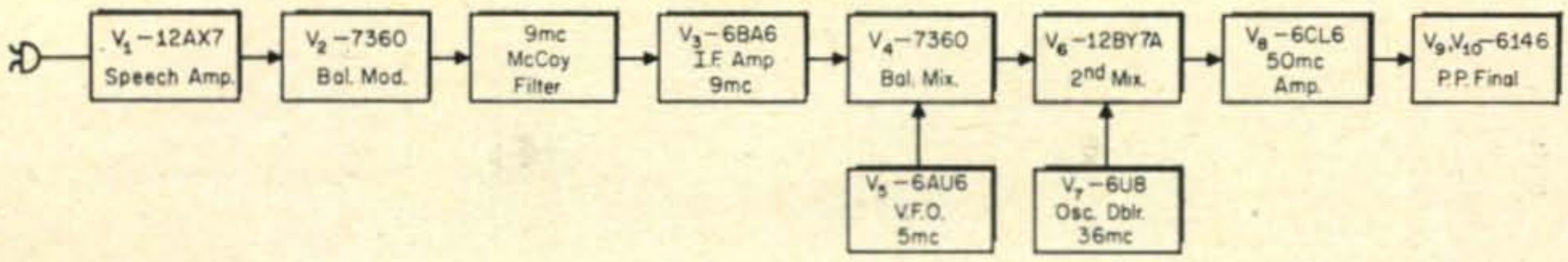


Fig. 1—Block diagram of the 6 meter s.s.b. transmitter. A 9 mc McCoy filter and two crystals provide a choice of upper or lower sideband operation.

from an ARC-5 transmitter is ideal for tuning the v.f.o. and is particularly adaptable in making the homebrew slide rule dial.

Power Supply

All power is supplied by a single television transformer using a bridge circuit with silicon diode rectifiers. The necessary low voltages are taken off the center tap of the transformer through a filter and appropriate dropping resistors. The high voltage runs from 600 to 700 volts depending on the particular transformer. The filter chokes are also television components with a rating of around 200 ma. V.f.o. and crystal oscillator voltages are regulated with a v.r. tube. Bias voltage, regulated with zener diodes, is obtained from a filament transformer in reverse and this d.c. voltage source also operates the changeover relay.

Layout and Construction

As with most homebrew equipment, the layout is dictated to some extent by the components available, but the physical arrangement of this transmitter is the result of considerable study and trial and error.

The low impedance input and output of the McCoy filter facilitate its placement on the chassis near the 9 mc amplifier tube. The speech and balanced modulator circuitry are at the extreme left corner of the chassis in a shielded compartment. This makes for short leads to and from the audio tube and the output of the balanced modulator is simply link coupled to the input of the filter by means of small RG-174/U coax cable running across the chassis.

All the controls associated with the mike amplifier and the balanced modulator are grouped to come inside the shielding underneath the chassis.

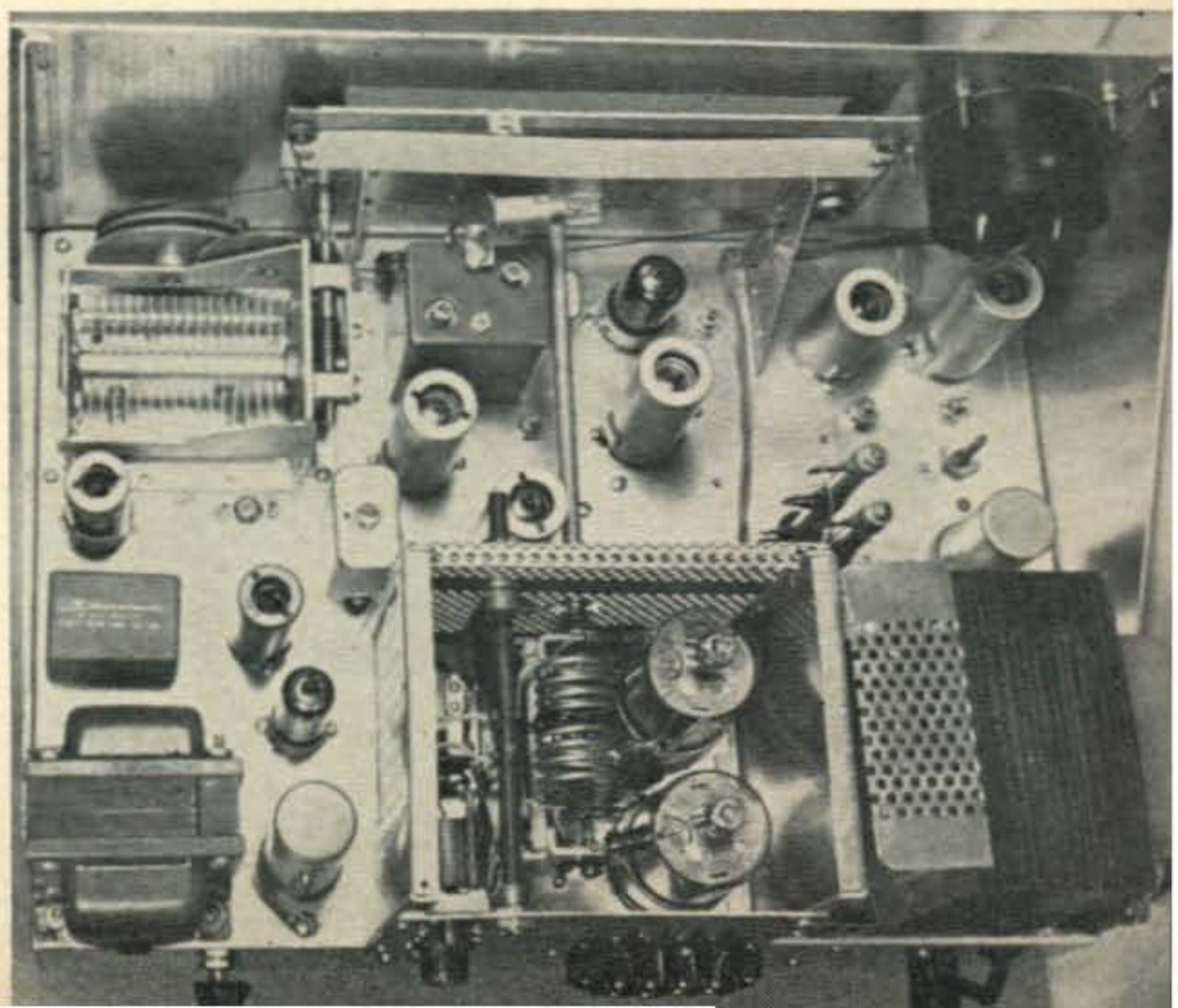
The SIDEBAND SELECTOR switch (a s.p.d.t. toggle) comes directly below the two carrier generating crystals and below this switch is the carrier insertion control with an attached snap switch, S_2. Turning the switch on unbalances the modulator deflection plates, allowing carrier to feed through the filter and the amount of carrier can be adjusted with the potentiometer. This control is used only for tuning up or when it is desired to use the rig on c.w. or a.m.

On the lower right hand side of the panel are the a.c. ON-OFF switch, key jack, and a three position mode switch. The four center panel controls are for tuning the 50 mc section of the transmitter. The link is moved by means of a screwdriver slot in the shaft that is reached from the rear of the chassis since continual adjustment is not necessary.

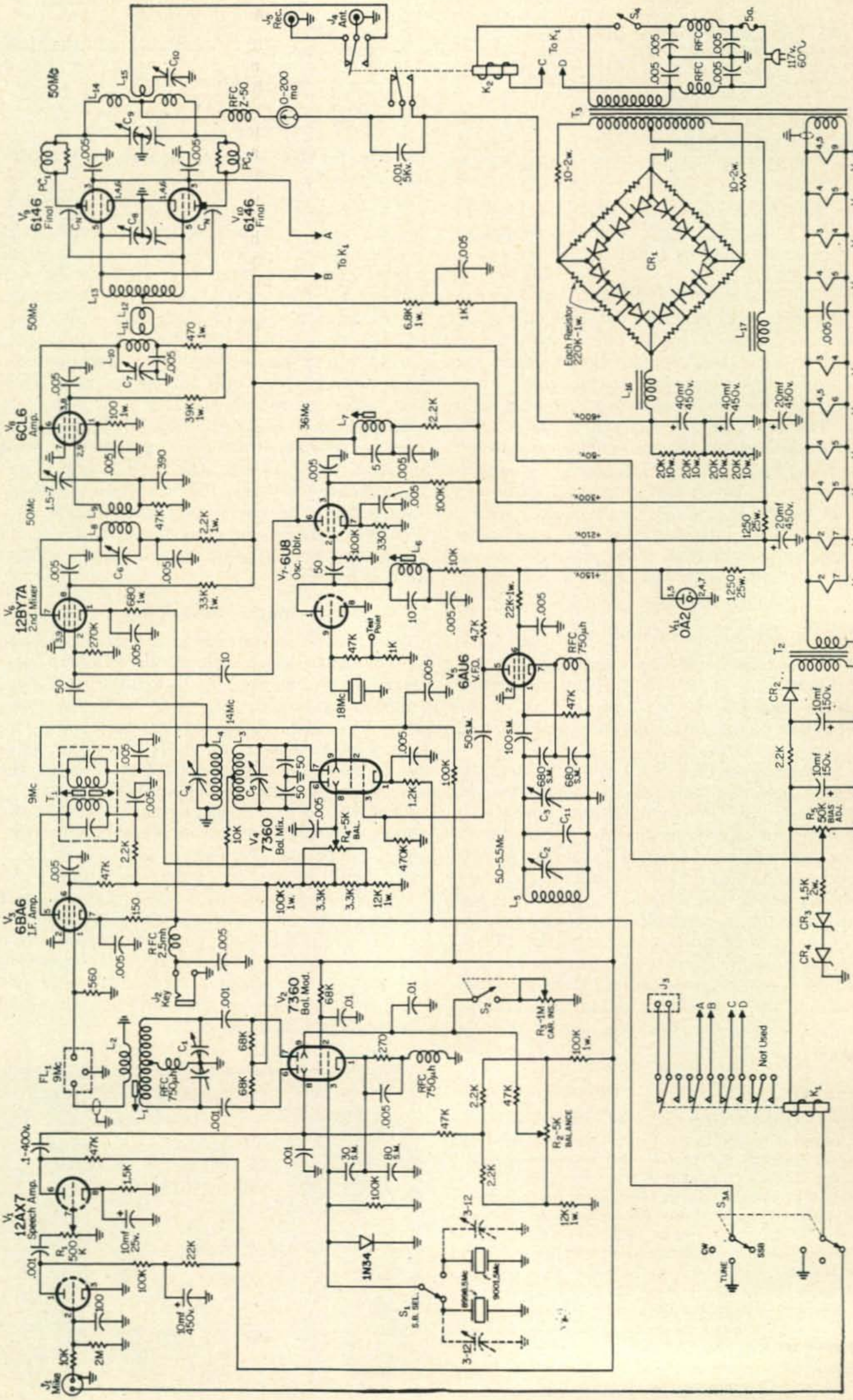
Special Assemblies

Much of the construction consists of making up individual units such as the rectifier diode assembly (see fig. 4). This is made from a piece of phenolic or fiberglass sheet with the center cut out to make a framework to mount the diodes and equalizing resistors. Hollow brass rivets in holes along the top and bottom sides of the framework are used as tiepoints.

The 14 mc transformer is made from an old i.f. transformer that had air variable trimmers, but it can be easily duplicated as shown in fig. 5. Any shield can that will hold two 35 mmf APC type variables would be suitable. Coils L_3 and L_4 are wound on a single length of ⅜" diameter polystyrene rod and mounted on standoffs from a phenolic base the same size as the inside dimensions of the can. This, in turn, is fastened with long bolts to another phenolic base on which the trimmers are mounted.



Top view of the 6 meter s.s.b. transmitter shows details not indicated in the layout sketch. The panel is secured to the chassis by the control mounting nuts and also has vertical side supports for increased rigidity. The tuning dial construction and stringing can be clearly seen above. The four 20K 10W resistors can be seen forward of the power transformer. The 1250 ohm 25W resistors are located under the perforated shield along side the power transformer. The cover plate from the final cage is removed to show details. Note the swinging link attached to the fibre shaft. Capacitor C_{10} is located just above the antenna connector, in the cage. The knob on the rear panel is R_5, BIAS ADJUST. The terminal block in the center is for connection to the receiver for muting.


50Mc
V_8 6146 Final
V_{10} 6146 Final
V_9 6CL6 Amp.
V_6 12BY7A 2nd Mixer
V_7-6U8 Osc. Dblr.
V_5 6AU6 V.F.O.
V_4 7360 Bal. Mix.
V_3 6BA6 I.F. Amp.
V_2 7360 Bal. Mod.
V_1 12AX7 Speech Amp.
V_{11} 0A2
CR_1
T_3
T_2
T_1
K_1
K_2
S_1
S_2
S_3
S_4
J_1 Mike
J_2 Key
J_3
J_4 Ant.
J_5 Rec.
FL_1 9Mc
L_1 L_2
L_3 L_4
L_5 L_6 L_7 L_8 L_9 L_{10} L_{11} L_{12} L_{13} L_{14} L_{15} L_{16} L_{17}
C_1 C_2 C_3 C_4 C_5 C_6 C_7 C_8 C_9 C_{10} C_{11}
R_1 500K
R_2 5K BALANCE
R_3 1M CAR. INS.
R_4 5K BAL.
R_5 50K BIAS ADJ.
PC_1 PC_2
CR_2 CR_3 CR_4
RFC Z-50
RFC 2.5mh
RFC 750µh
RFC 750µh
0-200 ma
.001 5Kv.
To K_1
A
B
C
D
Not Used
Each Resistor 220K-1w.
1N34
18Mc
14Mc
9Mc
50-55Mc
+600v.
+300v.
+210v.
+150v.
117v. 60~
Test Point
CW
SSB
TUNE

The ARC-5 transmitter tuning capacitor requires very little modification to be used for the v.f.o. A length of ¼" rod is put on the worm gear shaft so it will extend out beyond the panel to accept a tuning knob. The original dial is removed from the large gear and replaced with a dial cord drum from an old BC capacitor. A 2" drum will result in about 6" of linear tuning since the gear rotates almost 360 degrees. The capacitor is mounted on a 3/16" thick slab of aluminum slightly larger than the base area of the variable and is bolted solidly to the chassis.

The dial itself is made from a flat piece of medium weight aluminum with a horizontal cutout 1" × 6" in the center.

V.F.O. Construction

The shield for the v.f.o. components is made with aluminum sheet bent in a "U" shape 3½" on each side with lips for bolting it to the chassis. It is slightly less than 3" high so it will fit snugly under the chassis lip. The coil itself is 11 turns of ¾" Miniductor securely glued with Duco cement to a flat piece of plexiglass which is mounted on standoffs from the underside of the chassis. All the silver mica capacitors and the r.f. choke in the oscillator circuit are grouped near the coil and mounted rigidly on tie points.

Shielded wire is also used for all filament wiring throughout the transmitter, and the a.c. power lead is filtered with homemade chokes. They are made with 18 turns of #18 enameled wire, self supporting and fastened to tie points and bypassed at both ends.

Mixer Partition

The small partition in the center of the chassis (bottom view) runs across the 12BY7A amplifier tube socket to shield the input and output of the tube. The variable mounted on the panel side of the partition tunes coil L_8 in the mixer plate and makes no connection to the shield itself, but is bypassed with an 0.005 mf disc capacitor to a ground lug at the socket of the 12BY7A tube.

The driver is link coupled to the final grid coil to permit a symmetrical layout of the final amplifier. All grid components of the final are below the chassis and all plate circuit components above the chassis. The 6146's are neutralized with stub wires going through holes beside the tubes where they can be cut to proper length.

Check-Out

The really interesting part of homebrewing a rig is getting it to work after it has been assembled and wired. Before applying any voltage, the coils should be checked with a grid dip meter to be sure they will tune the range they are intended for. All the six meter coils can be easily reached and even the v.f.o. can be roughly checked for proper tuning range. Next, the a.c. can be turned on and the tube voltages checked. This is done with the mode switch in the ZERO or spot position. Voltage is applied to all circuits except the final plate and screen and this position of the switch has the protective feature of locking out the relays so the high voltage cannot be accidentally turned on to the final even if the

Fig. 2—Circuit of a 6 meter sideband transmitter designed by WØURQ. The 3-12 mmf disc ceramics (marked C_x) across the two crystals are for trimming the crystal frequency and are not always required. All resistors are ½ watt unless otherwise noted. All capacitors greater than one are in mmf, less than one in mf except electrolytics which are indicated by polarity markings. Capacitors marked SM are silver micas. Bypass and coupling capacitors are disc ceramics of at least 600 volts

C_1—19 mmf differential capacitor. E. F. Johnson 19MA11 or equiv.
C_2—180 mmf ARC-5 transmitting capacitor.
C_3—50 mmf APC type variable (brass plates).
C_4, C_5—35 mmf APC type variable (see text).
C_6—25 mmf APC type variable.
C_7—15 mmf variable. E. F. Johnson 15M11 or equiv.
C_8—25 mmf per section variable dual capacitor.
C_9—30 mmf per section variable. Hammarlund HFD30X or equiv.
C_{10}—15 mmf APC type variable.
C_{11}—10 mmf N750 temperature compensated.
CR_1—silicon diodes, 750 ma, 400 p.i.v. (12 required).
CR_2—silicon diode, 500 ma, 400 p.i.v.
CR_3, CR_4—25 volt Zener diodes, 10 watt stud mount.
K_1—4 p.d.t. relay 110 v.d.c. coil.
K_2—d.p.d.t. relay 110 v.a.c. coil.
L_1—24 t #24 Formvar bifilar wound on National XR-50 slug tuned form, ½" diam., 11/16" long.
L_2—3 t hook-up wire on center of L_1.
L_3—18 t #26 e. bifilar wound on ⅜" diam. polystyrene rod.
L_4—15 t #26 e. close wound spaced ⅜" from L_3 on same form. (See text).
L_5—11 t #20 tinned copper, ¾" diam., ¾" long. Miniductor #3011.
L_6—16 t #26 e. close wound on ⅜" diam., CTC slug tuned form.
L_7—8 t #26 e. spaced ½" on ⅜" diam. CTC slug tuned form.
L_8, L_{10}—6 t #20 e. on ½" diam. polystyrene form spaced ½".
L_9—8 t #20 e. spaced ½" on ½" diam. polystyrene rod.
L_{11}—2 t hook-up wire link on cold end of L_{10}.
L_{12}—2 t hook-up wire link around center of L_{13}.
L_{13}—10 t #18 e. ½" diam., ¾" long c.t. air wound.
L_{14}—8 t #12 tinned wire, ¾" diam., 2" long center tapped with space in center for swinging link.
L_{15}—2 t #18 Formvar terminated in holes drilled in ¼" fibre rod as described in text.
L_{16}, L_{17}—2.5 h., 200 ma filter chokes salvaged from TV sets.
PC_1, PC_2—5 t #16 on 100 ohm, 1 watt composition resistor.
R_1—500K audio taper potentiometer.
R_2, R_4—5K linear taper potentiometer.
R_3—1 meg. linear taper potentiometer.
R_5—50K, 2 watt linear potentiometer.
T_1—10.7 mc i.f. transformer tuned to 9 mc.
T_2—6.3 v. 1 amp. filament transformer.
T_3—700 v.c.t. at 200 ma, 6.3 v. at 5 amps. TV type similar to Triad R20A.

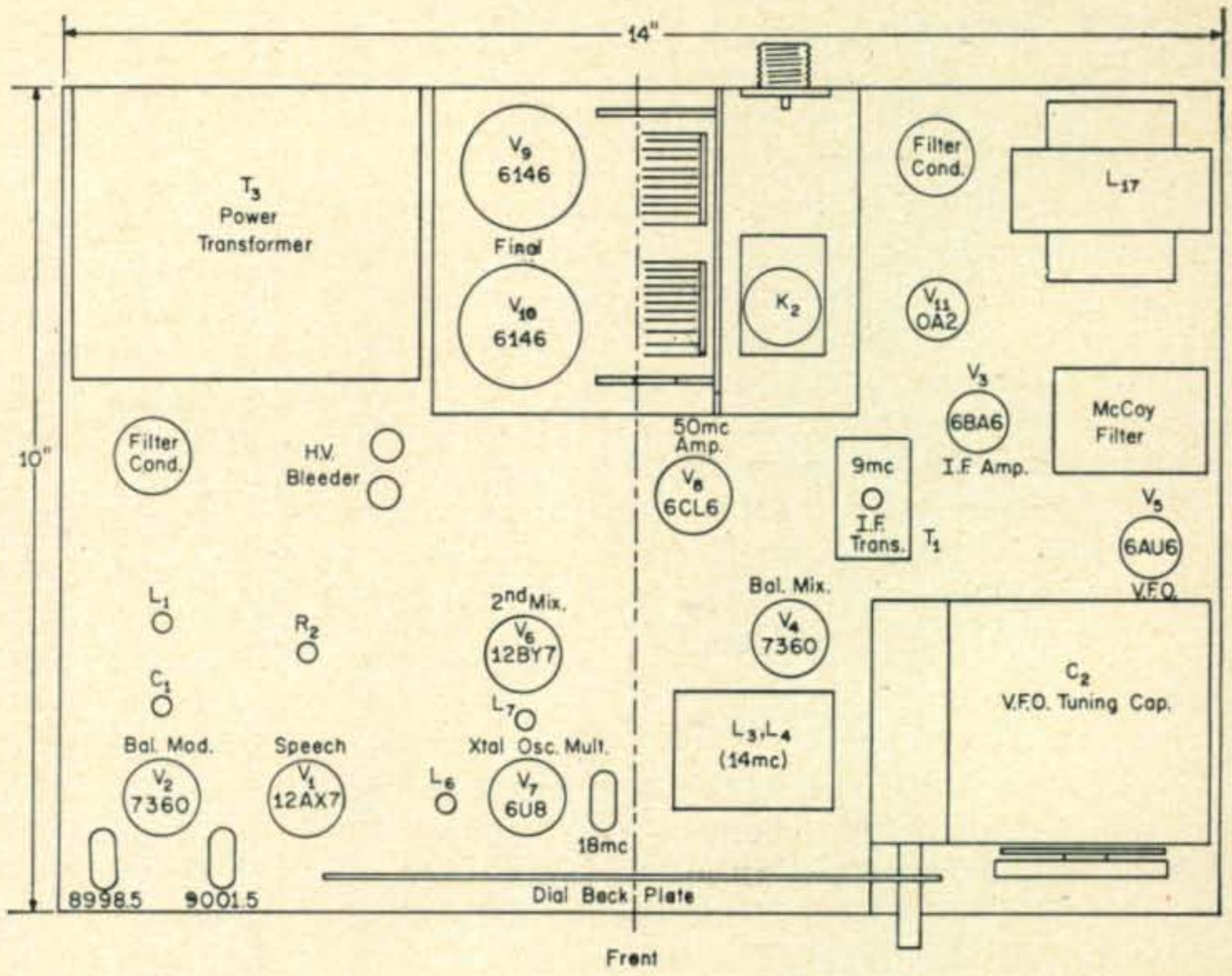


Fig. 3—Top view of the layout for the 6 meter s.s.b. transmitter is shown above.

p.t.t. switch on the mike is pressed. Caution is still required because the high voltage is always turned on—just not fed to the final. The diagram shows the approximate voltages to be expected from the divider network.

Alignment

The first step in the alignment is to get the v.f.o. tuning the 5-5.5 mc range. A fairly accurate receiver can be used for this purpose or an LM frequency meter. This oscillator runs all the time regardless of the position of the mode switch. A receiver can be used to check for operation of the two sideband generating crystals to be sure they are working. The grid of the 18 mc crystal oscillator has a test point for a low range voltmeter to aid in tuning up the crystal—a few volts will show on the meter when the crystal is oscillating. The crystal doubler coil should be checked for output on the proper 36 mc frequency with a grid dipper in the diode position. When it has been determined that these oscillators are working, the actual tuning up can be done starting with the balanced modulator.

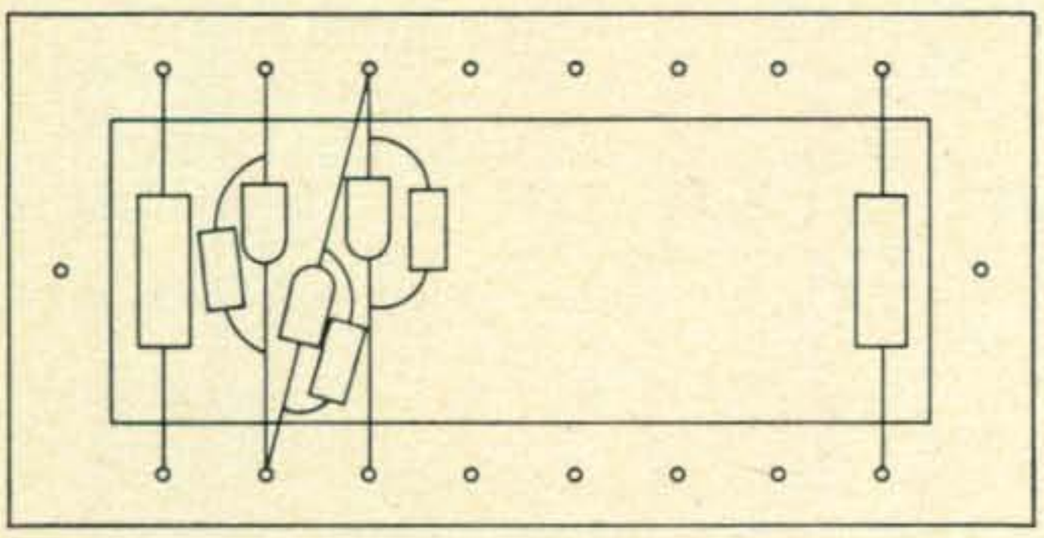


Fig. 4—Diode rectifier assembly is built on a phenolic board 2½" × 5" with the center cut out as shown above. The two 10 ohm surge resistors are located at each end and the diodes with their parallel resistors are strung between the hollow rivets.

The essential tool for r.f. alignment is an r.f. probe used with a v.t.v.m., and for the initial alignment the probe is placed at the plate of the 6BA6 9 mc amplifier tube. The balanced modulator coil, L_1, should be tuned by means of the slug to 9 mc using a grid dip meter. The phase balancing capacitor, C_1, should be centered for equal capacity and only the slug used to set the coil to frequency. The voltage balancing potentiometer, R_2, is set near the center of its range to start with and either sideband crystal may be used to generate the carrier. With the carrier control turned on and the potentiometer, R_3, advanced half way or more, a few volts should show on the v.t.v.m. A peak reading will be obtained when the plate coil of the 9 mc i.f. transformer is tuned. When the carrier control is turned off the v.t.v.m. reading should decrease considerably. Adjusting the balance potentiometer should cause the reading to decrease still further until a minimum is reached. Adjusting the phase balance capacitor slightly (trying both directions) may bring a still lower minimum. These two controls should be adjusted alternately a few times for the lowest voltage reading since both affect the carrier suppression. Once set, these controls ordinarily require no further attention unless the modulator tube is changed.

The ideal situation would be to have zero voltage at this point switching to either sideband, but a happy medium is about the best that can be expected. A little juggling of the balance controls and even a slight retuning of the balanced modulator plate coil can be done to bring equal carrier suppression regardless of the sideband used. Advancing the carrier control will give a meter reading of 6 to 10 volts. At this point the microphone can be plugged in to check the operation of the speech amplifier and modulator; just cut off the carrier control, advance the mike gain and talk into the mike

You can even listen to yourself if you have a receiver that will tune 9 mc sideband. The v.t.v.m. should jump from its minimum reading of a fraction of a volt to the maximum 6-10 volts with speech.

The probe is moved to the unbypassed side of the 9 mc transformer secondary and this coil tuned for a peak reading with carrier. The drive voltage from the v.f.o. can be measured at grid #3 of the 7360 mixer and should not be over 2 volts and can be as little as 0.2 volt. It can be adjusted by varying the capacity of the coupling capacitor from the v.f.o. or by putting a 5K to 10K resistor in series with the coupling capacitor. Too much voltage at this point can lead to undesirable harmonics in the output and too little voltage will provide inadequate output from the mixer.

The only adjustment required in balancing the 7360 mixer is done with potentiometer R_5 to get equal voltage on the two deflection plates of the tube. This should not be over 25 volts. The probe is next moved to the grid of the 12BY7A mixer and the 18 mc crystal removed from its socket so that no crystal injection voltage appears at this point to confuse the tuning of the 14 mc bandpass coils. The carrier injection control is advanced far enough to get some indication of voltage on the v.t.v.m. and the 14 mc trimmers tuned for a maximum reading. A double check is to listen for a 14 mc signal in a receiver—the exact frequency, of course, will be the crystal frequency plus the v.f.o. frequency. Tuning the v.f.o. through its range should cause very little change in the voltage at the grid of the mixer. A slight readjustment of the 14 mc trimmers should be sufficient to obtain a uniform voltage. Maximum voltage at this point should not be over 1 volt to prevent overdriving the mixer.

The 18 mc crystal is now replaced in its socket and the r.f. probe placed near, but not touching, the 12BY7A mixer plate coil to prevent detuning. Even with the probe just near the coil a small reading will show due to 36 mc energy feeding through the mixer tube. With the v.f.o. set on 5 mc and the carrier injection turned on, tuning the mixer plate capacitor will give a pronounced voltage increase which should be the desired

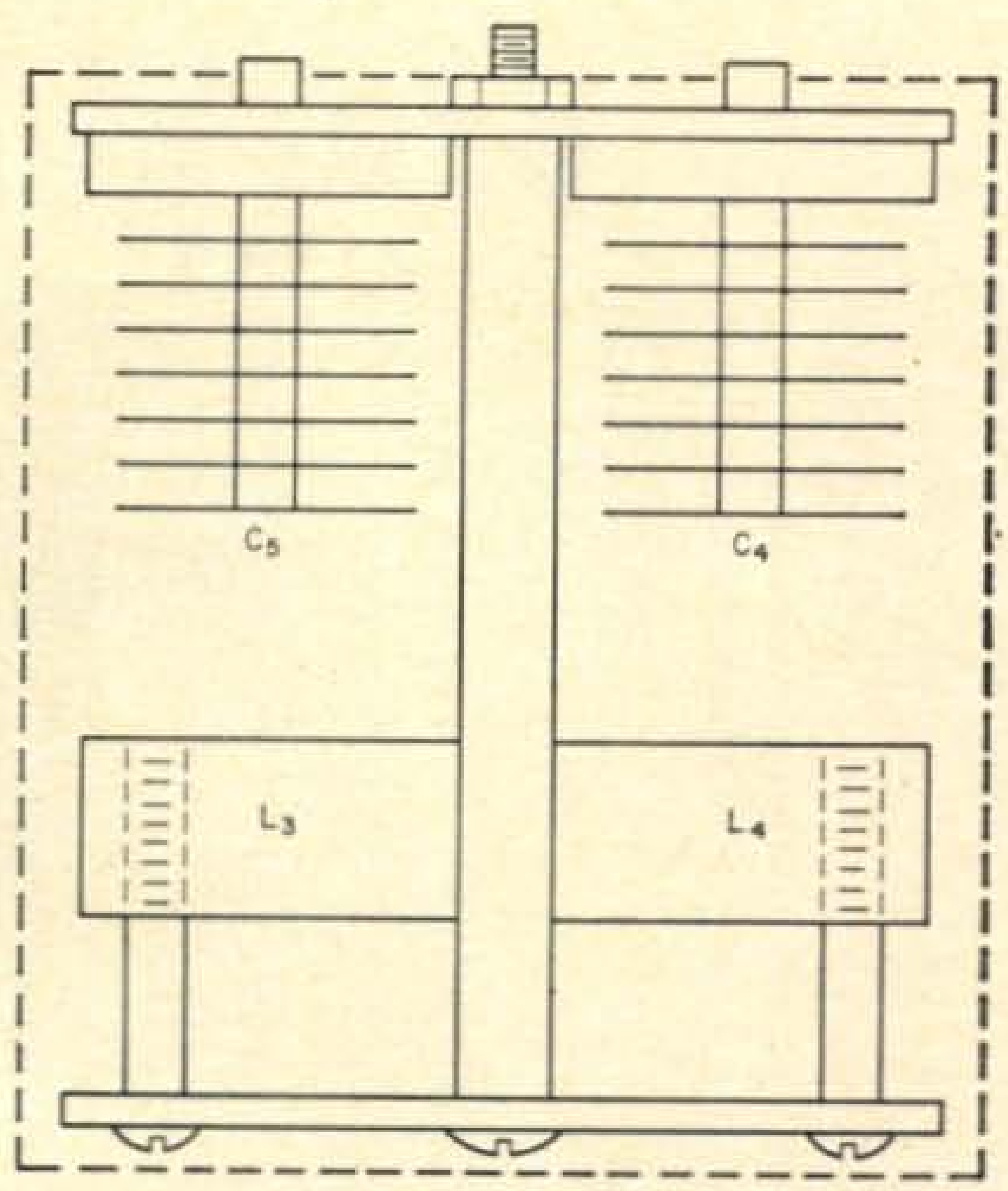


Fig. 5—Details of the 14 mc i.f. transformer construction described in the text. The separation between the top and bottom phenolic board is 2½ inches. The entire assembly is mounted in a shielded can

50 mc. A double check with a grid dip meter at this point is advisable or the signal can be monitored on a receiver.

The probe is now placed near the 6CL6 amplifier plate coil and the voltage reading peaked with the plate capacitor, checking as before to be sure it is 50 mc output. A check on the proper tuning range of the final grid coil can also be made by placing the r.f. probe near the coil and tuning the capacitor for a peak reading.

Neutralization

The 6CL6 is neutralized by disconnecting the B-plus voltage from the tube, placing the r.f. probe at the grid of one of the final tubes and adjusting the neutralizing capacitor for minimum feed through of r.f. voltage. The plate voltage is reconnected and the same process used to neutralize the final 6146 tubes. The r.f. probe is attached to the output side of the link ahead of the relay. Excitation will be applied to the grid with the mode switch in the ZERO position

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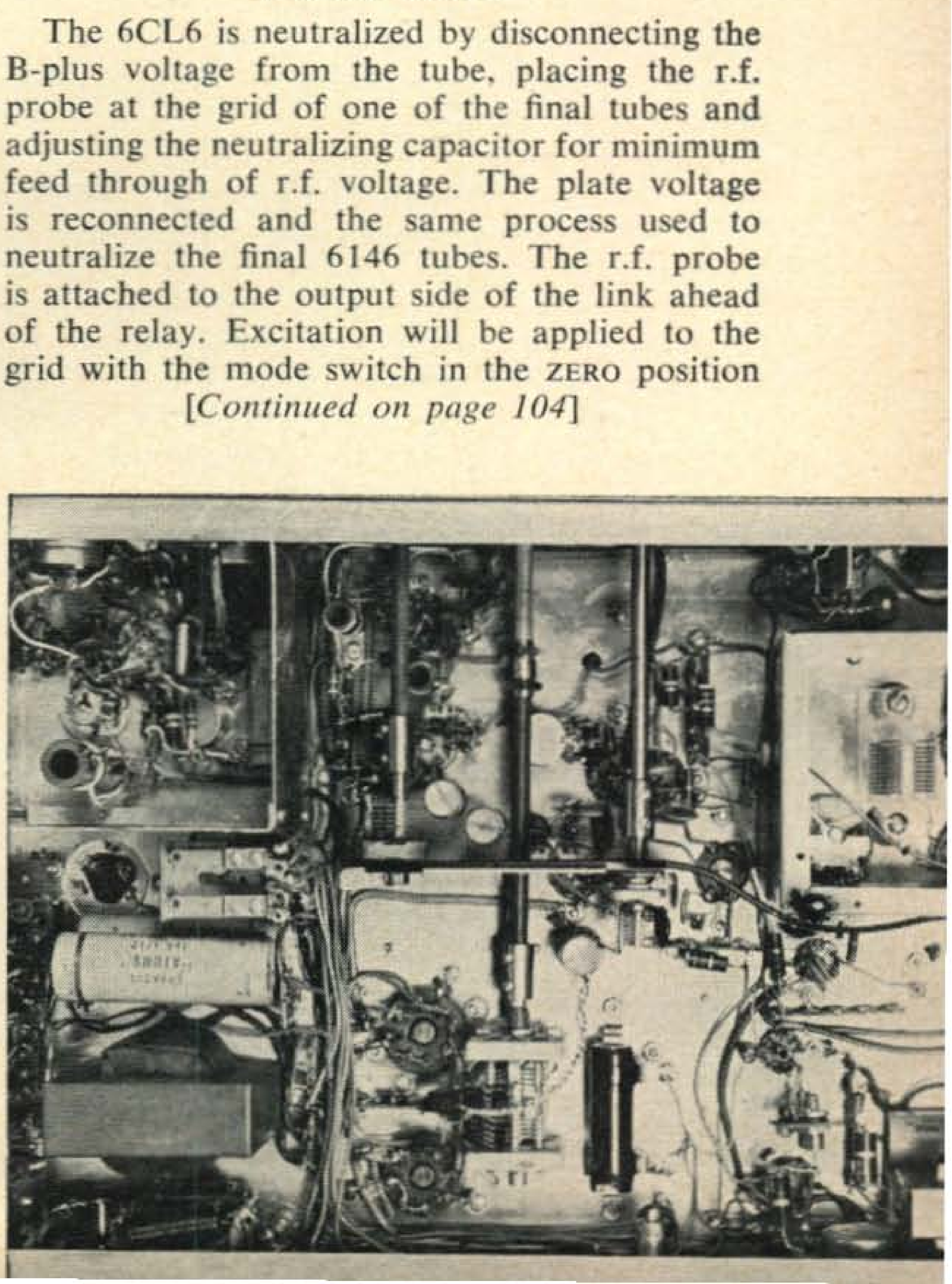
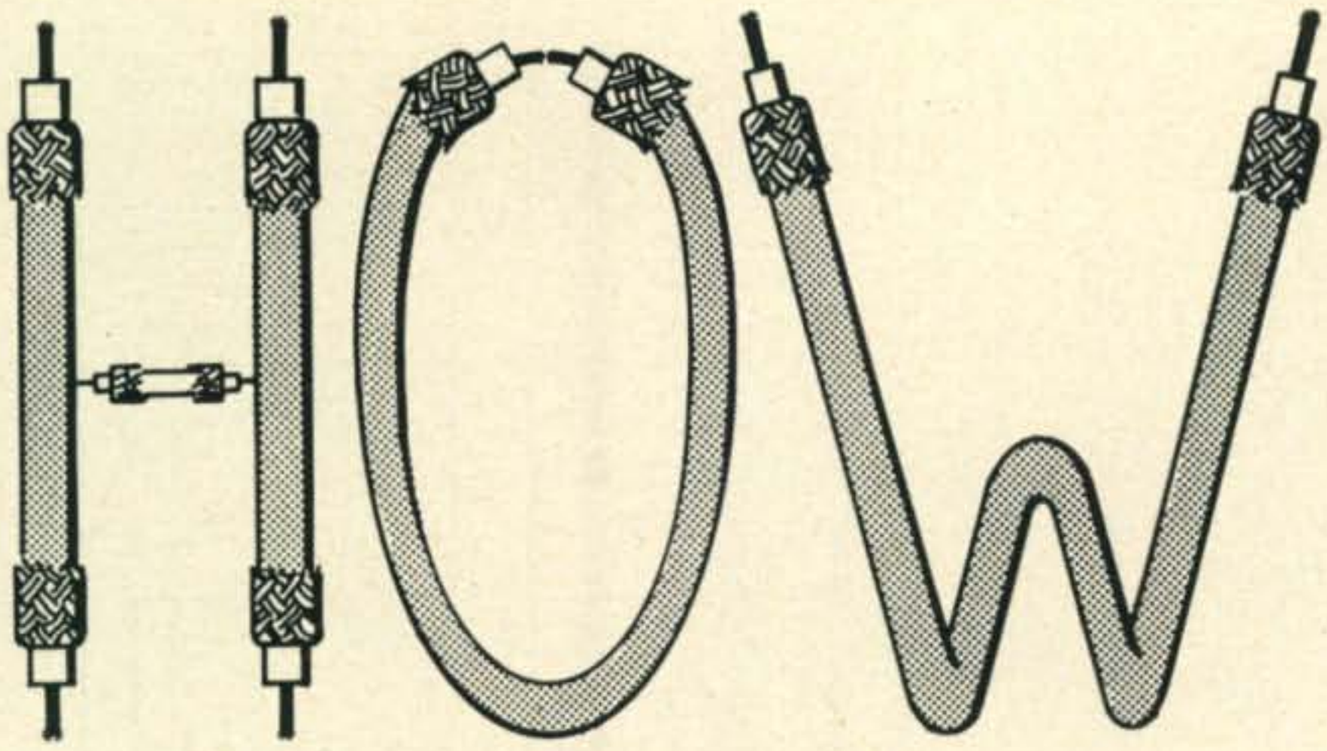


Bottom view of the six meter s.s.b. transmitter. At the lower left (rear) side of the chassis is the high voltage filter choke and capacitors with the diode rectifier assembly mounted on the chassis apron. Relay K_1 is next to the "L" shaped shield that encloses all the components for the speech amplifier and balanced modulator. The center bakelite shaft comes down to the final grid tuning capacitor which is mounted next to the bottom of the 6146 sockets. What appears to be a black line going across the center of the chassis is the RG-174/U coax coupling the balanced modulator to the McCoy filter at the opposite side of the chassis. The cable is fastened to a vertical shield in the center of the chassis that isolates the grid and plate of the 6CL6 amplifier. This shield is also used to mount the mixer and amplifier tuning capacitors. The shield box at the upper right contains all the v.f.o. components.



HOW TO SELECT COAXIAL CABLE

BY CHARLES CAMILLO,* K1RBO/9

COAXIAL cable seems to be a fool-proof commodity that most of us think can be bought "blind," and that one brand is just about the same as another. Few realize that a typical 300 watt rig can lose more than 100 watts in certain kinds of standard RG cable—and even fewer realize that two cables, each marked RG-8/U, can have radically differing TVI-preventing abilities.

Different manufacturers stress different features, while emphasizing that their cables are superior. Some suggest that coaxial cable should be chosen for flexibility, others stress the dielectric strength, while still others claim maximum power transfer and minimum attenuation. Certain manufacturers claim that "RG cable is RG cable, so why pay more?"

The fact is that RG cables *are* different; the features of one manufacturer's cable can differ radically from another cable maker's bearing the same RG number.

The selection of a transmission line is more important than most hams realize. Cost should hardly be a consideration when the complications of climbing towers and lowering antennas for maintenance are remembered. Yet, some amateurs spend hundreds of dollars on a rig and beam, only to connect them with a cheap coaxial cable which eats up one or more S-units before the signal even gets to the antenna!

Why Use Coaxial Cable

Before World War II, coax-fed antennas were practically unheard of. Balanced-line feeders were the only alternative to an end-fed long wire, and many a ham can remember making his own "open-line" from his unsuspecting junior op's Tinker-toy set.

Then came television, and the state of the art changed quickly. Before, hams loaded up their open-wire feeders without bothering about anything as sophisticated as s.w.r., because, after all, if the feedline did a little radiating, it mattered little. With the arrival of television, however, operators began to realize that open-wire feedlines were the cause of countless TVI problems. As they traced down stray r.f., they discovered that the open-wire transmission lines were more than a convenient way to load up an antenna—for they also loaded up power lines, radiators and plumbing, downspouts, and nearly every metal object nearby. They also discovered that open-wire fed antennas had annoying habits of radiating even weak harmonics.

The solution to these troubles was coaxial feed-lines. The shielded cable kept r.f. where it belonged—along the conductor, not loading up power lines, downspouts, and snow-banks. Only the dipole itself radiated.

Transmitter design changed to accommodate the new coaxial feed-line popularity. The era of the plug-in coil and exotic antenna coupler was doomed by the simple pi-network, as transmitter outputs sported coaxial connectors instead of pairs of ceramic feed-throughs. Today, nearly every commercial and *Handbook* rig being built has a pi-network output for matching to 50-75 ohm transmission lines. Trap antennas with coaxial transmission lines have replaced the mysterious "elf-ladders" which formerly ascended from the average amateur's shack.

Cable Selection

Because coaxial cable is taken so much for granted, few amateurs realize the differences between one cable and another. If the instruction manual calls for RG-8/U, or RG-58/U, most hams assume that these designations constitute dependable ordering information, insuring them that RG-8/U from the "A" Cable Company is the same as that from the "B" Cable Company. Nothing could be farther from the truth.

First of all, it's important to know just what the designation RG-blank/U means. This is a standard military designation for cable meeting certain well-defined specifications and test requirements.

Such factors as the following are covered:

1—Center conductor: composition and diameter.

* 8 Sealand Drive, New Town, Connecticut.

2—Dielectric: composition, diameter, and tolerance.

3—Outer conductor: composition, number of braid layers, gauge of braid wire, per cent braid coverage, maximum outside diameter, etc.

4—Jacket: composition and diameter.

Such tests as the following are made:

1—Continuity (usually 6 v.d.c.).

2—Flow (in pounds).

3—Dielectric strength (in v. r.m.s.).

4—Attenuation at 400 mc (maximum in db/100 feet).

5—Impedance (plus or minus *X* ohms).

6—Jacket spark (in v. r.m.s.).

If a cable meets certain requirements and passes certain tests, it will be considered by the military as meeting a designated RG specification. However, because a cable is marked RG-blank/U does not insure the buyer that it will meet all—or even some—of the RG-blank/U requirements. The amateur, when unaware of this fact, often pays a bargain price for a cable which is no bargain at all.

Let's examine just a few of the dangerous flaws which often are found in "bargain" cable.

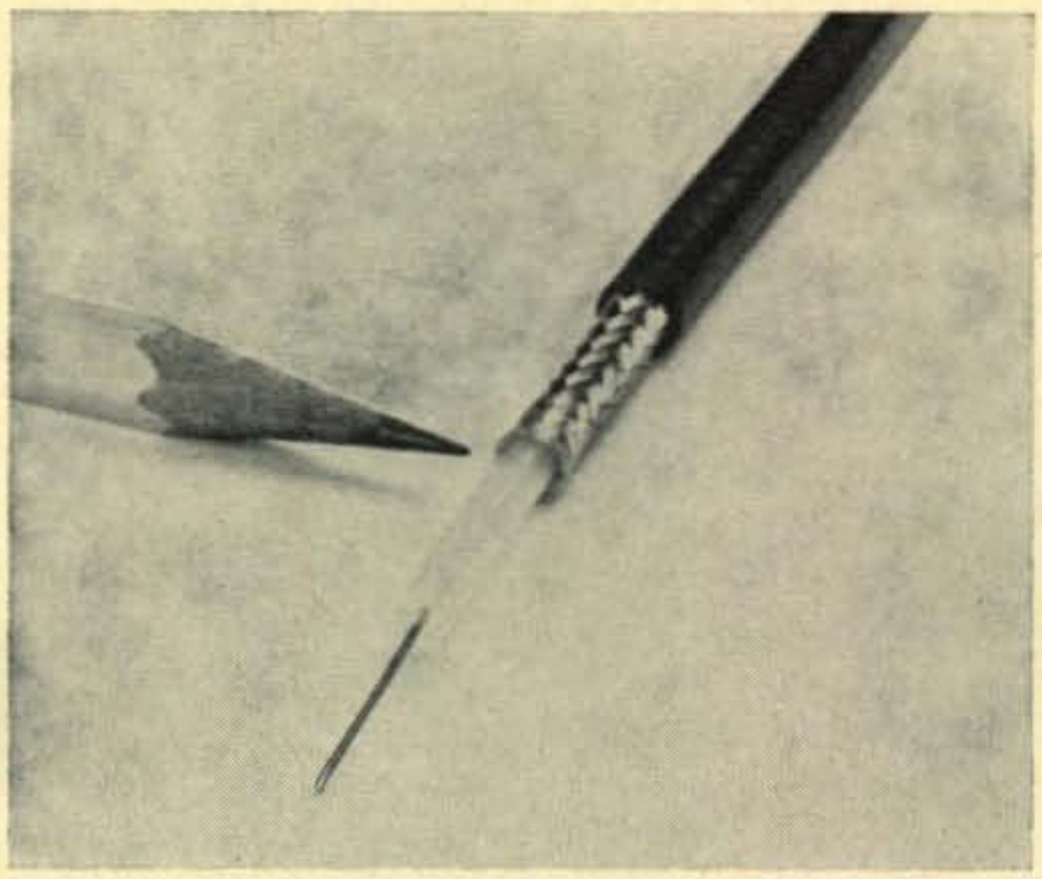
Percentage of braid cover is a typical "Achilles heel" of bargain cable. If a cable is to prevent TVI by virtue of its shield, the percentage of braid cover must be very high—at least 90 per cent of the dielectric must be completely shielded. After a recent hamfest, however, an electrical engineer discovered that the "bargain" cable he bought there had *only 40 per cent coverage.* When he checked further, he discovered that the braid coverage wasn't the only flaw, the actual impedance of the cable was nowhere near the 50 ohms marked on it. Measuring the dielectric diameter, he found the manufacturer had used an undersized dielectric, causing the incorrect impedance. This cost-cutting affected the characteristics of the whole cable, including the power and frequency-handling ability. A bargain?—hardly.

How To Select Coaxial Cable

Because of the casual way in which cable is often selected, it may sound unreasonable to suggest spending 15 to 30 minutes calculating which cable made by which manufacturer fits your situation best. In reality, however, it's just common sense—since it's a lot more difficult to replace a transmission line than a tube, and even harder to detect the slow cable degradation which can cause gradually-deteriorating signals.

The only reliable means of selecting a coaxial transmission line is to draw up your exact needs, and then buy from a manufacturer who supplies test data for the cable he produces. This second recommendation is important because many of the cables sold are manufactured by firms which do not have the facilities for determining whether the 52 ohm cable they are selling is actually 52 ohms or 80 ohms.

The military specifications make a good checklist for calculating your cable requirements. Those relevant to common amateur ap-



The quality of a cable's dielectric will determine its long and short-term attenuation and power-handling capabilities. The dielectric should be a clean, milky-white color, like that of the RG-59/U illustrated above. If it appears amber or gray when placed on a sheet of white paper, it may be composed of inferior or scrap polyethylene.

plications are as follows:

I. Center Conductor.
   A. Composition.
   B. Diameter.
   C. Stranded or Solid.

II. Dielectric Composition.
   A. Polyethylene.
   B. Polyethylene foam.

III. Outer Conductor.
   A. Composition.
   B. Gauge of Braid Wires.
   C. Per Cent Braid Coverage.

IV. Jacket Composition.

V. Attenuation at Frequency to be Used.

VI. Maximum Power Rating at Frequency to be Used.

VII. Impedance.
   A. Theoretical Value.
   B. Tolerance.

Center Conductor

The center conductor of RG-8/U should be made up of seven 21-gauge bare copper wires, while RG-58/U center conductors should be either 19 tinned 33-gauge copper wires or a single 20-gauge bare copper wire. Smaller conductors claimed to give additional flexibility will increase the resistance and attenuation of the cable. Larger wires, unless specially compensated by dielectric changes, can disturb the impedance of the line.

Physically, the choice between stranded and solid center conductors is easy; if the transmission line will not be subject to twisting or high flexing forces, the solid conductor type is most desirable, since it has lower signal attenuation factors. However, for highly flexible situations, for example, connecting to a rotatable beam, the stranded conductor will endure stresses better than the solid type. In fixed, low-power, short-run installations, like connecting to a mobile whip or halo, the solid conductor gets the nod.

Dielectric

High-grade solid virgin polyethylene is the minimum dielectric composition that will give good results in amateur applications. When picking out a cable, make sure that the dielectric isn't amber or gray, indicating the use of reclaimed polyethylene scrap instead of high-quality polyethylene. Also, see if you detect bubbles on a cross-section of supposedly solid dielectric cable—these bubbles create line imbalances which can result in "loss points" along the transmission line.

A relatively new development in cable dielectrics is cellular polyethylene, formed by expanding high-grade polyethylene with a special foaming agent. This polyethylene foam has a dielectric constant of 1.5, compared to 2.26 for conventional solid polyethylene.

Dielectric constants are very important in coaxial cable because the closer the constant of a given cable is to 1.00, the more nearly that cable's attenuation factor approaches the low figure of open-wire transmission lines. Because the dielectric between the center conductor and the shield of a coaxial cable unavoidably combine to form a capacitor, the dielectric constant of a cable heavily affects frequency-handling capabilities. Most amateurs forget that a coaxial transmission line is always the equivalent of a rather large capacitor across the loading capacitor of a pi-network.

What is the significance of this capacitance? For a top-quality polyethylene-dielectric RG-8/U cable, this capacitance amounts to 29.5 mmf per foot. A top-quality polyethylene-foam RG-8/U cable, however, has a capacitance of only 24.5 mmf per foot. Since the average amateur uses about 100 feet of coax to feed his dipole, the difference is 500 mmf, more than the capacitance of most transmitter loading controls. The benefits of this polyethylene foam will be seen again in considering comparative attenuation factors.

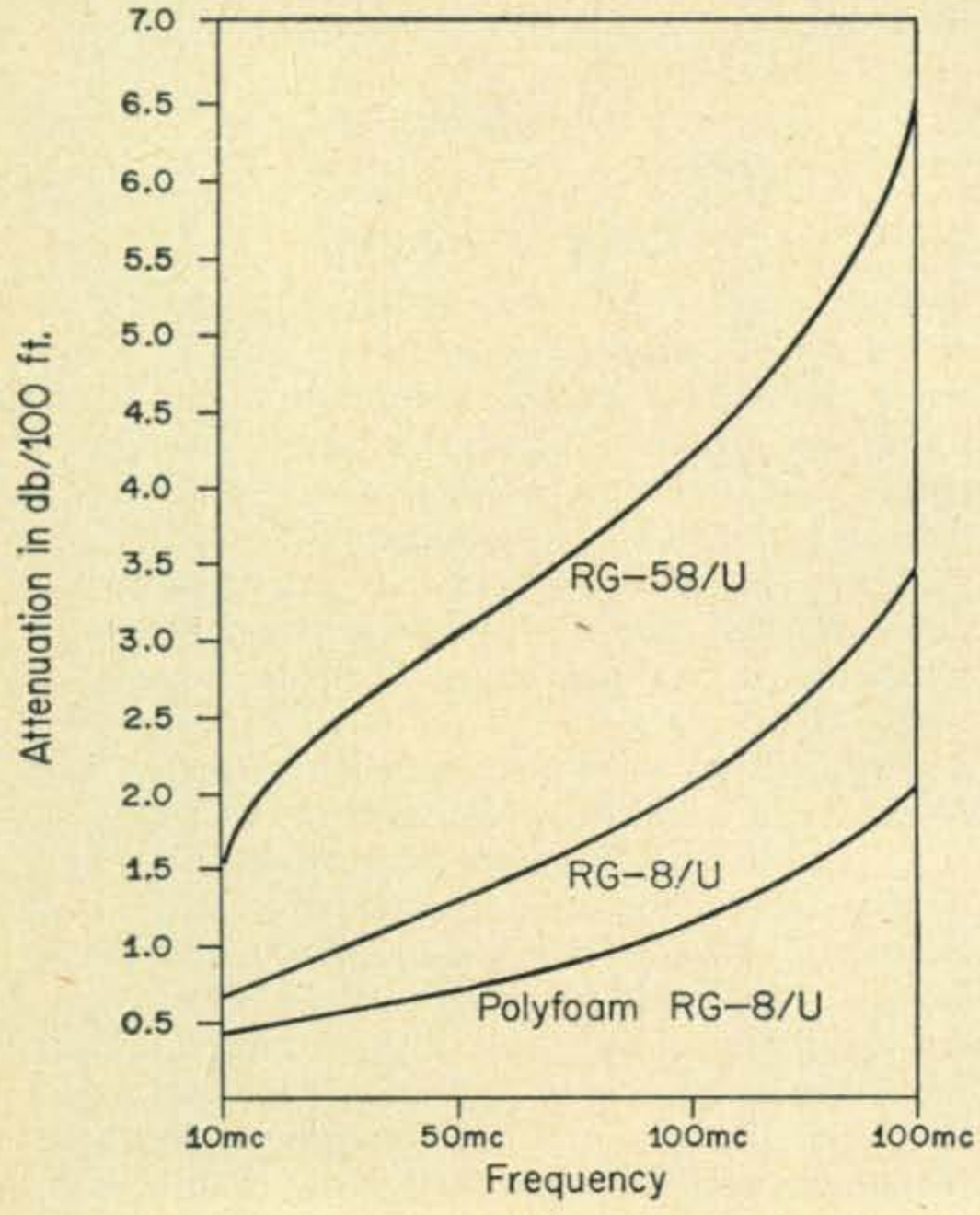


Fig. 1—Attenuation with regard to frequency.

Outer Conductor

One of the easiest places for a manufacturer to skimp in producing low-cost cable is in the braided shield. A good grade of RG-8/U, for example, will have at least 90 per cent of the dielectric covered with a braid of 36-gauge bare copper wire. As explained before, cheap cable usually has a coverage percentage between 40 and 60 per cent—which means poor TVI-preventing characteristics, to say the least. The best attenuation characteristics belong to the cable whose outer conductor most nearly approximates a solid metal tube—still another reason why high-density braid coverage is necessary.

Jacket Composition

Hams, to whom the characteristics of coaxial cable are completely familiar, may raise their eyebrows at this statement: cable jacket composition can determine whether your coaxial feedline is more than a mere resistor across your rig's output a year or so after you have installed it!

Most coaxial cables of any quality at all have black polyvinyl chloride jackets. However, there are two types of polyvinyl chloride jackets, designated by the military as Type I and Type IIa. They can be distinguished only by the addition to the RG-number of a special letter designation as, for example, RG-8A/U.

Type I jackets function well in climates where temperatures only rarely climb above the low 80's. But when the temperature rises, the "plasticizer" in the polyvinyl chloride gradually begins to migrate out of the jacket, through the braid, and into the dielectric. When this happens, the electrical characteristics of the cable are changed drastically—impedance goes haywire, and attenuation factors skyrocket—to say nothing of the s.w.r. Less than half the power put into such a cable may get to the dipole because of this unseen villain.

The solution is using cable jacketed with Type IIa polyvinyl chloride. Cables such as RG-8A/U are immune to this "dielectric contamination" because the plasticizer in Type IIa jacketing is molecularly bonded and cannot migrate out of its original position. The cost of this extra protection? *Less than $2.00 per 100 feet.*

Attenuation

One of the most critical characteristics of coaxial cable, attenuation is complex because so many factors are involved in its determination. Carelessness in selecting cable most often shows up in this area, resulting in such phenomenon as a 10 watt transmitter outperforming a rig with 20 times higher input.

Attenuation rating is determined by the many

factors discussed earlier: center conductor, dielectric, braid coverage, and jacket composition. Specifically, it is the number of power units (db's) lost per 100 feet of cable at a given frequency, with increases in frequency resulting in an increase in attenuation. Standing-wave ratios are calculated at 1:1 for purposes of determining basic attenuation figures, since mismatch increases conductor heating, dielectric heating, and radiation—all of which create additional attenuation problems.

A good solid-polyethylene dielectric RG-8/U cable, when new, will have an attenuation pattern resembling the following:

10mc	0.55 db/100 ft
50mc	1.33 db/100 ft
100mc	2.00 db/100 ft
200mc	3.50 db/100 ft

Compare these attenuation figures to those of a polyethylene-foam RG-8/U cable:

10mc	0.32 db/100 ft
50mc	0.77 db/100 ft
100mc	1.18 db/100 ft
200mc	2.07 db/100 ft

Now, take a look at a comparison of attenuation factors between solid-polyethylene RG-58/U and polyethylene-foam RG-8/U:

	Solid-poly RG-58/U	Poly-foam RG-8/U
10mc	1.25 db/100 ft	0.32 db/100 ft
50mc	3.13 db/100 ft	0.77 db/100 ft
100mc	4.16 db/100 ft	1.18 db/100 ft
200mc	6.9 db/100 ft	2.17 db/100 ft

Of course, these attenuation figures assume no cable degradation due to heat or general aging—under such ideal circumstances as new Type I jacketed cable or Type IIa jacketed cable.

What's the significance of these attenuation figures? Well, one S-unit equals 3 db—and every time you can boost your radiated signal 3 db, your signal is raised as much as if you doubled the power output. And, as the table of attenuation factors illustrates, the higher in frequency you go, the more significant these attenuation figures become.

Compare, for example, the effect of solid-polyethylene RG-58/U and polyethylene foam RG-8/U upon a two-meter signal. With the RG-58/U, more than two S-units are lost—with the polyethylene-foam RG-8/U, about half an S-unit disappears. That means you'd have to use more than three times the power with the solid-dielectric 58/U to achieve the same results as with foam-dielectric 8/U.

Thus, the difference in attenuation factors does matter, especially at higher frequencies and whenever cable length is much over a few yards. However, most operators incorrectly believe that the next topic, power rating, is the sole reason to choose between RG-8/U and RG-58/U.

Power Rating

Maximum power ratings, like attenuation, are affected by frequency. For example, note the following maximum power ratings for the standard amateur cables:

	RG-8/U	RG-58/U
10mc	3490 watts	840 watts
50mc	1443 watts	335 watts
100mc	1000 watts	240 watts
200mc	660 watts	158 watts

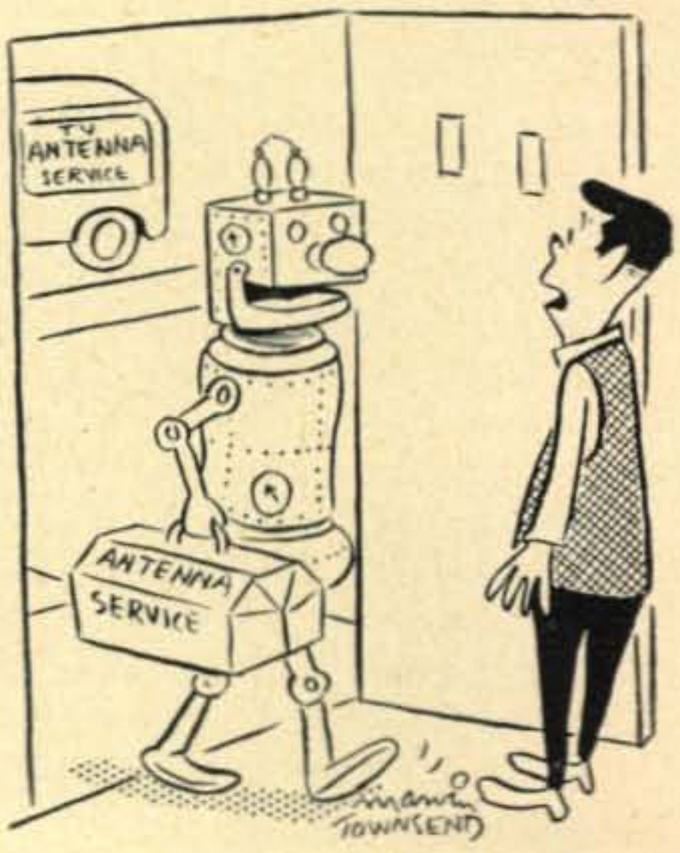
The lesson here is simple—just because you can put 500 watts through an RG-58/U on 80 c.w., don't think you can do the same on two meters. It's important to know the power handling capabilities of the cable you use, not just in general, but for *the specific frequency* you plan to use. And remember, these power ratings assume a near-perfect match between transmitter and transmission line, and between transmission line and antenna. If the s.w.r. is high, the power-handling capacity of coaxial cable diminishes and losses run high as dielectric heating occurs.

Impedance

The final consideration should be impedance—although it is this specification that most amateurs consider first when buying coaxial cable. Most antennas and transmitter outputs today are matched for 52 ohm loads. This impedance is a theoretical compromise, since minimum attenuation occurs at about 77 ohms and maximum power transfer occurs at about 30 ohms.

The question which should be asked when purchasing cable is not just "What impedance", but also "What tolerance?" As illustrated earlier, many manufacturers take considerable liberty in producing cable to a particular impedance. Variables such as braid coverage, dielectric diameter and composition, *etc.*, all affect cable impedance. If a power-consuming mismatch is to be avoided, the impedance should be within 3 to 5 ohms of the theoretical mid-point impedance of 53.5 ohms ($77 + 30/2 = 53.5$ ohms).

These seven tips to cable selection should make your next antenna feedline less of the "blind" choice it was in the past. Hidden in the jungle of formulas and figures surrounding dielectric constants, attenuation factors, etc., are simple facts that can make all the difference in the world in a radiated signal. ■



"Take me to your lead-in."

"The accomplishment of great things consists in doing small things well," said Confucius, and "The full measure of service goes with every Grebe receiver," said an equally famous Chinese philosopher, Dr. Mu. While Confucious may be well know to most people everywhere, Dr. Mu will most likely be remembered by the old timers as the character in the Grebe ads, circa 1920. It is possible that some newcomers do not know of the Grebe story so G. J. Gray, W8JDV, curator and owner of the Gray History-of-Wireless museum relates the history of Grebe Radio.

THE GREBE STORY

BY G. J. GRAY,* W8JDV

REMEMBER the Grebe ads in the early 1920s? The ads featured the venerable and wise Chinese gentleman, Dr. Mu, explaining why we should buy Grebe equipment. Grebe craftsmanship, pointed out Dr. Mu, was evidenced by solid, quartersawed, stained oak cabinets, satin finished bakelite panels, polished moulded dials, rigid bus wiring; all expertly assembled to produce a high quality radio receiver.

Alfred H. Grebe was born at Richmond Hill, Long Island in 1895. He later established a modern radio plant at the site of his birth. Like a lot of us, he started "tinkering" with radio at an early age. At the age of 14 (1909) he built a small workshop in his mother's backyard and started building exceptionally good loose couplers for his experimenter friends. Thus, a small business was started which was destined to have a great impact on the radio field.

In 1911, about the time Grebe's contemporaries started to college, he chose the romantic life of a sea going wireless operator, touring the seas as "sparks" for three years. The Orient held a special interest for him and may account for his Dr. Mu ads in later years. His experience as a wireless operator with the crude commercial spark equipment of that time gave him practical knowledge of what it took to transmit under all conditions.

Late in 1914, Grebe served as Chief Wireless operator on the S.S. Satanta, call GTG, a tanker under British registry. Ralph Barber, W2ZM, former Executive Secretary of QCWA, was 2nd operator. After a 9 month trip around the world, Grebe and Barber resigned at San Francisco and came back to New York by train. The ship was later sunk in the Indian Ocean by a German submarine and all hands were lost.

When he came back home he found that a change had taken place. Three years earlier few knew or cared about radio. Now, he found people interested in the fast growing science. Friends asked him to build receivers and amateurs asked for help with their transmitters. Grebe did not have a college degree but had a natural talent for the design and construction of radio equipment. With his talents so much in demand, he started building equipment for sale and issued a small catalogue. As the market for high quality radio gear increased the Grebe plant grew until it housed facilities for producing 10,000 receivers in 1926.

During the summer of 1916, Grebe had a contract with E. J. Simon & Co. to install Radio Detection gear on French Anti-Sub boats. Grebe and Barber installed the gear at Anacostia Naval Base.

AGP Receivers

Grebe built receivers with the letters AGP before the model number. These letters stood for Armstrong-Grebe-Pacent; Edwin Armstrong for his regeneration, Grebe the manufacturer, and Pacent of Manhattan Electric Supply for idea and merchandising the line. Pacent marketed the receivers through his company under the name, "Mesco". The AGP 101 sold for $32.50 in 1916. John Di Blasi, W2FX, former president of QCWA was manager of Manhattan Electric Supply.

Alfred Henry Grebe as he appeared in the 1920's.

*500 Church Street, Mason, Ohio 45040.

In 1917, The Grebe Company designed and built special receivers for use on U.S. Navy Sub Chasers with radium coated dials for visibility when sailing without lights to prevent detection by enemy ships.

Grebe had built the, now historical, loose coupler to function with the crystal detector. Later, the vacuum tube replaced the crystal and variocouplers replaced the loose coupler. Variometers were added to tune the grid and give smooth regeneration control in the plate circuit. Every part of the Grebe receiver was designed and built to high standards of quality. Here, the principle of doing small things well to accomplish great things went into practice. Metal sheets and rods became carefully made capacitors and small metal fittings. Finely powdered Bakelite dust, moulded under great pressure and heat became solidly built variometer frames, sockets, capacitor frames and dials. Electrochemical processes and skilled forming turned aluminum into satin smooth parts. Everything was built in the Grebe plant with high engineering standards and talented workers to produce the finest in receivers. These receivers were an inspiration from a brilliant mind associated with many of the foremost inventors of the time.

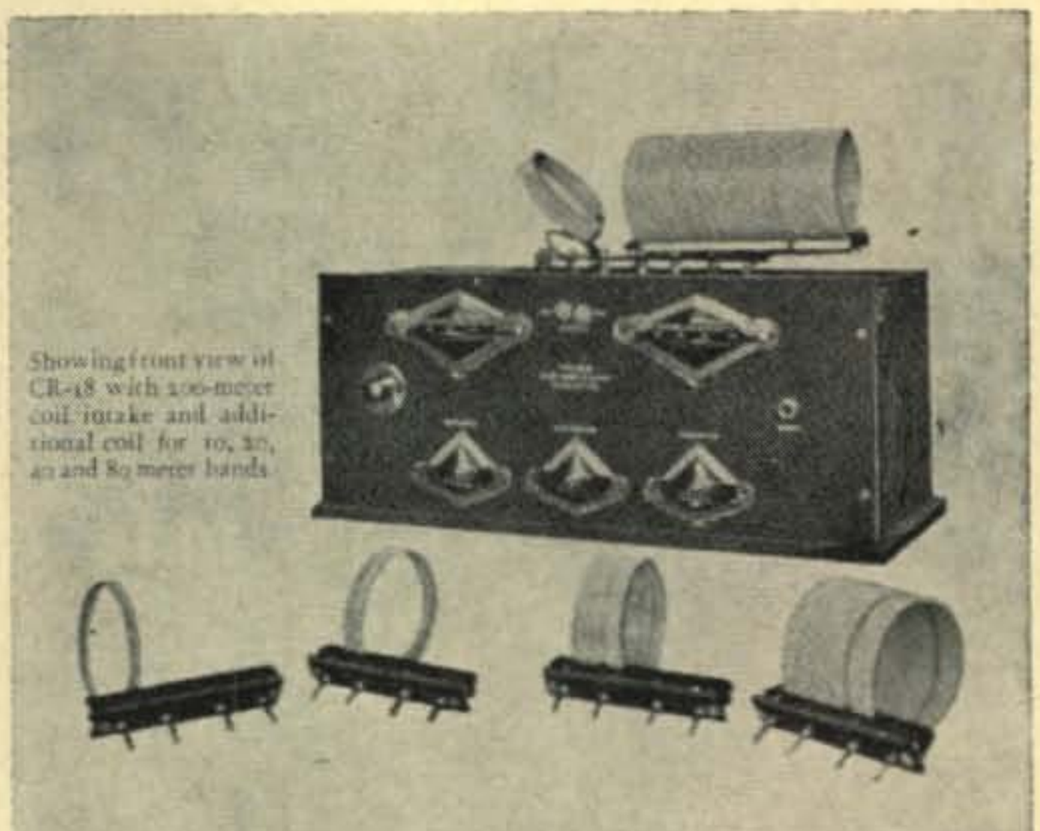
Personnel

To the Grebe plant came Stewart Ballentine, John Hogan, Major Armstrong, Dr. Ben Lieberwitz and others to make their contributions to a truly fine product. Alfred Grebe was a tireless experimenter who was responsible for many advances in radio design. If an idea occurred to him at 4 o'clock in the afternoon, the engineering staff would stay up all night until a "breadboard" model was constructed and some results were obtained. The experiment was continued until a complete receiver with all the refinements and wonderful workmanship was built. Bill Diehl, then Chief Engineer, recalls how at 5 o'clock in the afternoon, having finished work in the lab, he would check the production line and find 20 or 25 different receivers ready to be tested. He would spend the evening testing these completed receivers by hooking them up and listening to signals. He would tune the band checking for dead spots and testing the sensitivity on signals from California, New Zealand, Australia, Rome, Bordeaux and other DX stations. His first lab equipment was a wavemeter made with Seibt capacitor, coils and a hot wire galvanometer.

Grebe's secretary at that time, now Mrs. William Diehl, tells how Major Armstrong came in one day dressed in old clothes and she sent him to the employment office for a job.

The CR Series

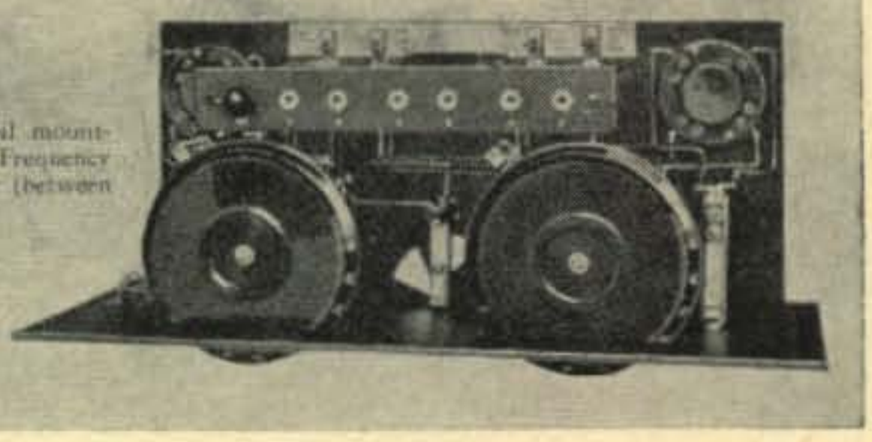
In 1919 the famous CR series started with the CR-1, 1 tube, short wave regenerative receiver. Wavelength range was 170 to 680 meters. No one talked in terms of kilocycles then. The CR-1 had a rotary coupler with unit tap switches for the primary, two variometers, one in the grid circuit and the other in the plate circuit, a



Showing front view of CR-18 with 200-meter coil intake and additional coil for 10, 20, 40 and 80 meter bands.

Features of the Grebe CR-18 Low-Wave Receiver

1. The CR-18 employs a coupled regenerative circuit adapted for reception of frequencies between 1500 and 30,000 kilocycles (10-200 meters).
2. *Antenna coupling coil of novel design* provides variable electromagnetic coupling between antenna and grid circuit, producing a high transfer of energy without affecting the wavelength calibration. This also makes possible the use of harmonic tuning to increase the signal strength, gives greater selectivity thru high-wave local stations and reduces interference and induction noises.
3. *Losses* in the entire circuit are reduced to a minimum by proper placing of the elements. Inductance coils are mounted on supports, far removed from operator's body and metal objects, thus eliminating capacity effects and attendant losses.
4. *Plug in coils*, enable rapid change to be made from one frequency band to another and are so designed that maximum signal strength is obtained. An isolated grid terminal lowers the minimum capacity, and insures correct insertion of the coil.
5. *Grebe S-L-F* (Straight-Line-Frequency) *Condensers* with small minimum capacity insure ease of tuning and maximum signal strength.
6. *Beat frequency control* which consists of a specially designed variable air condenser with a very small capacity variation insures accurate tuning to within a fraction of a kilocycle.
7. *Plate Circuit* designed to give smooth control of regeneration without affecting wavelength calibration and tuning. Oscillating point practically constant over entire tuning range. A non-inductive resistance prevents unstable action and dead spots.
8. *Cushion sockets* eliminate all vibration and microphonic noises detrimental to the reception of ultra-radio frequencies.



Showing coil mounting and Beat Frequency Condenser (between dials).

The Grebe CR-18 covered from 1500 to 30,000 kc using plug-in coils. Shown above is a reprint of a descriptive brochure.

vacuum tube socket mounted in the panel, a filament rheostat and the necessary binding posts and connections. UV-200, WE VT-1, and Audiotrons were used for detection. There was provided a small fixed capacitor to increase the normal wavelength range of 170 to 375 meters to a range of 280 to 680 meters. The change was made by switching the capacitor into the circuit. Maximum regenerative action was ob-

Dr. Mu, the venerable and wise Chinese gentleman who appeared in the Grebe Radio Ads.

tained with the plate circuit variometer producing resonance between the plate and grid circuits. The VT socket was made of seamless brass tubing, finished in satin nickel and held in a recess at the rear of the main panel by means of a bracket. The 1919 CR-1 sold for $100. This and all subsequent Grebe receivers were licensed under the Armstrong and Marconi patents. The other Grebe receivers of that year were all based on the CR-1 design. The CR-2 was a tuner only, without detector socket and one tap switch on the primary inductance. There was no filament rheostat. The CR-3 was a special relay man's receiver and had a range of 150 to 680 meters. The CR-4 was built upright and had a variable series capacitor in the antenna circuit. Other, more elaborate receivers, the CR-6 and CR-7 were also in the line. The CR-6, covering a range of 170 to 680 meters, had the basic CR-1 circuit with an antenna series capacitor and another variable shunt capacitor across the phone circuit for smoother regeneration control. The CR-7 was a long wave receiver covering the range from 500 to 20,000 meters. This was an elaborate receiver with a 12" × 21" panel, a detector tube socket mounted on the panel, an antenna series variable capacitor, a secondary variable capacitor, efficient banked litz-wound windings in two, four and six banks to obtain the proper coupling and inductance values. For wavelengths above 2200 meters, special concentrated inductances were used. Regeneration was secured by use of a tickler coil in the plate circuit in inductive relationship to the grid circuit.

The 1920 catalogue said, "Evenings may be spent listening to high power long wave stations in France, Germany, Italy, Britain, Japan and even Russia." Crystal detectors, tube detector cabinets, one and two stage audio amplifiers, unit variometers, unit variocouplers, unit variable capacitors, fixed capacitors and rotary synchronous spark gaps were listed in this catalogue.

The Grebe Company developed and held patents on automatic filament control, molded Bakelite variometers, rheostats calibrated in ohms, tangent wheel verniers, tapered grip dials and unit shielding. The automatic filament control gave the operator instant control of detector circuit, detector and one stage or detector and two stages of amplification. The plug energized only the filaments of the tubes actually in use. The line in 1923 incorporated all these improvements. The CR-8 selling for $135 replaced the CR-1 but the circuit was the basic variocoupler and two variometers with refinements to extend the wavelength range. This receiver, tuning the range from 150 to 1000 meters was an instrument to brighten the life of any relay man. The CR-5 was the first single circuit receiver with a range of 150 to 3000 meters and two dial control. This receiver was designed for the man who wanted simple control and wide range. It was tuned by an antenna series capacitor and a ten section, triple bank wound inductance in series with the stator winding of a variometer. The rotor was in the plate circuit to provide smooth regeneration control. The CR-9 added a two stage amplifier to the CR-5 circuit.

The first tuned radio frequency amplifier on the market was a Grebe RORN which provided excellent signal strength with only a small loop or short wire pickup. A vacuum tube with a tuned circuit was coupled to a standard regenerative receiver. Trouble developed due to r.f. feedback but by utilizing proper values of grid-leak and input capacitor combinations, Grebe was able to get adequate gain over the simple regenerative circuit.

Shorter Wavelengths

Amateur exploration into the shorter wavelengths was recognized in the CR-13 design which tuned down to 80 meters and incorporated tuned radio frequency amplification with regeneration in the detector plate circuit. The CR-12 and CR-14 were broadcast receivers, range 200 to 600 meters housed in beautiful walnut cabinets.

The CR-18 was the last of an illustrious line designed especially for the amateur. Following

The Grebe built transmitter and receiver, model CR-18 used by Lloyd Jacquet, 2OZ, to report on the International Radio Convention in Paris, April 1925. Ostman, Diehl and Oscanyan were the contacts in America. Grouped about the equipment, from l. to r., are, F. B. Ostman, 2OM, William F. Diehl, 2ZV, Lloyd Jacquet, 2DZ, and P. C. Oscanyan, 2AZA.

the trend to shorter wavelengths and efficient low loss coils the CR-18 had plug in coils, regeneration, one stage audio with horizontal dials projecting through gold escutcheon plates on the panel.

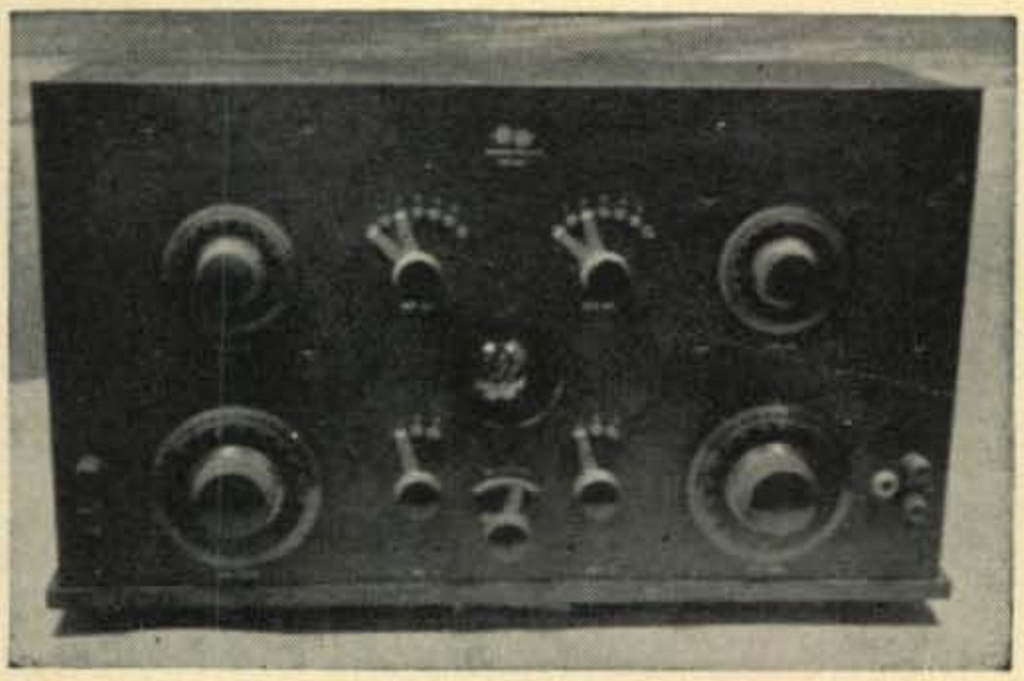
Grebe equipment went to the South Pole on Byrd's first expedition. Two of the early broadcast stations, WBOQ and WAHG were built and operated by Grebe. WAHG was later merged into WABC. The first marine broadcast station WRMU, which was used to broadcast yacht races and other marine events, was installed on MU-1, the yacht of Douglas Rigney, general manager and treasurer of The Grebe Company. WRMU had two oscillator tubes, two modulator tubes and power of 100 watts. When operated as a relay for WAHG a wavelength of 68 meters was used. For broadcasting direct to listeners, a wavelength of 236 meters was used. A motor generator operating on a 32 volt bank of batteries supplied 1500 volts for the plate.

In 1928 Grebe equipped the yacht, Fan Kwai with a transmitter for operation between 40 & 130 meters operating on phone and ICW. The receivers were Grebe CR-18 for short waves and Synchrophase 5 for broadcast reception and phonograph amplification. A station, manned by Lloyd Jacquet, was installed on the S.S. Aquatania to test ship to shore short wave communication.

The first mobile transmitter, WGMU, with a power of 100 watts was installed in a car and used to broadcast horse races (much to the disgust of the local bookies). It was also used for other remote pickups.

Amateur station 2LH was operated by Grebe in 1912 and handled a lot of relay traffic at that time. Experimental station 2PV became 2ZV and in 1916 operated with rotary spark and 500 cycle quenched gap. An arc telephone transmitter with special Grebe receiver made an imposing installation. Later, experimental station 2XE operated on wavelengths as low as 10 meters and included a CR-6 and CR-7 receiver. Ted Ostman, then director of Grebe Service, was 20M and won the second Hoover Cup for excellence in amateur design and operation. Ted recently became a "Silent Key" and another great amateur has passed on. A picture of station 20M taken in 1921 shows a CR-13 and 2 stage amplifier. A husky 1 KW transmitter with Grebe rotary synchronous spark gap and oscillation transformer with a single turn primary

The Grebe model RORN, the first tuned radio frequency amplifier ever marketed is shown above.



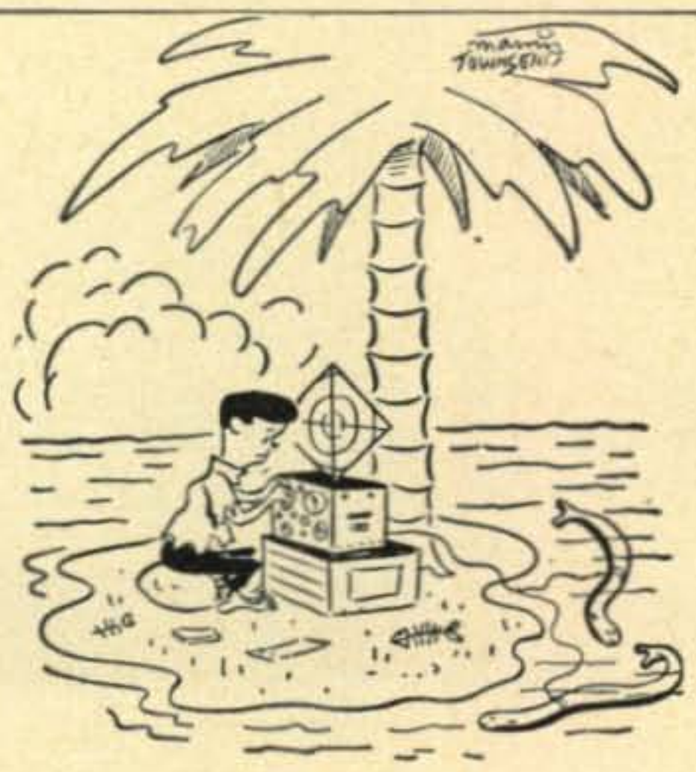
The Grebe CR-7 shown above covered from 500 to 20,000 meters as described in the text.

made of 3" copper strip was used. A sturdy wavemeter and loop modulated phone completed the set up. Contrast this solid, bulky gear with the stream-lined, efficient, tabletop gear of today.

In 1926 receivers designed for broadcast use featured the Synchrophase circuit with "binocular" coils designed to prevent interaction between stages. The patent rights on these coils started a lengthy legal action between Grebe and Hazeltine who remained good friends during the legal proceedings. The Synchrophase MU-1, Synchrophase 5 and 7 were all popular broadcast battery models which later used Grebe "A" and "B" battery eliminators for a.c. operation. The last models were self contained a.c. receivers featuring "Colortone" audio control and single dial control.

Grebe, the perfectionist and practical, self trained radio engineer was a shy, modest man concerned with producing only the very best radio equipment. He surrounded himself with capable men such as Bill Diehl, Ted Ostman, Douglas Rigney and other brilliant men mentioned earlier in this article. We can only wonder how far The Grebe Company would have gone if there had been no depression in 1929. This economic collapse reduced the market for high quality receivers and the company was liquidated in 1932.

In 1935, Grebe had completed his plans for a new company with a new line of 1936 receivers. However, Grebe had a serious operation on October 24, 1935. Complications set in and Alfred H. Grebe, W2ZG, became a "Silent Key". ■



CQ Reviews:

The Justin Mobiltrans 40

BY WILFRED M. SCHERER,* W2AEF

THE time of the year has arrived when the thoughts of many radio amateurs will be turning to mobile operation. Along with this, some may be seeking information about the Mobiltrans 40.

The Mobiltrans 40 is a low-cost and very compact unit designed for mobile use. It includes a complete 40-watt crystal-controlled a.m. transmitter and a receiving converter, the latter for use with an existing car radio. The power supply is included in the same package.

Except for the final amplifier tube, solid-state circuitry is used throughout with nine transistors and six diodes. A plate-modulated controlled-carrier system is employed which ensures a high percentage of modulation at all speech levels and that maintains a low average-current drain from the car battery during transmissions. The Mobiltrans 40 units are single-band affairs for either 40, 75 or 160 meters.

Transmitter Section

A high-frequency n.p.n. Silicon transistor is used for the crystal oscillator. Fundamental-type crystals are employed and a selector switch provides a choice of one of three crystals which are plugged in at the front panel. Sufficient output is available from the oscillator to directly drive the final amplifier tube, an 8156 pentode Compactron which utilizes a Pi-output network.

A unique feature is the manner in which plate voltage is obtained for the final amplifier. Referring to fig. 1, a carbon microphone is transformer-coupled to a push-pull a.f. stage, Q_1-Q_2, that is a common driver through T_2 for two separate class-B power amplifiers, Q_3-Q_4 and Q_5-Q_6. The amplified speech signals from the mic cause a voltage of 500 volts peak to be developed by Q_3 and Q_4 across the secondary of T_3. This voltage is rectified by D_1-D_4, filtered and applied to the plate of the final amplifier through the secondary of T_4. This d.c. plate voltage varies at an *average* audio rate and is in turn modulated by the a.f. voltage produced by the modulator transistors, Q_5-Q_6. Thus, the speech input simultaneously generates the d.c. plate voltage and the modulating voltage. The ratio of the two voltages remains nearly constant, so that a high percentage of modulation is obtained at all times. Since the plate voltage varies during operation, the average current drain is kept low.

Receiving Converter Section

The receiving converter has two n.p.n. h.f. transistors. One is an r.f. input amplifier, the other is a mixer/crystal-oscillator combination. The r.f. circuits are fixed tuned with trimmers and they are sufficiently broad enough to cover the band of interest. The crystal oscillator functions on the low-frequency side of the incoming signal on 40 and 75 meters, and on the h.f. side for 160.

The oscillator frequency is such that an output i.f. is obtained between 600 and 850 kc. This is then fed to the auto broadcast radio receiver which is used as a tunable i.f. system. The b.c. set is tuned from 700 to 600 kc for 1900-2000 kc reception, from 650 to 850 for 3800-4000 kc and from 750 to 850 kc for 7200-7300 kc. No provisions have been made for a noise limiter,

*Technical Director, *CQ*.

The Justin Mobiltrans-40. It is very compact and small as may be seen by comparison with the microphone at the left. The crystal sockets are at the center. The control knobs from left to right are: function switch, converter gain, palte tune with loading above. The edgewise-mounted plate meter is at the right.

since it often is possible to get away without one on the lower-frequency bands.

Controls

A carbon microphone is used that has a push-to-talk button to operate a receive-transmit transfer relay. A protective diode prevents the relay from closing and actuating the transmitter if the battery polarity has accidentally been reversed, thus protecting the power transistors from damage. On the panel are an r.f. gain control, 3 transmitting-crystal sockets with a selector switch, a 3-way mic jack, P.A. TUNE and LOAD controls, final-plate current meter and a function switch with the following positions: OFF, OPERATE, TUNE, SPOT and AUXILIARY.

Transmitter tuneup is conducted with the function switch set at TUNE, in which case it disabies the modulator transistors, Q_5-Q_6, and engages an a.f. feedback network between the collector of Q_3 and the mic input. This produces an audio tone (when the mic button is depressed) to produce a steady a.f. voltage at T_3 which is rectified, as described before, to a *constant* d.c. plate voltage for use during tuneup.

A SPOT position enables the receiving system to be tuned to a transmitter-crystal frequency. The Auxiliary position has spare switch contacts (4 p.s.t.) which may be rigged up for a future addition or modification. A slide switch on the rear enables the BC set to be switched from the Mobiltrans converter back to the BC antenna for normal BC reception with the car radio.

The Model checked for evaluation was a 40-meter unit. The sensitivity of the receiving converter measured 5 μv for 10 db S/N ratio, which should be adequate for most work on the lower frequency bands. There was sufficient gain and output from the converter to produce good signal levels out of the car radio. With a mobile antenna tuned to 40 meters, no particular difficulties were experienced with broadcast-station leakthrough, except when operating within a few miles of a 50 kw station.

Operating from a 12 v.d.c. source, the carrier output during tuneup was 20 watts. With modulation, the p.e.p. output was 80 watts. A high modulation percentage (75-100%) was obtained at nearly all speech-input levels. Good waveform was maintained at low audio levels, but at higher levels, the positive and negative peaks tended to square off, producing a clipped-sounding signal and an attendant degree of distortion; nevertheless, intelligibility was satisfactory and a good audio punch was evidenced.

There is no mic-gain control and the instructions suggest that the operator talk close to the microphone to produce sufficient plate voltage, but it was found that with heavy-type voices, maximum peak output was still obtainable when talking back from the mic; in fact, such a step was necessary to avoid excessive distortion and hissy or breathy sounds that often occur with the use of a carbon mic.

The Mobiltrans 40 takes up little space under the dash, its size being only 2⅞" h. × 8" w. × 8¼" l. Weight is 5 lbs. At 12 v.d.c. input, the current drain during receive or standby is 300 ma with an average current drain during modulation of about 5 a. These units are priced at $99.50 and are available from Justin, Inc., Box 135, San Gabriel, California.—*W2AEF*

Victory for WØJRQ!

CQ FOR April, 1965 reported on the lawsuit brought to force Mace Warner, WØJRQ, to remove his tower and beam from his property on Dudley St. at Lakewood, Colo.

The 37-month old lawsuit ended March 12, 1965 when District Judge Stoner at Golden, Colo. ruled that Mace Warner *could keep his tower.* However, he upheld the covenants of the Lakewood subdivision by decreeing that Mace would have to reduce the height of the tower to 35 feet (no more than 10 feet above the highest point on his house) in keeping with the covenants. He has 60 days in which to do this.

In two days of testimony, on Jan. 26-27, the plaintiffs (4 families in Mace's neighborhood) said Mace's "broadcasts" disrupted telephone conversations, television and radio reception. They claimed the tower, more than 60 feet high for some months but later reduced to 47 feet, had become a hazardous nuisance. They demanded damages claiming devaluation of their property because of the tower. The trial resumed March 11 and ended with Judge Stoner's ruling on the 12th.

The judge *denied* the plaintiffs' contentions the tower and Mace's operating were a nuisance and were in violation of county zoning regulations. He also refused to award $20,000 in damages sought by the plaintiffs.

This has been a long, wearisome, expensive action. Congratulations to you, Mace, for sticking with it, and to you and your attorneys, and all others who helped, in proving through the court the amateurs' indefeasible right to pursue their hobby!— *W5RZJ*

The Knight T-150 as a SSB Linear

Several economical methods for getting on sideband have been proposed such as the use of adaptors of the SB-10 type. The modification described assumes the existence of a sideband exciter with an output of at least two watts. The exciter output is fed into the final of a Knight T-150 transmitter which is modified for linear operation to provide about 100 watts of output.

BY M. P. HUGHES,* VE2AUB/W5

THE modification of the T-150 to a Class AB[1] linear described here, does not degrade the performance of the transmitter in its other modes. No new holes are cut in the front panel and, at most, only two new holes have to be cut in the rear apron of the chassis. One of these is unnecessary if advantage is taken of a concentric control arrangement for switching. The alterations to the transmitter are quite minor in character, but the full procedure is described for completeness and can be applied, with only a few changes, to other transmitter finals. The end result, while not an optimum design, is an acceptable Class AB[1] linear at minimal cost.

Several exciters, suitable for driving medium power Class AB[1] finals, have been described in amateur literature during the past few years. It is assumed that one of these exciters, correctly adjusted and having an output of about 2 watts, is available, together with a bias supply capable of furnishing at least 2 ma at —50 volts. Additional components required for the modification should cost no more than about $5. Only 7 inches of low-capacitance coaxial cable and a d.p.d.t. slide switch are added inside the transmitter.

Although the modification is described with reference to 20 meter operations, the method is equally applicable to other bands. Multiband operation is more-or-less precluded by the design of the T-150 final grid tank circuit, but if the final proves to be adequately neutralized on another band and the grid tank resonates with the exciter connected, there would appear to be no reason why satisfactory performance should not be possible.

Circuit

The circuit shown in fig. 1 illustrates the switching arrangement in the p.a. grid circuit. The d.p.d.t. switch, S_A, added inside the transmitter, performs two functions. One half disconnects the 7189 Class C driver for sideband operation; the other half connects the coaxial line from the exciter to the 6146 grids. In order to simplify switching and wiring, the bias for the 6146 grids is also brought into the T-150 along the coaxial line. In the AM-CW position of S_A, the circuit is restored to normal operation.

The 8 and 11 pin sockets make nineteen circuit connections available on the rear apron of the T-150. Among these are the 6146 screens and the screen supply. For linear operation it is necessary to stabilize the 6146 screen voltage at about 200 volts, and so the 380 volts that is available at pin #1 of the octal plug is dropped by R_1 and stabilized at 210 volts by a pair of OC3s in series as shown in fig. 2. The stabilized 210 volts is returned to the 6146 screens via pin #4 of the octal plug.

Switch S_B can be part of the NET-RECEIVE-TRANSMIT switch that will be necessary for sideband operation.

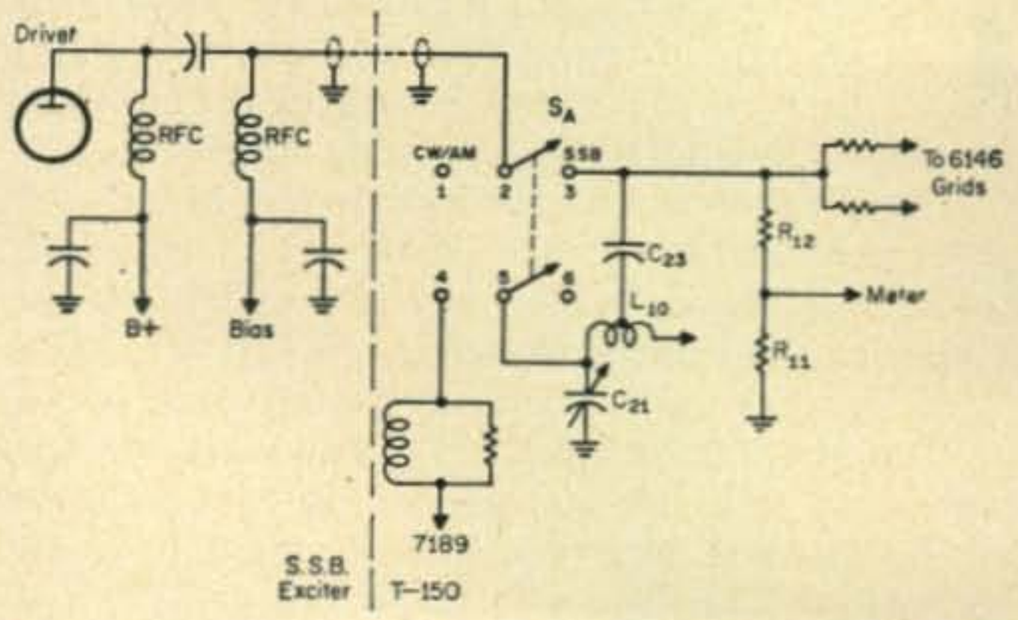


Fig. 1—The addition of switch S_A to the Knight T-150 transmitter permits the connection of an external s.s.b. generator to the final amplifier. The bias for Class AB[1] operation is fed to the 6146 control grids externally through the exciter as described in the text.

*Box 547, Fort Davis, Texas.

Also shown in fig. 2 are switching arrangements for an exciter and the transmitter keying circuit. Individual preference will dictate whether either of these circuits will be included. Keying the transmittter with the transmit-receive switch serves as protection against damaging the final tubes.

Final Grid Tank

The grid tank of the T-150 final is used as the plate circuit of the exciter-driver. The driver tube in the s.s.b. exciter shunt feeds the 6146 grid circuit through a short piece of low-capacitance coaxial cable. A 6CL6 driver and a total of 24 inches of RG-62/U add 33mmf to the grid circuit capacity. From this we subtract about 6mmf because the 7189 Class C driver tube is disconnected during sideband operation. Thus an extra 27mmf is added across the grid circuit. If the tuning capacitor C_{21} cannot bring the circuit to resonance with this additional capacity present, one of two things can be done; *a*) use a shorter length of coax, or coax with lower capacity such as RG-63B/U, *b*) will reduce the inductance of the circuit. I changed the original coil (L_{13} in the Knight circuit) to 5 turns, 22 gauge enamelled wire, close-wound on a short piece of ⅜ inch diameter polystyrene rod. Capacitor C_{21} has a maximum capacity of 50mmf and its minimum will be about 5mmf. The circuit can therefore accommodate no more than about 45mmf extra, if C_{21} is unmeshed for sideband and fully meshed for A.M.-C.W. operation. Allowing for a 10mmf margin, no more than 30 inches of RG-62/U or 40 inches of RG-63B/U should be used between the plate of the exciter tube and the 6146 grids.

Construction Details

The three mechanical changes to the transmitter are described below. The main problem centers around slide switch S_A which must be located near the 6146 grids, and yet be operated from outside the cabinet.

Switch S_A is mounted on a small bracket made from a scrap of aluminum. The shape and dimensions of the bracket are shown in fig. 3. It is held to the chassis by the power transformer stud nearest the driver tube. A hole, ⅛ inch in diameter, is drilled through the switch handle. A piece of coathanger wire, 6 inches long, is passed through this hole and bent so that it cannot slip out. If front-panel control is not desired, the wire can be insulated and passed through a hole in the rear apron of the chassis. For convenience, however, the AUDIO GAIN control may be replaced with the front portion of a concentric control (Centralab Compentrol or Mallory Midgetrol). The central shaft is removed from the rear part of the control and used to operate the slide switch. The coathanger wire is wrapped around and soldered to the control shaft with both the switch handle and the center control shaft pushed fully in the direction of the rear of the chassis.

A chassis receptacle, type UG-910/U, is assembled with the RG-62/U and mounted on the rear apron of the chassis, between the u.h.f. con-

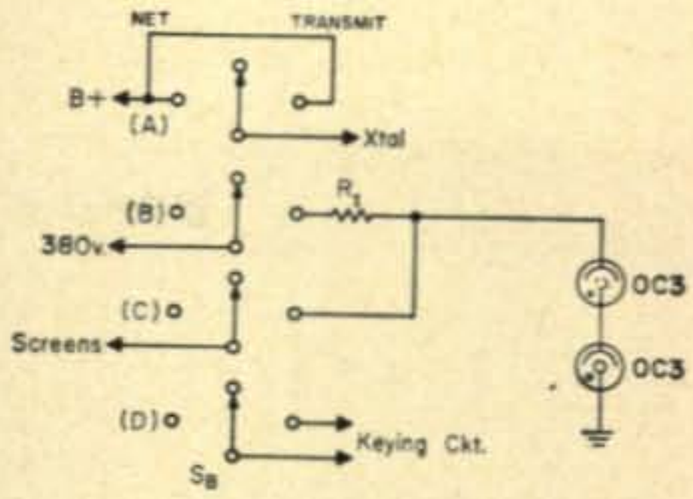


Fig. 2—When converting the Knight T-150 final to linear operation the screen voltage must be stabilized using the NET-RECEIVE-TRANSMIT switching circuit shown above. Section A of the switch is used to control the exciter, and section C is used to control the keying circuit and both are optional.

nector and the 11 pin socket. All that this requires is that a hole, ½ inch in diameter, be punched in the appropriate place. The coax is then cut to length (about 7 inches) and the center conductor is soldered to switch pin S_{A2}. The shield is grounded nearby.

A connection is made from S_{A3} to the junction of C_{23} and the grid resistor R_{12}. The connection where the parasitic suppressor in the plate lead of the 7189 is soldered to L_{10} is removed, and the suppressor soldered to S_{A4}. Connection is then made between S_{A5} and L_{10}. (In some models of the T-150 there is no suppressor so S_{A4} goes directly to the plate of the 7189.)

Neutralizing

The directions given for neutralizing the final of the T-150, although quite satisfactory for c.w. and a.m. operation, are inadequate for s.s.b. It is necessary to neutralize the 6146's with considerable care in order to avoid oscillation during s.s.b. operation. The method is quite straightforward:

1. Unplug the transmitter from the 115 v. supply and remove it from its cabinet.
2. Shunt R_{17} (4.7K) in the relative power metering circiut with a 100 ohm resistor. The relative power meter will be used to indicate the level of signal fed from the grid to plate circuits.
3. Solder a short jumper between S_{A2} and S_{A3}, and remove any connector from the UG-910/U socket.
4. Turn output meter adjustment fully counterclockwise.
5. Remove existing neutralizing wires and solder a 6 inch piece of thermoplastic or teflon insulated wire in their place. Wrap two or three turns of this wire around the lead from the final r.f. choke (L_{18}) to the 6146 plates. *Caution. Do not make an electrical contact at the plate lead.*
6. Remove the octal plug from the rear apron. (With the octal plug removed, the final plate and screen voltages are disconnected. Nevertheless, it is a wise precaution to check to be sure that no voltage is present on the final plates before working with the neutralizing wire.)
7. Plug the line cord into a 115 v. supply, switch on, and allow the tubes to warm up.
8. Set the v.f.o. to the middle of the s.s.b. section of the band, switch to v.f.o. spot, and ad-

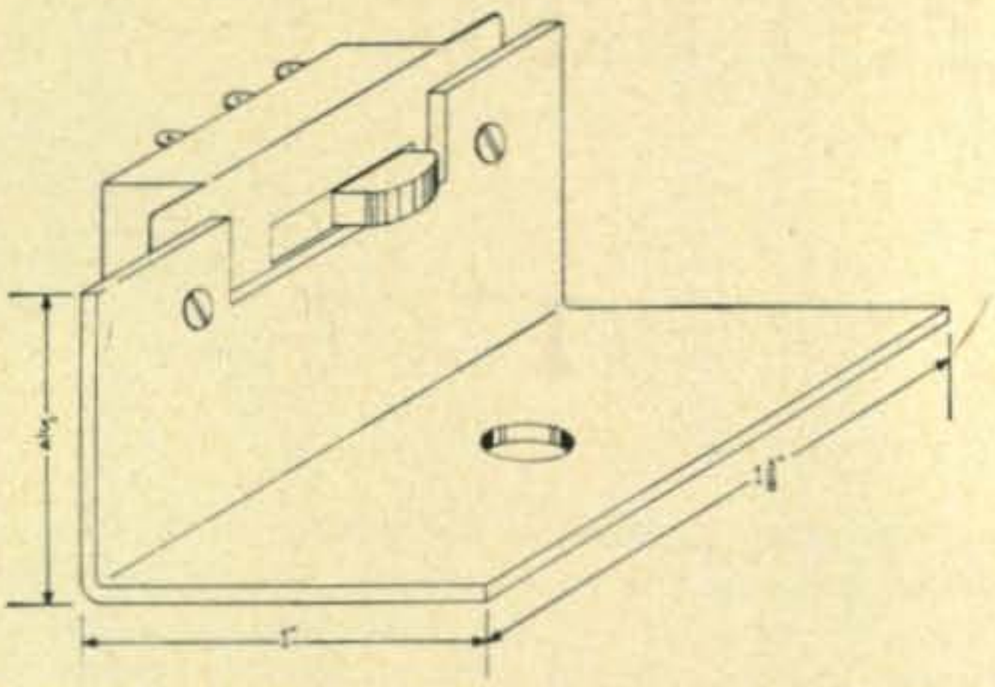


Fig. 3—Sketch of the bracket for mounting switch S_A, the location of which is described in the text.

vance output meter adjustment until a mid-scale reading is obtained.

9. Tune the plate and grid circuits for maximum relative power reading. Reset the meter adjustment for a mid-scale reading when necessary.

10. Adjust the neutralizing wire for minimum reading on the relative power meter.

Repeat steps 9 and 10 until the relative power reading cannot be reduced any further. If it is necessary to cement the neutralizing wire in position to prevent it from moving, the neutralization should be rechecked.

11. Remove the 100 ohm shunt across R_{17} and the jumper from S_{A2} to S_{A3}.

It should be possible to adjust the neutralizing wire so that there is barely any indication on the relative power meter with the adjustment set for maximum sensitivity.

The p.a. circuit is now adequately neutralized for s.s.b. operation on 20 meters. Neutralization on the other bands will not necessarily be as good.

Circuit Operation

It is advisable, first of all, to check the performance of the amplifier when switched for Class C operation. Connect a dummy load on the output and switch to the AM-CW position of S_A. Test both the c.w. and a.m. operation of the transmitter. It should load and tune just as it did before modification and the same drive and output power should be obtained. Of course, if L_{13} was changed, C_{21} will resonate the grid tank at a different position.

When all connections between the exciter and transmitter are complete, only a few adjustments are necessary to change from Class C to linear operation. Turn the FUNCTION switch to STANDBY and switch on the exciter and bias supplies. Then switch S_A to the SIDEBAND position. For the initial set-up procedure the 6146 grid voltage should be monitored and the bias supply adjusted to give —50 volts. The final grid meter reading should be noted. Subsequently, the bias can be set to —50 volts simply by bringing the grid current reading to this value. The bias supply should be well filtered, but it need not necessarily be regulated or "stiff" since the load on it does not vary.

Although an oscilloscope should be used for the proper adjustment of any linear amplifier, I have found that the following procedure gives a close approximation to the ideal tuning and loading. Switch the meter to monitor final plate current and turn S_B to TRANSMIT. With no output from the exciter, the plate current should be close to 25 ma. If it is not, the grid bias should be changed slightly to bring it near this value. Inject an audio signal into the exciter, or reinsert carrier, and tune the plate and grid circuits for maximum relative output power. Drive (or audio gain) should be adjusted to keep the indicated plate current less than 160 ma during this tuning procedure. During voice operation, the plate current meter will seldom kick up above 75 ma, and it is very difficult, if not impossible, to estimate where the audio gain control should be set. If you go on the air at this stage, keep the audio well down until you can get a reliable report from someone who is receiving you well and willing to check your signal thoroughly. This is about the best that can be done without a scope. One should be obtained at the earliest opportunity to confirm the adjustments and to make the usual linearity tests that are described in the sideband handbooks.

Several months of operation with the T-150 modified as described has shown that the system is reliable and performs most satisfactorily. Peak power for sideband has been measured at about 70% of that from the T-150 operated on c.w., and so about 100 watts output may be expected. BCNU on the high end of twenty when all you have to do is flip the FUNCTION switch to standby for sideband. ■

New Amateur Product

Hallett Ignition Noise Booklet

THERE is a new FREE booklet available on ignition noises. The booklet called *"Nothing But Noise"* is written by Robert McIntosh, President of Hallett Manufacturing Company. Topics discussed are: Noise spikes, basic types of noises, radiated noises, noise sources and many other sections illustrated with graphs, diagrams and pictures. To secure a free copy write to Hallett Manufacturing Company, 5910 Bowcroft Street, Los Angeles, California, 90016, or circle 64 on page 110.

A Three Transistor 6 Meter Converter

BY JOSEPH TARTAS,* W2YKT

This transistorized converter can be used either fixed or mobile. It uses low priced transistors which provide a noise figure of 3 db or less and an overall gain of 25 db.

It is highly desirable to add a converter to either the home station or the car receiver (BC or amateur) with a minimum of labor. With this in mind, I selected the most likely transistor for low-noise r.f. characteristics, consistent with low price, and designed the versatile converter described below.

This converter may be powered with any battery from 3 to 12 volts, but the higher the voltage, the higher the gain. For practical purposes, a 12 volt battery may be used with the values given in the circuit. If a 9 volt source, such as a small portable-radio battery, is desired for compactness, the 3.9K resistors indicated on the diagram with an asterisk, should be replaced with 2.7K resistors. For six volts, they should be replaced with 1.5K resistors.

A power switch may be mounted in the converter case itself, and the battery mounted within the case. The switch should be a double-pole, double-throw slide switch, so that the antenna may be switched from the converter input to the converter output. In this way normal receiver operation may be retained.

Circuit Description

The signal is introduced through a double-tuned circuit, as shown in fig. 1, to provide attenuation to interference outside the band. This interference can cause cross-modulation within the converter. These tuned circuits are identical, and are magnetically coupled due to their close proximity to each other. The mutual coupling achieved by the spacing tolerance given, provides a range from slightly undercoupled to slightly overcoupled. As a result, the approximate band-pass of fig. 2 is achieved.

The small value of capacities used to couple the antenna to the primary, and the secondary to the emitter of the r.f. stage, transforms these low impedances to the relatively high impedance of the tuned circuits. This provides correct loading and adequate matching to maintain a sufficiently high Q for rejection of undesirable signals.

The alternate circuit has proven adequate for a broad-banded input where cross-modulation is no problem. This same input circuit worked well in a low-signal area (35 miles from New York City) but when tried in New York City itself, encountered considerable cross-modulation problems. As a result of this experience, the selective circuit shown was developed.

The r.f. stage is operated as a low-noise common-base amplifier and as such is biased for low collector current (about 2 ma). It is a well-established fact that to obtain the optimum noise figure for a given transistor, the current must be small. No advantage was found in reducing the current further, since the gain also goes down with the current.

The common-base configuration eliminates the need for neutralization (or unilateralization, as it is commonly referred to) since in this circuit the feedback (collector-base) capacity

Top view of the 6 meter converter shows the location of the major components.

*1204 Ringwood Avenue, Haskell, New Jersey 07420.

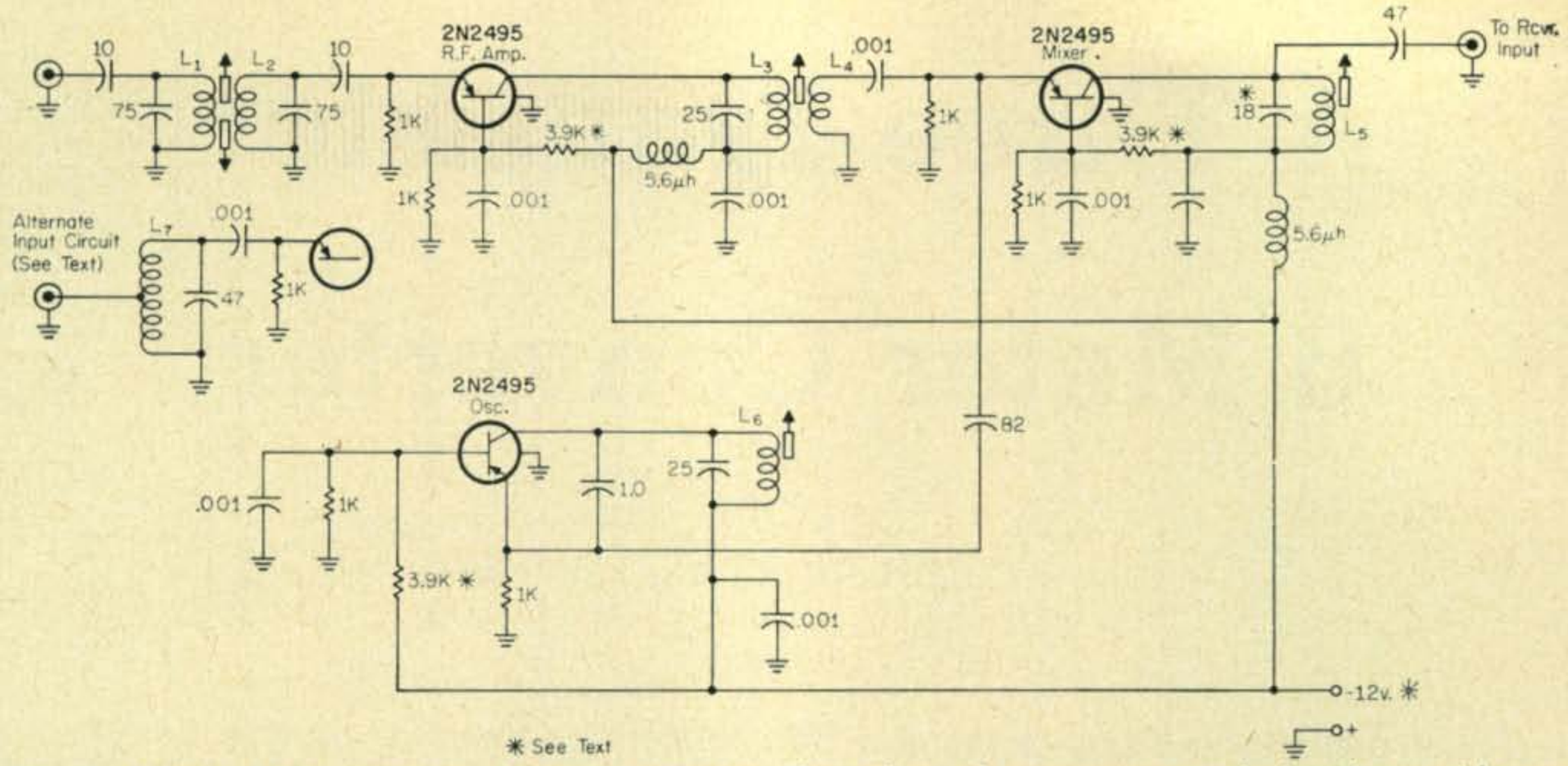


Fig. 1—Circuit of the low-noise 6 meter converter. The values of components marked with asterisks are varied as described in the text. All resistors are ¼ watt 10% composition types. All capacitors are in mmf.

L_1, L_2—5t #18 Formex or e. close wound on Cambian PLST-P form or equiv. Coils are prewound as explained in text.

L_3—9t #26 Formex or e. Close wound on PLST-P 2C4L Cambian form or equiv.

L_4—3t #26 e. close wound on cold end of L_3.

L_5—30t #32 Formex or e. close wound on a PLST-P Cambion form or equiv.

L_6—9t #26 e. same as L_3.

L_7—See Text.

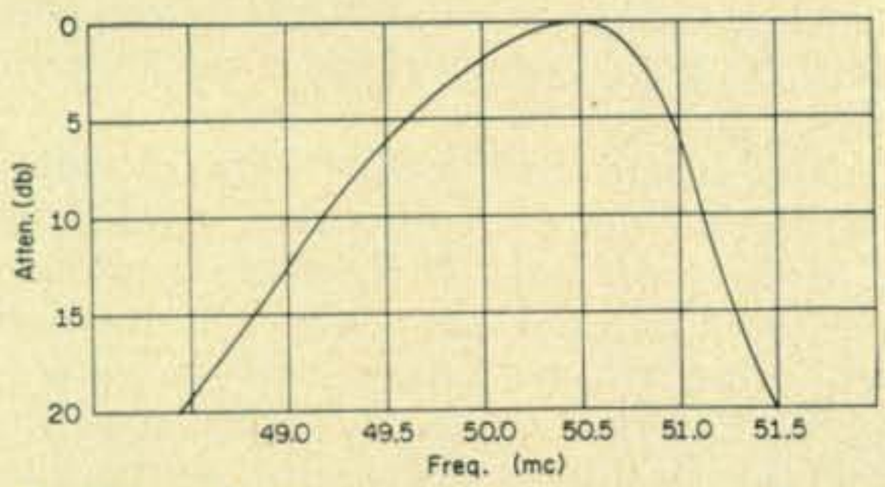


Fig. 2—The *output versus frequency* curve for the 6 meter converter using the dual tuned antenna coils is shown above. The overall gain was 25 db and the output was measured at 10 mc into a 50 ohm detector.

becomes part of the output tuning capacity. Although a better noise figure and more gain might be obtained with a neutralized common-emitter circuit, the circuitry is more complicated and the noise characteristic is more than adequate with the circuit used.

In all stages, the fourth lead of the transistor which is connected to the case of the transistor, is grounded to provide an r.f. shield for the amplifier and mixer. This reduces the chance of undesirable radiation from the local oscillator as well as preventing oscillation.

The combination of the 3.9K and 1K base divider resistors provides the correct combination of base current, and emitter voltage (which also helps to limit the collector current) is set by the 1K emitter resistor, to provide Class A operation.

The mixer circuit is the same, with the additional bias necessary for non-linear operation of the mixer provided by the signal from the local oscillator, at the base. Experience has shown that injecting both signal and local oscillator into into the base (for a common emitter circuit) gives good conversion gain, minimum conversion noise, and the least distortion at high signal levels.

The transformer (L_3, L_4) couples the amplified r.f. signal to the mixer, provides impedance transformation between the high-impedance collector circuit and the low impedance emitter circuit, and acts as a short circuit to the mixer output frequency.

The conversion oscillator is a common-base Colpitts oscillator. The small capacitor forms part of the capacitive divider that results in the correct tap point for the emitter. The equivalent circuit is shown in fig. 3.

The oscillator emitter resistor provides sufficient impedance to r.f. so no r.f. choke is needed to isolate the emitter from the bias resistor, as is common in vacuum tube circuits. This also provides an output point that does not affect the tuned circuits. The 82 mmf capacitor provides optimum oscillator injection level to the mixer. A higher or lower level will reduce the conversion gain of the mixer.

The Amperex 2N2495 is a pnp germanium transistor especially designed to operate as a low-noise r.f. amplifier to well above 200 mc, and with an omptimized noise figure of less than 3 db. This is equal to, or better than the best vacuum tube circuits. Furthermore, these tran-

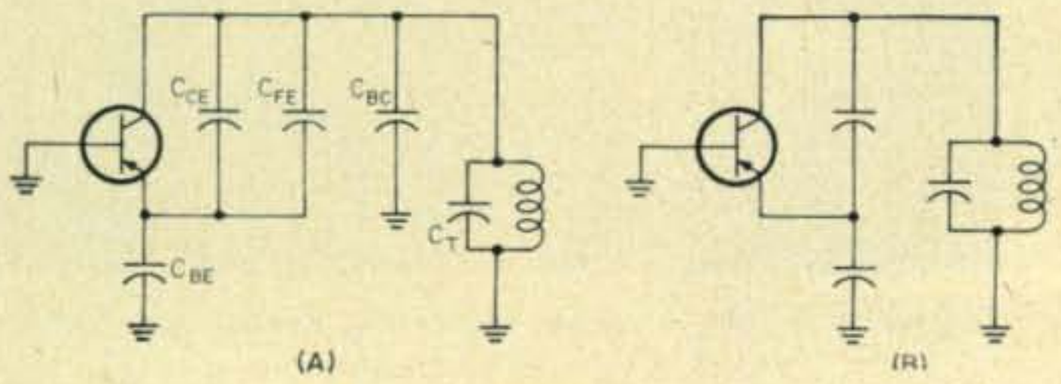


Fig. 3—Development of the local oscillator circuit. Capacities of both the circuit and the transistor are shown in A. In B, the parallel capacities are joined and the circuit is redrawn. At C the circuit is redrawn in the Colpitts configuration.

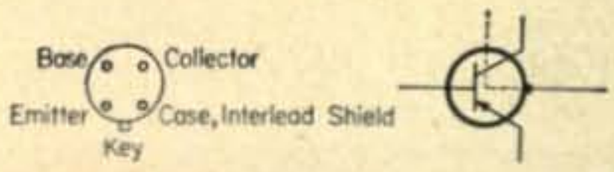


Fig. 4—The base diagram of the 2N2495 is shown as viewed from the bottom.

sistors are inexpensive and unlike most r.f. types, where the collector is tied to the case, has the advantage of a grounded case. Figure 4 shows the base diagram of this transistor.

The mixer output circuit is tuned by the combination of the tuning capacity and L_5. The value shown in fig. 1 (18 mmf) is used when the output is connected to a low impedance load (50 ohms) but when a higher impedance (300 ohms or more) is used, a higher value of tuning capacity is needed. For the inductance given, the 47 mmf is the correct tank value. This is due to the shunting effect of the coupling capacity when a low impedance is connected between the capacitor and ground.

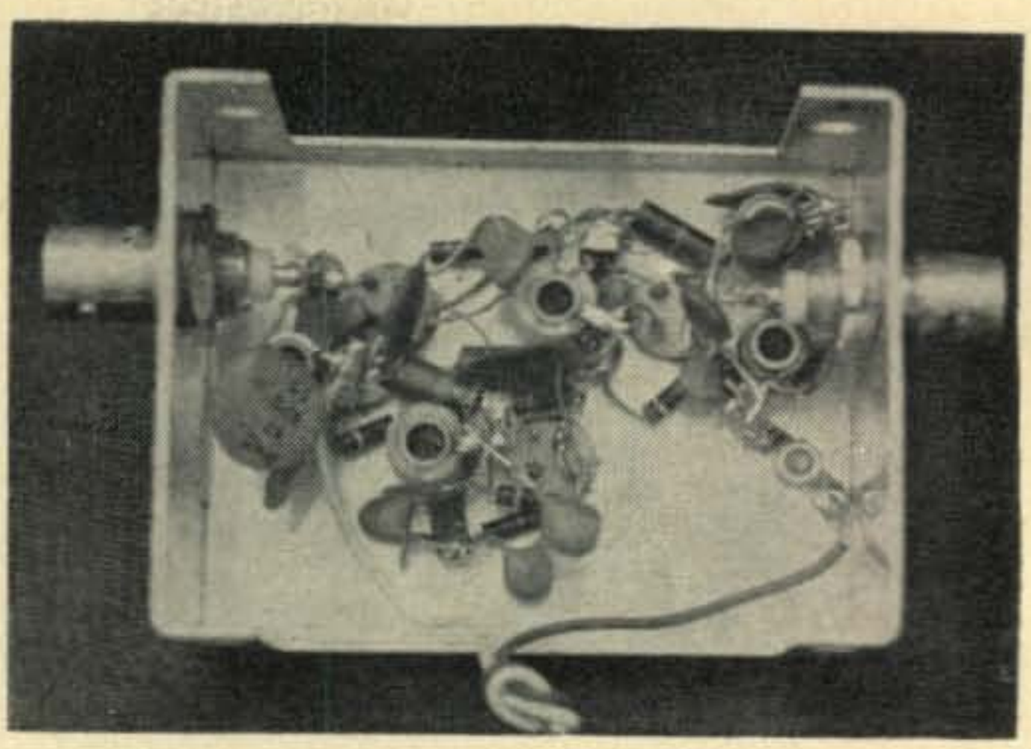
Construction

The complete converter is built into a 2¾ × 2⅛ × 1⅝ inch minibox, with input and output connectors at each end. The circuits are laid out for simplicity in wiring and to give best isolation without need for interstage shields.

The input tuned circuits are mounted as shown, and as in all the tuned circuits throughout the converter, the tuning capacitor is mounted directly across the terminals *on the coil form itself* with minimum lead lengths. This avoids the excess lead inductances involved in both the capacitor and coil, as well as the inductance in the ground path of the chassis. At 50 mc these are not insignificant, and their elimination often makes the difference as to whether or not the coil can be tuned properly by the slug.

The coils L_1 *and* L_2, are prewound on a #8 drill shank and then threaded onto the coil form making sure that the turns remain close to each other. Because of the large wire size involved, no coil terminals are used, and the ends of the coil itself acts as self-supporting terminals. The ends should be approximately ¼" long and the insulation is removed over this portion. The tuning and coupling capacitors are connected directly to these "self-terminals" to keep down the excess inductance previously discussed.

The coil in the alternate circuit consists of 5 turns of #16 bus wire, ⅜" inside diameter,



Interior view of converter.

and about ¾" long. The input is connected to the approximate center of this coil and, since the emitter loads this circuit considerably, it is extremely broadbanded. As a result, neither the exact coil inductance, nor the exact point of the tap is very critical.

The circuit was designed for a 10 mc output, so that a direct dial reading (10 mc = 50 mc, 11 mc = 51 mc) could be obtained. However, the range of the oscillator is sufficient to tune from 40 to 49.5 mc, so any i.f. from .5 to 10 mc may be used. This allows a broadcast receiver to

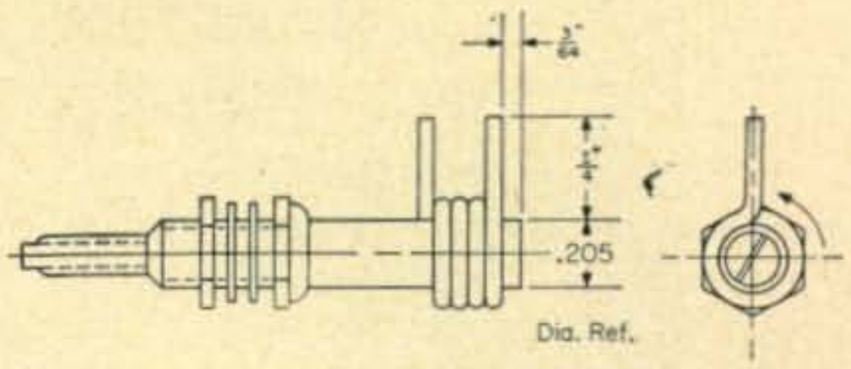


Fig. 6—Drawing of a typical coil similar to L_1 and L_2. Note the method of terminating the coil ends.

be used as the tunable i.f., so that this converter may be used for mobile service. If this is done, a 1 mh r.f. choke may be substituted for L_5 and the tuning capacitor eliminated.

The chassis drilling template is a good guide for layout, since it was planned to give the shortest connections between stages with the minimum of undesirable interstage coupling. Hole diameters may vary from those given, depending upon the type of sockets and connectors used. The connectors shown here are BNC types.

(Continued on page 103)

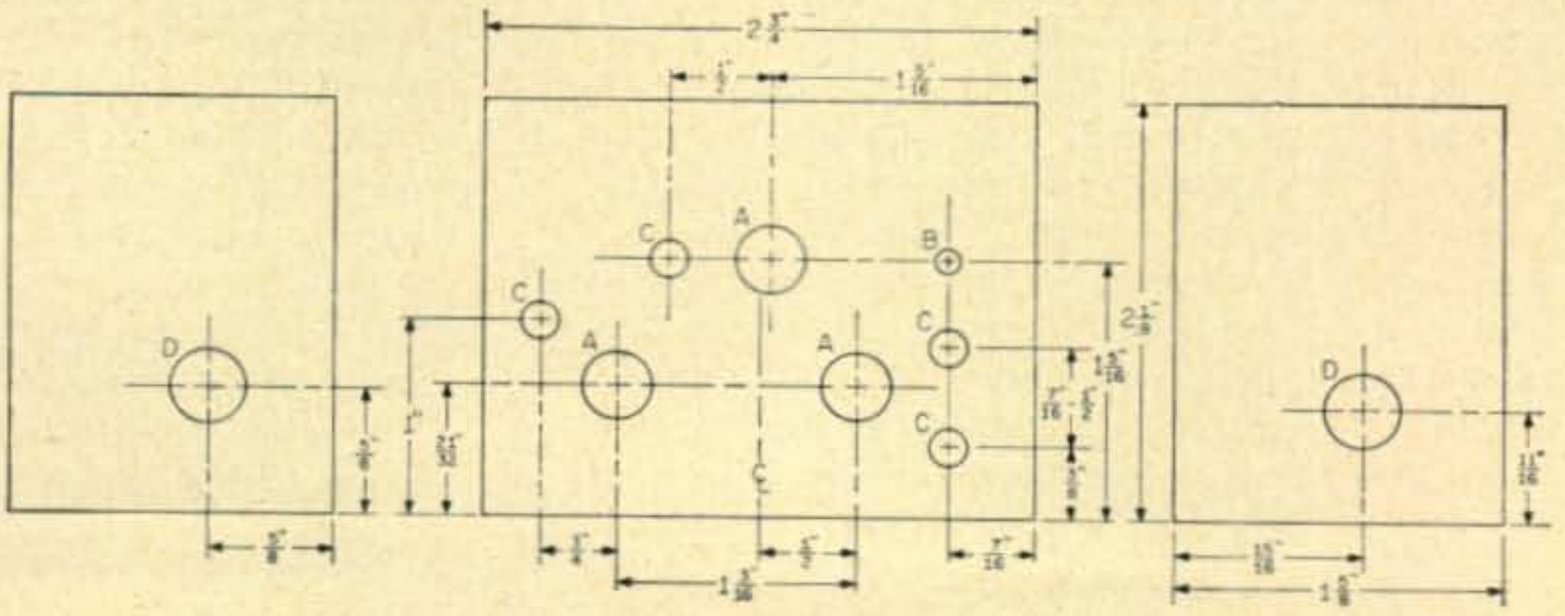


Fig. 5—Top and side views of the converter chassis show locations of all the holes. Those holes marked *A* are drilled to fit the transistor sockets, *B* with a #40 drill, *C* with a #19 drill and *D* to fit the r.f. connectors used.

other peoples

Learn By Mistakes

Most of us are aware of the dangers inherent in amateur radio work. Sometimes, however, the forms are not very evident but still quite deadly. The author describes his personal experience with one of our problems.

BY LOU ADLER,* K8IKA

SURELY this is no new statement, but nonetheless it will serve as a suitable heading for these writings. In reading the popular electronic magazines, I can't, in my poor memory, recall reading an article written about the subject covered below.

As we go through our ham life I'm sure many of us have made mistakes, but it's oh so hard to own up to them. This is about a mistake which could have cost me my life.

A couple of years ago I acquired an ARC-3/3 transmitter. This is of World War II vintage, usable from 100 to 156 mc; a beautiful piece of equipment to convert to ham use on the 2 meter band. It is, however, quite a job to convert properly, but at any rate we did accomplish this task.

The final tube in this job is an 832A. At 144 mc, in this particular rig, it has an input of about 15 watts. At that power on 2 meters, it does as well as can be expected. That is for most people, but of course, I guess I'm not most people.

In my short time on 2 meters with the rig, I heard a fellow in western Pennsylvania say he had an 829B in his ARC-3. I decided, since the tube base is wired the same, to use an 829B.

Looking in my stock of tubes, I found one, and *only* one 829B. With the tube tester I have, it showed to be *A* O.K. Wonderful, I'm in business, is what I thought. Three weeks later I discovered that I had failed in the conversion of the final and almost lost my life. No, I didn't get a charge of high voltage but something as bad and more insidious.

After installing the 829B in the rig and making changes in the screen and cathode resistors, I checked for neutralization. Sure enough, it needed to be neutralized. This we did in the conventional manner, using the outboard control rod method. Even after the initial checks with high voltage applied on the plates of the final, it had all the indications of being neutralized. We put it to work on the air.

After a few days and a couple of hours on the air it appeared to act in an erratic manner. Plate current changed from one transmission to another. Also the signal level changed in strength and I began to have TVI complaints. I pulled the rig from the cabinet to see if we could locate the trouble.

It seemed to have the symptoms of never being neutralized. I was so sure it was before I put it on the air. Everything I tried in neutralizing this circuit seemed to have no effect on it. I checked the tube once more. It still checked out *A* O.K.

Everyday, for about 2 hours, over a period of a week, I worked on this problem, but to no avail. This I must tell you before I proceed with the results. All of these attempts of neutralizing was done in the conventional manner, as described in the handbook. Not owning an r.f. probe at the time, I, of course, couldn't use this manner. Then I remembered a faster way of detecting unstable operation that was shown to me.

Some years back an old v.h.f. ham showed me how to use an argon bulb as a method for checking neutralization. In this method you wet an index finger tip and grasp one lead of the argon bulb with it. Touch the other lead to the tank coil momentarily and move away to one side. just enough to keep the bulb ignited. This being done with full voltage on the plates. If the bulb glows with a purple brilliance, it should be neutralized. If it glows orange, it needs to be neutralized. *Don't try this method.* It can be fatal as I'm about to explain.

After about a week of horsing with this rig, I developed a sickening headache and started to run a fever. I'm not one to miss work for such symptoms, so I went to work on the second shift. During the course of the evening my tongue started to get blisters on it as well as a swelling condition. As you might suspect by now I couldn't finish the evening out. I called my doctor at home. He suggested going to the hospital. After all it was 11 p.m. The intern at the hospital

*2822 11th Street, Cuyahoga Falls, Ohio.

checked me out and suspected trench mouth. He took saliva tests and had the lab technician check these out. The tests came back negative. So seeming to exhaust his knowledge he gave me a double shot of penicillin and sent me home after telling me to report to my doctor the first thing in the morning.

Of course, I did, and by this time the fever seemed to be on the downgrade. Another shot of penicillin and capsules were prescribed. Then I was sent home to report back in 2 days. By this time the blisters had broken in my mouth and thin layers of skin were peeling off. But I seemed to be feeling much better.

After a few days I felt like hamming again. Down to the hamshack I went. The first thing to catch my eye was that doggone problem sitting on the bench, glaring at me. Not one to give up so easily, I started to tackle the basic problem. After 3 days of fighting a losing battle with the neutralization, I started to become sick again. Same symptoms all over, only of a more serious nature.

Back to the doctor I went the next morning. By this time I was really in misery. Couldn't take a thing to my mouth. Even had sores on my lips. The doctor took a good look at me and asked one question. He asked, "Do you work around any X-ray equipment or anything to do with ultra high frequency transmitters? The more I look at these sores and blisters, the more they appear to be caused by X-ray."

This opened my eyes. How could I be so stupid? By this time the wheels in my head were spinning. I said, "It must be the project I'm working on at home." I went into detail explaining everything. I suspected at this time the tube running wild must be putting out strong harmonics in the X-ray frequencies or at least it surely must be awful high in frequency.

His prognosis was the silver fillings in my mouth, plus the body contact with the argon bulb, was picking up the r.f. and causing the burns to my gums, tongue and lips. He told me the most susceptible parts of your body for r.f. is the mouth and the rectum. He also told me, much more of these r.f. frequencies and I would have caused my body considerable damage, perhaps death.

After a few days of medication and loss of work I began to feel good again. You can be sure after all of this trouble I didn't even have the slightest idea of ever trying to solve the unstable condition of the 829B. In fact, I chickened out. I can only deduce that my problem was with the tube itself.

I returned the transmitter to the original 832A. Everything was alright again. I can only say after all of this trouble I didn't have much love for the transmitter, in fact I gave it away.

Believe me fellows, this is not fiction but a true story. Beware when working in the v.h.f. or any other range for that matter, or else risk sickness or death as I did. I'd like very much to see an article on the dangers of too much body contact with r.f., written by one of our doctor hams. ■

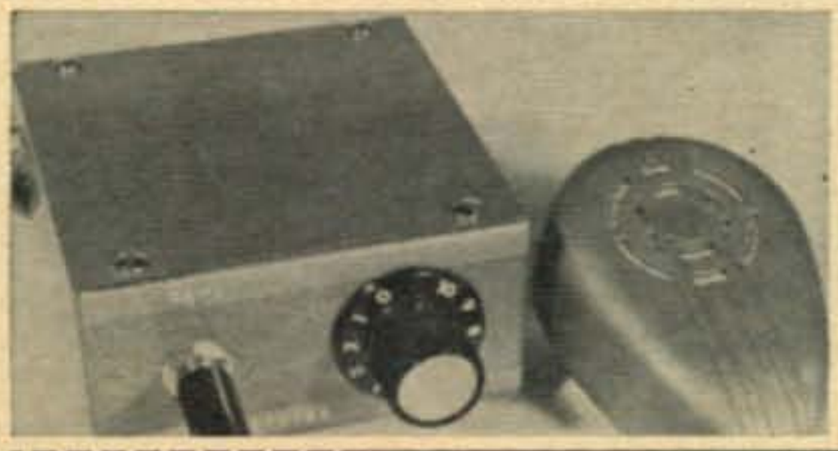
New Amateur Products

Sideband and Engineers SB-34

SINGLE sideband communications on four popular amateur radio bands (80, 40, 20, and 15 meters) are offered in new transistorized transceiver from Sideband Engineers, a unit of Raytheon Company. Compact, 20-pound SB-34 measures only 11¼" by 10" by 5".

Some of the features of the SB-34 are: built-in universal power supply for 117 volt a.c. or 12 volt d.c. operation; expanded frequency coverage with 250 kc span on all four bands for MARS and out-of-band DX frequencies; solid-state switching that eliminates relays, and drift less than 100 cycles in any half-hour period.

Tuning advances include a solid state varactor circuit for convenient dial calibration, delta receiver tuning that eliminates "leap-frogging" by permitting the receiver to be tuned over a range of several kilocycles either side of the transmitting frequency. The unit sells for $395. Complete specifications can be obtained from David Donath (W6JPM) Sideband Engineers, Raytheon Company, 317 Roebling Road, South San Francisco, Calif., or circle 65 on page 110.



Rann CA-1 Compressor

THE CA-1 is a four-stage microphone preamp and compressor, a form of automatic gain control, designed to give greater talk power. It is transistorized and operates from two penlight cells. The CA-1 sells for $19.95. For complete details write to: Rann Industries, 2801 West 50th Terrace, Shawnee Mission, Kansas, or circle 66 on page 110.

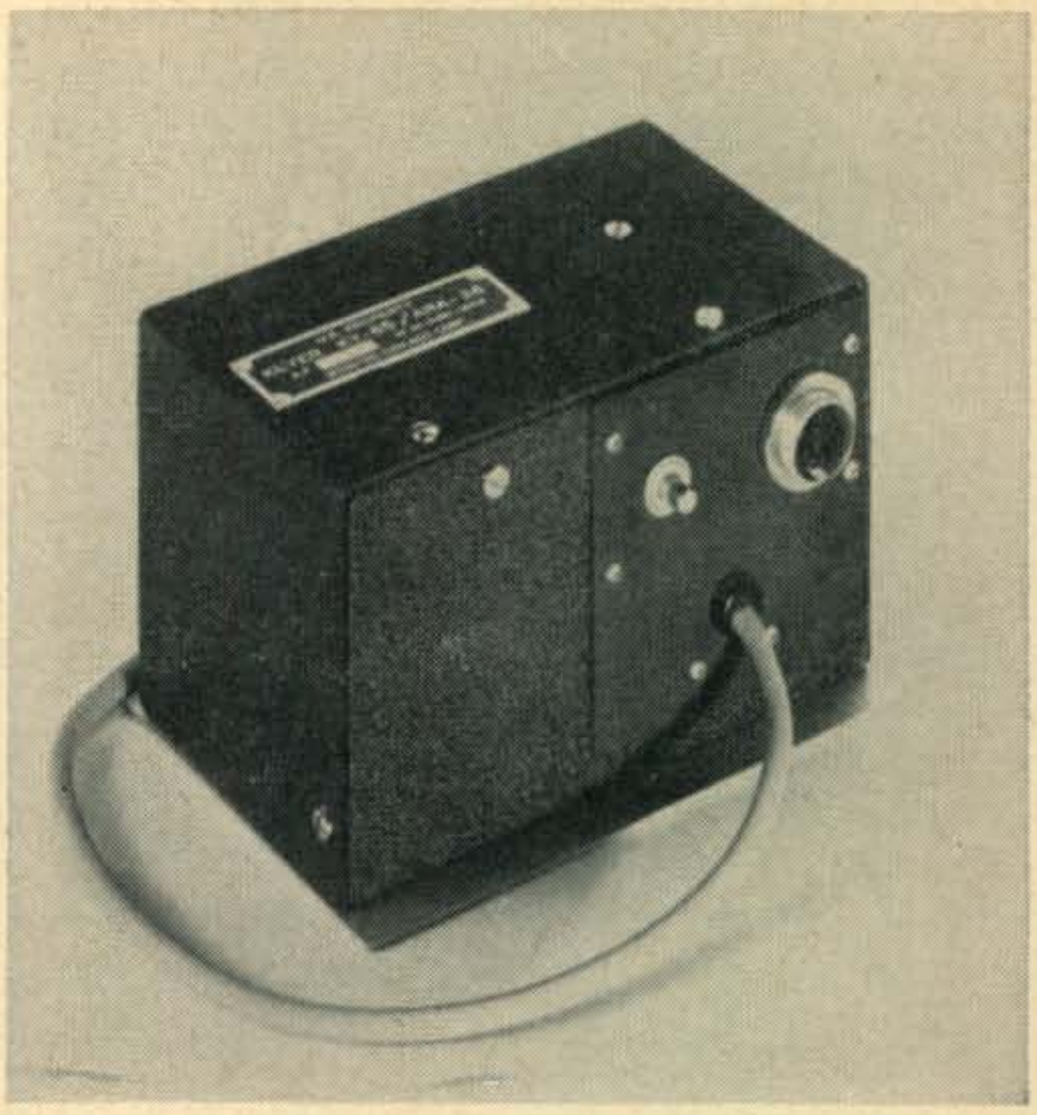


Fig. 1—Exterior view of the converted KY-65/ARA-26 Keyer shows the START button and the remote circuit connector (Amphenol 91-PC4F or equiv.) mounted on a 3⅜" square overlay panel.

Automatic Station Identification With A Surplus Keyer

BY A. F. KANDA,* KØMHU

THE recent amendment to the FCC rule on dual identification on RTTY, TV, etc.; requiring identification of the transmitting station only, makes automatic identification practical. The KY-65/ARA-26 Keyer is a surplus unit, probably collecting dust in many a shack, which can be easily converted to an automatic identifier.

Original Circuit

The original purpose of the unit is to automatically key SOS's, the last four digits of the aircraft serial number, and a series of long dashes when the craft is in distress. Briefly, the keyer consists of a 28 v. d.c. motor driving three code discs. In each disc, a step up in radius closes a keying switch and a step down opens the switch. One disc forms three SOS's per revolution and another forms two long dashes. The third disc is plastic with 94 break-away teeth, each equivalent to a dot length. The aircraft number is entered on this disc by breaking away teeth in the positions corresponding to spaces. A cam shaft driven one-seventh revolution by one revolution of the code discs (through a Geneva movement) connects the disc switches to the keyed circuit in the following sequence: One revolution of SOS disc, three revolutions of identification disc, and three revolutions of long dash disc. A tooth on a fourth track on the cam shaft opens a switch after the seven revolutions which presumably ends the automatic cycle for inclusion of manual keying or for reception. An adjustable time delay up to 30 seconds is provided after turn-on to allow the transmitter to be tuned to the distress frequency before keying starts.

Converted Circuit

In the conversion, the time delay is eliminated and the disc sequencing feature is disabled so that only the identification disc switch is connected to the keyed circuit. Six teeth are added to the stop cam to open the stop switch after every revolution instead of after every seven revolutions A transformer and bridge rectifier are added to permit line operation. Referring to the schematic diagram of the converted circuit in fig. 2, the identifier operates as follows: When the start button is pressed (or remote start terminals shorted) motor B_{101} will start rotating the identification disc and actuate the keying switch. Switch S_{102} will close shortly after the motor starts, permitting the start button to be released. After one revolution, a tooth on the stop cam will open S_{102} and stop the motor. The motor speed is regulated by a centrifugal switch in the rotor which opens at a predetermined speed and inserts R_{101} in series with the armature which slows the speed down until the centrifugal switch closes. The code speed obtained is approximately 12 w.p.m. The disc has a capacity of 95 dot-lengths which is large enough for a call like WAØOOO. Shorter calls may permit repeats and/or the inclusion of "de" before the call.

*2639 Harriet Avenue, Minneapolis, Minnesota 55408.

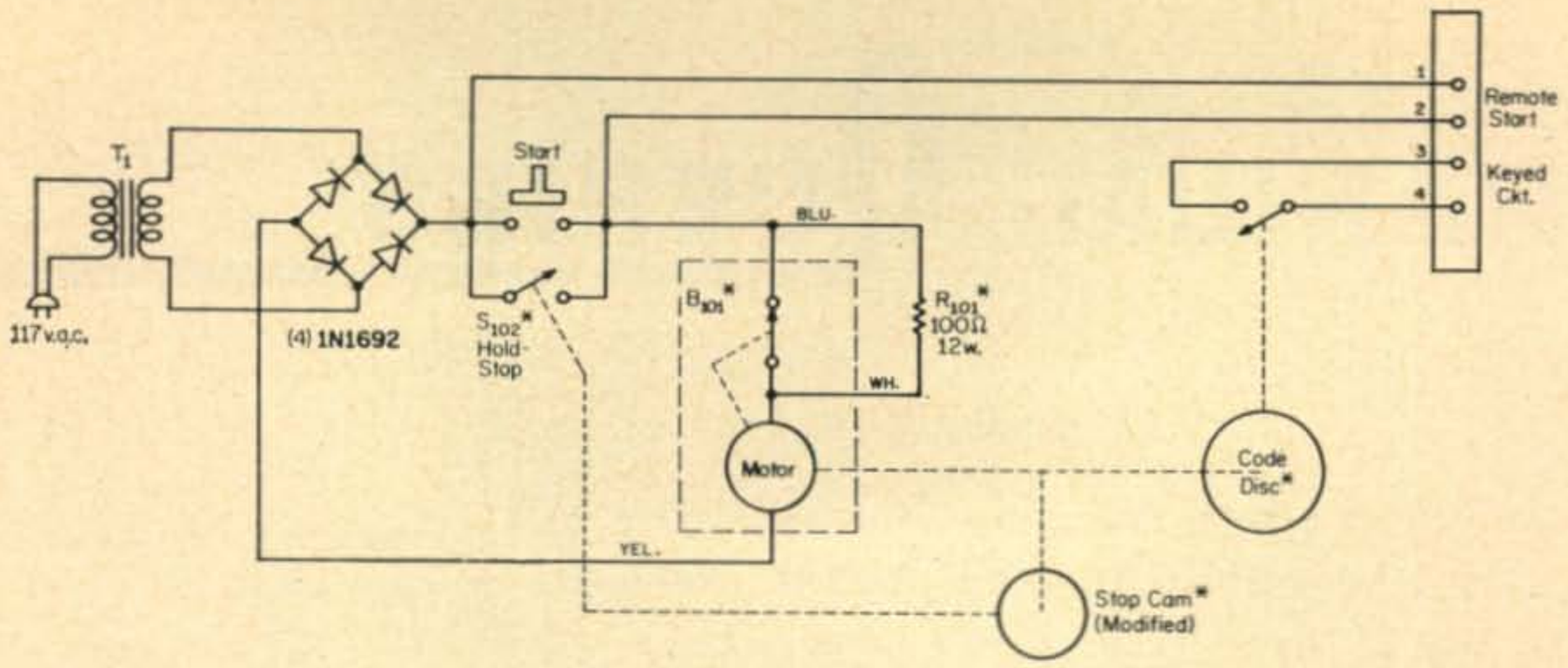


Fig. 2—Circuit of the modified keyer. All parts marked with asterisks are original equipment. Transformer T_1 is a 117 volt to 28 volt, 1 amp unit. The wiring and cam modifications are discussed in the text.

Step-By-Step Conversion

1. Remove receptacles $J_{101, 102, 103}$ and relays $K_{101, 102, 103}$.

2. Remove all wiring except blue, yellow, and white motor leads.

3. Install push button, connector, and line cord feed-thru bushing or grommet on plate covering original connector cut-outs as shown in fig. 1.

4. Mount transformer and rectifiers as shown in fig. 2.

5. Re-wire circuit to conform to fig. 2.

6. Bend switch feelers on SOS and long dash discs away from the discs.

7. Remove or disable linkage between cam shaft and identification disc switch.

8. Enter desired call on identification disc, saving the removed teeth.

9. Cement six teeth removed from identification disc to stop cam, and shape to conform to original tooth.

The last step is the most involved and the following amplification is offered to save any experimentation.

1. Locate positions of teeth to be added by first scribing a reference line on the cam bearing support in line with the existing tooth which may be in any convenient orientation. Rotate code discs until cam shaft advances one-seventh revolution. Transfer reference line to cam. Repeat until positions of all six teeth are located.

2. Cement plastic teeth to positions determined above with a two-part epoxy cement. Allow the mixture to get tacky to permit installing all six teeth at once without having them drift out of place.

3. After the recommended curing time, shape the new teeth to conform to the original with a small end mill or similar bit in a Dremel "Moto-Tool" or equivalent.

4. Check to see that the motor continues to run after the release of the start button and check that the code disc stops with the feeler opposite the second or third tooth ahead of the starting arrow. Failure indicates an improperly shaped tooth. Repeat for every stop tooth on the cam. ■

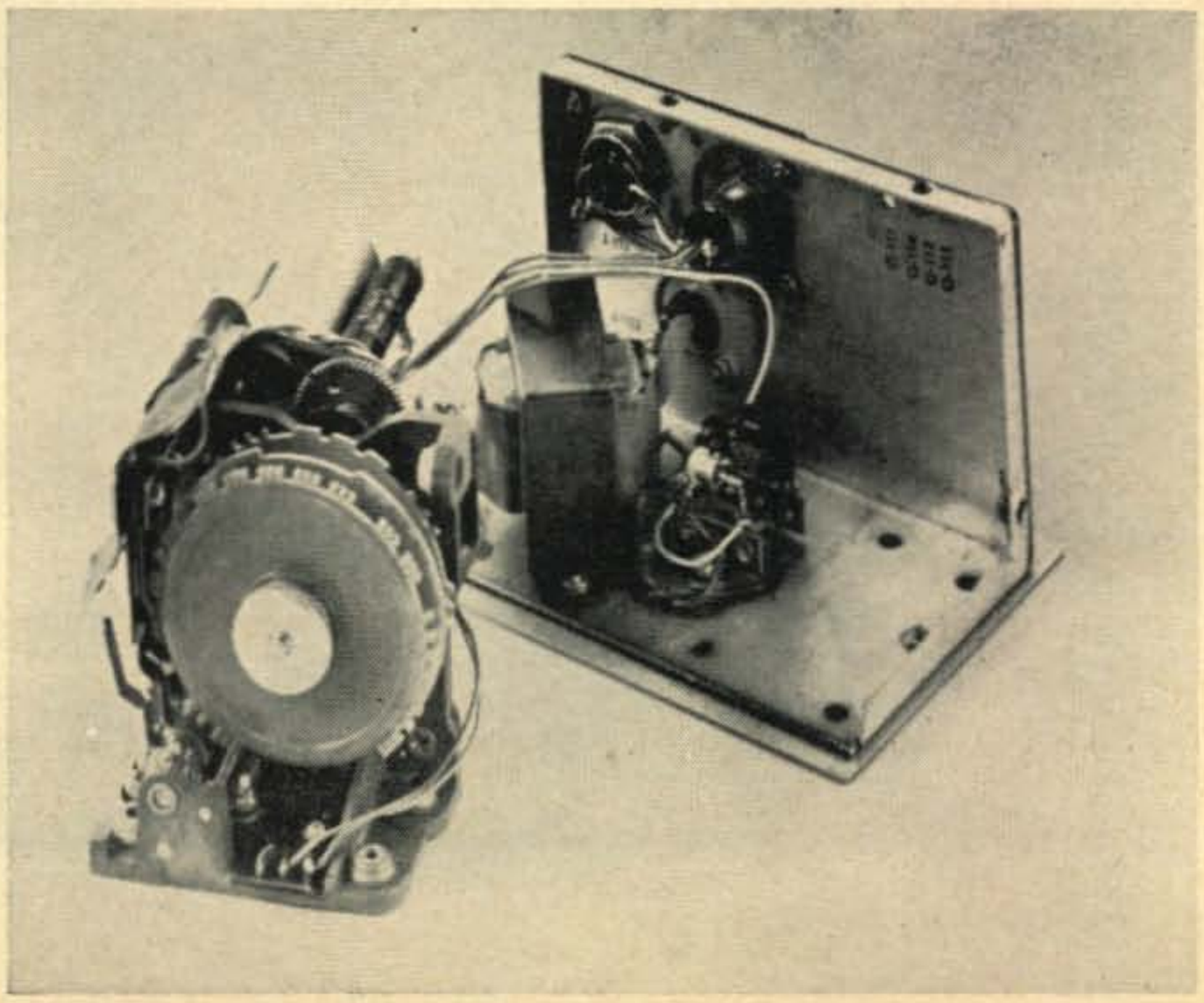


Fig. 3—Interior view of the modified Keyer shows the transformer and bridge rectifier. The motor/code disc assembly has been removed for clarity. The identification disc is the outermost one. The cam shaft is located at the seven o'clock position of the disc.

CRANIUM QUERIES

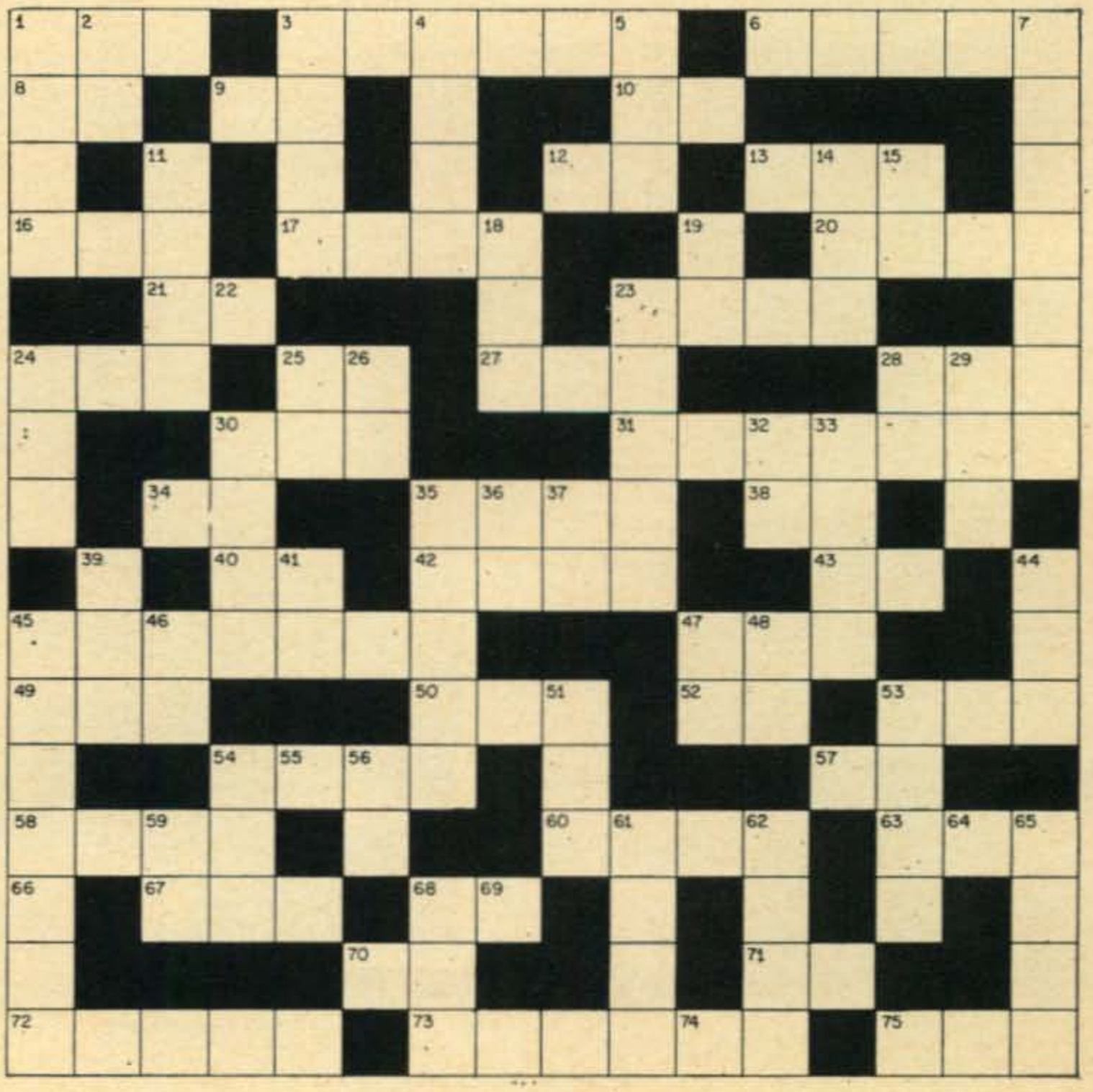
QRV? Pencil sharpened? Have some fun trying your skill at working this crossword puzzle. There are no gimmicks or trick words used. When you think you've penciled in all the right answers (pencil erases much easier than pen) check page 103 for the correct solution.

ACROSS

1. Push to talk
3. What a v.f.o. should be
6. r.f. output stage
8. Peruvian prefix
9. German prefix
10. Unit of capacitance (abbrev.)
12. 455 kc.
13. Voltage rating
16. What a 21 mc i.f. may lead to
17. — dipole
20. Ferrite — r.f. choke
21. Neon
23. Ear —
24. Send faster
25. — time constant
27. Not for a Novice
28. — adaptors are for checking a spectrum
30. For c.w. and s.s.b.
31. Cutting to size
34. Liechtenstein prefix
35. — wave
38. Power output (abbrev.)
39. — signals
40. End of transmission
42. Walked on
43. a.c.- —
45. May save your final(s) from burnout
47. Maximum number of kilowatts to the final stage
49. Automatic frequency control
50. Automatic volume control
52. Philippine prefix
53. — -dash means "A" on paper
54. — with tape
57. Dominican Republic prefix
58. Requires typing
60. — circuit
63. Automatic gain control
66. Letter symbol for current
67. Color representing "two"
68. End of QSO
70. Canadian prefix (*not* VE)
71. Megacycles
72. Antenna switching —
73. A v.f.o. must — down quickly for use on s.s.b.
75. Special postcard

DOWN

1. Binding —
2. Turkish prefix
3. Skeleton — antenna
4. Thomas — Edison
5. Electromotive force
7. "Check the —."
11. — coupling
14. A voltage level on a 500 ohm line may be measured in —.
15. Chilean prefix
18. Diode rating
19. OA2
22. Voltage symbol
23. Certain semi-conductors are — with arsenic.
24. Fading
25. An — probe may be required by your oscilloscope for certain measurements.
26. Cuban prefix
28. Many transmitters use a —-network in the final stage
29. Antenna
30. Three element —
32. Opposite of down.
33. What may be found in a radiation pattern
35. Grounding —
36. — drop along a resistance
37. Normally open
39. Now try sending with your left foot
41. Plate resistance
44. — side of the line
45. To be suppressed in s.s.b. and d.s.b.
46. 117 volts 60 cycle —
47. Outside diameter (abbrev.)
48. The thirteenth letter of the Greek Alphabet
51. Code practice oscillator (abbrev.)
53. Telephone —
54. Three phase power may be supplied by a — or delta connection of generators
55. Received OK
56. A carrier plus two sidebands equals —
59. A — switch may replace an antenna switching relay.
61. Component
62. Handle
64. Letter symbol for conductance (opposite of resistance)
65. Inductor
68. Distress signal
69. Go ahead



SPACE COMMUNICATIONS

We Made It Into Space!

BY GEORGE JACOBS,* W3ASK

"OH, Mr. Printer, how many exclamation points have you got? Trot 'em all out, as we're going to need them badly, because WE GOT ACROSS!!!!!!." So ran the lead story in *QST* which announced the reception of the first trans-Atlantic amateur radio signals late during 1921, and the opening of the "h.f. era" for amateur radio.

Well, Mr. Printer, trot those exclamation points out *again*, because this time WE MADE IT INTO SPACE!!!!!

OSCAR III Launched Successfully

OSCAR III, a communication satellite built entirely by radio amateurs, was launched into orbit successfully at 1830 GMT, March 9, 1965.

At that moment, a powerful rocket lifted slowly from its launching pad in California. With a mighty sheet of flame trailing from its tail, and with an ear-splitting roar, the giant rocket curved gently into the southeastern sky. Riding as ballast inside the rocket was the 35-pound, rectangular-shaped, OSCAR III satellite.

At an altitude of approximately 585 miles, the launch vehicle ejected its "deadhead" rider, and OSCAR III entered its own orbit. As the satellite roared overhead, radio amateurs anxiously awaited reception of its beacon transmitters, and prepared to communicate through the satellite's repeater system.

*11307 Clara Street, Silver Springs, Md. 20902.

RY RY RY. Bill, W6SAI, and Chuck, K6LFH, check out one of the RTTY printers at W6EE. Able maintenance of W6CYL and W6SCR elevated RTTY schedules from a chore to a pleasure!

Stations in Hawaii, Alaska, and California reporting receiving telemetry signals from OSCAR III during its initial orbit. Also during this orbit, K6GSJ, Palo Alto, California, reported hearing the signals of K6UQH, Santa Clara, California, relayed through the satellite. A five-year dream was now a reality; amateur radio was truly in the space age, as OSCAR III joined RELAY, TELSTAR and SYNCOM, as communication relay stations in space.

Orbit Data

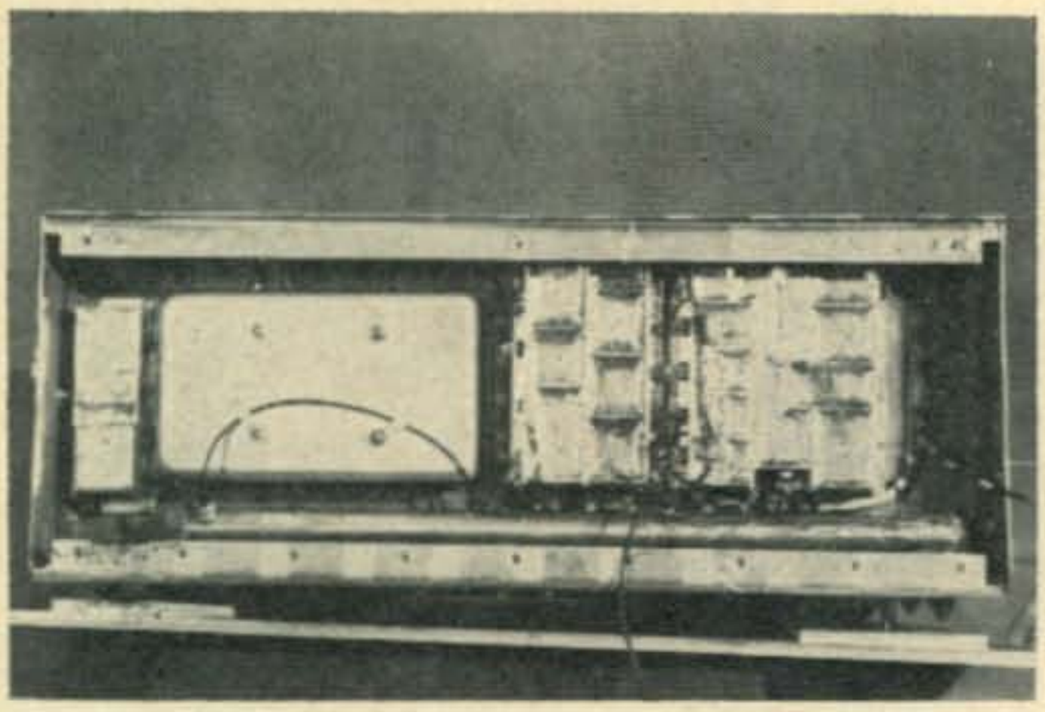
OSCAR III was launched into an essentially circular orbit at an altitude of approximately 585 statute miles, with an inclination of 70 degrees to the equator, and an orbital period of 103.5 minutes.

As soon as these parameters were established, they were flashed to OSCAR coordinators in every corner of the world, and to all radio amateurs via W6EE and W1AW.

Up-to-the-minute orbit and fly-over data was transmitted by W6EE on a regular basis, as well as by several radio amateurs in other parts of the world. (Deserving of special mention are

OSCAR Ceases Operation

PRELIMINARY reports indicate that the OSCAR III translator has become erratic or ceased operation some time after orbit 206 (1300 GMT, March 24, 1965). A study of available telemetry information reveals that the primary battery voltage is considerably lower than normal. Project OSCAR requests that radio amateurs monitor the telemetry channel (145.85 mc) as this transmitter is designed to switch to a separate, long-life solar cell and battery supply once the primary power supply fails. Reports of translator response, signals heard through the translator and beacon signals after orbit 206 would be welcomed by Project OSCAR. In addition, logs, reports of QSO's via OSCAR III and newspaper and magazine clippings of this radio amateur space experiment are requested. Please send all information, data, etc. to: Project OSCAR, Foothill College, Los Altos Hills, Calif.—*W6SAI.*



Side view of OSCAR III satellite with outer panel removed. Left to right: Telemetry transmitter (145.85 mc), linear amplifier for translator, and receiver portion of translator. Units are filled with quick-hardening epoxy foam and covered with aluminum foil. Across lower portion of the satellite package is a tuned filter used

Gary McGill (no call) and Bill Walters, W6MKE (right) prepare the Foothill College 1620 computer to run weekly prediction tapes for orbital parameters of OSCAR III. Computer was adjusted to punch 5-unit RTTY tape that could be immediately transmitted on the air by W6EE.

the independent orbital predictions prepared by G3AOX, and broadcast regularly by himself and other radio amateurs in the U.K., and those made by OK1FY, and transmitted regularly by 4U1ITU, Geneva).

As the world of amateur radio became aware of the successful launch of OSCAR III, an increasing number of antennas in all areas were beamed toward the speck of metal tumbling through space.

During the satellite's first eleven orbits, several dozen reports were received of stations being heard through the satellite, but there were no reports of any two-way QSO's. Although at the time that this column is being written, all reports of two-way communications through the satellite have not yet been evaluated, it appears as if credit for the first two-way QSO goes to K21EJ in Oceanside, N.Y. and K9AAJ in Quincy, Ill., who reported working each other on the satellite's 13th orbit.

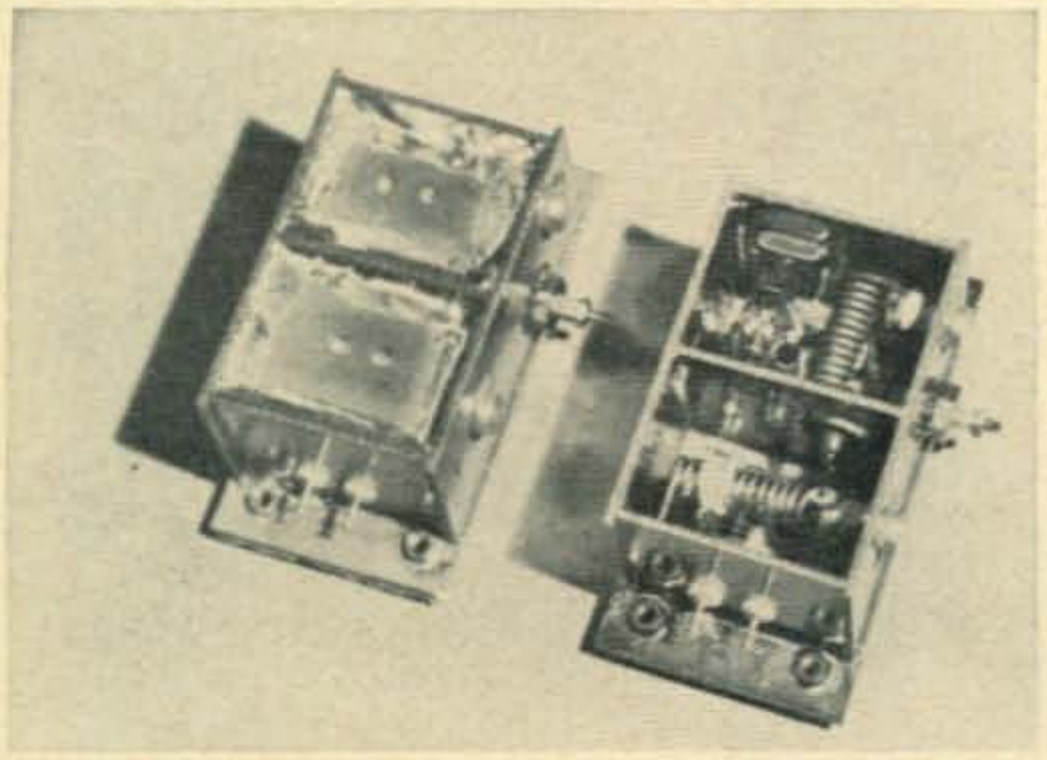
The ice was broken, and reports of two-way QSO's began to flow in to OSCAR Headquarters at Foothill College, Los Altos, California, in a way reminiscent of the first trans-Atlantic h.f. openings of 1922. New 2 meter records were made almost daily.

The event everyone was anxiously awaiting, the first trans-Atlantic QSO via the OSCAR III satellite, took place during orbit 61, when W1BU worked DL3YBA in northern Germany. This was followed soon after with a QSO between W1BU and HB9RG near Zurich, Switzerland.

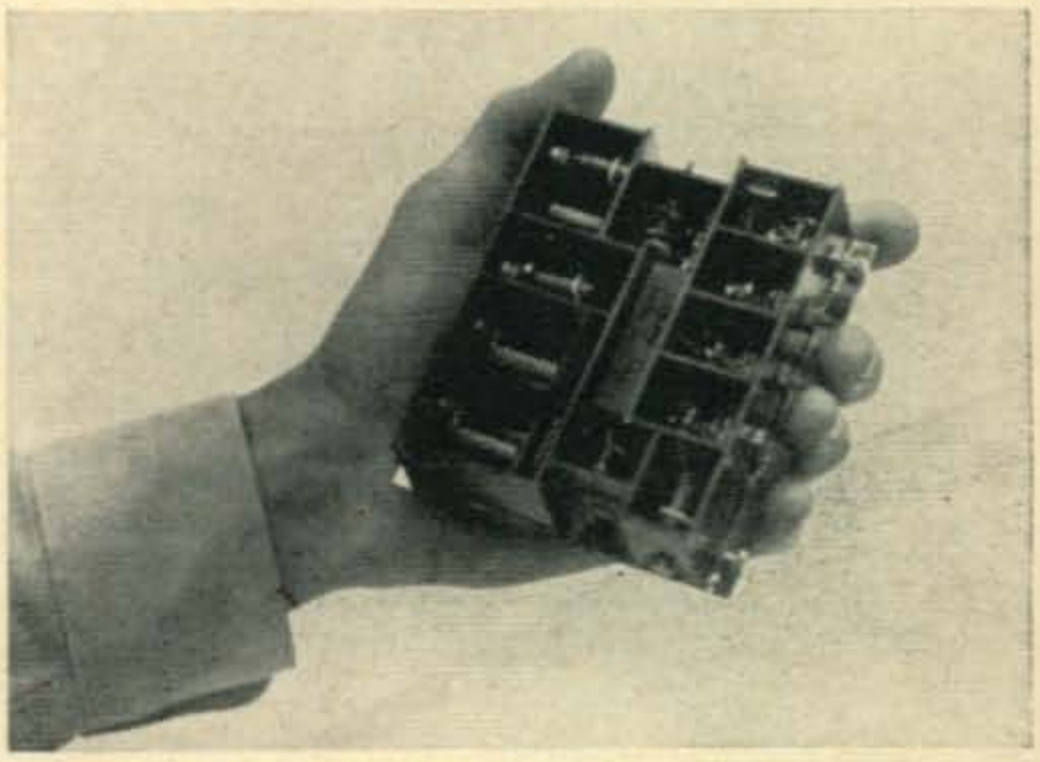
Several transcontinental contacts through the satellite have been confirmed. Credit for the first coast-to-coast 2 meter QSO is shared jointly between W6NLZ in southern California and K2GUG in New York State, who worked each other during orbit number 35, and K6HMS in southern California and K4IXC near Cape Kennedy, Fla., who also worked each other during the 35th orbit.

Stations Worked List

The following is a list of stations that have reported two-way contacts through OSCAR III's repeater during the first two weeks that the satellite was in orbit. The list is far from complete, but it indicates the wide-spread use made of the satellite.



The 145.95 mc coherent beacon that apparently failed during "blast-off". Complete beacon is at left (foam-filled and sealed) and duplicate open beacon is at right showing interior construction. It is thought that fragile overtone crystal of beacon shattered during launch of OSCAR III.



Receiver portion of OSCAR III translator is about twice the size of a package of cigarettes! Completely transistorized, this complex receiver converts the 144.1 mc input passband down to 30 mc, and passes it through a 50 kc-wide crystal filter. Signals are then converted up to 145.9 mc output passband.

The c.w. operating position at W6EE. Separate kilowatt transmitters were used on 80, 40 and 20 meter bands. Walt Read, W6ASH, at key, with RTTY operator Bob Walton, W6CYL, as observer.

The Hallicrafters 40 meter s.s.b. position. All s.s.b. transmitters were capable of control from a single microphone and tape recorder for simultaneous prediction broadcasts on 3 bands.

W1BU, W2AMJ, K2GUG, K2IEJ, K4IXC, W4WNH, W6QJW, W6NLZ, K6HMS, WA6MGZ, W8KAY, K9AAJ, KH6AQP, KL7CUH, DJ3ENA, DJ4AO, DJØZU, DL3YBA, DL9GA, EA4AO, G3BAR, G3LTF, HB9RG, LU3DCA, OK1CG, SM6CSO, SM7OSC, VK7DK, VK7LZ

OSCAR III Notes

During the last week of March, as this column is being written, the OSCAR III satellite continues to orbit the earth every 103.5 minutes. Telemetry measurements made as late as March 21 indicate that the satellite's internal temperature and battery voltage are both within normal limits.

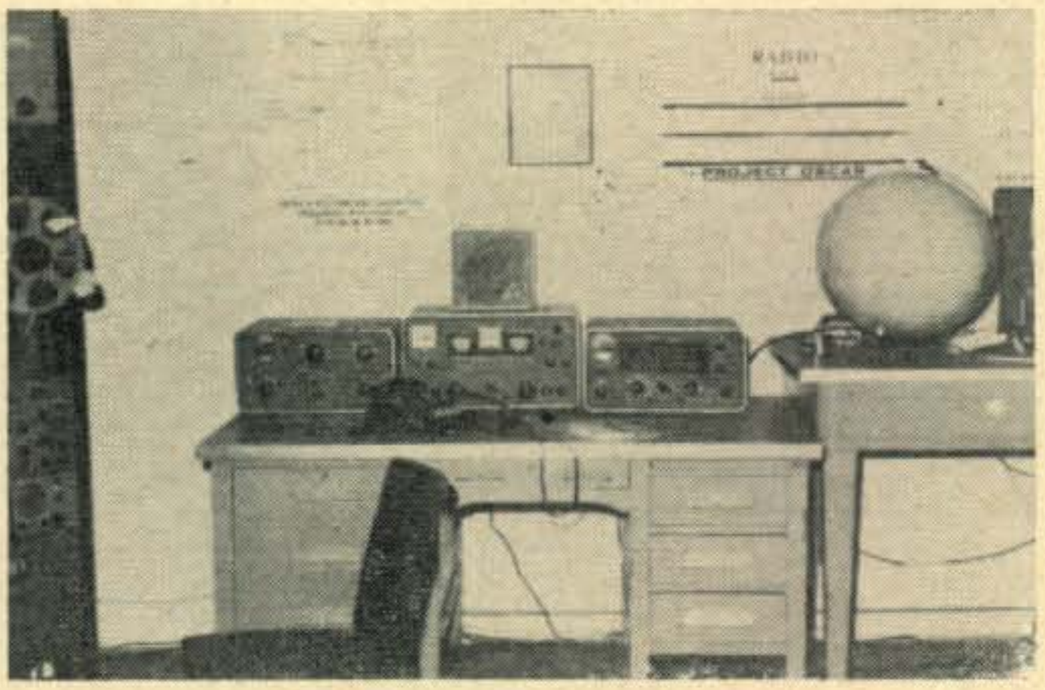
While the satellite's telemetry transmitter and repeater are expected to operate satisfactorily for at last the three weeks to one month period predicted prior to launch, the c.w. beacon transmitter on 145.950 mc appears to have run into difficulty. Although there were a few reports that the c.w. beacon may have been heard very weakly during early orbits, it seems that the transmitter never began to operate, or ceased shortly after launch. There is no explanation for the failure at this time, but the possibility that the transmitter's antenna failed to extend properly is under consideration.

The repeater's passband was found to be approximately 15 kc lower than originally planned. Instead of being centered on 145.900 mc, the repeater's 50 kc passband was actually centered on approximately 145.890 mc. This small shift in passband frequency did not appear to cause any difficulty, and its cause is not known.

The "tumbling" of the satellite in space appears to have produced a somewhat greater fading effect on signals than originally thought possible. As the satellite rotated end-over-end, the signals received on the ground by stations using linearly polarized antennas appeared to go into deep fades over relatively short periods of time. Often, the signal faded out completely for periods of several minutes. This effect was considerably less noticeable by stations using circularly polarized antennas.

OSCAR III's high orbit permitted a greater effective range for communications than was first anticipated. Many stations as far as 4000-4500 miles apart worked each other through the satellite, and at least one QSO was reported over a distance of nearly 6000 miles! The satellite's high orbit also required somewhat stronger signals from ground stations to activate the repeater than was originally planned. Although most of

The "S-line" at W6EE on 20 meter s.s.b. On 20 meters, 14.3 mc was chosen for the Oscar prediction broadcasts. Equipment was fixed-tuned to this spot and all controls marked for easy check and adjustment.



The 80 meter s.s.b. position of W6EE. Complete kilowatt s.s.b. station was loaned to Project OSCAR by Hammarlund Co. At left is rack of 145 mc tracking equipment in use at Project OSCAR HQ.

the stations reporting OSCAR QSOs were running high power levels, PAØRTD running only 60 watts was received through the satellite in Amsterdam, and DL1CK running 90 watts was heard in Sweden

The OSCAR III experiment brought out the importance of using antennas that can be rotated in both the horizontal and vertical planes. While many stations made contacts using either fixed arrays, or those that rotated in a single plane, those stations using arrays rotatable in both planes were able to "stay with" the satellite more often, and for longer periods of time.

C.w. appeared to be the most reliable mode for communicating through OSCAR III. Almost all of the two-way QSO's reported to date used c.w. Reception of s.s.b. was difficult due to the generally low signal-to-noise ratio, fading caused by tumbling, and Doppler shift.

A more complete analysis of the results of the OSCAR III experiment will be discussed in a special article now being prepared for presentation in *CQ* later this year.

A New Era

In this day of moon photographs and of human beings treading on the vacuum of outer space, the accomplishment of OSCAR III may seem small by comparison. To amateur radio, however, it is a dream that has come true. For the first time, the vast regions of the world have been spanned by radio amateurs operating in the vhf range. Just as the first trans-Atlantic QSO's of 1922 signaled the beginning of the h.f. era, so might the OSCAR QSO's signal the beginning of another new era for amateur radio—*the space era.*

As more than one radio amateur put it, upon hearing OSCAR III's repeater "open", "Gosh, it sounds like 20 meters during a DX contest."

Oh, Mr. Printer, trot out those exclamation points! ! ! ! ! ! ■

K2IEJ and K9AAJ QSO via OSCAR III

An event of such importance as the successful launch of OSCAR III on March 9 was bound to create a few "Men of the Hour." CQ is fortunate to have one of those heroes-for-a-day practically in its back yard.

MARCH 9 was a typical, dreary, late-winter day on Long Island, until about eleven in the morning when a breathless phone call from George Jacobs, W3ASK, started things popping. "OSCAR's up," he said. "Can you get something into the April issue?"

"Well, if we can't hold the press for something this big, I guess we never will!" was the reply.

And so started the most hectic few weeks in memory at the *CQ* offices. There were tracking systems to be built, phone calls to be made and information to be gathered so that we might be able to report intelligently on OSCAR. With an ear glued to the 20-meter OSCAR news channel on 14.300 mc, we wearily closed the day amid rumors that the three transmitters were only partly operative—rumors feeding upon the fact that to our knowledge, no signals had been heard relayed by the orbiting translator.

We did manage to squeeze a small blurb onto the April cover, and the next morning news arrived that signals had been heard through the satellite. ZERO BIAS was hastily altered to include the news, but it really pained us to see the presses begin to roll without mention of the first 2-way QSO via amateur radio's newest satellite, OSCAR III. Later in the day word came that the first 2-way QSO had taken place—K2IEJ worked K9AAJ on a random CQ on the 13th orbit (passing over Nebraska at about 11:50 A.M. New York Time)! This was history—two radio amateurs communicating through an earth satellite designed, built and tested *by* radio amateurs.

We quickly telegrammed our congratulations to K2IEJ and asked for the opportunity to photograph the equipment used, and interview our "back-yard hero." Our visit to Ernest Renner, K2IEJ, was a fascinating one, indeed. Here was a HAM and a real old-fashioned ham station from antenna to converter, from s.w.r. bridge to final. Only three pieces of commercially built gear were to be found in his second floor shack, and the only thing missing from the classic image of a ham station was the pungent odor of ozone.

Ernie Renner, K2IEJ, shown at the operating position of his strictly-two-meter station. Aside from the receiver and exciter, the only other commercially-built gear to be found in the shack is a Gonset Communicator used for local ragchewing. The W2AZL converter can be seen on the shelf, and several quarter-wave coax stubs used to protect it from the kw final are to the left.

The photos tell much of the story.

Getting down to specifics, the set-up consists of a Johnson 6N2 exciter driving a pair of 4-125A's (8 years old, well used), with silver plated tuned lines, producing a solid 2-meter kilowatt on c.w. The receiving system features a homebrew 417A converter (á la W2AZL) into a Hallicrafters SX-96 i.f. strip.

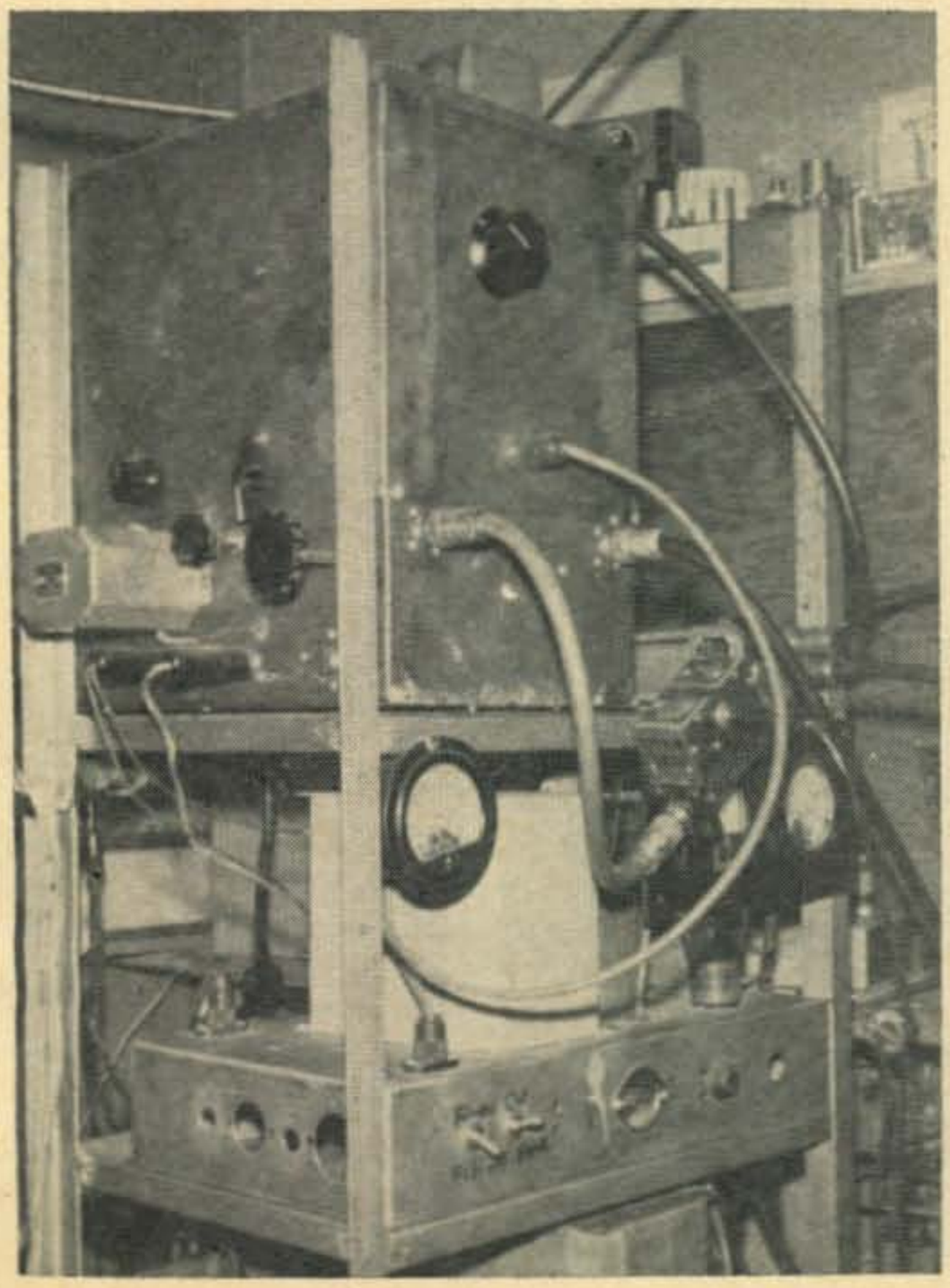
Ernie's antenna is not elaborate—not even tiltable. It is simply a homebrew 15 element yagi using large diameter elements for good performance over a wide frequency range. A prop pitch motor turns the 60′ high beam.

At the other end of the circuit was Lee Gray, K9AAJ also running a full gallon into an 8 over 8 J-slot antenna. The receiving set-up consists of a Parks 2-meter converter into a 75A-4. Lee was crystal controlled on 144.095 mc.

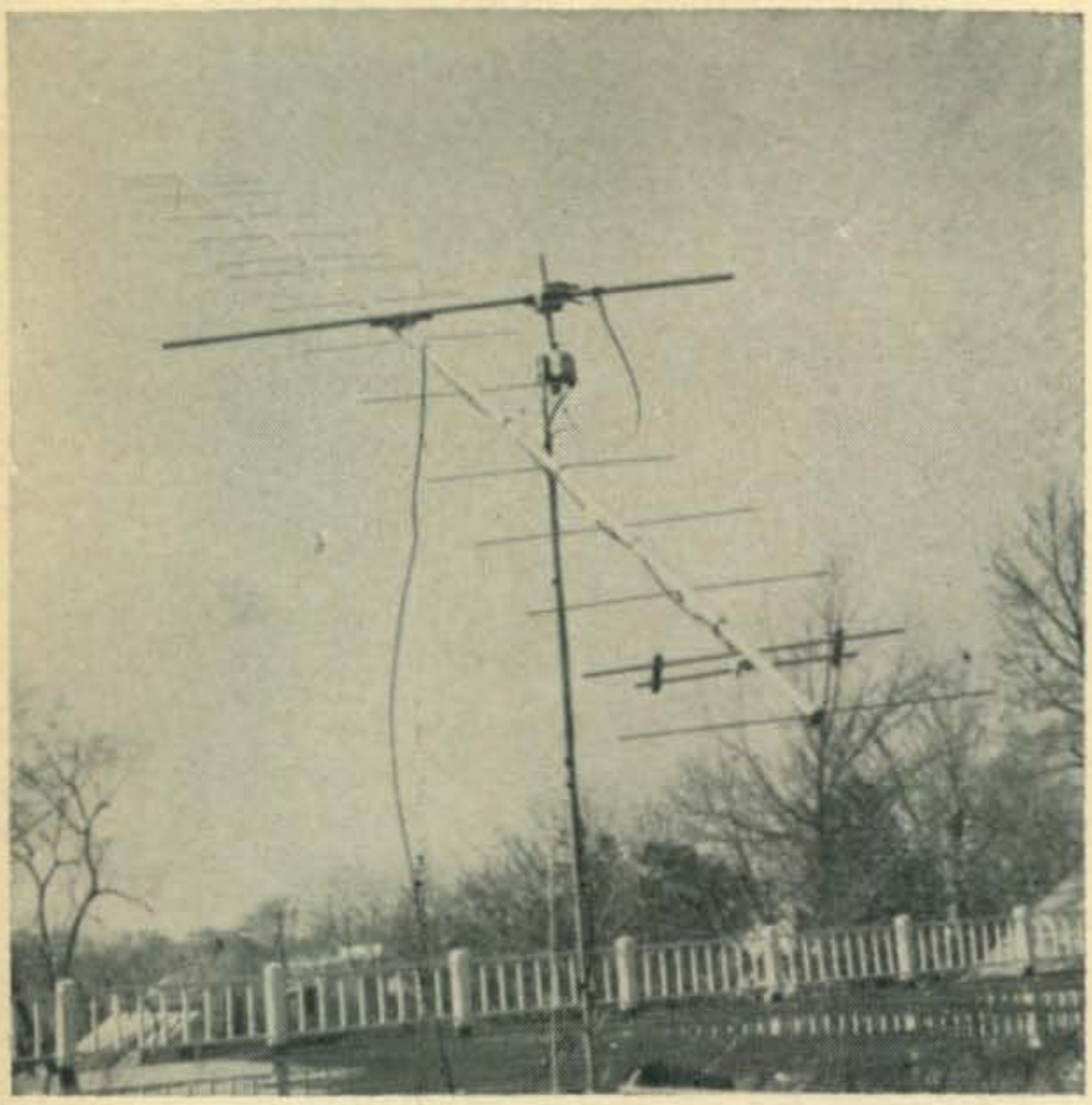
As Ernie tells it, the QSO came about through a random CQ beamed towards OSCAR on its 13th pass. Signals were fluttery, but a few quick c.w. exchanges at about 10 w.p.m. did the trick, with signals about 6 db above the receiver noise at each end. The whole series of exchanges spanned two minutes, and what with doppler shift, antenna tracking, etc, it was a hectic two minutes. Ernie was emphatic about the fact that relatively slow keying speeds are a must. This the *CQ* staff can verify, for at our own monitoring post in Port Washington the few speed-demon c.w. signals were almost always indecipherable in the noise.

K2IEJ was rock-bound on 144.075 mc. An unintentional error in the satellite's mixer frequency resulted in about 15 kc difference in the translator's output frequency, but once this was recognized, few fellows had any difficulty.

The high quality of the OSCAR signals can be



At the left is a close-up of K2IEJ's homebrew 4-125A final. The air-tight cabinet is of silver plated copper sheet for lowest possible ground resistance and best stability. In series with the output coax is a beautifully constructed s.w.r. bridge, one of several in the shack. Below is what the entire setup looks like. The large box containing a compass rose is, of course, the indicator for the prop pitch antenna rotor.



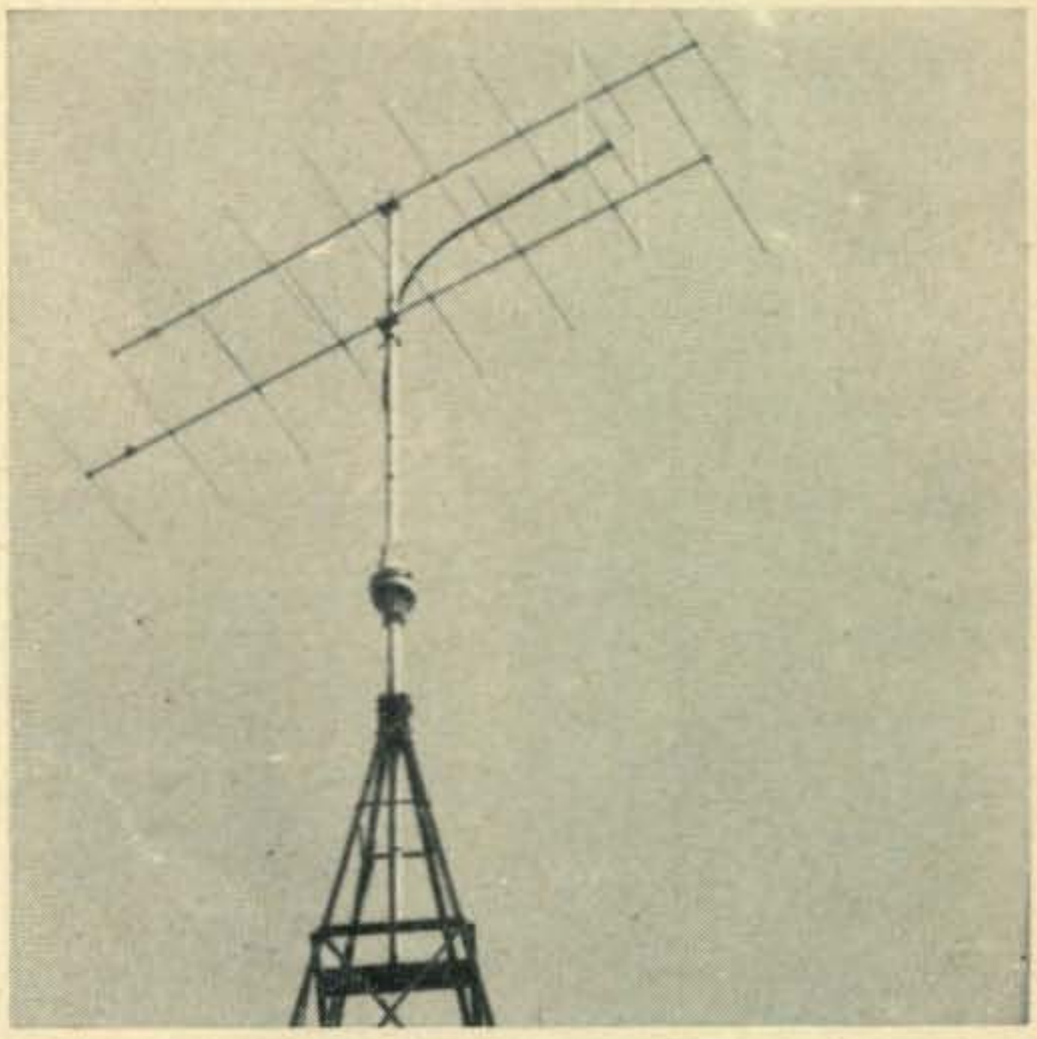
Just to prove that we've been on the job, the above photo is of our own 15 element beam, hastily erected on the roof of CQ's offices. The two Alliance rotors provide good control for tracking OSCAR's passes, although (by our own fault) the entire setup is rather "bouncy." In the first few weeks of OSCAR's orbiting we're proud to say that we heard every day-time, week-day pass within 2300 miles of New York.

adjudged from the high local noise level at Ernie's Oceanside QTH. With receiver noise, ignition noise and other assorted QRN, the S-meter seldom dropped below S-3, and OSCAR produced signals on S-unit above that!

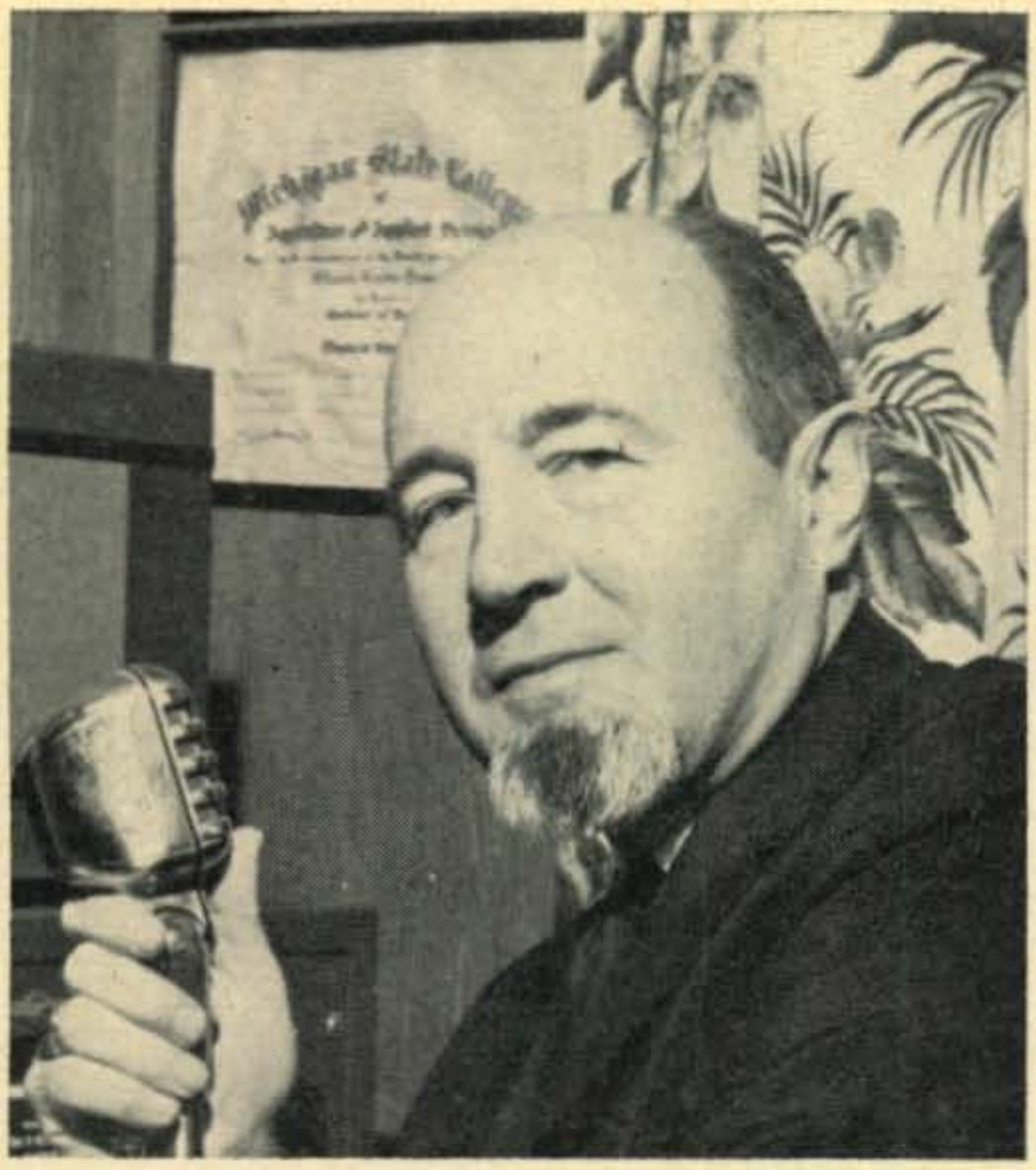
This, then, was the beginning. Many QSO's were to follow, not only by K2IEJ and K9AAJ, but by dozens of enthusiasts around the world. Even as this is written reports are still coming in of more spectacular contacts bridging continents, oceans, and international boundries. Two-meter DX records were broken again and again with the latest record being nearly 6,000 miles! Two meters will never be the same!

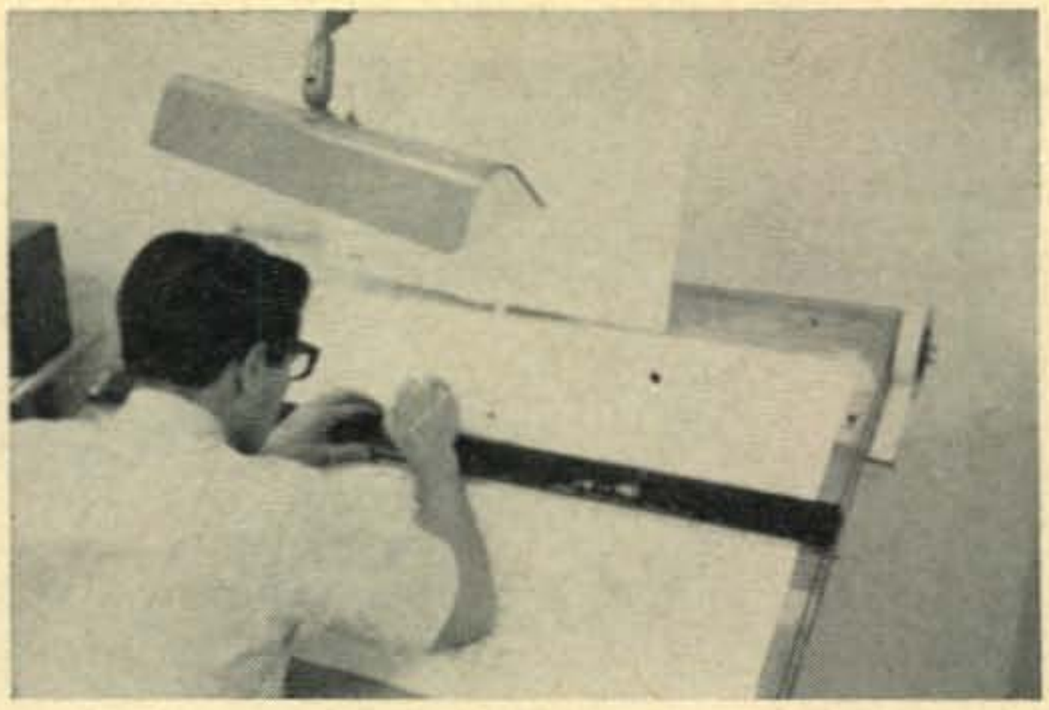
Among the stations active early in the OSCAR experiment were: WA2WEB, K2MWA, W2AMJ, K2GUG, K2IEJ, W1HDQ, W1BU, WØIDY, KØCER, WØEYE, WØNWX, K4QIF, K4IXC, W4WNH, K5TQP, W6KEV, W6QJW, W6NLZ, K6HMS, WA6MGZ, W8KAY, K9AAJ, KH6AQP, KH6UK, KL7CUH, VK7DK, VK7LZ, EA4AO, G3BAR, HB9RF. Of course the final tally won't be available for months to come, but rest assured that participation in the OSCAR experiment has *not* been limited to a select few. Literally *thousands* of amateurs around the world, working with equipment from the most exotic right down to the modest Heath Twoer, have either worked through or monitored OSCAR III.

OSCAR's translator won't be operative for very long. Surely as you read this, it's batteries will have been dead for weeks, but this by no means spells the end of OSCAR III, for it's telemetry transmitter will continue operation on 144.85 mc for an indefinite period, operating from solar batteries. This telemetry is important! Even if you missed out on the translator, get that 2-meter gear working and help complete the story for the Project OSCAR Association. Learn to track and predict OSCAR's orbit; study its Doppler shift; listen for the "tumbling rate"; and above all, prepare yourself and your equipment for the time that we can once again proclaim: "It's Up! It's A-OK!" ■



The 8-over-8 J-Slot antenna above took care of the sky-wire situation in Quincy, Ill., for Lee Gray K9AAJ, at the western end of the world's first known two-way communication via OSCAR III. By March 19, Lee had worked ten other stations, from coast to coast, through OSCAR III. All that with a non-tiltable antenna! Perhaps that "garden hose" he's using for coax has something to do with it!

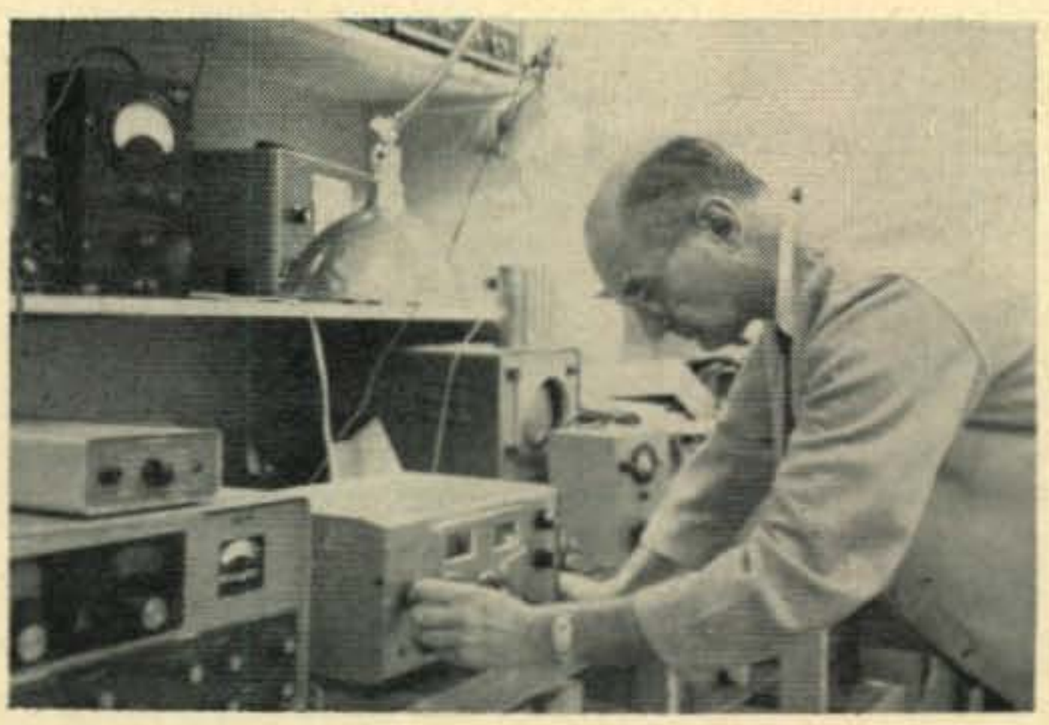




A peek over the shoulder look at one of the CQ art dept. preparing an upcoming article.

← Gil Pearsall, W8HEZ, Mason, Michigan, is chairman of the 1965 Michigan Week Amateur Committee. The object of Michigan Week is to tell other hams about Michigan during this week long contest. Check the ANNOUNCEMENTS column for further details.

PEOPLE AND PLACES



Here's Bill Scherer, W2AEF, our Technical Director hard at work checking another piece of gear. For a thorough evaluation of commercial equipment read Bill's reviews.

This is how our esteemed USA-CA Editor looked in early 1942. This ad was taken from *Amateur Radio Defense* magazine which ceased publication at the start of WW II. For an up-to-date photo of Ed look on page 84.

We welcome all photographs. Others are interested in what you or your organization does.

The Ten Minute Minder

BY J. OUELLETTE,* VE3DSF

THIS simple minder came about as a result of the necessity for an accurate intervalometer required for actuation of a time lapse movie camera. Repeatability and timing was found to be so precise, actually better than one second per ten minute, that it was decided to use the circuitry in other applications.

The unit described here, is for a one repeat per second continuously adjustable to one repeat every 12 minutes. Presently this device is used as a "Ten Minute Minder" tone generator with a warning light indicator as reminder for "time to identify radio amateur call" as per legal procedure. It is particularly useful during phone patch operations, long winded QSOs (when set at the three minute time), as a long distance telephone time reminder and also as a "beep" generator for legal recordings.

The transistors are of the unijunction type and basically C-R time adjusted relaxation oscillators. Components R_1 and C_1, in Q_1 were selected for one pulse every second and adjustable to one pulse every 12 minutes, in Q_2, R_4 and C_2 were selected for an audio tone of approximately 600 cycles. Resistor R_2 may be changed to other values for any desired tone.

The output of this tone generator is sufficiently loud to be heard throughout the house despite its surprisingly low current of 5 ma through the 3 inch speaker. For maximum cycling stability the value of R_3 is selected for a 1N869 zener current of 5 ma which is read during charging cycle (off time).

The normal power supply requirement is 25 v.d.c. but 12 v.d.c. may be used providing R_2, R_3, R_5 and another zener diode are selected (lowered) in value to maintain the same current relationship. The lamp circuit is optional, but does provide additional warning where other tones are being heard. The tone and light On period is approximately a 2 second duration and draws 50 ma total current of which the lamp takes 35 ma and the remainder for the conduction time of both Q_1 and Q_2. Rest period or charging time is only 5 ma.

The complete unit may be housed in a small defunct transistor radio case and the usual miniature phone jack, used as the input for the power supply voltage which may be coming directly from a 25 v.d.c. source or through the transmit relay source of the transmitter if on the air timing is required. The reset switch may be used at any time to start and time an operation. ■

*450 Judlea Court, Richmond Hill, Ontario, Canada.

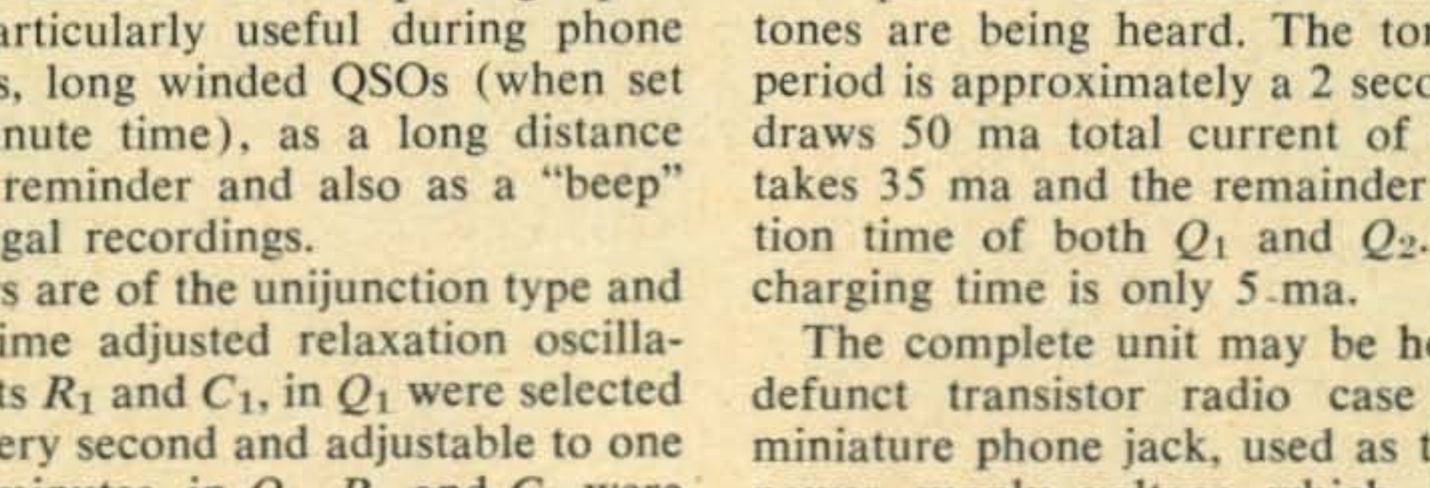


Fig. 1—The circuit of the "Ten Minute Minder" makes use of two Unijunction transistors. All resistors are ½ watt and all capacitors are in mf.

Who says 160 is Dead ?

BY CHARLES M. O'BRIEN,* W2EQS

YES, who says Top Band is dead? ? ? To many of you, that which is to follow will come as a complete surprise. But, before I get into the meat of the subject let us go back into the thirties at which time we had, excluding the u.h.f. and v.h.f. bands, 10, 20, 40, 80 and 160 meters. Those fortunate enough to have a Class A license were permitted the use of phone on 20 and 75 meters. Those with Class B and C were limited to phone operations on either 10 or 160 meters.

Back in the early 30's the 160 meter band extended from 1715 to 2000 kc. C.w. operations took place between 1715 and 1800 kc. which was shared with Canadian phone. Later in the 30's the band was shortened to 1750 thru 2000 kc. And, shortly before World-War II the band was increased 50 kc. to run thru 2050 kc. But this never went into effect due to the outbreak of the war and the resultant ban on all amateur radio operations.

One-Sixty used to be jammed from one end to the other 24 hours a day and many and many a cross-country net involving all districts would take place on a given frequency over the week-ends especially. Fun? You betcha! ! QRM was rampant such as it is today on, for instance, 20 and 75 meter phone. I ask, would you believe that statement? Many of the old timers will but you boys who have been licensed post war would never begin to realize that such was the case. Trans-Atlantic c.w. tests were conducted Saturday nights/Sunday mornings by Stew Perry, W1BB. Many crossings were made and one of the greatest thrills I ever had in my life was that of receiving a heard card from G2AA 'way back in 1933.

Then came infamous December 7, 1941 and all amateur operations ceased immediately. Very gradually, beginning in 1945, certain amateur frequencies were returned. Eventually we were assigned two entirely new bands, 11 and 15 meters, with 11 subsequently being taken away from us and turned over to the Citizens' Band communications. Different forms of licensing came into existence with 20 and 75 meter phone operations being permitted by anyone but Technician and Novice type of licensees. Then came 40 meter phone.

Now, what had been happening to 160? During the war a very secret type of transmission came into existence known as Loran. Its three main operating frequencies were 1850, 1900 and 1950 kc. Amateur radio operations on the 160 meter band weren't permitted to be resumed until April of 1949 and, at that, only on a shared basis with Loran. The segments we have today consist of 1800/1825 kc.; 1875/1900 kc.; 1900/1925 kc. and 1975/2000 kc. with only certain sections of the country being given operating rights in only certain portions of these four segments. Power was limited to 500 watts day and 200 watts night. Then, a couple of years back, varied power limitations were granted to amateurs in certain areas of the country. For instance, here in New Jersey we are now limited to 200 watts day/50 watts night within the frequency range of 1800/1825 kc. and 100 watts day/25 watts night within the frequency range of 1875/1900 kc.

Working DX on Top Band is both challenging as well as being extremely interesting. Many of you may ask, "What kind of DX can be worked with such comparatively QRP on this our lowest frequency band?" PULL-ENTY is the answer. And, to make matters even more amazing many foreign countries limit the power input to a mere 10 watts—yet they get across the pond. Exactly how many countries permit amateur operations on 160? That I cannot answer simply

The author Charles O'Brien. Charlie is a frequent contributor to CQ.

*48 Prospect Avenue, Westwood, New Jersey.

because many do permit such operations but there is no activity on the band by amateurs located within these countries. But, this I can say, W1BB has worked 84 countries; some Gs are well up in the 50 bracket and I, myself, am up to a respectable 45 on all continents but Asia, yet I've heard that continent when Bob Snyder was there operating as EP2BK. Unfortunately he is but one of three countries I've heard on the band but failed to QSO. He is now currently 9M4LP (ex-VS1LP) and is quite active on the band from that far away spot and just recently made the first ever QSO by anyone to Japan whose nationals are now allowed a spot frequency of 1880 kc. Worked All States? Many don't have that accomplished yet on the higher bands yet a number have QSOd all 50 States on 160 including your scribe.

A thrill? A challenge? You betcha it is! Nothing can be more rewarding than to work a G, a DL, a VP7 or a VP9 on this band while on the higher frequency bands such QSOs are so commonplace as to be considered nothing more than local QSOs.

Going back just a few years there was very little c.w. activity on 160 as compared to today. Listen in some night and see for yourself—particularly Saturday night/Sunday morning. During the Fifth Annual *CQ* 160 Meter World-Wide CW Contest held in January of 1964 a total of 1,506 stations in 28 different countries took part. Of this amount 904 were in the United States. How did so many stations squeeze into such a small frequency allottment? It was rough but they did.

Many foreign amateurs may operate only within the segments allotted to the United States and Canada. But, many other countries grant permission to use the entire band from 1800 to 2000 kc as long as they don't interfere with ship-to-shore and other sundry land services.

During the year September 18, 1963 through September 17, 1964 W2EQS, for example, had 794 QSOs with 411 different stations.

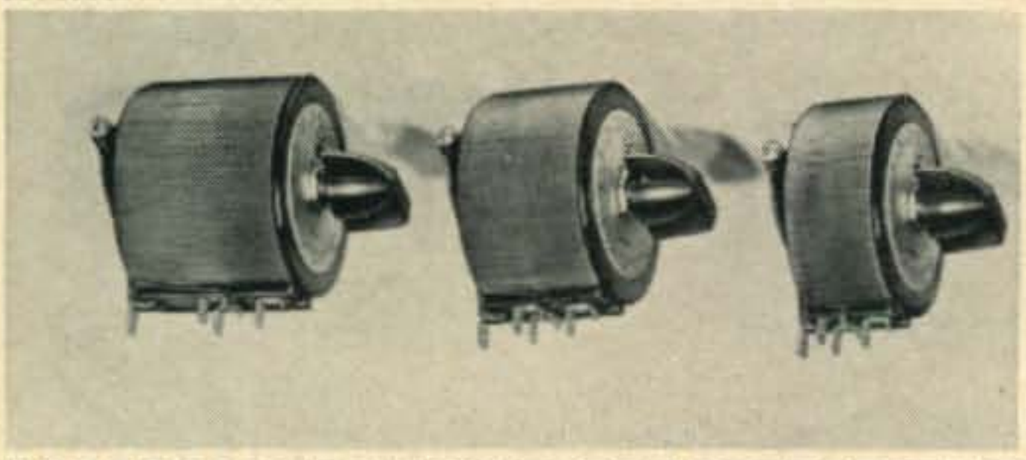
In the event you may be interested here is a breakdown of different stations worked by me by call area during this period of time: (1) 51, (2) 75, (3) 33, (4) 39, (5) 6, (6) 7, (7) 6, (8) 82, (9) 35, (Ø) 17. Amongst those outside of the United States were QSOs to 29 different VE/VO stations in *ALL* districts (including VE8) and 41 QSOs to different DX stations in 14 countries.

In ending just what is it that I've worked? CN2 CT1 DL EI FP8 G GD GI GM GW HB HC HI HK HR KG4 KH6 KL7 KP4 KS4 KV4 KZ5 LU OK PAØ TI TI9 UB5 VE VK VP1 VP2 (Antigua) VP2 (British Virgin Is.) VP3 VP4 VP5 (Cayman) VP5 (Turks & Caicos) VP7 VP8 (So. Orkneys) VP9 W XE YV ZL and 6Y5. Not bad, eh? Gotaways were EP2, a DXpedition to M1 and 9L1. The 9L1 just got on and undoubtedly by the time you read this I'll have him under my belt as #46.

WHO SAID ONE-SIXTY IS DEAD? To quote Mae West, "Come up and see me sometime." You may get the surprise of your life.

QRZ, QRZ, QRZ de W2EQS

New Amateur Products



Ohmite Variable Transformers

A NEW bulletin (504A) from Ohmite Manufacturing Company describes a new line of compact variable transformers offering 6 ratings between 1 and 3 amps.

Write for Bulletin 504A from Ohmite Manufacturing Company, 3650 Howard Street, Skokie, Illinois 60076, or circle 61 on page 110.

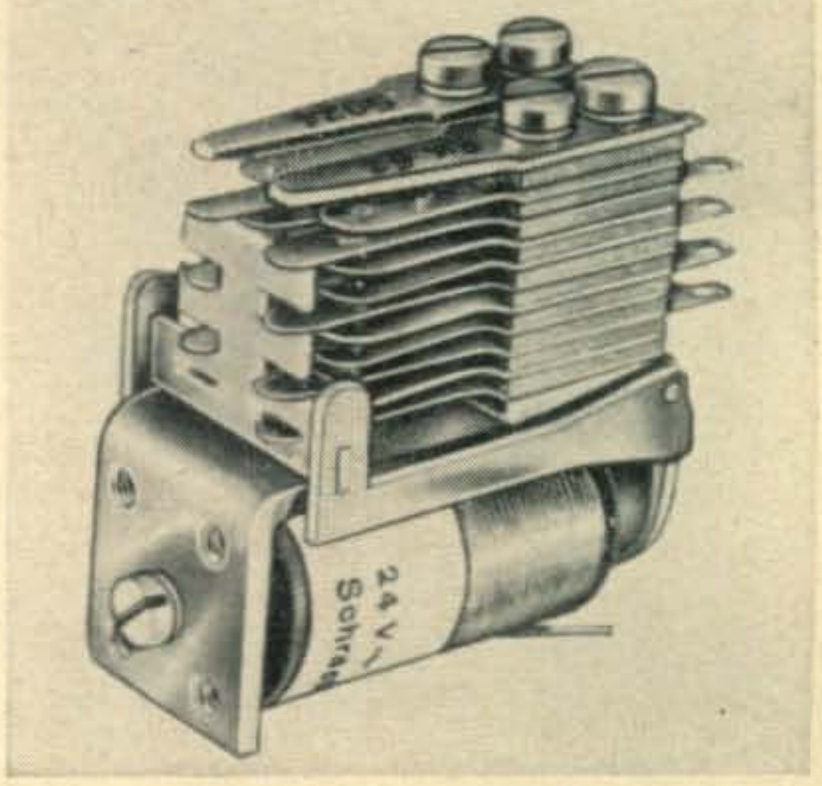
Schrack Type RK Miniature Relays

ANNOUNCEMENT has been made by Schrack Electrical Sales Corporation that they now have available the new Type RK Miniature Relays.

The Schrack Miniature Relay Type RK is a comb-actuated relay (laminated phenolic blade lifter plate). The standard contact material is fine silver (gold flashed), with a rating of 3 amps to 5 amps depending on size of contact.

The type RK, is also available with a clear transparent plastic dust cover.

For specifications covering RK Type Relays or the complete Schrack line, write to Schrack Electrical Sales Corporation, 1140 Broadway, New York, New York 10001, or circle 62 on page 110.



RTTY From A to Z

BY DURWARD J. TUCKER,* W5VU

Part X

This month's installment describes the adjustment procedures for polar relays and the circuit of a polar relay test set that may be constructed by the reader.

It was noted earlier that some amateurs use polar relays while others do not. If careful consideration was given to the advantage of the polar relay it is likely that all RTTY'ers would use them.

The greatest advantage is obtained when the polar relay is used for transmission. It is possible, as explained earlier, to frequency shift key a transmitter with the keyboard transmitter mechanism directly, either dry or wet method. Unfortunately, however, the keyboard contacts do not provide clean keying but introduce a problem called fortuitous distortion and the operator will be completely unaware of it. A discussion of this problem will be presented later.

Reception with the use of a polar relay poses a problem of hash. The contact arcing produces r.f. interference that can be a problem when trying to pick up weak signals. It is possible to install a hash filter[13] across the polar relay contacts which will effectively suppress this interference. This circuit is shown in fig. 63.

The component values are not particularly critical but they should be mounted close to the polar relay socket with the shortest leads possible.

General

In some respects it can be considered that the polar relay is fairly rugged considering its sensitivity, precision and speed of operation. Even with only a casual inspection one cannot help but realize and appreciate the superior qualities of this relay. Relays that have provisions for mechanical adjustments are not too common to amateur radio and might cause the average amateur to shy away from its use. This is certainly understandable because adjustments on a special piece of gear, such as a polar relay, usually requires special tools or test equipment as well as special skills.

The adjustment of a polar relay probably requires as much patience and careful handling as it does skill. The availability of one or two special tools as well as a volt-ohmmeter also helps. The additional availability of a special polar relay test set, such as the one covered in detail later on, should make the job of adjusting your polar a pleasant and interesting experience, instead of a rather distasteful and painstaking chore. The availability of an oscilloscope to be used to view the action around relay contacts 1, 4 and 5 should further aid in making the polar relay adjustments, and, at the same time, add to one's enlightenment and interest in the project.

Bias Distortion

It is not sufficient for the armature of a polar relay to just swing from side to side, closing and opening contacts. We are also concerned with the timing or precision with which it operates. For instance, a polar relay that is improperly adjusted may elongate or shorten the *mark* or *space* pulses. This is called *bias distortion* and it is a troublesome and unwelcome intruder. The elongation of the *mark* pulse, and the resultant shortening of the *space* pulse, simply means that the relay adjustment is such that the armature spends more time at the *mark*

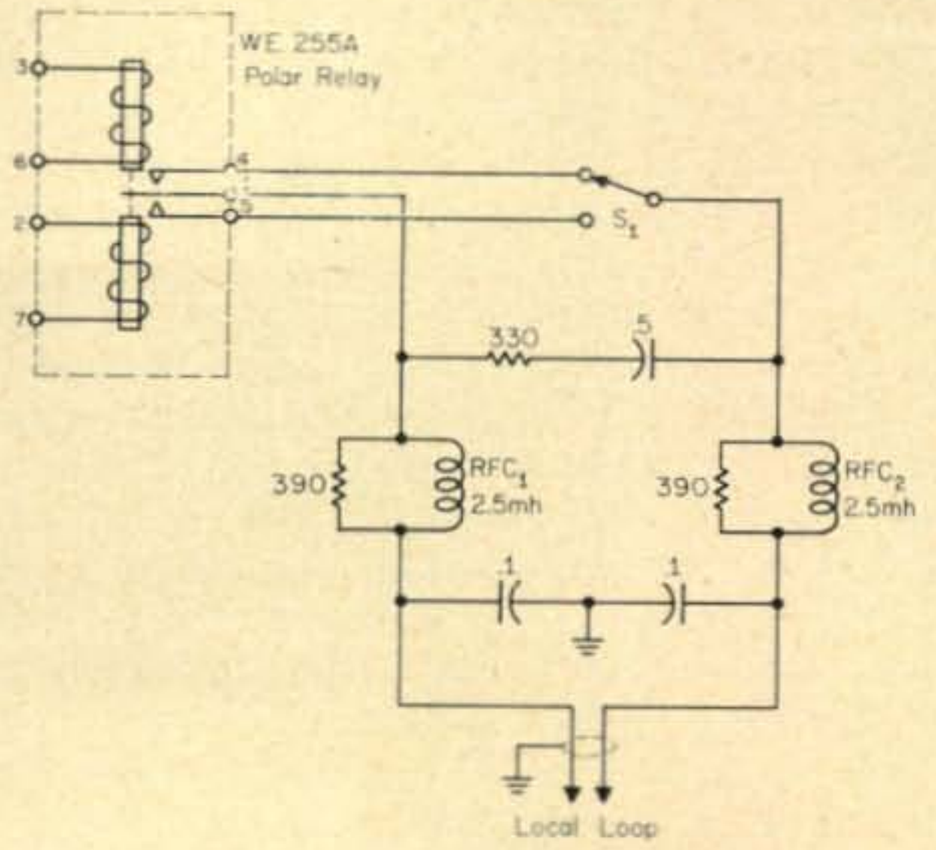


Fig. 63—Circuit of a polar relay hash filter that may be needed when the relay is used for RTTY reception. Switch S_1 is for reversing action.

*6906 Kingsbury Drive, Dallas 31, Texas.
[13]RTTY Column, Kretzman, B., *CQ* August 1961, p. 102.

Fig. 64—Homebrewed Polar Relay Test Set is made in two sections. The relay test socket is separated from the main unit by a four foot cable.

contact than it does at the *space* contact, even though the length of the pulses being fed into the relay are equal. One should be certain as to whether or not the *mark* and *space* pulses being received really are equal before an accusing finger is pointed at the polar relay. If the polar relay is in proper adjustment an elongated signal fed into it comes out elongated. Likewise, a shortened signal fed into it comes out shortened.

It can be seen, then, that one of the important reasons for adjusting the polar relay is to either eliminate bias distortion altogether or at least keep it to a minimum. Sometimes, you hope for the first and settle for the last.

At this point one might well ask why the armature of a polar relay will spend more time at one side than the other, elongating either the *mark* or *space* pulse. It is generally considered that the polar relay is "spring-less" since it has no spring to hold or bias the armature to one side. The construction of the armature is such that it *does* have some allowable spring action in its long slender length, since its base end is rigidly anchored. Incidentally, the contact spring sections (two pieces) at the free moving end of the armature is of non-magnetic spring material to cushion the contact action at this point. Under proper adjusted conditions, the distance of travel of the end of the armature, at the two contact points, is only 0.002 inch each way from center (0.004 inch total travel distance). This certainly is not much movement and it is several inches from the rigid end of the armature. Nevertheless, it requires spring action on the part of the armature. If the adjustable contacts and the adjustable pole pieces are screwed back a ways the armature stands free. In the proper adjustment of the relay the idea is to advance the adjustable pole pieces and adjustable contacts up to but not quite touching the armature. One can readily see that the armature action can be easily distorted if the adjustable contact and pole pieces on one side are advanced further than those on the other side. In fact, since the armature moves so easily it is possibie to shove it over considerably to one side or the other without realizing it. Result—bias distortion. This simply means that in pushing the armature to one side, the short flat spring section of the armature has been distorted, giving tension (or mechanical bias) to the armature. This in turn introduces the bias distortion. There are other adjustments associated with the armature that can assist in eliminating or reducing bias distortion and these will be covered later.

Polar Relay Test Set

It would be most desirable to have some device to aid one in adjusting a polar relay for minimum bias distortion at a price that one could afford. You can wish for an I-193-A Test Set and if you are real lucky you might even locate a used one. With this test set you can not only set the internal bias of a polar relay to zero but you can also correct for proper sensitivity. While you are wishing for the I-193-A Test Set you may want to go ahead and build a test set similar to the one shown in figs. 64 and 65. It will be noted from the circuit diagram, fig. 66, that it follows closely the circuit previously published in *CQ*.[14] The author built the unit in two parts as shown. One part is simply a polar relay socket properly mounted, with a four foot cord to plug into the other unit. The second unit houses the meter resistors, capacitors and power supply. The power supply was not included in the original circuit, but there were a number of advantages that made the addition worthwhile.

In the first place, a polar relay should not be tested and adjusted on an operating table where it will be near the receiver, transmitter, or other ham shack gear as well as any tools or other metal objects that might exert any appreciable magnetic influence. One shouldn't overlook the fact that this also includes the test set's own power supply as well as the meter. Meters, as a rule, have very strong permanent magnets so they can be the worst offenders if they are in the vicinity of the relay under test. The polar relay being tested should be at least two feet from such objects in order to be sure that they are not exercising any magnetic influence. The author used a four foot cord to be doubly sure. The four foot lead also adds to the flexibility of

[14]RTTY Column, Byron H. Kretzman, *CQ*, November, 1960, p. 111.

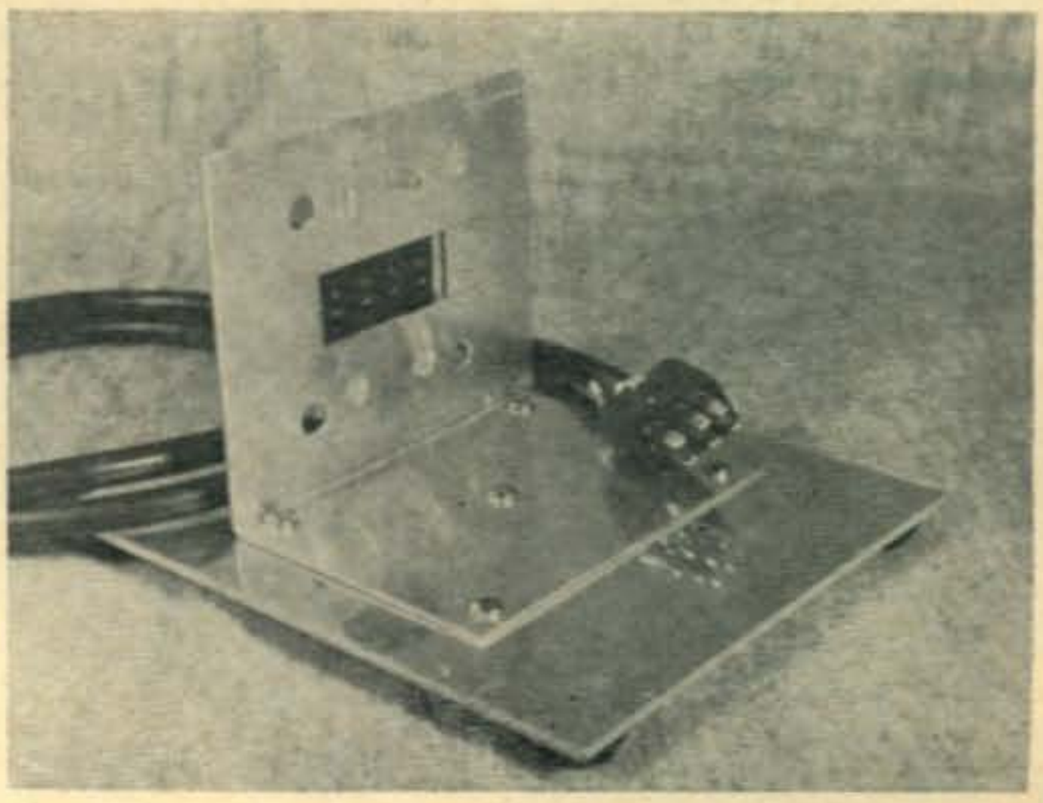


Fig. 65—Close-up view of the polar relay test socket. The large base flange prevents the relay from tipping over the base.

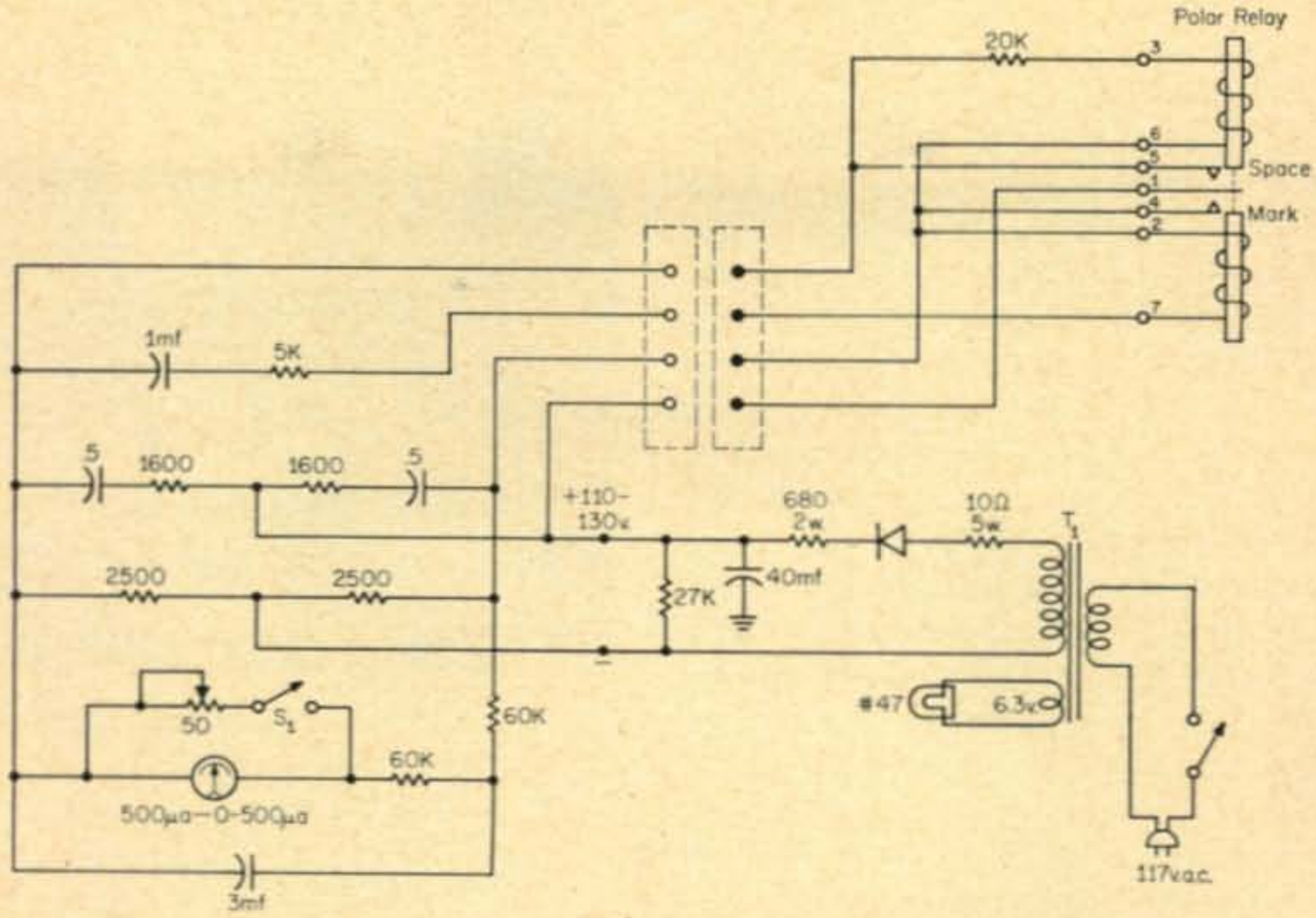


Fig. 66—Circuit of the polar relay test set. Transformer T_1 is a 1:1 isolation unit. All resistors are ½ watt, 1% tolerance except for the 680 ohm and 27K in the power supply.

the test set since the two foot requirement eliminates most of the operating tables found in the average ham shack. They don't usually have this much free space. This means that the testing has to be done elsewhere, such as in the shop, on the wife's kitchen table, or on the floor, away from a convenient source of 110-130 v.d.c. One shouldn't overlook the fact that the price of a few feet of twin-lead to the nearest source of 110-130 volts d.c. is insignificant compared to the price of an extra power supply.

It will be noted that a 1:1 isolation transformer was used in the power supply. One can omit this transformer and reduce the power supply cost considerably. If this is omitted it would be desirable to break both sides of the a.c. power source with the On-Off switch, and at the same time be aware of the danger of being connected directly to the line. The necessity of isolating the power supply from the vicinity of the polar relay under test is no longer a requirement if the transformer is eliminated. This naturally assumes that a choke is not added.

Under these circumstances the entire circuitry and equipment (except the meter) can be put into one cabinet and the polar relay can be plugged into one of the vertical faces. The only external component would be the meter on a four foot lead. The contents of the box would be relatively light whereas the polar relay weighs about 1½ pounds. The weight of the relay would probably cause the socket plate to tilt forward unless it was supplied with an extended base plate such as shown. The advantages of the test set being portable and completely self-contained are also obvious.

A 1-0-1 milliammeter was not available so a 500-0-500 microammeter was purchased in order to have more sensitivity. Naturally, greater sensitivity is obtained with the shunt switch, S_1, open. It turned out that even the 500-0-500 microammeter did not give the desired sensitivity. With a shunt, as indicated, it is possible to make initial adjustments, and then open the switch for greater sensitivity. However, if one does not use a meter more sensitive than the 500-0-500 microammeter it is not necessary to have the meter shunt and associated switch. The actual operation and use of this polar relay test set is relatively simple. The hard part comes when you begin to adjust the polar relay.

The armature (contact 1) of a polar relay plugged into this test set moves to and from contacts 4 and 5 at a frequency of about 23 c.p.s., which is about the baud rate (45.45) of the amateur teletype code rate of 60 words per minute. With a properly adjusted polar relay the armature should divide its time evenly between contacts 4 and 5. Under this condition the microammeter should read zero. If the armature spends more time at contact 4 than it does at contact 5, during each cycle, then the *mark* signal is elongated (*space* shortened) and *mark* bias distortion is present and the microammeter will swing to one side. The distance the meter swings to one side depends upon the amount of bias distortion present.

If the armature spends more time at contact 5 than it does at contact 4, during each cycle, then the *space* signal is elongated (*mark* shortened) and *space* bias distortion is present and the microammeter swings to the other side. The microammeter and other circuitry is polarized so that a swing of the meter to the right indicates *mark* bias distortion and a swing of the meter to the left indicates *space* bias distortion. However, this is not too important as the object is to adjust the relay so that bias distortion is eliminated.

Mechanical Adjustments

The first step in the process of adjusting a polar relay is to loosen the knurled tension nut on each of the two adjustable pole pieces and

back the adjustable pole pieces away from the armature just about as far as they will go. They exert their minimum pull on the armature in this position. Next, the two adjustable contacts (nos. 4 and 5) should be backed away from the armature about 1/16" to ⅛". During this latter operation one should note if each of the two contact screw brackets fit snugly around its associated contact screw. If they don't, then the screw contacts should be removed and the jaws of the contact screw bracket pressed together with a pair of pliers. The contact screws should fit tight enough in the screw brackets such that they will stay fixed during the normal operation of the relay. While the contact screws and the adjustable pole pieces are backed away from the armature it will give it a chance to swing free. Determine if the armature, in its free swinging position, is exactly centered in the oval slot in the forward end of the coil support, as well as the oval slot in the rear end coil support.

The coil can be moved about horizontally, within limits, after loosening the several screws supporting the coil spool. These screws should be well tightened after adjustment if it is found necessary to horizontally center the coil spool ends about the armature.

The armature may be slipped out to be inspected and cleaned by loosening the two armature heel piece holding screws that clamp the rear end of the armature. (See fig. 51.) This adjustment provides for centering the front contact points of the relay, as well as vertically positioning the armature in the center of the coil spool If it is necessary to center the contacts then the contact at each side should be advanced to within about 1/16" of the armature in order to better visually inspect this adjustment. If the contacts are not fully aligned they will not properly match or mesh with each other when they close. For instance, if the armature protrudes forward too much this puts the armature contacts out past the side contacts (nos. 4 and 5) such that they may only partially mesh or miss altogether when the relay operates. It might be necessary to go back and reposition the coil if it is necessary to loosen the armature and move it about to reposition the relay contacts. We have not been talking about the actual contact spacing, that comes next.

Contact Cleaning

The contacts should be cleaned by using a burnishing tool that has first been dipped in carbon tetrachloride. Do not touch the flat burnishing part of the tool with your fingers. Chances are that your fingers will be oily or otherwise contaminated. If you don't have a burnishing tool a flat hard surfaced clean piece of paper is better than nothing at all. A thin flat piece of metal, such as a blade of a feeler gauge can be pressed into service as a burnishing tool in the absence of anything better. Whatever is used should be free of rust, dirt, oil or other contamination and it should be thoroughly cleaned with carbon tet.

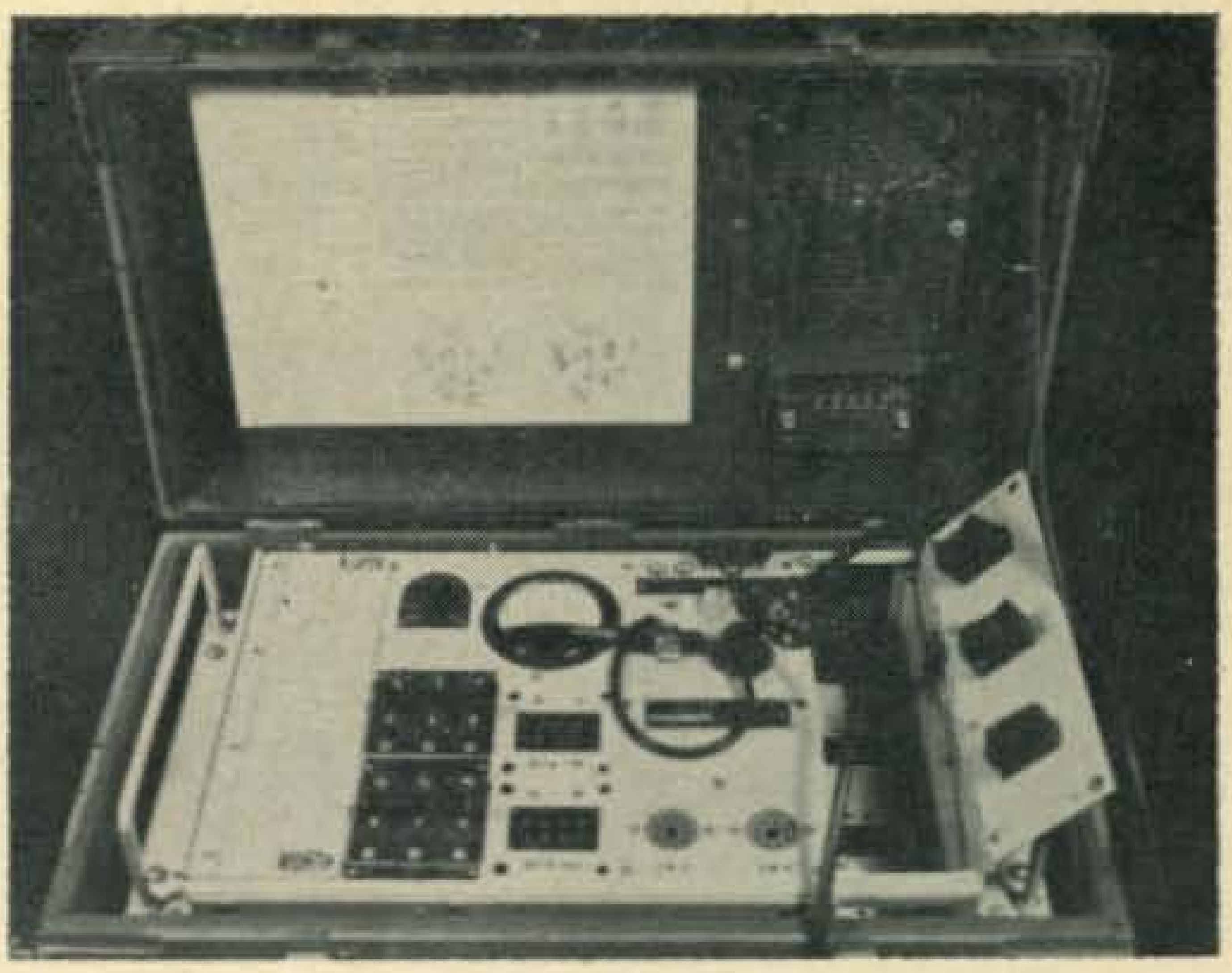


Fig. 67—The I-193 Western Electric Polar Relay Test Set.

Contact Spacing

An ohmmeter should then be connected across contacts 1 and 4 (right hand contact). A 0.002 inch thick feeler gauge should be placed between contacts 1 and 4, being careful that the surfaces of the feeler gauge are parallel to the contact surfaces. The gauge should be thoroughly cleaned of all foreign material before it is used. Slowly advance contact number 4 towards the armature by turning the capstan screw with a non-magnetic tool. Such a tool can be made from a four inch long brass rod whose diameter is about twice the hole size. Grind about a ¾ inch length at one end to fit the relay capstan screws. It was made more versatile by bending the ground-down end at about a 45 degree angle.

Try to hold the thickness gauge against the number 4 contact as it is advanced towards the armature (contact no. 1). If the feeler gauge is held against contact 1 the armature could be moved away from contact 4. Contact 4 should be advanced just up to the point where the ohmmeter shows continuity.

Contact 5 on the opposite side (left) of the armature should be advanced using the same procedures as outlined for contact 4. After this is done, check these two adjustments by carefully placing a 0.004 inch feeler gauge between the contacts on one side or the other. *Do not force* the gauge between the contacts if it does not enter readily. If it fails to fit between the contacts it means that you probably pushed the armature over slightly on one or both of the above contact adjustments. On the other hand, if the 0.004 inch gauge should fit between the contacts too readily, it means that either one or both of your intended 0.002 inch spacings are a bit more than that. It is helpful to use the ohmmeter for a continuity check in making this overall final check on the contact points. In either case, if the 0.004 inch feeler gauge fits too tightly or too loosely the 0.002 inch spacings for contacts number 4 and 5 should be done over.

After the contact spacing requirements have been satisfied the contacts should not be touched again during this general overall adjustment of

[*Continued on page 92*]

DX

BY URB LE JEUNE,* W2DEC

Here and There

Rumor Department has it that the RAF is planning a DXpedition to Rockall Island which, if it materializes, should add another DXCC "counting" to the sought-after list.

CR4 Cape Verde Islands: George, CR4AJ, is active almost daily between 14250 and 14260 kc s.s.b. *(Tnx LIDXA).*

CT3 Madeira Island: Frequently active on 14 mc c.w. between 14035 and 14055 kc. *(Tnx NCDXC).*

ET3 Ethiopia: ET3RN QRV daily around 14035 kc starting about 1800 GMT. *(TnxWGDXC).*

FB8W Crozet Island: The SR-150 sent back for repairs by FB8WW will not get back to him this year so s.s.b. is out. Usual c.w. frequency for Maurice is 14035/045. The shipboard operator of the S.S. *Galliene* that visited the Islands didn't get a license and so could not operate from the various ports of call. *(Tnx LIDXA).*

FG7 Guadeloupe: FG7XC 7010 kc from 1100 GMT and 14010 kc from 1500 GMT most days. *(Tnx WGDXC).*

FL8 French Somaliland: Andre, FL8RA, is now active on 14050/054 kc c.w. *(Tnx LIDXA).*

HBØ Leichtenstein: HB9ZT is planning to operate from this spot on May 8/9. *(Tnx NCDXC).*

KC6 Western Carolines: KC6BU is QRV daily at 2030 GMT on 14319 kc for skeds with his brother, W2HIN.

KG6I Marcus Island: KG6IF is now QRT. The FAA left Marcus Island and took its one ham operator along. *(Tnx LIDXA).*

KH6 Kure Island: KH6EDY is active again, mostly with traffic. He has a KX6 sked on Sunday at 2000 GMT on 14250 kc. *(Tnx WGDXC).*

Lebanon: OD5AI, OD5AX, OD5BZ active around 14120-30 kc and all licensed OD5 stations are now permitted to operate after a short ban. OD5BZ (W8BKO) was licensed Feb. 13th. *(Tnx WGDXC).*

OHØ Aland Island: OHØNI is very active on 14250/300 kc between 1300 and 1600 GMT. *(Tnx LIDXA).*

PJ2M Sint Maartin: PJ2MI active on 14115/125 kc s.s.b. various times. *(Tnx NCDXC).*

PY Fernando de Norohna: PY7BAL/Ø active on 7010, 7014 and 7021 kc c.w. starting at 0900 GMT, also same frequencies starting at 2300 GMT. He will QRT this month. *(Tnx NCDXC).*

*Box 35, Hazlet, New Jersey 07730.

SVØ Crete: SVØWGG on 14239 kc starting at 1700 GMT. *(Tnx WGDXC).*

TL8 Central African Republic: Sid, TL8SW, active 14115/125 s.s.b. from 1700 GMT. *(Tnx NCDXC).*

VK4 Willis Island: Also VK4TE still is active and has been heard calling CQ with no takers on 7021 kc c.w. around 0930 GMT where he is is on 14063 kc c.w. every Saturday morning at 0600 GMT. *(Tnx WGDXC).*

VK9 Christmas Island: VK9DR will be more active on c.w. on his crystal frequency of 14046 kc. More 40 and 80 meter activity will follow. Also 15 meter crystals are said to be under way.

VP8 South Georgia: VP8IE and VP8IG are on sporadically from South Georgia. *(Tnx VERON).*

VS9O Oman: Colin, VS9OSC, is active around 14050 kc from 1800 GMT. *(Tnx WGDXC).*

YA Afghanistan: YA4A, Dick, writes YA1AG, YA1AW, YA1BW are on c.w. occasionally and says the following data completes the amateur picture at present. YA1AN, Ali, 14280 kc using KWM-2 and vertical from Kabul. QSL via DL3AR. YA1YL, Mary, 14250 kc using HT-37 and HQ-170A to vertical from Khandahar, QSL via W2CTN. YA3TNC, Charlie, 14105 kc using 75A-4 and KWS-1 to a three-element beam from Khandahar, QSL via KØRZJ. YA4A, Dick, 14110 kc using a 75S-3 and 32-S-1 to a vertical from Kabul, QSL via K4KMX. Dick further states he is on the band every day from 1230 GMT until the band goes dead at 1500 GMT and is hearing mostly Europeans and W/K East Coast, and says the Southeast Asia Net operates daily on 14320 kc at 1200 GMT of which he is a member and conditions may be determined by listening to the net before they individually QSY to other frequencies. *(Tnx K4KMX and WGDXC).*

ZB2 Gibraltar: ZB2AK, who is ex-VP6IS, is now active on s.s.b. from Gibraltar. *(Tnx DX-MB).*

ZD8 Ascension Island: ZD8HL, Harold (ex-VP7CX) writes there are about 15 licensed hams on the Island at present but not very active, lots of equipment, antennas, and a special ham shack with lots of room for Rhombics, etc. Harold will be active s.s.b. daily around 14120 kc from 1730 GMT. *(Tnx WGDXC).*

5T5 Mauritania: 5T5AB active on 14125/

WAZ and WPX

THE WAZ and WPX certificates are awarded by the *CQ* DX department. WAZ is issued for proof of contact with the 40 Zones of the world as shown on the official WAZ Zone Map. WAZ is issued in three classes, *i.e.* Any mode, all phone and all s.s.b. For complete rules, see the January, 1962 *CQ*, page 50.

WPX is issued in four classes, *i.e.*, all c.w., all phone, all s.s.b. and Mixed. The number of prefixes required are: C.w.-300; Phone-300; s.s.b.-200; Mixed-400. For complete rules, see January, 1962 *CQ*, page 52. WAZ applications, Zone Maps and WPX applications may be obtained from the DX Editor at the address shown at the head of this column. Please send a self-addressed, stamped envelope or a self-addressed envelope and an IRC. All applications should be sent directly to the DX Editor.

The following certificates were issued between the period from February 6th to and including March 5th, 1965:

CW-PHONE WAZ

2112	W7MX	John Mardesich
2113	G3HIW	F. G. Jarvis
2114	W7VRO	Dick Moen

ALL-PHONE WAZ

287	W2EXH	Arthur Fenster
288	ZS5PG	Jack E. Winter
289	YV5A1P	Miguel A. Delgado O. Jr.
290	K2YQQ	Arthur Young
291	G6TA	Douglas Abbott

TWO-WAY SSB WAZ

298	W2EXH	Arthur Fenster
299	OA4KY	Juan W. Krackenberger
300	HB9J	Jean Lips
301	ZL3NS	T. Ositis
302	K8LSG	Roger W. DeBusk, M.D.

CW WPX

625	VP7NQ	Earle W. Weech
626	W8CJN	Robert R. Skutt
627	ZS5UP	John Ayres

PHONE WPX

114	I1ZLW	Edoardo Cassuccio

100 TWO-WAY SSB

468	K1AQI	Jack Sieg

200 TWO-WAY SSB

125	W5KC	Vincent L. Rosso

135 kc s.s.b. between 1900 and 2000 GMT. *(Tnx LIDXA).*

ZM7 Tokelaus: Although ZM7AE has been reported by various sources, word from Frank, VK2QL, indicates that the possibility of this operation being a phony is very good. It seems that he has not been heard or contacted by any stations in the VK/ZL area and that no one down under has heard of him.

5V8 Togo Republic: 5V8AB, Francois, 14100-10 kc 1700-1830 GMT, sometimes around 2130 GMT and says QSL to Lome Airport, Box 123, Lome, Togo enclosing a blank QSL for him to sign as he does not have printed QSLs. *Tnx (WGDXC).*

7Q7 Malawi: 7Q7GN has finished a two-year tour in Malawi with the Peace Corps and returned stateside. Just before leaving Africa he deposited 450 QSL cards in the mail, mostly via bureaus. Anyone needing confirmation of a QSO from him should wait until about May 1st and then write him at 5628 North Lafayette Avenue, Fresno, California.

W1BB on 160 Meters

Daylight DX noticed for the first time this IQSY year which may be the reason for it. During the *CQ* 160 c.w. contest, many stations in Europe and USA kept QSOing and running contact points all day, making local QSOs 800 to 1000 miles distant. Previous years contest work almost ceased during the day except for highly populated areas. Additionally, VO1FB has noticed greatly increased daylight DX, QSOing G3PU at 1930 GMT Jan. 24th with 250 watts, G3PU with 10 watts. This was about 2 hours after sunset time in G-land and broad daylight in VO land. Incidently, this QSO was also logged, both sides by G3PLQ/mm off the coast of Africa. European stations have reported W signals as late as 0930 GMT about 3 hours after sunrise. And, a report from G3PLQ/mm, John; M.V. *Kumba* (radio officer) off the coast of Africa near Sierre Leone reports Daylight DX—heard 1600-1640 GMT, GW3HUM, G3TMA, G6BK Nov. 8th. Also 1700-1745 GMT Nov. 9th G3TRF, 5LF, OK3KAG, G3TLY. "My theory," says John, "is that several hours before sunset, the band skip lengthens momentarily and providing someone is at an exotic DX spot could be worked. The lack of QRN/mm which is present when darkness has fallen, but not in daylight, is very noticeable." Essentially, we believe, all this means is less daylight ionization and absorption due to the lowered sunspot activity and, therefore, some reflection of l.f. signals during the daylight hours, the same as happens at night, only much weaker signals. Comments and explanations from the gang appreciated.

Strange Phenomonon! Weekend of Feb. 14th European DX was poor to nil. Europe is 3000 miles east from W land over the Atlantic Ocean. However, at the same time, if one looked west for DX, instead of east, the W6s and W7s were pouring in excellently, probably the best they have this year. This is 3000 miles over the land. This condition also repeated itself, although not to as great a degree during the last transatlantic DX test February 21st when Europe DX was poor, and West Coast DX good. Additionally, VP3CZ, Dev also reports l.u.f. predictions confirmed that signals stronger going from west to east. Gs hear me better than I hear them. Also, I hear W6s better than they hear me. It seems most unusually to look east and have conditions poor, but turn around and look west and have excellent DX. Can anyone explain this? Any comments? . . . .—*W1BB*

Triple Fone Patch

This is probably the most complicated relay ever accomplished. Recently, the California Maritime Academy training ship *Golden Bear*

SSB DX HONOR ROLL

TI2HP	301	K2MGE	278	G2BVN	263	YV5AFF	239
W2BXA	296	W6UOU	277	W2RGV	261	W7DLR	238
5Z4ERR	296	K1IXG	276	G3DO	260	W6YMV	235
W2ZX	295	HB9TL	275	PJ2AA	258	W3VSU	235
WØQVZ	294	DL1IN	275	KP4CL	256	OZ7FG	233
W8PQQ	292	I1AMU	275	W6WNE	254	W2PTM	230
W2TP	292	PZ1AX	274	W4RLS	252	W6ZJY	227
K4TJL	290	W6RKP	273	K6LGF	250	K1SHN	224
W2VCV	290	K9EAB	273	W1AOL	250	K2JFV	223
K8RTW	286	W2LV	271	W4PAA	249	W3FWD	216
W2FXN	281	W3KT	270	W4NJF	248	K1JMV	213
W1LLF	281	WA2IZS	269	K4HYL	248	WA2EOQ	210
W3MAC	281	G3NUG	269	GM3JDR	246	SM5UF	208
G8KS	279	G2PL	265	XE1AE	246	K6CYG	203
W4OPM	278	W4SSU	263	K8ONV	244	W6USG	203
				W4HUE	201		

was in the Galapagos Islands area with a large group of scientists and midshipmen aboard. A midshipman was sick and the doctor wished to find out if there was x-ray equipment on board the U. S. seaplane tender *Pine Island* which was also in the area. The *Golden Bear* ham operator WB6IWB/MM, Dean, called HC8FN, Forrest, to see if he could somehow contact the *Pine Island*. HC8FN in the Galapagos Islands called HC1HL, Earl, in Quito, Ecuador, who fone patched him to HC1BS, Herb, who called the Navy Mission Radio in the Canal Zone on a different frequency and patched Forrest through to the operator there who patched him to the Navy Duty Officer. The QSO thru four radios and three fone patches was R4 to R5. The Duty Officer called Navy communications center on another land line and they called the *Pine Island* radio operator who phoned the sick bay to get the desired information. The information was relayed back to the doctor on the *Golden Bear* via seven radios and five telephones. As stated before, three of these fones patched four radios into a continuous circuit. All this was done on an emergency basis and took half an hour or so to set up. After a while, the *Pine Island* fired up its ham rig and made direct contact with the *Golden Bear*. Easier that way, but not so much fun. If anyone knows of a relay to equal this, we should like to hear about it. *(Tnx HC8FN)*.

Certificates

Worked All VQ Areas Award

From the Radio Society of East Africa we learn that since Zambia will be the sixth 'ex-VQ' area to achieve independence and change of prefix in recent years, it has, therefore, been decided to produce an award designed to replace our 'Worked All VQ Areas Award' which has become almost impossible to obtain in view of the deductions of activity from certain parts of East Africa. Details of this new award will be issued immediately upon being finalized, but it is intended to continue processing applications for the 'WAVQ' award for some time to come to enable operators who have almost obtained sufficient confirmations the opportunity to qualify.

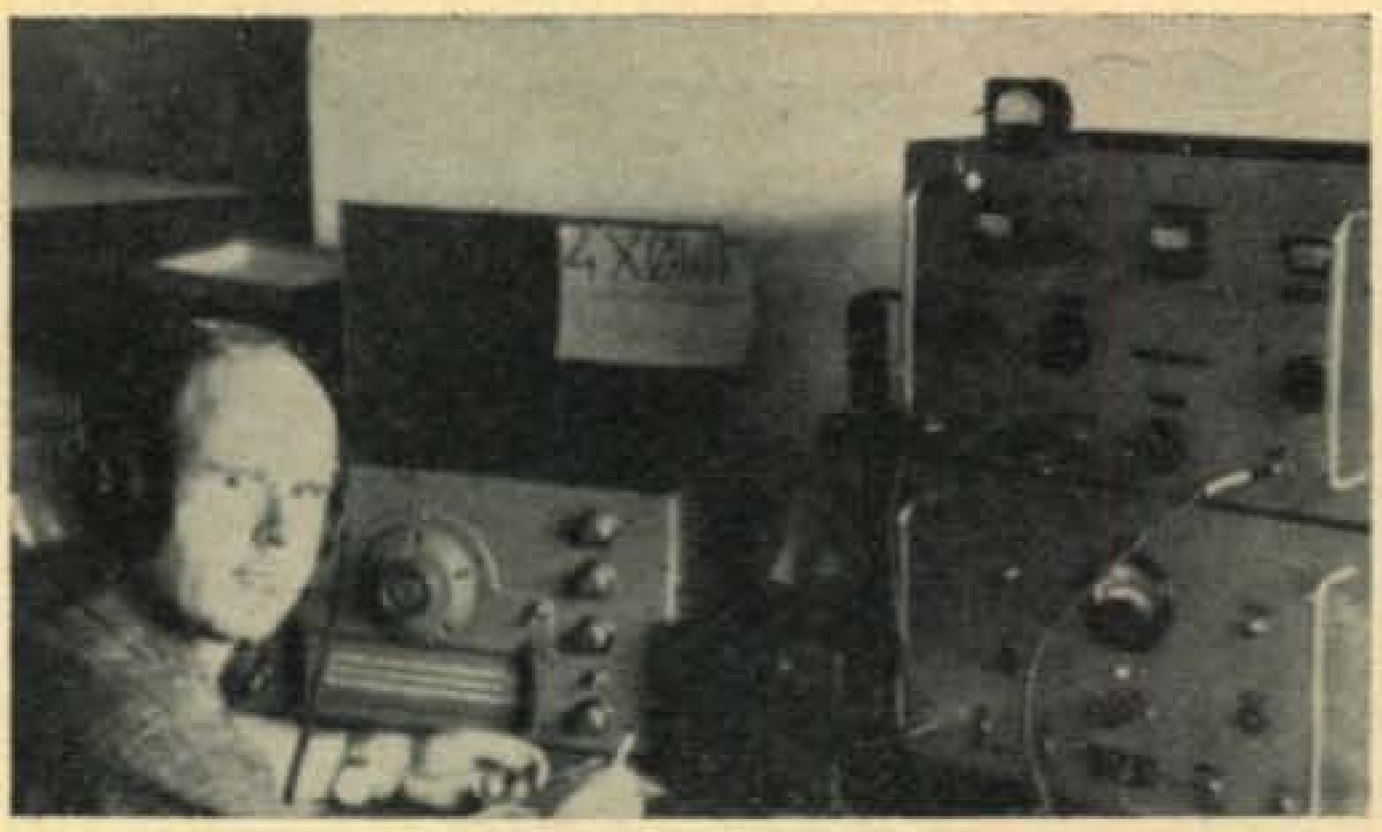
Diplom DTA—French Austral Lands Award

Stations of this land are FB8WW (Crozet), FB8XX (Kerguelen), FB8YY (Adelie Land), and FB8ZZ (St. Paul and Amsterdam).

Award for c.w., Phone or Mixed. QSO since Jan. 4, 1946 with 3 Austral countries. For four countries awards with Golden Star. Photocopy both sides of QSL accepted. Cost: 6 IRC. Send application to F3FA, Andre Jacob, 33 Avenue Victor Hugo, Pavillons-Sous-Bois, Seine, France.

YO DX Club Award

Award issued by YO DX Club, POB 95, Bucharest, Roumanian Peoples Republic for QSOs after 1 Jan. 1963 with YO DX Club members. Europeans must work 5, all others work 2. Send certified log data and 5 IRCs to above address. Members are YO2BN, BU, CD, FU, KAB, KAC, YO3AC, CR, JF, FF, RD, RF, RK, YO6AW, XI, YO7DO, YO8CF, YO9IA, VI, WL.



This is the operating position of 4XØWF with 4X4WF at the key. The operation was from the Dead Sea. *(Tnx W2VLS)*.

Kimchi Award

The eight U.S. Army Amateur Radio Club issues the Kimchi Award for having worked five HL9 stations. Send either the five QSLs or an extract of your log certified by a club officer to: Secretary, Eighth U. S. Army Amateur Radio Club, c/o EUSA Sig O, APO San Francisco, 96301.

QTH's and QSL Managers

AP5HQ	via W4LRN.
CO2KG	Box 6996, Havana, Cuba.
CR4AJ	via W2VCZ.
ET3RN	Box 145, Addis Ababa, Ethiopia.
HM1AQ	via W8BF.
HM1AX	via WB6GVV.
HI8AMA	Box 1131, Santo Domingo, Dominican Republic.
HI3JBR	Box 321, Santiago, Dominican Republic.
HR2ABC	Box 565, San Pedro Sula, Hondoras.
KC6BU	via W2HIN.
KG6SB	via W7PHO.
KR6JZ	via W2CTN.
KS6BO	Larry McMillen, c/o Educational TV, Pago Pago, American Samoa.
KV4CF	via K3AHN.
KW6EK	via W7WLL.
OD5AX	via W9YFV.
OD5BZ	Box 2806, Beirut, Lebanon.
PJ2AA	via K4RHL.
PJ2MI	Box 160, Sint Maartin.
PX1AX	via DJØIR.
PY7BAL/Ø	Box 842, Recife, Brazil.
SVØWGG	via K1EAT.
VP1GFQ	via WØGFQ.
VP1PV	via VE3BRG.
VP2GTA	via W2CQA.
VP2KM	Box 152, St. Kitts, BWI.
VS9AAS	via 5Z4HE.
VS9AWR	W. D. Reid, Officers Mess, RAF Steamer Point, BFPO 69, London, England.
VS9OSC	c/o RAF Salalah, BFPO 69, Muscat, Oman.
VU2LE	via W6BCT.
XW8AZ	Box 402, Vientiane, Laos.
YA3TNC	via KØRZJ.
YS1IGM	Box 1055, San Salvador, El Salvador.
YS1RFE	via K7UCH.
YV5CEY	via W3HNK.
ZB2AK	c/o Cable Company, Gibralter.
ZD3C	via K2IDE.
ZD5M	(ZS7M) via W2CTN.
ZD8DX	via WA4KCV.
ZD8HL	Harold R. Lund, RCA Ascension AAFB, Box 4187, Patrick AFB, Fla. 32925.
ZD8JC	via W5EBJ.
ZE1AC	Jeff Miles, Box 3232, Salisbury, Southern Rhodesia.

[*Continued on page 105*]

THE VHF COLUMN

BY BOB BROWN, K2ZSQ
AND ALLEN KATZ, K2UYH*

With the advent of Oscar III, some of the older yet still quite exotic forms of v.h.f. propagation tend to be forgotten. In particular we are thinking of meteor scatter (m.s.). There is probably no more "reliable" way for the newcomer to the two meter band to add a few distant states to his DX total—the more seasoned two meter DX operators have all already done so. Medium power, long yagis, and low-noise crystal-controlled converters into good communications receivers are the rule rather than the exception on two. An m.s. contact is certainly within the range of capabilities of the average two-meter station, although a few strange muscles may have to be flexed.

First of all, m.s. is primarily a c.w. form of propagation (with one station usually sending the first 30 seconds of each minute, and the other station the second 30 seconds). Recently some experiments have been conducted with s.s.b. This approach offers interesting possibilities when used in conjunction with a quick breaking system, since it enables a great deal of information to be sent in both directions during the short period of meteor burst ionization, and is worthy of further research.

Secondly, the ability to know precisely what frequency your receiver is tuned to is of utmost importance in m.s. operation. It would be a waste of time to listen for the station you are skeding on a frequency he is not on! Most modern receivers have a 100 kc crystal calibrator built in. If you don't have one, such a device would be a good addition to your shack. However, having the calibrator is only half the battle, since most do not generate harmonics strong enough to be heard in the v.h.f. bands. Thus they can only be used to calibrate your i.f. strip (h.f. receiver). Such a calibrator will tell you nothing about the frequency your converter crystal is oscillating on. A good 1 mc standard would be handy here. Fortunately for those of you without such gear, there are usually several fellows around who can set their transmitter frequency quite accurately. Checking with these stations will give you a reasonably good estimate of how far off frequency your converter crystal is. This derivation should remain relatively constant. Knowing it and the calibrator's frequency should permit you to determine a v.h.f. frequency with little error.

We might add, of course, that m.s. is not a sure thing on two meters. By making a schedule, though, the station, place and time are known ahead of time and with a little persistence (and a good meteor shower) the odds are highly in favor of a contact. And now is not too early to start sending those postcards to stations in states you need for the August Perseids, the granddaddy of all meteor showers. More two meter contacts have been made during this shower than any other! Will you be on?

The situation of 50 mc, however, is a bit different. Although meteor bursts produce stronger signals for longer durations, short Sporadic-E skip propagation does provide dependable communication to states in the same 700 to 1400 mile range of m.s. The experience of an actual meteor scatter QSO, however, is still well worth the effort. Work with s.s.b. should be particularly profitable on this band.

On 220 mc to our knowledge no m.s. contact has ever been accomplished. The chance of a good scatter contact definitely decreases as one ascends in frequency. But the opportunity is still there for a dedicated pair of 1¼ meter operators to contribute to the state of the art.

An Unfair Multiplier

Amid the normal reaction to our May contest announcement a while back came this note:

"I would like to comment on the rules of the contest. I agree with everything you say in your January, 1965 column except for the power multiplier. A multiplier of only 1.25 is completely unrealistic for a power of only 30 watts. It doesn't pay to operate low power with such a skimpy multiplier and try to fight all the QRM.

METEOR SHOWER DATA

Night Showers

Quadrantids	Jan. 1-4
Lyrids	April 19-23
Aquarids	May 1-6
Aquarids	July 26-31
Perseids	Aug. 10-14
Giacobinids	Oct. 9
Orionids	Oct. 18-23
Leonids[1]	Nov. 14-18
Geminids	Dec. 10-14

Daylight Showers

Cetids	May 19-21
Perseids	June 4-6
Arietids	June 8
Taurids	June 30—July 2

NOTE: Year to year variation is negligible, making this data chart accurate for any year.

[1]Peak intensity in cycle due in 1965. Should be excellent for 144 mc work.

*c/o Allen Katz, Electrical Engineering Department, Murray Hall, Rutgers University, New Brunswick, New Jersey.

Long promised 144-to-432 mc varactor tripler, as originally developed by W1FRR. For construction details, see fig. 1 and text.

It also places everyone from 31 to a KW in the same class. We plan to run 150 watts and I don't feel that we can evenly compete with the KW boys. I feel that a power multiplier system such as the ARRL (*???*) uses would tend to balance things out. Notice that almost none of the leaders in the Summer 1964 V.H.F. contest ran lower power."—*K2QPN*.

We beg to differ with you, Bob, and feel that the facts are on our side. First of all, the ARRL has never used power multipliers in their v.h.f. contests. Power multipliers were completely an innovation of past staff members of *CQ*. We choose to cut the size of these power multipliers for rather than detour the use of lower power (a fault you accuse the present rules of) they detoured the use of high power! We have past score sheets as data to back up that assertion. We feel that any amateur who has put the effort into building an effective high powered rig should not be discouraged from using it in a v.h.f. contest. This is just what the past rules did! However, we do not feel that the present multiplier arrangement will discourage the use of low power. The fact is, that the majority of contest contacts are not made under weak signal conditions. The difference between 100 watts and a KW should not make the difference between a contact or not! We do admit there is QRM, but here is where the skill of operating a contest comes in. If we could predict how well a station would do in a contest by just knowing his equipment, what would be the point of having the contest in the first place? Due to our summer work schedule we were unable to operate the August V.H.F. contest. However, we allowed a ham friend to operate our station. Although he was running more than 5 times the power of W2NLN, W2NLN easily beat him. We have likewise on other occasions used Gonsets or 99'ers in contests and come up with top scores—multipliers or not. No, the 1.25 multiplier should be quite adequate.

Practical Varactor Tripler

As long promised, here is the circuit (see fig. 1 and picture) of a 144 to 432 mc varactor tripler. The reason for the delay, we must admit, was due to the fact that we wanted to do some practical fiddling ourselves. As mentioned nearly a year ago (when we first discussed varactor multipliers), we have used 2C39's to triple to 432 mc for several years now. This varactor beats these tubes in just about every respect—size, power, efficiency, and maybe soon price. The 40 watters sell for about $18.00 right now.

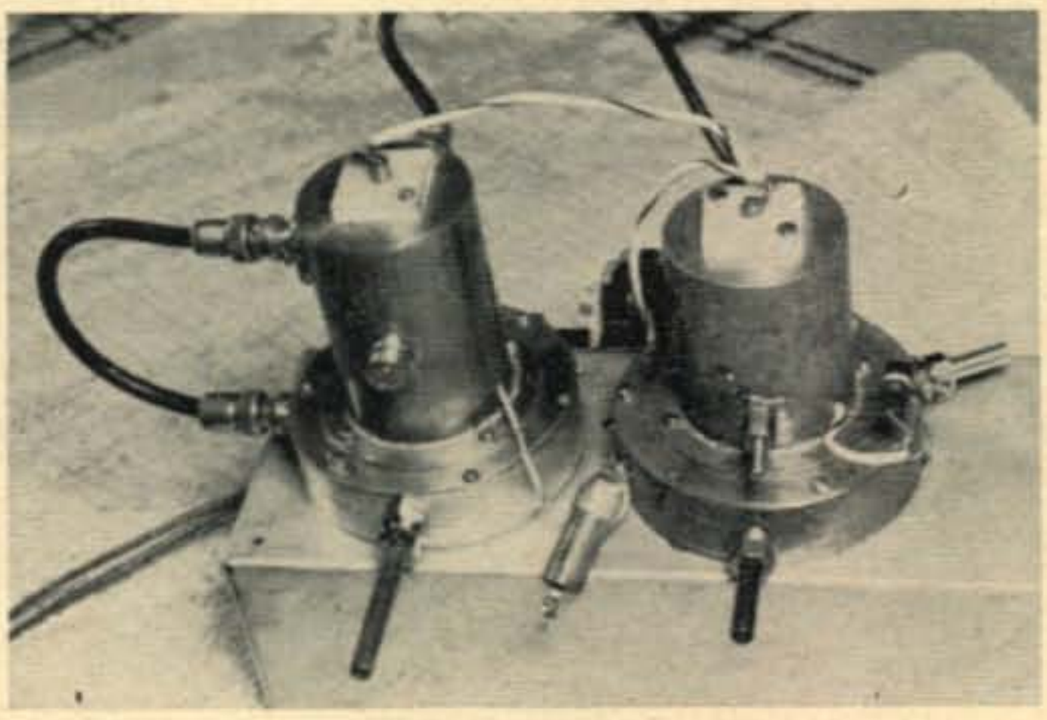
As for the circuit we can claim no originality; it is basically the same as first developed by Fred Collins, W1FRR, at Microwave Associates. It is pure simplicity to construct—several variable capacitors, a few small coils, the diode, and a resistor capacitor combination for back bias. If you are planning to run the tripler directly into an amplifier, forget about the final tuned circuit and run the varactor directly to the amplifier tube's grid. The tuned circuit on the plate side of the amplifier will eliminate the unwanted subharmonics present.

Tune-up is not complicated, although it can get a little exasperating, since all controls seem to interact. The important thing is to make sure you are looking at power output on 432 mc. A coaxial filter before the watt meter or whatever you use to measure power out would be a good idea. Then keep tuning everything until you have achieved (what you believe to be) maximum output. That's it!

We will try to keep abreast of all the latest v.h.f.—u.h.f. solid state developments, and maybe even have a 432 to 1296 varactor tripler circuit soon.

From the Mailbag

Bob Gainer, WA8EHI, on Cleveland 50 mc DX Club: "Just a few lines about the activity of our club and members. K8MMM is on 6 meter a.m. and s.s.b. running a full gallon to a 4-400A and an 8 element beam up 100 feet. K8TOL is on 6 and 2 meters with Collins S-line and a homebrew kilowatt linear. WA8EIC is also on 6 and 2 with Collins S-line and similar KW linear, but with four 6 and 2 meter beams on an "H" frame. K8UQA is on 6 and 2 with a.m. running 300 watts. Talk is that he will be on s.s.b. soon. WA8EHI is also on S-line. WA8KLC is now working on a kilowatt linear using a pair of 4CX300A's. K8YVA is also now working on a KW linear for 6, but with a pair of 4-400A's.



Transmitter end of W8JLQ's 1296 mc station, consisting of a 2C39 432-to-1296 mc tripler and 2C39 amp, providing 10 watts of carrier on 1296.

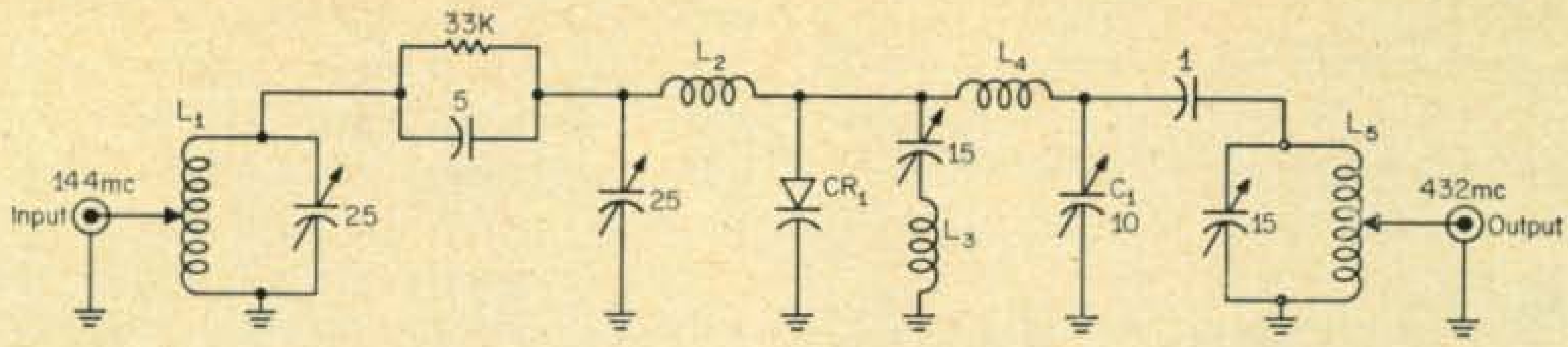


Fig. 1—144 to 432 mc varactor tripler.

C_1—1-10 mmf glass piston trimmer.
CR_1—Varactor diode.
L_1—4 t. #18 tinned ¼" dia. ½" l. Tap at 1½ t. from cold end.
L_2—4 t. #18 tinned ¼" dia. ½" l.
L_3—3 t. #14 tinned 3/16" dia. ⅜" l.
L_4—2 t. ⅛" wide copper strap ⅜" dia. ½" l.
L_5—1½" long copper strap across C_1.

K8JCG can be heard every Sunday morning between 5 and 6:00 AM bringing up the sun on six. K8OLB is using all homebrew equipment for his v.h.f. work." *Sounds like you've got a real active club, and quite a concentration of 6 meter high power gear. Who have you fellows been working lately?*

"The club now has its own call—WA8BCA (Best Cleveland Amateurs—hi)—and a membership of 18. To date 22 trophies *(see picture)* have been awarded to hams throughout the U.S.A. and in nearby countries. I think our trophy is one of the most unusual yet." *It sure does look impressive, Bob, but how about some further information on its presentation? I am sure many 6 meter operators will be interested.*

Jack Sanders, K6PUU, on ATV: "Thanks for the video transmitter circuit; I was just working on a 2 meter transmitter to drive the old 5894 tripler—amplifier as per the *ARRL Handbook.* This is just what I needed to save power and effort. This was the first TV modulator I have seen for anything bigger than a 6J6 rig." *I might also mention that the varactor tripler described in this column will work well for ATV operation too, when the two meter rig driving it is modulated in a manner similar to 5894 in the TV transmitter. In fact, the same modulator circuit could probably be used to modulate almost any two meter rig with a power input less than 40 watts. And the varactor tripler does have the added advantage that it allows you to also operate phone on 432 too! Some of us still like to use that mode—hi.*

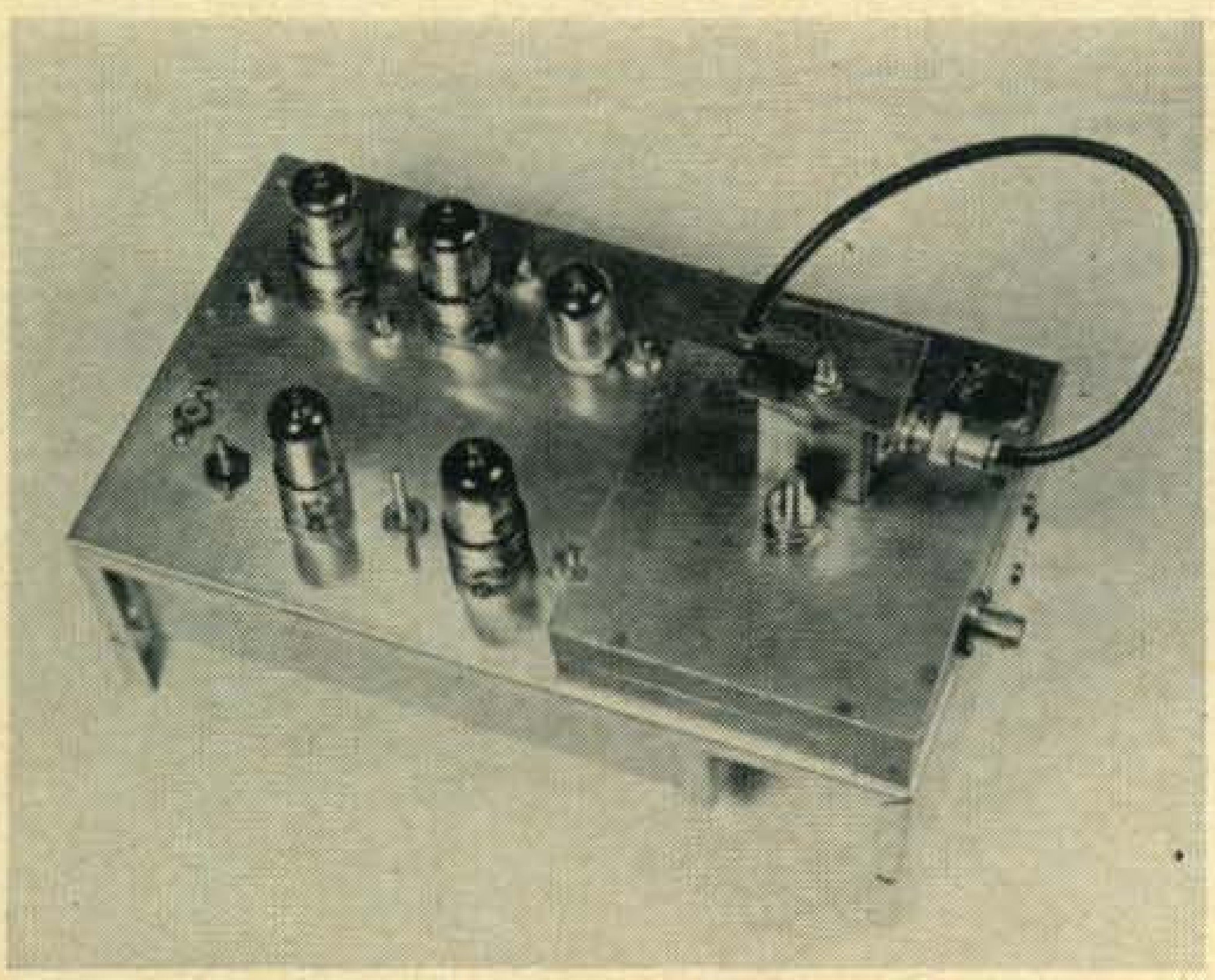
"Activity on TV is coming on strong here in the Los Angeles area. One or two stations are on almost every evening. I hope to be able to join them by next month. I built my two meter audio rig (147.6 mc) and receiver set up last month. The ATJ camera has been on local loop for some time now." *Keep up the good work Jack!*

Al, K7VQI, also on Ham TV: "On the ham TV front the boys are still working on various projects. John, WA7BBM, put my converted AXT-2 on the air and sent me a good picture. I converted this to be tuned by butterfly condensers, both oscillator and PA." *How about the details of your conversion some time?* "John put it on frequency and on the air. He and Bob, K7KYQ, are working on nuvistor converters with preamps for 440 mc. Bob will grid modulate his APQ-2. John, K7JQJ, gave another ATV demonstration for the Old Pueblo Radio Club." *Nice Work. Any convertees?*

Bob Nelson, K2OPN, on lechers: "I would like for you to publish construction information on a pair of lecher wires for 432 mc. I enjoy your columns and like to see that you are dividing your space between general and technical information. I enjoy them both."

Thanks. We believe in a balanced column, but need the support in terms of correspondence from our readers to do the job right! On lecher wires, they actually are nothing more than a length of open wire transmission line (a couple

[*Continued on page 105*]



W8JLQ's new 1296 mc converter utilizing a cavity injection filter.

The Cleveland 50 Mc DX Club Award. For further information, send a self-addressed stamped envelope to WA8EHI, club secretary.

HAM CLINIC

CHARLES J. SCHAUERS,* W6QLV

CONTRARY to what some people think, the average ham can, and often does his own trouble-shooting, and a moderate amount of his own equipment construction. When a circuit comes along that interests him, he'll try it out—especially if the circuit is simple and uses transistors or other semiconductor devices.

Lately, for some unknown reason, we have received a lot of questions on using transistors in receiver circuitry. We of course do not consider ourselves transistor experts, but we try to do the best we can "fielding" the questions received.

Each month we try to include some information of general interest on transistors or transistor circuitry in this column, but the selection of material is a difficult task because the field is so broad. We are of course always trying to come up with something new or novel, but above all, practical.

It stands to reason that we carry information on topics on which we receive the greatest number of queries. You can help us by sending in your own ideas or full descriptions of gadgets of general interest to other hams.

Please keep your letters short, and remember that answering our mail takes time. If your question is an urgent one then be sure to inclose two IRC's or the equivalent in U.S. coin and address your letters to us at 4 Lutzelmatt Str. Luzern, Switzerland.

Transfilters In Oscillator Circuits

Clevite Transfilters (Reg.) are either two or three terminal piezoelectric filters designed as replacements for conventional i.f. transformer assemblies and selective i.f. filters. They can also be used very effectively in oscillator circuits, although this is not known by most hams.

Using Transfilters in transistorized oscillators have the following advantages: small physical size; freedom from shielding requirements . . . not affected by external magnetic fields; frequency may be varied with a conventional potentiometer; tuning elements may be remotely located from oscillator circuitry and the cost is low.

Figure 1 shows an oscillator using the type TO-01 Transfilter. Oscillator action is provided by taking advantage of the 180° phase shift between the Transfilter's high input impedance and its low output impedance.

Frequency variation over a limited range can be accomplished by adjusting the forward bias resistor R-1. This quite effectively varies the transistors internal impedance and hence the impedance "seen" by the Transfilter's dot electrode. Since this load impedance affects the Transfilter's operating frequency, changing the transistor impedance will shift the oscillator frequency.

Effective transistor impedance is also a function of temperature, so temperature stabilization of the transistor must be provided for.

In the circuit shown, the TO-01 Transfilter oscillates about 2 kc above its nominal resonant frequency. The capacitor C_1 shown in the diagram is used to lower the oscillator frequency to the nominal TO-01 frequency, which is around 455 kc.

To reduce waveform distortion and to increase oscillator stability, the Transfilter's input and output terminals are reversed.

With the circuit constants shown, the approximate frequency shift that may be achieved is around 5 kc. Adjustment of the value of C_1 (the padding capacitor) will result in obtaining an equal frequency shift above and below the designed Transfilter frequency.

By using an r.f. choke as shown the r.f. output voltage will be substantially increased for a given collector supply voltage as well as increasing the possible frequency shift to a total of about 8 kc. If lower r.f. output is required replace the r.f. choke with a 1.5k resistor.

Figure 2 shows the signal waveform from this fine little oscillator. Figure 3 shows the effect of collector voltage variation on frequency—note the small change. By using stabilized voltage to the oscillator it works beautifully as an injection oscillator (b.f.o.) for s.s.b. work.

We thank the Piezoelectric Division of Clevite, 232 Forbes Road, Bedford, Ohio for making the foregoing and other information available to us. We tried out the oscillator and it really works fine.

Next month, we'll give you some information on using Transfilters instead of i.f. transformers in a typical i.f. amplifier. We'll also include agc and a detector.

Questions

Equipment Selection—"I am a ham just starting

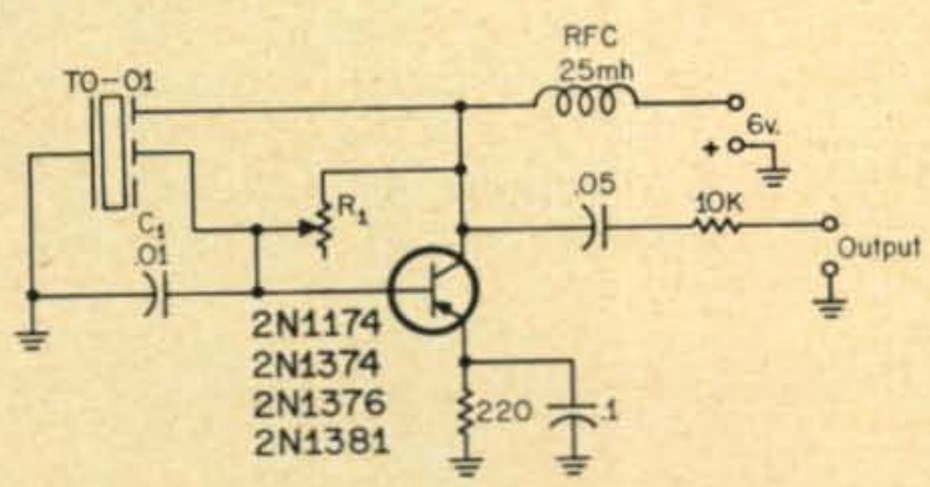


Fig. 1—An oscillator using a transfilter for operation on or about 455 kc. This circuit works very well as a b.f.o. If used for s.s.b. work (with a product detector) the voltage should be stabilized.

*c/o *CQ*, 14 Vanderventer Ave., Port Washington, L.I., N.Y.

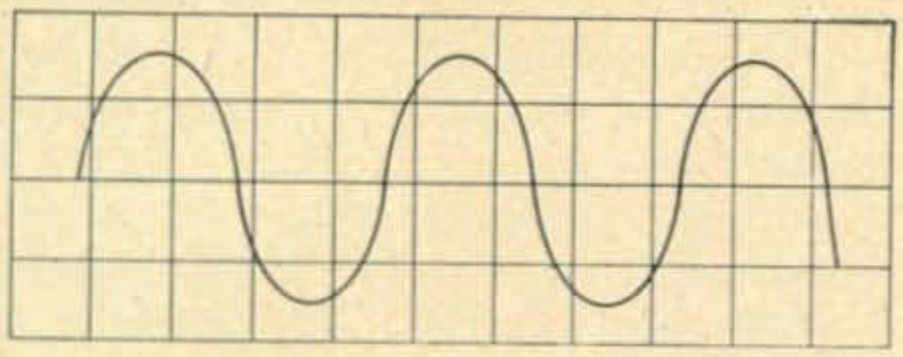


Fig. 2—Signal waveform of transfilter oscillator shown in Fig. 1.

out. I have my General license at last and am now ready to buy station equipment. Being a businessman I have no time for making my own gear. The decision I must make is whether I should buy a transceiver or a separate transmitter and receiver. What are your ideas?"

I like the simplicity of operation and compactness of transceivers, but I also like the tuning versatility of separate sets for possible cross-band or dissimilar frequency operation. Further, when overseas, one can operate in the lower or DX portions of the ham bands on phone. Of course owning a transceiver and an extra receiver solves these problems—at least that is the way I will do it when Americans are allowed to operate in Switzerland.

Most transceivers do not have manual selectivity controls, separate receivers do. Of course a Q multiplier can be added to any transceiver and this is no major problem.

Transceivers offered in the U.S. today are designed for mobile as well as fixed operation—a very fine feature.

If you have no plans to travel to other countries to operate, I would suggest you consider a transceiver. If the transceiver you choose provides for full c.w. coverage then you can still use the set overseas.

Using Zener Diodes—"I often see this statement in radio magazines, 'to stabilize such and such a circuit, use a diode of the correct voltage and power rating.' Now how is this done? Make your explanation simple please."

Zener diodes can always be used very effectively instead of bulky space consuming and inefficient v.r. (gaseous) tubes. I personally would not use anything else now for regulation except a zener.

Zeners are available now in a wide range of voltage and power ratings. Selection of the correct type of zener for a given voltage regulation task is not too difficult. However, the subject is not too simple.

First of all, the supply voltage must exceed the *desired* regulated voltage by only a few volts in the case of the zener. Unlike the v.r. tube, it has no striking voltage as such.

For ham use, the zener is generally used as a shunt regulator as shown in figure 3.

Where the source voltage V_s is not constant, the formula:

$$R_s = \frac{V_s - V_z}{I_z - I_l}$$

is used to calculate the ballast resistance R_s—this includes the effective internal resistance of

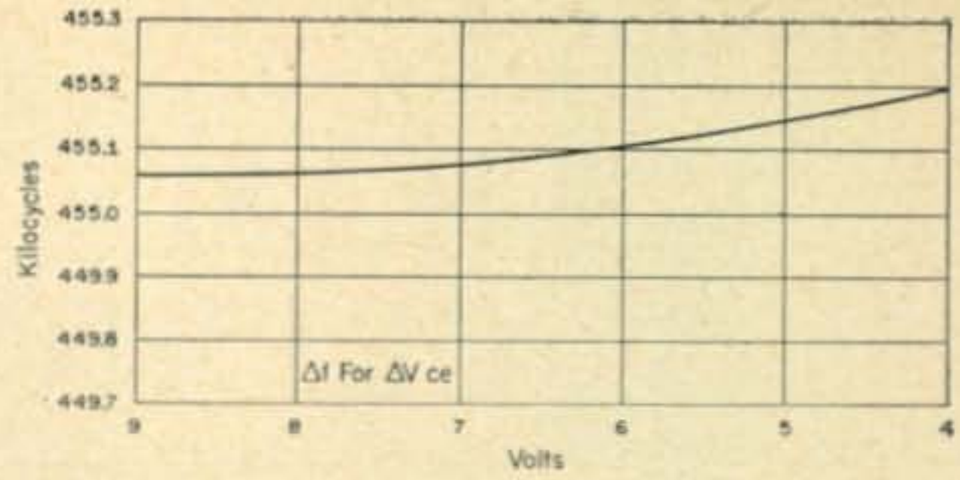


Fig. 3—The effect of collector voltage variation on frequency of oscillator in fig. 1.

the power supply (in ohms). V_s is the input supply voltage (varying); V_z is the nominal zener voltage (in volts) from type data; I_z is the current through the zener (in amperes) and I_L is supplied to the load (in amperes).

The formula. $P_z = V_s \times I_{z\,max}$ is used to figure the power dissipated (P_z) in the zener (in watts) for a *constant* output load. To calculate the I_z maximum, the formula,

$$I_z = \frac{V_s - V_z}{R_s} - I_l$$

is used. The upper excursion of V_s (input supply voltage) is used in this case. This means, that if the voltage V_s varies from 3 to 5 volts (for example), the upper excursion of V_s is 5 volts.

When you have calculated R_s and I_z, and finally P_z from the formulae given, you can pick your zener from a long list having the characteristics required. There are many other considerations in zener shunt regulator design and some of these will be covered along with practical examples of zener circuitry later on in this column.

Remember that the regulated output voltage V_L will never be *exactly* the same as the nominal zener voltage V_z rating, but very close to it. This is so because of heating effects and the variation in magnitudes of zener current.

Where much power is involved, heat sinking of the zener will often be necessary.

Like zener types, in matched sets, can be series connected to provide higher voltage and power ratings as well as a lower temperature coefficient. Series connection of a number of zeners is more economical than using only one of the same tolerance.

For more detailed information on zeners, order the *Silicon Zener Diode Handbook* from Motorola Inc., 5005 E. McDonald, Phoenix, Arizona. The handbook is $1.00. If you want to make zener selection real easy, then order their zener diode slide rule calculator (also $1.00).

Tube Substitution—"Can you recommend a substitute for the 6BQ7A tube? I'm looking for something a little better."

Aren't we all! Try the Amperex 6DJ8.

KWM-2 on a.m.—"Without tearing up my KWM-2 I'd like an easy way to use it on a.m. All I want is a few watts for local rag-chews with some of my friends who have not switched to s.s.b. yet. What say?"

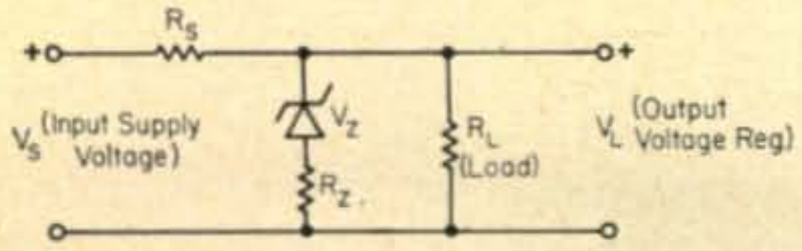


Fig. 4—Regulator circuit with zener diode.

Well believe it or not, it can be done without a soldering iron or parts! This scheme used by KZ5SW works because I tried it. Here's what you do. Inside the KWM-2 on the front right side on top the chassis you will find *two* controls which are marked, "carrier balance." One of these controls is a potentiometer (screwdriver adjustable), this is your "a.m. control." The other is a round variable ceramic capacitor—*leave this one alone*. Tune up the set as you generally do and set it back to u.s.b. Use the push-to-talk for operation. Place the meter switch in the plate position then rotate the carrier balance pot for maximum plate current. You'll find that you have about 85 to 90 ma. Then adjust your mike gain for a small flicker on voice peaks. Do not ride the mike gain—keep it down! You'll be running about 12 to 15 watts of power, plenty for a.m. local rag-chews. To go back to s.s.b., adjust the carrier pot to its original position (which you should mark). For *best* carrier null, use another receiver and watch its S meter as you turn the pot shaft with the rig in the u.s.b. position and PTT keyed on. Set the pot for minimum S meter reading. Happy a.m.'ing with the KWM-2!

NCX-3 S Meter—"I cannot seem to zero my S-meter according to the instructions given in the NCX-3 manual. What should I do?"

Check V_{6A} (12AT7). If this tube is not bad, then check R_{24} and R_{25}. While you are at it, also check C_{88}.

HQ-170 Calibrator—"Can you tell me how to troubleshoot my crystal calibrator in my HQ-170 receiver? Before it went completely out, it would sometimes work and sometimes not."

First check V_{11} (6BZ6 tube). Check capacitor C_{135}. If these are okeh, then check the voltage at pins 5 and 6 of the 6BZ6. The voltage on pin 5 should be about 25 to 40 volts and 6 to 8 volts on pin 6, both measured when the calibrator is on. The last thing to check is the crystal.

SX-117 Noise Limiter—"The noise limiter in my SX-117 stopped functioning. Please tell me what and how to check out the circuit involved. This is my first trouble with this fine set."

No radio receiver on the market today is "trouble-proof." As pointed out before, electronic parts do fail—even in guided missiles.

The noise limiter used in the SX-117 uses two diodes and is activated by switch S_2. Check C_{122} and C_{123}, then R_{42} and finally the diodes CR_1 and CR_2. If the diodes must be replaced, use those obtained from Hallicrafters, or one of its authorized service points.

HX-20 with 6146B—"I was wondering if I could use the new RCA 6146B to any advantage in my Heath HX-20 transmitter?"

As I have said before, the 6146B *is* a direct replacement for the 6146, *and* if power is available, the change is worthwhile. The RCA 6146B is a better tube than the old 6146 and does give you more r.f. power output.

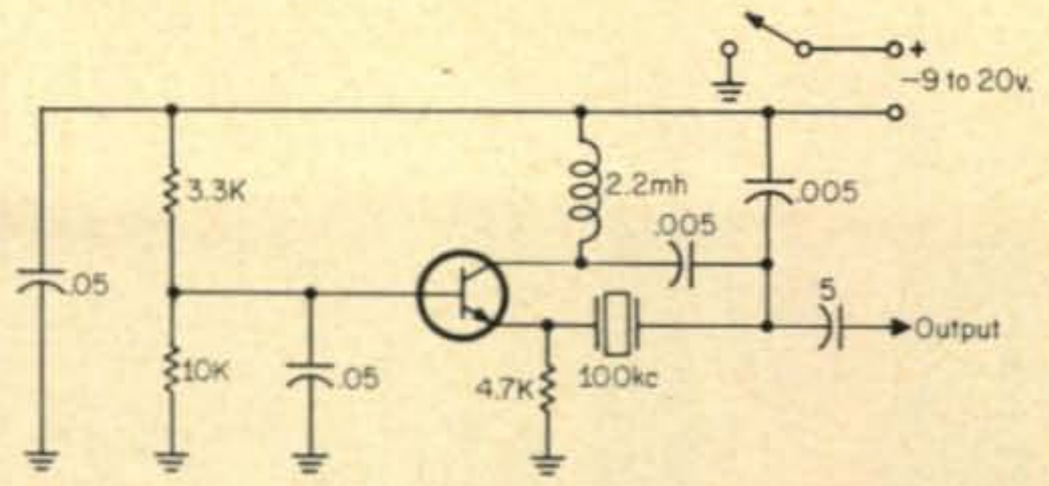


Fig. 5—Texas crystals 100 kc crystal calibrator. Transistor types 2N117, 2N160, 2N789, 2N902 or 2N332 may be used. Try a *small* variable capacitor across the crystal for fine calibration with wwv.

Texas Crystals 100 Kc Calibrator—"Please publish a circuit of a good 100 kc crystal oscillator using one transistor. I desire to use this in my transceiver where little extra room is available."

Sure. See Fig. 5. This is a circuit recommended by Texas Crystals using their in-stock TX100 crystal in a small HC6/U holder which fits a CE-1 socket. The price is only $4.50.

The operating voltage for the oscillator is not critical but should not exceed 20 volts. The voltage need not be stabilized but the frequency stability will be better if it is. You can use either a battery or voltage from your bias supply to power the oscillator. Be careful however, where you place the oscillator. Keep it away from high temperature areas. The output is connected via a 5 mmf capacitor to the *input* of the *receiver r.f. stage*. *Do not* connect it to the transceiver's antenna terminal which is used for both receiving and transmitting. The oscillator will enable you to check calibration every 100 kc. I tried out the circuit and it's a very good one.

ASB-5 Radar Receiver to 420 mc—"A couple of friends and myself picked up some surplus ASB-5 radar receivers. I understand these can be converted to 420 mc. If so can you supply the information?"

In the October 1956 issue of *CQ* there is an article that shows you how to convert the ASB-5 to a good 420 mc receiver.

Reprint Service—Please address your requests for reprints of articles which have appeared in *CQ* (with $1.00) to our Assistant Editor, Al Dorhoffer, K2EEK. *Do not* send them to me. If Al has the back issue in which the article you require is published, you'll get the back issue, otherwise you'll get the reprint. The current year's CQ's are available at the newstand price.

Thirty

To all of you who have written to us requesting information as to what is holding up implementation of PL-88-313 (reciprocal operations), we are sorry to say we do not have the answers. The necessary moves are up to the State Department and the FCC—many countries are waiting for an approach, and so are many of the world's over 350,000 hams.

73-75, Chuck, W6QLV

NOVICE

WALTER G. BURDINE,* W8ZCV

THE opportunity of the ham, regardless of class of license, to contribute to the advancement of the science of communication is unlimited. We are hopefully awaiting the launching of the world's only privately built and financed communications satellite. OSCAR III will soon be sent into orbit with facilities to receive and retransmit signals from other amateur transmitters. The possibility of creating new two meter records is unlimited; if we have enough participation and report the results. We must use the best communication techniques that we can muster to obtain optimum results. We must depend upon the amateur fraternity to keep the OSCAR frequencies clear as possible of local interference. The time of use by any one locality will be of short duration and we must make the best use of that time to achieve best results. Co-operate and operate with care.

The fact that we are still able to contribute to the science of communication is shown by the new records established by the few hardy souls operating above 220 mc and developing new techniques of operation. We must have more and more operation on the higher frequencies to achieve better results. Activity on the higher frequencies will cause many present DX records to topple. It is almost always proven that occupancy of a band widens its communication range. When I started operation on the two meter band it was proven ??? that communication beyond line-of-sight was an impossibility, two or three hams now have over 40 states and with the launching of OSCAR they just might get WAS for their untiring efforts. I want to live to see that day. I had a very hard time to make WAS on ten meters with 55 watts n.b.f.m., but I did it. I am going to try for WAS on six in the future, and then?

I have an idea that this is going to be one of our best years for ham radio. Let's make it a year of achievement for our hobby. Make some schedules with a ham that you don't usually talk to because he is too far away. Do it at The Dayton Ham-vention and other ham gatherings. You meet the active hams there and the ones that are really trying to do something for ham radio. Attend some of the technical sessions that is part of these gatherings and learn the newest techniques of doing your particular part of experimentation for the improvement of our hobby. Almost everything we are doing is obsolete, it has been improved upon by someone else. TRY SOMETHING NEW, you would be surprised how much fun it is to be able to use more than one band and one method of communication, you might make a significant contribution to the science of communitcation. TRY IT.

*R.F.D. 3, Waynesville, Ohio 45068.

Oscillation Indicator

Does it oscillate? Have I got it tuned for maximum power output? How many times when building a new piece of equipment have you asked these questions? This simple instrument will tell you the whole story.

The parts required are not expensive, and the unit can be assembled in a very short amount of time. This could be the most used test set with the possible exception of the grid-dip meter. The meter can be mounted in a case and possibly connected to the exploring coil with a short length of coax cable. I have never tried this. I built my unit on the back of the meter and hold it near the coil to be tuned. The unit will indicate oscillation at any frequency. It can be used for very low power. I tune my 12.5 mw transistor rig entirely with this unit. The coil can be made with two or three turns of solid hook-up wire with the connecting wires twisted to the meter. The diode can be any unit that you have laying around the shack or one of the bargain-type on sale in any radio catalog. The capacitor can be anything near .001 mmf to by-pass r.f. around the meter. The meter used here is a surplus 0 to 1 ma unit, Lafayette has one for $2.95, new. To use: hold the "exploring coil" near the circuit to be tuned and tuned for maximum meter deflection, move the coil away from the tuned circuit if the meter goes off-scale. If the meter reads backwards, reverse the diode. Couple to the antenna line and tune for maximum meter deflection for maximum transmitter output, the plate meter rarely tells the point of maximum output, this meter does. This is shown in fig. 1.

Monitor and Tune Up Meter

Along with the same idea above, I wanted a unit that I could couple to the transmitter output terminal and use for monitoring my signal as others hear it. I also wanted to tune for maximum r.f. output into the antenna. The unit in fig. 2 is the result of that need. I just inserted a "T" connector into the antenna lead and sampled the r.f. output. A portion of the output is rectified to actuate either the meter or a pair of headphones plugged ino the jack. The unit was built into a Minibox 2¼ × 2¼ × 4 inches. It is connected to the transmitter by an RG-58 cable. I have not used it on a transmitter of over

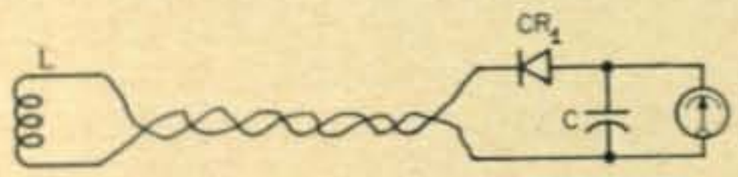


Fig. 1—Oscillation indicator. It can be used as a field strength meter. The meter is 0-1 ma, CR_1 is a 1N34 or equivalent, C is .001, and *L* is 2 or 3 turns of solid hook up wire with the leads twisted, 1 inch diameter.

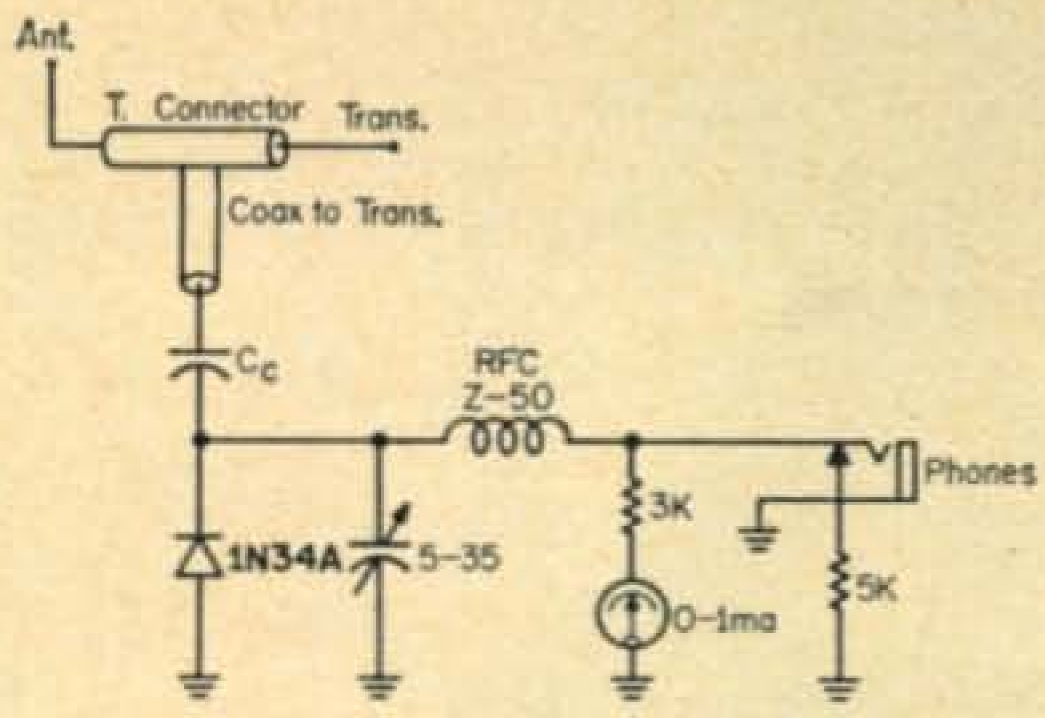


Fig. 2—A transmitter tune-up meter for low power transmitters. Resistors are ½ watt.

10 watts but I have an indication on 12.5 mw. Possibly changing the value of the 3k resistor would increase or decrease the meter reading. The amount of signal coupling can be controlled by changing the value of the coupling capacitor C_c. Capacitor C_c can be a gimmick made by twisting a short length of hook-up wire to form a capacitor, the shorter the twisted part of the wire, the less the capacitor value. The amount of r.f. can be controlled to some extent by tuning the 5-35 mmf capacitor. Be sure the jack is not a grounding type but a circuit closing jack. Watch this part of the construction, I had trouble here. The insertion of this unit into the antenna line does not seem to affect the transmitter ouput. You will use this often.

Beat Frequency Oscillator (b.f.o.)

To receive c.w. transmissions you must have a stable oscillator working at a frequency that is ± 2 kc of your i.f. frequency. This oscillation can be fed into either the detector input or the grid of the last i.f. amplifier stage through a very small capacitor. This could be a gimmick or a value of 2 to 10 mmf, this capacitor is indicated by *C* in fig. 3. Coil *L* must be wound to resonate at the frequency of the i.f. amplifier with the bandset capacitor C_1 set at midscale. This capacitor should be small, just enough capacity to change the frequency about 4 kc, this gives you about 2 kc, either side of the i.f. frequency. This causes an audio note up to 2 kc on the output by beating the two frequencies (the b.f.o. and i.f. frequency) of your receiver. The coil must be wound to resonate at the i.f. frequency and the tap will be near ¼ to ⅓ the total turns from the ground end. The tap determines the feed back to cause oscillation. The parameters for the coil can be taken from the coil winding nomograph in the *Handbook*, don't forget the tap. More on this circuit later. I aim to use this on a Gonset Communicator with a product detector.

Letters

Our letters column frequently brings this response and it is always well received by the editor. The fact that we are responsible for the growth of amateur radio in any small way is reward enough for the effort put in making this column well read. Your letters are received and enjoyed and if it has any thing of interest to our readers, it will be published in our column for others to enjoy. Why don't YOU write?

"Dear Walt: I've been SWL-ing off and on for the past five or six years and have wanted to obtain my own license but I could never find anybody close by to help me learn the code. I've logged all on the territories and states of the United States and many foreign countries using a home-brew receiver with a ten foot wire for an antenna. I have copied nearly all of this on 40 meters.

"I am presently in the Navy attending Electronics Technician School at Great Lakes, Illinois. I would very greatly appreciate being contacted by a local ham to help me with the code and theory, etc.

"I think your articles in NOVICE are the greatest, and an inspiration to anybody interested in amateur radio. I know this because your articles helped me decide to ask for help and to get my license. Best 73. Ray N. Sheets, 656 McAllister Street, Waukegan, Illinois."

Are you a member of this group?

"Dear Walt: I've had my novice license since June of 1964. I have never been on the air but I hope to some day. I take electronics at Meyers High School and my instructor is W3QXW. I have bought an NC-188 and am building my own transmitters. My code speed is up to 18 W.P.M. from constant practice at the school's club radio station. I seem to be the only amateur that uses the equipment.

"But the reason I'm writing this letter is to ask you to send me plans for a b.f.o. It's a six meter receiver that's being built. If you happen to have the schematic, fill me in on the place it fits in the schematic.

"I am 17 years old. I have one or more things that your column could use. First of all, when I decided to write to you, I didn't know where to write. So, I called up a fellow ham (K3PPV) to ask the call book address. Then as he was giving me your address I noticed it at the bottom page of the column. I think you should mention this place in the column, I would never have found it if I didn't look down at the bottom of the page.

"Secondly, I would like to see you put a little article in the column on transmitters, starting from the very beginning and ending up wih the designing your own transmitters. It's just an Idea. 73. Ronald Stone, WN3BCG, 883 South Franklin Street, Wilkes Barre, Pennsylvania."

My Gosh, where have you been? I have tried to explain the theory of each part and circuit in a transmitter and explain the workings of each component. My address appears in all issues and about 50 percent of the time at the end of the help wanted column. I frequently receive letters saying that the reader reads every word of the column and then the letter is sent to me at the *CQ* office, why didn't he know my address if he read the column as stated? Sending the mail to New York only makes extra work for the already overworked office staff at the *CQ* offices and the mail often arrives late for the column.

I will include a couple of circuits of a b.f.o. and explain its use and its location in a receiver's circuitry.

"Dear Walt: Although I am no longer a novice, Your NOVICE section is read second only to receiver construction articles in *CQ*. I enjoy your technical articles and the dope on clubs and activities.

"To give you some idea of the home-brewing that has gone on here at K8VBL (ex KN8VBL) at Kalamazoo, Michigan, a foto is enclosed. The receiver is a dual conversion super-het (with Eddystone dial) covering 40 and 80 meters, with dual half-lattice filters at 1700 kc, 1st i.f. and 50 kc 2nd i.f. with selectivity control. The latter being a design from the 1960 ARRL *Handbook*. The receiver also features a product detector and a rather unique mechanical arrangement of the tuneable oscillator.

The regulated power supply is just to the right, with a 100 kc xtal calibrator with a 10 kc relaxation oscillator on it. A crystal-controlled converter is used for 20, 15,

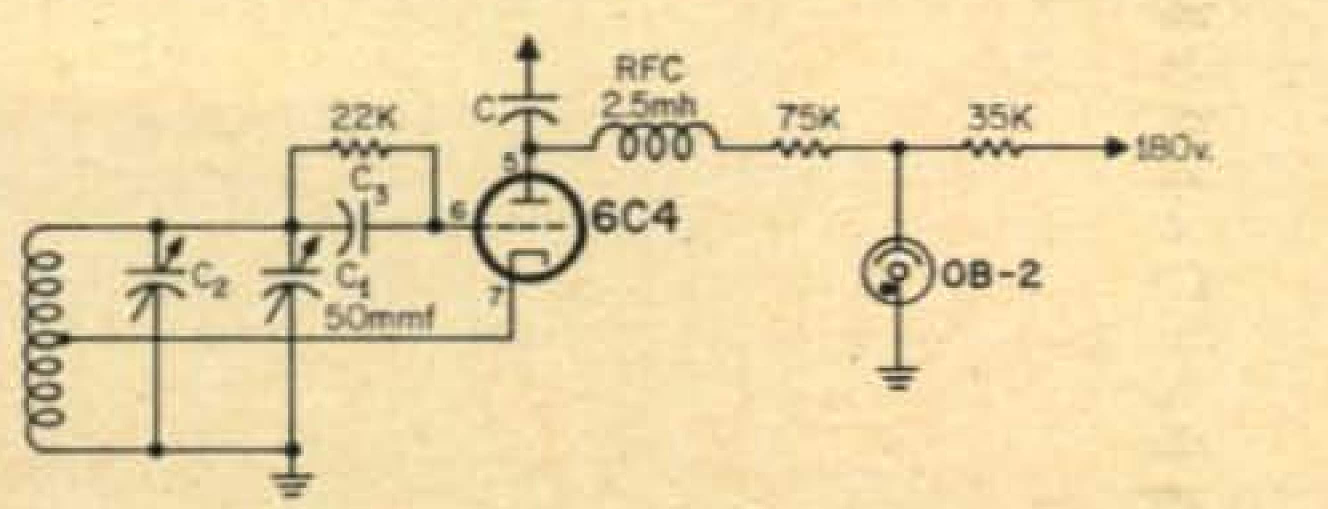


Fig. 3—B.f.o. circuit. As I am unable to get a b.f.o. transformer, I am offering the circuit shown. More information is described in the text.

and 10 meter reception, which is not shown. The surplus audio filter is used occasionally. The mini-box just visible behind the key is a transistorized "Oss-Key" built from an article in *QST* and it permits break-in. The C. Brandes fones are over 40 years old and are the best of 10 pairs I own. I use phones exclusively here. The old Mesco key mounted on a wood block makes a fine "side-swiper". The AT-1 was a loan from Ken, K8ADJ as my 30 watt rig was out of order at the time. The antenna was a folded dipole with a Heath balun coils.

"At present I am serving a hitch in the Navy Hospital Corps at Oakland California, and was operating c.w. as portable 6 at a friends home. My equipment is a DX-20 and an NC-101-X which is kept for its historical aspect more than any other reason. I am having some difficulty finding a QTH now so I am not presently on the air. I am looking for a place in the vicinity of the Naval Hospital.

"I am in the market for a *Radio Society of Great Britain Amateur Handbook*. I remember seeing a paragraph in *CQ* about it a few months ago but can't locate it now. Could you supply the address of the RSGB and the cost of their handbook? I wonder if the radio amateurs of France have a handbook or something along this line? Thanks and best wishes to you and your wonderful column in *CQ*. 73. Tom . . . Thomas M. Turner, HM3, K8VBL/6, U.S. Naval Hospital, (staff), Oakland 14, California."

Thanks for the letter Tom. I think this letter will show many that it is not absolutely necessary to buy an expensive factory built receiver to get on the air. It looks good to me.

The address of the RSGB is: The Incorporated Radio Society of Great Britain, New Ruskin House, 28/30 Little Russell Street, London, WCI. Membership in the RSGB is about $5.00. The Handbook costs 34 shillings plus postage. A shilling is equal to about $.14 in our exchange. Thanks W8LUZ ex G3HLP. It surely contains some good information. As to the other question, I do not know if France puts out a handbook or if there is a club there but I presume that they have a national organization.

"Dear Sir: I would like to say that even though I have read your articles in *CQ* for just a few short months, they have been full of information.

"I became re-interested in ham radio last spring after losing interest for almost twenty years. Meanwhile work, marriage, a family kept me too busy. I started with crystal radios and ended up with one and two tubers by the time I was out of high school. The code was the draw back then.

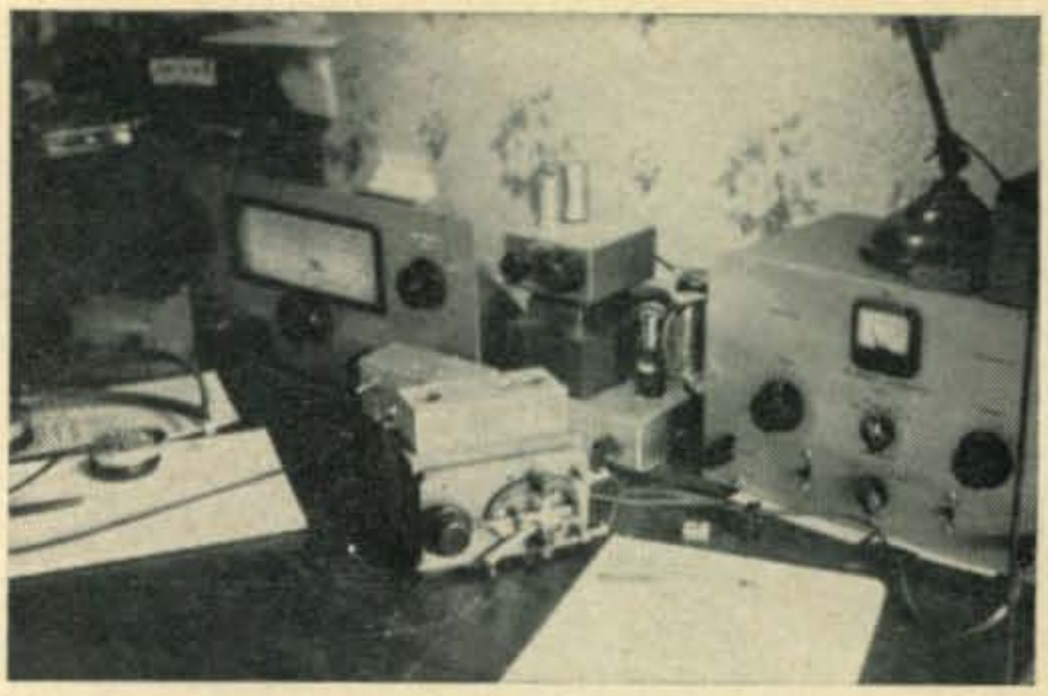
"I thought I was going to have a hard time, but found that with nightly practice I could copy 5 w.p.m. by September. But was very surprised that by Christmas I was able to pass the 13 w.p.m. test and have now passed the written test so am now waiting for the new ticket.

"Keep up the good work. I might say that being a rare state I can more or less pick the calls that I want to work, but don't pass up many. I have worked 36 states in 3½ months, mostly on 15 meters. I have worked every thing East of the Mississippi except Vermont and Delaware, I need a schedule with them. I have also worked Alaska, Japan, Cuba, and Brazil but have not worked Montana (40 miles) and Utah (200 miles). Most of my trouble is I do not want to fight the QRM on 40 and 80 meters. I have sent out over 100 QSL cards. I do this by doing more listening than transmitting, I think more novices should do this to improve their DX quotient.

"I have built the linear from the November 1964 *CQ* but using only two tubes. I have rewound a husky TV transformer to give me about 520 volts at over 800 ma 6.3 volts at 6 amps and 32 volts at 800 ma all at the same time. I now need a voltage doubling circuit to give me about 1000 volts at 400 ma. I have the general idea but could you send a rough sketch?

"I will try to schedule anyone needing Wyoming for a new state. From March on I am very busy caring for the mink. I usually try to work some on Saturday and Sunday afternoons. I would like to work Vermont and Delaware before the band is dead for the summer. I will try to finish up the East coast novices before that happens. Thanks and keep up the good work, Walt. 73 Paul."

By the way, Paul sends a mink covered QSL card and



Most of this station is homebrew and looks like it does the job it is supposed to do in working DX for KN8BVL/6. Read about the receiver and wish for one. It belongs to Thomas M. Turner, U.S. Naval Hospital, Oakland, California.

it surely is different. I would enjoy talking with you as I have been through Cody and stayed at a motel out East of Cody near the fairgrounds or the place where the circus is held. I will send the diagram. Paul's address is Paul M. Rich, WN7BPO, Box 1208, Cody, Wyoming.

Help Wanted

If you are stuck and need help with the code or theory why not let me have a little letter from you and I'll see what I can do to get some one near you to help. Once in a while a ham in some foreign country will offer to help and this makes it more interesting. I get lots of letters from those that have asked for help telling me that they have been contacted by someone to help them to the place where they are now hams. You can offer to help and gain much more from your hobby by helping others. My mother used to tell me that one of the most beautiful things about flowers was the pleasure that others had when you could send home a bouquet with them. A kind deed is one of the greatest little things that we can do for nothing. Here is the list this month.

Tom Fleck, 3824 Hascall Street, Omaha, Nebraska, needs help with code and someone to give him the test. Tom reads the column and sent his letter to New York. It arrived one day toooo late for the column last month.

John Ocak (13) would like some help with the code and would like to be able to go to a radio club for young hams. His address is 1213 Dayton Street S.W., Grand Rapids, Michigan. Please some member of the Grand Rapids club contact John.

Mark P. Mitchell, 415 Duke Drive, Portsmouth, Virginia, needs some help with the theory and someone to give the test. Help him please.

Scott Krauss, C.R. #4, Box 133, Clyde, Ohio, would like to have a chance to contact a local for some information and a little help with terminology.

WNØJRD, Dan Wright, 5015 West 20th Terrace, Topeka 4, Kansas would like to have anyone within two meter distance of Topeka know that they have formed the "pi-net" to further the cause of two meters in Kansas. They meet on Saturday night at 9:00 P.M. By golly, Dan let me know what frequency you use and I'll try to get out there next summer. I am planning a new antenna and some more rig. I am now sure that my receiver will get there if anyone can, I should know a little about where to look after almost ten years of daily contacts above 50 mc.

That is just about all for this month. I hope you can use one or more of the building projects for this month. I have more new ideas coming up soon and the new transmitters and receivers are progressing very well and they should be good enough for the serious ham as well as the beginners. I am having some local talent try their hand at the project before passing them along to you.

Good luck and the best of DX to you and don't forget that this summer is a real good time to try for that VHF DX record, better get your thinking cap on and plan to build for VHF this summer. I'll be there with a signal every day on some band above 50 MC. I choose to operate there, I have a Class A license. I enjoy it more, that's why. 73. Walt, W8ZCV

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

May	**1-2**	***CQ* Spring VHF**
May	1-2	OZ CCA C.W.
May	8-9	USSR C.W. DX
May	15-17	Georgia QSO Party
May	15-16	OZ CCA Phone
May	23-24	Bermuda Contest
June	4-7	CHC/FHC/HTH Party
June	6-7	Bermuda Contest
June	12-13	National Field Day
June	12-13	ARRL VHF QSO Party
June	26-27	ARRL Field Day
July	3-5	Venezuelan Contest

CQ Spring VHF

Starts:
Ends:

You will find all the information about this one in Bob Brown's VHF Report in last month's issue, on page 41.

USSR C.W. DX

Starts: 2100 GMT Saturday, May 8
Ends: 2100 GMT Sunday, May 9

The tendency in this contest has been to only work the USSR stations and some of the other European activity. However this is a world wide contest and serial numbers can be exchanged with stations all over the world.

Check last month's CALENDAR for a detailed explanation of the rules and the many awards.

Mailing deadline for your logs is June 1st and they go to: USSR Central Radio Club, Att: Chief Judging Board, P.O. Box 88, Moscow, U.S.S.R.

OZ CCA

C.W.—May 1-2. **Phone**—May 15-16.
Starts: 1200 GMT Saturday
Ends: 2400 GMT Sunday

Although not too well known this contest is in its 14th year. It's a world wide type contest but contacts with OX, OY and OZ stations have double point value. C.W. and Phone are separate contests and competition is limited to single operator only.

1. Use all bands 3.5 thru 28 mc.
2. The usual five and six figure serial numbers, RS/RST report plus a progressive 3 digit QSO number starting with 001.
3. Each completed contact is worth 3 points, OX, OY and OZ contacts 6 points.
4. The multiplier is determined by the number of countries (ARRL DXCC list) worked on each band. Each call area in W/K, VE/VO, PY, LU, VK and ZL will also be considered as a multiplier.
5. The final score, total QSO points multiplied by the sum of the multiplier from each band.
6. Certificates will be awarded to the highest scorer in each country and call areas as indicated above.
7. Your log should show in this order: Date/Time in GMT, station worked, country, progressive multiplier for each band, serial number sent, received and QSO points.
8. Include a summary sheet showing your scoring, equipment description, name and address in BLOCK LETTERS, and sign the usual declaration that all rules and regulations have been observed.

Mailing deadline for your logs is June 15th to: The E.D.R. Contest Committee, P.O. Box 335, Aalborg, Denmark.

Georgia QSO Party

Starts: 2300 GMT Saturday, May 15
Ends: 0500 GMT Monday, May 17

This is the fourth annual Georgia QSO Party sponsored by the Columbus Amateur Radio Club.

There are no time or power restrictions, contacts can be made on c.w. or phone but only one contact per band is permitted with the same station. Crossband contacts are not permitted but c.w. to phone is OK.

Exchange: *Georgia stations;* QSO number, RS/RST report and county. *Others;* QSO number, RS/RST report and state or province. (Georgia to Georgia contacts are permitted for the purpose of obtaining the section multiplier and QSO points.)

Scoring: *Georgia stations;* 2 points for each completed contact, multiplied by the number of different states and provinces worked. *Others;* 2 points per contact multiplied by the number of different Georgia counties worked.

Awards: Certificates to the highest scoring station in each state, province and Georgia county. Second and third place awards will be made in sections that warrant additional recognition. A plaque will be presented to the Georgia station submitting the highest SSB score and the highest overall score. Plaques will also be awarded to the highest scoring non-Georgia entry and to the Georgia club with the greatest aggregate score.

Frequencies: c.w.—1805, 3590, 7060, 14060,

*14 Sherwood Road, Stamford, Conn. 06905.

21060, 28060. a.m.—3995, 7260, 14230, 21310, s.s.b.—3975, 7220, 14290, 21410. Novices—3735, 7175, 21110.

Your log should show in this order: Date & time in GMT, station worked, RS/RST sent and received, QSO number sent and received, county, state or province, band and mode.

Include a signed declaration that all contest rules and operating regulations have been observed and mail your entry no later than June 10th to: Columbus Amateur Radio Club, Att: K4BVD, 1638 Forest Avenue, Columbus, Georgia, 31906.

Bermuda Contest

Starts: 0001 GMT Sunday, May 23 & June 6
Ends: 0200 GMT Monday, May 24 & June 7

Once again the Radio Society of Bermuda is holding its annual contest open to all USA and Canadian stations, and once again the "Top BANANA" in the contest will be the guest of the Society at The Elbow Beach Surf Club. You and a guest can spend a week there and have nothing to worry about as they will also pick up the tab on your airline ticket. How about that.

1. Use all bands, 3.5 thru 28 mc.
2. Only single operator stations allowed.
3. Both c.w., phone and cross mode contacts permitted, one contact per band with the same station.
4. W/K and VE/VO stations will give a RS/RST report. VP9 stations RS/RST report plus their Parish.
5. Each completed contact counts 3 points.
6. Your multiplier is derived by the number of Parishes worked on each band. (A possible total of 45.)
7. Final score: total QSO points multiplied by the total number of Parishes from each band.
8. There are no equipment, power or time limitations.
9. A certificate signed by His Excellency The Governor of Bermuda will be awarded to the highest scoring station in each call area for the US and Canada. In case of a tie, the winner will be determined by the highest number of Parishes on 3.5 mc or each band.
10. Keep all times in GMT, carefully check your log and compute your own score. Print your name and address in BLOCK LETTERS and sign a declaration that all rules and regulations have been observed.

Bertus Backer, VE1AGH winner of the 1964 Bermuda Amateur Radio Club contest arriving in Bermuda. L. to R. Cynthia, Mrs. VE1AGH, Reg, VP9AX, Al, VP9DC and the proud winner VE1AGH. Al and Reg are President and Vice President of the Radio Society of Bermuda.

All logs must be in the hands of the committee no later than July 15th and they go to: Radio Society of Bermuda, Att: Contest Committee, P.O. Box 275, Hamilton, Bermuda.

List of Parishes

Sandy's	SAN	Warwick	WAR
Devonshire	DEV	Hamilton	HAM
Pembroke	PEM	Paget	PAG
Southampton	SOU	St. George	GEO
Smiths	SMI		

CHC/FHC/HTH Party

Starts: 2300 GMT Friday, June 4
Ends: 0600 GMT Monday, June 7

This one generates a multitude of varied activity. What with the Certificate Hunters Club, the Flying Hams Club and Hunt the Hunters all going at it, it gets a bit involved.

Exchange: *CHCers and FHCers;* QSO number, RS/RST, name, CHC/FHC number, state and county. (DX stations, DOK, LAAN, Province and etc. *HTHers* (all non CHCers are HTHers) send same as above, less the membership number.

Scoring: *CHCers:* CHC to CHC, 1 point per contact; CHC to HTH, 2 points; YL and FHC contacts count 3 points. *HTHers:* HTH to CHC, 3 points; FHC contacts 4 points and YL CHCers 5 points. (HTH to HTH no value.) The same station can be worked on a different band and mode for contact point credit. (s.s.b. and a.m. different.)

S.w.l.s can also submit a log of stations heard in this activity for s.w.l. awards. They use the same scoring system as the HTHers.

Multiplier: Add the number of different continents, countries, VE provinces and US states worked. Your own state/country can be claimed as a multiplier. KH and KL count both as a state and DX. Sum total of above is your multiplier.

Final Score: Add the accumulated QSO points; add your total multiplier. Multiply total QSO points by your total multiplier.

Awards: 1st, 2nd and 3rd place certificates for the world, each continent, country, US state and VE province. Plue *30 Trophies* for many different categories of CHCers, HTHers and SWLs.

Frequencies: (Plus or minus 10 kc.) c.w.—3575, 7030, 14075, 21090, 28090. a.m. 3810, 7235, 14230, 21330, 28800. (DX 3675, 7075) s.s.b.—3990, 7210, 14340, 21440, 28690. (DX 3775, 7090) VHF—50.3.

A detailed and accurate log and summary sheet is requested. Inaccuracy in the scoring will

[*Continued on page 100*]

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Propagation

BY GEORGE JACOBS,* W3ASK

EXCEPT for an occasional daytime opening to southern or tropical areas, few DX openings are forecast for 10 meters during May. Frequent short-skip openings between distances of approximately 750 and 1400 miles should be possible, however, as a result of increased sporadic-*E* propagation. While opening to fewer areas than during the winter months, generally good DX conditions are predicted for 15 meters. During May, DX openings on this band should take place during the daylight hours, with conditions peaking during the early afternoon. Frequent short-skip openings between 600 and 1400 miles are also predicted for 15 meters. Twenty meters is expected to continue to be the best band for DX during May. The band is forecast to open shortly after sunrise, and good propagation conditions should prevail to one area of the world or another through the early evening hours. When propagation conditions are normal or better, the band may remain open to southern and tropical areas well into the hours or darkness. Numerous short-skip openings are forecast for 20 meters, between distances of approximately 350 and 2300 miles. Conditions are expected to peak on 20 meters during the late afternoon and early evening hours.

Although fewer 40 meter DX openings are predicted for May, some fairly good openings should be possible from shortly before sunset, through the hours of darkness, until shortly after sunrise. Daytime short-skip openings are predicted for distances between approximately 150 and 750 miles, with nighttime openings extending up to 2300 miles, and beyond. Static levels are expected to be noticeably higher on 40 meters during May. DX conditions on both 80 and 160 meters are expected to decline during the month as a result of seasonally higher static levels, increased ionospheric absorption, and fewer hours of darkness. During the daylight hours, 80 meter short-skip openings should be possible between distances of approximately 50 and 250 miles, while 160 meter openings will be limited generally to distances less than approximately 50 miles. During the hours of darkness, some 80 meter openings are expected for distances up to 2300 miles, and beyond, while 160 meter openings should extend up to 1000 miles, or so. Occasional 160 meter openings up to 2300 miles, and to some DX areas of the world, may also be possible on some nights during the month.

*11307 Clara Street, Silver Springs, Md. 20902.

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for May

	Forecast Rating and Quality			
Days	(4)	(3)	(2)	(1)
Above Normal: **6, 15, 18, 21**	A	A-B	B-C	C
Normal: **1, 3-5, 7-9, 11-12, 14, 16-17, 19-20, 22, 24, 27-28, 30-31**	A-B	B-C	C-D	D-E
Below Normal: **2, 10, 13, 23, 26, 29**	C	C-D	D	E
Disturbed: **25**	D	D-E	E	E

How To Use These Charts

The following is an explanation of the symbols shown above, and instructions for the use of the *CQ* propagation predictions:

1—Enter Propagation Charts on following pages under appropriate band and distance or geographical area columns. Read predicted times of band openings at intersection of both columns.

2—Following each predicted time of band opening is a forecast rating which indicates the relative number of days the band is expected to open during each month of the forecast period. The higher the rating, the more frequent the opening, as follows: (4) band open more than 22 days each month; (3) between 14 and 22 days; (2) between 8 and 13 days; (1) less than 7 days.

On the "Short-Skip" Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. Note the forecast rating for later use.

3—With the forecast rating noted above, start with the numbers in parentheses at the top of the "Last Minute Forecast" appearing above. Read down the table for a day-to-day forecast of propagation conditions in terms of Above Normal (WWV rating higher than 6); Normal (WWV rating 5-6); Below Normal (WWV rating 4); Disturbed (WWV rating less than 4). The letter symbols (A-E) describe reception conditions (signal quality, noise and fading levels) expected for each day of the month and have the following meanings: A—excellent opening with strong, steady signals; B—good opening, moderately strong signals, little fading and noise; C—fair opening, signals fluctuating between moderately strong and weak; D—poor opening, signals generally weak with considerable fading and noise; E—poor opening, or none at all.

4—This month's Propagation Charts are based upon a transmitter power of 75 watts c.w.; 150 watts s.s.b., or 300 watts d.s.b., into a dipole antenna one quarter-wave above ground on 160, 80 and 40 meters and a half-wave above ground on 20, 15 and 10 meters. For each 10 db increase above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss, reception will become poorer by one level.

5—Local Standard Time for these predictions is based on the 24-hour system.

6—These Propagation Charts are valid through June 30, 1965. These Charts are prepared from basic propagation data published monthly by the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colorado.

The *CQ* Propagation Charts contained in this month's column include predictions for short-skip openings between distances of 50 and 2300 miles, for May and June, 1965. Forecasts centered on Hawaii and Alaska are also included in this month's charts. DX Propagation Charts for May appeared in last month's column. Instructions for the correct use of these Charts appear directly beneath the "Last Minute Forecast" at the beginning of this column.

VHF Ionospheric Openings

A considerable increase in sporadic-*E* propa-

gation is expected to result in occasional 6 meter openings during May. Openings of this type are most likely to occur between 9 A.M. and 1 P.M., and between 5 P.M. and 9 P.M., Local Standard Time, between distances of approximately 1000 and 1400 miles. DX openings between stations in the southern part of the United States and Central America may be possible on 6 meters as a result of sporadic-E propagation.

The *Aquarids*, a fairly large meteor shower, is expected to occur during the first week of May. Millions of meteors may enter the earth's atmosphere during this period, making possible some meteor-type ionospheric openings on 10, 6 and 2 meters.

While auroral activity is generally at a very low level during May, some displays may occur during periods of below normal or disturbed ionospheric conditions. During such periods, 6 and 2 meter propagation may often be possible for distances up to approximately 1200 miles as a result of reflection or scatter from ionospheric patches produced by the auroral display. Check the "Last Minute Forecast" at the beginning of this column for periods during May that are likely to be below normal or disturbed.

Sunspot Cycle

The Zurich Solar Observatory reports a monthly mean sunspot number of 14 for February, 1965. This results in a 12-month smoothed sunspot number of 10 centered on August, 1964. (Solar activity appears to have remained practically constant during the three-month period June-August, 1964.) A smoothed sunspot number of 15 is predicted for May, 1965.

The Zurich Observatory has published recently the official monthly mean sunspot numbers for 1964, as follows:

Jan.	15.3	July	3.1
Feb.	17.7	Aug.	9.3
Mar.	16.5	Sept.	4.7
Apr.	8.6	Oct.	6.1
May	9.5	Nov.	7.4
June	9.1	Dec.	15.1

The yearly mean value for 1964 was 10.2. This was the lowest yearly mean recorded since 1954, and indicates very strongly that the minimum of the 19th sunspot cycle occurred during 1964.

73, George, W3ASK

CQ Short-Skip Propagation Chart

May-June, 1965

At Path Mid-Point
(24-Hour Time System)

Band Openings Given in Local Standard Time

Band (Meters)	*50-250 Miles*	*250-750 Miles*	*750-1300 Miles*	*1300-2300 Miles*
10	*Nil*	07-09 (0-1) 09-13 (0-2) 13-17 (0-1) 17-21 (0-2) 21-23 (0-1)	07-09 (1) 09-13 (3) 13-17 (1-2) 17-21 (2) 21-07 (1)	07-09 (1-0) 09-13 (3-0) 13-21 (2-0)
15	*Nil*	06-09 (0-2) 09-13 (0-3) 13-17 (0-2) 17-19 (0-3) 19-23 (0-2) 23-06 (0-1)	06-09 (2) 09-13 (3) 13-17 (2) 17-19 (3) 19-23 (2) 23-06 (1)	06-09 (2-0) 09-13 (3-0) 13-17 (2-0) 17-19 (3-1) 19-23 (2-0)
20	*Nil*	06-09 (0-2) 09-16 (0-4) 16-20 (0-3) 20-23 (0-2) 23-06 (0-1)	06-07 (2) 07-09 (3) 09-16 (4) 16-20 (3-4) 20-23 (2) 23-06 (1)	06-07 (2) 07-09 (3-2) 09-15 (4-3) 15-20 (4) 20-23 (2) 23-06 (1)
40	07-09 (0-2) 09-15 (1-4) 15-19 (2-4) 19-21 (1-2) 21-23 (0-1)	07-09 (2) 09-15 (4-2) 15-17 (4-3) 17-19 (4) 19-21 (2-4) 21-23 (1-3) 23-07 (0-2)	07-15 (2-1) 15-17 (3-1) 17-19 (4-2) 19-21 (4) 21-23 (3-4) 23-02 (2-4) 02-07 (2)	07-17 (1-0) 17-19 (2-1) 19-02 (4) 02-04 (2-3) 04-06 (2) 06-07 (2-1)
80	07-10 (4) 10-18 (4-3) 18-22 (4) 22-01 (2-4) 01-05 (2-3) 05-07 (3)	07-10 (4-1) 10-16 (3-0) 16-18 (3-1) 18-20 (4-2) 20-01 (4) 01-05 (3) 05-07 (3-2)	07-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-3) 22-01 (4) 01-05 (3) 05-07 (2-1)	07-18 (0) 18-19 (1-0) 19-20 (1) 20-22 (3-2) 22-01 (4-3) 01-05 (3-2) 05-06 (1) 06-07 (1-0)
160	05-07 (4-1) 07-09 (3-0) 09-18 (2-0) 18-20 (3-1) 20-22 (4-2) 22-05 (4-3)	05-07 (1) 07-18 (0) 18-19 (1-0) 19-20 (1) 20-22 (2-1) 22-00 (3-2) 00-03 (3) 03-05 (3-2)	05-07 (1-0) 07-19 (0) 19-22 (1) 22-00 (2-1) 00-03 (3-2) 03-05 (2-1)	05-07 (0) 07-20 (0) 20-00 (1) 00-02 (2) 02-03 (2-1) 03-05 (1)

Alaska
*Openings Given In GMT**

TO:	*15 Meters*	*20 Meters*	*40 Meters*	*80/160 Meters*
Eastern USA	*Nil*	21-00 (1) 00-02 (2) 02-04 (1)	*Nil*	*Nil*
Central USA	01-03 (1)	13-16 (1) 21-00 (1) 00-03 (2) 03-05 (1)	09-12 (1)	*Nil*
Western USA	01-03 (1)	15-18 (2) 18-00 (1) 00-02 (2) 02-05 (3) 05-07 (2) 07-15 (1)	10-14 (1)	*Nil*

Hawaii
Openings Given in Hawaiian Standard Time †

TO:	*10*/15 Meters*	*20 Meters*	*40 Meters*	*80/160‡ Meters*
Eastern USA	12-15 (1)	04-05 (1) 05-07 (2) 07-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-21 (1)	18-20 (1) 20-23 (3) 23-02 (1)	20-21 (1) 21-23 (2) 23-01 (1) 21-23 (1)‡
Central USA	09-15 (1) 15-18 (2) 18-20 (1)	05-08 (2) 08-14 (1) 14-16 (2) 16-19 (4) 19-21 (2) 21-23 (1)	19-20 (1) 20-21 (2) 21-01 (3) 01-02 (2)	20-21 (1) 21-00 (2) 00-02 (1) 22-00 (1)‡
Western USA	13-18 (1)† 09-15 (1) 15-18 (2) 18-20 (1)	04-06 (1) 06-11 (2) 11-15 (3) 15-19 (4) 19-21 (2) 21-23 (1)	17-19 (1) 19-20 (2) 20-02 (4) 02-04 (3) 04-05 (2) 05-07 (1)	19-20 (1) 20-21 (2) 21-02 (3) 02-03 (2) 03-05 (1) 21-02 (1)‡

*GMT, or Z time is 5 hours *ahead* of EST; 6 hours *ahead of* CST; 7 hours *ahead* of MST; 8 hours *ahead* of PST; and 9 hours *ahead* of Alaskan Standard Time in the zone between Skagway and 141 degrees west longitude, etc.

†Hawaiian Standard Time is 5 hours *behind* EST; 4 hours *behind* CST; 3 hours *behind* MST; 2 hours *behind* PST; and 10 hours *behind* GMT.

§Indicates possible 10 meter openings.

‡Indicates possible 160 meter openings.

the USA-CA PROGRAM

BY ED HOPPER,* W2GT

ALTHOUGH Fred Woodley, VE3-9301 (erroneously listed in our records as VE2-9301) was the 5th s.w.l. to merit a USA-CA-500 Award, he is the one and only s.w.l. to earn USA-CA-1000 and now he is number *ONE* s.w.l. to receive not only USA-CA-1500 but *also* USA-CA-2000 *and* USA-CA-2500, congratulations and our regrets for calling him VE2. Fred has done a bang-up job on corralling awards, he has 215 and is all set for an additional 40 as soon as he can find time to prepare the necessary applications.

Other awards and endorsements, issued up to March 8th (My birthday) are as follows: Charles, WØJWD, USA-CA-2500 #7 Mixed, USA-CA-2000 #15 All 7 mc 2X s.s.b., USA-CA-1500 #29 All 7 mc 2X s.s.b., and USA-CA-1000 #69 All 7 mc 2X s.s.b. Carl, WØKZZ, USA-CA-2000 #14 Mixed, USA-CA-1500 #27 All 7 mc 2X s.s.b. and these are #1 for North Dakota. Geo, K8VSL received USA-CA-2000 #16 Mixed. The other two USA-CA-1500 endorsements were for WØVFE and W2CYB/2 for mixed operations. The other five USA-CA-1000 awards went to WØVFE, WA4CLR, W9UX, K4VRI and K1CXP/W1BHV for mixed operations. Half of the ten USA-CA-500 awards were for mixed, but W9UX got All c.w., W9CTA All 2X s.s.b., K5MOF All 7 mc, W9UZC All Phone and FG7XL All Phone.

The County Hunters' Net

Cliff, K9EAB writes—". . . In August 1963, Otts Beyer, K8CIR, Earl Harrison, K9UTI and Lou Braun, K8IQB, gathered on 7.223 and began calling for mobile check-ins from needed counties, thus began the County Hunters' Net. Shortly thereafter, K9EAB joined the group and K8CIR, K9UTI and K9EAB took regular shifts as Net Control. At first, mobiles were few and "regulars" numbered 10-12 each day. The Net opened at 1300 GMT and operated till all hours of the evening, depending on band conditions and mobile availability.

"Through the dedication of the Net Controls and the energy of the regulars, mobiles were sought out and brought to the net frequency. Attendance grew and several mobiles became a regular part of the daily activity . . . 7 days a week! Many mobile operators who checked in to be good fellows, offering new counties, soon became hunters and joined the fun. It was not uncommon to pick up 30-50 new counties in a day—and no wonder, with 10-15 different mobiles checking in from all points during the day. Soon, planned expeditions grew from interested participants, striving to activate rare and uninhabited counties. Here was an exciting quest which took the place of the lacking DX activity. The net offered universal appeal to certificate chasers, DX hounds, rag chewers, traffic men and to the limited-time operators. Something always stirring on the County Hunters' Net.

"The participation in the County Hunters' Net is the story of ham radio: for example, some of the long-time "regulars" are: a minister in Texas, a TV repairman in Oklahoma, an X-ray engineer in North Dakota, a dog food salesman in Ohio, an electronic equipment representative in Indiana, a Federal Labor Mediator in the Carolinas, a City Manager in Kansas, a shoe salesman in Nebraska, TV Station engineers in Missouri, a truant officer in Florida, an air conditioning jobber and his wife in Louisiana, a priest in Michigan, distributors of western goods in New Mexico and Colorado, an automotive supply representative in the entire south-east . . . and so on to a total exceeding 50 . . . all on the ball for new counties for Net members.

"Generally, the Net opens with a few of the boys rag-chewing and clearing up the frequency . . . 1250-1300 GMT. By the way, the group voted to change their customary frequency on March 1 from 7.223 to 7.233, for a one month trial. Reason: foreign broadcast on Net frequency. If it works out OK, 7.233 will be permanent official frequency . . . if not satisfactory, Net will return to 7.223 on April 1. As soon as the first mobile checks in, the Net Control takes over and all calls and check outs are through him. He prepares a list in the order acknowledged and this is his work sheet. Each person is given his chance, in proper order, to contact those being offered. Sometimes, two or three mobiles will be "run" simultaneously. Mobile operators who collect counties are given first chance. Anyone can check into the Net when Net Control asks for breakers. Approved regulations apply with a minimum report of 3x3 required for an acceptable contact. No "help" on signal reports is tolerated. When Net Control must leave, he passes list to his successor. There have been numerous outgrowths from the County Hunters' activity. As mentioned, expeditions develop with

USA-CA HONOR ROLL

3000

K9EAB	1

2500

WØJWD	7
VE3-9301	8

2000

WØKZZ	14
WØJWD	15
K8VSL	16
VE3-9301	17

1500

WØVFE	26
WØKZZ	27
W8CYB/2	28
WØJWD	29
VE3-9301	30

1000

WØVFE	66
WA4CLR	67
W9UX	68
WØJWD	69
K4VRI	70
K1CXP/W1BHV	71

500

W9UX	456
W9CTA	457
W7TDK	458
W7WLL	459
K5MOF	460
W5EJT	461
K1OOJ	462
K3BNS	463
W9UZC	464
FG7XL	465

*103 Whittman St., Rochelle Park, New Jersey, 07662.

Worked All Florida Counties Rules in CQ April

The Presidential Award

The Worked All Hawaii Certificate

routes planned to cover counties without amateur activity or counties most needed. Several vacations have been planned with an eye to the Hunters' needs. A picture album of Net regulars is in constant circulation among the Members who add their own snapshots with notations and pass it along to the next on the list. A few of the more generously endowed, spend their vacations traveling counties and at the same time visiting fellow members.

"The QSL problem became apparent early and a way was devised to assist the mobile operator who often became obligated to confirm from 100 to 1000 contacts! Obviously he did not have the time nor the money to handle a job of this size . . . and unless relieved, the mobile operator would be forced to avoid the County Hunters' Net. A county Hunters' QSL was drawn up, these are filled out by the fixed station, self-addressed and stamped—if more than one is needed, a s.a.s.e. is supplied for the return of the cards. This got the job done and put the job and cost on the beneficiary. These cards were procured in large numbers by K9EAB and were made available to County Hunters—500 for $3.00, post paid.

"As a side light and an example of how the County Hunters' fever affects some of its patrons, my father, WA9DCQ, ran an expedition February 15-19, through Missouri, Oklahoma, Texas and returning through Arkansas and Missouri. He traveled 3200 miles and had 850 QSOs from 115 counties! His trip particularly covered many of the inactive and off-the-road counties in west and southwest Texas.

"Another offspring: Last year, K9UTI conceived the idea for the Presidential Award. It was presented to the County Hunters who made donations to get the job started. K9EAB was commissioned to do the job. A professional artist in Berwyn, Stanley Gorski, drew the Capitol background and soon the beautiful Presidential Award became a reality, sponsored officially by W5NXF-K8CIR-K9EAB-WØMCX. Hope your readers will enjoy this story of the County Hunters' Net." Cliff, K9EAB"

Georgia QSO Party

Georgia QSO Party May 16-17 sponsored by the Columbus Amateur Radio Club. Fine time to catch some of those needed and rare Georgia Counties. There will be some special expeditions as well as many fixed stations active in some of these less active counties. See CONTEST CALENDAR by Frank Anzalone, W1WY, for details.

Florida Ham Directory

Mention must be made of the wonderful work that so many clubs are doing and this month a BIG THANKS to the Amateur Radio Club of Florida for all their fine cooperation and help. Among the many fine things they are doing is the *Florida Ham Directory*. They have now published the 2nd edition which lists over 8000 Florida Hams alphabetically by Call, with full address and COUNTY, and also listed alphabetically by name. The first edition of this fine Ham Directory was printed just a year ago and was an idea in conjunction with USA-CA for COUNTY listing. Also listed are Florida Nets, Florida Radio Clubs, GMT conversion chart as well as data on their four awards. It would seem that many readers would desire and have good use for this Ham Directory and they can be obtained for $3.00 from the Amateur Radio Club of Florida, Box 7326, Euclid Station, St. Petersburg, Florida.

Letters

Duane, K2PFC writes—"If the boys will write telling me what rare counties they need in Pennsylvania, I will plan on getting to them, portable on 7034 kc, the first week in May. We plan to work our way towards Harrisburg for the trailer show."

Paul, W8CXS writes– ". . . I have tried to promote the USA-CA Program in a small way by making contacts available in some of the more inactive Michigan Counties. So far I have operated portable in 45 Michigan Counties. Here is my spring expedition schedule—May 15, Emmet County; May 16, Charlevoix County; May 22, Cheboygan County; May 23, Luce County; and June 5-6, Manistee County. Minimum operating hours on 7030 kc is 1600-2100 GMT; on 14075 kc 2100-2230 GMT. Additional evening operation when possible on 3575—7030—7223 or 7233. All these are rare and were foremost on 50 county want lists received from the 75 Hunters on my notification mailing list. I have been expeditioning for 3 years in the summer time and enjoy it very much. The rig runs 200 watts, dipole antennas up in trees in State Parks, gasoline power plant, setup on picnic tables or the back seat of my 2 door sedan car. Mostly a one operator deal, but occasionally have a second operator. With all that

The Worked Fifteen Maui Stations

Worked New Hampshire Counties Rules in CQ April

Worked All Massachusetts Counties. Rules in CQ April

equipment to carry along, there is not much room for passengers, Hi. Kindly mention the 12th Annual "Michigan Week" Award."

Awards

To finish what I started, on page 85 of *CQ* for March, about the **Radio Society Of Great Britain** awards, one important fact was left out, pre-war as well as post-war cards may be submitted as proof of contact or reception. I have a few copies of their rules and regulations which may be had for sending an s.a.s.e. Shown is one of their awards, but the new Commonwealth DX Certificate is not shown as this is a hand produced document on vellum, each one drawn individually for the applicant, but it is similar to the Empire DX award shown in the March column.

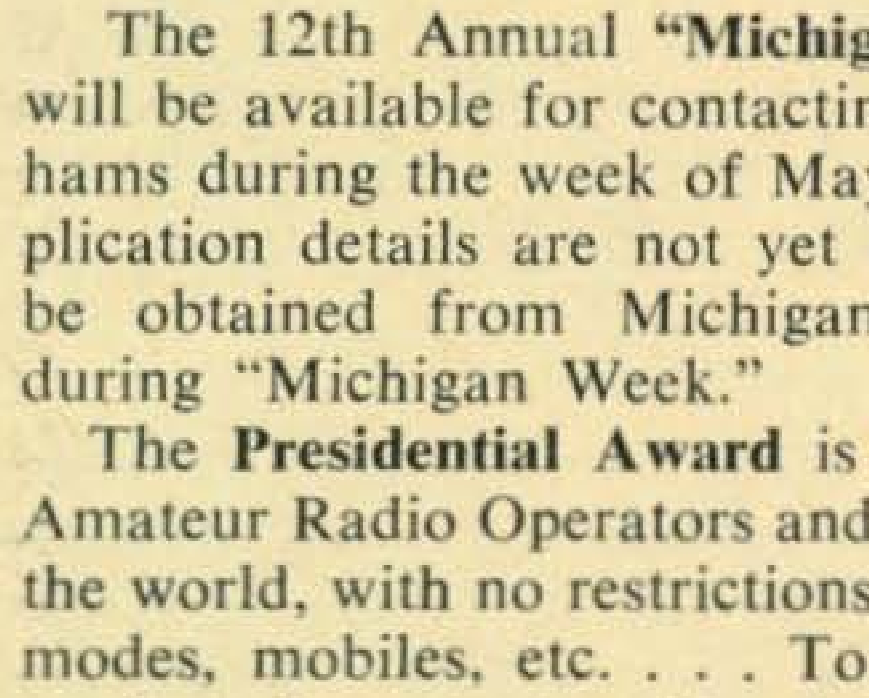
The 12th Annual **"Michigan Week"** Award will be available for contacting FIVE Michigan hams during the week of May 16-22. Exact application details are not yet available but may be obtained from Michigan hams contacted during "Michigan Week."

The **Presidential Award** is available to ALL Amateur Radio Operators and s.w.l.s throughout the world, with no restrictions as to time, bands, modes, mobiles, etc. . . . To qualify you need confirmed contacts with stations operating in COUNTIES of the United States bearing names IDENTICALLY THE SAME as names of Presidents of the United States, such as Lincoln, Adams, Washington, etc. There are 244 such Counties in 40 different States, as listed in your USA-CA Record Book. QSL cards must be in hand for all contacts claimed, but do not send QSLs, GCR applies. Basic Award Class D requires 50 Counties in a MINIMUM of 10 States; Class C for 100 Counties in a minimum of 20 States; Class B for 150 Counties in a minimum of 40 States. Send list showing Class or Classes being claimed. Calls of Stations worked; listing alphabetically by States and Counties. Fee is $1.00 or 10 IRCs for BASIC AWARD, endorsements are free but when requested separately, an s.a.s.e. or 1 IRC is required. Send applications to Presidential Award C/O Cliff Corne, K9EAB, Custodian, 711 West McClure Ave., Peoria, Illinois 61604. Since June 1964, 117 of these awards have been issued.

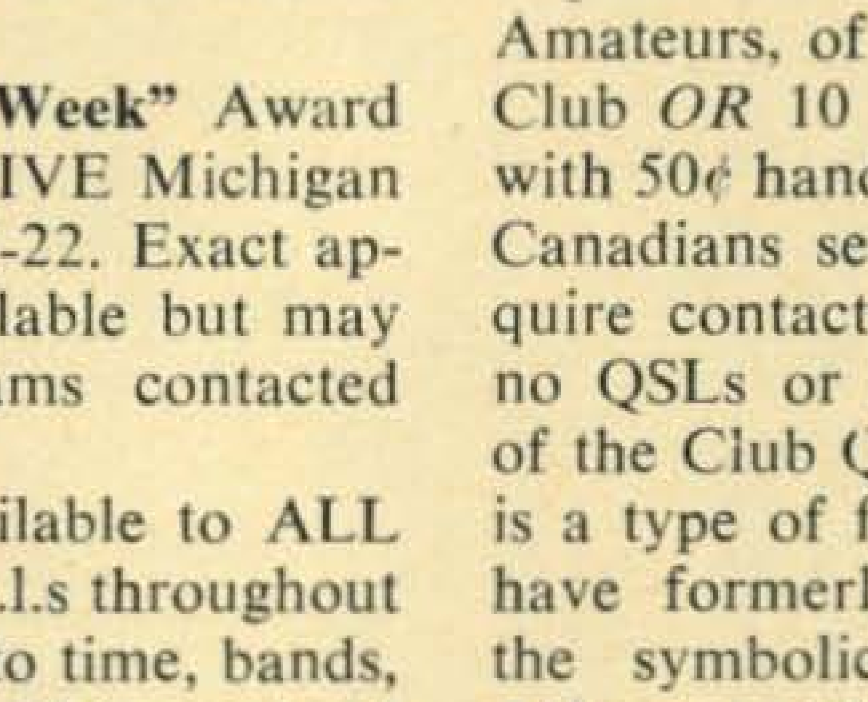
The **Razorback Award** offered by the Amateur Radio Club of the University of Arkansas, Inc., Room 802, Science-Engineering Building, Fayetteville, Arkansas. U.S. and Canadian Amateurs require confirmed contacts with 25 Arkansas Amateurs, of whom 5 must be members of this Club *OR* 10 members of the Club. Send QSLs with 50¢ handling charges in stamps or currency, Canadians send 3 IRCs. Foreign Amateurs require contacts with 5 members of this Club—no QSLs or handling charges, just send a log of the Club QSOs. Incidentally, the "razorback" is a type of fierce wild pig which is thought to have formerly inhabited this area. It is now the symbolic mascot of the University of Arkansas, where it identifies the student body in sports events, etc. Many amateurs in the Fayetteville area are Club members.

The **Newport County Radio Club** Certificate may be obtained free of charge for working FIVE members of the Newport County Radio Club. Send list of stations worked to Robert Bass, K1VQO, Box 85, Seamans Church Institute, Newport, Rhode Island. Active members are: K1VQO, YQP, VPK, TAQ, PTV, USD, IRK, MCT, LRR, JQM, AUN. W1WLG, TXL, JFF,

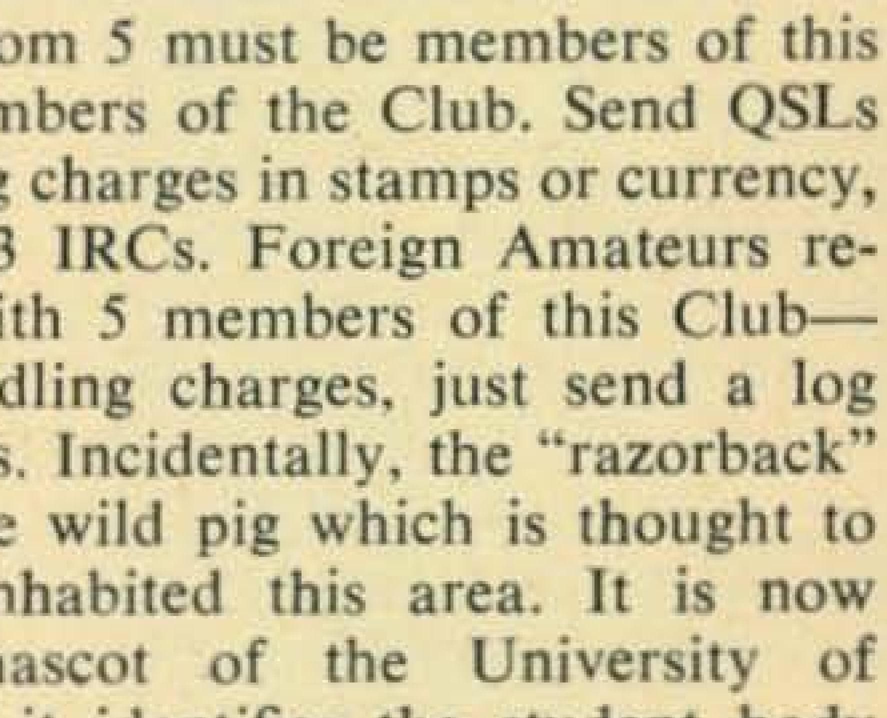
[*Continued on page 102*]



The Newport County Radio Club Certificate



The Razorback Award



Worked The British Commonwealth. Rules page 85 CQ March

RTTY

BYRON H. KRETZMAN,* W2JTP

RTTY Operating Frequencies

Nets centered on frequencies given; operation usually ± 10 kc on h.f.

80 meters	3620 kc
40 meters	7040 kc
40 meters (narrow shift)	7140 kc
20 meters	14,090 kc
15 meters	21,090 kc
6 meters	52.60 mc
2 meters	146.70 mc

RADIO printer operation is not always by means of the 5-level Teletype code that we use, and as specified by the FCC. Most RTTYers are aware, too, of the fact that a different teleprinter code is used in Europe by radio amateurs, and that still other codes are used commercially both in this country and in other countries. (We covered this business of different codes in fine detail in the April 1958 RTTY Column in *CQ*.) Many of you are now becoming aware of the ever-increasing use of an 8-level "computer" code where teleprinter machines are used as read-out devices in data transmission systems.

The Siemans-Hell System

RTTYers in this country are no doubt unfamiliar with still another method of radio printer transmission and reception called the "Hell" system. This system is of German origin and the machines are made by Siemans. Transmission is initiated from a keyboard, not unlike that of a teleprinter machine. Reception is in the form of a print-out of the letters on tape. The tape is just a bit narrower than that which we use, and the letters are duplicated, one above the other. (Fig. 1 shows the appearance of the Hell-tape.)

Since the Siemans-Hell system is a frequency-shift system, in so far as radio transmission is concerned, we have been asked before, by a Mexican ham, and just recently by HK4BD, whether or not we could use it under present rules and regulations of the FCC. First of all, we would like to say that it doesn't make any difference whether or not we are permitted to use it simply because no Siemans-Hell equipment is available to radio amateurs in this country. (If it *were*, it would have to be available at the present low prices we pay for used, obsoleted, Teletype gear.) Technically, the Siemans-Hell system would be classified as an "odd-ball" system, therefore it would be relegated to amateur frequencies above 420 Mc.

Hector Posada Trujillo, HK4BD, is an electronics engineering student in the Javeriana University in Bogota, Columbia, and is President of the Radio Club there. The club is presently making tests using a Siemans-Hell Transmitter "S" (T send 62a), a Siemans-Hell Printer "F" (T empf 40a), and a Siemans Amplifier-Detector (T verst 32a). Radio transmissions are being made on a Philips 50-watt h.f. transmitter. Hector would like to know, first of all, if there is anyone who could receive, at least, their test transmissions from Columbia; and secondly, where could they obtain copies of bulletins or magazine articles on this subject. His address is: Universidad Javeriana, Apartado Aero #21522, Bogota, Columbia, S.A. Drop me a line or write to Hector directly if you have any information on this interesting system.

RTTY Procedure

We haven't said too much lately about the putrid signals and the crummy operating procedure observed on 20 and 80 meters this past year or so. It seems that every year, at least, we have to devote one column to standard operating procedure, even though that subject is covered in the *New RTTY Handbook*. For example, old-timer WØLFH of Algona, Iowa, writes us: "One thing bothers me is where did this habit of the RTTYers saying, 'CW IDENTIFICATION TO FOLLOW' come from? A lot of the fellers that can't even type very well go to all the trouble of sending it and take up most of the transmission doing it. To me it looks unnecessary. If you are printing the feller, you know that when he stands by, the c.w. is bound to come, to be legal. The above bugs me about as much as the feller who leaves my carriage in the middle of the page."

No further comment is necessary by your RTTY Editor.

The AN/SGC-1

The latest piece of military surplus Teletype terminal equipment to appear on the surplus

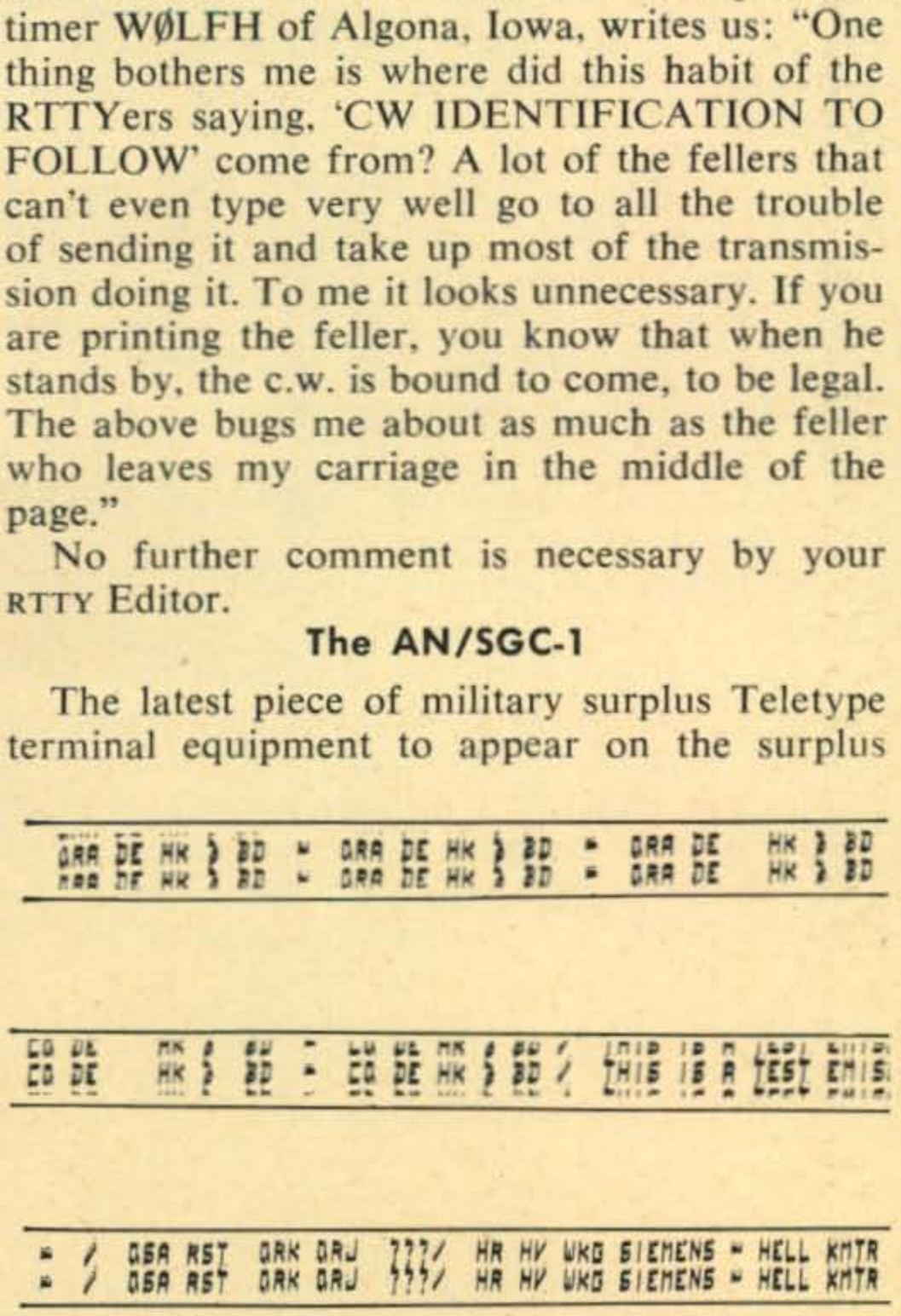


Fig. 1—Printer Reception of Siemans-Hell System of F.S.K.

*431 Woodbury Road, Huntington, N. Y. 11743.

K3GAX at Glen Burnie, Maryland. The machine is a Model 19, the transmitter is a BC-610, and the receiver is a Super-Pro.

market, and in the hands of MARS members, is the AN/SGC-1. This is a combination send and receive a.f.s.k. unit. It was designed to use 700 cycles as *mark* and 500 cycles as *space*. A 400 to 900 cycle band-pass input filter, which may be switched in or out, is provided. The converter part of this TU operates into a standard neutral 60 ma local loop.

The AN/SGC-1 may be converted, with a little effort, to operate with the standard tones of 2125 cycles for *mark* and 2975 cycles for *space*. Complete detailed conversion data, by W2DXD/6, is contained in the February 1965 issue of *RTTY*, the monthly bulletin of the RTTY Society of Southern California, Inc. This publication can be obtained by subscription for $3 per year via W6AEE, 372 Warren Way, Arcadia, California 91007.

On the Bauds

K1YUY of Medford, Mass., is now on 50.64 with tape Tuesdays at 2130R. K1LVV of Danvers, Mass., is on 80. W1DDP of Newington, Conn. (!), is on 80 with tape gear. K1WAR, the ROTC station of Worcester Polytechnic Institute, in Worcester, Mass., is on 80 meters. W1AOH of Darien, Conn., works 20. W1OHF of Norwalk, Conn., is on 80.

W2TPM of Huntington Station, L. I., has a Model 19 with problems. W2SZ of Troy, N. Y., is on 80. W2PBG is on 20 with three new 255A polar relays. W2OYX of Vestal, N.Y., uses tape on 80. W2IDX of Westbury, N.Y., uses narrow shift on 80. WB2FWE of Neptune, N.J., is on 20. WB2CTU of Syracuse, N.Y., uses tape on 80. W2KQP of Huntington, L.I., uses a pair of 250-TH's at 600 watts with his Models 15 and 19.

W3UQX of Allentown, Pa., and K4VZZ of Kingsport, Tenn., both work 80. W6CEM of Santa Barbara, California, is on 20 meters. W7VKO of Phoenix, Ariz., uses a 32S-3 driving a KW linear into a DB-24 20 and 40 meter beam, with Model 14 and 15 machines. The TU is a W2JAV-transistor unit and the receiver is a 75A-4. A TT-63/A regenerative repeater is also used.

K8YNG of Buckhannon, West Virginia, stripped a gear in his "rusty" 'ole Model 26. K8RFU of New Philadelphia, Ohio, is on 80. W8NSO of Pontiac, Mich., uses tape on 80 with a Model 19. W8SDZ of Toledo, Ohio, uses "n□n-overline" on his Klienschmidt Model TT-100, a "vital feature for autostart operation." WA8DMW of Detroit, Mich., uses tape on 80. K8DNV of Elyria, Ohio, also works 80 as does W8TMO of Fenton, Mich., K8ANN of Cincinnatti, Ohio, W8LEW of Olmsted Falls, Ohio, and K8IJL of Detroit, Michigan.

K9DJW of Montgomery, Ill., is on 20. W9EEL of Anderson, Ind., works 80 as does K9CMW of Elkhart, Ind. WAØFQA of Denver, Colorado, has a Model 15, an SX-100, and an "MU-1 Western" TU. (*What's that?*) WØFLK of Grand Rapids, Minn., is an RTTY-OBS station, transmitting bulletins at 0100 GMT Tuesdays, Thursdays, and Saturdays, around 3625 kc.

KP4AXM runs tape gear on 80, with a terrific signal up to New York. DL1VR uses a 32S-3 with a linear amplifier, a 51J-4, a cubical quad, and a midget Siemans tape printer. ON4DM worked W2PBG on 20. ON4UN of Bettelare, Belgium, has a Model 28ASR with a 60-cycle synchronous motor which he would like to swap for a series-governed motor. He also needs gears for 50-band operation. VE3GK of Willowdale, Ont., is looking for a machine. VO1EC of St. Johns, Newfoundland, has a TT4A/TG, a Model 19, and a CFA1 for sale. VE3SD is looking for a reperforator and a TD.

Comments

We are always happy to receive letters, particularly if they are accompanied with a nice glossy print of an RTTY ham shack. But, if you would like a personal answer to some question on RTTY, please enclose a self-addressed stamped envelope with your letter.

Have *you* written your ARRL Division Director yet to ask him just when W1AW is going to begin Official Bulletin transmissions on RTTY?

73, Byron, W2JTP

"It looks like Junior has been interferring with our neighbor's TV reception again."

YL

LOUISA B. SANDO,* W5RZJ

MOTHER and daughter hams are numerous (God bless 'em!)—but how many grandmother/granddaughter hams do you know? Thirteen-year old Donna Lane is WB6AUB, and it was her grandparents, WA6PTU and WA6QZA, who got her interested by letting her talk over their mobile rig when she was nearly 11. Then they bought her a key and code oscillator, helped her with theory and math, so that she got her Novice ticket and went on the air, using a Gonset I.

When the Novice license expired it took some intensive study for Donna to get her General in May '64. Now she is on 20 and 40, sideband or c.w., with a Galaxy III transceiver most every day after school and again from 7 to 8:30 p.m. During vacations she's on all the time, except when her mom wants her for "certain other interests!" Donna expresses regret over working so few other *young* YLs, though she finds boys galore. WB6AUB is the youngest member of BAYLARC and also of the Oakland Radio Club. Donna loves writing (hopes to be an author), and also enjoys art, coin collecting and swimming. She is completing the 8th grade at James Lick Jr. High in San Francisco.

WA6PTU-WA6QZA

Donna's grandparents, WA6PTU and WA6QZA, are Virginia and Virgil Schooley of Oakland. They got their licenses in 1961 after listening to 40-meter QSOs on an a.m.-f.m. radio, followed by classes at Oakland City College. Now they have gone all-out for ham radio, handling traffic, running phone patches, etc. They belong to the Oakland CD net, West Coast Noontime Emergency Net and Army MARS. They also are AECs for Oakland area and for Oakland Radio Club (it's station, W6OT, is comm. center for Oakland Red Cross). Both belong to Oakland R.C., and Virginia to BAYLARC, and both represent their clubs at Central Calif. Radio Council, with Virginia being secretary for second year. They also serve on the Bay Area Hamfest committee.

WA6PTU-WA6QZA are on all bands; they operate a.m., c.w., s.s.b. and also are on RTTY. They use a Swan 240 in their car; an Invader with Drake 2B at home QTH, a Galaxy III transceiver, a GC-105 for 2 meters, and for RTTY they use Model 15 & 28 printers. Just to keep up their good work Virginia and Virgil are teaching the code to Donna's sister Michele, aged 9.

Our thanks to W7ZC for info on this FB family after he had QSO'd them all.

Pink-and-Blue Net

In mid-February the 7th area YLs held another of their now well-known pink-and-blue nets; this time for Alice, K7RQZ, of Bend, Ore. Gifts were sent ahead to K7JPI, Betty, who handled preshower correspondence. At net time K7JPI, K7KQC, W7HHH, W7JEC and W7DHK arrived at K7RQZ's QTH with gifts and goodies to surprise Alice! K7RFO, Ruth, was NCS. Altogether 30 YLs were on the net, plus Alice's parents (at W7GWG QTH) and sister (at W7DAT's). Held on 3880 kc, it lasted a good two hours with K7JPI and RQZ keeping all posted on the many nice gifts awaiting the new baby, Alice's 5th jr. op (who should be well established in the McCullough household by the time this is in print).

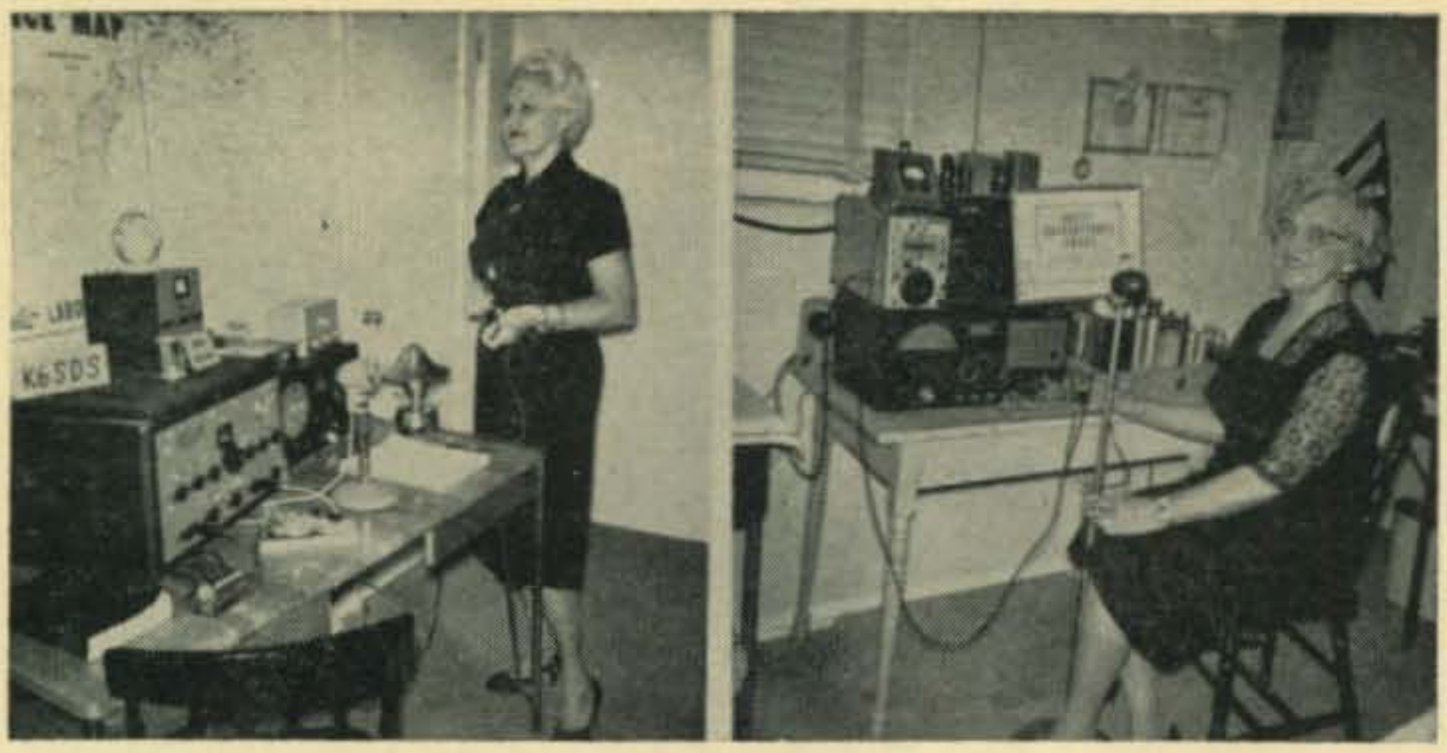
Tnx to W7NJS for the above info, and also for sending us a copy of the full page spread of pictures and story on the Portland Roses which appeared in the Feb. 7th *Oregonian*. The Roses' club call is K7UER and all members participate in emergency work. Among YLs pictured were W7QKU, Donna (who holds trafficker's award and BPL medallion); K7ADI, Ruth (who worked many hours in Red Cross emergency station during the Christmas flood); K7PEE, Edith; W7NOK, Pat; K7VFC, Cecil (president of the Roses); W7NJS, Beth (who alerted authorities to Christmas flood conditions that led to evacuation of homes along Willamette River below the Taylor's home in Oak Grove); and K7PEE, Edith (Roses secretary); also OM K7PHP, Wade, who is co-ordinator for AREC and has worked on many rescue missions.

K6SDS—W6TCN

K6SDS, Alice Zaruba, and W6TCN, Mary Peffly (pictured here), are the mother and mother-in-law, respectively, of K6POC, Joan.

13-year old Donna, WB6AUB, started as a Novice at age 11 with help from her grandparents, WA6PTU-WA6QZA.

*4417 Eleventh St., N.W., Albuquerque, New Mexico 87107.



K6SDS, Alice (left) and W6TCN, Mary (right) are the mother and mother-in-law, respectively, of K6POC, Joan, who was pictured in April CQ.

who was written up in April *CQ*. It was Mary who got Joan started in Ham radio, and she in turn "went to work" on her own mother to get her license. Mary is a long-time YL, having earned her license in 1940. She was a charter member of the L.A. YLRC and a founder of the great-grandmothers award. She operates phone on all bands and enjoys making and painting her own QSL cards. Alice, K6SDS, recently retired from the Los Angeles Board of Education. She is active on 40 meters. Both Mary and Alice operate from Pine Valley, a mountain community east of San Diego.

K1IZT Honored

On Feb. 20 K1IZT, Blanche, was honored by WRONE with an informal gathering of YLs/OMs at the 1812 House in Framingham. The occasion was to present Blanche with the president's plaque, for serving as YLRL president during 1964.

RMD Convention

The Colorado YLs will serve as hostess group for YLs and YFs attending the Rocky Mtn. Div. Convention to be held at the Centre Denver Motel on July 17-18. Sponsored by the Denver Radio Club and chairmaned by Slats, KØATZ, there will be an FB program, special rates at the motel, and lots of prizes.

33, Louisa, W5RZJ.

WA6QZA, Virgil, and WA6PTU, Virginia, grandparents of WB6AUB, Donna, who helped her get a license. Photo by W6ELW.

K1IZT, Blanche, and OM Wes, K1HTK, at the Feb. 20 informal gathering of WRONE to honor Blanche and present her the plaque as YLRL's president during 1964. We also salute Wes as "Mr. YLRL" for all his help to Blanche in her years of service to our YL League.

Reciprocal Licensing In Great Britain

GREAT Britain plans to extend reciprocal licensing privileges to foreign radio amateurs in the near future.

On March 16, the subject of reciprocal licensing of radio amateurs was discussed in the House of Commons. Mr. Wallace, a Member of Parliament, asked the Postmaster-General if he will seek to negotiate reciprocal arrangements with other countries whereby visiting licensed radio amateurs may be allowed to engage in amateur radio transmissions within the country to be visited. The Postmaster-General replied, "Yes, subject to certain conditions to be met, I shall in future grant licenses to engage in amateur radio transmissions in this country to licensed radio amateurs who are nationals of countries which are prepared to grant reciprocal facilities to UK licensed radio amateurs. I shall be shortly taking steps to negotiate such arrangements."

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For further information, check number 56, on page 110

For further information, check number 49, on page 110

RTTY A-Z [*from page 66*]

the relay and we are now ready to tackle the adjustable pole pieces—one at a time.

Pole Piece Adjustment

The two knurled tension nuts, associated with the adjustable pole pieces, should first be tightened slightly before one attempts to adjust the two pole pieces. This tension should be just enough to firmly hold the pole piece as it is being adjusted. The tension should be increased slightly with the advancement of the pole piece to its final resting position. If this is not done the pole piece will invariably shift when you finally tighten up the knurled tension nut.

Again, place the ohmmeter across contacts 1 and 4. Advance the opposite adjustable pole piece (the one that is to the left side of the armature very carefully and slowly. As the left hand pole piece is advanced towards the armature it reaches a point at which the armature is attracted towards this pole piece, pulling the armature contact to contact 5 (on the left hand side). This is no what you are looking for at this moment. Continue to advance the left hand adjustable pole piece towards the armature until it physically touches it and further advancement of the pole piece physically pushes the armature to the right side making contact with the right hand contact (no. 4) as indicated by continuity on the ohmmeter. Do not advance the pole piece past this point—just to the point of contact. Now back off the pole piece about one half of a turn (more or less). When this is done the armature naturally follows the left hand pole piece back until the armature contact rests on the left hand contact (no. 5). The half turn back up of the pole piece was sufficient to still leave a small air gap between it and the armature with the armature contact resting against the left hand contact (no. 5).

At this point you may leave the ohmmeter connected across contacts 1 and 4 or else place it across numbers 1 and 5. Better still, if you have two ohmmeters place the second one across contact numbers 1 and 5. Advance the right hand adjustable pole piece towards the armature, fast at first, then slowly as it approaches the spacing of the other pole piece. At some point in this area the pull on the armature from the advancing right hand pole piece exceeds the pull from the left hand pole piece. When this happens the armature contact (no. 1) breaks continuity with the left hand contact (no. 5) as indicated by the associated ohmmeter. The armature may swing on across and make contact with the right hand contact (no. 4) as indicated by the ohmmeter at the right hand side, or it may assume some neutral position in between contacts 4 and 5, depending upon how skillful you were in your adjustments and upon the condition of your particular polar relay.

If your work was done well a visual inspection should indicate that the space between the armature and the adjustable pole pieces on either side is about the same and more important the armature stands midway between the contact points. Also, the armature will stick lightly against whichever contact it is moved to by means of a gentle push with a slender tooth pick. It may be necessary to readjust the first pole piece ever so slightly or maybe both before your adjusted polar relay passes the "tooth pick and sticking" test. If it passes this test chances are that the microammeter pointer will be resting squarely on zero when you plug the relay into the polar relay test set. If it is not on zero, one or the other, or possibly both pole pieces, will have to be moved ever so slightly to cause the meter to read zero. You can now finish tightening the two knurled tension nuts. Be sure to hold each pole piece capstan firmly in position with its adjusting tool while the tension nut is being tightened or else it will also turn and all will have to be done over.

The I-193-A Western Electric Polar Relay Test Set shown in fig. 67 was used to verify the adjustments on a number of polar relays. It proved that one does not necessarily have to have an I-193-A Polar Relay Test Set to satisfactorily adjust a polar relay.

[*To be continued*]

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Incentive Licensing [*from page 12*]

E—The Conditional Class license shall no longer be available to new applicants who claim eligibility solely by virtue of active duty in the military service. This proposal is consistent with the Commission's policy that, where feasible, applicants for higher classes of amateur licenses be examined by Commission personal rather than by volunteer mail examiners. Of course, many military members will be able to establish their eligibility for the Conditional Class license under one of the other categories such as the distance basis or temporary overseas residence.

F—New holders of the Novice Class license shall be given a two year non-renewable license term in lieu of the present one year non-renewable term. This will afford Novice Class licensees a more reasonable period for the development of skills necessary to advancement to the higher classes of licenses.

G—Effective one year after adoption of these rules, telephony privileges for the Novice Class licensees in the frequency segment 145-147 Mc/s shall be deleted. Deletion of this privilege is proposed because too many Novice Class licensees operate telephone equipment to the neglect of improvement of their telegraphy speed. One of the prime purposes of the Novice Class license is to prepare, through actual operating experience, for the higher classes of licenses which require increased code proficiency.

H—Each new amateur station shall be systematically assigned a distinctive call sign to denote the licensee's class of operator license.

This is necessary in order for our monitoring facilities to immediately determine whether a particular licensee is operating within the range of his privileges and whether a licensee is subject to re-examination of his qualifications.

The following schedule will be used for assignment of station call signs. Presently assigned call signs will be changed upon renewal or modification of the station license to conform with this schedule:

(1) Amateur Extra Class—the single letter prefix "W" and a double letter suffix, provided that the licensee submits evidence of having held an amateur station license issued by the United States Government prior to July 1, 1932 (*e.g.* W2AB); a double letter prefix beginning with the letter "W" and a double letter suffix (*e.g.* WA2AB);†

(2) Amateur First Class—the single letter prefix "K" and a double letter suffix, provided that the licensee submits evidence of having held an amateur station license issued by the United States Government prior to July 1, 1932 (*e.g.* K2AB); a double letter prefix beginning with the letter "K" and a double letter suffix (*e.g.* KA2AB);

(3) General (Advanced)—a single letter prefix and a three letter suffix (*e.g.* W2ABC);

(4) Conditional—the double letter prefix "WC" or "WD" and a three letter suffix (*e.g.* WC2ABC);

(5) Technician—the double letter prefix "WT" or "WU" and a three letter suffix (*e.g.* WT2ABC);

(6) Novice—the prefix KN and a three letter suffix (*e.g.* KN2ABC);

(7) The call signs of General (Advanced), Conditional or Technician Class licensees who currently hold a station call sign which has a single letter prefix and a double letter suffix will not be changed solely because of failure to qualify for an Amateur First or Extra Class license.

(8) Stations located in Alaska, Hawaii, Puerto Rico, and in United States possessions under Commission jurisdiction will be assigned special double letter prefixes to show their specific locations followed by a double or triple letter suffix which will, where feasible, indicate the class of operator license.

I—Assignment of station call signs shall be in accordance with the foregoing schedule with only the following exceptions:

(1) A specific unassigned call sign may be reassigned to a previous holder thereof provided that it is appropriate to the class of operator license currently held by the station licensee;

(2) A specific unassigned call sign may be assigned to an amateur organization in memoriam to a deceased member and former holder thereof provided that it is appropriate to the class of operator license currently held by the station trustee;

(3) A specific unassigned call sign may be temporarily assigned to a station connected with an event, or events, of general public interest provided that it is appropriate to the class of operator license currently held by the station trustee or licensee.

7. It is the Commission's belief that these proposed amendments reflect a realistic solution to the need for an immediate and effective incentive licensing program in the Amateur Radio Service as advocated by most of the petitioners. To the extent that the particulars of any of the petitions involved are a variance wih these proposals, they should be considered as having been denied. However, this does not preclude, and the Commission hereby encourages, the submission of new counter-suggestions for consideration. Comments are particularly invited as to: (1) the utility and interest in continuing the Amateur Extra Class of license in the light of the proposal to establish an Amateur First Class license and the possibility that the reserved frequencies associated with the Amateur Extra Class may not be fully occupied; (2) the width and the placement of the various reserved frequency segments for each class of license in each band.

8. These proposed amendments are issued pursuant to the authority contained in Section 4(i) and 303 of the Communications Act of 1934, as amended.

9. Pursuant to applicable procedures set forth in Section 1.415 of the Commission's Rules, interested persons may file comments on or before July 15, 1965, and reply comments on or before July 30, 1965.

All relevant and timely comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision, the Commission may also take in account other relevant information before it, in addition to the specific comments invited by this Notice.

10. In accordance with Section 1.419 of the Commission's Rules and Regulations, an original and fourteen copies of all statements or comments shall be furnished the Commission.

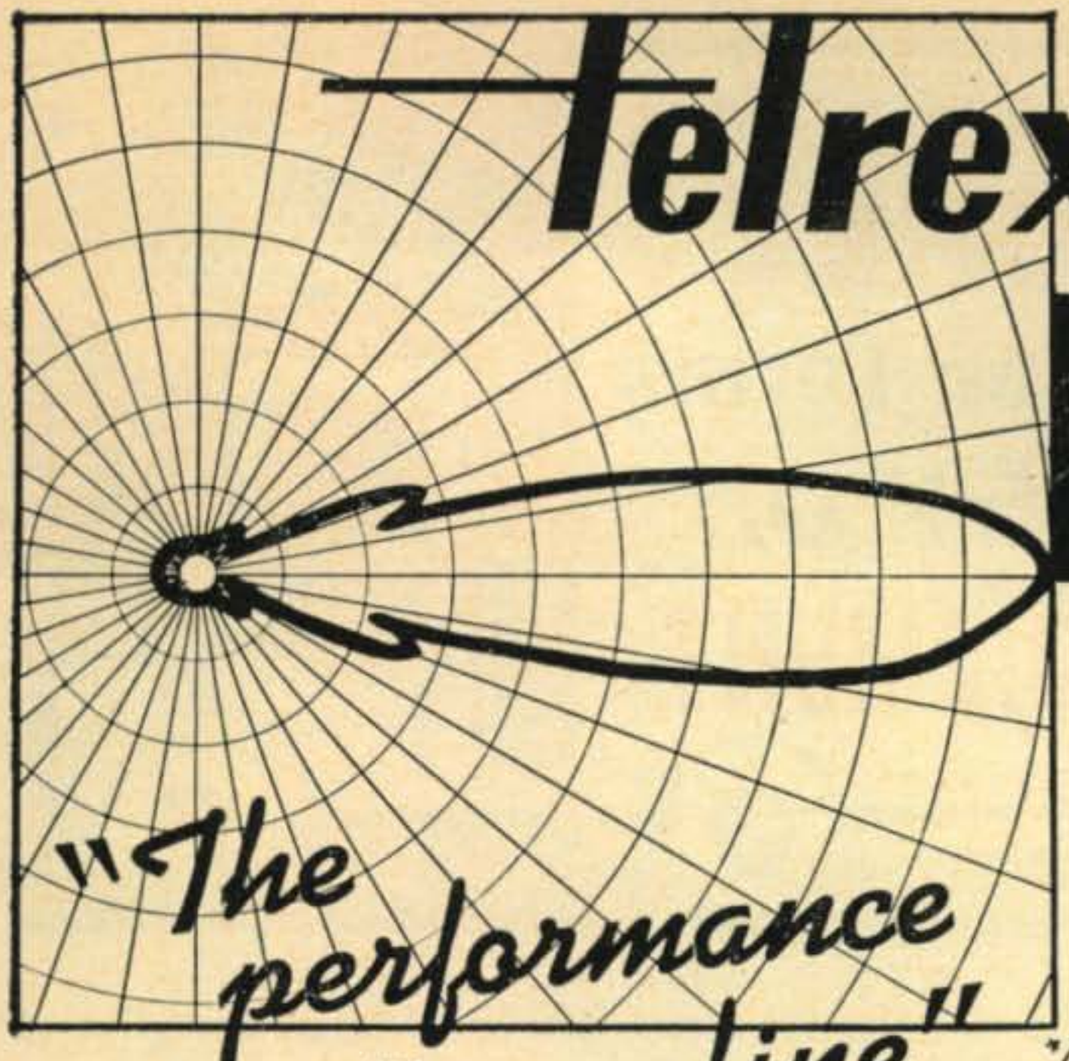
FEDERAL COMMUNICATIONS COMMISSION
BEN F. WAPLE
Secretary

†Consideration will also be given to the assignment of call signs having a two-letter prefix and a one-letter suffix (*e.g.*, WA2B).

APPENDIX

PETITIONS INVOLVED IN THIS PROCEEDING

Petition No.	*Date Filed*	*Petitioners*
378	Nov. 5, 1962	Chester L. Smith Bedford, Massachusetts
455	June 5, 1963	Roy R. Cone Chicago, Illinois
470	Aug. 9, 1963	Walter A. May, Jr., Simon Kahn, Stanford G. Houghton, Stephen M. Newmark Los Angeles, California
474	Aug. 26, 1963	Alex S. Labounsky Oyster Bay, New York
480 & 481	Sept. 11, 1963	Ellen W. Ackerman Panama City, Florida
499	Oct. 3, 1963	American Radio Relay League Newington, Connecticut
516	Oct. 28, 1963	George H. Goldstone Bloomfield Hills, Michigan
517	Oct. 28, 1963	Lowell E. White Elmwood Park, Illinois
538	Nov. 22, 1963	Leland W. Aurick, George S. Gadbois Columbia, Pennsylvania
577	March 3, 1964	Wayne Green Peterborough, New Hampshire



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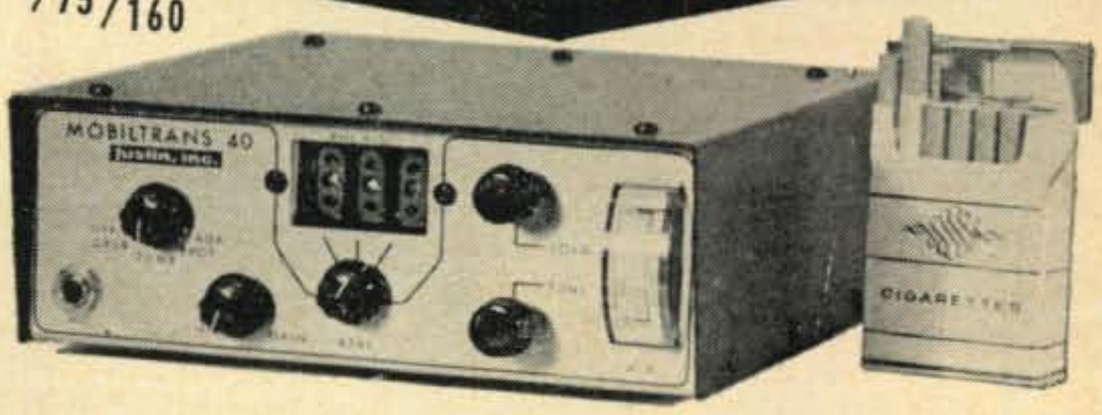

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901A	AC Power Supply for 900A.....	(2.25)	73.50
902A	DC Power Supply for 900A.....	(2.70)	79.50
903A	500 Watt 2m Linear.....	(10.65)	299.00
910A	6m Sidewinder (SSB ,AM, CW) Xcvr...	(14.26)	399.50
911A	AC Power Supply for 910A.....	(2.52)	73.50
912A	DC Power Supply for 910A.....	(2.70)	79.50
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3341	2m Communicator IV 12VDC + 117VAC	(14.62)	409.95
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3409	Civil Defense Kit for Comm. IV.....	(2.16)	64.95
3363	Canvas Carrying Bag.....		12.95
GA-138	108-138mc Xcvr Aircraft.....	(17.51)	489.95
3362	Civil Air Patrol Kit.....	(1.62)	49.95
3357	2, 6, + 1¼ meter VFO.....	(3.06)	89.95
3340	GSB-201 10-80m Linear.....	(12.27)	345.00
3221	G-50 6m Xcvr, 117VAC.....	(13.00)	367.30
3300CD	G-50 (CD Version).....	(13.90)	389.95
3448	5DB RF Attenuator.....		10.79
3449	10DB RF Attenuator.....		10.79
3450	15DB RF Attenuator.....		10.79
3365	Mobile Mtg. Brackets.....		4.26
3350	Ceramic Microphone.....		13.60
621-018	Telescoping Antenna.....		3.30

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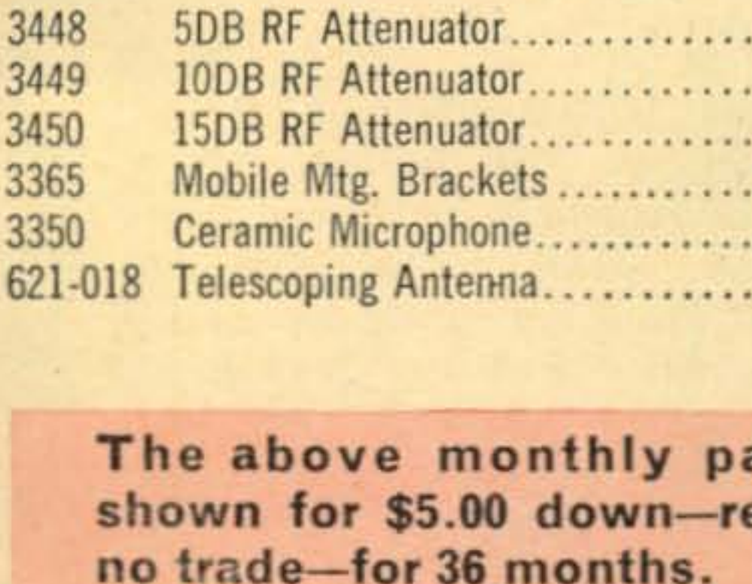

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Best time to call: _____

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Contest Calendar [*from page 80*]

be deemed sufficient cause for disqualification.

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National Field Day

Starts: 1700 GMT Saturday, June 12
Ends: 1700 GMT Sunday, June 13

This is primarily a British Isles and European contest, somewhat along the lines of the ARRL Field Day. Contacts are not confined to portable stations, the portables are also looking for DX contacts with fixed stations. You can help the boys by working their low power portable rigs.

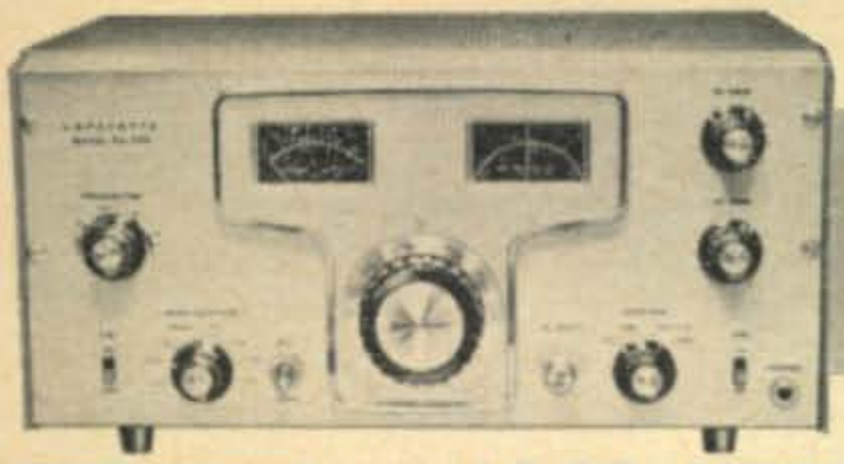
Venezuelan Contest

Starts: 1000 GMT Saturday, July 3
Ends: 2400 GMT Monday, July 5

The Venezuelan Radio Club invites all amateurs to participate in the "Venezuelan Independence Contest" to commemorate the 154th anniversary of the Independence of Venezuela.

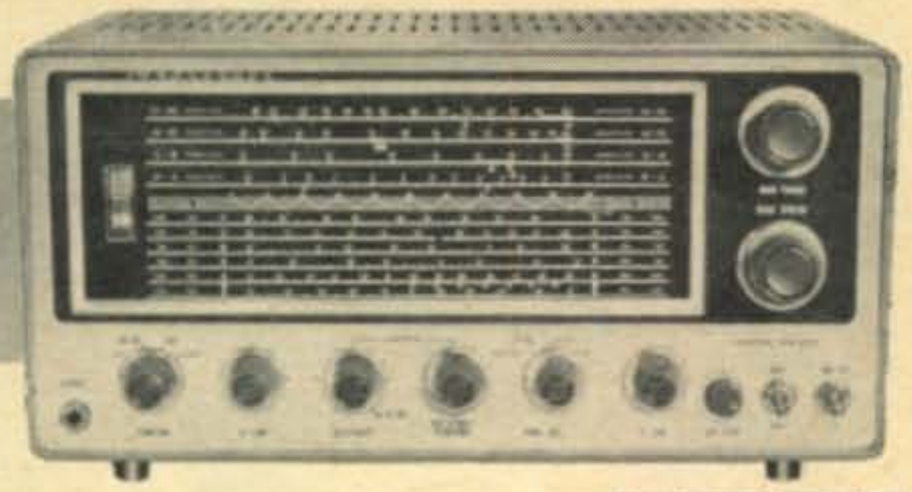
Details will be given in next month's CALENDAR.

NEW! LAFAYETTE AMATEUR RECEIVERS



MODEL HA-350

MODEL HA-230



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Lafayette's newest! A dual conversion superheterodyne communications receiver covering the 10 through 80 meter amateur bands and offering a high order of electrical and mechanical stability for superior AM, CW and SSB operation. Check some of the exceptional features!

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Professional Quality 8 TUBE AMATEUR RECEIVER

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WIRED
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SEMI-KIT VERSION
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FREE! Lafayette 516—Pg. 1965 Catalog No. 650. Write: Lafayette Radio Electronics Corp., Dept. CE-5, P.O. Box 10, Syosset, L. I., N. Y. 11791

For further information, check number 50, on page 110

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For further information, check number 51, on page 110

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Evans RADIO

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For further information, check number 52, on page 110

Editor's Note

Received too late for detailed description. The Pasadena City College QSO Field Day, weekend of May 21/23. Further information can be obtained from Ken Johnson, W6VEB, Pasadena City College, 1570 Colorado Blvd., Pasadena Calif. 91106

The Alexander Volta RTTY DX Contest. May 22/24, all bands 3.5 thru 28 mc. Logs should contain Nr. exchanges, times, calls, bands, state or country. Contacts in North and South America 2 points, with all other countries 10 points. Reports go to: SSB & RTTY Club, Box 144, Como, Italy.

Following USA stations were CW winners in the 1964 OZ-CCA contest: W1CKA, W3MSR, W4HKJ, WA6SBO. The lone phone winner was K1DII.

There was a time when we were able to give the results of the Phone section of our World Wide contest in this issue. We had to give up the idea last year and make it the June issue. Now we even find it difficult to make it in June, seems that more of the fellows are going to Phone. However, baring any unforseen difficulties we should be able to have a complete listing of all the Phone entries in the next issue and then tackle the job of making the July issue the c.w. report. A last minute surge of returns has brought the total up to last year's, maybe a little better.

73 for now, Frank, W1WY

USA-CA *[from page 86]*

JHF, AWG, IAG, WA1AUL, ACP, ACO, CSO, AQZ, WN1BLC, DCJ.

The Maui Amateur Radio Club of Hawaii Awards

The **Worked Fifteen Maui Stations** certificate which will be issued to any amateur who submits proof or confirmation of having worked 15 different stations on the island of Maui, State of Hawaii, on or after October 3, 1952. These stations need not be members of the Maui Amateur Radio Club and there are no restrictions as to the bands or mode used.

The **Worked All Hawaii** certificate will be issued to any amateur who submits proof or confirmation of having worked 1-two letter call station and 1-three letter call station on each of the major islands in the State of Hawaii. These islands are: Hawaii, Maui, Oahu, Kauai, Molokai and Lanai. Contacts must be on or after October 21, 1959, and there are no restrictions as to bands or mode used. All QSLs sent in must be accompanied with a stamped, self-addressed envelope. Send to A. Saito, KH6ATU, 314 W. Niihau St., Kahului, Hawaii 96732. Some of the local hams active are: KH6ATU, ATZ, AUM, BLL, BXH, CFA, CIO, DHO, ED, EK, EL, EM, FF, EXI, EXJ, EXK, EXQ, EXR, FBG, EXO and WH6FJR. Aloha.

Guess I've run out of space, thanks all the mail, Good Hunting, and how was your month? CU next month. 73, Ed, W2GT

Cranium Queries [*from page 52*]

P	T	T	■	S	T	A	B	L	E	■	F	I	N	A	L	
O	A	■	D	L	■	L	■	■	M	F	■	■	■	■	O	
S	■	L	■	O	■	W	■	I	F	■	V	D	C	■	A	
T	V	I	■	T	R	A	P	■	■	V	■	B	E	A	D	
■	■	N	E	■	■	■	I	■	D	R	U	M	■	■	I	
Q	R	K	■	R	C	■	V	F	O	■	■	■	P	A	N	
S	■	■	B	F	O	■	■	■	P	R	U	N	I	N	G	
B	■	H	E	■	■	S	I	N	E	■	P	O	■	T	■	
■	Q	■	A	R	■	T	R	O	D	■	■	D	C	■	H	
C	L	A	M	P	E	R	■	■	■	O	N	E	■	■	O	
A	F	C	■	■	■	A	V	C	■	D	U	■	D	O	T	
R	■	■	W	R	A	P	■	P	■	■	■	H	I	■	■	
R	T	T	Y	■	M	■	■	O	P	E	N	■	A	G	C	
I	■	R	E	D	■	S	K	■	A	■	A	■	L	■	O	
E	■	■	■	■	V	O	■	■	R	■	M	C	■	■	I	
R	E	L	A	Y	■	S	E	T	T	L	E	■	Q	S	L	

6M Converter [*from page 45*]

Adjustments

When the supply voltage has been decided upon, wire in the correct divider resistors. Although it seems unfortunate that all American automobiles with 12 volt systems have the negative grounded (and hence cannot be used as the converter supply) it is more desirable to use a separate battery. This prevents ignition noise in the electrical system of the car from being coupled directly into the converter.

The case of the converter should be connected to the receiver case through a short, low-inductance ground connection, or by bolting them together. In initial tests, the coaxial cable shield proved inadequate as a ground to the receiver, and 10 mc signals were heard on top of the 50 mc signals. Bonding the cases together cured the interference.

The circuits may be pre-tuned with a grid-dip oscillator or a signal generator or tuned by peaking on an on-the-air signal near 50.5 mc. Using the S-meter as an indication, tune L_6 for meter deflection with the receiver set for the correct i.f. frequency (signal frequency minus oscillator frequency) then tune L_5, L_3, L_2, and L_1, in that order, for maximum indication on the S-meter. Be sure to keep the signal low enough to prevent overloading of the receiver before the S-meter circuit. A slight detuning of the oscillator will occur when tuning L_3, so L_6 may have to be retuned again, while aligning.

When the converter was first tried out, the band had opened up, and using a low frequency tri-band beam, every district in the country was heard without any difficulty. No background noise of any consequence was heard, except when the R.F. GAIN control of the receiver was turned up all the way. The additional noise was due to the front of the receiver itself. ■

6M SSB Transmitter [*from page 31*]

and the carrier control advanced. A small r.f. indication will show on the meter as the tank capacitor is tuned through resonance and the two neutralizing stubs can be clipped off a half inch at a time and moved closer or farther from the sides of the tubes until a minimum reading shows on the v.t.v.m.

Band Coverage

Although a single 18 mc conversion crystal is shown for this rig giving output from 50 to 50.5 mc with the 500 kc v.f.o. tuning range, complete band coverage is possible by changing this crystal in steps of 250 kc. A crystal on 18250 whose output is doubled to 36500 will provide for operation from 50.5 to 51 mc and so on up the band.

Tuning

All tuning is done with the single plate meter. With the mode switch in the PTT position, pressing the button on the microphone puts the rig on the air. The carrier control is turned off for s.s.b. operation and in this mode the meter will show a resting current of 40 to 50 ma. Inserting a small amount of carrier will increase the reading of the plate meter and a slight adjustment of the mixer, amplifier and grid controls for a further increase in current will indicate drive to the final. With the antenna connected, drive can be increased by advancing the carrier control and the final plate tuned to resonance—plate current dip—adjusting the link for maximum loading of about 200 ma. The plate meter will return to its idling reading when the carrier is turned off and the rig is all tuned for s.s.b. operation. Talking into the mike, the audio gain is adjusted so that normal speech swings the plate meter no higher than 100 ma.

To operate the rig on a.m., all that is required is to insert carrier until the plate current reads about 100 ma and adjust the audio gain so that speech barely makes the needle flicker.

To zero in on a signal, the mode switch is placed in the TUNE position and the v.f.o. tuned to zero beat with the desired signal in the receiver. No signal is put on the air since the final voltage is not applied, but enough carrier is radiated to be heard in the receiver.

Those familiar with building will recognize that this rig is operated with very conservative design parameters. What? Only 600 volts on 6146's for s.s.b.? Well, this rig runs real cool, man! The power is very adequate just using the rig by itself and of course it makes an ideal exciter for any legal powered linear that can be dreamed up. ■

VHF [*from page 72*]

of feet of #12 wire spaced ½ inch apart and mounted between wooden blocks will work quite well on 432 mc) with one end coupled by means of a hair-pin loop to the piece of gear under measurement. A small pilot bulb mounted on clips and slid along the line will give an indication of the points of maximum and minimum current. The distance between successive maximums or minimums should equal a half wavelength, since the velocity of propagation factor is just about unity on this type of line.

The frequency can be, of course, obtained from the wavelength by the $C = f\lambda$ relation. A similar device, the open wire type slotted line mentioned previously in this column, is probably a better instrument to use since it does not load down the oscillator being measured.

Frank M. Huminski, K2SQS, on things in general: "I received the February *CQ* today and browsed through it immediately, reading the VHF column along the way. I must say that this has been one of the most consistently enjoyable columns of *CQ*." *Hear that, K2MGA?*

"Although I haven't been active on the air recently—work, night school and renovating the shack—I have been working on several projects, foremost of which are a 2 watt 6 meter walkie-talkie and a 6 meter transmitter. Future plans appear to be in the direction of u.h.f., with anticipation of some experimentation with antennas on these frequencies." *Our best wishes in that direction!*

Thirty

We would like to hear from those who received signals from Oscar III, as well as further reports on those working through it. And let's get some circuits into the column! Mail has been running slower than usual this month.

73, Bob, K2ZSQ & Allen, K2UYH

DX [*from page 69*]

ZE4JS	via W3HNK.
ZS8G	via W2CTN.
ZS8H	Box 1729, Johannesburg, South Africa.
4W1G	via HB9NL.
5A3TX	via W3HNK.
5A5TR	via W3HNK.
5U7AG	Box 201, Niamey, Niger Republic.
5V8AB	Lome Airport, Box 123, Lome, Togo Republic.
7Q7GN	via WB6DDL.
7Z3AB	Box 2486, Dhahran, Saudi Arabia.
9J2AB	via W6BAF.
9J2BD	Clair St. Kitwe, Zambia.
9U5ID	via W8HBI.
7Q7GS	Box 72, Zomba, Malawi.

73, Urb, W2DEC

CQ TECHNICAL BOOKS

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We've looked back through the years 1945-1952 and assembled all in one place the articles that have made a lasting stir. The issues containing most of these articles have long ago been sold out and are unavailable.

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This new Mobile Handbook by Bill Orr, W6SAI, has been getting raves from top experienced mobile operators. Written for advanced, as well as beginning mobile operators, much of this information cannot be found anywhere else. This is NOT a collection of reprints.

SIDEBAND HANDBOOK

Written by Don Stoner, W6TNS, who was almost one full year in the preparation of this terrific volume. This is **not a technical** book. It explains sideband, showing you how to get along with it . . . how to keep your rig working right . . . how to know when it isn't . . . and lots of how to build-it stuff gadgets, receiving adaptors, exciters, amplifiers.

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If you are, or are planning to be a VHF operator, you can't afford to be without this dynamic new handbook written especially for you. Filled from cover to cover with all new and original construction material presented so you can understand it. Written by Frank C. Jones, W6AJF, nationally acclaimed for his VHF pioneering.

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QSLs Samples 25¢. Rubber Stamps; Name Call, Address, $1.55. Harry Sims, 3227 Missouri Avenue, St. Louis, Mo. 63118.

PRINTED CIRCUIT BOARDS Hams, Experiments. Many different projects. Catalog 10¢ P/M Electronics, Box 6288 Seattle, Washington 98188.

HAMS Convert any television to sensitive, big-screen oscilloscope. Simple changes. No electronics experience necessary. Illustrated plans, $2.00. Relcoa, Box 10563, Houston, Texas.

ATTENTION HAMS! We buy, sell ham gear. Repair and alignment facilities available. Hold Advanced and First phone. Used Gear always reconditioned. Money back guarantee. KitKraft Company, P.O. Box 406—Canal St. Station, New York N.Y. 10013.

FOR SALE Complete instructions including 28 page booklet and 22" × 36" schematic for converting the ART-13 transmitter to a.m. and s.s.b. Satisfaction guaranteed. $2.50. Sam Appleton, 501 No. Maxwell St., Tulia, Texas.

WANTED—An APR-14, 13 receivers. SG-13, H-p4, SG-1, SG-2, MD-83, 479 Collins, in any condition. T-368-C xmtrs. R-390, 390A, R-388, 389, 391. Receivers. RT-66 thru 70 Rt units RT/77-GRC-9, GRC-10, GRC-19. RCA, Bendix, Collins Aircraft Radio and Radar Equip. Hewlett Packard, General Radio, Tektronix, etc., Test Equipment. GRC, PRC, GRR, TCC, ARC, sets ARM, PRM, URM, UPM, URM, SG Test sets any and all types. You name it. Call E. Charol, Tech Systems Corp., 42 W. 15th Street. N. Y. 11, N. Y. CH 2-1949 Collect.

REMOTE CONTROL UNIT, brand new $5.00. Postpaid. (Cost Navy $125.00) MDC, 923 W. Schiller, Phila. 40.

ELECTRONIC TUBES—TOP BRANDS SOLD at substantial savings! (Minimum Order $15.00). Authorized GE distributor. Send for FREE Buyers' Guide for all your Tube Requirements. Top Cash paid for your excess inventory (New Only—Commercial Quantities). Metropolitan Supply Corp., 443 Park Avenue South, New York, N.Y. 10016, 212-MU 6-2834.

ANTENNA tuning unit, brand new $3.00 postpaid (cost Navy $85.00). MDC, 923 W. Schiller, Phila. 40, Pa.

QSL's CB, WPE Samples 10¢ Nicholas & Son Printery P.O. Box 11184, Phoenix, Arizona 85017.

THIS COMPANY is looking for Ham & CB cartoon artists and ideas per idea IF ACCEPTED. For information, write AMBRU PRODUCTIONS. 10 Burbank Street. Yonkers, New York 10710.

MANUALS for surplus electronics. Stamp for list. W3IHD, 4905 Roanne Drive, Washington, D.C. 20021.

TELETYPE RIBBON modification kit for Model 15. New surplus. Special nylon ribbon automatically re-inks, outlasts 250 ordinary ribbons! $4.95, postpaid. Telemethods 3075 E. 123 Street, Cleveland, Ohio 44120.

INTERESTING OFFERS GALORE in the new "Equipment Exchange —Ham Trader"! Rush $1 for next 12 issues. Brand, WA9MBJ, Sycamore, Illinois.

BRAND NEW 5894 $18.00; 6442 $15.00; 6DQ5 $2.00; 7027 $1.00. Johnson Low Pass #250-20 $10.00. WA9NKT 1235 Hillcrest Lane, Freeport, Illinois.

FOR SALE—Gonset Communicator III 6 meters, 12v., complete with mike and book. Like new. Local sale only. $165.00 K2EEK, 75-15 177 St., Flushing 66, N.Y.

WANTED: Complete set or bound volumes of CQ for 1945 and 1946 for private collection. Write Scott Cowan, 73-62 Bell Blvd., Bayside, L.I., N.Y. 11364.

WANTED early issues of **QST.** 1922—Jan., Feb., Mar., 1921—all but May and July, 1920—all but April, May and June. K2EEK, **CQ,** 14 Vanderventer Ave., Port Washington, .I., N.Y., 11050.

BOUND VOLUME 1964 **CQ** for sale. Order no wand be sure to receive your copy. Limited quantity. First come first served. Send $15.00 to Dept. H.W., **CQ** Magazine, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050.

FOR SALE—Clegg Zeus transmitter $475; Clegg Interceptor Receiver $300; both for $750. or what do you have to trade. W1ZZF, 18 Fairview Ave., Trumbull, Conn.

Swan SW-240 $220 with Heathkit DC supply $245 HQ-170C $175, both excellent. W4SDC.

SELL—Eimac 4CX1000A, SK-810, SK-806, all together $150. B&W 825A $30. All new. Watkins, WA4NPA, Route 1, Box 118, Melbourne Beach, Florida.

S.R.R.C. HAMFEST: June 6, 1965. See Announcement section of "CQ" in the May issue or write for details after April 1, 1965. Starved Rock Radio Club W9MKS/W9QLZ, FRD #1 Box 171, Oglesby, Illinois 61348.

FOR SALE: Swan model 512 d.c. power supply. Swan model 406 frequency control unit, with instructions, in original cartons, very little used, $170 pp for both. Hustler 20 and 40 meter mobile resonators, $5 and $7.50. WA2HSB, 5 Addoms St., Plattsburgh, N.Y.

TELETYPE Model 28KSR, Mint Condition. $250 or best offer. K8JZW.

SX-140 Receiver for sale, factory wired. $75.00. WØEGC, 2042 North 33rd Terrace, Kansas City, Kansas.

KW-1 For Sale. Excellent Condition electrically and mechanically. $310. Write Bill, 1285 So. Smith Avenue, St. Paul, Minnesota.

PACKAGE DEAL: Collins 75A-4, serial 1926; KWS-1 serial 382; speaker; tubes; Eico oscilloscope #420; best offer over $1200! W8EUU 1000 Ingersoll, Coos Bay, Oregon.

FOR SALE: 70 ft Vesto Tower, complete. Telrex R200S rotator; Beams 4 ele wide spaced 20 mtr Telrex; 2 ele 40 mtr Hy-Gain 402-B; 6 ele 6 mtr; 15 ele 2 mtr. Flexible Steel Mast—24 ft ¼ in. wall; 500 ft. polyfoam coax and rotator control cables $400 and take it down—or, makd a bid. KØSGY—1723 Arizona Ave., NE, Cedar Rapids, Iowa, Tele: 362-4746.

SPRING AUCTION of the Rockaway Amateur Radio Club will be held Tuesday, May 28th, at 8:00 p.m. at the American Legion Hall, 301 Beach 92nd Street, Rockaway Beach, N.Y., Come to the best AUCTION in the New York area. Donation one dollar at the door, Free Prizes.

FULL KILOWATT on Sideband BX 5100B 51SB speech compression L1000A KW linear all $400; HQ170 $150. R Freeman K2JCK, work 201 843 2400 home 212 YU 9-5612.

KWM-1—Just checked by Collins. Big 6 meter beam. Prop Pitch motor. Best offer. WA2JDG Rowan, 8 Van Duyne Ave., Riverdale, N.J.

WANTED: Military Surplus Prop-Pitch motor preferable unmodified. William Firestone, 71 Southampton Dr., Willingboro, New Jersey 08046.

NOVICE: Heath HX-11 c.w. transmitter, 50w input, $35; Hallicrafters S-120 receiver $40; In good condition . . . Joun Seirsen, 1034 Clark Road, Aiken, S.C. 29801.

KWS-1 RF unit wanted. Electrically defective acceptable. Describe completely, W6BE.

CQ-20A, rack and cabinet, QT-1, manual $120. 500 watt Gonset linear, cabinet, 3-10 watts drive, 80-10 $100. Rack, 6' semi-enclosed $25. No shipping. K1KWV, Sleepy Hollow Road, New Canaan, Conn.

FOR SALE: Model 28 KSR teletype—mint condition—write John R. Niehaus, 208 ½ Church St., Doylestown, Ohio 44230.

For further information, check number 53, on page 110

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Please send me more information on your ads in the May 1965 *CQ* keyed as follows:

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49	50	51	52	53	54	55	56	57	58	59	60
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For further information, check number 24, on page 110

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Here's a whole dictionary of value in just **TWO WORDS!**

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MEANS TOP QUALITY VHF!

22'er TWO METER TRANSCEIVER

A ready-to-go fixed and mobile station covering the full 2 meter band (including MARS and CAP) that works directly off 115 volt AC, or 12 volts DC from built-in solid state supply. Combines the features which have made Squires-Sanders' Clegg equipment famous in VHF circles. Transmitter has powerful 20-watt input to high-efficiency final. Receiver boasts unique triple conversion design for increased stability. Increases selectivity to 10 KC at 6 db down. Nuvistor RF stage and low noise mixer provide .2μv sensitivity. S meter doubles as RF output indicator — this plus broadband exciter tuning makes it easy to peak transmitter for maximum output power. 14 tubes.

VALUE PRICED AT $239.50
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"VENUS" SIX METER SSB TRANSCEIVER

Most powerful 6 meter SSB transceiver! FB for AM and CW operation, too. 85 watts PEP input in all modes. Less than 100 cycle/hour drift after warmup. 24 tubes. Mike included.
YOURS FOR $495 **OR ONLY $22 A MONTH***

MODEL 416 AC POWER SUPPLY/SPEAKER to drive the "Venus."
$110.00 **or only $5 a month***

"APOLLO 700" LINEAR AMPLIFIER for "big-station" performance on 6 meters. 700 watts PEP input with only 10 watts drive. Built-in solid state power.
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SS BOOSTER provides to 20 db increase in average power. Plugs into the "Venus" RF stage. Can be used with or without the "Apollo 700" . . . . . $97.50 **or only $5 a month***

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For further information, check number 5, on page 110

2 Full Gallons
in a pint size container

Nothing under the table . . . National's self-contained NCL-2000 amplifier packs a full 2000 watts PEP in its desktop cabinet. A real rock-crusher, the NCL-2000 delivers up to 1400 watts of peak SSB output into your antenna on the 80 through 10 meter bands, and is fully rated for 1000 watts *D.C.* input in CW, AM, and RTTY operation.

National's two-gallon package has features you won't find elsewhere at twice the price: two husky RCA 8122 output tubes, designed specifically for high-power SSB service, provide 800 watts of available plate dissipation; adjustable passive grid circuit allows operation with exciters providing from 20 to 200 watts output, and may be used as exciter dummy load for easy exciter tune-up with amplifier plate voltage removed; ALC output for use with the NCX-5 and other exciters incorporating ALC provisions; separate plate and multi-meters; high-efficiency operation in CW and RTTY modes; all changeover relays incorporated for use with either transceiver or transmitter-receiver combinations; automatic switch-over to exciter-only when plate voltage is removed; and complete safety and overload protection, including lid interlock, automatic B+ shorting bar, time delay, and current overload relays. To top it all off, the NCL-2000 carries National's One-Year Warranty.

Your National dealer will wrap up this potent little package for you at the pint-sized price of $685.

NATIONAL RADIO COMPANY, INC.

37 Washington Street, Melrose, Massachusetts, 02176 World Wide Export Sales: Auriema International Group, 85 Broad Street, New York City, N. Y.; Canada Tri-Tel Associates, 81 Sheppard Ave. W., Willowdale, Ontario

See us at the AFCEA Show, Booth 82

For further information, check number 55 on page 110

RCA-7094...TOPS FOR GROUNDED-GRID IN SSB

RCA-7094 offers a remarkably simple way to build a medium power grounded-grid linear for SSB.

Because it is designed with an indirectly heated cathode, special filament chokes are not required. Most of the driving power appears as useful power in the output circuit so that high overall efficiencies can be achieved. Neutralizing, generally, is not necessary. "Swamping" resistors are not needed. A screen and bias power supply is eliminated, too.

For complete information on how to build an RCA-7094 grounded-grid linear...refer to RCA "Ham Tips," Vol. 19, No. 3, August, 1959 issue. For complete technical data on the 7094 in other classes of service, write to Commercial Engineering Department, Section E15M, RCA Electronic Components and Devices, Harrison, N.J.

AVAILABLE THROUGH YOUR AUTHORIZED RCA INDUSTRIAL TUBE DISTRIBUTOR.

LINEAR RF POWER AMPLIFIER
CLASS B—TRIODE CONNECTED

SSB-Service (ICAS) Typical Operation Ratings

DC Plate Supply Voltage	1750 volts
Max.-Signal Plate Input	350 watts
Max.-Signal Driver Power Required (Approx.)	15 watts
Max.-Signal DC Plate Current	200 ma

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